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Line squall and minor tornadoes at Holyhead, 23 November 1981

By A. K. Kemp and S. J. Morris

(Meteorological Office, Royal Air Force, Valley)

Summary

On 23 November 1981 an active line squall which was associated with tornado development swept eastwards across England and Wales. The *Journal of Meteorology*, *Trowbridge** gives references to '70 known tornadoes' on this day. This article relates to tornadoes reported at Holyhead.

Introduction

Severe gales or storms occur on west Anglesey on several days each year. At Valley the strongest gust of the year averages 70 knots and yet even with winds of this speed little damage is normally reported, apart from the occasional television aerial blown down. The citizens of Holyhead, therefore, were a little surprised when on the morning of 23 November a storm struck without warning causing serious damage to a school and many houses in the town.

An investigation into the meteorological situation showed conditions were favourable for severe squalls at Holyhead.

The synoptic situation

The 00 GMT chart for 23 November (Fig. 1) shows a deep complex depression of 986 mb near the Faeroes and an associated cold front, with a minor wave, over western Scotland. Most of the British Isles was under the influence of a strong west-south-westerly flow in the warm sector. The warm air was potentially unstable and scattered outbreaks of heavy rain from unstable medium cloud were reported. Thunder was heard at Cork at 0300 GMT and lightning was seen at Valley between 0500 and 0530 GMT. Upper-air charts suggested a minor trough embedded in the general south-westerly upper flow over the British Isles and probably this trough provided the mechanism for the release of the instability. During the morning of the 23rd the depression engaged very cold air from the Iceland area

**J Meteorol*, *Trowbridge*, 6, 344, *ibid.* 7, 29-30 and 60.

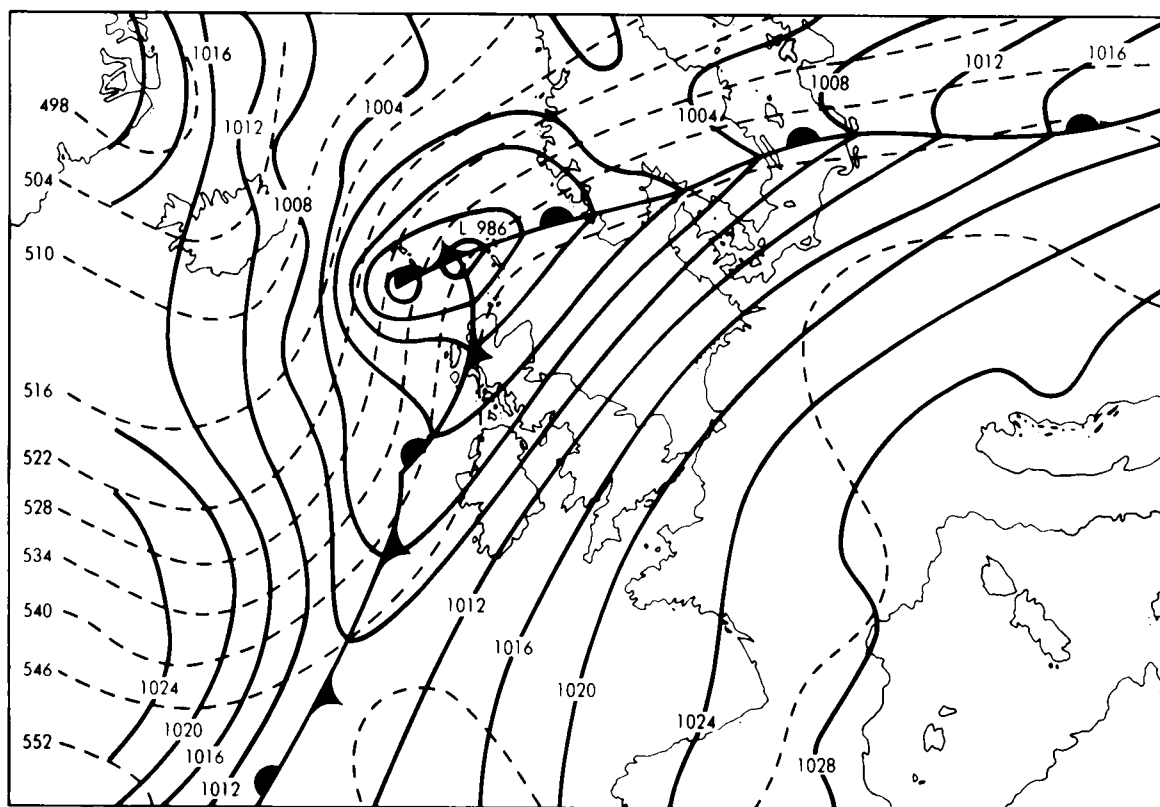


Figure 1. Surface and 1000-500 mb thickness analysis for 00 GMT 23 November 1981. Pressure (full lines) in millibars. Thickness (dashed lines) in decageopotential metres.

and deepened to 968 mb whilst at the same time the cold front accelerated south-eastwards. At 10 GMT (see Fig. 2) a small cyclonic centre had developed on the front just to the west of Anglesey and large pressure falls were occurring over north-west Wales. These pressure falls were produced on the forward side of an intense thermal trough which showed marked extension as it moved east across the British Isles. The tephigrams for Long Kesh 12 GMT and Aberporth 06 GMT (see Fig. 3) give a good indication of the very marked change of air mass associated with the cold front and also Aberporth shows the latent and potential instability in the warm air.

The squall as observed at Valley and Holyhead

At the meteorological office at Valley, situated about 10 km south-east of Holyhead, the cold front was timed to cross the station between 1000 and 1100 GMT. The large pressure falls ahead of the accelerating active cold front prompted the duty forecaster to issue a warning of a squall at the passage of the front with gusts likely to exceed 50 knots. Heavy rain commenced at 0900 GMT with the front crossing the station at 1035 GMT when the wind veered from south-south-west to north-north-west and gusted to 57 knots. The autographic records from Valley (Fig. 4) show the classic features of the passage

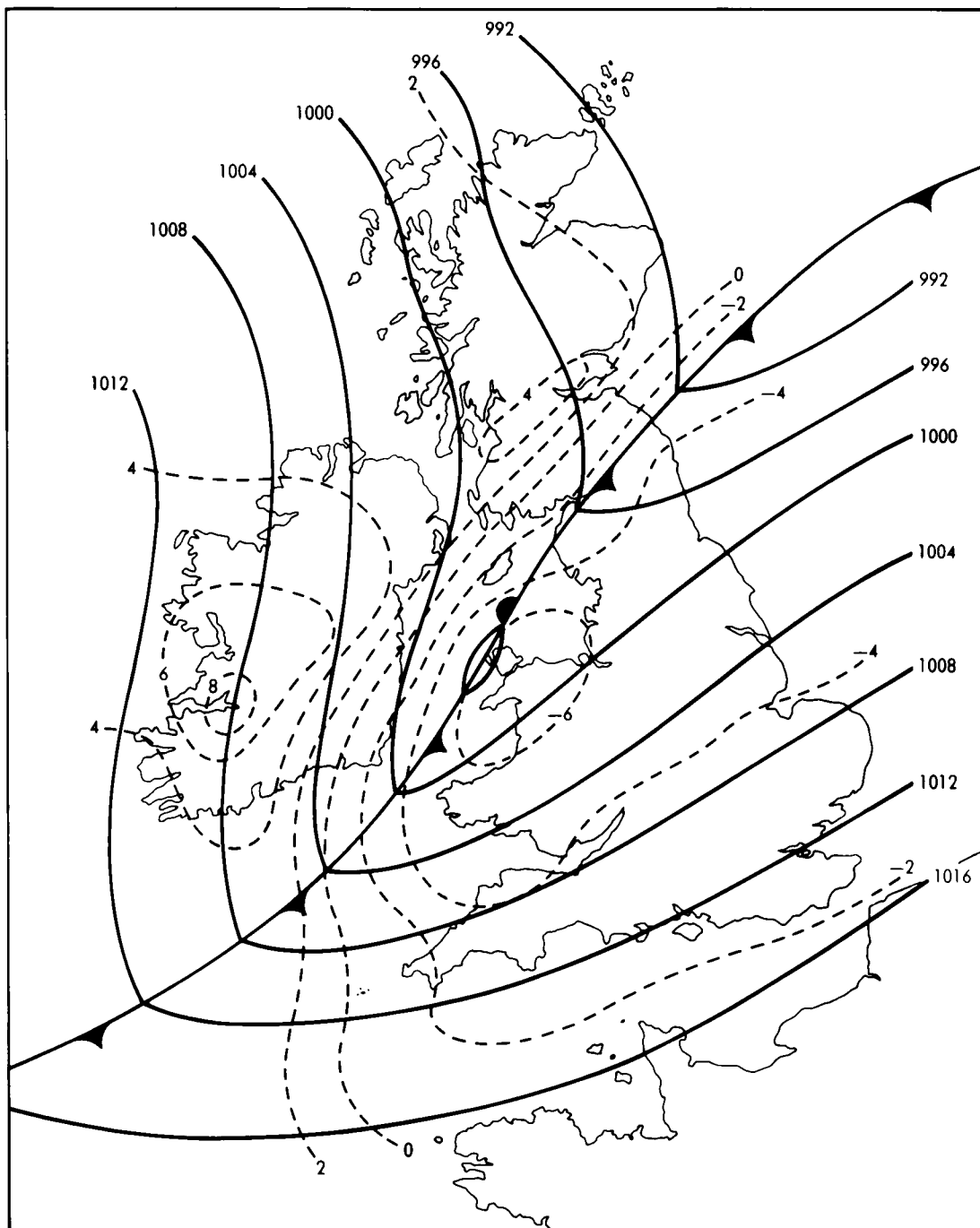


Figure 2. Surface analysis for 10 GMT 23 November 1981. (Isallobars in millibars for the period 07-10 GMT are shown as dashed lines.)

