

M.O. No. 197.

REPORT OF THE EIGHTH MEETING  
OF THE  
INTERNATIONAL METEOROLOGICAL  
COMMITTEE,

PARIS, SEPTEMBER, 1907.

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Published by Authority of the Meteorological Committee.

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Barometric Gradient and Wind-Force. Report to the Director  
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Life-History of Surface Air Currents. A Study of the Surface  
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Meteorological Observations made at Sanchez, Samaná Bay, St.  
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Report on the Meteorology of Kerguelen Island. By Rev. S. J.  
Perry, S.J., F.R.S. (No. 37, 1879.) 3s.

Climatological Observations at Colonial and Foreign Stations.  
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## LIST OF INTERNATIONAL METEOROLOGICAL MEETINGS.

- 1872. LEIPZIG, Conference of Meteorologists.
- 1873. VIENNA, Congress of Official Delegates.
- 1874. UTRECHT, First Meeting of the Permanent Meteorological Committee.
- 1876. LONDON, Second Meeting of the Permanent Meteorological Committee.
- 1878. UTRECHT, Third Meeting of the Permanent Meteorological Committee.
- 1879. ROME, Congress of Official Delegates.
- 1880. BERNE, First Meeting of the International Meteorological Committee.
- 1882. COPENHAGEN, Second Meeting of the International Meteorological Committee.
- 1885. PARIS, Third Meeting of the International Meteorological Committee.
- 1888. ZÜRICH, Fourth Meeting of the International Meteorological Committee.
- 1891. MUNICH, First Ordinary Conference of Directors of Offices and Observatories.
- 1894. UPSALA, Fifth Meeting of the International Meteorological Committee.
- 1896. PARIS, Second Ordinary Conference of Directors of Offices and Observatories.
- 1899. ST. PETERSBURG, Sixth Meeting of the International Meteorological Committee.
- 1903. SOUTHPORT, Seventh Meeting of the International Meteorological Committee.
- 1905. INNSBRUCK, Third Ordinary Conference of Directors of Offices and Observatories.
- 1907. PARIS, Eighth Meeting of the International Meteorological Committee.

A meeting of the Committee was held in Paris in 1900 for the transaction of formal business in connexion with an open Congress of Meteorologists.

## PREFACE.

THIS Report of the eighth ordinary Session of the International Meteorological Committee, held at Paris in September, 1907, is translated from the German edition issued by the Prussian Meteorological Institute, of which Geheimrat G. Hellmann, Secretary of the Committee, is the Director.

I have added to the report on Meteorological averages (Appendix XIII) the replies to the official circular of 15th November, 1907, which have been received since the original edition was sent to the press. At this date the list of normal averages available for Meteorological work is by no means complete, and I am therefore adding the titles of official publications of other countries which are in the Library of the Meteorological Office and to which reference may be made for normals.

The organisation of the system of international meteorological co-operation was formulated at Paris, and rules embodying the usage are printed in Appendix XI. To those who were present these rules will always be affectionately regarded as the last and in some ways the most characteristic of the services rendered to the International Committee by its lamented president, the late M. Mascart. I have printed on the opposite page a list of the international assemblies, the traditions of which are embodied in the rules.

I have found by experience that it is convenient to have at hand a list of members of the International Committee and of its Commissions. I have therefore given in an additional Appendix, XIV., the lists as completed at the Paris meeting. In doing so I must note with regret that in the short time that has elapsed vacancies have occurred, and I must pay the fitting tribute of well-merited respect for the services of those whose names are no longer on the roll. To those who are so closely associated as the members of the International Committee the loss of a colleague is a personal grief, and the duty of writing these few lines of preface is saddened by the recollection that death has claimed M. Lancaster, Sir John Eliot, and M. Mascart.

W. N. SHAW.

Meteorological Office,  
11th November, 1908.



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# REPORT OF THE MEETING

OF THE

## INTERNATIONAL METEOROLOGICAL COMMITTEE AT PARIS,

September, 1907.

### PROVISIONAL PROGRAMME.

#### I.—SUBJECTS REFERRED TO THE COMMITTEE BY THE METEOROLOGICAL CONFERENCE AT INNSBRUCK.

1. The classification of Meteorological Stations.
2. Definition in a clear and precise manner of the terms  
"rime" (*Rauhreif, Duft*) (*givre transparent*), "white frost"  
(*Raufrost, Anreim*) (*givre opaque*) and "glazed frost" (*Glatteis*)  
(*verglas*).

#### 3. International Organisation :—

"The Conference requests the International Meteorological Committee to prepare for the approval of the next Conference of Directors a general scheme for regulating international meteorological organisation. The scheme should take account of the historical development of the present organisation, and should be in agreement with the various resolutions adopted at Conferences of Directors and at meetings of the International Meteorological Committee or of Commissions."

Great importance was attached to this question at the Conference at Innsbruck and it forms the subject of suggestions by several members of the Committee. The great number of Commissions, which frequently meet independently of the meetings of the Committee, has proved a source of considerable difficulty to those of our members who belong to several Commissions, as they have trouble in obtaining the necessary authority from their respective Governments for undertaking these, almost annual, journeys. In order to be able to discuss this question in an effective manner, we have thought it necessary to invite the Presidents of Commissions to take part, on this occasion, in our discussions.

#### 4. International System of Storm Signals.—Item No. 34, of the Innsbruck programme, brought forward by the Rev. Louis Froc :—

"Would it not be of advantage to marine meteorology (storm-warning services) to recommend to all institutions engaged in this branch of work, an improved system of signals for communicating to ships the information which they at present send to ports and semaphore stations?"



5. *Extremes of Temperature in Daily Weather Reports.*—Item No. 5, of the Innsbruck programme, brought forward by M. Herz:—

“The introduction of uniformity in the manner of publication of extremes of temperature in daily weather reports.”

was referred to the Committee with the following rider:—

“As this point bears also on climatology, the Conference agrees that it be referred to the International Meteorological Committee. The Conference favours the entry in the reports of the minimum temperature for the 24 hours preceding the despatch of the telegrams.”

## II.—NEW SUBJECTS.

6. *Wireless Messages.*—The advisability of each member urging upon his Government the importance of national regulations for such control of wireless telegraphy as will compel each ship licensed to carry wireless instruments to take and transmit meteorological observations, also to transmit to other ships or to stations on shore all observations received. (W. L. Moore.)

7. *International Storm Signals.*—The advisability of adopting a form of international storm signals. (W. L. Moore.)

8. *Projection and Scale of Weather Maps.*—The desirability of uniformity in the matters of projection and scale for weather maps and marine meteorological charts. (W. N. Shaw.)

9. *Reference to Mean values.*—The method of reference to average values in the international forms. How many years are we to use, and which years? (W. N. Shaw.)

10. *Wireless Telegraphy.*—(W. N. Shaw.)

11. *Daily Reports for the whole Globe.*—The necessity of following day by day the state of the principal meteorological elements over the whole surface of the globe, with the help of observations from about 30 stations (most of which are already in existence) distributed over equatorial, subtropical, temperate and polar regions. This project could be realised with least expense by sending telegrams from the individual stations to their Central Offices, and having these reports forwarded by post to the Offices of neighbouring countries. We should then be in a position to determine the general conditions of the globe day by day.

(L. Teisserenc de Bort.)

12. *Synoptic Charts for the Tropical Regions of the Atlantic Ocean.*—Can the publication of small synoptical charts for the intertropical regions of the Atlantic Ocean be organised in order to complete the interesting “*Internationaler Dekadenbericht*,” published by the *Deutsche Seewarte*?

(L. Teisserenc de Bort.)

13. *Mean values for Lustra.*—It is desirable that all central observatories publish mean values for the lustra defined by the Congress of Vienna, for the principal meteorological elements for stations in their respective systems. (K. Nakamura.)

14. *Damage by Lightning.*—It would be useful if Central Meteorological Institutes would organise a special service of information regarding the incidence of damage by lightning.  
(L. Palazzo.)

15. *Telegrams from the Iberian Peninsula.*—It is a matter of great importance to the forecasting services of Europe to increase the number of stations in the Iberian Peninsula, which send international meteorological telegrams. (L. Palazzo.)

16. *Stations in Italy.*—On the equipment of temperature and rainfall stations in Italy. (L. Palazzo.)

17. *On the Establishment of Observatories in Centres of Atmospheric Action.*—This question was brought forward at the meeting of the Committee at St. Petersburg in 1899, and a report on the subject is contained in the Official Report of the Proceedings of that Meeting (Appendix XI.). Most of the members took part in the discussion, and the Committee unanimously adopted the following resolution:—

“The Committee recognizes the great importance of securing regular observations from certain spots which appear to possess special importance in indicating the general character of the movements of the atmosphere.”

The Conference at Innsbruck in 1905 (Report, pp. 36-37) unanimously adopted a resolution of the Solar Commission advocating the establishment of permanent stations in the regions in question. (This resolution only referred to stations of the 2nd order:—barometrical pressure, temperature, rain, wind and direction of the upper clouds.)

As most of the Directors, who are in a position to assist in carrying out this important enterprise, are members of the Committee, an effective discussion of the subject leading to practical results should be possible. (H. H. Hildebrandsson.)



# MINUTES OF THE MEETINGS.

## First Meeting, Tuesday, September 10th, 1907.

The meeting commenced at 9.15 a.m.

Present: Messrs. Hellmann, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Rykatcheff, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot and Hergesell.

1. M. Hildebrandsson, as the only officer present, opened the meeting, and proposed that M. Angot, Director of the Central Meteorological Office of France, be invited to take part in the meetings.

The proposal was adopted.

2. M. Hildebrandsson read a letter from the President, M. Mascart (Appendix I.), who was prevented from attending the meeting on account of illness.

Mr. Shaw was asked to take the chair in his stead.

3. M. Hildebrandsson read the Report of the Bureau (Appendix II.)

4. M. Angot submitted to the meeting the French edition of the Report of the Conference at Innsbruck.

5. M. Hildebrandsson read a letter from M. Hepites, saying he would be unable to attend the meeting.

6. M. Hildebrandsson read a letter from M. Hann. (Appendix III.)

This letter was accompanied by the three following papers:—

*Der tägliche Gang der Temperatur in der inneren Tropenzone.* Vienna, 1905. 4°. 1 Vol., p. 118. S.-A., Vol. 78. Denkschr. d. math. naturw. Kl. d. Kaiserl. Akad. d. Wiss.

*Der tägliche Gang der Temperatur in der äusseren Tropenzone.* A. *Das amerikanische und afrikanische Tropengebiet.* Vienna, 1904. 4°. 1 Vol., p. 88. S.-A., *Loc. cit.* Vol. 80.

*Der tägliche Gang der Temperatur in der äusseren Tropenzone.* B. *Das indische und australische Tropengebiet.* Vienna, 1907. 4°. 1 Vol., p. 93. S.-A., *Loc. cit.* Vol. 81.

All published by Karl Gerolds and Son, Vienna.

M. Pernter gave notice that, on behalf of M. Hann, he intended to bring forward at a subsequent meeting a proposal for taking steps to produce new charts of isotherms for the world.

7. The report of the Magnetic Commission was submitted by M. Rykatcheff. (Appendix IV.)

8. The report of the Aeronautical Commission was submitted by M. Hergesell. (Appendix V.) In connection with this report

the chairman stated that Captain Lyons had had pilot balloons sent up from Cairo which had reached the average height of 5,300 meters; above 1,200 meters a constant west wind was observed.

M. Hildebrandsson reported that, in conjunction with M. Teisserenc de Bort, he had sent up from Kiruna, in Swedish Lapland, 22 pilot balloons in March, 1907, of which half were found again.

9. Messrs. Angot and Hellmann stated that observations of radiation with the Ångström apparatus had been commenced in France and at Potsdam.

10. Items 1 and 2\* of the provisional programme were postponed to a later meeting by request of M. Pernter.

11. *Uniform system of Storm Signals.*—Discussion was opened on Item 4 of the provisional programme. After an exhaustive discussion the Committee passed the following resolution:—

“In view of the fact that the system of signals proposed by M. Froc has been used successfully in Eastern Asia, the Committee has appointed a Special Commission to examine it.”

The members appointed to serve on this Commission were Messrs. Froc, Nakamura, Herz, Shaw, Mohn, Moore, and Angot. Mr. Shaw was asked to act as President of the Commission. A request was also made that a report be printed and circulated two months before the next meeting of the Committee.

12. *Extremes of Temperature in Daily Weather Reports.*—Item 5. “The Committee proposes that telegraphic reporting stations take an additional reading of the maximum and minimum thermometer at the morning observation, in order that the telegrams may report the highest and lowest temperatures of the preceding 24 hours.”

13. *Projection and Scale of Weather Maps.*—Item 8. (1) After discussion the Committee passed the following resolution:—

“The Committee agrees in principle to the proposals of Mr. Shaw. It recognises that there may be difficulties in altering the sizes of the charts now in use in different countries. In cases where changes are possible, the Committee suggests proceeding with them in accordance with the motion brought forward by Mr. Shaw.” (Appendix VIIA.)

14. *Marine Meteorological Charts.*—Item 8. (2) This was referred to the Special Commission mentioned above. (See Minute 11.)

The meeting adjourned at 11.50 a.m.

(Signed) W. N. SHAW.

## Second Meeting, Tuesday, September 10th, 1907.

The meeting commenced at 3.15 p.m.

Present: Messrs. Hellmann, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Rykatcheff, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot and Hergesell.

\* Classification of stations; definitions of “Givre,” “Verglas.”



Items 9 and 13. (Appendix VIIb.)

*Reference to Mean Values in international forms.—Means for lustra.*—In connection with these items, Mr. Nakamura presented the following publication :—

*Results of the meteorological observations made in Japan for each period of five years since 1876, and for the 10, 15, 20, 25, 30 years ending 1905.* Published by the Central Meteorological Observatory, Tokio, 1906.

After an exhaustive discussion, in which all present took part, the Committee adopted the following resolutions :—

1. "The Committee attaches importance to the publication of means for lustra in accordance with the resolutions of Vienna and Munich."

2. "The Committee decides to request Directors to enumerate the publications containing average values for long periods for the various meteorological elements for stations in their systems. These statements are to be published as an appendix to the minutes." (Appendix XIII.)

The meeting adjourned at 5 p.m.

(Signed) W. N. SHAW.

### Third Meeting, Wednesday, September 11th, 1907.

The meeting commenced at 9.45 a.m.

Present: Messrs. Hellman, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot, Hergesell, and Teisserenc de Bort.

1. *Minutes.*—The minutes of the meetings of the 10th September were read and confirmed.

2. *Telegraphic Reports of Cloud Motion.*—The Secretary read a communication from the Deutsche Seewarte, regarding the introduction of observations of the form and direction of motion of clouds in international weather telegrams. (Appendix VIII.)

3. *Commission on Isothermal Charts for the World.*—M. Pertner proposed, in the name of M. Hann, that a Commission be appointed for the preparation of new isothermal charts of the world.

The proposal was adopted, and the following gentlemen were appointed members of this special Commission :—M. Hann, President, M. Mohn, and Sir John Eliot.

4. *Damage by Lightning.*—Item 14. M. Palazzo read a report on damage done by lightning, in which he explained the utility of investigations on the subject.

The Committee noted M. Palazzo's report with interest.

5. *Daily Reports for the whole Globe. Commission appointed.*—Item 11. The Committee was most interested in the proposal of M. Teisserenc de Bort, and appointed a special Commission for the

examination of this important question, consisting of Messrs. Teisserenc de Bort, *President*, Hildebrandsson and Hergesell. (Appendix X.)

6. *Ten-Day Charts of the Atlantic Ocean.*—Item 12. After a discussion the Committee agreed to request the Deutsche Seewarte to extend the area of the "Dekadenberichte" to include the tropical regions of the Atlantic Ocean. The Committee leave the Seewarte to arrange for the co-operation of other institutions which are able to assist in carrying out the enterprise.

7. *Telegraphic Reporting Stations in Spain and Portugal.*—Item 15. M. Palazzo pointed out the enormous importance, especially to Italy, of securing daily weather telegrams from several stations in the Iberian Peninsula. After discussion the Committee came to the conclusion that it was not within their competence to adopt a resolution on this question which only concerns Italy and Spain. As several members expressed a desire that steps should be taken to ensure weather telegrams from Spain arriving in good time, the Committee, on the motion of M. Angot, adopted a resolution requesting that the Spanish Government be approached officially with a view to securing the despatch of daily weather telegrams from Spain in good time.

The meeting adjourned at noon.

(Signed) W. N. SHAW.

### Fourth Meeting, Wednesday, September 11th, 1907.

The meeting commenced at 3.15 p.m.

Present: Messrs. Hellmann, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot, Hergesell, Teisserenc de Bort.

1. *Government control of Wireless Telegraphy.*—Items 6 and 10. The Committee was of opinion that there would be great difficulty in adopting the demands put forward by Mr. Moore.

The Committee noted the communication of Mr. Shaw with great interest. (Appendix VIIc.)

*Commission on Weather Telegraphy.*—M. Hellmann proposed to the Committee that a new Commission be appointed on weather telegraphy, which should deal with all questions connected with weather telegraphy and especially with wireless telegraphy. This proposal was adopted. The following were appointed members of the Commission :—Messrs. Shaw, *President*, Angot, Herz, Moore, and Rykatcheff.

2. *Auxiliary Climatological Stations.*—Item 16. M. Palazzo read an account of the equipment of rainfall and temperature stations (auxiliary climatological stations) in Italy.

3. *Observations from Centres of Action.*—Item 17. M. Hildebrandsson reported on the erection of observatories in the regions designated as "centres of atmospheric action." He showed on a chart what parts of the world are of most importance for this



study. The Committee recognised the great importance of such observations, and the Directors, present at the meeting from countries owning the regions mentioned by M. Hildebrandsson, promised to assist in the establishment of such stations.

The meeting terminated at 5.30 p.m.

(Signed) W. N. SHAW.

### Fifth Meeting, Thursday, September 12th, 1907.

The meeting was held at Poissy, at 11 a.m.

Present: Messrs. Mascart, *President*, Hellmann, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Rykatcheff, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot and Hergesell.

1. *International Meteorological Organisation*.—Item 3. A report by Messrs. Mascart and Hildebrandsson was read concerning the regulation of international meteorological organisation. The first part of the report was discussed and adopted with certain alterations.

2. *Resignation of M. Mascart*.—M. Mascart stated that he wished to resign his position on the Committee, as he was no longer Director of his Institute, and bade his colleagues farewell.

Mr. Shaw then spoke as follows:—

"HONOURED COLLEAGUES,—Allow me to express, in the name of the Committee, the deep regret with which we have received the intimation of the resignation of Monsieur Mascart, and, at the same time, to give voice to our thanks for the eminent services which he has rendered to the Committee and to Meteorological Science.

"We shall always remember the President as an illustrious physicist whom we have to thank for the International Meteorological Tables, who has, for 14 years, conducted the business of our meetings with such remarkable ability and tact, with such a thorough knowledge of meteorology and of science in general, as well as of the world as we find it. Monsieur Mascart has left us that most valuable heritage—an incurable optimism as regards international meteorology. A short while ago I read in a French journal that the word 'impossible' is not French. To-day, we meteorologists feel ourselves to be French, and, in future, for international meteorology let us adopt that motto.

"There remain still, I am well aware, many difficulties to be overcome, but, at the same time, I recollect another *mot*—which is also French, I think—'The greatest and most terrifying difficulties are those which do not really exist.'

"On your behalf I wish for Monsieur Mascart a speedy and complete recovery, and for Monsieur and Madame Mascart and their family many years of happiness."

The meeting adjourned at 12.30 p.m.

(Signed) W. N. SHAW.

### Sixth Meeting, Thursday, September 12th, 1907.

The meeting commenced at 4.45 p.m.

Present: Messrs. Hellmann, Lancaster, Mohn, Nakamura, Palazzo, Pernter, Rykatcheff, Shaw, and Hildebrandsson, *Secretary*.

Visitors present: Messrs. Angot, Hergesell, and Teisserenc de Bort.

1. *Election of President*.—Mr. Shaw was unanimously elected President.

2. *Minutes*.—The minutes of the meetings of 11th September were read and confirmed.

3. *Election of New Member*.—M. Angot was elected a member of the Committee as successor to M. Mascart.

4. *International Organisation*.—The Committee continued the discussion of the regulations of international meteorological organisation, which, with a few alterations, were accepted as final. (Appendix XI.)

These regulations will be submitted to the next Conference of Directors, and will be circulated six months before the meeting to all directors who are invited.

Until the next Conference of Directors the Committee will look upon the regulations as being in force.

5. *Radiation Commission*.—The Secretary read a letter from M. Ångström, Chairman of the Radiation Commission. The letter contained:—

(1.) A report on the most recent work on Radiation, with printed supplement; and,

(2.) A request to be allowed to resign the Presidency of the Commission for reasons of health. (Appendix XII.)

The Committee noted the decision of M. Ångström with great regret. M. Pernter was asked to take over the Presidency of the Commission on Radiation for the time being.

6. *Squall Commission*.—M. Hildebrandsson resigned his place on the Commission for the Investigation of Squalls, and M. Angot was elected chairman in his stead.

7. *Resignation of M. Hildebrandsson*.—M. Hildebrandsson stated that he wished to resign his membership of the Committee as he was no longer Director of his Institute, and bade his colleagues farewell.

On behalf of the Committee, the President thanked M. Hildebrandsson for his successful and prolific services as Director of the Royal Observatory in Upsala, as member of the Committee since the Conference at Munich, and as Secretary since the resignation of Mr. Scott in 1900.

The President recalled particularly the Reports of the Cloud Commission, the splendid work undertaken jointly with M. Teisserenc de Bort, the Cloud Atlas, the papers on the Centres of



Atmospheric Action, and the history of our knowledge of dynamic meteorology. He concluded with a sympathetic reference to the cause of M. Hildebrandsson's resignation of the directorship of the Observatory at Upsala, celebrated, and with good reason, throughout the meteorological world.

*Election of new Members.*—The Committee proceeded to elect new members in the place of Messrs. Paulsen, Russell, and Hildebrandsson.

Messrs. Hamberg, Maurer, and Stupart were elected by ballot.

8. *Election of Secretary.*—M. Hellmann was elected Secretary of the Committee in place of M. Hildebrandsson.

9. On behalf of the Committee, M. Rykatcheff thanked the late President of the Committee, M. Mascart, in the following words:—

"We are about to part from our esteemed President, Monsieur Mascart, who for many years has taken the Chair at our meetings with wonderful ability. He has presided over our discussions with remarkable circumspection, for he possesses the art of reconciling opinions which at first sight seemed quite opposed to one another. I think I express the general feeling of the whole meeting when I tender our thanks to Monsieur Mascart. I lay the following proposition before my colleagues—that we present to Monsieur Mascart an album containing the portraits of all members of Committee, in remembrance of our mutual work, and as a token of our esteem and the friendly sentiments we bear him."

This proposition was unanimously adopted; the Officers were charged with its execution.

The Chairman declared the session of the Committee closed.

The meeting adjourned at 6 p.m.

(Signed) W. N. SHAW.

## APPENDICES.

### APPENDIX I.

#### LETTER FROM M. MASCART.

"MY DEAR COLLEAGUES,—I was looking forward to receiving you this year and to taking part in your deliberations at a session which would be the last for me. Above all I wish to express my gratitude for the kindness and goodwill which, for many years, you have unceasingly shown to me, especially for your kind thought at Innsbruck in reserving for me the office of President of the Committee, in spite of my absence.

"It is with the keenest regret that I am obliged to give up this honour on account of my health.

"I now take the liberty of asking you a great favour, which is that you will hold a private meeting of the Committee at Poissy, which will enable me to see you all again, and to say good-bye to you. M. Angot will show you how this can be arranged without much loss of time, and I hope that you will join me in a simple lunch.

"I leave you to choose the day which will be most convenient to you.

"E. MASCART."

### APPENDIX II.

#### INTERNATIONAL METEOROLOGICAL COMMITTEE.

##### REPORT OF THE OFFICERS.

The German edition of the Official Report of the general Conference at Innsbruck was published and distributed at the commencement of this year. The English and French editions have gone to press.

The Conference re-elected all the old members of the Committee. It appointed M. Nakamura, Director of the Imperial Meteorological Institute at Tokio, to the vacancy occasioned by the death of M. Billwiller.

At the meeting of the 14th September held at Innsbruck, the Committee re-appointed the following Commissions:—

- (1) Magnetic Commission, President M. Rykatcheff.
- (2) Aeronautic Commission, President M. Hergesell.
- (3) Solar Commission, President Sir Norman Lockyer.
- (4) Radiation Commission, President M. Ångström.

At the meeting at Southport the International Committee requested Messrs. Hellmann and Hildebrandsson to prepare for



official publication an International Meteorological Codex, containing the resolutions adopted by the Conferences and Committees which have met since 1872, together with commentaries and explanatory notes. The manuscript of this codex was submitted and examined at the Innsbruck Conference, which expressed a wish to see it published in German, English and French. The Reverend José Algué, of Manila, offered to undertake the preparation of a Spanish edition. The German edition was published and distributed at the beginning of this year, the English and French editions are in course of preparation.

Since the session at Innsbruck we have been unfortunate in losing, by death, our colleagues Messrs. Paulsen and Russell, and our former colleague M. von Bezold. Mr. Russell living at a distance, had not been able to take part in the meetings of the Committee. Messrs. Paulsen and von Bezold took part in our work during many years with a zeal and devotion which we hold in most grateful remembrance.

E. MASCART.  
H. HILDEBRANDSSON.

### APPENDIX III.

#### ISOTHERMAL CHARTS FOR THE WORLD.

Spital am Pyhrn,  
5th September, 1907.

"To Professor Dr. H. Hildebrandsson.

"MY DEAR COLLEAGUE,—As you know, some time ago, I think on the occasion of the meeting of the International Committee at St. Petersburg, I suggested the collection and publication of all existing observational results on the diurnal change of temperature, in order to create a secure foundation for the calculation of accurate, so-called true, temperature means.

