

DUPLICATE ALSO



CENTRAL FORECASTING MONITORING NOTE NO. 13
MONITORING STATISTICS FOR SATEMs AND SATOBs
December 1992 - February 1993

J.R.Leighton

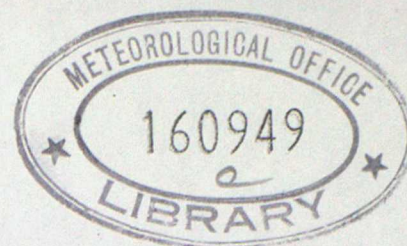
Central Forecasting Division

April 1993

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METEOROLOGICAL OFFICE.

Central Forecasting Monitoring Note No.13

Monitoring statistics for SATEMs and SATOBs, December 1992
- February 1993. By LEIGHTON, J.R.

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Contents

1. Introduction
2. Temperatures
 - 2.1 SATEMs
 - 2.2 TEMPs
 - 2.4 LASS
3. Winds
 - 3.1 SATOBs
 - 3.2 TEMPs/PILOTs
 - 3.3 AIREPs
4. Summary

Figures

Temperatures

1-7	SATEMs
8-13	TEMPs
14-15	AIREPs
16-18	LASS

Winds

19-28	SATOBs
29-32	TEMPs/PILOTs
33-35	AIREPs

1 Introduction

This monitoring note, the sixth in a series, continues monitoring results from SATEMs and SATOBS for the quarterly period December 1992 - February 1993.

Results for SATEMs (500 km resolution) and SATOBS, as in previous monitoring notes, have been compared with similar statistics for TEMPs/PILOTS, AIREPS and LASS (Local Area Sounding System) observations. The background field used to infer the quality of the observations is a T+6 hour forecast from the operational Unified global model.

Only significant features are commented upon for each chart and comparisons will be made with the previous Central Forecasting Monitoring Note No. 12, "Monitoring Statistics For SATEMs and SATOBS (September - November 1992)", referred to as P1.

2 Temperatures

From 15th October 1992 LASS data were permanently rejected from model input due to a cold background field at high levels feeding back into the data assimilation.

2.1 SATEMs (figs 1 - 7)

Due to operational problems data for February is missing from the archive.

Compared with P1 between 850-1000 hPa (fig 1) the positive biases over the entire globe have decreased except for a larger positive bias over Nova Scotia and the eastern seaboard of USA. These areas, in addition to an area north east of Iceland, also have markedly higher RMS temperature differences (fig 2), whereas the rest of the globe generally has lower values.

Between 100-300 hPa the southern oceans have smaller O-B temperature differences compared with P1 and there is a large area of negative bias in the central Pacific between 20°-30°N.

At 30-50 hPa (fig 5) the high positive biases reached in the last quarter have continued into this period with corresponding high RMS values (fig 6). There is an area of high RMS O-B temperature differences in the central Pacific, overlying the area of negative O-B differences mentioned above at the lower level band between 100-300 hPa.

2.2 TEMPs (figs 8 - 13)

The bands used for TEMPs are not the same as those used for SATEMs due to the form of the data archive.

O-B temperature differences between 801-1000 hPa (fig 8) show similar biases to P1 with the exception of a larger negative bias over South America, near neutral over West Africa and a more positive bias in the Far East.

O-B temperature differences between 101-300 hPa (fig 10) show generally more negative biases in the northern hemisphere compared with P1.

P1 showed a strong negative bias of O-B temperature between 11-100 hPa towards the end of the period due to the warm bias in the model temperature fields at high levels. This is continued throughout this quarter (fig 12). As in P1, compared with the upper level SATEMs (fig 5), the bias is in the opposite sense due to the SATEM background being derived from the thickness field, not the temperature field.

2.3 AIREPS (figs 14 - 15)

The mean O-B temperature differences between 101-300 hPa (fig 14) show marked negative biases over the Middle East and Poland. The main airlines over the North Atlantic have near-zero bias, in contrast with positive bias in P1. This is probably due to the removal of LASS data.

2.4 LASS (figs 16 - 18)

Mean O-B temperatures at 850 hPa (fig 16) and between 250-150 hPa (fig 17) show more negative biases compared with P1. Between 50-30 hPa (fig 18) the large negative biases found towards the end of the period in P1 have continued throughout the current period.

3 Winds

Throughout the period of this report, SATOBs from GOES, north of 20° N above 500 hPa and from GMS, poleward of 20° above 500 hPa were permanently rejected. All INSAT SATOBs were rejected.

From 2nd February, in addition to the above, all Meteosat and GOES above 500 hPa over land, poleward of 20° were permanently rejected, but GOES above 500 hPa over sea poleward of 20° were re-instated.

From the same date, changes were made to the AIREP station list, AIREP track checking was introduced and alterations were made to AIREP duplicate checking.

3.1 SATOBS (figs 19 - 28)

Windspeed differences between 701-1000 hPa (fig 21) are similar to P1 with the exception of the Gulf of Guinea where the differences have reduced and the Indian Ocean where differences have increased significantly over P1. The Indian Ocean differences are probably due to the change to the new INSAT satellite. Reports started in January, but there are few observations in this region (fig 23).

The vector wind differences in the 101-400 hPa layer show a strong meridional component in the tropics (fig 25), possibly indicating a problem with the Hadley circulation in the background field.

Again, 101-400 hPa speed differences are high over the tropical eastern Pacific (fig 26) with a maximum of 6.4 m s^{-1} albeit with very few observations (fig 28).

3.2 TEMPs/PILOTs (figs 29 - 32)

O-B speed differences between 701-1000 hPa (fig 29) are more widely spread in range compared with P1. There are large negative differences over Alaska, Central and North East Asia and South America and large positive differences in central West Africa, South Africa and Australasia. These areas correspond to high RMS vector wind differences (fig 30).

There are large positive speed differences between 101-400 hPa (fig 31) in South America and South Africa with corresponding high RMS vector differences (fig 32).

There are large positive and negative differences over central Asia with corresponding high RMS vector wind differences.

3.3 AIREPS (figs 33 - 35)

As in P1 there are positive differences in O-B speeds between 101-400 hPa over all areas with data coverage (fig 33).

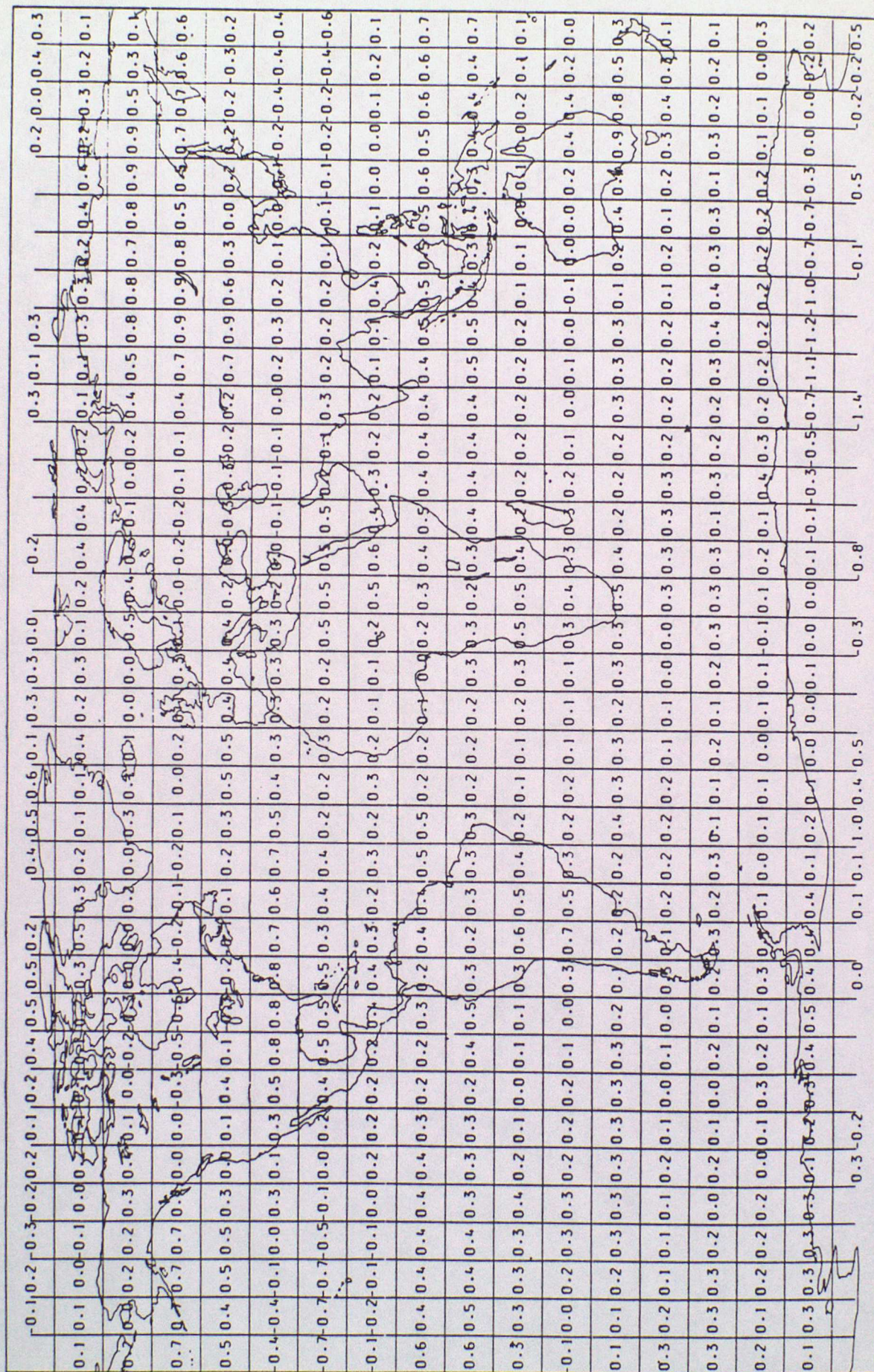
4. Summary

Removal of LASS data from the data assimilation appears to have improved the O-B temperature differences in the bands 850-1000 hPa and 100-300 hPa with corresponding slight improvements in the RMS temperature differences. Any possible improvement at the upper band, 30-50 hPa, has been masked by the model's warm bias above 300 hPa.

Upper level windspeed O-B differences in band 101-400 hPa are generally positive for the 3 platforms monitored (as in previous periods) emphasising the model's tendency to underestimate winds at these levels.