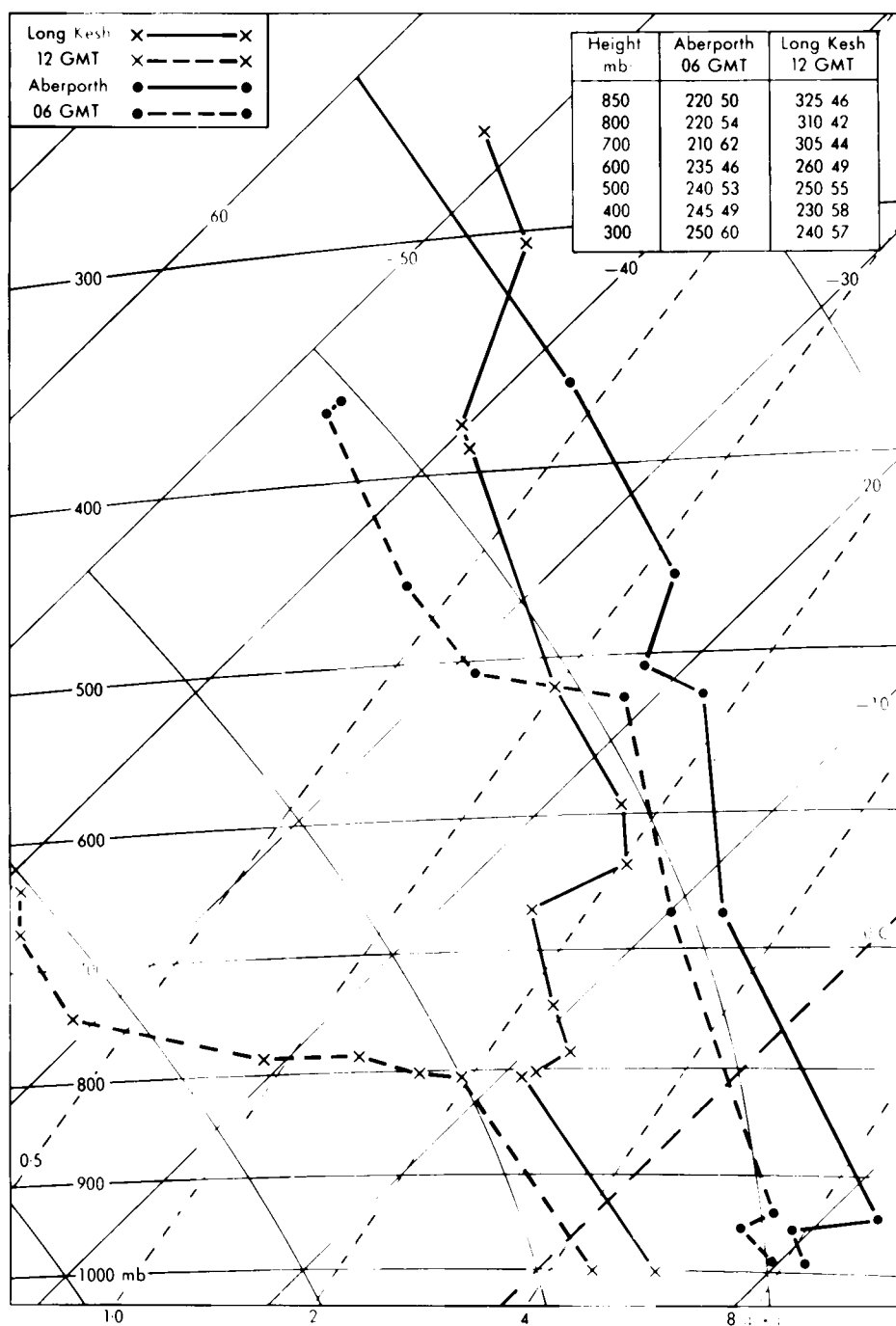


Figure 3. Tephigrams for Long Kesh 12 GMT and Aberporth 06 GMT, 23 November 1981.

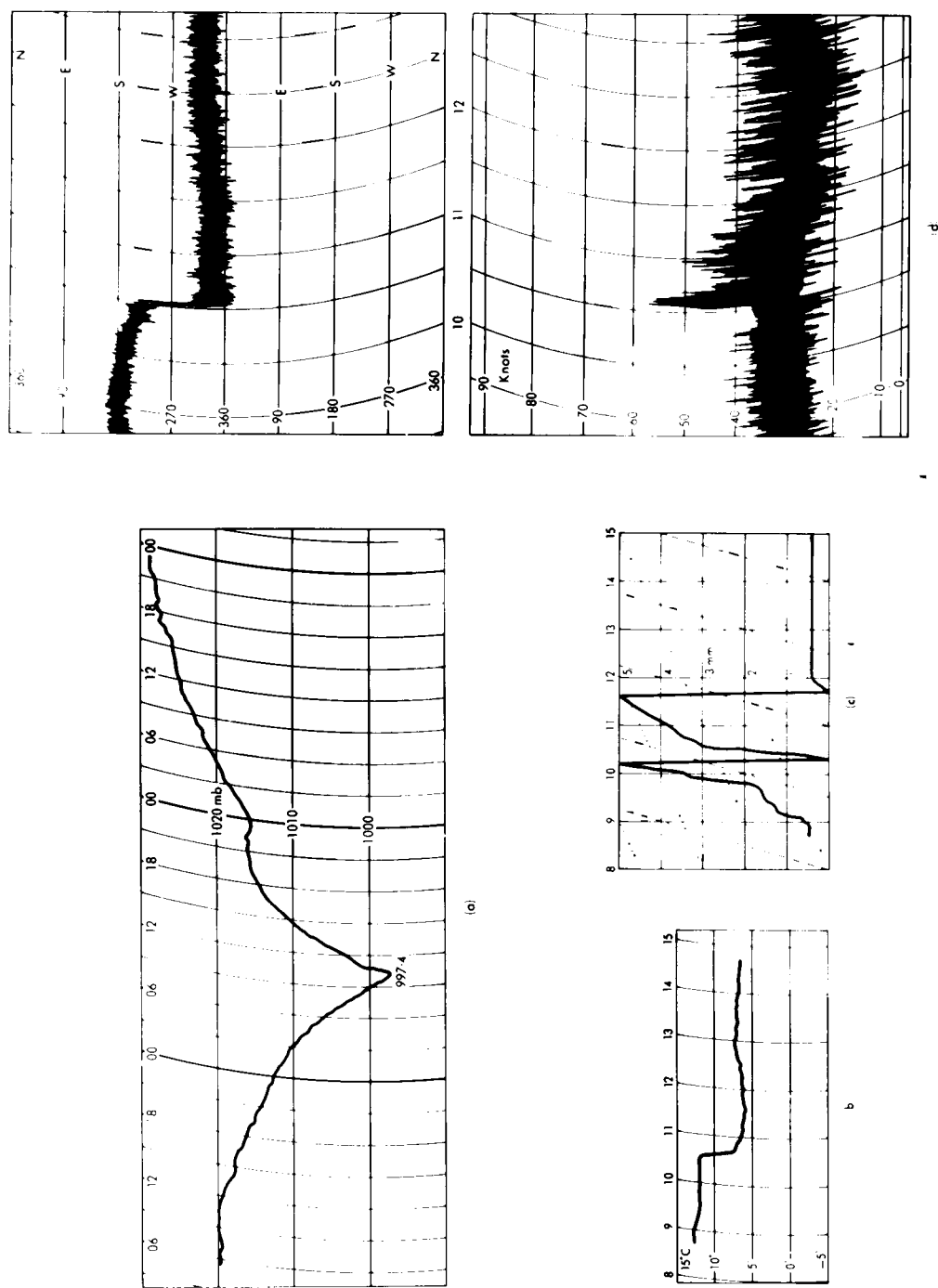


Figure 4. Diagrammatic representation of autographic records for Valley, 23 November 1981. (a) barogram, (b) thermogram, (c) rain recorder chart, and (d) anemogram.

of an active cold front very well. During the worst of the storm driving rain made it impossible to recognize any particular cloud features and because of the bad weather no Valley-based aircraft were flying, so no cloud information was available from this source either. However, a radar report from Manchester Weather Centre at 1105 GMT reported a solid line of cloud 3 n. mile wide extending from Colwyn Bay to Kendal with the top of the rain echoes at 17000 feet.

Shortly after the passage of the squall at Valley several telephone calls from members of the public in Holyhead made it clear that a very severe squall had struck the town. The squall was described by several people as a whirlwind sweeping across Holyhead from the west. Sergeant Whelan at 1113 Marine Craft Unit, Holyhead observed the squall and supplied a written statement and sketch (see Appendix). From his description it appears that two short-lived tornadoes may have formed over Holyhead.