"Since Dove's papers on the diurnal change of temperature, which were published about the middle of the last century, no further collection, comprising the whole world, has appeared of the existing data of the diurnal change of temperature. It is true that, for extra-tropical countries, this want has been partially met, particularly by the researches of Wild. But we have no recent tables on the diurnal change of temperature for just those great expanses of the Earth's surface, namely, the Tropics (India excepted) where the need of such a collection is most felt; because there, more than anywhere, systems of observations with methodically arranged temperature records are wanting. This has induced me, after some delay, to start this work myself and to collect and discuss the existing hourly tropical temperature records. This work, in three parts dealing with over 70 temperature stations, is now ready.

"I take the liberty of sending a copy and request that you will undertake the duty of laying it before the International Committee.

"I have endeavoured in my work to collect and discuss all the available material, and to lay the results before my professional

colleagues in the most convenient form. I should like to draw attention to the fact that for each station I have briefly dealt with all meteorological elements which influence the change of temperature.

"The aim of my work was first and foremost a practical one, and short series of observations were, therefore, also taken into consideration. Perhaps, however, theory will also be able to make occasional use of my work.

"With kind regards,

"Your sincere colleague,

"J. HANN."

### APPENDIX IV.

#### REPORT OF THE PRESIDENT OF THE INTERNATIONAL COMMISSION ON TERRESTRIAL MAGNETISM AND ATMOSPHERIC ELECTRICITY.

Although its organisation is very recent, the Commission has already had the misfortune to lose two of the most eminent of its members, Messrs. von Bezold and Paulsen. It is not necessary for me to recall here the great services which they have rendered to Science and the sympathy which they inspired in all who came in contact with them. The credit for the re-organisation of the Magnetic Commission, adopted by the Innsbruck Conference should be given to M. von Bezold.

Concerning this re-organisation, the Conference passed the following resolution:—

"A Permanent Bureau, consisting of from three to five members, is to be elected from among the members of the Magnetic Commission. It shall be the duty of this Bureau to carry out the resolutions of the Magnetic Commission, and to prepare the business for the meetings. The Bureau is also instructed to communicate with the Department for Terrestrial Magnetism of the Carnegie Institution, and to work out a plan for the co-operation of the larger existing institutes with the Department. This plan for co-operation shall be submitted for approval at the next Conference of Directors." (The sixth of the nine resolutions of the Magnetic Commission adopted by the Innsbruck Conference, 1905.)

The Conference re-elected Messrs. Bauer, von Bezold, Carlheim-Gyllensköld, Liznar, Mascart, Mendenhall, Moureaux, Palazzo, Paulsen, Rücker, Rykatcheff, Schmidt, Schuster, and Snellen. M. Rykatcheff was elected President.

At the first meeting of this Commission the following new members were co-opted: Messrs. Brunhes, Chree, Dubinsky, Kesslitz, Messerschmitt, Stupart; the following were appointed to serve on the Permanent Bureau (Executive Committee): Messrs. Rykatcheff (President), Schmidt (Secretary), Chree, Carlheim-Gyllensköld and Moureaux.

The Commission has authorised the President and the Secretary to transact business in the name of the Executive Bureau, giving



them entire authority to decide in what cases the remaining members of the Commission should be consulted. M. von Bezold, in the name of the Prussian Meteorological Institute, to which body the Secretary of the Commission belongs, has informed us that that Institute will defray provisionally the expenses of the Bureau.

Our first care has been to ascertain if those newly-elected members of the Commission and of the Executive Bureau, who were not present at Innsbruck, will consent to serve. We have had the pleasure of receiving replies in the affirmative from all.

In December, 1905, a circular containing the report of the re-appointment of the Commission and the resolutions of the Innsbruck Conference was distributed to all members of the Commission. We stated that the Bureau would pursue to the best of its ability the object for which it was appointed, and at the same time we begged members of the Commission to assist it as much as possible—not only during the meetings, which cannot be convened very often, but also to communicate with it during the intervals. The Bureau will send reports of its work to all members and ask them to be good enough to express their opinion, their proposals, and their advice with regard to the steps to be taken.

The President and the Secretary are conducting the business of the Commission in accordance with the following regulations, which have been communicated to the members of the executive Committee:—

- (1). Current business will be conducted by the Secretary acting conjointly with the President.
- (2). This applies primarily to the formal execution of all business connected with resolutions of the Conference.
- (3). Propositions concerning all other questions will be submitted to all the other members of the Bureau, and be decided by vote; a simple majority of votes given before a stated date will decide.
- (4). This regulation applies to agreements come to with the "Department of Terrestrial Magnetism," and also to all proposals made by members of the Commission.
- (5). Copies of all documents concerning the conduct of business will be sent to all members of the Bureau.
- (6). In order to facilitate the work of the Bureau, correspondence will be carried on in French, German, or English.

In January, 1906 the Bureau sent a circular to all Magnetic Observatories, communicating the resolutions of the Innsbruck Conference, and calling particular attention to resolutions 2 and 3.

In Resolution 2, Magnetic Observatories are invited to draw up, from January, 1906, lists containing a classification of all days in the year on the scale 0, 1, or 2.

0 meaning quiet day,

1 „ day with moderate disturbances,

2 „ „ „ violent disturbances.

The Bureau has prepared a scheme for publication of these lists, and has announced that M. Snellen, who formerly collected and

published the lists of "quiet" days, has kindly consented to continue to collect and publish the lists in their new form.

In Resolution 3, a desire is expressed that Magnetic Observatories shall exchange copies of magnetometer traces for very disturbed days (type 2 of the scale mentioned above), or other exceptionally interesting days with as little delay as possible. During the last two years such curves have been exchanged between most observatories; the Commission has recommended the extension of such exchanges as much as possible, but it has expressed the opinion that the adoption of formal regulations would be premature; the choice of the process of reproduction and of the scale is left to each observatory. The circular was completed by including a recommendation by M. Snellen that all times should be given according to Greenwich Mean Time.

The two proposals have been adopted by most observatories. The lists mentioned form the subject of a special publication issued by the Royal Meteorological Institute of the Netherlands (de Bilt) under the title "Commission Internationale de Magnétisme Terrestre. Caractère Magnétique de chaque Jour."

To the circular we have added a provisional list of Magnetic Observatories, and we have asked each Director to communicate to us accurate values for the geographical co-ordinates of his establishment, the name of the superintendent, its status, *i.e.*, whether it be maintained by the State, or by private individuals, and whether it be independent, or form part of another Institute, the nature and extent of the observations, the date of its establishment and historical development. When the replies have been received, a list of observatories, giving these particulars, will be published and distributed to all observatories, to members of the Meteorological Committee and of the Magnetic Commission. We hope that this list will be published also in "Terrestrial Magnetism," as our colleague Mr. Bauer intended to prepare and publish a similar list, and only gave up the idea on receipt of our circular. I regret to report that the number of replies is as yet very small; I would ask those of my colleagues who have not yet answered the circular kindly to do so as soon as possible in order not to delay the publication of the list.

After taking steps to carry out the requirements of Resolutions 2 and 3, we had to deal with the project for completing the network of stations. In Resolution 7 the Conference expressed a desire that the network of Magnetic Observatories be made more complete. For theoretical and practical reasons, it is necessary to commence with a series of temporary stations situated near a line passing through the poles of the magnetic axis and crossing Africa meridionally. These stations should be provided with autographic variometers and should be maintained in operation for a complete sunspot cycle, if possible.

At the invitation of the Secretary in co-operation with the President of the Bureau, M. Carlheim-Gyllensköld the initiator of the proposal in question, sent to the Bureau a supplementary note to his paper presented to the Innsbruck Conference, in which he made practical proposals for studying perturbations according



to his method. He also gave a list of stations which should be established in polar regions, to complete the system of observatories required along the meridian mentioned. This supplement was important, as a Polar Congress was about to assemble at Brussels in September, 1906. The President of the Magnetic Commission, who was invited to be present at the Congress, submitted the memorandum to the Congress; it was published in the appendices of the Official Report. In order not to miss opportunities for obtaining the best results from researches on terrestrial magnetism made by polar expeditions, the President of the Magnetic Commission moved that the Congress pass a resolution that the Commission be informed each time a polar expedition is organised. This proposition was supported and amplified by M. Angot, who proposed that the Meteorological Committee be informed in the cases mentioned. This body should then communicate with the special Commissions with a view to attaining the desired end. The results of researches will be communicated to the Committee and Commissions.

I think that this unity of action on the part of the various international bodies is the best means for guaranteeing the success of our labours.

With regard to observations in polar regions, the executive Committee has received a letter from Sir John Eliot, communicating a resolution of the Solar Commission, stating that the establishment of a Magnetic Observatory in about latitude  $70^{\circ}$  N. (Bossecop in Norway) and in a high latitude in the Southern Hemisphere would be of the greatest importance to the advancement of Science. The President has replied that he fully concurred in the importance of this proposition, and that he will call on the members of the Bureau to support the resolution, immediately on receipt of information as to what steps the Solar Commission proposes taking.

In order to obtain magnetic observations along the meridian which crosses Africa, we have in view, firstly the establishment of an observatory in the centre of Italy, and, if possible, another at Tunis. After preliminary correspondence with M. Palazzo, the Bureau addressed an official letter to the Director of the Central Meteorological Institute at Rome, in which it gave expression to its views with regard to the importance of the establishment of these two observatories. We asked, in the event of M. Palazzo concurring in our views, that he would kindly communicate our proposal on this subject to his Government. We stated that subsequently it would be desirable to have a Magnetic Observatory also in the North of Italy. This letter was submitted to all the members of the executive Committee before despatch and approved by them.

In connexion with the request expressed by the Conference for the extension of the network of Magnetic Observatories, we have to report that Captain Lyons has informed us that recording instruments have been in regular use since April 1st, 1907, at the Magnetic Observatory at Helwan, near Cairo. The sub-station of Potsdam Observatory at Seddin (13 km. from Potsdam), has also been in regular working order since the beginning of the year 1907.

We have also had under consideration arrangements for carrying out the first resolution of the Conference :—

“The Conference considers it essential that the instruments used at the different magnetic observatories be regularly and frequently compared with one another. The Directors of the chief meteorological institutes are requested to arrange for making the comparisons.”

With this end in view the Secretary, in consultation with the President of the Commission, elaborated a preliminary plan, which will be submitted to all the members of the executive Bureau for corrections and additions which they may like to introduce, and will then be sent to all directors of observatories. This plan suggests that a comparison be made by one observatory during 1907 and 1908, and by another during 1909 and 1910, and by a third during 1911 and 1912, and so on. The observatories which consent to take part in the scheme should agree upon the years which suit them best. Pavlovsk may perhaps be able to begin making comparisons in 1908, and Potsdam in 1909 and 1910.

I have also to mention that at the meeting of the International Association of Academies on the 30th May, I was elected President of a Commission for organising Magnetic Measurements along a Parallel of Latitude. This Commission was appointed for a special object, but the latter is in intimate connexion with the aims pursued by the Magnetic Commission appointed by the Innsbruck Conference. The execution of the plan, so far as it concerns the continental portion of the parallel, depends very largely on the institutes represented at the present meeting. I therefore think it necessary to set out in a few words the position of this Commission. The reasons for undertaking this enterprise and the means for carrying it out have been elaborated by M. von Bezold, assisted by M. Schmidt. The scheme was submitted to the Association of Academies in London in 1904. The Association appointed a Commission to deal with it, consisting of M. von Bezold (President), Dr. Bauer, Lord Kelvin, Professor Lizzar, Professor Mascart, M. Paulsen, Professor Palazzo, Sir Arthur Rücker, General Rykatcheff, Professor Wiechert.

The Commission has not met again owing to the illness and death of M. von Bezold. The Association of Academies unanimously passed the following resolutions :—

1. “General Rykatcheff, who is already a member of the Commission, is invited to accept the Presidency.”
2. “Mr. Schuster is invited to become a member of the Commission.”
3. “The Academy of Berlin is invited to nominate a member of the Commission in place of M. von Bezold.”
4. “The International Association of Academies requests that when the series of magnetic measurements along a parallel is completed, similar measurements be made in other parts of the earth's surface.”

Since this date I have received a communication from the Academy of Berlin, informing me that M. Helmholtz has been



appointed to represent it on the Commission. I have as yet only had time to write to M. Schmidt, as colleague of M. von Bezold, and to M. Helmert, to ask them for documents and information which may be in their possession, or which they are able to obtain from the Academy of Berlin.

I have sent a circular to all members of the Commission asking them kindly to communicate to me proposals they wish to bring forward, and their views as to the place and the earliest practicable date for a meeting of the Commission, to discuss what steps should be taken to attain our object. Dr. Bidlingmaier's apparatus, which enables us to determine the horizontal component at sea with sufficient accuracy, gives hope that the work may be completed in a comparatively short time.

The co-operation of the Meteorological Committee is quite as important and necessary for solving the problem of the Commission on Measurements along a Parallel of Latitude, and for carrying out the request of the Association of Academies, expressed in the 4th resolution, as for the success of the work of the Commission on Terrestrial Magnetism. As representative of these two Commissions, I ask you, Gentlemen, for your support and aid.

M. RYKATCHEFF.

3rd September, 1907.

## APPENDIX V.

### REPORT OF THE PRESIDENT OF THE INTERNATIONAL COMMISSION ON SCIENTIFIC AERONAUTICS.

Since the meetings of the Committee at Southport and Innsbruck, the work of the Commission has progressed without interruption. The number of observing stations in Europe has been increased considerably, and simultaneous ascents have taken place on the first Thursday of every month. In Europe, mention must be made of the co-operation of the Belgian Institute, which has carried out a series of particularly successful balloon ascents on the international days. The establishment of a station in the Balkan Peninsula has not yet been realised. Nevertheless, we hope that Roumania, which already shares in the expense of printing the international observations, will soon join. The activity of Aeronautical Societies in various countries has also frequently assisted the work of the Commission; thus we are indebted to the French and Italian Aero Clubs for a number of valuable ascents; and also to the Berliner Verein and the Oberrheinische und Niederrheinische Vereine. In America, the station established by the Weather Bureau on Mount Weather, Virginia, has lately taken regular part in our simultaneous investigations of the atmosphere, in addition to the Blue Hill Observatory, directed by Mr. Rotch.

Since my last report the Commission has held two official meetings, one in 1904, at St. Petersburg, the other, in 1906, at Milan. I need not go into the details of the proceedings of these meetings as, thanks to the co-operation of the Russian and Italian Governments,

the official minutes have been printed,\* and can be referred to for details.

The most important results of these meetings have been the following :—

In the first place, means were found for issuing, as proposed at the meeting in Berlin, an official publication of the Commission, containing the results of the international simultaneous ascents and the special observations taken in connexion therewith at mountain and cloud stations. Through the generosity of the Imperial German Government this publication appeared up to the end of the financial year 1904, entirely at the cost of that State. From that time onwards most of the Governments taking part in ascents participated by sending contributions of varying amounts, as shown in the following table :—

	frs.
German Empire ... ..	5,000
England ... ..	1,300
Italy ... ..	1,200
Russia ... ..	1,200
Spain ... ..	1,200
India ... ..	1,000
Austria ... ..	1,000
Roumania ... ..	1,000
Sweden ... ..	1,000
France ... ..	800
Switzerland ... ..	500

As resolved at the Conference at Milan these contributions should be paid into the bank "Aktiengesellschaft für Boden-und Kommunkredit in Elsass-Lothringen" to the account of the President of the International Commission, who has undertaken to supply a copy of the publication for every 25 francs.

In St. Petersburg I urged the extension of the single day ascents to three consecutive days. This proposal was accepted. International ascents extending over three days were made three times before the meeting at Milan. In Milan it was decided, on the motion of M. Teisserenc de Bort, to endeavour to arrange for extended co-operation of observing stations during these serial ascents. Observations in the upper air were not to be confined to land stations in Europe, but the conditions of the atmosphere above the oceans were also to be investigated by marine expeditions. Moreover, the number of stations was to be increased, if possible, also in Asia and America. These so-called extended serial ascents were to be carried out, if possible, four times a year. The first attempt of this kind took place in July, 1907. It fell to my lot to undertake the laborious duty of arranging for the carrying out the Milan resolution, and after much correspondence, I was successful in securing the co-operation of a great number of expeditions. I beg leave to express the hearty thanks of the International Commission to all participating in the work, for their valuable co-operation.

\* Quatrième Conférence de la Commission Internationale pour L'Aérostation Scientifique. St. Pétersbourg, 1905. Imprimerie de l'Académie Impériale des Sciences.

Cinquième Conférence de la Commission Internationale pour L'Aérostation Scientifique à Milan. Strasbourg, 1907. Imprimerie M. du Mont Schauberg.



The results obtained may be summarised as follows:—

TRAPPES. (Observatoire de Météorologie Dynamique: M. Teisserenc de Bort.)

22nd.	Registering balloon	...	...	13,490 m.
23rd.	"	"	...	16,060 m.
24th.	"	"	...	11,510 m.
25th.	"	"	...	15,500 m.
26th.	"	"	...	14,170 m.
27th.	"	"	...	12,710 m.

AZORES. (French Navy: Cruiser "Forbin.")

22nd.	Registering balloon	...	...	(11 min.)
23rd.	"	"	...	7,000 m.
24th.	"	"	...	10,000 m.
25th.	"	"	...	20,000 m.

SOUTH OF THE AZORES. (Yacht "Otaria": Messrs. Teisserenc de Bort and A. L. Rotch.)

AZORES. (Service météorologique.)

22nd-26th July. 8 pilot balloon ascents up to 7,100 m.

UCCLE. (Service météorologique de Belgique.)

24th.	Registering balloon	...	...	21,140 m.
25th.	"	"	...	?

PLYMOUTH HILL. (Meteorological Office, London: Mr. W. H. Dines.)

23rd.	Registering balloon	...	...	—
24th.	"	"	...	8,650 m.
25th.	"	"	...	12,350 m.
26th.	"	"	...	—

CRINAN. (Meteorological Office, London: Mr. W. H. Dines.)

22nd.	Registering balloon	...	...	—
23rd.	"	"	...	—
24th.	"	"	...	15,700 m.
25th.	"	"	...	8,450 m.
26th.	"	"	...	13,400 m.

MANCHESTER. (The University of Manchester, The Royal Meteorological Society and the British Association: Mr. J. E. Petavel.)

23rd.	Registering balloon	...	...	21,500 m.
24th.	"	"	...	20,600 m.
25th.	"	"	...	21,500 m.
26th.	"	"	...	10,800 m.
28th.	"	"	...	4,400 m.

GLOSSOP MOOR. (The University of Manchester, The Royal Meteorological Society and the British Association: Mr. J. E. Petavel.)

22nd.	Kite ascents	...	...	500 m.
23rd.	"	"	...	500 m.
24th.	"	"	...	800 and 500 m.
26th.	"	"	...	1,370 m.
27th.	"	"	...	2,600 and 600 m.

ROSS, HEREFORDSHIRE. (The Royal Meteorological Society and the British Association: Captain Ley.)

23rd.	Registering balloon	...	...	20,500 m.
24th and 25th.	Registering balloon	...	...	—

PETERSFIELD, HANTS. (Mr. C. J. P. Cave.)

22nd.	Registering balloon	...	...	lost.
23rd.	"	"	...	6,350 m.
24th.	"	"	...	16,000 m.
25th.	"	"	...	6,100 m.
26th.	"	"	...	lost.
27th.	"	"	...	8,760 m.
26th.	Kite ascent	...	...	620 m.

BRIGHTON. (Mr. S. H. R. Salmon.)

22nd.	Kite ascent	...	...	213 m.
24th.	"	"	...	407 and 580 m.
26th.	"	"	...	500 m.
27th.	"	"	...	1,150 and 760 m.

GUADALAJARA. (Parc d'Aérostation militaire.)

22nd-27th July.	Pilot balloons, up to	...	...	3,000 m.
23rd.	Registering balloon	...	...	11,900 m.
24th.	"	"	...	9,980 m.
24th.	Manned balloon	...	...	3,415 m.
25th.	Registering balloon	...	...	9,160 m.
25th.	Manned balloon	...	...	2,770 m.

PAVIA. (Reale Osservatorio.)

23rd.	Registering balloon	...	...	20,960 m.
24th.	"	"	...	10,890 m.
25th.	"	"	...	11,930 m.
26th.	"	"	...	12,280 m.

MEDITERRANEAN SEA. (Italian Navy: Warship "Fulmine.")

25th and 26th July. Ascents of Registering balloons.

ZÜRICH. (Meteorologische Zentralanstalt.)

22nd-27th July. Ascents of 5 Pilot balloons from 10,000 to 11,000 m.

23rd.	Registering balloon	...	...	11,300 m.
24th.	"	"	...	13,100 m.
25th.	"	"	...	20,300 m.
26th.	"	"	...	—

STRASSBURG. (Meteorologisches Institut.)

22nd-27th July. Ascents of Pilot balloons up to 7,000 m.

22nd.	Registering balloon	...	...	11,000 m.
22nd.	Captive balloon	...	...	1,340 m.
23rd.	Registering balloon	...	...	15,200 m.
24th.	"	"	...	—
24th.	Captive balloon	...	...	1,550 m.
25th.	"	"	...	1,230 m.
25th.	Registering balloon	...	...	8,500 m.
26th.	"	"	...	19,000 m.
26th.	Captive balloon	...	...	5,800 m.
27th.	Registering balloon	...	...	18,200 m.



SPITZBERGEN. (The Prince of Monaco, accompanied by Prof. Hergesell.)

24th-27th July. Ascents of Kites and Captive balloons up to 2,000 m.

26th-29th July. Ascents of Pilot balloons up to 7,500 m.

Ascents of Registering balloons were not possible on account of the heavy ice conditions this year.

HAMBURG. (Deutsche Seewarte.)

22nd. Kite ascent. 1,240 and 3,170 m; Pilot balloon.

23rd. " " 4,600 m.; Registering balloon.

24th. " " 1,120 m.; " "

25th. Registering balloon.

27th. " " ; Kite ascent, 4,030 m.

NORTH ATLANTIC OCEAN. Between Iceland and Norway. (German Navy: S.M.S. Möwe.)

23rd-27th July. Ascents of Pilot balloons.

22nd. Kite ascent. (Lost.)

23rd. " " 3,980 m.; Registering balloon (lost).

24th. " " (Lost.)

25th. Registering balloon. 1,640 m.; II. "Registering balloon (lost).

26th. " " (Lost, only float found.)

PACIFIC OCEAN. Bismarck Archipelago. (German Navy: S.M.S. "Planet.")

23rd. Kite ascents .. ... 2,800 and 1,810 m.

24th. " " ... ... 2,450 m.

25th. Captive balloon ... ... 930 m.

ICELAND. (M.M. Hewald and Hildebrandt.)

22nd. Captive balloon ... .. ca. 980 m.

23rd. " " ... .. " 510, 800 and 1,400 m.

24th. " " ... .. " 3,050 m.

25th-27th. Ascents impossible on account of the gale.

31st. Registering balloon. 800 m.; the same, 3,300 m. (off the South of Ireland).

1st August. Captive balloon (torn away and lost).

2nd. " Registering balloon, ca. 11,800 m. (English Channel).

LINDENBERG. (Aeronautisches Observatorium.)

22nd. Kite ascents, 1,445 and 1,840 m.; Registering balloon, 10,640 m.

23rd. Kite ascents, 1,735 and 1,540 m.; Registering balloon, 10,420 m.

24th. Kite ascents, 1,870 and 5,070 m.; Registering balloon, 17,000 m.; Manned balloon, 1,854 m.

25th. Kite ascents, 1,670 and 3,815 m.; Registering balloon, 13,610 m.

26th. Kite ascents, 3,800 and 2,980 m.

27th. " 1,150 " 950 m.

BARMEN. (Niederreihn. Verein für Luftschiffahrt.)

22nd. Manned balloon, 2,100 m.

23rd. " 4,500 m.

24th. " 1,500 m.

24th-25th. " 3,000 m.

25th. " 1,500 m.

26th. " 2,200 m.; Registering balloon.

27th. " 2,650 m.

FRANKFURT a. M. (Physikalischer Verein.)

22nd-23rd. Manned balloon ... .. 1,670 m.

26th-27th. " ... .. 2,490 m.

1st August. " ... .. 1,500 m.

MUNICH. (Meteorologische Zentralstation.)

22nd. Registering balloon ... .. 11,030 m.

23rd. " " ... .. 17,060 m.

24th. " " ... .. 12,390 m.

25th. " " ... .. 20,300 m.

26th. " " ... .. 14,230 m.

27th. " " ... .. 14,400 m.

MUNICH. (Baron v. Bassus.)

22nd. Pilot balloon up to 6,540 m.

VIENNA. (Militär Aeronaut. Anstalt associated with Meteorolog. Zentralanstalt.)

23rd. Manned balloon ... .. 5,880 m.

24th. " " ... .. 3,960 m.

25th. " " ... .. 5,870 m.

PAVLOVSK. (Observatory.)

23rd. Registering balloon, 12,550 m.

24th. " " 15,250 m.; Kite ascent, 720 m.

25th. " " 10,500 m.; Captive balloon, 380 m. and 2,110 m.

26th. Captive balloon, 2,840 m.; Kite ascent, 900 m.

27th. Kite ascent, 1,820 m.

ST. PETERSBURG. (Parc d'Aérostation militaire.)

23rd. Manned balloon (Captive balloon), 600 m.

25th. " " 2,600 m. (actinometer measurements).

26th. " " 3,200 m. (electrical " )

27th. " " 2,000 m.

KOUTCHINO. (Aerodynamical Institute.)

25th. Registering balloon, 11,540 m.

KASAN. (Meteorological Observatory.)

No ascent on account of unfavourable weather.

EKATERINBURG. (Observatory.)

22nd. Kite ascents, 2,090 and 1,570 m.

25th. " " 550 m.

23rd and 24th. Pilot balloons.



## SEBASTOPOL. (On board a ship.)

23rd-27th July. Four Kite ascents: 1,900, 1,400, 1,000,  
2,300 m.