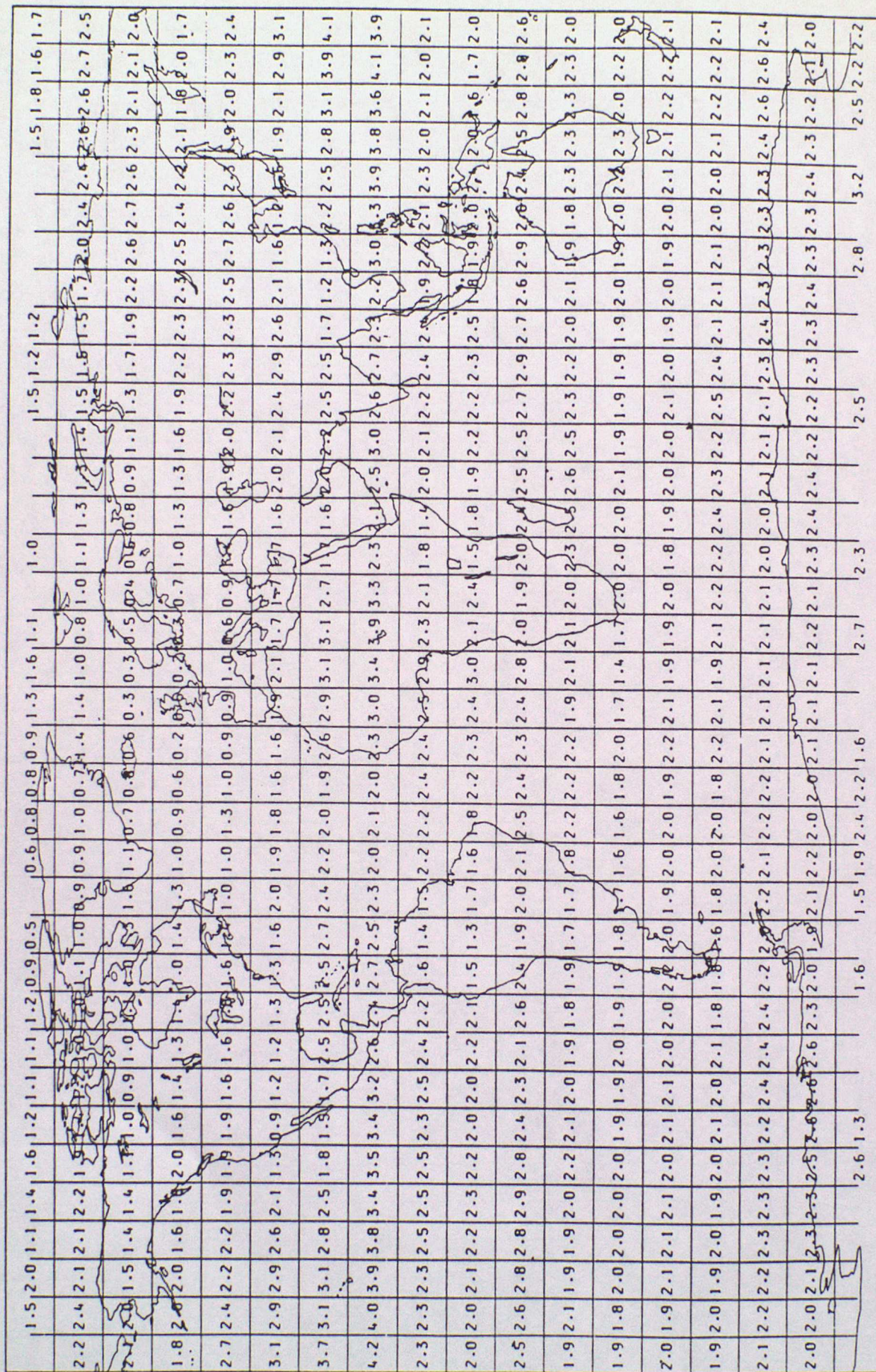
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-0.6-1.0-1.5-1.9-1.6-1.2-0.5-1.0-0.5	4.6-1.0-0.1-0.3-0.4-0.9-0.5-0.7-0.1-0.4-0.7-1.7-2.2-0.9-0.4-1.4-1.7-1.0-0.8-0.1			
-0.8-0.2-0.0-0.7-1.3-0.0-0.9-0.5-1.8	0.7-0.9-0.0-0.1-0.4-0.7-1.3-1.3-0.7-0.7	-1-50.4		1.6-1.0-0.4
0.1-0.1-1.3-1.6-1.1-0.9-0.6-3.1	1.0-1.6-0.9-0.6-3.1-1.0-0.1-0.3-0.0-0.7-0.9-0.9-1.1-1.0-0.2-0.5			1.2-0.5-0.0-0.7
0.2-0.8-1.0-1.4-0.7-0.3	2.6-2.3-0.7-0.3-0.2-0.1-0.2-1.0-0.3-0.3-1.5-1.6	0.9-2.3-0.0-0.0-0.1		0.0-0.1-0.1
0.5-0.1-0.1-0.6-0.8-0.0-0.7	1.2-1.1-2.3-0.9-0.6-0.4-0.5-0.8-0.0-0.8-0.7-0.3-1.0-1.6	1.3-2.6-0.7-0.1-0.2-0.3		0.7-0.1-0.2-0.3
1.1-0.3-0.3-0.6-0.9-0.8-0.0-0.5-0.6	1.0-1.2-0.4-0.5-0.3-0.3-0.8-0.6-1.8	0.0-0.3	0.0-0.2-3-2-3-0.6	1.4-1.1-1.0-1.0-1.2-1.6
0.7-0.6-0.3-0.2-0.3-0.5-0.6-0.1-0.1-0.7-0.0-0.1-0.1-0.3-0.4-0.1-1.8-1.9-1.3				
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0.7-0.7-0.8-0.8-1.2-1.5-1.5-1.4-1.4-0.4-3.2-1.8-2.6-1.3-0.8-1.0-0.9-0.7-0.7		0.3-0.5-0.7-0.7-0.6-0.9-0.7-0.6-0.8-0.8-0.7-1.2-0.8		0.5-0.7-1.2-0.8
0.8-0.7-0.5-0.5-1.0-1.1-1.3-2.0-2.2-1.6-0.8-3.1-3.3	0.8-2.3-2.5-1.9-0.6-1.3	0.1-0.5-0.5-0.9-1.5-1.7-1.9-1.0-0.5-0.6-0.4-0.9-1.1-1.1		0.4-0.9-1.1-1.1
1.1-0.7-0.7-0.4-0.4-0.1-0.4-1.0-1.4-1.6-0.8-4.2-2.1-0.3-0.2-0.7-1.5-1.6-1.1-0.8		0.2-0.4-0.6-1.2-1.4-2.1-2.3-1.4-0.3		-0.8-0.8-1.2-1.2-1.2
0.3-0.0-0.0-0.0-0.3-0.2-0.1-0.2-0.1-0.3-0.2-2.0-1.0-0.0-0.0-0.0-0.3-0.8-0.5-0.4		0.0-0.2-0.3-0.0-0.3-0.6-0.5-0.5-0.4-0.1-0.4-0.0-0.2-0.4-0.5		0.0-0.2-0.4-0.5
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-0.2-0.3-0.4-0.4-0.7-0.0-0.5-0.0-0.1-0.3-0.8-0.5-0.3-0.1-0.5-0.9				0.0-0.1

500 KM SATEMS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) : 100 TO 300 HPA
DECEMBER 1992 - JANUARY 1993
NOAA-11 AND NOAA-12 STATISTICS COMBINED
VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT



500 KM SATEMS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) : 30 TO 50 HPA
 DECEMBER 1992 - JANUARY 1993
 NOAA-11 AND NOAA-12 STATISTICS COMBINED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 5



1.9	2.3	1.7	1.7	2.0	1.6	1.6	1.7	1.6	1.1	1.5	1.3	1.5	1.3	1.9	1.9	1.6	1.5	1.8	1.6	1.5	1.8	2.4	2.8	2.9	3.0	2.9	3.1	3.0	2.4	1.8	2.4	1.9	2.0	
2.7	2.9	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.7	1.5	1.6	1.4	1.9	2.0	1.9	1.7	1.8	1.8	1.8	1.9	2.0	1.9	2.4	2.8	2.9	3.0	2.9	3.1	3.0	2.4	2.8	2.9	3.1	3.0
2.8	2.3	2.0	2.0	2.0	1.9	1.7	1.8	1.8	2.2	1.8	1.9	1.9	2.2	1.7	1.5	1.6	1.4	1.8	2.0	1.8	2.0	2.3	2.4	2.8	3.1	3.1	3.1	3.0	2.9	3.0	2.9	2.6	2.5	
2.5	2.4	2.1	2.6	2.4	2.1	2.0	2.2	2.2	2.0	1.9	1.7	1.5	2.0	2.0	1.6	1.6	1.6	1.6	1.6	1.7	1.9	2.0	2.1	2.3	2.7	2.7	2.9	2.9	2.4	2.7	2.6	2.5	2.2	
3.1	2.7	2.6	2.6	2.3	2.4	2.4	2.1	2.1	2.3	1.9	1.7	1.8	1.6	1.6	1.7	1.8	1.4	1.6	1.6	2.1	2.4	2.3	2.5	2.7	2.9	3.2	3.0	2.8	2.5	2.6	2.7	2.8		
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4.5	4.3	4.3	4.2	3.8	3.8	3.8	3.7	3.8	3.1	3.0	2.8	2.6	2.7	2.5	2.8	3.5	3.9	3.7	2.8	3.6	2.9	3.4	3.0	3.1	2.9	2.6	3.4	4.1	4.2	3.9	4.4	4.4		
2.6	2.8	2.7	3.0	2.9	2.7	2.9	2.8	2.7	2.2	2.3	2.8	2.8	2.8	3.0	3.4	2.7	2.5	2.4	2.0	2.5	2.6	2.8	2.9	2.8	2.4	2.7	2.6	2.8	2.5	2.7	2.8	2.6		
2.4	2.4	2.5	2.6	2.8	2.7	2.5	2.6	2.7	2.5	2.3	2.4	2.3	2.7	2.7	2.8	3.3	2.6	2.8	2.4	2.4	2.7	2.6	2.7	2.8	2.4	2.7	2.5	2.3	2.2	2.5	2.2	2.5		
2.8	3.0	3.2	3.2	3.3	3.2	2.9	2.7	2.6	3.0	2.9	2.4	2.5	2.9	2.9	2.8	2.8	3.2	2.5	2.5	2.4	2.9	2.9	3.1	3.3	3.1	3.0	3.2	3.0	2.9	3.2	3.1	2.9		
2.3	2.5	2.4	2.3	2.3	2.4	2.4	2.2	2.1	2.0	2.3	2.2	2.3	2.5	2.6	2.5	2.3	2.5	2.5	2.6	2.9	2.8	2.6	2.5	2.4	2.5	2.3	2.4	2.7	2.8	2.7	2.6	2.4		
2.1	2.0	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.7	2.1	2.2	1.9	2.0	2.2	2.4	2.1	1.9	2.3	2.3	2.4	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.4	2.6	2.3	2.4	2.3	
2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.3	2.2	2.2	2.2	2.4	2.4	2.2	2.2	2.3	2.1	2.2	2.2	2.3	2.2	2.1	2.2	2.1	2.2	2.2	2.3	2.4	2.4	2.3		
2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.3	2.1	2.2	2.0	2.3	2.3	2.1	2.5	2.4	2.4	2.5	2.6	2.7	2.7	2.6	2.3	2.5	2.4	2.5	2.3							