Damage in the area

The storm made the headlines in the local Press and on Welsh Television. From these reports and with the help of the local Fire Station personnel we were able to locate where the damage had occurred (Fig. 5). The most serious damage took place along a line about three-quarters of a kilometre long

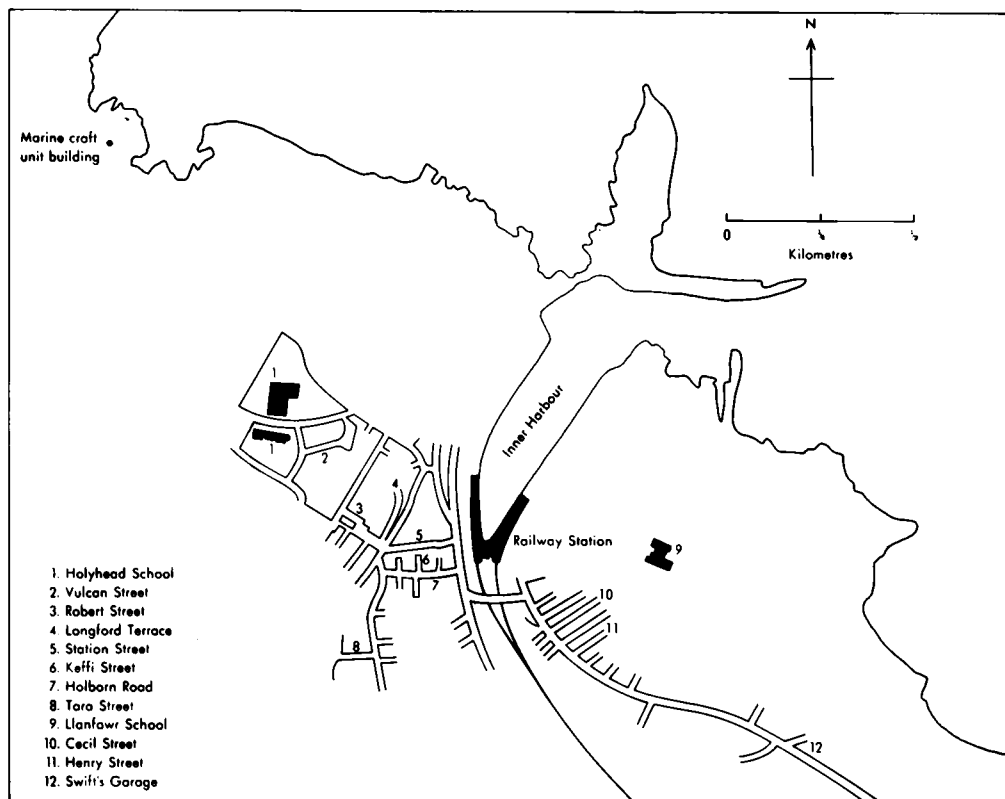


Figure 5. Locations of reported tornado damage.

between Holyhead School and Holborn Road. Further damage occurred about half a kilometre to the east-south-east, near Swift's garage. At Holyhead School (Fig. 6) a large section of the roof of an old school building was removed, hurling joists, bricks and slates all over the school yard and damaging nearby buildings. Had the storm occurred five minutes later, children would have been in the yard for their morning break. A tall modern science block at the school was also damaged and rendered unsafe for use that day. In the town the most serious damage occurred in Station Street with eight houses damaged, mainly roofs and windows. One quotation from a local newspaper about the damage in Station Street is of meteorological significance— 'The suction of the whirlwind had blown windows outwards'. Other Press reports described damage in the Penrhosfeilw area, to the south-west of Holyhead. Here, a farmer's van was 'tossed in the air' and a heavy coal bunker lid was 'whirled round the house, landing at the front door broken in half'.

Discussion and conclusions

The damage in the Holyhead area indicated that wind speeds had occurred in excess of anything normally reached in winter storms in this area. Visual evidence of a dark rotating cloud reaching the ground and the instance where windows were blown outwards, strongly suggests that minor tornadoes



Figure 6. Tornado damage at a Holyhead school.

affected the area. Certainly many of the necessary meteorological conditions for tornado development were present—a potentially unstable warm air mass, a supply of moist air at low levels, the presence of a small cyclonic centre with falling pressure and resulting low-level convergence. The main trigger action was of course the active cold front. A cold-front squall is normally caused by frictional retardation of the surface air and the formation of an overhanging nose of cold air. This nose of cold air will at times plunge to the surface giving strong downdraughts and severe gusts. The advance of the front may thus take place in a very unsteady manner and its activity may vary greatly with time and locality. Surface relief may also affect the movement and activity on a front and this was probably a very important factor in the case under consideration. The western side of Holyhead town is situated on the lower slopes of Holyhead Mountain which rises to a height of 220 metres. The western side of the high ground drops steeply to the sea (see Fig. 7), ending in a line of formidable cliffs about 100 m high. As the cold front and small depression moved east across Holyhead Island the low-level wind flow would become very complex. The resulting complex interaction of very different air masses in an area of strong horizontal wind shear and strong cyclonic vorticity almost certainly led to the development of the tornadoes.

Acknowledgement

The authors wish to thank the *North Wales Chronicle* for supplying the photograph for Fig. 6.

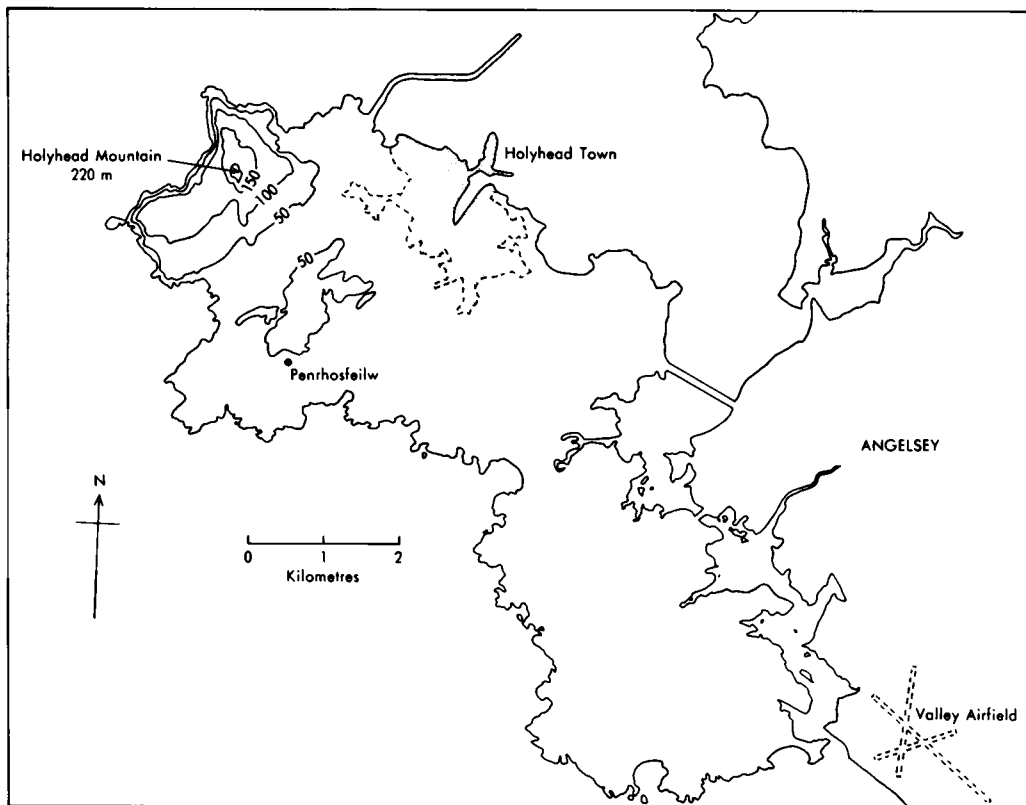


Figure 7. Map of Holy Island. Contours in metres.

Appendix

Eye-witness account of the squall supplied by Sgt Whelan of 1113 Marine Craft Unit, Holyhead:

Time. Approximately 1040 a.m.

A large, very dark, cloud of approximately $\frac{1}{2}$ mile in a north-south direction and 1 mile in an east-west direction in extent, was passing over the seaward side of town and harbour. The wind was southerly F7-8 with fine precipitation. Within 5-10 minutes the wind veered through west to north-west, increasing in strength to whole gale F10 occasionally F11 in gusts.

I glanced towards Holyhead town and noted that the large black cloud was developing a hooked tail at the western end (similar to enlarged hooked cirrus). The tail started to extend and a mushroom top started to form under the cloud. Within approximately half a minute the tail of the now formed whirlwind appeared to extend down to ground level beyond the sea-front houses (see Fig. A1).

The whirlwind was dark in colour as if filled by water vapour visible in suspension mixed with cloud.

This first whirlwind had a duration of approximately 15-20 seconds, collapsing from ground level up after covering a distance of $\frac{1}{4}$ mile, travelling east.

A second larger whirlwind formed about 10 seconds later (see Fig. A1) moving east and collapsed after 10 seconds. This was later followed by heavy rain and gusts of wind to F11.

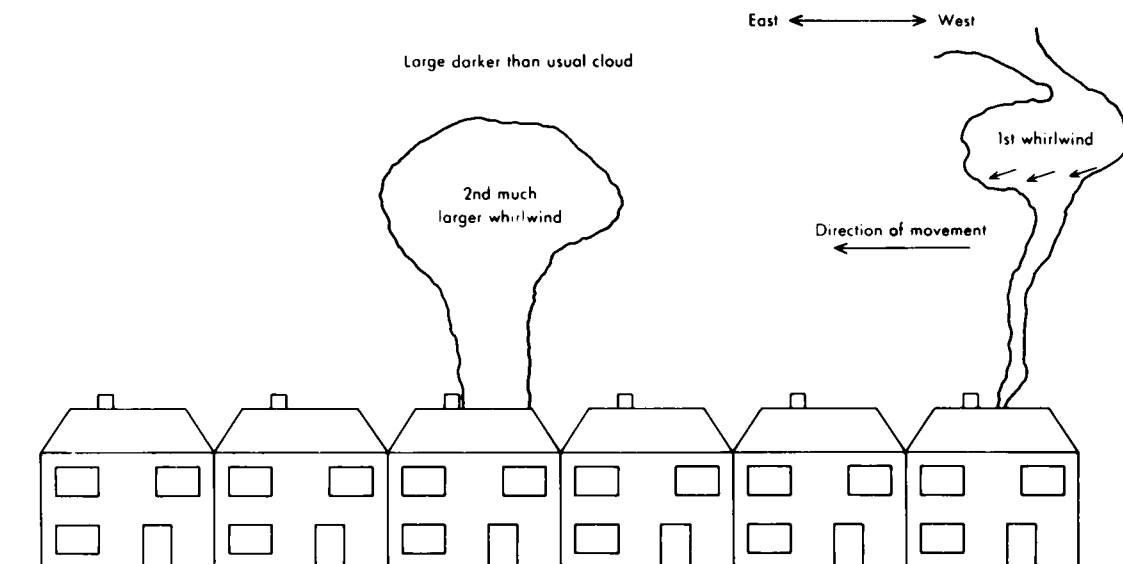


Figure A1. Picture of the squall. (Drawn from a sketch supplied by an eye-witness, Sgt Whelan of 1113 Marine Craft Unit, Holyhead.)