## GULF OF FINLAND. (Russian Expedition.)

23rd.	Kite ascents	...	...	...	1,320 and 1,040 m.
24th.	" "	...	...	...	2,020 " 440 m.
25th.	" "	...	...	...	1,370 m.
26th.	" "	...	...	...	590 m.
27th.	" "	...	...	...	2,560 m.

## CHINA SEA. (Russian Expedition.)

23rd.	Kite ascent	...	...	...	2,140 m.
24th.	" "	...	...	...	1,580 m.
25th.	" "	...	...	...	1,680 m.

## TIFLIS. (Observatory.)

One Kite ascent.

## KIEFF (Russia).

24th.	Kite ascent	...	...	...	1,620 m.
26th.	" "	...	...	...	1,470 m.

## OMSK (Russia).

24th.	Registering balloon	...	...	...	16,840 m.
26th.	Manned "	...	...	...	2,600 m.

## KOVNO (Russia).

23rd.	Kite ascent	...	...	...	450 m.
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## NOVOGEORGIEWSK (Russia).

25th.	Manned balloon	...	...	...	3,300 m.
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## IVANGOROD (Russia).

25th.	Manned balloon	...	...	...	3,500 m.
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## OSOVETS (Russia).

24th.	Manned balloon	...	...	...	3,600 m.
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## WARSAW (Russia).

24th.	Manned balloon	...	...	...	2,440 m.
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## Murman Expedition.

## CAIRO. (The Helwan Observatory, Egypt.)

Ascents of Pilot balloons from 31st July onwards.

31st.	Pilot balloon	...	...	...	2,930 m.
1st August.	Pilot balloon	...	...	...	5,170 m.
2nd	" " "	...	...	...	1,410 m.

## SIMLA. (The Meteorological Reporter to the Government of India.)

No ascents on account of unfavourable weather.

## BLUE HILL, U.S.A. (Meteorological Observatory.)

22nd.	Kite ascent	...	...	...	964 m.
26th.	" "	...	...	...	500 m.
27th.	" "	...	...	...	2,120 m.
29th.	" "	...	...	...	1,455 m.
31st.	" "	...	...	...	1,130 m.
2nd August.	Kite ascent	...	...	...	1,500 and 2,780 m.

## MOUNT WASHINGTON, U.S.A. (Mr. Rotch.)

21st.	Kite ascent	...	...	...	1,870 m.
26th.	" "	...	...	...	1,950 m.
27th.	" "	...	...	...	1,010 m.
28th.	" "	...	...	...	1,860 m.

Additional observations were taken at different heights on Mount Washington from the 22nd-29th July.

## MOUNT WEATHER, VIRGINIA. (Local Office of the Weather Bureau, U.S.A.)

22nd.	Kite ascents	...	...	...	4,030 m.
23rd.	" "	...	...	...	4,000 m.
24th.	" "	...	...	...	2,410 m.
25th.	" "	...	...	...	2,520 and 2,030 m.
26th.	" "	...	...	...	4,310 " 1,980 m.
27th.	" "	...	...	...	3,730 m.
2nd August.	Kite ascents	...	...	...	3,740 m.

The results of this great enterprise are now being prepared for publication; they will be printed in a special issue of the international publication. Most of the expeditions at sea suffered greatly through unfavourable weather, for which reason the results obtained are all the more creditable.

A repetition of the experiment is planned for 1908, but I must point out that the wish expressed at Milan for the organisation of such undertakings four times a year cannot be realised. I take this opportunity of inviting all Meteorological Institutes to help us in this matter, as far as possible.

Of other special aerological events I have to report the establishment of several new observing stations.

A permanent floating observatory was established on Lake Constance on January 1st, 1908. After a series of preliminary experiments on Lake Constance in 1902 and 1903, I was in a position to present to the Imperial Chancellor of the German Empire a report in which the establishment of a permanent floating Observatory was suggested. In response to this, funds were granted by the Imperial Government and by the South German States for the construction of a special ship fitted with all necessary appliances, and also for providing the necessary assistants. In the future the station will undertake daily ascents whenever possible.

The establishment of a new aerological observatory in Lindenberg by the Prussian Government under the direction of M. Assmann has also to be chronicled. This institute, which was formally opened in 1905, in the presence of His Majesty the



German Emperor and the Prince of Monaco, as well as of several members of our Commission, has taken the place of the Observatory at Tegel. It is probably the best equipped Observatory for aerological purposes now in existence, and in every respect well merits the admiration of the scientific world.

At the suggestion of the Deutsche Seewarte, a kite station was established some years ago near Hamburg under the Directorship of our member M. Köppen. This institution has achieved excellent results in spite of the limited means at its disposal.

I should like to mention also that the establishment of additional aerological stations in Germany is under consideration. I hope to be in a position to give more details in the next Report.

In Russia, a magnificently equipped aerological institute has been started at Koutchino. It was established at his own expense by M. Riabutchinsky, an enthusiastic scientist, to whom we are greatly indebted, and has worked for several years in co-operation with the excellent station at Pavlovsk. In the interior of the Russian Empire, kite stations have been started at Kazan, Ekaterinburg, &c.

I must further refer with special thanks, to the activity of our members, M. Teisserenc de Bort and Mr. Rotch, who have joined in the work of the Commission, at their old-established institutes and have established many new and important facts.

When referring to the extended serial ascents in July, 1907, I mentioned the marine expeditions for the investigation of the atmosphere. In connexion with the fitting out of these expeditions mention should be made first and foremost of the assistance given by His Highness the Prince of Monaco, who, at my instigation, has taken part in the investigation of the atmosphere over the sea since 1904, with untiring zeal. The Arctic Seas as well as the Trade Wind regions have been investigated during the summer months by voyages of the yacht "Princess Alice." It has been a special pleasure and honour to me to have taken part in these expeditions.

A good many other marine enterprises took place in connexion with the ascents. M. Teisserenc de Bort and Mr. Rotch fitted out a small vessel, the "Otaria," which was at work principally in the Trade Wind regions and Tropics, and has there achieved some very interesting results. In consequence of my reports to His Majesty the German Emperor, and to the Secretary of State for Naval Affairs, it was decided that the German Navy should systematically take in hand the scientific investigation of the atmosphere. Two surveying ships the "Planet" and the "Möwe" were fitted out with all the apparatus necessary for carrying out kite and balloon ascents. The voyage of the surveying ship "Planet" in the Atlantic and Indian Oceans and South Sea, in particular, has supplied us with some very valuable and useful results.

We are also grateful for the co-operation of the Russian, Italian and French Navies in the extended serial ascents of July, 1907. An Italian ship, under the personal direction of M. Palazzo, observed in the Mediterranean. A French cruiser, "Le Forbin" carried out successfully ascents with Registering balloons in the neighbourhood of the Azores. The observations were

made by Lieutenant Hautesfeuilles. The latter was ordered on board the yacht "Princess Alice" of His Highness the Prince of Monaco, by the French Minister of Marine, in order to take part temporarily in several ascents organised by myself. Russian ships were active in the Baltic, Black Sea and Chinese waters.

Finally I refer, with thanks, to the private expedition of Messrs. Hildebrandt and Hewald, which investigated the upper air between Iceland and the British Isles during the International week.

In conclusion I wish to touch upon the question of instruments for scientific ascents. Here also steady progress has to be recorded. If carefully handled, instruments for balloons as well as for kites are capable of thoroughly satisfactory results. Of course it is necessary—and I wish to lay especial stress on this point in connexion with ascents of Registering balloons—to recalibrate the instruments carefully before each ascent. If this is not done experience has shown that the most singular results may be obtained. It is principally to this point that I wish to draw the special attention of my colleagues. An ascent without sufficiently accurate preliminary, and if possible also subsequent, calibration, is in most cases useless. In future special attention will have to be given to the determination of altitude by recording barometers. The investigations of Dr. Kleinschmidt and myself have all shown that the influence of temperature on the readings of sensitive Bourdon tubes is very great. In most Institutes the temperature co-efficient is determined in accordance with the method we have elaborated.

Measurements of altitude have in many instances been confirmed satisfactorily from theodolite observations. This method has proved most serviceable in determining air currents with so-called Pilot balloons as well as with Registering balloons. I believe it was originally suggested by M. Kremser in Berlin; it was first applied at the Institute of M. Teisserenc de Bort. Later on exhaustive experiments were made at Strassburg, and no doubt at other Institutes also, to perfect the method. In this connexion I wish to draw special attention to the theodolites constructed by Dr. de Quervain while attached to the Strassburg Institute, which are particularly suited for observing small Pilot balloons, and to the experiments made by this investigator and by Dr. Kleinschmidt and myself, at the same Institute, for determining the vertical velocity of a Pilot balloon as a function of its free lift. Knowledge of this law enables us to determine the direction and velocity of the air at all heights passed through by the balloon from observations with a single theodolite. The simplicity of this method makes it specially suitable for small Institutes, and thus we may hope that determinations of the direction and velocity of currents in the upper air will be made in future at a large number of points on the surface of the earth.

Thanks to the efforts of Mr. Shaw a number of aeronautical enterprises have been started in England also. The individual stations are referred to among the results of the July proceedings (pp. 24, 25). It is satisfactory to know that a number of these



stations can be regarded as permanent. In the first place I mention the investigations of Mr. Dines at Pyrton Hill and Crinan, then also the ascents at Petersfield (Mr. Cave), Brighton (Mr. Salmon), Glossop Moor and Manchester (Mr. Petavel for the University of Manchester.) The necessary funds have been supplied for the ascents at the last two stations through the generosity of Professor Schuster.

I take this opportunity of mentioning also the ascents made in Egypt from the Helwan Observatory near Cairo, with Kites and Pilot balloons. These have already led to interesting results.

H. HERGESELL.

## APPENDIX VI.

### REPORT OF THE PROCEEDINGS OF THE SOLAR COMMISSION.

Presented by the President, Sir Norman Lockyer.

I beg to submit the following report of the action of the Solar Commission from the period of the meeting at Innsbruck in September, 1905, to the present time. In its preparation I attempt to state what has actually been done to carry out the resolutions of the Commission at the Meeting in September, 1905, in the order of time.

The following gives in full the report of the Innsbruck Meeting for reference.\*

#### I.—Programme for the Meeting of the Solar Commission at Innsbruck, in September, 1905.

1. To consider the desirability of modifying the name of the Commission, as the present title appears to be too long. The only name as yet suggested for substitution is "The Commission for the Correlation of Solar and Terrestrial Meteorological Research."

2. To consider letters† received from members of the Commission in response to Resolution (2) of the meeting of August 19, 1904, at Cambridge, and to prepare a complete list of meteorological observations, for which meteorological data should be obtained from the various organisations concerned.

3. To draw up a list of magnetic observatories, from which it would be desirable to obtain systematic data, and to determine the nature and extent of the data desired, and the form in which they should be tabulated and prepared for the use of the Commission, and in connection therewith to consider certain suggestions made by Prof. Langley and the Solar Physics Committee with respect to the collection of magnetic data, and more especially the suggestion that ten-day means, as well as monthly means, should be obtained.

\* See Appendices printed in the Report made to the Solar Physics Committee by Sir Norman Lockyer, upon the work done in the Solar Physics Observatory, South Kensington, from 1st January to 31st December, 1905.

† The letters are not reprinted here; they are included in the Report to the Solar Physics Committee.

4. To consider the question of the publication of the meteorological and magnetic data, and also of the solar physics data, and in connection therewith the suggestion of the Washington Weather Bureau, to publish the data regularly in the Washington "Monthly Weather Review."

5. To consider the suggestion made by Mr. W. G. Davis, Cordoba, that systematic observations of evaporation should be made at certain stations by means of a selected standard instrument.

6. To consider the suggestions made in a letter from Hofrat Julius Hann, and in connection therewith to consider, from the point of view of the Commission, Question 25 of the provisional programme of the International Meteorological Committee, viz:—

"The great need of series of observations of the meteorological elements, truly *homogeneous*, and extending over long periods of time, which are necessary for the investigation of secular changes, makes it very advisable that in every system of meteorological stations the observations at one or more stations, according to the number of stations in the system, should be continued in as unchanged a form as possible."

7. To consider the desirability of selecting a standard instrument for the measurement of solar radiation, and of recommending its use at selected stations in every important meteorological system.

8. To consider a letter received from Dr. Julius Hann, dated June 5th, 1905, containing suggestions for the determination of the variation of the temperature of the atmosphere during a sun-spot period.

#### II.—Acta of the Meetings at Innsbruck.

##### FIRST MEETING.

11th September, 1905. 2 p.m.

Present: MM. Angot, Sir J. Eliot, Hann, Köppen, Sir J. N. Lockyer, W. J. S. Lockyer, Pernter, Rizzo, Rotch, Shaw.

The minutes of the meeting of the 24th August, 1904 (Cambridge), were read and confirmed.

Several new members were elected to serve on the Commission, and the following list gives a complete record of all the members up to the present time:—

Monsieur A. Angot, Bureau Central Météorologique, Paris.

Prof. H. J. Ångström, University, Upsala.

Geheimer Oberregierungsrat von Bezold, Berlin (*since deceased*).

Prof. F. H. Bigelow, Weather Bureau, Washington.

Prof. Birkeland, University of Christiania.

Monsieur Teisserenc de Bort, Observatoire de Trappes, près Paris.

Rev. P. R. Cirera, S. J., Observatorio del Ebro, Tortosa, Spain.

Dr. W. G. Davis, Oficina Meteorologica Argentina, Córdoba, Argentine Republic.



Monsieur H. Deslandres, Observatoire d'Astronomie Physique, Meudon, Seine et Oise.

Sir John Eliot (*Secretary*), 79, Alleyn Park, Dulwich, London; Bon Porteau, Cavalaire, Var, France (*since deceased*).

Prof. G. E. Hale, 678, St. John Avenue, Pasadena, California, U.S.A.

Hofrat Prof. J. Hann, XIX, Hohe Warte, Vienna.

Monsieur S. Hepites, Institut Météorologique, Bukarest, Roumania.

Monsieur Janssen, Observatoire d'Astronomie Physique, Meudon, Seine et Oise (*since deceased*).

Prof. W. H. Julius, Rijks Universiteit, Utrecht, Holland.

Hofrat Prof. Dr. N. Thege v. Konkoly, k. meteor. Reichsanstalt, Budapest.

Prof. Dr. W. Köppen, Deutsche Seewarte, Hamburg.

Prof. S. P. Langley, Secretary of the Smithsonian Institution, Washington (*since deceased*).

Sir Norman Lockyer (*President*), Solar Physics Observatory, South Kensington, London.

Dr. W. J. S. Lockyer, Solar Physics Observatory, South Kensington, London.

Captain H. G. Lyons, R.E. Survey Department, Cairo, Egypt.

Monsieur E. Marchand, Observatory, Pic du Midi, France.

Prof. H. Mohn, Meteorologisches Institut, Christiania.

Hofrat Prof. J. M. Pernter, Hohe Warte, Vienna, Austria.

Prof. Riccò, University of Catania, Sicily.

Prof. G. B. Rizzo, University of Messina, Sicily.

Prof. L. A. Rotch, Bluehill Meteorological Observatory, Boston, Mass.

Sir Arthur Rücker, 19, Gledhow Gardens, London, S.W.

General Rykatcheff, St. Petersburg, Russia.

Prof. Dr. J. Scheiner, Königl. Friedrich-Wilhelms-Universität, Berlin.

Dr. W. N. Shaw, Meteorological Office, 63, Victoria Street, London.

Monsieur A. Silvado, Direction de Meteorologia, Morro de St. Antonio, Rio de Janeiro, Brazil.

Prof. A. Steen, Meteorological Institute, Christiania.

Mr. R. F. Stupart, Canadian Dominion Meteorological Service, Toronto.

Prof. J. Violle, Conservatoire des Arts et Métiers, Paris.

\*Prof. Dr. C. H. Wind, University of Utrecht, Holland.

Prof. A. Woeikoff, St. Petersburg, Russia.

Prof. Dr. Max Wolf, Grossherzog. Ruprecht-Karls-Universität, Heidelberg, Germany.

Prof. A. Wolfer, Zurich Observatory, Switzerland.

The Secretary reported that Dr. W. J. S. Lockyer had been elected (by correspondence) to represent the Commission at the meeting of the Solar Research Union, at Oxford, on the 27th September next.

It was proposed by Prof. Mohn and seconded by M. Angot, and passed unanimously, that the Secretary be instructed to report the

\* Retired since the meeting at Innsbruck; his place has been taken by his successor Prof. E. van Everdingen.

proceedings of the meetings of the Commission held at Cambridge in August, 1904, and at Innsbruck, in September, 1905, to the International Meteorological Committee, and to ask that it will take the proper steps to bring before the International Association of Academies their suggestions relating to Government action.

It was suggested by the President (with respect to the first item), and agreed to, unanimously, that the name of the Commission should be changed to Solar Commission, International Meteorological Committee.

With respect to the second subject of the programme, the selection of meteorological observatories from which it is proposed to obtain data, the following resolutions were passed:—

(a) "That the limit for the receipt of MS. or printed observations should be fixed at twelve months after the date of the period to which they refer."

(b) Il a été proposé, par M. Angot, secondé par M. Mohn et résolu "que pour la pression et la température, les chefs des différents services météorologiques soient priés de préparer une liste des stations qu'ils considèrent comme suffisantes pour bien représenter les différents régimes météorologiques qui existent dans leur pays."

(Signed) NORMAN LOCKYER.

## SECOND MEETING.

12th September, 1905. 2 p.m.

Present: MM. Angot, Teisserenc de Bort, Sir J. Eliot, Hepites, Köppen, Sir J. N. Lockyer, W. J. S. Lockyer, Captain Lyons, Marchand, Mohn, Rizzo, Rotch, Rykatcheff, Shaw, Silvado, Stupart.

The discussion of the second subject of the programme was continued and the following resolutions were passed:—

"La Commission exprime le désir que dans le nord de la Sibérie et le nord de l'Amérique soient organisées des stations permanentes météorologiques au moins 2 ou 3 sur chaque continent.

"La Commission solaire exprime le désir de recevoir la communication des observations des îles dont les noms suivent\* et insiste sur l'utilité d'assurer la permanence des observations météorologiques dans ces régions.

"La Commission prie son Président de faire officiellement auprès des divers gouvernements les démarches nécessaires pour que des observations météorologiques soient organisées ou maintenues dans les stations, où ces observations n'existent pas d'une manière régulière et permanente."

(Signed) NORMAN LOCKYER.

\* See p. 47 for list of islands.



## THIRD MEETING.

13th September, 1905.

Present: MM. Angot, von Bezold, Teisserenc de Bort, Sir J. Eliot, Hale, Hepites, Köppen, Sir J. N. Lockyer, W. J. S. Lockyer, Lyons, Marchand, Mohn, Pernter, Rizzo, Rotch, Rykatcheff, Shaw, Silvado, Stupart.

The minutes of the last meeting were read and confirmed. The Commission continued the consideration of subject 2 of the programme.

The following form was prepared and approved for the tabulation of the pressure and temperature data:—

				Pressure.		Temperature.					Rainfall.		
Station.	Lat.	Long.	Elevation.	Mean of Month to 0° C. and 45° Lat.	Var. from Normal.	Mean Max. of Month.	Absolute Max. of Month.		Min. of Month.	True Daily Means Red. to 24 hrs.	Var. from Normal.	Total.	Var. from Normal.
							Reading.	Date.					

“Pour le but que poursuit la Commission, il est désirable que dans toutes les stations les valeurs normales soient déduites des mêmes années (20, 25 ou plus), le millésime de la première année se terminant par 1 ou 6 d'après les recommandations du Comité Météorologique International.”

It was further resolved that the normal period shall be twenty-five years from 1881 to 1905.

M. Angot presented a selected list of stations for France, which the Commission decided should be utilized in the circular as an example of the requirements of the Commission (see p. 40). In connection with this selection, it was decided that the number of mountain stations to plain stations in any country should not exceed one to four.

The Commission then proceeded to the consideration of subject 3 (magnetic observations) of the programme. After some remarks from General Rykatcheff:—

It was resolved that the Magnetic Commission should be asked to assist the Solar Commission in the selection of magnetic observatories, and to advise as to the amount and extent of information which those observatories would be able to give the Solar Commission in order to assist it in the investigation of the relations of solar and terrestrial meteorology.

It was also resolved that the suggestion of Mr. Langley for the employment of ten-day as well as monthly means should be referred to the Magnetic Commission for opinion.

No discussion was raised on item 6 as it had been fully dealt with by the International Meteorological Committee.

The Committee resumed its consideration of item 2 (on the selection of meteorological data) and the following resolutions about rainfall and allied data were adopted:—

(1.) Pour le moment on se content de demander les données relatives à la pluie aux stations qui fournissent déjà celles de la température et de la pression; on pourra ultérieurement étendre le nombre des observations pluvio-métriques si la nécessité s'en fait sentir.

(2.) Les chefs des services météorologiques et hydrographiques sont priés d'ajouter aux données météorologiques envoyées à la Commission, autant de données sur le niveau et le débit des rivières et des lacs, qu'ils croient possibles et utiles.

It was resolved that the Secretary be asked to prepare a regional statement of rainfall for India as an example of what the Commission desires in the way of reports of regional rainfall and variation of rainfall for each meteorological organisation.

With respect to subject 5 of the programme (evaporation), the Secretary was instructed to write to Mr. Davis and inform him that the matter was outside the operation of the Commission.

The meeting adjourned from 11.30 a.m. to 2 p.m. Subject 7 of the programme (solar radiation) was then taken up, and the resolution of the meeting of August 23rd, 1904, was re-affirmed, viz.:—

“That a circular should be sent in the following terms:—  
The Commission desire to call attention to the concluding paragraphs of Professor Violle's report to the International Meteorological Committee, 1903, and would be greatly obliged if the Commission could be informed of the arrangements for observing solar radiation adopted at the observatories of the various meteorological organisations and the methods employed to render the observations comparable with those of other observatories.”

Prof. Hale gave, for the information of the Commission, a short statement of the methods employed at Mount Wilson for the accurate determination of the Solar Constant.

General Rykatcheff, President of Magnetic Commission, read the following communication from that Commission in reply to the request as given above. The Magnetic Commission express themselves willing to help the Commission in every way.

“Décision de la Commission magnétique par rapport à la demande de la Commission solaire.

La Commission magnétique a pris certaines décisions qui entrent dans les vues de la Commission solaire, telles sont les décisions sur la publication des courbes troublées, sur les listes des jours calmes et troublés, sur les coefficients exprimant l'activité de chaque jour et sur la publication d'une liste d'observatoires magnétiques.

La Commission magnétique décide que toutes ces publications seront communiquées aux membres de la Commission solaire.



Si la Commission solaire trouverait que d'autres données, que celles énumérées tout à l'heure sont désirables, la Commission magnétique se déclare prête à collaborer avec la Commission solaire en la priant toutefois de vouloir bien préciser ses désirs.

Quant à la question des moyennes par décades la Commission estime que cette question ne peut être résolue que par la Comité des directeurs, auquel elle sera remise.

La Commission magnétique estime qu'il serait bien de diriger l'attention du futur Bureau permanent magnétique sur les demandes de la Commission solaire."

Instructions were given to Dr. W. J. S. Lockyer for his action as representative of the Commission, at the Oxford meeting of the Solar Research Union.

It was resolved, with respect to item 9 of the programme, that, while thanking the Washington Weather Bureau for their courteous offer, the Commission is not yet in a position to decide upon the most appropriate form of publication of the collected data.

It was decided to append the following communication from A. Silvado :—

"Je demande la permission de communiquer à la Conférence que, d'après les résultats obtenus, jusqu'à présent sur les relations de la rotation du Soleil avec les phénomènes terrestres, j'ai adopté au Brésil l'expression âge du Soleil (par analogie avec âge de la Lune), pour indiquer quel fuseau de la surface solaire est tourné vers le méridien local dans un certain jour, en supposant que sa rotation complète se réalise en 27.25, après avoir adopté un jour d'origine pour ce registre."

(Signed) NORMAN LOCKYER.

#### FOURTH MEETING.

14th September, 1905.

Present: MM. Angot, Teisserenc de Bort, Hepites, Köppen, Sir J. N. Lockyer, W. J. S. Lockyer, Lyons, Marchand, Rizzo, Rotch, Shaw, Silvado, Stupart.

The minutes of the last meeting were read by the President, in the absence of the Secretary, and confirmed.

M. Rizzo was good enough to present to the Commission a first list of places at which actinometric observations exist at the present time. The following is the list referred to :—

Kensington.  
Christiania.  
Upsala.  
Vienna.  
St. Petersburg.  
Dorpat.  
Kilvese.  
Potsdam.  
Meudon.  
Montpellier.  
Pic du Midi.  
Tortosa.

Modena.  
Messina.  
Cairo.  
Kodaikanal.  
Zi-Ka-Wei.  
Manila.  
Mt. Wilson.  
Chicago.  
Washington.  
Blue Hill.  
Toronto.

The following resolution was then proposed by M. Angot and seconded by M. Köppen :—

"Q'une circulaire soit dépêchée aux directeurs des services météorologiques pour leur demander de désigner les stations de leur pays où les observations actinométriques sont régulièrement faites. Dans la listes des stations il serait utile d'éviter les grandes villes où les conditions atmosphériques sont généralement défectueuses."

On further discussion a resolution was proposed by Dr. Shaw in the following terms :—

"Prof. Rizzo submitted a first list of places at which actinometric observations are made, and the President is desired to take steps to obtain regular observations from the places mentioned on the list."

A resolution relating to the distribution of solar energy was then proposed by M. Rizzo, and seconded by M. Angot, in the following terms :—

"La Commission solaire prie M. le Président de vouloir bien obtenir les courbes de la distribution de l'énergie solaire par les observatoires qui ont déjà eu l'obligeance de communiquer les autres données indiquées dans les Comptes Rendus des Séances de la Conférence de Cambridge."

The question of printing the minutes was then referred to, but no action was taken. The form of the General Report drawn up for the use of the International Meteorological Committee was then described and approved.