AVERAGE DAILY NUMBER OF 500 KM SATEMS
 DECEMBER 1992 - JANUARY 1993
 NOAA-11 AND NOAA-12 STATISTICS COMBINED

FIGURE 7

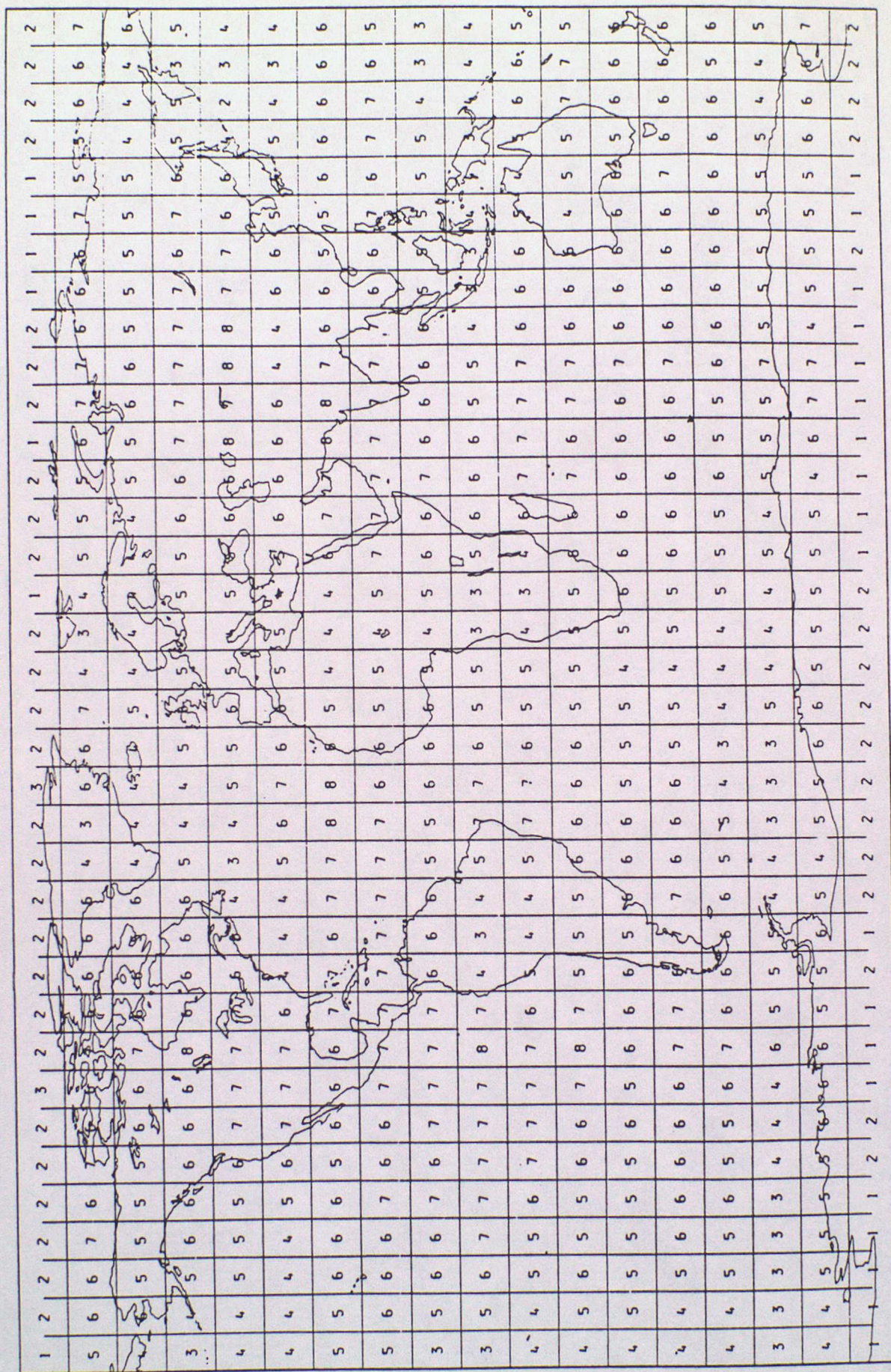
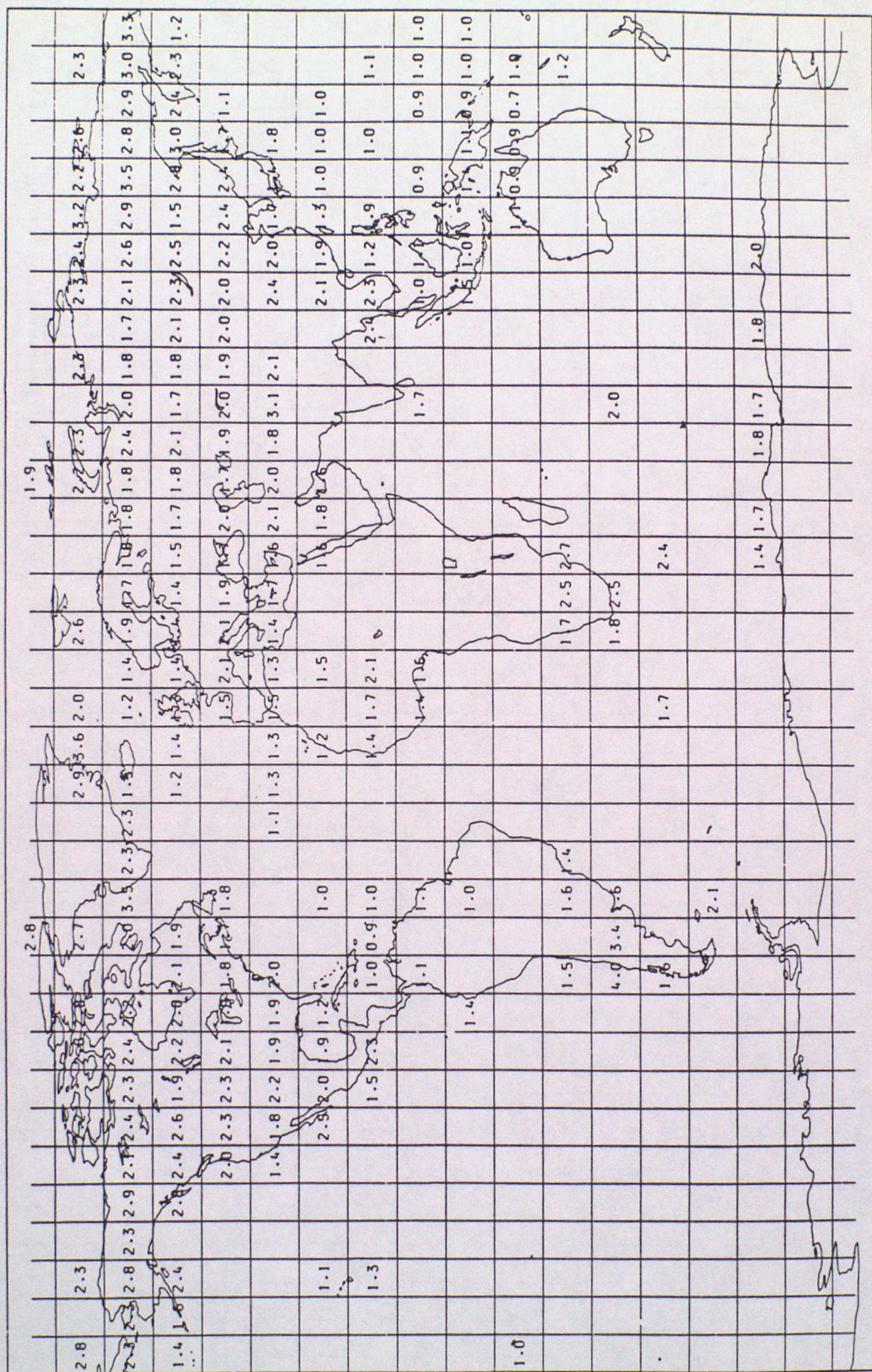