ALPEX: The Alpine Experiment

This account is based on a WMO Press release issued shortly before ALPEX was due to begin; the use of the future tense in many sentences of this release has been retained.

- Where:** *Outer experiment area:* Europe; eastern Atlantic; North Africa.
Inner experiment area: countries surrounding the Alps; Mediterranean Sea.
- When:** *Special Observing Period:* 1 March to 30 April 1982.
General Observing Period: 1 September 1981 to 30 September 1982.
- Who:** 19 European nations and the USA.
Project direction and co-ordination by:
 WMO (World Meteorological Organization)
 ICSU (International Council of Scientific Unions)
 IOC (Intergovernmental Oceanographic Commission)
- Why:** To observe and understand the influence of mountains on the global, regional and local weather.
 To improve the capability of predicting weather developments induced by mountains, specifically by the Alps, including:
 (a) floods and storm surges caused by the so-called 'Genoa cyclones'
 (b) severe downslope winds, such as mistral, foehn and bora.
 To simulate mountain effects properly in computer models of the atmosphere and ocean.
 To aid, through improved weather prediction, the economy and well-being of countries in mountainous areas in other parts of the world.
- How:** Co-ordinated international effort composed of numerous national contributions including:
over land: 22 additional upper-air sounding stations supplementing the World Weather Watch, a network of microbarographic stations, radars, etc.,
over sea: 11 ships and many buoys, fixed platforms and tide gauges,
in the air: 17 aircraft, including some highly instrumented long- and medium-range planes, and
in space: the European geostationary satellite 'Meteosat 2' and the utilization of polar-orbiting satellites.

ALPEX and the Global Atmospheric Research Program

The Alpine Experiment is part of the 'Global Atmospheric Research Program' (GARP), a program supported by virtually all countries of the world. GARP focuses on major scientific problems which are holding up the progress of atmospheric sciences and of weather forecasting because they cannot be solved without pooling the resources of many countries.

ALPEX is the last in a series of large international research projects conducted under GARP. It addresses the critical problem of airflow over and round mountain complexes and its effects on the global, regional and local weather.

Among the possible sites for this experiment the Alps were selected, in spite of their modest size (compared with mountain ranges such as the Andes, Rocky Mountains or Tibetan Mountains). The

reasons for selecting the Alps are that they produce most of the severe weather phenomena encountered in other mountain areas of the world, that they have already a long record of meteorological observations, and that the weather effects of the Alps are of vital importance to the European countries surrounding them.

What ALPEX will do

Mountain complexes even of moderate size are known to influence the atmosphere on practically all scales. On the largest scale, the planetary scale, the airflow over the northern hemisphere can switch to an alternative state under the influence of mountain ranges affecting the weather world-wide.

On the next smallest scale, the cyclonic scale, mountains often cause powerful disturbances on their down-stream side, the so-called lee cyclones (Fig. 1) which are usually associated with severe weather, floods and, over the sea, with storm surges. No mountain range in the world produces more of these depressions than the Alps. These are the 'Genoa cyclones' responsible for many of the disasters which have ravaged the alpine valleys and Italy. The events in Florence and Venice are reminders of these cyclones which present a notorious forecasting problem for the countries surrounding the Alps. ALPEX will try to clarify the processes leading to their development.

On the next smallest scale, mountains cause a host of local weather phenomena which may lead to entirely different weather characteristics on opposite sides of the mountains or between the plains and the mountain tops (Fig. 2). Best known are the 'mountain waves' (see Fig. 3) and the severe downslope winds which carry different names in different parts of the world (e.g. the 'chinook' of the Rocky Mountains, the 'foehn' and 'mistral' of the Alps and the 'bora' of the Yugoslavian coastal mountains). Duration and intensity of these winds on the ground—they can reach over 200 km/h in some parts of the world—are among the most difficult forecasting problems. Their mechanism is not fully understood. ALPEX will systematically explore these phenomena. For this purpose a vertical stack of aircraft will make co-ordinated traverses over the St. Gotthard and Brenner Passes (Fig. 4) directly above lines of highly accurate ground pressure stations ('microbarographs'). The same will be done above the Dalmation coast.

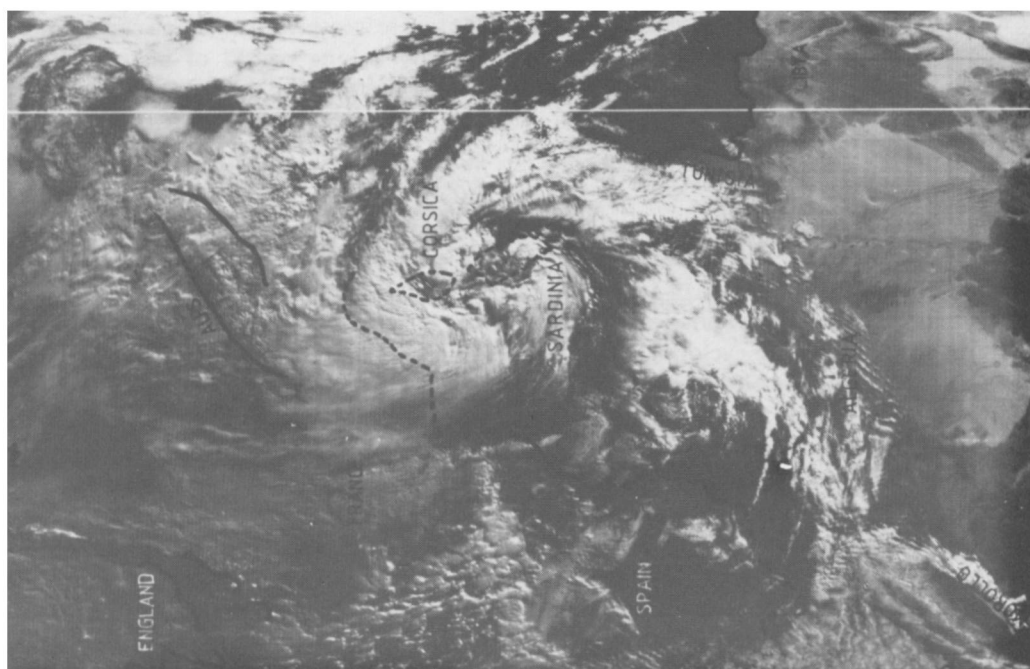
There is a special difficulty in simulating steep mountain ranges such as the Alps properly in mathematical forecasting models as they are used today in all major weather services. The detailed observations to be achieved by ALPEX will serve to diagnose the errors of these models and to verify their predictions.

In the western Mediterranean and the Adriatic Seas an oceanographic program, called MEDALPEX (for Mediterranean ALPEX), is being implemented. It focuses on the effects of 'wind forcing' on the western Mediterranean and Adriatic Seas, specifically on ocean currents, eddies, storm surges and dynamical factors governing the plankton distribution. Numerous ships, buoys, fixed platforms and tide gauges will be used for these investigations (see Table I).

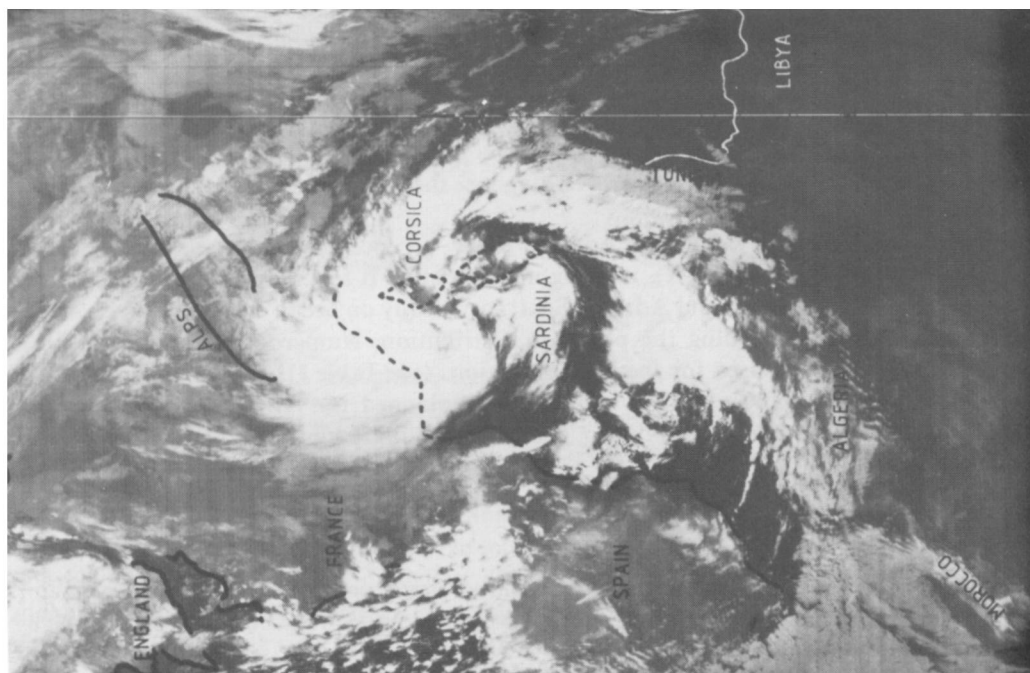
These are examples of the many scientific investigations planned for ALPEX according to an internationally agreed research plan. In addition, the participating countries will conduct a great number of national programs.