The President thanked the members for their attention at the meetings.

The Report of the Commission, embodying the foregoing, was presented to the Conference, and the various resolutions were approved by the Conference at its last meeting on September 15th.

The first step was taken in December, 1905, when the following circular asking for monthly data of pressure, temperature, and rainfall, in the form approved by the Commission, was drafted in accordance with the resolutions of the Commission and addressed to directors of meteorological organisations.

Solar Physics Observatory,  
South Kensington.

Sir,—I have the honour, on behalf of the Solar Commission of the International Meteorological Committee, which has been formed to discuss meteorological observations from the point of view of their connection with Solar Physics, to ask for your co-operation in collecting the meteorological data required for the purpose.

I enclose a copy of the Report of the Solar Commission presented to the International Meteorological Conference which will explain the scope and object of its work.

It will evidently be necessary as the first step to obtain meteorological data for the whole globe so far as is possible, and it is hence desired to obtain similar data from every meteorological organisation.



It is believed that data for a comparatively small number of stations for each country will suffice for the preliminary enquiries at least.

The Commission now wish to be supplied with certain meteorological data for a limited number of stations in the area included in your organisation. The preparation and transmission of the data will, it is hoped, not take up much time, or interfere with the ordinary work of your office, and the Commission are hence anxious that the number of stations selected from any area should be as small as possible, consistent with adequate representation of the more important conditions and variations of conditions obtaining in that area.

The Commission feel that they are not in a position to make a suitable selection of representative stations in your meteorological field, but are confident that your knowledge of its meteorology and of the work of observation will enable you to draw up for the purposes of the Commission, a list of a comparatively small number of observatories which will satisfactorily represent your area for the investigations that the Commission desire to carry out.

As it will probably be found desirable to extend the comparison for as long a period as possible, it is wished by the Commission that some, at least, of your stations should be of long standing and their observational data be available.

The Commission also desire to have data for representative hill stations, and would be pleased if you included any such stations under you in your list, in a proportion to plain stations not exceeding one to four.

The following list of stations for France and its Colonies, drawn up by M. Angot, of the French Meteorological Bureau and Member of the Commission, will perhaps serve you as a guide in your selection of stations.

*List of Stations for France, drawn up by M. Angot.*

Stations.	Altitude.
Paris ... ..	50 m.
Nantes ... ..	40 m.
Bordeaux ... ..	75 m.
Clermont-Ferrand ... ..	390 m.
Lyon ... ..	300 m.
Perpignan ... ..	35 m.
Marseille ... ..	75 m.
Montagne { Puy-de-Dôme ... ..	1,460 m.
{ Pic du Midi ... ..	2,860 m.
{ Mont Vendôme ... ..	1,900 m.

Also a station in Algeria, in Tunis, and in Corsica, and one or two stations in Tonquin.

It would be useful when preparing your list to add the latitude, longitude, and elevation of each station.

The Commission considers that it will be sufficient for their present requirements if they are supplied with monthly means of pressure, temperature, and rainfall for each of the selected stations.

The following gives explanations on certain points in the above :—

- (a.) Mean pressure. This should be given for a definitive hour of the day, 8 a.m. for preference, or the nearest hour to 8 a.m. at which observations are recorded at the station.
- (b.) Mean daily temperature. This should be the mean of the hourly observations, or mean of certain definite hours corrected to true daily means.

The comparison of actual with normal data is of great importance for the proposed investigations, and it is hence desirable that the normal means should be—

- (1.) Derived from similar observations for the same period at all stations ; or
- (2.) Of the same order of accuracy as given by the probable errors of the normal means, which should be for the same element the same in amount.

The latter is considered not to be possible at the present stage, and hence it has been suggested that means derived from data of a fixed period should, so far as possible, be employed. The period suggested is 1881–1905.

The Commission would hence be much obliged if you could supply means for that period, for the determination of the variations of pressure, mean temperature, and rainfall from normal.

If, however, the preparation of the normal means should require more labour than your office can spare, the Commission will be glad if you will utilise any normals which you may have, provided that they have been obtained from observations of, at least, 19 years. In that case the period should be definitely stated.

The Commission believe it will be found that the rainfall data of a small number of stations in your meteorological area will ultimately not be sufficient to furnish the final satisfactory comparison between rainfall and solar data. It will consider this matter later very carefully, and will probably address you again on this subject.

It may be pointed out that data from insular stations are of very great importance for investigations of the relations between solar and terrestrial meteorological phenomena, and the Commission will be glad if you will include all the important insular stations (mentioned in Appendix 1\*) which are under your direction.

The Commission also wish to take the present opportunity of inviting your attention to the following remarks of Prof. Violle, contained in a Report on Radiation sent in to the Secretary of the International Meteorological Committee at Southport in 1902 :—“The Ångström compensating pyrheliometer is the most suitable instrument for such researches. Failing this, any of the instruments whose trustworthiness has been established by experiment could be used. In all cases, it is of the greatest importance only to work with suitably constructed instruments

\* For list of Islands, see p. 47.



which have been carefully verified and standardised. As far as possible, a continuous self-recording apparatus, and also a direct-reading instrument for controlling the readings of the self-recorder, should be used. It would also be highly desirable to experiment with several instruments of different types, at least, at some observatories in each country, so as to ensure more efficient control and to make a more complete comparison of the different systems."

The Commission would be heartily obliged if you would inform them of the arrangements for observing solar radiation at any of the observatories under you, and of the methods employed to render the observations comparable with those of other observatories.

JOHN ELIOT,

*Secretary of the Solar Commission.*

December, 1905.

A second circular was sent to the heads of all meteorological organisations in July, 1906, respecting the preparation of regional rainfall data which the Commission regarded as necessary in order to obtain the fuller information of that element of meteorological observation required to supplement the limited data asked for in the first circular of December, 1905. The following gives these circulars in full.

Solar Physics Observatory,  
South Kensington,  
London, S.W.,  
July, 1906.

DEAR SIR AND COLLEAGUE:—Since the meeting of the Solar Commission, held at Innsbruck in September of last year, a circular has been addressed to you, requesting data regarding pressure, temperature, and rainfall for *some selected* stations in the area over which you have control.

At the third meeting at Innsbruck (September 13, 1905), it was resolved—

"That the Secretary be asked to prepare a *regional statement* of rainfall for India as an example of what the Commission desires in the way of reports of regional rainfall and variation of rainfall for each meteorological organisation."

In the circular above-mentioned (page 6) it was stated:—

"The Commission believe it will be found that the rainfall data of a small number of stations in your meteorological area will ultimately not be sufficient to furnish the final satisfactory comparison between rainfall and solar data. It will consider this matter later very carefully, and will probably address you again on this subject."

The Commission is now in possession of the statement relating to the regional rainfall of India, prepared by the Secretary to serve as an example, and this statement is forwarded to you. I have to

express the hope that the Commission may shortly receive from you the data for the pressure, temperature, and rainfall for the area under your control, in order that the general tabulation of the results may be commenced.

I am, dear Sir and Colleague,  
Your obedient Servant,

JOHN ELIOT,  
*Secretary of the Solar Commission.*

*Statement concerning the Regional Rainfall of India.*

Prepared by Sir John Eliot, K.C.I.E., F.R.S. (*Secretary.*)

Rainfall measurements are taken in India at about 220 meteorological observatories, and 2,250 rain-gauge stations.

The late Mr. Blandford, Head of the Meteorological Department, devoted several years to the collection of all the available rainfall data of India, and published the results in his valuable "Memoir on the Rainfall of India." As the result of his investigations he divided India into 27 rainfall provinces, selected representative stations (about 450 in number), and calculated the mean rainfall of each station and each province for the months of the year and the year. He also, in the same work, gave mean data for each year from 1866 to 1886. This work has been continued in exactly the same manner up to the present time, so that there are available, for the Indian area, data strictly comparable for the period 1866 to 1905.

The distribution of rainfall in India varies very greatly with season and locality. The mean annual varies from 3 inches in Upper Sind to 200 to 500 inches on the West Ghats, Assam Hills, Arakan, and Tenasserim. About 90 per cent. of the rainfall occurs during the south-west monsoon, or wet season, and the small remainder in the dry season.

During the cold weather, from the middle of December to the middle of March, shallow depressions cross Northern India, and give light to moderate rain in the plains and heavy precipitation on the mountain ranges of Northern India, increasing in amount with elevation. The total seasonal amount averages about 2 inches in the plains of Northern India.

During the hot season, from the middle of March to the beginning or middle of June, rain occurs during local thunderstorms in certain areas, subject to strong local sea breezes, *e.g.*, Tenasserim, Lower Burma, Bengal, Assam, and Malabar.

From June to the end of September or middle of October the precipitation is due to the south-west monsoon. It varies very largely in different parts of India, depending upon position with respect to the direction of advance and to the goal of the current in Upper India, and their distance from the sea, and upon the lie of the mountain ranges which obstruct or deflect the movement of the current, and other less important conditions. The rainfall in the Arakan and Tenasserim coast districts averages about 150 inches, and in the Konkan and Malabar coast districts about 100 inches. In Sind it is only about 2 inches, and in Baluchistan practically *nil*.



From the middle of October to the middle of December the rainfall occurs during the slow withdrawal of the turned south-west monsoon currents from Northern India and the recurvature of the current in the Bay, and is hence chiefly received in Lower Burma, Tenasserim, and the east coast and central districts of the peninsula. The precipitation is heaviest on the Coromandel Coast districts, which receive averages of 10 to 30 inches.

The chief principle employed by Blanford in his selection of the 27 rainfall provinces was "similarity of those physical conditions on which rainfall depends," and hence a comparatively small range of variation of the rainfall of the group of stations from the mean of the group.

The following gives a list of the 27 rainfall provinces with comparative data of area, average rainfall, &c. :—

No. of Province.	Name of Rainfall Province.	No. of Rain-gauge Stations.	Average Rainfall.	Area of Province.	Ratio of Area of Province to No. of Stations.
			Inches.	Sq. miles.	
I.	Western Himalaya ...	28	—	Indefinite	?
II.	Punjab Plains ...	29	21.5	120,000	4,138
III.	United Province of Agra and Oudh.	45	35.9	83,500	1,855
IV. { <sup>a</sup> b	Rajputana, East ...	18	27.0	67,000	3,722
	Rajputana, West ...	3	12.5	65,000	21,666
V.	Central India States ...	21	41.3	91,000	4,333
VI.	Behar ...	14	44.1	30,000	2,143
VII.	West Bengal ...	10	49.6	38,000	3,800
VIII.	Lower Bengal ...	28	67.2	54,000	1,930
IX.	Eastern Himalaya ...	7	?	Indefinite	?
X.	Assam and East Bengal ...	18	102.1	61,000	3,388
XI.	Orissa and North Circars ...	16	47.8	27,000	1,687
XII.	Central Provinces, S. ...	19	50.0	61,000	3,210
XIII.	Berar and Khandesh ...	13	34.7	43,000	3,310
XIV.	Guzerat ...	13	32.9	54,500	4,200
XV.	Sind and Cutch ...	10	8.8	68,000	6,800
XVI.	North Deccan ...	14	29.3	48,000	3,428
XVII.	Konkan and Ghats ...	12	143.8	16,000	1,333
XVIII.	Malabar and Ghats ...	8	114.9	18,000	2,250
XIX.	Hyderabad ...	19	30.8	74,000	3,900
XX.	Mysore and Bellary ...	18	29.5	58,000	3,222
XXI.	Carnatic ...	38	34.9	72,000	1,890
XXII.	Arakan ...	7	149.0	Indefinite	?
XXIII.	Pegu ...	7	73.0	32,500	4,643
XXIV.	Tenasserim ...	4	172.0	Indefinite	—
XXV.	Upper Burma* ...	—	—	—	—
XXVI.	Bay Islands ...	2	—	—	—
XXVII.	Nilgiris* ...	—	—	—	—

\* Added recently to number of Provinces.

The average or normal rainfall of each province is the arithmetical mean of the normal data of all the stations in that province, as the rain-gauge stations are, as a rule, fairly distributed in each province. Their rate of distribution on the other hand, differs very greatly in different parts of India from one per 1,300

square miles in the Konkan and West Ghats to one per 21,666 square miles in West Rajputana. Hence, in order to obtain a fairly correct estimate of the mean rainfall of the Indian area, the mean rainfall for each province is multiplied by its area, and the quantities thus obtained for the 27 provinces summed and the result divided by the total area. Blanford thus ascertained that the mean normal rainfall of India is 42 inches.

The same methods and data (furnished by the same groups of stations) have been employed to determine the seasonal and annual rainfall of the Indian area for the years of the period 1864–1905 (*vide* "Rainfall of India," page 151, and annual reports). The data thus obtained form a homogeneous series, and strictly comparable so far as that is possible in India.

The data are obtained by monthly statements from the rain-gauge stations. Tabular returns, illustrated with charts, for the four seasons and for the whole year, are prepared for the information of the chief government authorities. The annual return also includes a brief statement in words of the chief abnormal meteorological features of the year, and of the distribution of the rainfall and its variations, and a brief explanation of the chief causes and actions giving rise to the more prominent variations.

The following statement is the tabulated data for one province for the year 1903 :—

*Province—Lower Bengal.*

Season.	Month.	Mean Normal Rainfall.	Mean Actual Rainfall.	Difference, Actual and Normal.
Cold weather ...	January ...	0.44	0.46	+ 0.02
	February ...	0.95	1.00	+ 0.05
	March ...	1.38	1.69	+ 0.31
Hot weather ...	April ...	2.57	0.74	— 1.83
	May ...	6.60	4.44	— 2.16
	June ...	12.51	13.43	+ 0.92
South-west monsoon ...	July ...	13.14	7.95	— 5.19
	August ...	12.37	13.07	+ 0.70
	September ...	10.57	10.79	+ 0.22
Retreating south-west monsoon.	October ...	4.49	6.96	+ 2.47
	November ...	0.57	0.39	— 0.18
	December ...	0.14	Nil.	— 0.14
	Year ...	65.73	60.92	— 4.81 or — 7 p.c.

The tabulated data are the important feature of the annual return, and the discussion appended to the data is of subsidiary value, and such as usually accompanies meteorological observational data. Specimens of some of the illustrative charts will be found on Plate XI., "Rainfall of India." They are added to show at a glance the broad features of the rainfall of the year, but are in no way necessary to anyone studying the data from a scientific standpoint.



The following is the actual form in which the data are presented :—

Return showing the Monthly and Total Rainfall of India in 1903, and compared with the average of previous years—

*No. of Province, I.—Western Himalaya.*

Information.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Average ..	2.95	3.08	2.65	1.95	2.51	6.22	14.87	14.46	5.80	1.08	0.49	1.17	57.23
1903 ..	3.01	0.63	4.59	0.69	2.61	2.08	9.98	14.54	6.17	1.14	0.05	1.15	46.60
Difference..	+0.06	-2.45	+1.94	-1.26	+0.10	-4.14	-4.89	+0.08	+0.37	+0.06	-0.44	-0.02	-10.63
													-19 p.e.

*Summary.*

Circular (No. 1), dated December, 1905, was sent out to the Directors of the Meteorological organizations of the following countries :—British Isles, France, Germany, Austria, Roumania, Holland, Italy, Switzerland, Russia, Norway, Sweden, Spain, Azores, Canada, United States, Argentina, Brazil, Australia, Transvaal, Egypt, Japan, India. Of these four countries have sent in monthly returns :—France, New South Wales, Canada and Brazil, Egypt and Holland sent in monthly data yearly. Besides these three observatories have replied, Blue Hill, Darmstadt and Heidelberg. Several other Directors have replied and referred the Commission to data for their stations already published.

In answer to circular issued July, 1906 (No. 2), asking for an account of the Regional Rainfall in the various countries one institution, Philippine Weather Bureau has furnished a statement.

In April last I suggested to the Secretary that as the meteorological data were coming in much more slowly than was contemplated at the meeting of the Solar Commission [when a time limit of 12 months was suggested as the utmost that would be required even for the most distant observatories (vide resolution (a) at the meeting of the 11th September, 1905).

“That the limit for the receipt of MS. or printed observations should be fixed at twelve months after the date of the period to which they refer”] we should write to Messrs. Rykatcheff, Pernter, Shaw, Mohn and Angot and ask their advice as to the steps advisable to take in order to accelerate the transmission of the data from the larger weather bureaus.

Letters to the above-mentioned directors were accordingly sent. A certain amount of delay has probably been caused by the request for mean values for a fixed period (suggested period 1881-1905), but it was stated in the circular that failing such mean values for that period any mean should be adopted so long as the period equalled or exceeded 19 years in length.

It may again be that too much information has been asked for.

If this is so the question arises whether the data regarding temperature may not be postponed for the present as the things of greatest initial importance from the point of view of solar and terrestrial changes are pressure and rainfall.

With reference to the resolutions of the Second Meeting of the Commission at Innsbruck (p. 35) the resolutions were reported to the conference of Directors and adopted with the recommendation that the attention of the International Association of Academies should be called thereto.

The question was raised at the general assembly of the Association at Vienna in June, 1907, upon the initiative of the Académie Française, and the following resolution was unanimously adopted by the Association :—

“Consideration of the distribution of meteorological stations over the globe shows that stations in the far north and on islands in the various oceans are of special importance ; the International Association of Academies desires therefore to express the hope that the Governments concerned will take any necessary steps for securing the continuance of observations where they already exist ; for the modification of their form, if necessary, to bring them into conformity with meteorological usage ; for establishing stations where they do not yet exist ; and for placing the observations at the service of science by suitable publication. As regards the far north, observations are desired from two or three stations, at least, in the north of Siberia and of the Continent of America respectively, and as regards the islands the following list is suggested :—Greenland, Faerøe Islands, Azores, Madeira, Canaries, Cape Verde, Ascension, St. Helena, Falklands, Fernando Naronha, Staten Island, Fernando Po, West Indies, Bermudas, Sandwich Islands, Carolines, Guam, Bismarck Archipelago, Samoa, Fiji, New Caledonia, Tahiti, Java, Borneo, Seychelles, Mauritius, Réunion, Madagascar, Zanzibar, Socotra, Chagos Archipelago, Christmas Island, Karmakuli.”

The Directing Academy has taken steps to bring the matter to the notice of the Governments concerned through the good offices of the Austrian Foreign Office.

At the fourth Meeting of the Commission, which took place on September 14, the following resolution was passed which requested the President to take action with regard to obtaining curves of the distribution of Solar Energy.

“La Commission solaire prie M. le Président de vouloir bien obtenir les courbes de la distribution de l'énergie solaire par les observatoires qui ont déjà eu l'obligeance de communiquer les autres données indiquées dans les Comptes Rendus des Séances de la conférence de Cambridge.”

I therefore wrote in December to Professor S. P. Langley, but at that time he was indisposed and unfortunately he died soon after. No further action has since been taken.

Solar Physics Observatory, 1907, November 13.

J. NORMAN LOCKYER.



## APPENDIX VII.

## A.—PROJECTION AND SCALE FOR METEOROLOGICAL CHARTS.

The progress of dynamical meteorology tends more and more towards the discussion of the atmospheric circulation over wider areas and the consideration of the details of the relation of barometric distribution to wind force.

From both these points of view there would be great advantage in the adoption of a uniform system of projection and scale for maps representing synchronous meteorological data.

Two sides of the question require separate consideration, namely, (1) The Daily Weather Charts of the various Meteorological Institutes, and (2) The Marine Meteorological Charts.

1. *Daily Weather Charts.*

These are, generally speaking, based upon conical projection, and the only question which arises is that of scale. Uniformity of scale is desirable, first, in order that a map for an extended area may be compiled without replotting the observations, and secondly in order that the "theoretical wind" may be computed from the earth's rotation and the latitude by measuring the distance apart and the curvature of the isobars.

For this second purpose it is convenient to use (1) a straight scale of graduation drawn on a transparent material which gives directly the wind velocity or wind force when the scale is so set that consecutive isobars fall on consecutive divisions, and (2) a series of consecutive circles which gives for a certain range of latitude the appropriate correction for curvature, according to the formula—

$$\gamma = \Delta (2 \omega V \sin \lambda \pm V^2 \cot \rho / R).$$

It cannot be supposed that all maps published or used by Meteorological Institutes can be on the same scale, but a cursory examination shows that the scales in general use for maps published in Europe do not differ much from that of 1 : 20,000,000 or 1 : 40,000,000 both of which are sub-multiples of 1 : 10,000,000, the scale of the maps of the United States and Canadian Services. A scale of graduation and series of circles constructed for a map on the scale 1 : 10<sup>7</sup> could be employed without difficulty for the two sub-multiples.

I desire therefore to propose—(1) That for the purpose of Daily Weather Charts the scale of 1 : 10<sup>7</sup> and its sub-multiples, one-half and one-quarter, be recommended by the Committee.

2. *Marine Meteorological Charts.*

The case of Marine Charts presents some difficulty. They are generally prepared in the first instance for the use of mariners and employ Mercator's projection. The exaggeration of distance in the higher latitudes makes this projection unsuitable for the purpose of dynamical meteorology, and the evaluation of the theoretical wind from the distance apart and the curvature of the isobars, a matter of special importance over the sea, cannot be carried out except by elaborate calculation.

The question therefore arises if separate charts must be prepared for the purpose of dynamical meteorology, or if some other projection could be used for practical marine charts. The resolution of the question turns largely upon the extent to which those who use marine meteorological charts may be interested in the consideration of meteorological data from the point of view of dynamical meteorology. Such a consideration can hardly be determined by the International Committee without first eliciting the opinions of persons representing those for whose use the charts are prepared. The matter is not without practical importance. Evidence is gradually accumulating to show that the surface circulation of the atmosphere is an approximation to steady motion in which the acceleration appropriate to the distribution of pressure is balanced by the geometrical acceleration due to the rotation of the earth and the curvature of the path. The approximation is more or less close according to the meteorological conditions and the study of the degree of approximation, as M. Guilbert has shown, has a practical bearing.

That this investigation should take into account the observations over the seas is a proposition which can hardly be doubted, and to this consideration must be added the important one of the analogies and differences between the circulation of the ocean waters and its laws and the circulation of the atmosphere of the surface and its laws. With these are associated such questions as the analogies between direction of flow and distributions of pressure or density in the air and the sea.

As regards scale, it would be reasonable for the scale of marine charts to be some sub-multiple of 1 : 10<sup>7</sup>; but the question of the most suitable scale cannot be resolved until the question of projection is settled because the scale on Mercator's projection is different in different parts.

The subject has already engaged the attention of the Conference at Paris in 1896.

I desire therefore to propose—(2) That steps be taken, by the appointment of a commission, or otherwise to elicit the opinion of meteorologists who prepare or use marine charts with reference to the adoption of a projection for marine charts which will give a satisfactory representation of marine data from the point of view of dynamical meteorology.

## B.—MEAN VALUES FOR CLIMATOLOGICAL DATA.

The completion of a series of mean values for a network of climatological stations marks a definite stage in the discussion of meteorological data. The next stage may be regarded as defined by the comparison of the monthly data for single years with the ascertained mean values.

When a common form of publication was adopted in pursuance of the conclusions of the International Congress at Vienna, mean values for long periods only existed for a few stations, and no provision was necessary for exhibiting the differences between the mean values for the stations and the values for the current year. In the period of nearly 35 years since 1873 mean values



have been obtained for very many stations, and meteorologists are now in a position to undertake inquiries concerning the departures of the current values from the established means. The work is, however, rendered difficult by the following facts:—The recommendations of the international meetings with reference to the publication of mean values have not been carried out in a systematic manner. The mean values are issued for the most part as separate publications of the respective institutes, and an investigator not endowed with an unusual acquaintance with meteorological literature does not know for which of the stations, included in a volume of observations of the Second Order, mean values have been computed nor for how many years, nor where the mean values that have been computed may be found.

Some meteorological institutes have amplified the international form so as to include columns for departures from mean values. This process may not commend itself to all institutes, but in those cases in which mean values have been computed the means might be regarded as a definite characteristic of the station, and their existence noted at the head of the table in a manner similar to the notification of the geographical position or height above sea level.

It is desirable, as far as possible to use a homogeneous series of means. It does not follow from the existence of means for long periods, say 50 or 100 years, for a few stations that the means for the longest period should be used for these stations in investigations which are concerned with the comparison of data from a large number of stations. It is better, if possible, to use the same period for all, reserving the use of the longer periods for special investigations. The difference of duration of different stations introduces a difficulty which may be overcome to some extent by international agreement.

We might agree, for example, that the normal period for mean values should be 35 years, and the institutes should aim at preparing mean values for their stations for the 35 years ending at 1905. The existence of means for a particular station for the standard period could be indicated in the international forms by putting the mark \* against the name of the station in the volume of Second Order observations and giving in the introductory pages a reference to the publication in which the mean values have appeared.

There may be, however, a number of stations for which mean values for other periods, longer or shorter, have been evaluated and published. These might be similarly indicated by a suitable mark against the name of the station and a reference in the introduction to the publication in which the means have appeared. Thus—

\* (1900) might indicate that means have been published for the 35 years ending with 1900,

† (1905) might indicate that means have been published for the 25 years ending with 1905,

‡ (1900) might indicate that means have been published for the 10 years ending with 1900, and so on.

I desire, therefore, to propose—(3) That the existence of published mean values for the stations included in the annual volumes of observations at stations of the Second Order be indicated by a distinguishing mark placed against the name of the station, and that a reference be given in the introductory portion of the volume to the publication in which the mean values can be found.

Further progress towards a homogeneous series of mean values might be secured by an understanding as to the periods to be aimed at for the computation of mean values. It is obvious that new stations cannot extend their records backwards, and true homogeneity can only be secured by extending the values for stations forward.

Taking 35 years (Brückner's period) as the longest natural period that is at present within the range of practical meteorology for any considerable number of stations, the evolution of a homogeneous series of mean values for 35 years seems to be a reasonable object for international co-operation. It would involve the evaluation of means for each period of 35 years, as defined by 1900, 1905, &c., as the terminal year, for those stations which go back beyond 1865, so that as additional stations reach the 35-year limit they may take their places in a homogeneous series.