FIGURE 9



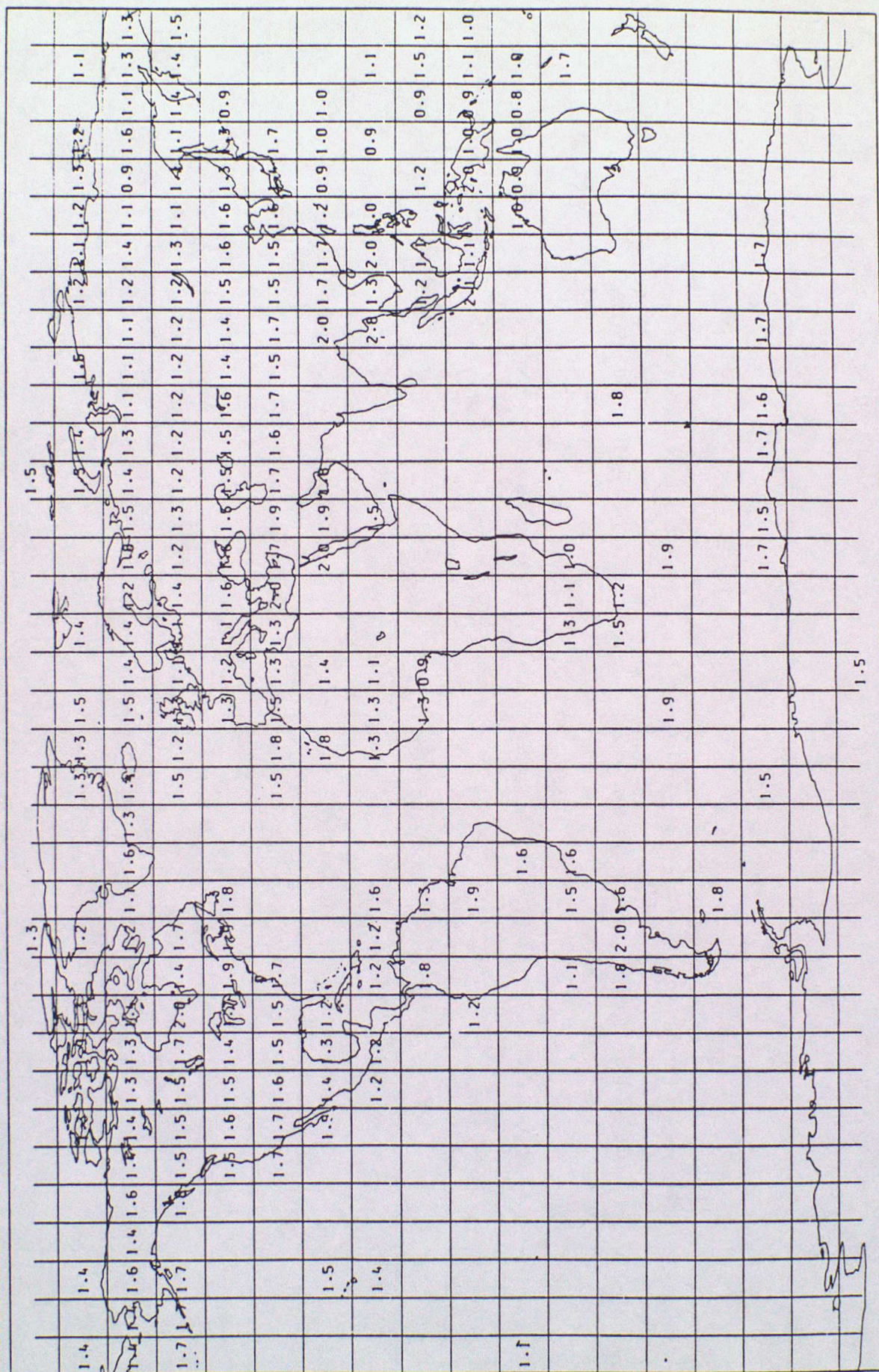
SONDES : RMS O-B TEMPERATURE DIFFERENCES (DEG C) 101 TO 300 HPA

DECEMBER 1992 - FEBRUARY 1993

QUALITY CONTROL APPLIED

VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 11



SONDES : 0-B TEMPERATURE DIFFERENCES (DEG C) 11 TO 100 HPA
 DECEMBER 1992 - FEBRUARY 1993
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 12

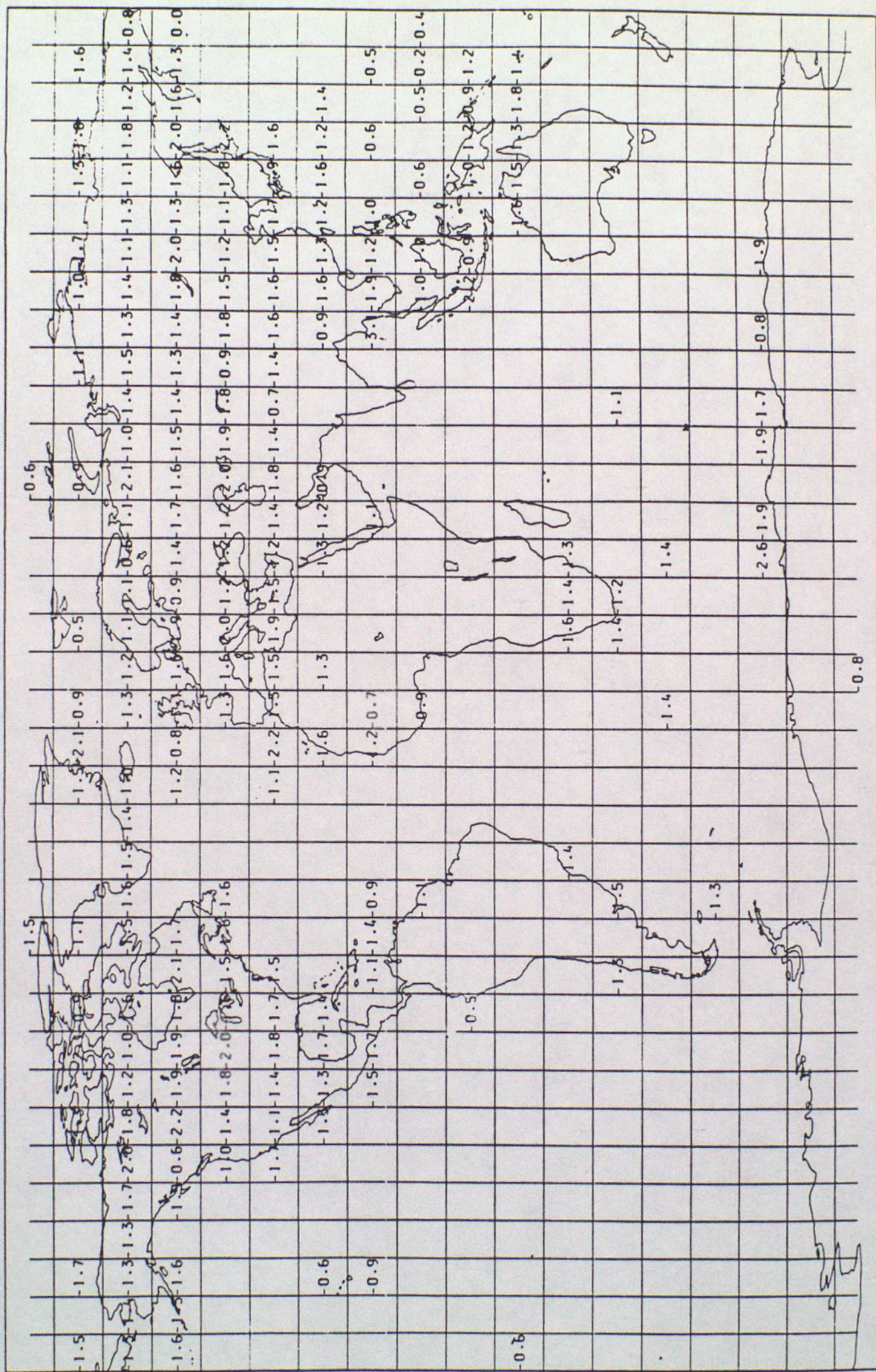
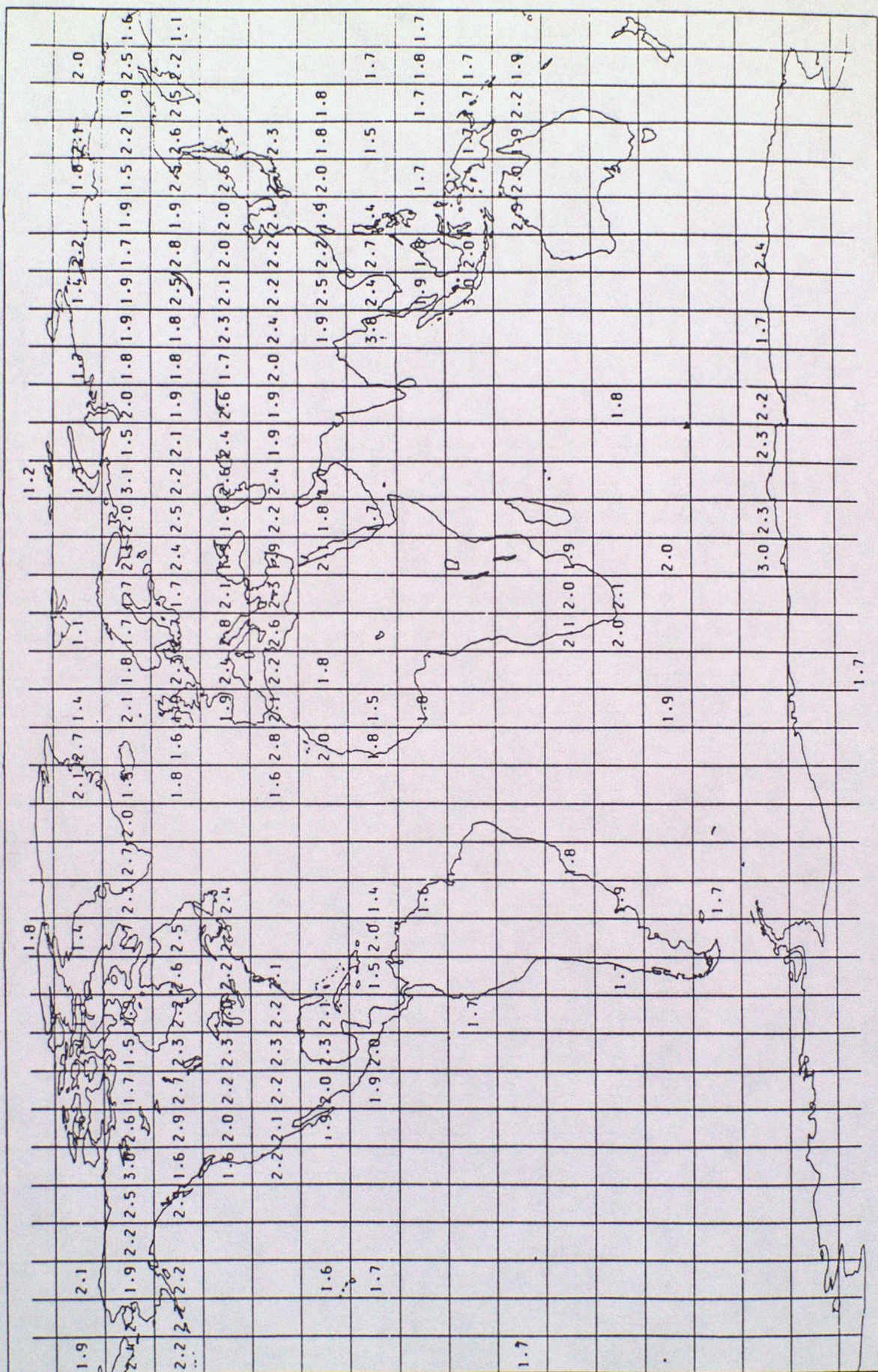


FIGURE 13



AIREPS & ASDARS : MEAN O-B TEMPERATURES BETWEEN 101 AND 300 HPA
 DECEMBER 1992 - FEBRUARY 1993. UNITS DEG C
 OBSERVATIONS WITH O-B > 10 DEG C EXCLUDED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 14