Observational systems and experiment areas

Numerous special observing systems are required to conduct this experiment. Table I lists the major systems to be used in ALPEX. Never before has such a comprehensive array of observing platforms been installed in Europe. They have been contributed by the participating nations. These observing systems complement each other and form jointly a 'composite observing system'.



(b) Infra-red image



(a) Visual image

Figure 1. The development of a cyclone in the lee of the Alps as seen from space. The centre of the cyclone is near Corsica.

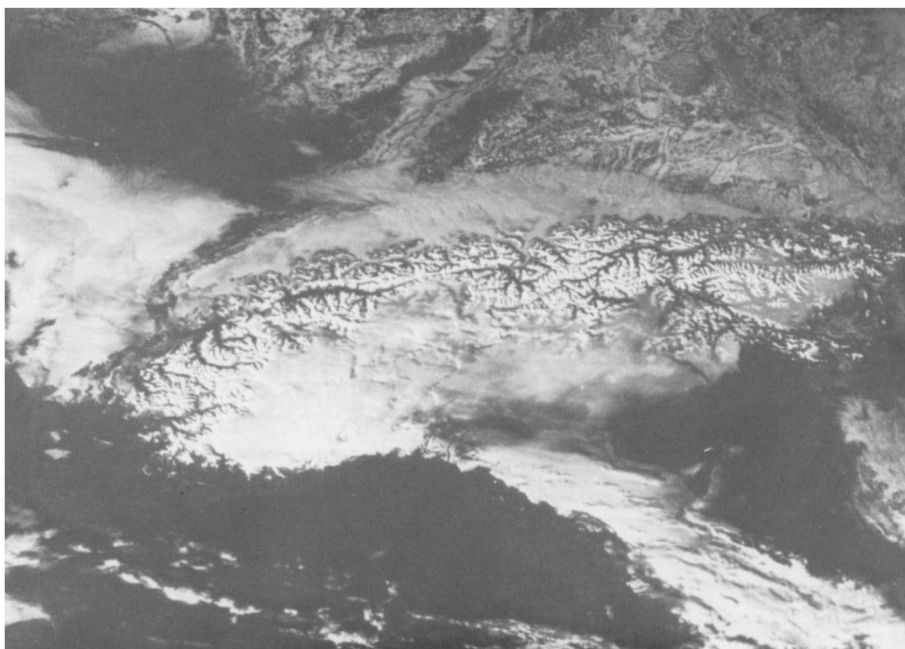


Figure 2. The Alps on a fair weather day in winter as seen from space (NOAA-6 visual image). The snow covered mountains are surrounded by fog and cloud fields covering the plains and valleys.



Figure 3. Wave clouds at about 10 km altitude formed by the Sierra Nevada mountains (California).

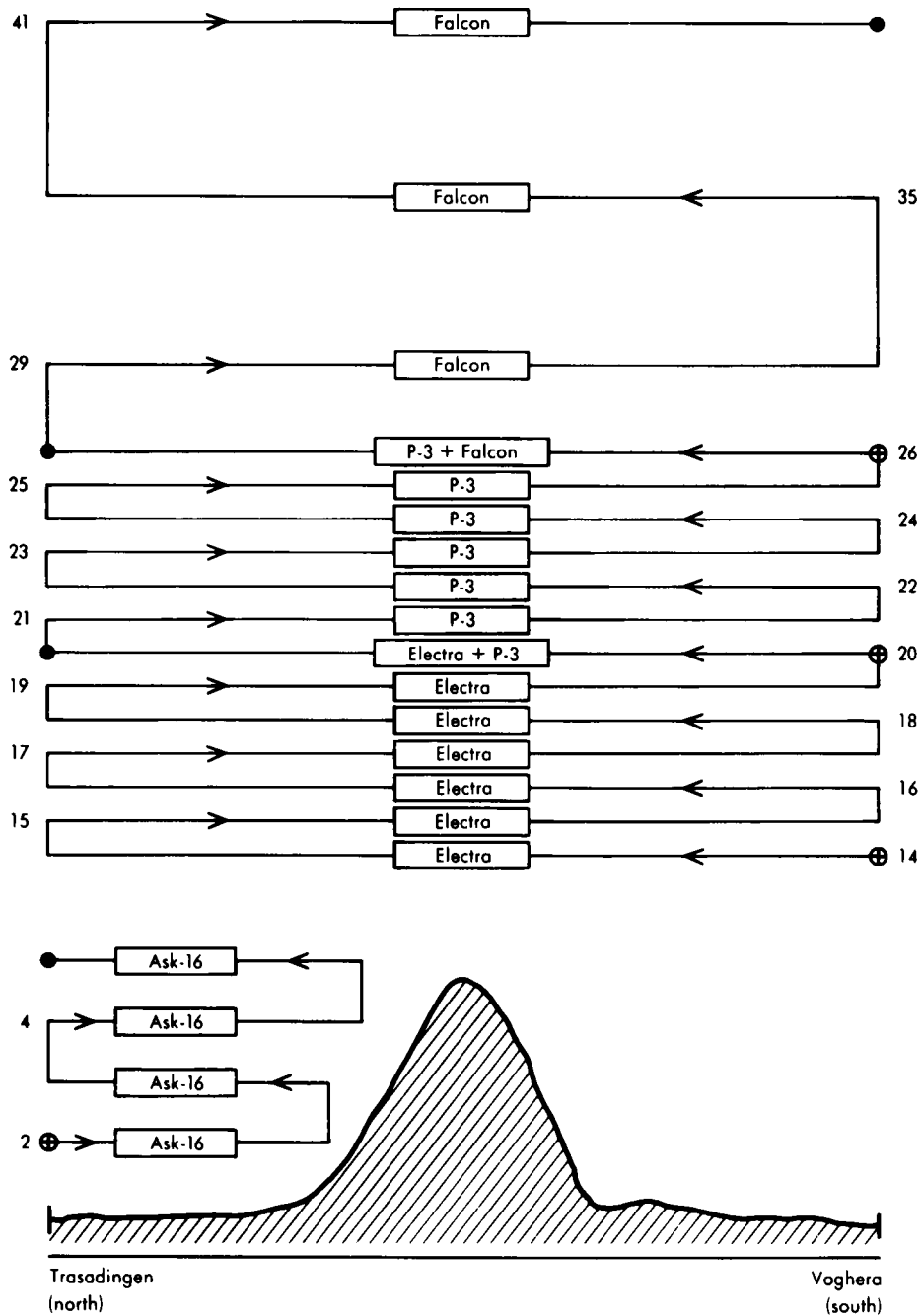


Figure 4. Proposed flight traverses over the Alps during foehn situations. The aircraft (a Falcon jet, a P-3, an Electra turboprop and 3 ASK-16 motorgliders) fly back and forth in a co-ordinated vertical stack.

Table I. *National contributions to the ALPEX special observing systems*

Nation	Aircraft	Ships	New upper-air sounding stations	Microbarograph stations	Radars available to ALPEX	Ocean buoys and fixed platforms
Austria			3	4	1	
Belgium		1				1
Czechoslovakia	1 ^a					
France	2 ^a	2	3		6	20
Federal Republic of Germany	8 ^b		4	10	1	
Greece			1			
Hungary					2	
Italy	2 ^a	3	4	9	3	4
Poland	2 ^a					
Romania					6	
Spain		1				2
Switzerland			4	27	3	
USA	2 ^c				2	
USSR		3 ^d				
Yugoslavia		1	3	12		1
Total	17	11	22	62	24	28

In addition: the European geostationary satellite Meteosat 2, the USA polar-orbiting satellite TIROS N together with 35 tide gauges, balloon systems, acoustic sounders, lidars, etc.

Notes: a. Short-range aircraft.

b. Includes 1 medium-range aircraft and 4 motor gliders.

c. Long-range aircraft.

d. Plus 3 weather ships.

Most of the observing systems will be installed in the 'inner experiment area' surrounding the Alps. This area is part of a larger 'outer experiment area' which describes the general airflow in which the mountain induced disturbances are embedded, (see Figs 5 and 6).

The participants

Table II gives a list of countries and international agencies participating in ALPEX and in MEDALPEX, its oceanographic component. About 20 nations have pooled their technical, scientific and monetary resources to make this project possible.*

Field operations

The nerve centre of ALPEX will be the Operations Centre near Geneva Cointrin airport. From here all international operations will be directed. Telecommunications exist between this centre and the nine national operations subcentres, the oceanographic fleet, the various forecasting and satellite centres and the secondary operations centre at the Marco Polo airport in Venice. A stream of up-to-date scientific and operational information will arrive at the Geneva centre and allow the assembled international group of scientists to decide on the daily operations plans. Three of the most modern

*The Meteorological Office took part in the early planning stages of ALPEX but, because of other commitments, was unable to take part in the experiment itself.