It appears, therefore, desirable that every five years ending with '05, '10, &c., the institutes should issue mean values for 35 years for those stations at which observations have been made for the previous 35 years.

It may not be regarded as necessary to publish sets of mean values for 40 years or 45 years; the next periods for which complete sets of mean values are required may perhaps be taken as 50 years and 70 years. But in order that meteorologists may have the opportunity of compiling homogeneous mean values for any special investigation not necessarily confined to 35 years, it seems desirable that the five yearly means of monthly values for each period of five years ending with 0 and 5 be regularly published for a "sufficient" number of stations in each country.

When the period for which a station has been established does not extend to 35 years, mean values for shorter periods may still be useful. The sun-spot period of eleven years suggests itself, but it does not fall in with the understanding to deal with mean values for decennial or quinquennial periods ending with 5 or 0. In order to secure as near approach to uniformity as possible, it seems desirable to define the periods shorter than 35 years for which mean values should be published, as five years, 10 years, 15 years, and 25 years.

I therefore desire to propose—(4) That mean values for 35 years ending with '05, and subsequently '10 and so on as they are completed, be adopted as the normal mean values.

(5) That the attention of Directors be called to the resolutions of the meetings at Vienna, Zurich and Munich with reference to the publication of mean values for each five years ending with '5 or '0.



(6) That for less than the normal period of 35 years means for 5, 10, 15 and 25 years ending with 0 or 5 be regarded as subsidiary normals.

(7) That in view of the distribution of stations over the globe and the scale upon which investigations referring to very wide areas must be conducted, a sufficient number of stations be regarded as not less than one to each 5° square, and not more than four to each 5° square.

### C.—WIRELESS TELEGRAPHY.

At the Conference at Innsbruck I undertook to make inquiry respecting facilities for obtaining meteorological reports by wireless telegraphy from the North Atlantic Ocean.

The inquiry resolves itself into two distinct parts—

(1) *The Administrative Part*—The number of ships equipped with wireless telegraphic apparatus and the terms upon which messages can be procured.

(2) *The Meteorological Part*—The arrangement of the meteorological message and the means of avoiding or detecting errors in observations or transmission.

As regards (1), the Marconi Wireless Telegraph Company publishes regularly a list of ships with which communication can be made by wireless telegraphy through the agency of the ordinary telegraphic service of the Post Office. A copy of a recent issue of this list is appended.

The ordinary cost of messages is at the rate of 6d. [62.5 c., 50 pf.] per word with a minimum of 6s. 6d. [8.25 f., 6.5 mk.] per message. At the rate of one message per day this works out at about £120 a year. We ought to aim at four or five messages per day at least, which would cost, say, £600 [15,000 f., 12,000 mk.]. Probably we ought to expect to pay a sum approaching £1,000 [25,000 f., 20,000 mk.] for a service that would extend the effective area of our daily charts to the meridian of 15° or 20° W. of Greenwich, which is perhaps the range that we might expect to cover without re-transmission of the messages.

I have recently received a letter from the Managing Director of the Marconi Wireless Telegraph Company in which he says:—  
“We are prepared to transmit reports from ships at sea at our scheduled rate of 6d. per word plus the forwarding charge from the wireless shore stations, but with no minimum charge *e.g.*, if a message of this character consisting of six chargeable words was transmitted on behalf of the Meteorological Office the charge would be 3 shillings plus the inland forwarding charge. This would reduce the cost very materially, especially if the Meteorological Institutes prepared and used a code in connexion with their messages.”

“The annual cost of the service mentioned in your letter, viz., £1,000 per annum, is the highest estimate, and the probability is that in practice it would work out at a very much lower figure.”

As regards (2), by the courtesy of the Lords of the Admiralty I have been enabled to test a scheme for transmitting Meteorological messages by wireless telegraph from H.B.M. ships, including provision for detecting accidental errors of observation or in transmission. This consists in sending as a control message a set of observations taken from the ships' log for the hour of observation immediately preceding the readings taken directly for the purpose of transmission. The mode of procedure will be best illustrated by quoting the regulations which have been issued.

A number of messages have been received already in accordance with these regulations, and so far there have been very few doubtful readings. The plan may, therefore, be said to have been found efficient.

I submit the scheme as a suggestion to the Committee, and if it be approved there remains the question of providing for the large annual cost.

The funds at present at the disposal of the Committee of the British Meteorological Office do not permit them to undertake the whole or even a substantial share of this expense; consequently, so far as my own Office is concerned, circumstances do not permit me to carry the negotiations further without an appeal to Government for additional funds. Nor can I say what the result of such an appeal would be.

If the arrangement for the transmission of meteorological reports by wireless telegraphy be regarded as a meteorological subject of international interest, it would, I presume, rest with the Committee to formulate a proposal which could be transmitted to the various Governments concerned in the usual manner.

W. N. SHAW.

Meteorological Office, London,  
July, 1907.

### APPENDIX VIII.

#### REPORT OF THE DEUTSCHE SEEWARTE ON QUESTIONS 20 AND 21 OF THE INNSBRUCK CONFERENCE, RESPECTING THE INTRODUCTION OF CLOUD OBSERVATIONS IN DAILY WEATHER REPORTS.

Reports of cloud motion are not included in the European scheme for weather telegraphy, and hitherto they have only been made use of by a few systems in their own districts.

As far as we know they have been included in the North American scheme since its inauguration.

On the 1st January, 1886, the Deutsche Seewarte invited the German stations to add to their morning and afternoon telegrams a new group of five cyphers, of which the first specifies the form of the upper clouds, the second and third their direction, and the fourth and fifth the direction of the striae; the directions were expressed in accordance with the European scheme for wind direction. The reports referred only to upper clouds—Cirrus, Cirro-Stratus,



and Cirro-Cumulous. For example, the group 12016 meant "Cirrus clouds coming from the south-west, the principal direction of the striae being from south to north"; 00000 meant "No upper clouds visible."

It has not been found practicable to realise the wish expressed in the Annual Report of the Deutsche Seewarte for 1886, that this system might be extended to reports received from abroad, especially from Western Europe. When, in April, 1900, a thorough reform of the telegraphic service of the Seewarte was carried through which has enabled us to issue weather reports and charts much more promptly than was formerly the case, we endeavoured to abridge the telegrams as far as possible by omitting all unnecessary matter. The group 00000 which, in the majority of cases, took the place of the cloud observations was thus considered unnecessary. The German stations were directed to add an appropriate group to the telegram only on occasions when an observation of the direction of the upper clouds was possible. At the present time only a few stations give this group under favourable circumstances, others omit it even when the state of the sky is favourable for observing the direction and striae of Cirrus clouds. Other countries have, no doubt, also experienced the fact, that the majority of observers find it far easier to take 100 thermometer readings than one good cloud observation.

In international intercourse it is even more difficult to include in the telegrams data which are not of every-day occurrence; the great demands, which meteorology is bound to make on the telegraphic authorities and the fact that the messages must be sent on as expeditiously as possible, compel us to curtail our requirements, and keep them within bounds as far as possible. It is, of course, much more difficult to secure the assistance of the telegraphic authorities for services, of which the extent cannot be estimated very exactly, and which have to be left to the discretion of observers; for this reason the addition of remarks to telegrams, in spite of the fact of their being most valuable, has been by degrees almost entirely excluded from international intercourse.

To these outward hindrances is added the determining circumstance that meteorology has not as yet been successful in bringing cloud observations, and in fact other observations of the upper air, into relation with the present system of weather forecasting on the basis of isobaric charts. Many interesting facts have been already established; in fact there can hardly be any doubt that the progress of meteorology in the next ten years will be shown mainly in a reform of our views with regard to the upper air, but for the present there is no adequate bridge between the new knowledge and synoptical meteorology. For this reason the introduction of cloud observation or of kite and balloon observations into the scheme for international weather telegraphy must be postponed for the present. We must leave the individual systems to make experiments of this kind, to collect data and to promote, as far as possible, their systematic treatment.

(Signed) W. KÖPPEN.

## APPENDIX IX.

### ON THE ORGANISATION BY CENTRAL METEOROLOGICAL OFFICES OF A SERVICE FOR COLLECTING INFORMATION REGARDING CASES OF DAMAGE BY LIGHTNING.

In view of the fact that Meteorological Offices collect data regarding thunderstorms, in order to study statistically their distribution in time and space (on the earth's surface) it seems only natural that cases of damage by the electrical discharges which accompany these phenomena should be studied by meteorologists.

We often read accounts of very strange phenomena associated with damage by lightning. The phenomena are not always easy to define, and for this reason they excite the interest of students of natural philosophy in a high degree.

The importance to meteorologists of a study of damage by lightning, and the benefits to be derived from accurate statistics on the subject, are set forth in the *Gesammelte Abhandlungen* of Professor von Bezold, whose recent death is keenly regretted by us all; here, in the midst of the International Committee to which he belonged, I cannot utter this illustrious and venerated name without deep emotion and the feeling of affectionate devotion of the disciple.

Professor von Bezold, in several papers, of which the last and most important, as I see with pleasure, is reproduced in the *Gesammelte Abhandlungen*, has brought forward some remarkable facts based on data abstracted from statistics of Fire Insurance Companies, which should be noted:—

1. During the last 60 years the risk of damage by lightning has been continually on the increase. This is a striking fact, for which one can give no definite explanation; Professor von Bezold puts forth a hypothesis. It is a fact that the instances of damage by lightning have been increasing in Germany in the most decided manner since 1870, that is to say, during a period of great industrial expansion, and one wonders whether the thick clouds of smoke which large industrial towns throw into the air in ever-increasing quantities do not play an important rôle in the phenomenon. One also wonders whether railway lines, telegraph and telephone wires, electric power conductors, which envelop vast regions of the earth with a net-work daily becoming more intricate, have an influence on the formation of thunderstorms, and, in consequence, also on phenomena connected with lightning. Whatever may be the cause, the fact certified by Professor von Bezold is that storms are increasing both in number and in strength:—"Die Gewitter haben an Häufigkeit und zugleich an Heftigkeit zugenommen."

(2) Another fact demonstrated by Professor von Bezold is that if we compare the curve of cases of damage by lightning with the Wolf's curve of the relative frequency of sun spots we find the following relation:—"A minimum in the curve of cases of damage by lightning always corresponds with a maximum of sun spots;" this indicates that it is possible for a physical affinity (real, not accidental) to exist between the two kinds of phenomena.



I have recounted all this here, not only in order to take the opportunity of rendering homage to the memory of the illustrious and regretted Professor von Bezold, but also to demonstrate the importance to meteorologists of collecting data regarding damage by lightning.

Professor von Bezold studied the question from statistics collected first in Bavaria, and subsequently in the whole of Germany, and he rightly observes that it is most desirable that similar studies should be extended to the other regions of Europe and the world in order to find a better confirmation of the facts.

It is precisely with the object of promoting an extension of this study, from Professor von Bezold's point of view, that I thought of putting the question before the International Meteorological Committee—a question presented, not as a proposition to be decided, but only as a recommendation.

I know that in England the Royal Institute of Architects has elected a special committee (Lightning Research Committee) for researches on damage by lightning. This committee has prepared a catechism for collecting information on the phenomena relating to damage by lightning.

In Italy also, acting on an idea suggested by Professor Jean Platania, of Catania, I have endeavoured to accomplish something similar. Through a circular letter which I sent to all Professors of Physics, to Directors of Meteorological Stations, to the chiefs of the Bureau of Civil Engineers, etc., I have tried to obtain competent correspondents in each town, that is to say, people who will take it upon themselves to inform our Central Bureau of Meteorology of cases of damage by lightning, as was done, and is done now, with regard to thunderstorms.

I have furnished these correspondents with a series of questions which I have arranged in a similar form to the English catechism, mentioned above. I have distributed several copies of it here to my colleagues. Although written in Italian, you can easily understand the questions to which you are asked to give an answer. A few of these queries refer to the efficacy, always disputed, of lightning conductors; and the last article asks whether lightning provoked magnetic polarity in pieces of iron and in bricks and stones used for building purposes, a question which interests many scientists who study terrestrial magnetism.

I ask the committee to express an opinion as to whether a special service of information on damage by lightning is desirable; such a service would naturally enter into the province of Central Bureaux of Meteorology.

L. PALAZZO.

A copy of the catechism issued by the Lightning Research Committee is printed here in place of the Italian catechism:—

"1. Name of building struck, and for what purpose used. (A photograph taken after the disaster would be useful.)

"2. Date and hour of occurrence; name of place and county.

"3. Description and situation of the building, and height above sea level. (Give particulars as to its position with regard to other buildings and high trees, and its propinquity to any wells.)

"4. Was rain falling when the building was struck? If not, did rain precede or follow the stroke, and at what interval?

"5. Was the building provided with lightning rods? If so, state number, position, height above roof, material (both of rod and staples), shape, sectional area, how finished at top and at bottom, condition of ends after flash, *i.e.*, whether melted or blunted. (A sketch plan should be made, which should aim at being a sort of Röntgen-ray representation, the metal-work being shown a different shade from the brick and stone work.)

"6. Was the conductor continuous? Describe the earth connection. When was the conductor last examined and tested? Has the building been previously struck?

"7. Nature of soil.

"8. State fully the effect on the building—if any portion was set on fire; also, if any damage occurred to metal-work, such as bells, rain-water and other pipes, electric bells or telephones, &c.

"9. State distance (vertical and horizontal) of any portion of the building affected by the lightning from the nearest point of the conductor. (If stones, &c., were displaced, state to what distance.)

"10. State materials of roof coverings, and position of gutters and down pipes. Was the conductor in contact with any other metal?

"11. Were there any metal cresting, weathercocks, finials, or flagstaffs? If so, state distance from and height above conductor.

"12. If the conductor was struck, state whether the damaged portions can be obtained for examination."

## APPENDIX X.

THE NECESSITY OF FOLLOWING DAY BY DAY THE STATE OF THE PRINCIPAL METEOROLOGICAL ELEMENTS ON THE WHOLE SURFACE OF THE GLOBE, WITH THE HELP OF OBSERVATIONS FROM ABOUT 30 STATIONS DISTRIBUTED OVER EQUATORIAL, SUBTROPICAL, TEMPERATE AND POLAR REGIONS.

The marked progress made by meteorological science in recent years brings more and more into prominence the necessity for considering meteorological phenomena over the earth, as a whole.

We have learned to recognise that compensation prevails between the values of the various meteorological elements at



different points. Such compensation justifies us in connecting with general phenomena anomalies which appear at first sight to be accidental.

Again, if we wish to study the external influences affecting our atmosphere, we must include the entire earth in our investigations. The meteorological data collected and published at the present day are almost sufficient for this purpose, if we are content to study phenomena which occurred two or three years ago; but researches of this kind necessitate laborious examination of many different volumes, and I do not think I shall be contradicted when I say that it would be very desirable to follow, step by step, the general course of events as they occur, even if all we can do is to obtain a preliminary glance which will bring into relief points which require detailed subsequent study.

Amid all the complications which the atmosphere presents, we must try to distinguish the accidental and secondary from the essential, and to do this effectively we must avail ourselves of every opportunity which offers. In my opinion one of the most hopeful lines of progress lies in the direction of studying the daily changes of phenomena all over the world.

It seems to me to be unnecessary to insist further on the advantages of a scheme which would place before us day by day the principal data in the physics of the atmosphere as observed in equatorial, temperate, and polar regions.

Let us examine what is required to enable us to realise this object, and what facilities already exist. Since we propose to deal only with general phenomena, observations from a very limited number of stations will suffice provided that their selection be made judiciously. We might be satisfied if the publication appeared two days after date. This would allow of considerable reduction of expenditure.

#### CHOICE OF STATIONS AND ORGANISATION OF SERVICE.

It is necessary, as far as possible, for stations to be distributed uniformly in longitude and latitude.

In the equatorial region, four or five stations will probably suffice; say one at Singapore or at Batavia, one on the Congo near the coast, one at Quito, and one in Australasia. The neighbouring tropical regions might be represented by one station in India, one in the Sahara, one in Mexico, and one in the Pacific Ocean. In the Southern Hemisphere, we should require one station in Australia, one near the Cape of Good Hope, one in the Argentine Republic, and, if possible, one in the Pacific.

The temperate regions should be represented by one Siberian station, one or two European stations in addition to those already existing, two American stations, one station in the Pacific and one in Japan.

In the Southern Hemisphere points of observation will naturally be scarce; for the time being we might be satisfied with a station at Cape Horn or on Terra-del-Fuego, one in the south of New Zealand, and one on one or other of the islands, such as Kerguelen, which one of these days will be permanently inhabited for fishing purposes.

The polar regions proper will be represented by one of the Greenland stations, one station in North America in about  $140^{\circ}$  E. longitude, and one in North Siberia near the pole of greatest cold.

Finally, special importance would attach to establishing a meteorological station at Spitzbergen. The numerous coal mines, which are beginning to be regularly worked, would facilitate the heating of the station during the bad season.

The distance between Spitzbergen and the coast of the Scandinavian Peninsula allows of communication by wireless telegraphy.

We may also hope to see some scientific stations established in the Southern Hemisphere, but means for the transmission of observations are not available.

Each one of these stations should send a daily meteorological telegram to the country on which it depends, or to one of the European Meteorological Centres. The latter will forward the observations by post to the other European Meteorological Institutes.

The expenses entailed in working this scheme would be very small, as each centre would have to pay for only two or three telegrams; the cost incurred for postal services would amount to only a few francs per day.

The most important meteorological elements to be observed and transmitted seem to me to be the intensity of solar radiation observed at different fixed levels above sea level, pressure and temperature of the air, amount of cloud, direction of upper air currents, wind direction and force, rain and perhaps also magnetic elements, if it is possible to summarise magnetic conditions with sufficient precision in a telegram.

I think the establishment of this system would prove of great scientific interest, and I beg leave to call the attention of the International Meteorological Committee to the proposal. Ways and means for the carrying it out might be discussed by a Commission, if, as I trust will be the case, the Committee view the scheme with favour.

L. TEISSERENC DE BORT.

#### APPENDIX XI.

##### RULES OF INTERNATIONAL METEOROLOGICAL ORGANISATION.

The International Meteorological Organisation comprises:—

1. Conferences of Directors.
2. The International Meteorological Committee.
3. Commissions.

1. *Conferences of Directors.*—The special function of Conferences of Directors is to "discuss concrete questions, to agree as to methods of observation and calculation, and to organise co-operative researches."\* Purely theoretical questions cannot be included in the programmes of the Conferences.

\* Munich, Rapport du Bureau, p. 2, re-adopted at Innsbruck (pp. 17, 28).



The Conferences are to be convoked by the International Committee (*see below*).

The Officers of the Committee shall invite to the Conferences all Heads of Systems of Stations and the Directors of Meteorological Observatories which are official and independent of one another in each country.

Further, the Officers shall consult the Directors of official services in each country as to whether the Directors of certain private institutes, or the representatives of Meteorological Societies shall be invited to attend.

2. *The International Meteorological Committee.*—The Conferences of Directors shall nominate a Committee whose authority shall end at the following Conference. The Committee shall be composed of members chosen by the Conference. Each member must belong to a separate country, and must be the Director of an independent meteorological establishment.

The Committee is empowered to elect new members in the event of the resignation or death of any of its members. It may also co-opt, for the purpose of consultation, distinguished men of science whose advice is likely to prove of service.

The Officers, consisting of a President and a Secretary, are nominated by the Committee.

The Committee shall superintend the carrying out of the resolutions adopted at the Conferences. It shall make it its business to propose measures likely to prove helpful to the development of Science, to bring about uniformity of ideas, or to foster the maintenance of good relations between the services of different countries, and shall prepare for discussion questions to be submitted to the Conferences. Whenever necessary it shall appoint Commissions, whose duty it will be to advance the study of special questions.

3. *The Commissions.*—One of the objects of the International Meteorological organisation is, "to organise co-operative researches." Since 1891, the International Committee has, with this end in view, appointed several Commissions. The creation of these Commissions has been of the utmost service in the development of our Science. By this agency we have been able to organise and carry out successfully, work which would have been beyond the power of individual workers. It is most desirable that all who are working at the same or similar problems should meet periodically, to allow ideas to become crystallised, and to co-ordinate isolated efforts, without in any way interfering with personal initiative.

In the cases of newly organised Commissions, the Presidents shall be nominated by the Committee.

The Commissions have power to co-opt additional numbers, and to arrange their work as they please.

The Presidents of Commissions who are not members of the Committee shall be invited to attend the meetings of the Committee, and to take part in the discussions, but with a consultative

voice only. At the commencement of each meeting of the Committee they should present a report on the work of their Commission.

*Dates of Meetings.*—The Directors' Conferences are to be convoked by the International Committee when there are important questions to be submitted for discussion.

The Committee and the Commissions shall meet, as a general rule, once in three years.

The Officers of the Committee shall inform members of the Committee and the Presidents of Commissions by circular, one year in advance, of the intention to hold a meeting of Committee, and shall desire them to fix the time and place of the meeting by vote.

The date and place for a meeting of a Commission shall be fixed by the President of the Committee and the President of the Commission acting conjointly.

It is very desirable that those who wish to bring up a subject for discussion at a meeting of the Committee, or of a Commission,\* should distribute a short report on it to the respective members two months before the meeting.

## APPENDIX XII.

### REPORT OF THE COMMISSION ON SOLAR RADIATION.

Upsala, 8th September, 1907.

To the Secretary of the International Meteorological Committee.

My dear Colleague,

I beg to give you below a brief report of my work on solar radiation during the last two years.

After the meetings at Innsbruck and at Oxford in 1905 had approved the electric compensation pyrheliometer as a standard instrument, about 30 Institutions and Observatories in different parts of the world procured this instrument. Since the beginning of 1906 certain improvements have been introduced in the construction of the instrument to make it stronger. The instruments have all been made with the greatest care by Monsieur Rose, mechanician of the Upsala University, and I have myself determined their constants and standardised them. I have therefore reason to believe that we have a good guarantee of their being comparable one with another. The need for standard instruments is thus being gradually met.

However carefully the constants of the pyrheliometer are determined, the instruments are, nevertheless, always in danger of being damaged by use; the blackened surface, in particular, is easily spoilt if it is not treated with the greatest care. It is

\* Southport, 11th September, 1903, p. 18.



therefore very important for standard instruments to be compared with one another from time to time, as is done, for instance, with standards of length, of mass, &c. A scheme for this purpose was presented to the Congress assembled at Meudon in 1907, by the Swedish Sub-committee of the International Union for Co-operation in Investigations of the Sun, and was accepted.

#### SCHEME OF THE SWEDISH SUB-COMMITTEE.

1. It is very desirable to establish central stations for the comparison of the instruments used in countries in which observations of the intensity of solar radiation have been organised.

2. Observers may make use of any instrument they choose in their researches, but all these instruments should be compared at the central station with the instrument adopted as standard by the Congresses of Oxford and Innsbruck, that is to say, with the pyrheliometer of Ångström.

3. The Standard Instruments at Central Stations should be supplied with two sets of pyrheliometer bands, one for measuring and current comparisons, the other, the standard proper, for control experiments.

4. The standard bands should be kept in a closed metal cylinder, which should be sent to the principal centre (Upsala?) every three (?) years for comparison of the bands with the primary standard.

In addition to the work mentioned above, I have lately been busy in perfecting a new method for the study of solar radiation by means of absorbent screens, which I had the honour of presenting to the Congress of Oxford in 1905. I have given a detailed account of this method in a pamphlet "*Méthode nouvelle pour l'Étude de la Radiation Solaire*," a few extracts of which you will find herewith; I trust you will have the goodness to distribute these amongst the members of the Committee.

On account of failing health I have been obliged to resign the position of President of the Committee for Solar Radiation of the International Union for Co-operation in Investigations of the Sun. The numerous duties, which occupy my time more than ever, render it at present impossible for me to respond adequately to the confidence which has been shown me by the International Meteorological Committee in nominating me President of the Commission on Solar Radiation. For this reason I would ask you, my dear Colleague, to kindly present to the Committee my request to be relieved of this office.

With kind regards, Believe me,  
My dear Colleague,  
Yours very truly,  
KNUT ÅNGSTRÖM.

#### APPENDIX XIII.

##### REPORT ON THE METEOROLOGICAL MEAN VALUES FOR LONG PERIODS USED IN VARIOUS METEOROLOGICAL SYSTEMS.

[The countries are arranged in the order adopted in the International Catalogue of Scientific Literature for Topographical Classification. The letters in the margin refer to subdivisions in this classification.]

##### DENMARK, FAROE, ICELAND, GREENLAND.

DET DANSKE METEOROLOGISKE INSTITUT.

da

Copenhagen,  
11th December, 1907.

In reply to the letter from the Committee of the 15th November, I beg to state that the average values for stations in connexion with the Danish Meteorological Institute are contained in the following publications:—

(1) "*Meteorologisk Aarbog*, 1892, Part I.," which includes an article "*Nogle klimatologiske Middeltal m.m. for Danmark*." (A few climatological averages, etc., for Denmark) by Willaume-Jantzen. This article contains:—Averages for various elements for Copenhagen and Tarm, 1861-90; temperature averages for 30 stations, 1861-90; average number of days of frost for 20 stations for 12-17 years (ending 1890); mean barometric pressure for eight stations, 1874-1890; rainfall for 132 stations, 1861-1885 (varying periods).

(2) "*Meteorologiske Observationer i Kjöbenhavn*" (meteorological observations at Copenhagen) by Willaume-Jantzen, Copenhagen, 1896, published by the Danish Meteorological Institute, summarises data for the years 1768-1893.

(3) "*Meteorologiske Middeltal og Extremer for Faeröerne, Island og Grönland*" (Meteorological averages for the Faeroe Islands, Iceland and Greenland), issued as an Appendix to "*det danske meteorologiske Instituts Aarbog*," 1895, II., Copenhagen, 1899, contains all the most essential climatological elements for the 16-25 years ending 1895 for stations of the Institute in the Faeroes, Iceland and Greenland.