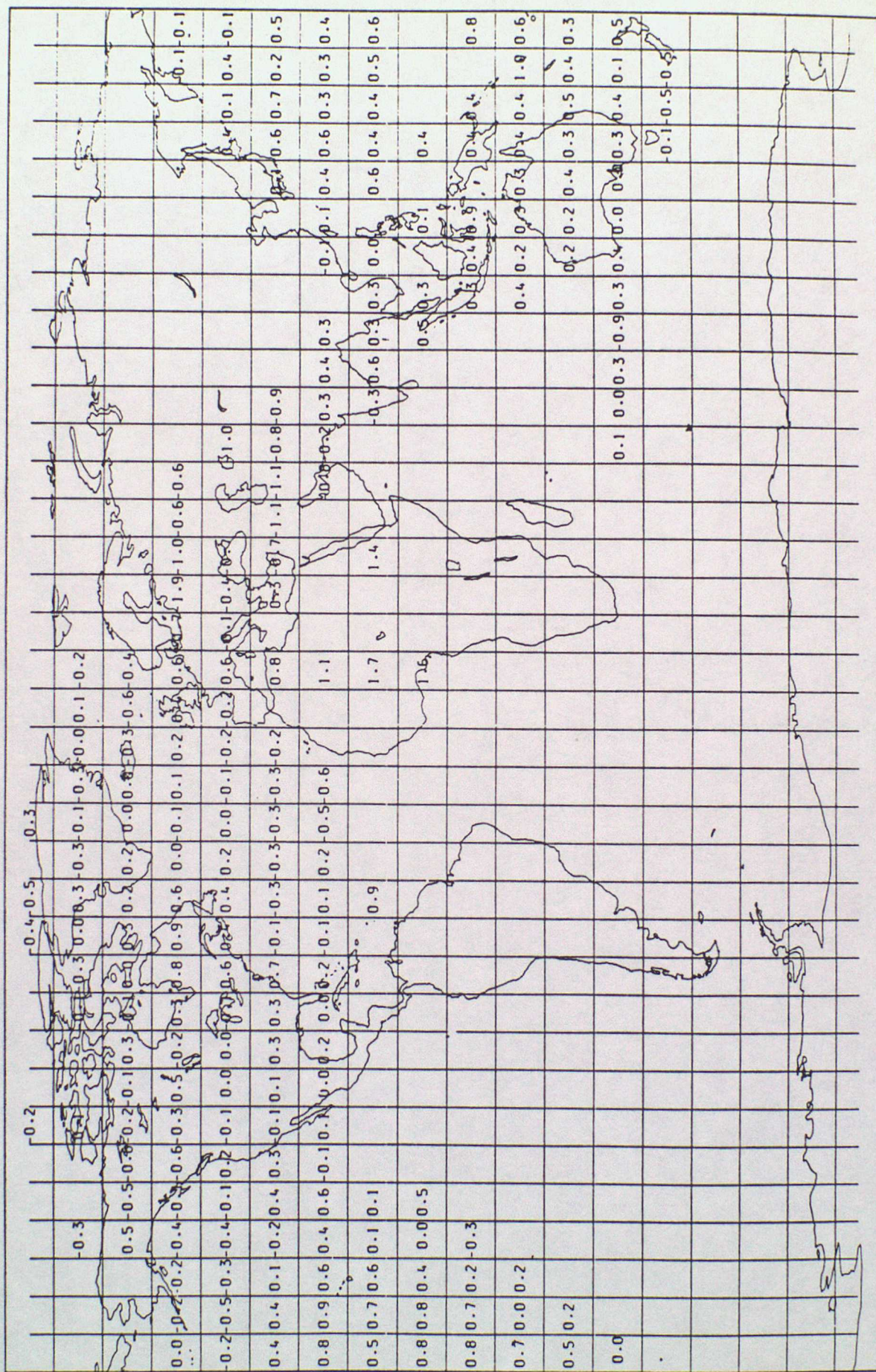
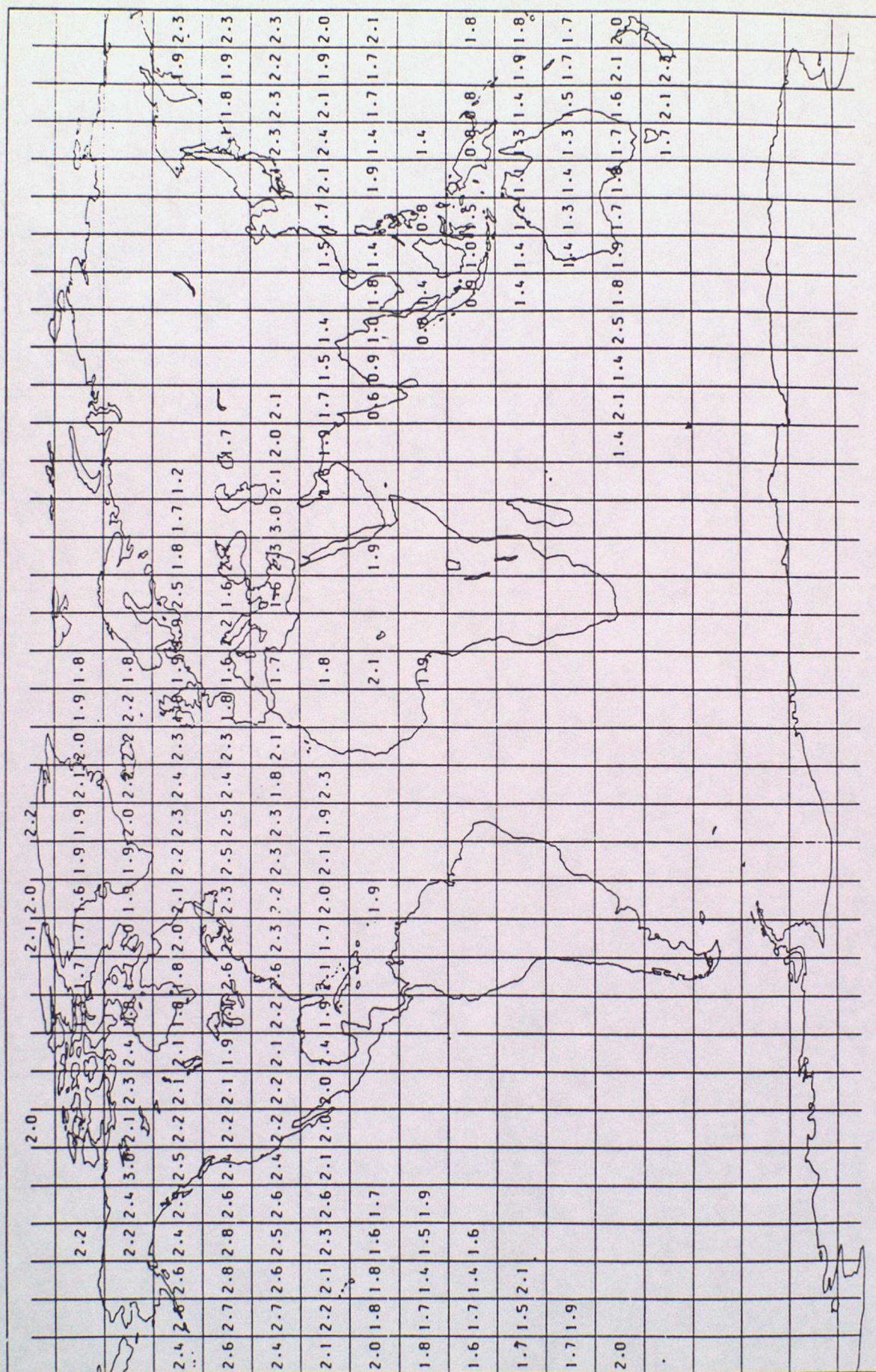


FIGURE 15



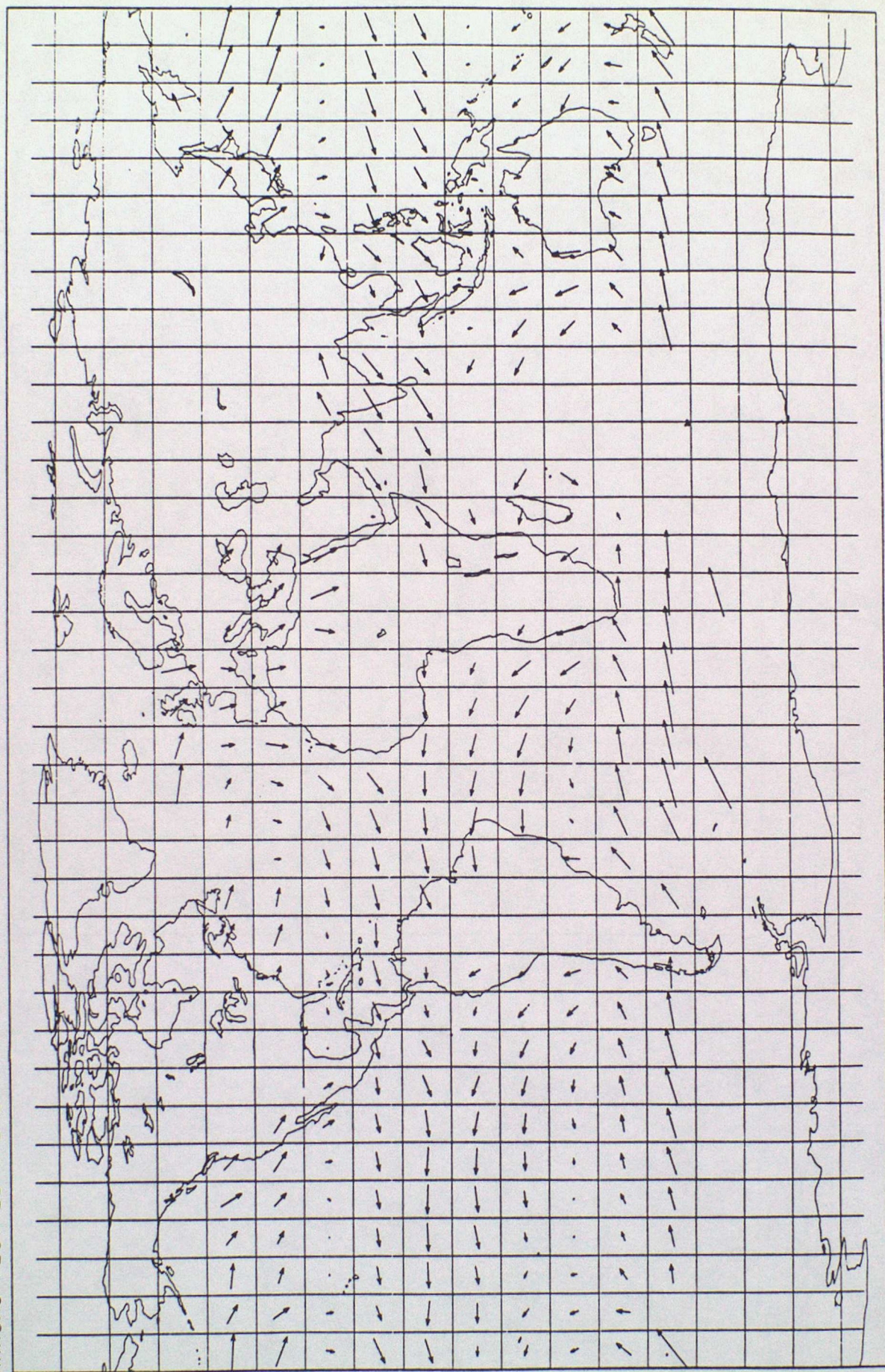
LASS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) 250 TO 150 HPA
 DECEMBER 1992 - FEBRUARY 1993
 OBSERVATIONS FROM NOAA-11 AND NOAA-12
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 17



SATOB VECTOR MEAN WINDS BETWEEN 701-1000 HPA
DECEMBER 1992 - FEBRUARY 1993
ALL OBSERVATIONS
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