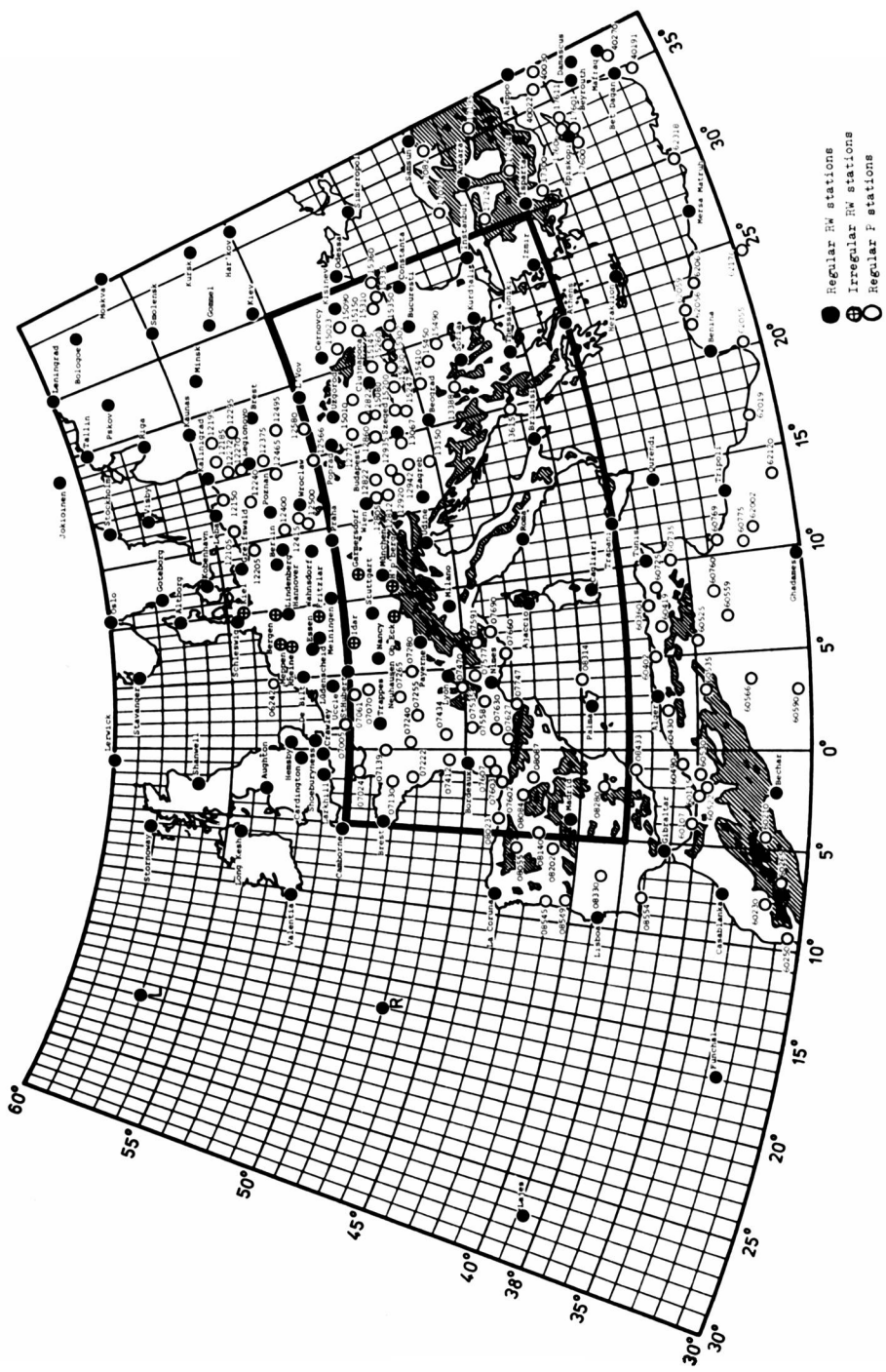


Figure 5. Outer and inner experiment area of ALPEX.

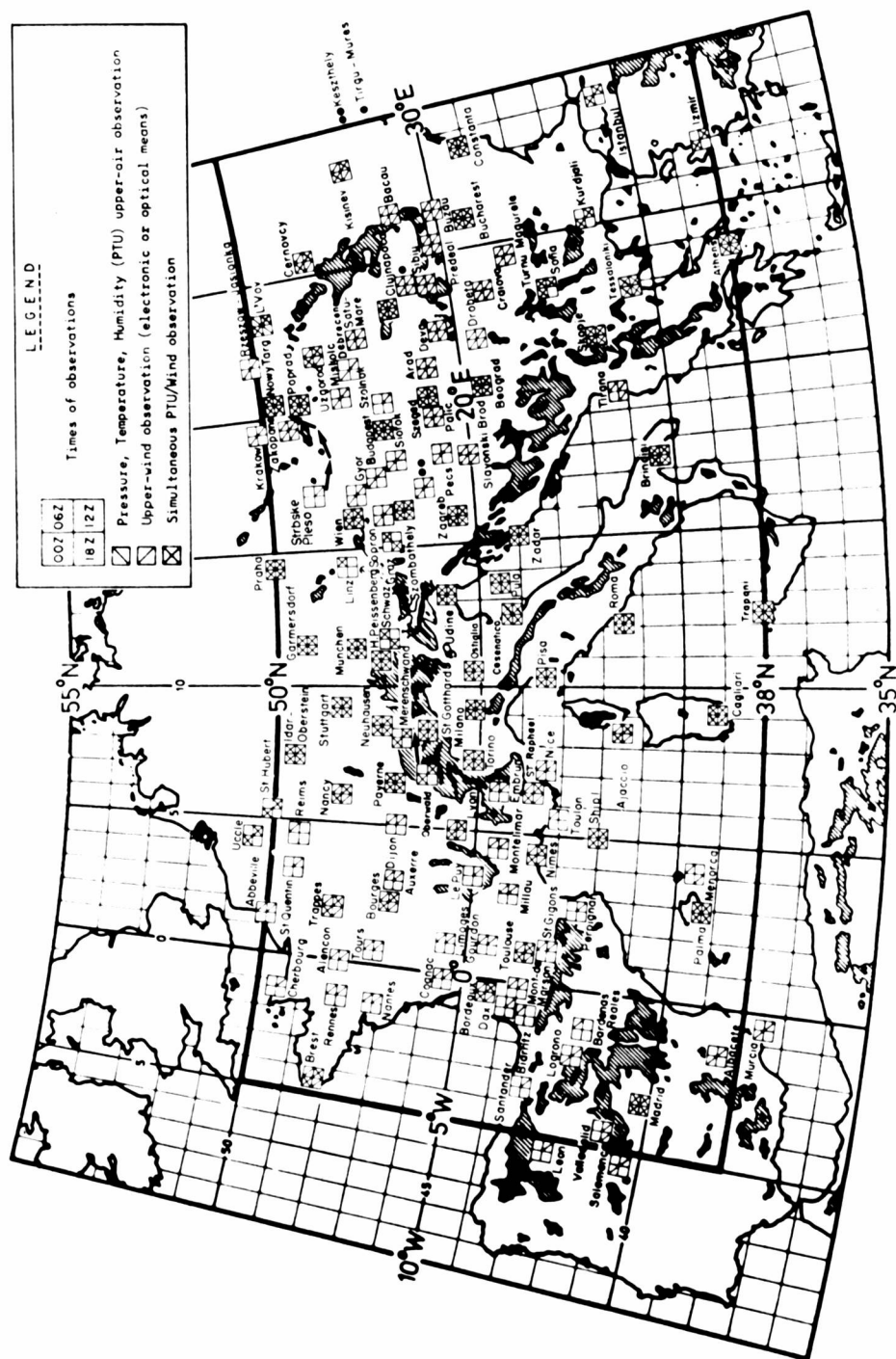


Figure 6. Upper-air sounding stations operating in the inner experiment area of ALPEX during March and April 1982.

Table II. *Countries and international agencies participating in ALPEX and in MEDALPEX, its oceanographic component.*

ALPEX:	Austria	Greece	Spain
	Belgium	Hungary	Switzerland
	Czechoslovakia	Italy	USA
	France	Poland	USSR
	Federal Republic of Germany	Romania	Yugoslavia
Canada, Israel, Portugal and Turkey are also contributing.			
European Space Agency (ESA)			
European Centre for Medium Range Weather Forecasts (ECMWF)			
MEDALPEX:	Belgium	Monaco	USSR
	France	Spain	Yugoslavia
	Italy		

research aircraft in the world will fly out of Geneva across and around the Alps, over central Europe, the Atlantic and the Mediterranean Sea, according to the given atmospheric conditions. The Operations Centre in Geneva will house over 100 scientists, technicians and supporting personnel.

Data management

An enormous amount of data will evolve from ALPEX. These will be processed by national and special data centres and subsequently assembled and validated by the 'International ALPEX Data Centre' in Reading, UK. From this centre the final ALPEX data set will go to the World Data Centres in Moscow and Ashville, USA for distribution—in late 1983—to all interested scientific users. The World Meteorological Organization, the International Council of Scientific Unions and the Intergovernmental Oceanographic Commission will be responsible for following up this data flow and its scientific evaluation. The final scientific results of ALPEX may be expected around 1985.

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ALPEX completed

Based on a WMO Press release dated 10 May 1982

The work of the ALPEX Operations Centre in Geneva and its subcentres within Europe was completed on 30 April 1982. This brought to an end the two month Special Observing Period of the Alpine Experiment organized under the auspices of the World Meteorological Organization.

During the months of March and April 1982, excellent data have been collected by the research aircraft (see Fig. 1) in Geneva, as well as by the numerous observing networks installed by the participating countries around the Alps in Europe and by the research ships (see Fig. 2) operating in the Mediterranean Sea.