CARL RYDER.

##### NORWAY.

DET NORSKE METEOROLOGISKE INSTITUT.

da

Christiania,  
25th November, 1907.

Averages of meteorological elements for Norway are contained in the following publications contained in Videnskabselskabets



Skrifter. I. Math.-naturv. Klasse under the general title "Klima-Tabeller for Norge":—

I. Luftens Temperatur (Air Temperature) ...	1895 No. 10
II. Lufttryk (Pressure) ...	1896 No. 1
III. Luftens Fugtighed (Humidity) ...	1897 No. 11
IV. Vind (Wind) ...	1898 No. 2
V. Midlere maanedlige Minima og Maxima af Lufttemperatur (Mean Monthly Minima and Maxima of Temperature) ...	1899 No. 5
VI. Antal Dage med Frost (No. of Days with Frost) ...	
VII. Skydaekke (Amount of Cloud) ...	
VIII. Antal Dage med Nedbør, Sne, Hagel Taage, Klart, Overskyet, Torden (No. of Days of Rain, Snow, Hail, Fog, Clear Sky, Overcast Sky, Thunderstorm) ...	1900 No. 1
IX. Absolut Nedbørsandsynlighed ...	
X. Antal Nedbør-Timer i en Nedbør-Dag ...	
XI. Nedbør-Høide i en Nedbør-Dag ...	1906 No. 5
XII. Nedbør-Høide i en Nedbør-Time ...	
XIII. Nedbør-Vindroser (Rain Windroses) ...	
XIV. Nefiske Vindroser (Cloud Windroses) ...	

H. MOHN.

#### SWEDEN.

SVENSKA METEOROLOGISKA CENTRAL-ANSTALTEN.

da

Stockholm,  
21st November, 1907.

*Meteorological Averages for Sweden.*

*Barometric Pressure.*

H. E. Hamberg: "La pression atmosphérique moyenne en Suède, 1860-1895." Kongl. Svenska Vetenskaps-Akademiens handlingar. (Memoirs of the Royal Academy of Sciences.) Band 31, No. 1. Stockholm, 1898.

*Temperature of the Air.\**

H. E. Hamberg: "Vieljährige Temperaturmittel für Schweden." Meteorologische Zeitschrift, November 1904, p. 521.

H. E. Hamberg: "Moyennes mensuelles et annuelles de la température et extrêmes de température mensuels pendant les 150 années, 1756-1905, à l'observatoire de Stockholm." Kongl. Svenska Vetenskaps-Akademiens handlingar. Band 40, No. I. Upsala and Stockholm, 1906.

H. E. Hamberg: "Sveriges klimat." see "Handbok i Sveriges geografi" by Dr. J. Fr. Nyström. Upsala, 1895. (Average number of days of frost for the various provinces on p. 156.)

*Rainfall.*

H. E. Hamberg: "Om skogarnes inflytande på Sveriges klimat." (Influence of forests on the climate of Sweden.) IV. Precipitation. Appendix to "Domänstyrelsens underdåniga berättelse rörande skogsväsendet år 1895." Stockholm, 1896.

\* For Means and Extremes of Air Temperature in Sweden 1856-1907, see Appendix (Bihang) to "Meteorologiska Iakttagelser i Sverigē." Vol. 49, 1907. Upsala 1908. W.N.S.

H. E. Hamberg: "Månadsöfversikt af väderleken i Sverige till landtbrukets tjänst utgifven under Meteorologiska Centralanstaltens inseeende." (Monthly Meteorological Report of Sweden.)

*Depth of Snowfall.*

H. E. Hamberg: "Om skogarnas inflytande på Sveriges klimat." (Influence of forests on the climate of Sweden). V. Depth of Snowfall. Appendix to "Domänstyrelsens underdåniga berättelse rörande skogsväsendet år 1895." Stockholm, 1896.

*Thunderstorms.*

H. Mohn and H. Hildebrand Hildebrandsson: "Les orages dans la péninsule Scandinave." Nova Acta Reg. Soc. Sc. Upsal., Ser. III., 1887, Upsala, 1888.

*Lake Levels.*

H. Hildebrand Hildebrandsson and C. A. Rundlund: "Prise et débâcle des lacs en Suède, automne 1871—printemps 1877." Nova Acta Reg. Soc. Sc. Upsal., Ser. III., 1878, 1879.

*Night Frosts.*

H. E. Hamberg: "Die Sommernachtfröste in Schweden, 1871-1900." Kongl. Svenska Vetenskaps-Akademiens handlingar. Band 38, No. 1. Stockholm, 1904.

H. E. HAMBERG.

#### RUSSIA.

NICHOLAS CENTRAL PHYSICAL OBSERVATORY AT  
ST. PETERSBURG.

db

St. Petersburg,  
11th February, 1908.

Meteorological averages calculated for a long series of years ending 1895 inclusive, have been taken as the basis for the "Atlas climatologique de l'Empire de Russie, publié par l'Observatoire physique Central Nicolas à l'occasion du cinquantième anniversaire de sa fondation." The averages used therein have not yet been published in tabular form. Older averages are contained in the following works:—

(1) Barometric Pressure: A. de Tillo. "Répartition géographique de la pression atmosphérique sur le territoire de l'Empire de Russie et sur le continent Asiatique." Mém. de la Soc. Imp. de géogr. Vol. XXI. St. Petersburg, 1890.

(2) Temperature of the Air: H. Wild. "Neue Normal-Lufttemperaturen für das Russische Reich." Mém. de l'Acad. des Sc. de St. Pétersbourg. VIII, sér. Classe phys.-math. Vol. I. No. 8. St. Petersburg, 1894.



- (3) Humidity of the Air: A. Kaminsky. "Der jährliche Gang und die Verteilung der Feuchtigkeit der Luft in Russland nach den Beobachtungen von 1871-1890." VI. Supplement Repertorium für Meteor. St. Petersburg, 1894.
- (4) Cloud amount: A. Schönrock. "Die Bewölkung des Russischen Reiches." Mém. de l'Acad. des Sc. de St. Pétersbourg. VIII. sér. Classe phys.-math. Vol. I., No. 9. St. Petersburg, 1895.
- (5) Wind: J. Kiersnowsky. "La direction et la vitesse du vent sur la surface de l'Empire Russe." Mém. de l'Acad. d. Sc. de St. Pétersbourg. VIII. sér. Classe phys.-math. Vol. II., No. 4. St. Petersburg, 1895.
- (6) Precipitation: H. Wild. "Neue vieljährige und fünfjährige Mittel der Niederschlagsmengen und der Zahl der Tage mit Niederschlag für das Russische Reich." Mém. d. l'Acad. Imp. d. Sc. de St. Pétersbourg. VIII. sér. Classe phys.-math. Vol. III., No. 1. St. Petersburg, 1895.
- (7) The breaking up of Ice and freezing of Water: M. Rykatcheff. "Über den Auf- und Zugang der Gewässer des Russischen Reiches." II. Supplement to Repertorium für Meteor. St. Petersburg, 1886.
- (8) Temperature of the Soil: P. Vannary. "Sur la température du sol dans certains endroits de l'Empire de Russie." Mém. de l'Acad. Imp. des Sc. de St. Pétersbourg. VIII. sér. Vol. V., No. 7. St. Petersburg, 1897.
- (9) Duration of Insolation: P. Vannary. "La durée de l'insolation en Russie." Mém. de l'Acad. Imp. des Sc. de St. Pétersbourg. VIII. sér. Vol. XXII., No. 3. St. Petersburg, 1907.
- (10) Evaporation: O. Britzke. "Der jährliche Gang der Verdunstung in Russland." Repert. für Met. Bd. XVII., No. 10. St. Petersburg, 1894.
- (11) Quantity of Snow: E. Heintz. "Über die Niederschläge, die Schneemenge, und die Verdunstung in den Flussgebieten des Europäischen Russland. Arbeiten der Expedition zur Erforschung der Quellgebiete der Flüsse in Russland." St. Petersburg, 1898.

M. RYKATCHEFF.

INSTITUT MÉTÉOROLOGIQUE CENTRAL DE LA SOCIÉTÉ DES  
SCIENCES DE FINLANDE.

db

Helsingfors,  
15th January, 1908.

I regret that we have not much to communicate in connexion with what you ask, as very few meteorological summaries and averages have been published for Finland.

The most complete, although already very old summaries are contained in Russian works such as "Die Temperaturverhältnisse

des Russischen Reiches," "Die Niederschlagsverhältnisse u.s.w." in Wild's Repertorium. As for summaries published in Finland, there are only those prepared by G. Hällström, which are contained in the first volumes of "Acta Societatis Scientiarum Fennicae." The following also contains a few averages:—Observations Météorologiques publiées par l'Institut Météorologique Central de la Société des Sciences de Finlande." Resumé of the years 1881-1890, Kuopio, 1897.

In the near future I hope to publish, either in the "Meteorologische Zeitschrift" or in "Öfversikt af Finska Vetenskaps-Societätens Förhandlingar" a few averages for Stations in Finland, especially for temperature and precipitation. Professor Hann has already for some time past requested me to do this.

OSC. V. JOHANSSON.

# DORPAT-JURJEW AND RAINFALL STATIONS OF THE METEOROLOGICAL SYSTEM IN LIVONIA AND ESTONIA.

db

The results of the observations of the Observatory at Dorpat-Jurjew are published under the title "Meteorologische Beobachtungen angestellt in Jurjew (Dorpat)."

Averages for pressure, temperature, wind, amount of cloud, and precipitation for *months*, and *seasons* or *years* are printed as follows:—

6 years from December 2nd, 1865, with the issue for 1871, p. 84.	
7 " " " " " " 1872-73, p. 102.	
8 " " " " " " 1872-73, p. 210.	
9 " " " " " " 1874, p. 100.	
10 " " " " " " 1875, p. 80.	
10 years from January 1st, 1866, in a supplement (Ergänzungsheft) to Vol. II.	
11 " " " " " " with the issue for 1876, p. 82.	
12 " " " " " " 1877, p. 128.	
13 " " " " " " 1878-80, p. 81.	
14 " " " " " " 1878-80, p. 165.	
15 " " " " " " 1878-80, p. 249.	
20 " " " " " " in a supplement (Ergänzungsheft) to Vol. IV.	

Averages for the same elements for *days*, *periods of 5 days* and *seasons* are published as follows:—

5 years from December 2nd, 1865, with the issue for 1866, pp. 31-46.
10 years from January 1st, 1866, in a supplement (Ergänzungsheft) to Vol. II.
20 years from January 1st, 1866, in a supplement (Ergänzungsheft) to Vol. IV.

The supplement (Ergänzungsheft) to Vol. IV. of "Meteorologische Beobachtungen angestellt in Dorpat" also contains:—

*Hourly* averages for months and years for the 19 years from January 1st, 1867, for pressure, temperature, amount of cloud and wind.

*Hourly, daily, 5 daily, monthly* and *annual* averages, for the 15 years from January 1st, 1871, of *Atmospheric Humidity*.



The following average values are also published in "Meteorologische Beobachtungen angestellt in Jurjew" :—

Average annual variation of water level in the River *Embach* as observed at Dorpat-Jurjew, 1868-1903, published with the data for 1903, p. 102.

Hourly averages of Temperature, 1867-1903, with the data for 1903, p. 103.

Frequency of Temperature groups, 1867-1903, with the data for 1903, p. 104.

Diurnal variation of Wind Direction and Velocity, 1867-1885 and 1886-1903, with the data for 1903, p. 105.

Average values of humidity for the 35 years 1871-1905, with the data for 1905, pp. 111-114.

Average amount of cloud for 40 years, 1867-1906, with the data for 1905, p. 115.

Data for the diurnal and annual variations of humidity at Dorpat-Jurjew for the years 1871-1905, are published in "Sammlung von Arbeiten ausgeführt von Studenten am Meteorolog. Observatorium d. K. Universität zu Jurjew (Dorpat)" Vol. I., 1906, pp. 96-128.

#### DATA FOR STATIONS IN LIVONIA AND ESTONIA.

Averages of rainfall amounts, number of raindays and temperature for the lustra, 1886-1890, 1891-1895, see "Bericht über die Ergebnisse der Beobachtungen an den Regenstationen der Kais. livländischen gemein-nützigen und oekonomischen Societät für d. Jahr 1895," pp. 17-30.

Averages of rainfall amounts, number of days of rain and temperature for the period 1886-1900, see "Bericht über die Ergebnisse der Beobachtungen für das Liv-Estländische Regensstationsnetz."

#### METEOROLOGICAL AND MAGNETICAL OBSERVATORY OF THE IMPERIAL UNIVERSITY AT ODESSA.

db

Odessa,

24th November, 1907.

The results of observations made at Odessa and at other stations belonging to the meteorological system of the South-west of Russia, are given in the following publications :—

- (1.) *Annales de l'Observatoire météorologique et magnétique à Odessa. Année 1894-1906.*
- (2.) *Matériaux pour la climatologie du sud-ouest de la Russie. Odessa, 1898.*
- (3.) *Le climat d'Odessa d'après les observations de l'année 1866 à l'année 1893.*
- (4.) *Revue Météorologique. Travaux du réseau, du sud-ouest de la Russie, 1886-1906.*

ALEXANDER KLOSSOVSKY,

Professor at the University, Director of the Observatory, Founder of the Meteorological System of the South-west of Russia,

#### PHYSICAL OBSERVATORY, TIFLIS (CAUCASIA).

db

Tiflis,

20th May, } 1908.  
2nd June, }

SIR,

IN reply to your circular of November 15th, 1907, I beg leave to inform you that homogeneous series of averages for long periods have not been prepared for the stations connected with the Physical Observatory of Tiflis. The averages used at the Observatory are for varying periods. The largest series of observations is that for Tiflis, which covers about 60 years. The periods for other stations are much shorter. The adopted averages may be inferred from our "Bulletin Météorologique Mensuel," in which we give the divergence from the average as well as the actual values. Data for a large number of stations in Caucasia are contained in the well-known papers of Wild, Kaminsky, Schönrock, and others, on the climatology of Russia. I regret that no special publications exist for Caucasia.

E. KLOSSENS,

Director.

#### METEOROLOGICAL BUREAU OF THE WARSAW SYSTEM.

db

Warsaw,

28th November, 1907.

The publication mentioned below is the principal source containing meteorological elements collected at the various stations of the Warsaw system (in Russian Poland) :—

*Pamiętnik Fizyograficzny* (Vol. I. in 1881, Vol. XIX. in 1907), published in Polish. (Warsaw, 4°).

I.—(a). Amongst the memoirs which have appeared in "Pamiętnik Fizyograficzny," we mention those of MM. J. Kowalczyk (Vol. I., pp. 1-46, Vol. II., pp. 1-33); A. Pietkiewicz (Vol. I., pp. 1-46, Vol. II., pp. 1-33); A. Pietkiewicz (Vol. I., pp. 1-46, Vol. II., pp. 1-33); W. Choroszeffski (Vol. I., pp. 449-452, Vol. III., pp. 515-521); J. Jedrzejewicz (Vol. I.-IV.), &c.

N.B.—These memoirs contain series and averages of the meteorological elements for Warsaw (detailed series since 1826), for Plonsk (since 1875), for Plinsk (since 1876), for Lublin, &c.

(b). Amongst the more recent memoirs which contain averages for one or more meteorological elements for stations of the Warsaw system are the following :—

R. Merecki. "Klimatologia ziem polskich. Czesc I. Nieokresowa zmienność temperatury powietrza." (Climatology of Poland. First part. Non-periodic variation of the temperature.) (8°, p. 112. Extract from Vol. XXXV. of "Rozprawy," of the Academy of Science of Krakau; Krakau, 1899.) Contains detailed tables and averages for 43 stations.

Lad. Gorczyński. "On the annual range of the intensity of solar radiation at Warsaw, and on the theory of the methods employed" (8°, p. 203, issued by the Meteorological Bureau of Warsaw, 1906).



Contains averages for 1901-1905 for intensity of solar radiation at Warsaw, as well as the duration of insolation and heat totals. (1903-1905.)

II. Since 1886 meteorological observations made in Russian Poland are collected and published under the heading, "Spostrzeżenia meteorologiczne dokonane na stacyach meteorologicznych sieci warszawskiej, wydane przez Stację Centralną Meteorologiczną przy Muzeum Przemysłu i Rolnictwa w Warszawie" (Meteorological observations made at Meteorological Stations of the Warsaw system, and published by the Central Meteorological Station of the Museum of Industry and Agriculture at Warsaw).—Vol. I., in 1887 . . . Vol. XIII., in 1907 (these annuals of the Warsaw system form part of the publication, "Pamiętnik Fizyograficzny.")

N.B.—Vol. X. (for the year 1895) contains averages (1886-1890, 1891-1895, and 1886-1895) for a few stations of the meteorological system of Warsaw.

The text of these volumes is published in Polish, but the headings of the numerical tables are given also in French.

III. For a few averages referring to Poland, see also publications of the neighbouring systems of the Academy of Science of Krakau, of the Society of Tatra, of the Zentral Anstalt für Meteorologie und Erdmagnetismus at Vienna, of the Königl. Preuss. Meteorologisches Institut at Berlin, and of the Nicholas Central Physical Observatory at St. Petersburg.

For the Director,

DR. LAD. GORCZYNSKI.

### GERMAN EMPIRE.

#### METEOROLOGISCHER LANDESDIENST ELSASS-LOTHRINGEN.

dc

Strassburg.

H. Hergesell: "Die meteorologischen und klimatologischen Verhältnisse Elsass-Lothringens, forming part of "Das Reichsland Elsass-Lothringen," contains:—

Pressure and temperature averages, from three years' observations, 1892-94, reduced to Hann's period by comparison with data from Basle, Strassburg, and Karlsruhe.

Precipitation, averages, 1881-1890.

Cloud amount, 5-year averages, reduced by comparison with data for Paris, 1873-1890.

Wind direction and velocity, and humidity, 3-year averages.

E. Kleinschmidt: "Die Niederschlagsmengen in Elsass-Lothringen." Appendix to "Deutsches Meteorologisches Jahrbuch für 1903. Elsass-Lothringen." Strassburg, 1907.

A. Stolberg: Über die Bewölkungsverhältnisse von Strassburg i. Els." Met. Ztschr. 1904, p. 414. Seven-year averages from hourly observations.

H. HERGESELL.

#### ZENTRAL BUREAU FÜR METEOROLOGIE UND HYDROGRAPHIE IM GROSSHERZOGTUM BADEN.

dc

Karlsruhe,

3rd December, 1907.

Temperature averages for 1851-1880 are published in "Singer, Temperaturmittel für Süddeutschland" (part of "Beobachtungen der meteorologischen Stationen im Königreich Bayern," Vol. X., 1888), Munich, 1889.

Averages for amount of precipitation, frequency of rain and snow for 1888-1896, are contained in "Beiträge zur Hydrographie des Grossherzogtums Baden," forming part of Vol. 10 of "Die Niederschlagsverhältnisse des Grossherzogtums Baden," Karlsruhe, 1900.

Averages for lustra are published every five years in the German Meteorological Year-books ("Deutsches Meteorologisches Jahrbuch"). The volume for 1907 will contain averages of barometric pressure and temperature for 1886-1905, as well as for rainfall for 1888-1907.

SCHULTHEISS.

#### DEUTSCHE SEEWARTE.

dc

Hamburg,

5th December, 1907.

In reply to the circular from the International Meteorological Committee of the 15th November, the Deutsche Seewarte has the honour of forwarding the cover of the November number of the "Annalen der Hydrographie und mar. Meteorologie" on which the required information is shown in the passage underlined.

"Ergebnisse der meteorologischen Beobachtungen im Systeme der Deutschen Seewarte für die Lustren 1876-80 und 1881-85 sowie das Dezennium 1876-85." Hamburg, 1889. Price 4 Marks.

Ergebnisse . . . für das Lustrum 1886-90 und 1891-95. Hamburg, 1891 und 1896. 4°. Price 2 Marks.

Ergebnisse . . . für das Dezennium 1886-95. Hamburg, 1898. 4°. Price 2 Marks.

Ergebnisse . . . für das Lustrum 1896-1900 sowie für die 25 Jahre 1876-1900. Hamburg, 1904. Price 3 Marks.

#### GROSSHERZOGLICH HESSISCHES HYDROGRAPHISCHES BUREAU.

dc

Darmstadt,

27th November, 1907.

In reply to the circular from the International Meteorological Committee of the 15th instant, I have the honour to state that the only averages which have been published are those for the five years 1901-1905. These are contained in the supplement for 1905. Hessen to the "Deutsches Meteorologisches Jahrbuch," for 1905. This Bureau also makes use of the averages for Darmstadt for the years 1881-1905, for purposes of comparison. These were computed here last year, for the monthly schedules sent to the Solar Commission, but they have not been published.

IMROTH.



## KÖNIGLICH PREUSSISCHES METEOROLOGISCHES INSTITUT.

dc

Berlin.

Averages for precipitation for long periods (1851-1900), comprising the elements, amount and frequency of rain, snow, hail, "graupel," are contained in :—

"Die Niederschläge in den Norddeutschen Stromgebieten. In amtlichem Auftrage bearbeitet von G. Hellmann, Berlin, Dietrich Reimer, 1906.

Temperature averages for the same period are given in :—

"Fünfzigjährige Pentadenmittel der Lufttemperatur in Norddeutschland von V. Kremser." ("Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung i. J., 1900." Berlin A. Asher and Co., 1906.)

Other average values are available in manuscript only.

G. HELLMANN.

## KÖNIGLICH SÄCHSISCHE LANDES-WETTERWARTE.

dc

Dresden, N.,

1st December, 1907.

In reply to the inquiry of the 15th November last, I have the honour of informing you that the averages deduced from the meteorological observations made in Saxony are contained in the following publications :—

- (1.) "Das Klima des Königreiches Sachsen." Vols. I., II., III. (1864-1890), and Vol. VII. (1864-1900).
- (2.) "Vorarbeit zum Jahrbuch des Königlich sächsischen meteorologischen Instituts für 1900." (Pressure, 1866-1900.)

SCHREIBER.

## KÖNIGLICH WÜRTTEMBERGISCHE METEOROLOGISCHE ZENTRALSTATION.

dc

Stuttgart.

For the system of Württemberg, meteorological averages for long periods are contained in the following publications :—

- (1.) H. Schoder, "10 jährige Resultate der an den württembergischen meteorologischen Stationen in der Zeit von 1866 bis 1875 angestellten Beobachtungen." (Württembergische Jahrbücher für Statistik und Landeskunde, 1880.)
- (2.) H. Schoder, "50 jährige Ergebnisse der meteorologischen Beobachtungen in Stuttgart, 1828-1875." (Württembergische Jahrbücher, 1882, p. 101, reprinted in the "Witterungsbericht" for 1878-79.)
- (3.) K. Mack, "Einige Ergebnisse der meteorologischen Beobachtungen in Hohenheim von 1878-1902." Prize essay for the 85th anniversary of the Hohenheim Academy, 1903.
- (4.) K. Mack, "Ergebnisse 10 jähriger Windregistrierungen in Hohenheim." Meteorologische Zeitschrift, Hannoversche, 1906.

- (5.) L. Meyer, "75 jährige Monatsmittel (1826-1900) der Temperatur und 15 jährige (1888-1902) des Niederschlages in Württemberg." (Deutsches Meteorologisches Jahrbuch für 1904, württembergisches Teilheft).
- (6.) A. Bühler, "Die Hagelbeschädigungen in Württemberg, 1828-1887." (Württembergische Jahrbücher für Statistik und Landeskunde, 1888.)
- (7.) C. R. Heck, "Die Hagelverhältnisse Württembergs in dem Zeitraum 1828 bis 1890." (Jahrbücher für Statistik und Landeskunde, 1902.)
- (8.) R. Fink, "Das Klima von Gingen a.d. Brenz nach 23 jährigen Beobachtungen, 1824-1846." Heilbronn, 1895.
- (9.) H. Müller, "Das Klima von Calw nach 100 jährigen Wetterbeobachtungen." (Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg, 1901, p. 189.)

A. SCHMIDT.

## NETHERLANDS.\*

## KON. NEDERLANDSCH METEOROLOGISCH INSTITUUT.

dd

De Bilt,

26th November, 1907.

In reply to your letter of the 15th instant, I have the honour to inform you that the Royal Meteorological Institute of the Netherlands has published averages of temperature and barometric pressure in "Marche annuelle du thermomètre et du baromètre en Néerlande, déduite d'observations simultanées de 1843 à 1875 en rapport avec les observations des stations normales Copenhague, Greenwich et Paris." Utrecht, 1876. (P. 128.)

The insufficiency of the information available concerning the exposure and corrections of instruments, a number of errors which have been found in the tables, and the method followed in calculating the averages, have obliged the present Direction of the Institute to repudiate all responsibility for these results.

Summaries of temperature, barometric pressure, and rainfall, given at the end of a few of our "Annales" (1898, 1888, &c.), are in the same position.

Since 1904 the Institute has published Monthly Weather Reports for the Netherlands. These reports contain, in addition to other matter, averages for Utrecht (de Bilt) from 1849, and for 11 other stations since 1894.

An extension of these averages, to include a longer series of observations, is in course of preparation. Averages for the period 1881-1905 have already been communicated to the Solar Commission, and we propose to publish, in the course of a few years, averages for this period for several stations. This publication will appear in the "Mededeelingen en Verhandelingen" of the Institute.

E. VAN EVERDINGEN,  
Director.

\* For Belgium, see p. 92.



## BRITISH ISLES.

I.—TABLES PUBLISHED BY THE METEOROLOGICAL OFFICE,  
LONDON.de. *Stations of the First Order (4).*

1. "Hourly readings at Four Observatories (Valencia, Aberdeen, Falmouth, Kew) in connexion with the Meteorological Office," issued annually. Each volume contains average hourly values for each month and for the whole year, of
  - (a) Pressure, 35 years, 1871-1905.
  - (b) Dry bulb temperature, 35 years, 1871-1905.
  - (c) Wet bulb temperature, 35 years, 1871-1905.
  - (d) Wind Velocity, 25 years, 1881-1905.
  - (e) Rainfall, 35 years, 1871-1905.
  - (f) Bright sunshine (Campbell-Stokes autograph), 25 years, 1881-1905.