FIGURE 19



→ REPRESENTS 10 M/S

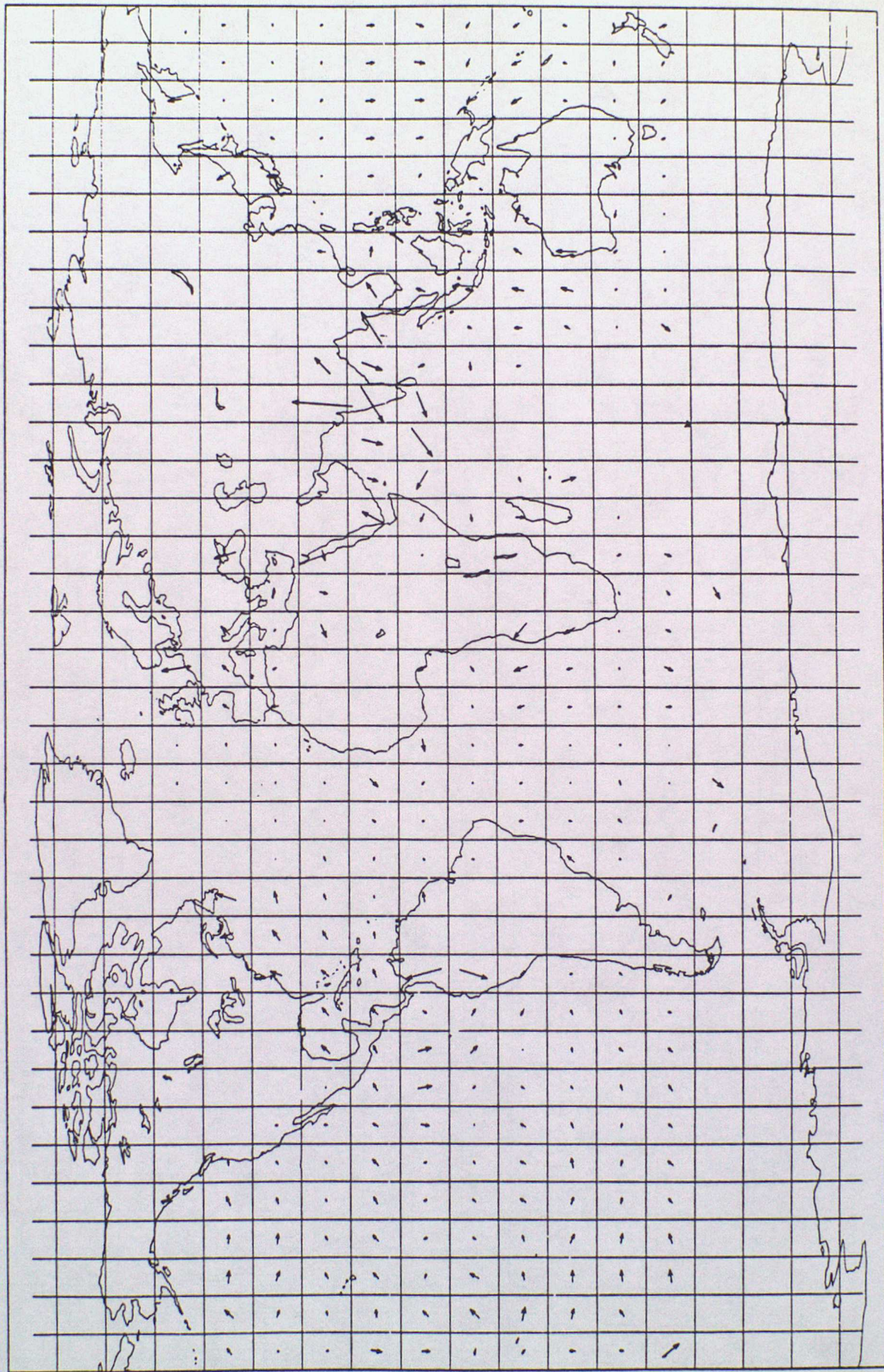
SATOB O-B VECTOR WIND DIFFERENCES BETWEEN 701-1000 HPA

DECEMBER 1992 - FEBRUARY 1993

ALL OBSERVATIONS

ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

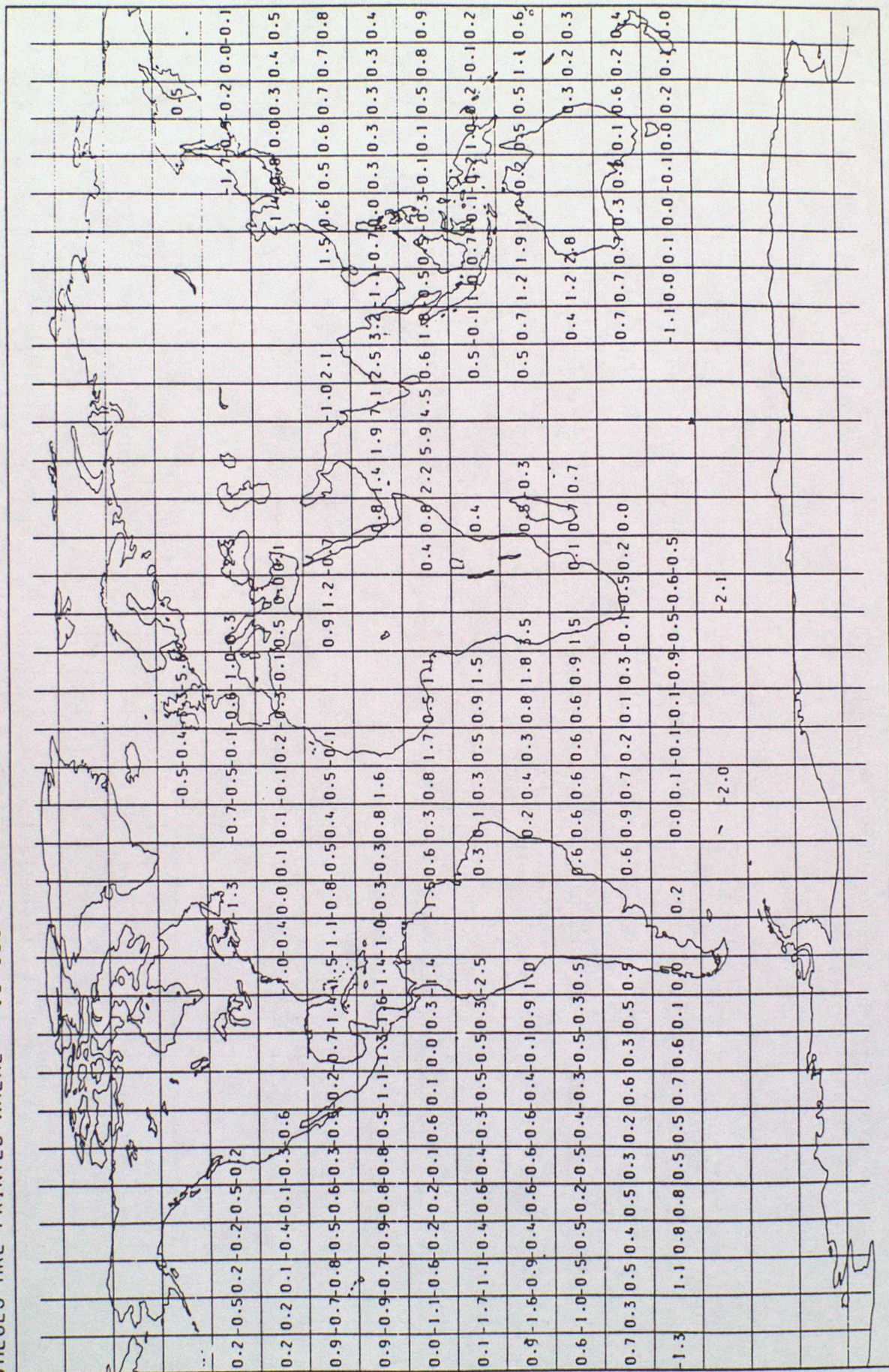
FIGURE 20



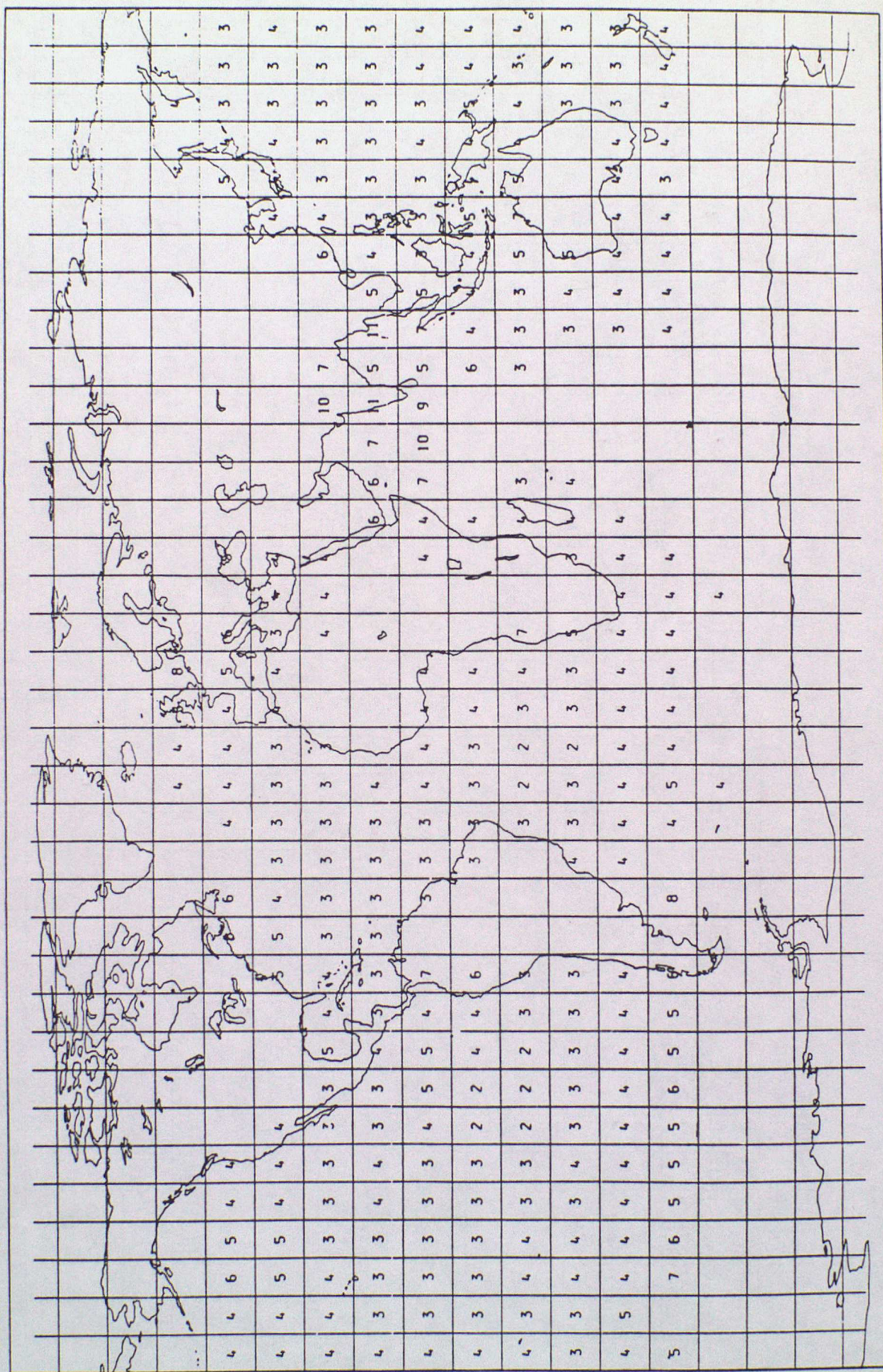
→ REPRESENTS 5 M/S

SATOB5 : MEAN O-B SPEED DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
 DECEMBER 1992 - FEBRUARY 1993
 USING ALL OBSERVATIONS
 VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT

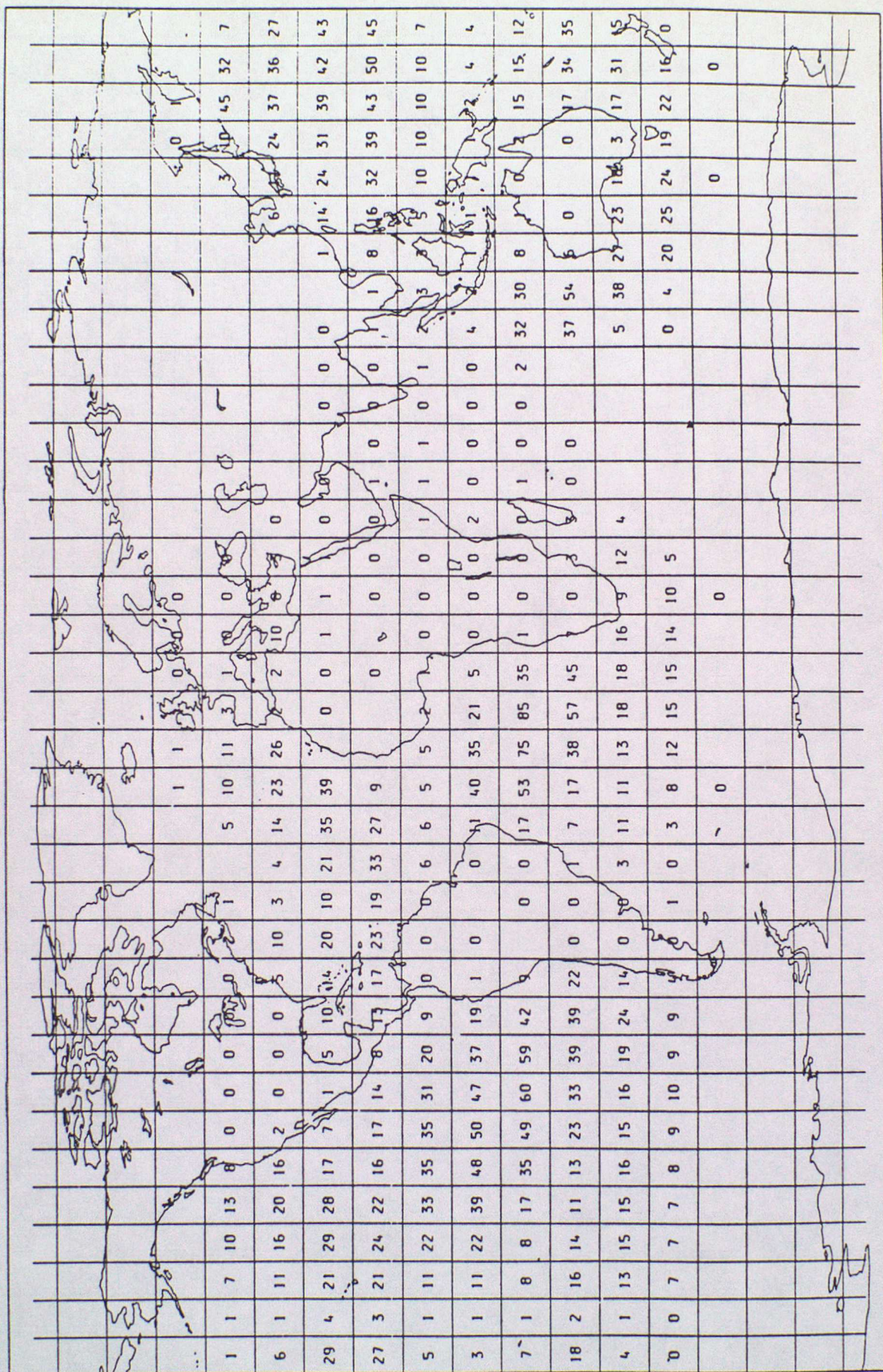
FIGURE 21



SATOB5 : RMS O-B VECTOR DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
DECEMBER 1992 - FEBRUARY 1993
USING ALL OBSERVATIONS
VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT

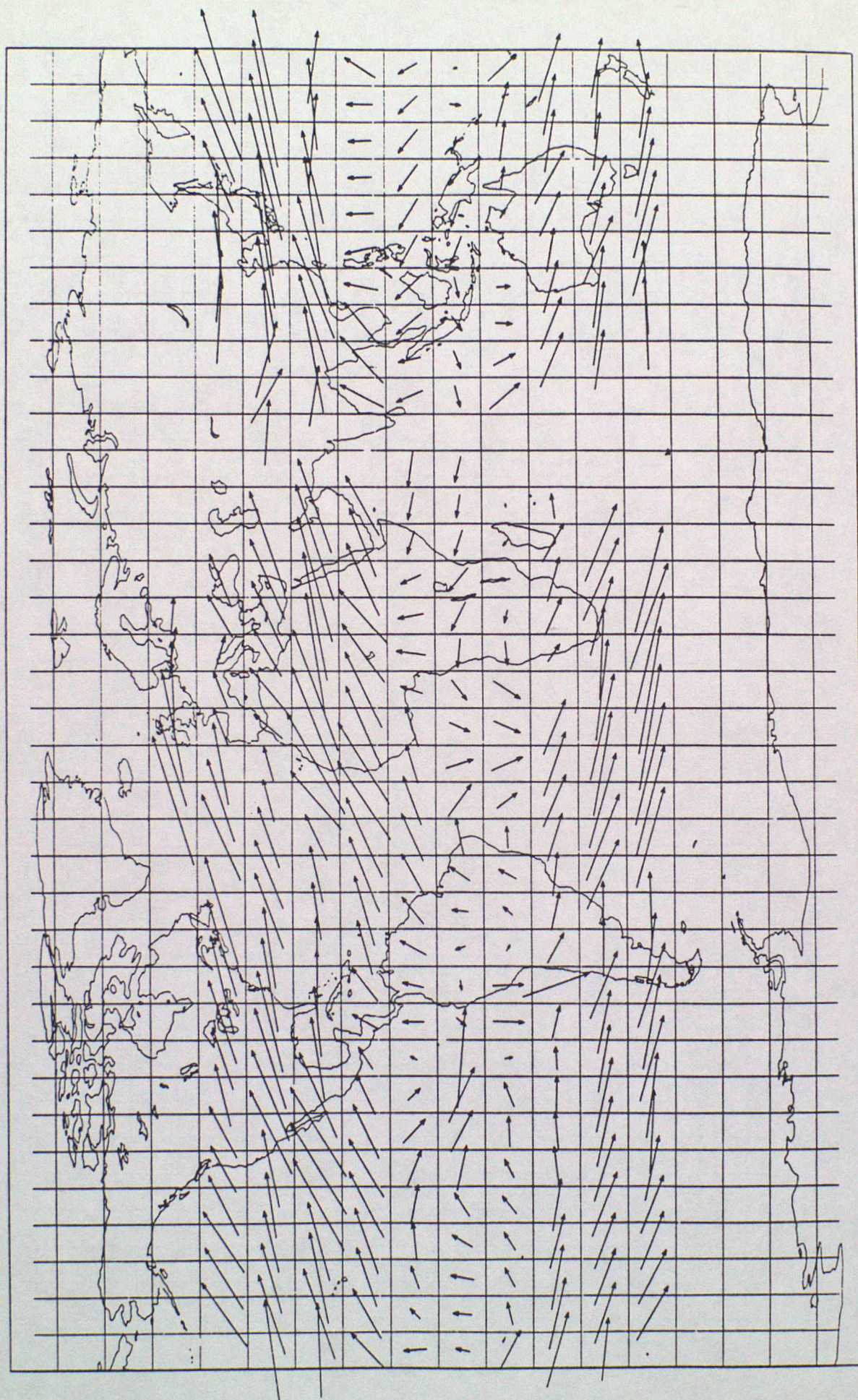


AVERAGE DAILY NUMBER OF SATOB OBSERVATIONS BETWEEN 701 AND 1000 HPA
DECEMBER 1992 - FEBRUARY 1993



SATOB VECTOR MEAN WINDS BETWEEN 101-400 HPA
DECEMBER 1992 - FEBRUARY 1993
ALL OBSERVATIONS
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