Figure 1. One of the highly instrumented long-range research aircraft participating in ALPEX. (USA Lockheed 'Electra'.)



Figure 2. One of the USSR research ships participating in ALPEX.

Favourable weather conditions made it possible thoroughly to investigate the formation of cyclones over the Mediterranean Sea caused by the Alps. Two to three events were expected but six occurred. The analysis of the collected data should bring improvements in the very difficult forecasting of these complex disturbances. Also mountain induced winds, such as the mistral in southern France and the bora over the Adriatic Sea, were explored. Weather conditions were not favourable for the study of the foehn which is normally connected with southerly winds; however, the so-called 'north-foehn' was studied both over the Alps and the Pyrenees. Finally, the deformation of fronts passing over and round the Alps was measured.

One of the most striking features observed by the ALPEX aircraft was the degree to which cold air masses in the atmospheric boundary layer flow round rather than over the Alps. Adjustments of computer models to this reality should bring improvements in weather forecasting, especially for several days ahead. Other scientific results will have to await the processing and finalization of the complete data set.

The aircraft in Geneva flew over 330 flight hours or 94% of those available to ALPEX. The scientific success rate of most of these flights is estimated at near 80%. Eleven ships operated in the Mediterranean, collecting surface and upper-air data and oceanographic parameters. Numerous upper-air stations, radar and special observing systems were operated successfully by the 19 participating countries.

The ALPEX Operations Centre at Geneva, installed in the vicinity of Cointrin airport, functioned smoothly under Swiss direction and housed a total of 170 participants. The co-operation of the air traffic control centres in Europe during the research flights was outstanding.

ALPEX brought together an unusual group of scientists from many countries, all interested in the airflow over and round mountains. This resulted in a lively exchange of ideas. Nearly 40 seminars were given by the visiting scientists.

It will take another 18 months until all data have been processed and finalized. There is little doubt that this unique data set will have an impact on weather forecasting and on the understanding of atmospheric flows over mountains in many parts of the world.

ALPEX is the last of the major international research projects conducted under GARP and jointly organized by WMO and ICSU. Its scientific results will bring to an end a 12-year effort to explore the weather of the globe, and with it the largest scientific undertaking ever conducted by the nations of the world.

Sunshine cards—then and now

By Désirée M. Allen

(Meteorological Office, Bracknell)

During the last century meteorological instruments have undergone many changes and have been redesigned to improve efficiency of record and measurement. The sunshine recorder is no exception to this period of change. The current Mk 3C recorder is a far cry from the earliest type, which was a wooden bowl with a glass sphere in its centre.

The sunshine card, however, has changed very little in the last 67 years. Recently, a small bundle of sunshine cards for January 1915 from the climatological station at Raunds (Northants) was sent to the Meteorological Office at Bracknell to be archived. Except for the use of roman numerals, the face of the card has changed little in those 67 years, as shown in Fig. 1.

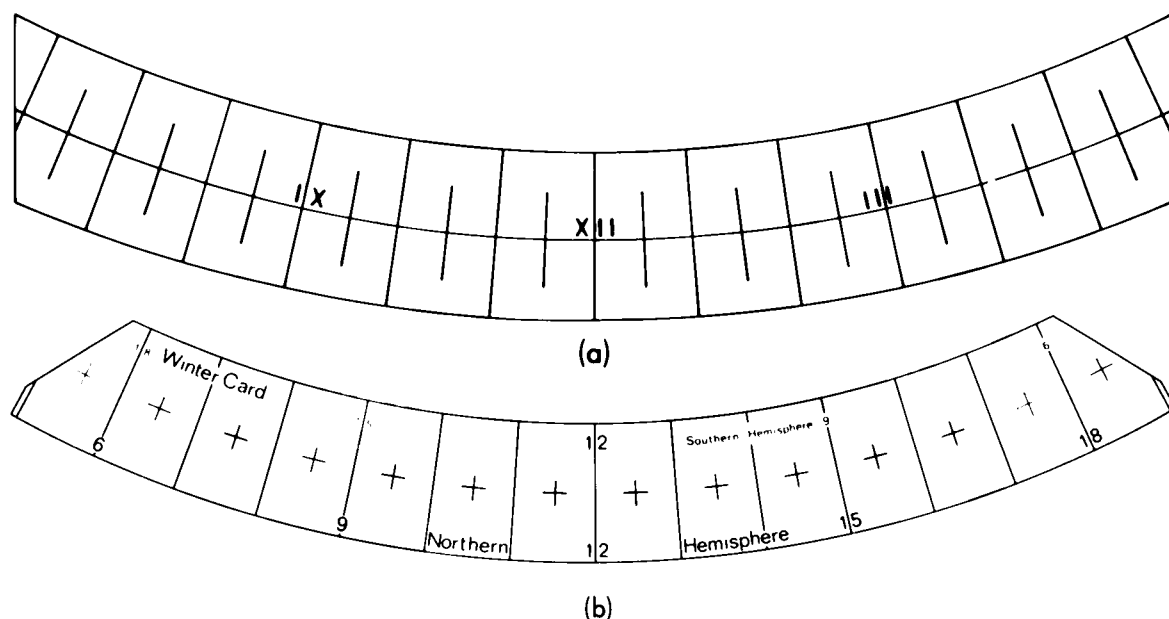


Figure 1. (a) Sunshine card used by Raunds (Northants) during January 1915 and (b) a present-day winter card.

Those seem to have been days of strict economy (probably due to World War I) in that the card remained in the recorder until there was sunshine to be recorded. All measurements of cards were verified. This bundle was accompanied by M.O. Form 424, as shown in Fig. 2. It is interesting to note that the verification shown here was by E. Gold* who in 1940 became Deputy Director of the Meteorological Office.

*See *Meteorol Mag* 76, 241, *ibid.* 105, 133.

M.O. Form 424.

METEOROLOGICAL OFFICE, S.W.

18th March, 1915.

Result of Examination of Sunshine Cards.

from RAUNDS for January 1915.

Day.	Measurements.		Notes.
	M.O.	Observer.	
2	3.0	2.8	
6	2.4	2.4	
15	1.3	1.3	
18	4.5	4.5	
31	<u>2.7</u>	<u>2.5</u>	
	<u>13.7</u>	<u>13.5</u>	
	R.F.	R. Gold	

Figure 2. Result of examination of sunshine cards from Raunds (Northants) for January 1915.

Review

Climatic variations and variability: facts and theories, edited by A. Berger. 160 mm × 240 mm, pp. xxvi + 795, illus. D. Reidel Publishing Company, Dordrecht, Boston, London, 1981. Price Dfl. 175.00, US \$87.50.

This book is the proceedings of the First Course of the International School of Meteorology at Erice and is a massive tome of nearly 800 pages containing the text of 41 lectures and 3 papers reviewing the lectures. The lectures are grouped in six parts whose titles indicate the scope of the Course: 'Mathematical and Physical Basis of Climate', 'Mathematical Techniques in Climate Reconstruction and Data Banks', 'Facts: Reconstruction of Past Climates' (the use of the world 'facts' is perhaps a little tendentious, in the pre-instrumental period at least), 'Theories of Climatic Variations and their Modelling', 'Man's Impact on Climate', and 'Climate Impacts on Man'. The 'summary-reviews' are called 'Techniques for reconstructing past climates', 'Climate modelling', and 'Man's impact on Climate'. The lectures include most of the leading workers in the field from America and Europe. A detailed critical review of a book such as this is impossible in a short notice; suffice it to say that it must be an essential reference for all meteorologists interested in the subject.

Regrettably, but perhaps not surprisingly, the word 'anthropogenic' is used unnecessarily in the anomalous sense of 'man-made' or 'human' with wearisome frequency in Parts V and VI.

R.P.W. Lewis

Notes and news

An Edwardian dedication

Some happy serendipity in the deeper recesses of the National Meteorological Library has brought to light a sizeable book by William Digby, published in 1902 by Hutchinson, entitled *Natural Law in Terrestrial Phenomena*. It opens with the following sonorous dedication:

TO
**The Astronomers Meteorologists and Geologists
of the United Kingdom**

WHOSE SINGULAR AND UNEQUALLED DEVOTION AND ZEAL
IN THE
STUDY OF NATURAL PHENOMENA

PRODUCE GREAT RESULTS AND WIN ADMIRATION FROM
ALL WHO BECOME ACQUAINTED WITH THEIR PAINSTAKING,
CONTINUOUS, AND OFTEN VOLUNTARY, OBSERVATIONS
AND RECORDS WHICH CONSTITUTE
A MONUMENT OF UNWEARIED INDUSTRY
THE ATTEMPT (HEREIN RECORDED) TO GET BEHIND
VARIOUS OUTWARD MANIFESTATIONS OF
TERRESTRIAL PHENOMENA
(AN ATTEMPT CONCEIVED AND CARRIED OUT IN A
REVERENT AND SCIENTIFIC SPIRIT) AND THE
BODY OF EVIDENCE AND EXAMPLES
OF HITHERTO UNRECOGNISED CO-ORDINATION OF NATURAL
FORCES IN THE CAUSATION OF PHENOMENA ARE
SUBMITTED FOR CONSIDERATION AND EXAMINATION
AND RESPECTFULLY DEDICATED,

IN THE HOPE THAT IT MAY BE RECOGNISED AND
AGREED THAT ONE MORE OF NATURE'S SECRETS
HAS BEEN WRESTED FROM THE UNKNOWN

It is unlikely, though it may be regretted by some of our readers, that this style will be followed in future official publications of the Meteorological Office.