*Stations of the Second Order (12).*

2. Appendix I. to the Volume of "Meteorological Observations at stations of the Second Order" for the year 1891. Monthly averages of the elements observed at stations of the Second Order, for 12 stations for the 15 years 1876-1890.

*Rainfall only (500).*

3. "Rainfall Tables of the British Islands." Monthly and annual averages of rainfall for lustra and for the period named below for about 500 stations in the British Islands. Vol. I., 1866-1880, Vol. II., 1866-1890.

*Temperature only (133).*

4. "Temperature Tables for the British Islands." Daily averages of maximum, minimum, and mean temperature for the four observatories (Valencia, Aberdeen, Falmouth, Kew) for the 30 years 1871-1900; monthly averages of maximum, minimum, and mean temperature for stations in the British Islands, generally for the years 1881-1900. This publication also contains information regarding the absolute extremes of temperature experienced during the period referred to.

*Temperature, Rainfall, and Sunshine. (About 120 stations.)*

5. Appendix III. to the "Weekly Weather Report" for 1906. Monthly averages of maximum, minimum, and mean temperature, rainfall and rain-days for the 35 years 1871-1905, and of duration of bright sunshine and percentage of possible duration for the 25 years 1881-1905. Corresponding values were issued in connexion with the Weekly Weather Reports for the years 1895, 1901.

*Telegraphic Reporting Stations (25).*

6. Appendix I. to the "Daily Weather Report" (issued quarterly with the Report). Monthly averages of pressure, dry bulb

temperature, wet bulb temperature at 8 a.m., daily extremes of temperature, rainfall and bright sunshine, for the telegraphic reporting stations of the Meteorological Office. For most stations the averages are for the 35 years 1871-1905 (sunshine 25 years, 1881-1905).

Note:—A full list of Tables of Mean Values issued by the Meteorological Office up to the end of 1903, is given in Appendix XI. of the Report of the Meteorological Council for 1903-4.

II.—PUBLICATIONS OF OTHER AUTHORITIES IN THE UNITED  
KINGDOM.*Royal Observatory, Greenwich.*

"Results of the Magnetical and Meteorological Observations," issued annually. In each volume current values are compared with the averages: the most recent averages are, for most elements, for the 65 years, 1841-1905 (for wind, 40 years, 1867-1906, for sunshine, 1897-1906). A summary of the observations made at the Royal Observatory is given in "Reduction of Greenwich Meteorological Observations" Part I., Barometer, Dry Bulb and Wet Bulb Thermometers, Earth Thermometers (1878). Part II., Barometer, Dry Bulb and Wet Bulb Thermometers (1889). Part III., Temperature (1895). Part IV., Temperature (1906).

Results for other Observatories, as the Radcliffe Observatory, Oxford, the Observatories of Stonyhurst and Jersey, and the Southport Observatory, are also separately published.

*Royal Meteorological Society.*

Quarterly Journal of the Royal Meteorological Society, Vols. 18, 28, 29, "English Climatology" (F. C. Bayard). Monthly averages of observations made at stations of the Second Order in connexion with the Royal Meteorological Society.

*Scottish Meteorological Society.*

Mean values for Barometer, Wind direction, Temperature and Rainfall, for a number of British stations are given in the Volumes II to XI of the Journal of the Scottish Meteorological Society.

W. N. SHAW.

17 December, 1907.

## FRANCE.

BUREAU CENTRAL MÉTÉOROLOGIQUE DE FRANCE.

df. Paris,  
27th November, 1907.

You ask me, on behalf of the International Meteorological Committee, for references to publications containing average values of the various meteorological elements for France.



Average values have hitherto been published for temperature only. In a memoir which I published in Vol. I. of the "Annales" of the Bureau for 1903 (pp. 119-232), there are given annual and monthly temperature averages for French stations for the 50 years 1851-1900, which we take as the normal period.

A paper, now in the press, which will appear in Vol. I. of the issue for 1904, will contain full information relative to extremes of temperature. Pressure and rainfall data will be issued subsequently. The work has been commenced, but I cannot say yet when it will be published.

A. ANGOT,  
Director.

#### SPAIN.\*

##### OBSERVATORIO ASTRONÓMICO Y METEOROLÓGICO.

dg.

Madrid,  
25th December, 1907.

In reply to your esteemed letter of the 15th, I have the honour to inform you that the meteorological averages for our Observatory are contained in the volume of our publications "Treinta y cinco años d'Observaciones Meteorológicas," of which I beg to send you a copy.

Our publication "Treinta años d'Observaciones Meteorológicas," which is out of print, deals with the same subject.

The Director.

#### ITALY.

##### UFFICIO CENTRALE DI METEOROLOGIA E DI GEODINAMICA.

dh.

The Central Office for Meteorology and Seismology, Rome, publishes every two or three years a volume of yearly statistics for Italy, in which are contained the average values for various meteorological elements for 27 stations in Italy.

The period covered by the observations from which the averages are computed, is 40 years for 12 stations, and 30 years for the remaining 15.

Several Italian observatories have published average values deduced from observations extending over a long series of years. We indicate below the periods dealt with by each observatory in obtaining the normals :—

*Florence.*—(R. Osservatorio del R. Museo di Storia Naturale.) For rainfall, 1832-1905; for other elements, 1843-1905.

The data are published in the "Annuario Statistico del comune di Firenze." Printers, Barbera, Florence, 1907.

\* For Portugal, see p. 92.

*Naples.*—(R. Osservatorio Astronomico di Capodimonte.) Cloud data, 1874-1900; for all other meteorological elements, 1866-1900.

Average values are contained in the following pamphlet :—

Alberti, V. "Sul Clima di Napoli: Riassunto generale delle Osservazioni meteorologiche fatte nella R. Specola di Capodimonte dal 1866 al 1900." (Naples, 1901. Atti del R. Istituto di incoraggiamento (Proceedings of the Royal Institute of Research).)

*Milan.*—(R. Osservatorio Astronomico di Brera.)

Averages of barometric pressure have been computed by Professor Schiapparelli for the period 1835-1859; those for temperature by Professor Celoria for 1835-1872; for absolute and relative humidity by Professor Schiapparelli for 1845-1879; for rainfall by E. Pini for 1805-1884, supplemented by a further period of 20 years 1885-1904.

Averages for other meteorological elements (wind, state of sky, various meteoric phenomena) are available only for the 25-year period 1881-1905, computed by E. Pini.

All these data are contained in the meteorological publications of the Royal Observatory contained in the Proceedings and Memoirs of the Royal Institute of Science, Letters, and Art, of Lombardy (Atti e Memorie del R. Istituto Lombardo di Scienze, Lettere e Arti).

*Riposto.*—(Osservatorio Meteorologico annesso al R. Istituto Nautico.)

Averages for all meteorological elements have been computed for the period 1875-1905, and are contained in Professor D. Cafiero's pamphlet "Il clima di Riposto," printed in the "Annali" of the Central Meteorological Office, Vol. XXVII., 1905.

*Padua.*—(R. Osservatorio Astronomico.) Averages for all meteorological elements, 1866-1905.

A. Favaro: "Valori normali dei principali elementi del clima di Padova." (Atti del R. Istituto Veneto di Scienze, Lettere, e Arti (Proceedings of the R. Venetian Institute of Science, Letters, and Art), Vol. XXII., Disp. IV., 1906.)

*Lecce.*—(Osservatorio Meteorologico.)

Averages for all meteorological elements, 1875-1904.

C. de Giorgi: "Note statistiche sul clima di Lecce nel trentennio 1875-1904." (R. printer and publisher, Salentina, Spaccante Bros., Lecce, 1905.)

*Catania.*—(R. Osservatorio Meteorologico annesso al R. Istituto Fisico della R. Università.)

Averages for temperature, computed for the period 1817-1900. L. Mendola and F. Eredia, in "La Temperatura in Catania dal 1817-1900." (Atti dell' Accademia Gioenia di



Scienze Naturali in Catania (Proceedings of the Academy of Natural Science, Catania), Series IV., Vol. XIV.) Gales, averages computed for 1866-1900.

F. Eredia: "Sui temporali osservati a Catania dal 1866-1900." (Memorie della R. Accademia degli Zelanti (Memoirs of the Royal Academy, 3rd series, Vol. I., 1901-1902—Acireale.)

Averages for rainfall, 1865-1900. L. Mendola: "La pioggia in Catania dal 1865 al 1900." (Atti dell'Accademia Gioenia di Scienze Naturali in Catania (Proceedings of the Academy of Natural Science in Catania), series IVA., Vol. XV.)

The Royal Observatory of Meteorology and Geodynamics, attached to the Royal Astrophysical Observatory, possesses averages for all meteorological elements for the period from 1892 (year of its foundation) to 1906.

Modena.—(Osservatorio Meteorologico annesso all'Istituto Fisico della R. Università.)

Averages for rainfall and snow, 1830-1895.

C. Chistoni: "Risultati udometrici ottenuto al R. Osservatorio Meteorologico di Modena dal 1830 al 1895." (Atti della R. Accademia di Scienze, Lettere, e Arti (Proceedings of the Royal Academy of Science, Letters, and Arts), Series II., Vol. XII.)

C. Chistoni: "La neve nel clima di Modena." (*Loc. cit.*, Series II., Vol. XII., 1830-1895.)

Rome.—(Osservatorio Meteorologico annesso al R. Osservatorio Astronomico del Collegio Romano.)

Temperature averages for 40 years (1856-1894). E. Bortolotti: "Sulla variazione annua della temperatura nel clima di Roma." (Rendiconti della R. Accademia dei Lincei (Report of the Royal Academy of Science), Vol. VII., first six months.) Rainfall averages computed for 81 years (1825-1905). F. Eredia: "La pioggia a Roma." (*Loc. cit.* Vol. XV., first six months.)

Turin.—(Osservatorio Meteorologico annesso al R. Osservatorio Astronomico.)

Averages computed for the period 1865-1894. G. B. Rizzo: "Il clima di Torino" (Memorie della R. Accademia di Scienze di Torino, 1896).

At several other observatories, such as Bassano, Ferrere, Cuneo, Salò, Messina, averages calculated from observations for a shorter period than 20 years are in existence.

A report on the rainfall distribution in Italy containing pluviometric values from 214 Italian stations (1880-1905) is in the course of publication. It will be published in Vol. XXVII. (1905) of the "Annali" of the Central Office for Meteorology and Geodynamics.

L. PALAZZO.

## SWITZERLAND.

SCHWEIZERISCHE METEOROLOGISCHE ZENTRALANSTALT.

di.

Zürich,  
23rd November, 1907.

In reply to the Circular of the 15th instant, kindly sent to us, I have the honour to inform you that since the commencement of this decade we have made use of 37-year averages for all meteorological elements deduced from observations for the period 1864-1900. These have not yet been published; they are, however, to appear in a special publication in the course of the year 1907-1908.

J. MAURER.

## AUSTRIA.

ZENTRALANSTALT FÜR METEOROLOGIE UND GEODYNAMIK IN WIEN.

dk.

Vienna,  
7th February, 1908.

I have the honour of giving below a list of publications which contain averages of Meteorological elements for Austrian Stations. The list does not claim to be complete.

J. M. PERNTER.

### A. General.

- "Klimatologie von Böhmen," by C. Kreil, Vienna (1865, Gerold).
- "Versuch zu einer Klimatographie des Salzburgerischen Alpenlandes," by Johann L. Woldrich. Leipzig (1867).
- "Untersuchungen über die Regenverhältnisse von Oesterreich-Ungarn," by J. Hann. Sitzungsberichte d. kais. Akademie der Wissenschaften in Wien (1880).
- "Die Temperaturverhältnisse der österreichischen Alpenländer," by J. Hann. Sitzungsber. k. Akademie d. Wiss. in Wien (1884, 1885).
- "Die Verteilung des Luftdruckes über Mittel- und Südeuropa," by J. Hann. Penck's geogr. Abh. B. II., Heft 2, Wien (1887).
- "Die Meteorologie von Wien nach Beobachtungen von der k. k. Zentralanstalt für Meteorologie, 1852-1900" by J. Hann. Denkschriften der k. Akademie d. Wiss. Wien, Bd. 73 (1901).
- "Der tägliche Gang der Lufttemperatur in Oesterreich" by J. Valentin. Denkschriften d. k. Akademie d. Wiss. Wien, Bd. 73 (1901).
- "Isothermen von Oesterreich" by W. Trabert. Denkschriften d. k. Akademie d. Wiss. in Wien, Bd. 73 (1901).



"Klima von Krain," by F. Seidl. Laibach (1902).

"Klimatographie von Nieder-Oesterreich," by J. Hann. Wien (1904).

Short tables of averages have appeared from time to time in the "Jahrbücher" of the k. k. Zentralanstalt für Meteorologie und Erdmagnetismus.

### B. Special Results.

"Einige Resultate der anemometrischen Aufzeichnungen in Wien (1873-1892)." Wien. Sitzungsber. d. k. Akademie d. Wiss. (1893).

"Ergebnisse 20 jähriger meteorologischer Beobachtungen auf dem Sonnblickgipfel," by J. Hann. 15th "Jahresbericht" (Annual Report) of the "Sonnblickverein." Vienna (1907.)

"Über die Temperatur von Prag," by S. Kostlivy. Abh. d. böhm. Gesellschaft d. Wiss. Prag (1887).

"Das Klima von Görz," by J. Trombetta. Görz (1896).

"Über das Klima von Brünn," by J. Lisnar. Reprint from Vol. XXIV. Verhandl. d. naturforschenden Vereines in Brünn (1886).

"Das Klima von Abbazia," by Dr. Franz Tripold. Abbazia (1906).

"Veröffentlichungen des k. k. hydrogr. Amtes in Pola; Lustrenmittel." (1901.)

"Über die klimatogr. Verhältnisse zu Krakau," by Daniel Wierzbicki. Jahrbuch d. k. k. Zentralanstalt für Meteorologie, Bd. VII.

"Abhandl. über verschiedene meteorologische Elemente in Triest," by E. Mazelle. Sitzungsber. d. Kais. Akademie d. Wiss. in Wien.

"Klima von Tarnopol," by W. Satke. (Polish) Krakau (1887).

"Die meteorologischen und klimatographischen Verhältnisse Innsbrucks," by Karl W. Von Dalla-Torre. Innsbruck (1874).

"Klima und Witterung von Klagenfurt," by J. Prettnner. Jahrb. d. naturhistorischen Museums VII., Klagenfurt (1865).

"Das Klima von Innsbruck," by A. Fessler. Innsbruck (1907).

Numerous tables have appeared from time to time in the "Meteorologischen Zeitschrift."

K. K. STERNWARTE, KRAKAU.

Krakau,

25th November, 1907.

The average temperature and barometer values for Krakau which are used here for the calculation of differences from the averages of several years have not been published.

A manuscript table, computed by the late F. M. Karlinski, is used for the calculation of temperature differences. It contains average daily mean temperatures from observations at 6 a.m., 2 p.m., and 10 p.m., extending over 70 years (1825/26-1894/95) calculated from the formula:—

$$T_m = \frac{1}{4} (T_6 + 2T_2 + T_{10}).$$

This table also gives average barometer readings from 59 years' observations (1837-1895). It is not in regular use, as differences of barometer readings from several years' averages are not calculated here.

M. P. RUDZKI.

### MARINE OBSERVATORY AT TRIESTE.

Trieste,

5th February, 1908.

In answer to the Circular of the International Meteorological Committee I have the honour to state that meteorological averages for Trieste are contained in the first two of the Annual Reports of the Imperial Observatory of Trieste, viz. :—Rapporto annuale, Vol. I., 1884, pp. 87-101, and Vol. II., 1885, pp. 111-120. The data refer to the periods 1841-1880 and 1841-1885 respectively.

A comprehensive collection of averages for Trieste up to 1900, inclusive, is near completion. Climatological data for Austrian coast stations (Görz, Trieste and Istria), as well as for Dalmatia, are likewise in course of preparation.

Meteorological averages are also given in:—

"Über den Luftdruck in Trieste." Rapporto annuale del Osservatorio, Vol. III.

"Der Tägliche Gang der Häufigkeit und Stärke der einzelnen Windrichtungen zu Triest." Sitzungsber. der Kais. Akad. der Wissensch. in Wien, Math. naturw. Klasse, 1891.

"Untersuchungen über den täglichen und jährlichen Gang der Windgeschwindigkeit zu Triest." Ibid., 1891.

"Beitrag zur Bestimmung des täglichen Ganges der Veränderlichkeit der Lufttemperatur." Ibid., 1895.

"Tägliche Periode des Niederschlages in Triest." Ibid., 1897.

"Verdunstung des Meerwassers und Süßwassers." Ibid., 1898.

"Zur täglichen Periode und Veränderlichkeit der relativen Feuchtigkeit." Ibid., 1899.

"Der tägliche and jährliche Gang und die Veränderlichkeit der Lufttemperatur." Denkschriften der Kais. Akad. Wien, Math. naturw. Kl., 1893.

"Beziehungen zwischen den mittleren und wahrscheinlichsten Werten der Lufttemperatur." Ibid., 1895.

"Einfluss der Bora auf die tägliche Periode einiger meteorol. Elemente." Ibid., 1901.

"Temperatur von Triest, nebst einem Beitrag zur Kenntnis des Temperaturunterschiedes Stadt-Land." "Hann-Band" of the "Meteorologische Zeitschrift," 1906.

E. MAZELLE,  
Director.



## HUNGARY.

CENTRAL INSTITUTE FOR METEOROLOGY AND TERRESTRIAL  
MAGNETISM.

dk

Budapest,  
2nd December, 1907.

*Barometric Pressure.*—Róna Zsigmond. "A légnyomás a magyar birodalomban 1861–1890." "Die Luftdruckverhältnisse Ungarns," by S. Róna, in Hungarian, with an appendix in German, contains 30 year averages (1861–1890) of barometric pressure for 23 stations. Published by the Royal Hungarian Scientific Society, Budapest, 1897.

*Temperature.*—S. Róna and L. Fraunhoffer. "Die Temperaturverhältnisse von Ungarn," in Hungarian and German, contains 30 year averages of temperature (1871–1900) for 142 stations, in "Publications of the Royal Hungarian Institute for Meteorology and Terrestrial Magnetism. Budapest, 1904. Vol. VI.

S. Róna. "Der jährliche Gang der Temperatur in Ungarn," in Hungarian and German, contains 45 year pentad averages (1851–1895) from seven stations, in "Publications of the Royal Hungarian Institute for Meteorology and Terrestrial Magnetism." Budapest, 1900. Vol. III.

*Rainfall.*—Dr. Aurel von Anderkó. "Durchschnittliche Verteilung des Niederschlages in Ungarn" (1871–1900) in Hungarian and German, contains 30 year averages for 92 stations. This was published in "Jahrbücher der Kgl. ung. Reichsanstalt für Meteorologie und Erdmagnetismus." Vol. XXXI. 1901. Part IV.

Raum Oszkár. "A magyar korona országainak csapadékviszonyai" (Niederschlagsverhältnisse der Länder der ung. Krone), in Hungarian. This work contains averages for 184 stations for different periods to 1895. It was published in the journal "Magyar Mérnök és Építész-Egylet Közlönye." Vol. XXXII.

*Cloud Amount.*—Hegyföky Kabos. "A felhőzet a magyar szent korona országában" in Hungarian. This work contains averages for different periods for 244 stations. It was published in "A magyar tudományos Akadémia Matematikai és Természettudományi Közlemények." Vol. XXVII. No. 3. Published by the Academy of Sciences. Budapest, 1899.

Fraunhoffer Lajos and Tolnay Lajos. "A felhőzet évi menete Magyarországon" (Jährlicher Gang der Bewölkung in Ungarn) in Hungarian. This work contains 20 year averages (1886–1905) for 45 stations, and 40 year averages (1866–1905) for 5 stations. It was published in the meteorological journal "Az Időjárás." 1906. Vol. II. Budapest.

*Wind.*—J. Hegyföky. "Über die Windrichtung in den Ländern der ungarischen Krone," in Hungarian and German, contains the mean prevalence of winds at 216 stations, principally for the period 1876–1885. Publication of the Royal Hungarian Society of Science. Budapest, 1894.

*Thunderstorm.*—Héjas Endre. "A zivatarok Magyarországon az 1871-től 1895 ig. terjedő megfigyelések alapján." "Die Gewitter in Ungarn nach den Beobachtungen von den Jahren 1871–1895," in Hungarian with an appendix in German. Publication of the Royal Hungarian Society of Science. Budapest, 1898.

DR. N. VON KONKOLY.

## BOSNIA-HERZEGOVINA.

## METEOROLOGICAL SERVICE.

dk.

Sarajevo,  
18th December, 1907.

In reply to your esteemed communication of the 15th November, 1907, the Government has the honour of intimating that average values for long periods have not yet been worked out from the meteorological data from stations in this country. A publication containing this information will appear, probably in 1910, and will be sent to the Committee.

N. VASSINI,  
Director.

## GREECE.

## NATIONAL OBSERVATORY.

dl.

Athens,  
26th November 1907.

In reply to your Circular of the 15th instant, I have the honour to inform you that averages for Athens are published in the "Annales de l'Observatoire National d'Athènes," Vol. I., 1896; in my paper entitled "Le climat d'Athènes"; as well as in a pamphlet, which will appear in a few months in Greek:—Τὸ Κλίμα τῆς Ἑλλάδος, Μέρος Α (τὸ κλίμα τῶν Ἀθηνῶν ὑπὸ Δ. Αἰγινήτου, ἐν Ἀθηναῖς 1907). This work will contain also averages for Décélie.

Means for individual months and years for the departmental stations are published, as you know, in the "Annales" (Annual Reports) of the Observatory, Sections III. and IV., but we have not yet published general averages, deduced from a long series of observations for these stations.

D. EGINITIS.

## ROUMANIA.

## INSTITUTUL METEOROLOGIC AL ROMANIEI.

dl.

Bucharest,  
21st December, 1907.

In reply to the Circular of the 15th November, I have the honour to state that averages of meteorological elements for the Roumanian system have not been published as yet.

We reckon on publishing them, at least partially, in Vol. XIX. of the "Annales de l'Institut Météorologique de Roumanie," now in the press.

No. XXVI. of "Materiale pentru Climatologia Romaniei," published by the Roumanian Academy, contains averages for the three last lustra for 30 meteorological stations.

ST. HEPITES.



## CHINA.

OBSERVATOIRE MAGNÉTIQUE, MÉTÉOROLOGIQUE ET  
SISMOLOGIQUE DE ZI-KA-WEI.

eb.

"Bulletin des Observations." Each annual volume contains in an appendix monthly averages for the principal elements for the period 1873 to date.

"Calendrier-Annuaire" for 1904 contain smany important data regarding the climate of Zi-ka-wei (Shanghai).

"Réduction des Observations de Température, 1873-1903," by Rev. J. de Moidrey, S.J., contains a discussio n of the temperature data for the period named. A similar publication dealing with the period 1873-1892, by Rev. S. Chevalier, S.J., appeared in 1897.

W. N. S.

## JAPAN.

CENTRAL METEOROLOGICAL OBSERVATORY.

ec.

Tokyo,  
7th January, 1908.

In reply to the Circular dated the 15th November last, I have the honour to submit to you a list of the publications which contain averages for long periods for meteorological stations in the Japanese system :—

- (1.) "Results of the meteorological observations made in Japan for each period of five years since 1876, and for the 10, 15, 20, 25, 30 years ending with 1905," published by our Observatory in 1906, contains the required averages.
- (2.) On pages 4-7 of the "Monthly Report of the Central Meteorological Observatory of Japan," published every month, and in the column headed "normal" there are given averages for air temperature and for precipitation since the commencement of observations at each station.
- (3.) In the "Japanese Calendar," published by the Astronomical Observatory of Tokyo, are included averages for all stations for the principal meteorological elements for the period since the commencement of observations.

K. NAKAMURA,  
Director.

## BRITISH INDIA AND CEYLON.

INDIA METEOROLOGICAL DEPARTMENT.

The following list has been communicated by the Director-General of Indian Observatories :—

"Meteorological Atlas of the Indian Seas and the North Indian Ocean," Charts I. to XII., showing the normal pressure, wind direction and force, and sea currents for each month.

"Indian Meteorological Memoirs,"\* Volume XIII. Daily normals of maximum temperature, minimum temperature, air pressure at 8 a.m. reduced to 32° F., rainfall at 171 stations. Flve-day means of normal cloud amount, normal relative humidity, and of normal amount of aqueous vapour, all at 8 a.m., for 171 stations.

"Indian Meteorological Memoirs," Volume XVI., Part I. Monthly and annual means of air-pressure reduced to 32° F. and constant gravity lat. 45° for 121 stations.

"Indian Meteorological Memoirs," Volume XVII. Corrections for reducing to true diurnal means from daily observations at fixed hours for maximum and minimum of temperature, atmospheric pressure, vapour pressure, relative humidity, amount of cloud. This volume also contains monthly and annual means for the following elements :—

*Temperature.*—Mean maximum, mean minimum, true diurnal means, mean diurnal range (170 stations). Sea-level equivalents of air temperature (145 stations). Absolute maxima and minima and absolute range for the years previous to 1903 (170 stations).

*Pressure.*—At station level and latitude, 8 a.m. (161 stations); 10 a.m. (109 stations); 4 p.m. (109 stations); for whole day (112 stations). At mean sea-level and lat. 45°, 8 a.m. (141 stations); 10 a.m. (199 stations); 4 p.m. (99 stations); for whole day (102 stations). Diurnal range between 10 a.m. and 4 p.m. (113 stations); the same reduced to sea-level (101 stations).

*Wind.*—Direction at 8 a.m. (164 stations); at 10 a.m. (124 stations); at 4 p.m. (121 stations); throughout day (126 stations). Steadiness at 8 a.m. (164 stations); 10 a.m. (123 stations); 4 p.m. (121 stations); throughout day (126 stations). Mean hourly velocity (161 stations).

*Humidity.*—Vapour pressure at 8 a.m. (165 stations); 4 p.m. (118 stations); corrected to true diurnal mean (124 stations). Relative humidity at 8 a.m. (165 stations); 4 p.m. (117 stations); corrected to true diurnal mean (124 stations).

*Proportion of Cloud.*—At 8 a.m. (165 stations); 10 a.m. (112 stations); at 4 p.m. (107 stations); corrected to true diurnal means (110 stations).

*Rainfall.*—Amounts in inches and number of rainy days for 2,219 stations in India and Ceylon.

## CEYLON.

The "Ceylon Administration Reports, Part iv., Education, Science, and Art" (issued annually), include a separate section by the Surveyor-General devoted to Meteorology. Each issue gives monthly averages for a number of stations for the most important elements. Period varying up to 39 years ending 1907.

W. N. S.

\* Many of the normal data for India and Ceylon are represented in the "Climatological Atlas of India," published by authority of the Government of India under the direction of Sir John Eliot, K.C.I.E., F.R.S. (Bartholomew & Co., Edinburgh, 1906.)  
W. N. S.



## EAST INDIAN ISLANDS.

KON. MAGN. EN METEOR. OBSERVATORIUM, BATAVIA.

eg.

In reply to your Circular of the 15th November, 1907, I have the honour to inform you that complete information on the publication of the average values is given in Vol. XXVIII. of "Observations made at the Royal Magnetical and Meteorological Observatory at Batavia," p. 35.

I may add that averages of rainfall observations made at 700 stations on the Island of Java will be published\* here in a few months' time.

W. VAN BEMMELEN,

Director.

## PHILIPPINE ISLANDS.

THE WEATHER BUREAU, CENTRAL OFFICE.

eg.

Manila,

11th January, 1908.

In answer to your Circular of November 15th, 1907, I have the honour to enclose herewith some tables containing the mean and extreme values of atmospheric pressure and temperature for Manila during the period 1885-1907, and of rainfall for the same place during the period 1865-1907.

In regard to these tables I beg to make the two following remarks:—

(1.) The tables for pressure and temperature begin with the year 1885, because it was in that year that hourly observations during day and night began to be made regularly in this Observatory.

(2.) Since the year 1904 the thermometers began to be observed at a place which is not far from the old one, but much lower. The temperature data published in our bulletins from 1885-1904 were those taken on the tower of the Observatory, whilst since 1904 they are made in the park, at 1.50 meter above the ground.

When we received your Circular we were just on the point of commencing a series of comparisons in order to determine the correction to be applied to the old readings to make them comparable with the new series. But as we are desirous of making this study as complete as possible, considering not only the general differences, but examining also the influence on these

\* Since issued. "On the Rainfall in Java. Results of the Observations at more than Seven Hundred Stations in the Period 1879 till 1905." Javasche Boekhandel & Drukkerij, Batavia, 1908.

differences due to the different directions of the wind and to the different kind of weather, it would delay our answer too much if we waited to satisfy your request till we get the final results.

The first rough comparison we have just finished shows that the maximum readings of the thermometers in the park are invariably higher than those on the tower, and the minimum lower, the average differences being  $+0.4^{\circ}\text{C.}$  and  $-0.8^{\circ}\text{C.}$  respectively. Yet we did not apply any correction to the readings of the adjoined tables, but I send them as they have been published in our bulletins.

The result for the mean temperature has been so far rather unsatisfactory, due perhaps to the fact that we took a series of observations too short. A longer series will have to be taken up.

MIGUEL SADERRA MASÓ,

Acting Director.

The enclosures referred to in M. Masó's letter consist of:—

I. A copy of the Appendix to the "Annual Report of the Director of the Weather Bureau (of the Philippine Islands)," giving—

(a.) For Manila Observatory, Monthly amounts of rain exceeding 500 millimetres registered in the Observatory since 1865.

(b.) For Manila Observatory, Daily amounts of rain exceeding 100 millimetres registered in the Observatory since the year 1865.

(c.) Greatest Hourly amounts of rain exceeding 40 millimetres registered in the Observatory (Manila) since the year 1886.

(d.) Monthly Rainfall at Manila for each year since 1865.

(e.) Monthly Rainfall amounts for other stations in the Philippine Islands.

II. Manuscript Schedules giving, for the Observatory at Manila, for each month of each year since 1885—

The mean monthly Pressure,

The absolute maximum Pressure,

The absolute minimum Pressure,

The mean monthly Temperature,

The absolute maximum Temperature,

The absolute minimum Temperature,

and the averages for these elements for the period 1885-1907.



As these averages do not appear to have been published elsewhere, a summary of them is appended:—

### OBSERVATORY OF MANILA (1885-1907).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Average Rain-fall mms.	27·8	9·9	17·1	30·4	102·1	246·8	391·5	352·9	366·5	191·2	129·6	58·7	1,924·6
Average Mean Pressure mms.	761·12	761·46	760·60	759·46	758·43	757·91	757·33	757·42	757·54	758·68	759·48	760·54	759·16
Absolute Maximum Pressure.	767·29	767·65	766·10	763·65	762·86	762·56	761·78	762·62	762·84	763·70	766·12	766·84	767·65
Year ..	1885	1903	1905	1905	1885	1886	1890	1888	1885	1902	1885	1904	1903
Absolute Minimum Pressure.	755·60	753·82	753·00	750·40	749·10	748·60	747·50	750·35	741·80	748·02	747·00	750·29	741·80
Year ..	1899	1898	1898	1905	1906	1904	1888	1907	1906	1894	1898	1889	1906
Average Mean Temperature °C.	25·0	25·3	26·8	28·3	28·6	28·0	27·2	27·1	27·0	26·9	26·0	25·2	26·8
Absolute Maximum Temperature.	33·9	35·4	36·2	37·7	37·8	36·5	35·0	34·6	35·3	35·1	33·9	33·4	37·8
Year ..	1897	1892	1905	1905	1889	1907	1900-1	1892	1903	1903	1907	1900	1889
Absolute Minimum Temperature.	15·0	15·7	17·1	18·7	20·4	21·6	21·1	21·2	20·9	19·6	17·5	15·7	15·0
Year ..	1907	1902	1903	1902	1903-6	1895	1891	1906	1902	1902	1905	1892	1907

### EGYPT.

#### SURVEY DEPARTMENT, GIZA (MUDIRIA).

*fb.*

I. A provisional set of average values is in the press and will be published in—

- (1) The Statistical Year-Book of Egypt—(in the press).
- (2) Meteorological Report (Part II.) for the year 1907—(in the press) (Cairo).

These are provisional because the standard of pressure is at present doubtful.

II. Average values for a number of stations have been collected and published in "Physiography of the River Nile," by Capt. H. G. Lyons (Cairo).

III. Averages for five stations will be found in the Almanac, compiled at the offices of the Survey Department (Cairo, Annually, November).

IV. The averages for the following stations have been published as indicated:—

Abbassia: Climate of Abbassia (near Cairo), Survey Paper No. 3, by B. F. E. Keeling (Cairo, 1907).

Alexandria: Meteorological Report for the year 1900 (Cairo).  
 Suakin: " " " 1902 ( " ),  
 Wadi Halfa: " " " 1901 ( " ).

V. The Daily Weather Report and the Monthly Summaries give "differences from the normal" for pressure, temperature, and rainfall.

H. G. LYONS,  
 Director.

### SOUTH AFRICA.

#### TRANSVAAL METEOROLOGICAL DEPARTMENT.

*fg.* Johannesburg,  
 13th December, 1907.

In reply to your Circular letter of the 15th ultimo, this Department has been started so recently that in regard to the questions raised it has no prejudgment, and will abide by the decisions of your Committee.

(Signed) R. T. A. INNES,  
 Director.

### CAPE COLONY.

*Royal Observatory, Cape of Good Hope.*—"Results of Meteorological Observations made at the (1871). Averages for various elements, generally for the period 1841-1870.

*Meteorological Commission, Cape of Good Hope.*—"A discussion of the Rainfall of South Africa during the Ten Years, 1885-94," by Alexander Buchan, M.A., LL.D., F.R.S. Cape Town, 1897.

"Annual Report" for the year 1906. Temperature averages for various stations.

*Dr. J. R. Sutton.*—Various papers, see Trans. S. Afr., Phil. Soc., and Reports of S.A.A. Advancement of Science.

W. N. S.

### NATAL.

*Government Observatory, Durban.*—The "Annual Reports" of the Government Astronomer contain some averages for Durban, and a summary of the data for a few other stations.

W. N. S.

### MADAGASCAR.

*fh.*

Annuaire de la Société Météorologique de France, 56<sup>e</sup> Année, 1908, p. 209, contains a pamphlet entitled—

"Observations météorologiques faites à Tananarive," by R. P. E. Colin. Averages, 1874-1905, for the principal elements.

W. N. S.



## UNITED STATES OF NORTH AMERICA.

## WEATHER BUREAU.

Washington, D.C.,  
December 5th, 1907.

gf

In reply to your inquiry asking for the "List of the publications in which are found the means of the series of meteorological elements of their system," I beg to make the following statement:—

*Barometric Pressure.*—The Barometric Pressures of the United States were reduced to a homogeneous series for the years 1873–1899 inclusive, and Professor Bigelow's Report on this subject is to be found in the Annual Report of the Chief of the Weather Bureau, Vol. II., 1900–1901, pp. 429–623. They are reduced to the mean of 24 hourly observations, and to the elevations of the epoch January 1, 1900. The observations for the years following this date have been reduced on the same plan, and the values, found in the Reports of the Chief of Weather Bureau for successive years, form a continuation of the series comparable throughout.

*Temperatures.*—Professor Bigelow has just completed the preparation of the monthly and annual mean temperatures for the years 1873–1905 inclusive, all reduced to the 24-hour means and to a homogeneous series, the stations of short record being specially corrected to the 33-year interval. This work is in manuscript ready for publication.

*Vapour Pressures.*—At the same time Professor Bigelow carried through the reduction of all the Vapour Pressure records of the United States to a homogeneous series, based upon the 24-hour means and the 33-year interval. These important results are in manuscript ready for publication.

From the preceding values of the monthly temperatures we have prepared normal daily temperatures for the United States, and these have been in use throughout the Climatological Service for a few months.

From all our available precipitation records, there have been prepared in the Records Division, the normal daily precipitation values throughout the United States. These have also been recently put in use at our stations. The daily normals of temperature and precipitation are in manuscript, ready for publication.

It will give us much pleasure to aid the International Committee in its work, as opportunity offers.

WILLIS L. MOORE,  
Chief, U.S. Weather Bureau.

## CANADA.

## METEOROLOGICAL SERVICE.

Toronto,  
December 31st, 1907.

gb

In reply to your letter of the 15th November, I have the honour to inform you that the normals for Canadian stations will be published in the Annual Report of the Canadian Service for 1906, about to be printed.

R. F. STUPART.

## JAMAICA.

hc

*Maxwell Hall, M.A.*—"The Rainfall of Jamaica."—Special Publication of the Institute of Jamaica, No. 1, 1892.

For Tables, subsequent data, and results for other elements, see "Weather Reports," Nos. 31, 33, 123, 124A, 192, 256A, 275, published by the Jamaican Government Meteorologist.

W. N. S.

## BRAZIL.

hh

*Observatoire de Rio de Janeiro.*—"Le Clima de Rio de Janeiro," by L. Cruls, Director. (H. Lombaerts & Co., Rio de Janeiro, 1892.)

Monthly average values, 1851–1890, for Rio de Janeiro. Some of the Tables are reprinted in an Appendix to the "Annuario" of the Observatory for 1896.

W. N. S.

## ARGENTINE REPUBLIC.

*Oficina Meteorologica Argentina.*—"Ligeros Apuntes sobre el Clima de la República Argentina," by W. G. Davis (Director). Buenos Aires, 1889. Mean values for 21 stations.

"The Climate of the Argentine Republic, compiled from Observations made to the end of the Year 1900," by W. G. Davis. Buenos Aires, 1902. Text in Spanish and English.

W. N. S.

## AUSTRALIA.

COMMONWEALTH METEOROLOGICAL BUREAU, CENTRAL OFFICE.

Melbourne.

i.

Monthly and annual average values for the principal meteorological elements are contained in "The Climate and Meteorology of Australia," Bulletin No. 1 of the Commonwealth Meteorological Bureau (March, 1908), reprinted from the Year Book of the Commonwealth of Australia.



The average annual distribution of rainfall is shown in Bulletin No. 2 (July, 1908), "Rainfall Map of the Commonwealth of Australia." It is proposed in the future to publish average rainfall charts showing the monthly and seasonal creep and distribution of moisture and also the extreme annual totals; and when the series is completed it will be followed by similar charts giving the annual and monthly distribution of temperature.

H. A. HUNT.

#### MAURITIUS.

ROYAL ALFRED OBSERVATORY.

mb

Colony of Mauritius.

In reply to your circular of 15/11/07, I have the honour to inform you that the monthly normals of the several meteorological elements for the Royal Alfred Observatory are published in the annual "Results," and those for Seychelles and Rodrigues may be derived from the "Results" for 1899 and previous years, in which the monthly values and their departures from normal are given.

"Results of the Magnetical and Meteorological Observations made at the Royal Alfred Observatory, Mauritius," appear in annual volumes. The normals for Seychelles are for 1887-1899, those for Rodrigues for 1885-1899 (pressure and wind), and 1876-1899 (temp., rain, and cloud).

T. F. CLAXTON,

Director.

*Addenda.*

#### BELGIUM.

dd

OBSERVATOIRE ROYAL DE BELGIQUE.

Uccle, 14th November, 1908.

I BEG to inform you that average values for meteorological elements for Belgium are contained in the volume of the "Annuaire de l'Observatoire royale de Belgique" for the years 1899 and 1900; and in the "Annuaire Météorologique" since 1901.

J. VINCENT.

#### PORTUGAL.

dg

OBSERVATORIO DO INFANTE D. LUIZ.

Lisbon, November, 1908.

Meteorological average values for Lisbon for the period 1856-1875 have been published in "Annaes do Observatorio do Infante D. Luiz.—Resumo das principaes observações meteorológicas executadas durante o periodo de 20 annos decorridos desde 1856-1875." (1877.)

We are about to send to press average values for Lisbon for the period 1856-1905. Averages for other stations are in course of preparation.

A. A. DE PINA VIDAL.

#### APPENDIX XIV.

#### INTERNATIONAL METEOROLOGICAL COMMITTEE.

(Re-appointed at the Innsbruck Conference, 1905.)

LIST OF MEMBERS AT THE CLOSE OF THE PARIS MEETING, 1907, WITH THE DATES OF THEIR FIRST APPOINTMENT.

MEMBERS (17):

- W. N. SHAW, 1900, Director of the Meteorological Office, London, *President*.  
 G. HELLMANN, 1903, Geheimer Regierungsrat, Professor, Director of the Prussian Meteorological Service, *Secretary*.  
 H. MOHN, 1873, Professor, Director of the Norwegian Meteorological Service.  
 ST. C. HEPITES, 1891, Director of the Roumanian Meteorological Service. (*Since retired*).  
 W. G. DAVIS, 1894, Director of the Meteorological Service of the Argentine Republic.  
 SIR J. ELIOT, 1894, late Meteorological Reporter to the Government of India, and Director-General of Indian Observatories. (*Since deceased*).  
 WILLIS L. MOORE, 1896, Chief of the Weather Bureau, United States of North America.  
 M. RYKATCHEFF, 1896, Lieutenant-General, Director of the Russian Meteorological Service.  
 J. M. PERNTER, 1898, Hofrat, Professor, Director of the Austrian Meteorological Service.  
 LUIGI PALAZZO, 1900, Professor, Director of the Italian Meteorological Service.  
 FRANCISCO S. CHAVES, 1901, Commandant, Director of the Meteorological Service of the Azores.  
 A. LANCASTER, 1903, Director of the Belgian Meteorological Service. (*Since deceased*).  
 K. NAKAMURA, 1905, Director of the Meteorological Service of Japan.  
 A. ANGOT, 1907, Professor, Director of the French Meteorological Service.  
 H. E. HAMBERG, 1907, Director of the Swedish Meteorological Service.  
 J. MAURER, 1907, Director of the Swiss Meteorological Service.  
 R. F. STUPART, 1907, Director of the Meteorological Service of Canada.

#### INTERNATIONAL COMMISSION ON TERRESTRIAL MAGNETISM AND ATMOSPHERIC ELECTRICITY.

- Major-General M. Rykatcheff\*, St. Petersburg, *President*.  
 Prof. Ad. Schmidt\*, Prussian Meteorological Institute, Potsdam, Germany, *Secretary*.  
 Prof. L. A. Bauer, Carnegie Institution, Washington, U.S.A.

\* Members of the Executive Committee.



- Prof. B. Brunhes, Meteorological Observatory, Puy-de-Dôme, France.  
 Dr. V. Carlheim-Gyllensköld\*, Stockholm, Sweden.  
 Dr. Ch. Chree\*, National Physical Laboratory, London.  
 W. Dubinsky, The Observatory, Pavlovsk, Russia.  
 Captain W. Kesslitz, Hydrographic Office, Pola, Austria.  
 Prof. J. Liznar, Hochschule für Bodenkultur, Vienna.  
 Prof. E. Mascart, Central Meteorological Office, Paris (*since deceased*).  
 Prof. T. C. Mendenhall, Worcester, Mass., U.S.A.  
 Prof. J. Messerschmitt, Magnetic Observatory, Munich, Germany.  
 Th. Moureaux\*, Parc Saint-Maur Observatory, France.  
 Prof. L. Palazzo, Central Meteorological Office, Rome.  
 Sir A. W. Rücker, University of London.  
 Dr. A. Schuster, Manchester, England.  
 R. F. Stupart, Meteorological Office, Toronto, Canada.

#### INTERNATIONAL COMMISSION ON SCIENTIFIC AERONAUTICS.

- Prof. H. Hergesell, Director of the Meteorological Service of Alsace-Lorraine, *President*.  
 H.I.H. The Grand Duke Nicolaewitch, St. Petersburg, *Honorary Member*.  
 H.R.H. The Prince of Monaco, *Honorary Member*.  
 H.R.H. Prince Roland Bonaparte, Paris.  
 P. Y. Alexander, London.  
 Prof. A. Angot, Paris.  
 A. Arcimis, Central Meteorological Institute, Madrid.  
 Prof. R. Assmann, Aeronautical Observatory Lindenberg, Germany.  
 Colonel Baden-Powell, London.  
 Baron von Bassus, Munich.  
 Prof. A. Berson, Aeronautical Observatory, Lindenberg, Germany.  
 G. Besançon, Paris.  
 Commandant Borgatti, Rome.  
 A. Bouquet de la Grye, Bureau des Longitudes, Paris.  
 L. P. Cailletet, Paris.  
 C. J. P. Cave, Petersfield, England.  
 W. H. Dines, Meteorological Office, London.  
 Dr. H. Ebert, Technical High School, Munich.  
 Prof. F. Erk, Meteorological Central Station, Munich.  
 Dr. O. L. Fassig, Mount Weather, Virginia, U.S.A.  
 W. de Fonvielle, Paris.  
 Dr. P. Gamba, Geodynamic and Aeronautical Observatory, Pavia.  
 Captain Antonio Gordejuela, Military Balloon Station, Guadalajara, Spain.  
 Major Gross, Military Aeronautical Department, Berlin.  
 G. Hermite, Paris.  
 Prof. H. H. Hildebrandsson, Upsala.  
 Captain Hildebrandt, Charlottenburg, Prussia.  
 Captain Hinterstoisser, Military Aeronautical Department, Vienna.  
 J. Jaubert, Montsouris Observatory, Paris.  
 Hofrat Th. von Konkoly, Meteorological Office, Buda-Pesth.  
 Prof. W. Köppen, Deutsche Seewarte, Hamburg.

\* Members of the Executive Committee.

- General Kowanko, Military Aeronautical Department, St. Petersburg.  
 W. W. Kusnetzov, The Observatory, Pavlovsk, Russia.  
 Dr. J. Maurer, Zürich.  
 Colonel Moedebeck, Strassburg.  
 Commandant Moris, Rome.  
 Major General Neureuther, Munich.  
 Dr. Emilio Oddone, Central Meteorological Office, Rome.  
 Prof. L. Palazzo, Rome.  
 Prof. J. M. Pernter, Vienna.  
 Dr. A. de Quervain, Central Meteorological Office, Zürich.  
 Paul Renard, Chalais-Meudon, France.  
 D. Rjabouchinsky, Koutchino Observatory, Moscow.  
 Major Francisco de P. Rojas, Guadalajara, Spain.  
 Prof. A. L. Rotch, Blue Hill Observatory, Hyde Park, Mass.  
 Lieutenant General Rykatcheff, St. Petersburg.  
 Captain Scheimpflug, Vienna.  
 Lieutenant Semkovsky, R. Technical Society, St. Petersburg.  
 Dr. W. N. Shaw, London.  
 Prof. R. Süring, Prussian Meteorological Institute, Berlin.  
 L. Teisserenc de Bort, The Observatory, Trappes, France.  
 Colonel Trollope, London.  
 Comte de la Vaulx, Paris.  
 Commandant Pedro Vives y Vich, Military Aeronautical Department, Guadalajara, Spain.  
 Dr. N. J. Zukovsky, The University, Moscow.

#### INTERNATIONAL COMMISSION ON RADIATION.

- Hofrat Prof. J. M. Pernter, *President ad interim*.  
 Prof. C. Chistoni, The University, Naples.  
 Prof. O. D. Chwolson, The University, St. Petersburg.  
 Prof. G. E. Hale, Carnegie Institution, Pasadena, U.S.A.  
 A. R. Hinks, The Observatory, Cambridge, England.  
 R. T. A. Innes, Transvaal Meteorological Department, Johannesburg.  
 E. Marchand, The Observatory, Pic du Midi, France.  
 Prof. J. Violle, Paris.

#### INTERNATIONAL SOLAR COMMISSION.

- Sir J. Norman Lockyer, K.C.B., F.R.S., Solar Physics Observatory, London, *President*.  
 A list of the members of the Commission is given in the Report of the Commission on pp. 33, 34 of this volume.

#### COMMISSION ON WEATHER TELEGRAPHY.

- Dr. W. N. Shaw, London, *President*.  
 Prof. A. Angot, Paris.  
 Rear-Admiral Herz, Deutsche Seewarte, Hamburg.  
 Prof. Willis L. Moore, Washington, U.S.A.  
 Lieutenant-General M. Rykatcheff, St. Petersburg.



# COMMISSION ON STORM SIGNALS AND ON THE SCALE AND PROJECTION FOR MARINE CHARTS.

Dr. W. N. Shaw, London, *President*.  
 Prof. A. Angot, Paris.  
 Rev. L. Froc, S.J., Zi-Ka-wei, Shanghai.  
 Rear-Admiral Herz, Deutsche Seewarte, Hamburg.  
 Prof. H. Mohn, Christiania.  
 Prof. Willis L. Moore, Washington, U.S.A.  
 K. Nakamura, Tokio.

## COMMISSION ON THE PREPARATION OF ISOTHERMS FOR THE WORLD.

Prof. J. Hann, Vienna, *President*.  
 Prof. H. Mohn, Christiania.  
 Sir John Eliot, London (*since deceased*).

## COMMISSION FOR SECURING DAILY WEATHER REPORTS FOR THE GLOBE.

L. Teisserenc de Bort, Paris, *President*.  
 Prof. H. H. Hildebrandsson, Upsala.  
 Prof. H. Hergesell, Strassburg.

## COMMISSION ON SQUALLS.

Prof. A. Angot, Paris, *President*.  
 E. Durand Gréville, Paris.  
 Dr. W. N. Shaw, London.

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INTERNATIONAL CONGRESSES, CONFERENCES, &c., Reports of  
Proceedings :—

- Leipzig. 1872. (Non-Official, No. 6.) 1s.  
Vienna. 1873. (No. 21.) 1s.  
Vienna and Utrecht. 1873 and 1874. (Non-Official, No. 9.)  
1s. 6d.  
London. 1874. Maritime Meteorology. (No. 23.) 2s.  
London. 1876. With Supplement. (Non-Official, No. 11.) 2s.  
Utrecht. 1878. (Non-Official, No. 13.) 6d.  
Rome. 1879. (No. 36.) 1s. 6d.  
Berne. 1880. (Non-Official, No. 14.) 1s.  
Copenhagen. 1882. (Non-Official, No. 15.) 2s. 6d.  
Paris. 1885. (Non-Official, No. 16.) 1s.  
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Paris. 1896. (No. 127.) 1s.  
St. Petersburg. 1899. (No. 148.) 2s.  
Southport. 1903. (No. 164.) 2s.  
Innsbruck. 1905. (No. 195.) 2s.  
Paris. 1907. (No. 197.)

International Codex of Resolutions adopted at Congresses,  
Conferences, and at Meetings of the Permanent International  
Committee. (Translation in preparation.)

PUBLICATIONS ON MARINE METEOROLOGY issued since 1900 :—

- Charts illustrating the Weather of the North Atlantic Ocean in  
the Winter of 1898-99. (No. 142, 1901.) 6s. 6d. [Out of  
Print.]  
Wind Charts for the Coastal Regions of South America. From  
Information collated and prepared in the Meteorological  
Office. Published by the Admiralty. (No. 159, 1902.) 7s.  
Monthly Wind Charts of the South Atlantic. Published by the  
Admiralty. (No. 168, 1903.) 6d. each.  
Charts showing the Surface Temperature of the Atlantic,  
Indian, and Pacific Oceans. (No. 59, 2nd Edition, 1903.)  
4s. 6d.  
The relation between Pressure, Temperature, and Air Circulation  
over the South Atlantic Ocean. (No. 177, 1905.) 9d.  
Meteorological Charts of the Southern Ocean between the Cape  
of Good Hope and New Zealand. (No. 123, 1899.) (New  
Edition, 1907.) 6s.