Enquiries on the weather, then and——

It seems that the type of enquiry received by meteorological organizations has not changed all that much in over one hundred years, as is shown by this extract from the 1869 volume (Number II, new series) of the *Journal of the Scottish Meteorological Society*.

CASES OF INQUIRY FOR INFORMATION AT THE OFFICE OF THIS SOCIETY, ON MATTERS AFFECTING IMPORTANT INTERESTS.

By ALEXANDER BUCHAN, *Meteorological Secretary*.

1. A corn merchant inquired whether, on a particular day in the autumn of 186—, rain had fallen in a certain district of Scotland. He had purchased a quantity of potatoes from a farmer, who, by agreement, carted them two or three miles to a railway station, where they were weighed immediately on arrival. On being delivered in Edinburgh, they were weighed by the merchant, and the weight was found to be considerably less than that alleged by the farmer as ascertained at the railway station. The merchant maintained that the greater weight stated by the farmer was owing to a heavy rain which fell while the potatoes were being carted to the station, and that they were weighed in a wet condition, but that when weighed by him they were dry. On this account he refused to pay the full amount charged. The farmer, on the other hand, maintained that no rain fell on that day; and he insisted on payment according to his weight. The case went into Court. The Society had several stations in the district where the potatoes had grown and had been carted. On consulting the returns from these stations, the Secretary, on being consulted, found such entries as 'a rainy day' marked on the day in question, a considerable quantity of rain also marked as having fallen, a low barometer, and wet weather, as reported at stations at a greater distance. He considered, therefore, that there was no reasonable doubt that rain had fallen on the potatoes on the way to the station. Extracts were given from the schedules detailing the state of the weather on this day.

2. A house-agent wished to be informed if it had rained in a particular town on a certain day in the summer of 186—. One of the tenants of the houses for which he was agent, stated that it had rained heavily on that day, in consequence of which rain had entered by the roof, and damaged the ceiling of a room. The tenant insisted that the agent bear the cost of the damage. This the agent refused to do, on the ground that he had not been informed in time of the damage done to the roof, in which case he would have had the roof repaired before the rain fell. The point was this: The tenant alleged that he had written the agent, acquainting him with the state of the roof, two days before the ceiling was damaged, and that as the repairs were not executed till after the ceiling was damaged, he would not be held responsible for it. The agent left on a tour through Scotland before the tenant's letter was delivered, and a day or two elapsed before he received it in the country. It so happened that in that part of the country where he was the weather was very fine, and no rain whatever fell on the day the ceiling was stated to have been damaged. It was surmised that the damage had been done before the letter was written by the tenant; and this could evidently be shown to be the case, if no rain fell at the place on the day the damage was said to have taken place. The Society had a station in the town, and for the day in question the observer had entered in the column of remarks in the schedule, that 'several heavy showers had fallen in the course of the day.' From this information, the lawsuit which had been proposed was given up.

3. A dealer in perishable goods forwarded a large quantity to a distant town, one day in spring 186—, by rail. These goods the company was bound to deliver to the consignees without delay, unless prevented by some occurrence which could not have been foreseen or provided against. The goods were not delivered till two days after date, when, on the boxes being opened, the goods were found to be unfit for sale. The dealer claimed damages, which were refused, the company saying that so heavy a fall of snow

had taken place just before the goods arrived, that the streets were impassable for their vans, that two days elapsed before they were cleared, and that immediately on the streets being cleared, the goods were delivered. As no snow had fallen in the town from which the goods had been sent, the consigner doubted the excuse made by the railway company. He proposed to prosecute the case, but before doing so, called at the office to ascertain the facts as to the weather. It was plainly shown, from the records in the office, that the statements made by the company were correct. The proposed lawsuit was accordingly given up.

4. Some time since an engineer applied for a statement of all the heavy daily rainfalls that had taken place in one of the large towns of Scotland during several years. An important drainage scheme was proposed at the time, and he had ascertained what sizes of drains were required to carry away all the water which fell during certain days of heavy rain,—the amount that fell on each occasion having been measured with the rain-gauge. The object was to determine the size of the drains which would be required to carry away all the rain, except in those cases of very heavy rainfalls, which, as they occur but seldom, do not require, in a case of this sort, to be provided against.

5. A considerable number of applications have been made for an account of the average annual rainfall in particular districts, with reference to the water supply of towns. From the number of years for which observations have been made at the stations, viz. thirteen, and for rain, a longer period at some places, trustworthy annual averages are now available, together with the amounts for the smallest annual rainfall of any two consecutive years.

6. A lawsuit was instituted by the proprietors of a bleachfield against a company that made coke in the immediate neighbourhood. Damages were claimed for the damage done by the smoke of the cokerworks when it was carried by the wind over the bleachfield. The point was to settle the amount of damages, which plainly would to a great extent be determined by the number of days during the time the wind had blown from that direction which brought the smoke to the bleachfield. Extracts showing this were given from the schedules of a station a few miles distant. The observer proved his observations, and I was examined as a skilled witness, for my opinion how far the observations at the Society's station might be held as showing the direction of the wind at the bleachfield and cokerworks.

7. Some years ago a severe railway accident occurred through some trucks being blown off a siding, and thence down an incline, up which a passenger train was proceeding at the time. In the collision which followed, some lives were lost, and severe injuries were sustained. In an action of damages against the railway company, it was pled, on behalf of the company, that a great storm of wind was raging at the time—a storm so unprecedentedly great, that the company could not be held responsible for the trucks being driven down the incline, and for the events which followed. The schedules from the Society's stations were examined, from which it appeared that a storm of wind of considerable violence had passed over this part of Scotland at the time, but not so great as several storms which had previously occurred; that it was such a storm as might be expected to occur once or twice, or oftener, every winter. On this account the company were held responsible, for not having made provision to secure the trucks in such a manner as to resist being driven from their position by the force of the wind.

8. Application was made for the probable force of the wind at a railway station, on a night during which some trucks had been moved from a siding. The point in dispute was, whether the trucks had been set in motion by some malicious person, or by the wind.

9. Observations showing the particular character of the weather on a day in November 186—, were asked for. A gentleman of weak mind and in infirm health was boarded with some friends, who had been directed by the medical attendant on no account to allow him to walk out in wet or cold weather, such weather being, from the nature of his complaint, almost certain to prove fatal. On that day he had been allowed to go out. Shortly after he took ill, and died, and the friends with whom he resided at the time thereby succeeded to considerable property. A lawsuit was instituted by some others of the relatives,

who stated that the day on which the gentleman had gone out was wet and cold, and that he had been allowed to go out in this weather for the purpose of bringing on illness. An examination of the returns from two of the Society's stations in the immediate neighbourhood, together with others at a greater distance, showed that on that day the barometer was moderately high and steady, the temperature a little above the average, the wind very light, the sky clear or nearly so, and no rain; in other words, that the weather was indicative of a fine November day.

10. A gentleman, whose health had broken down from too close application to study, and who had been advised by his medical attendant to leave this country for Australia or New Zealand, called to make inquiries regarding his passage out, and the general characteristics of the climates of the parts of Australia and New Zealand where he might ultimately settle. It was most desirable that he should have the benefit of the long voyage round the Cape of Good Hope, and it was judged necessary that he should leave the British Isles as soon as possible, so as to avoid the east winds of spring. The voyage round the Cape could be taken, provided that the temperature there in June (the winter season) would not be too low, otherwise the overland route would be taken. From an examination of the mean and extreme temperatures in the south of Africa at this time of the year, and comparing them roughly with our own climate, it was decided that his health would stand the weather likely to be met with in rounding the Cape. A general idea was given of the climates of the parts of Australia and New Zealand he thought of going to, particularly with respect to their temperature and humidity. Many similar inquiries regarding the colonies and other foreign countries have been made.

11. Very many inquiries have been made asking advice regarding winter, spring, summer, or permanent residences. These inquiries are made mostly by invalids, and by persons who have returned to this country, and intend settling somewhere in Great Britain. Guided mainly by the facts stated, and the opinions given, property has been leased or purchased, and houses built.

Much is now known regarding the capabilities of our British climate in different parts of the island; but the knowledge is far from being so generally diffused as it might be. It still sometimes happens, for example, that an invalid is sent from a place in the east of Scotland to one of the inland counties in the south of England, for the benefit of the milder winter climate which is supposed to prevail there. Since the climates of these two parts of Great Britain are at this season, as regards temperature, practically the same, no advantage is gained from a residence in this part of the south of England.

Award

We note with pleasure that the International Meteorological Organization Prize for outstanding work in meteorology or operational hydrology and international co-operation has been awarded by the WMO Executive Committee to Dr W. J. Gibbs, OBE, former Director of the Australian Bureau of Meteorology.

Dr Gibbs was born in 1916 and graduated with a BSc degree from the University of Sydney in 1938. He joined the Australian Bureau of Meteorology in 1939. During the Second World War he served as a weather forecaster in the Royal Australian Air Force. In 1943 he took an MSc degree at the University of Sydney and in 1952 an MS degree at the Massachusetts Institute of Technology. From 1948 he occupied a full-time research position in the Bureau of Meteorology and was promoted to Assistant Director (Research) in 1958. Dr Gibbs became Director of Meteorology in 1962, a post which he occupied until his retirement in 1978.

Dr Gibbs became widely known in the meteorological community both for his activities at national level and for his valuable and prominent role in international meteorological affairs for more than 30 years.

Dr Gibbs's meteorological research activities continued throughout his career. In all, he published some 75 scientific papers and participated in many scientific conferences. He is a member of many scientific institutions and was awarded in 1965 an honorary Doctorate of Science by the University of Melbourne. In 1968 he was awarded the title of Officer of the Order of the British Empire.

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NOTICES

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