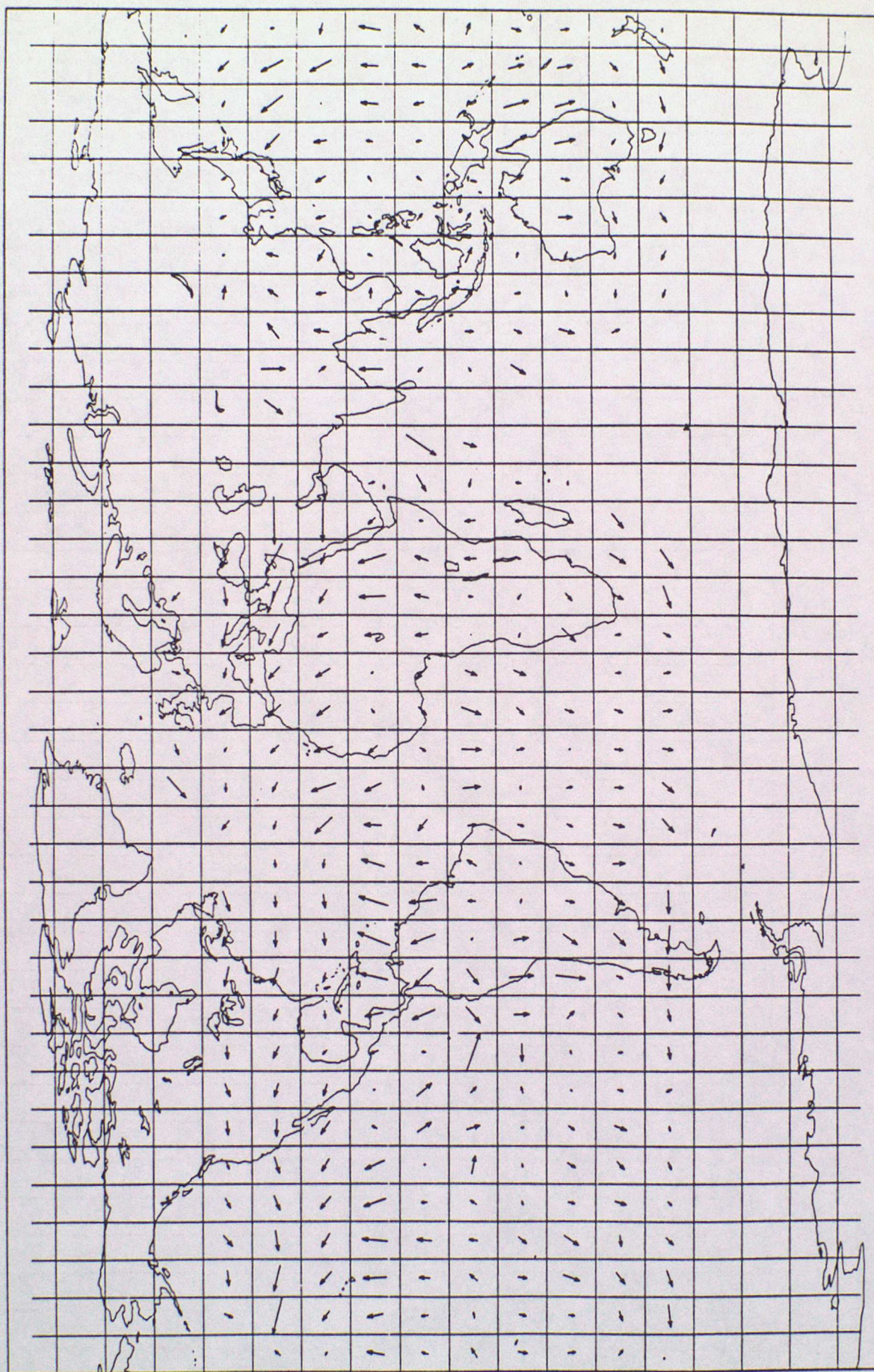
FIGURE 24



→ REPRESENTS 10 M/S

SATOB 0-B VECTOR WIND DIFFERENCES BETWEEN 101-400 HPA
DECEMBER 1992 - FEBRUARY 1993
ALL OBSERVATIONS
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

FIGURE 25



→ REPRESENTS 5 M/S

SATOB5 : MEAN O-B SPEED DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 DECEMBER 1992 - FEBRUARY 1993
 USING ALL OBSERVATIONS
 VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT

FIGURE 26

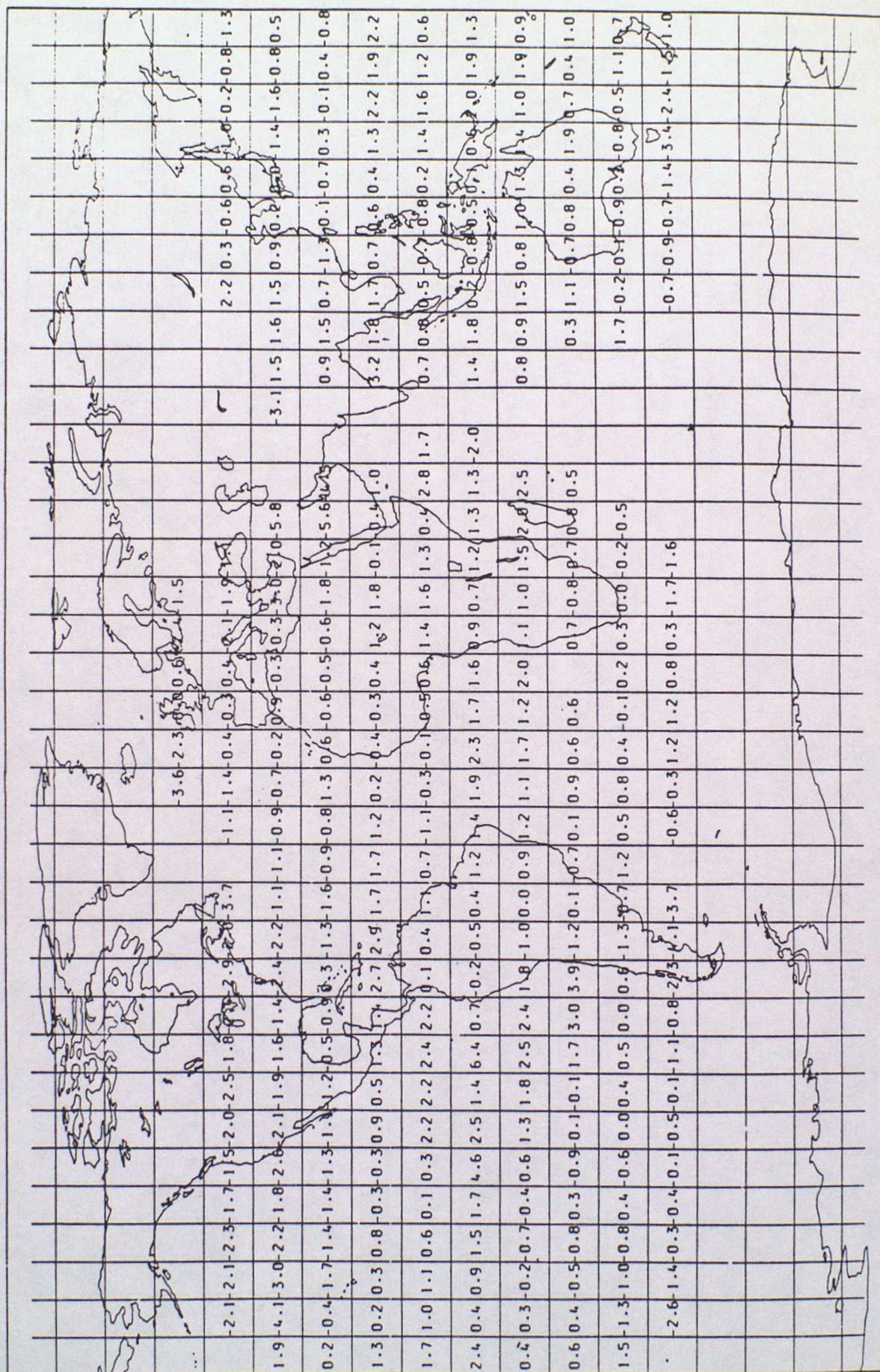
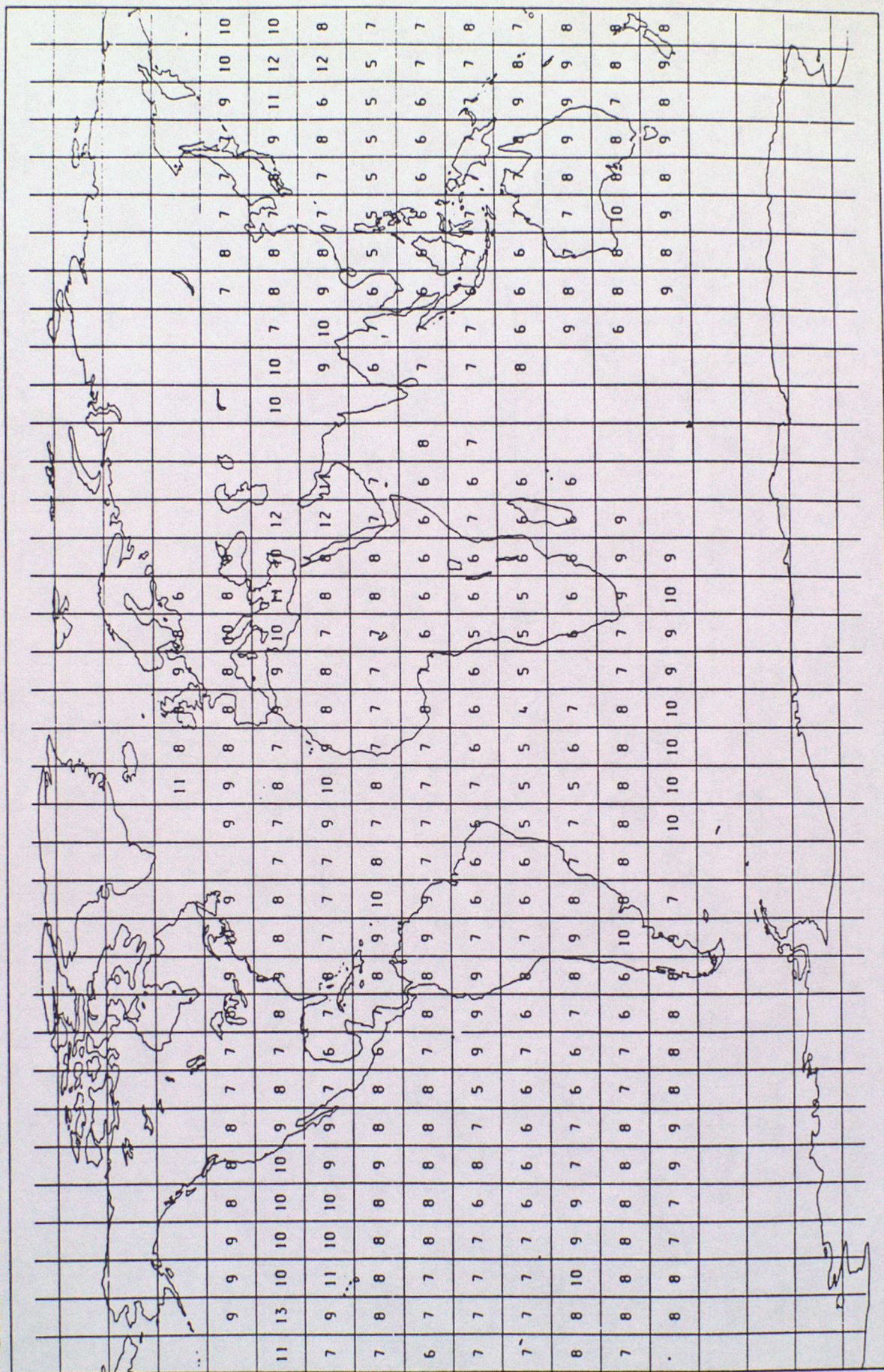


FIGURE 27



AVERAGE DAILY NUMBER OF SATOB OBSERVATIONS BETWEEN 101 AND 400 HPA
DECEMBER 1992 - FEBRUARY 1993

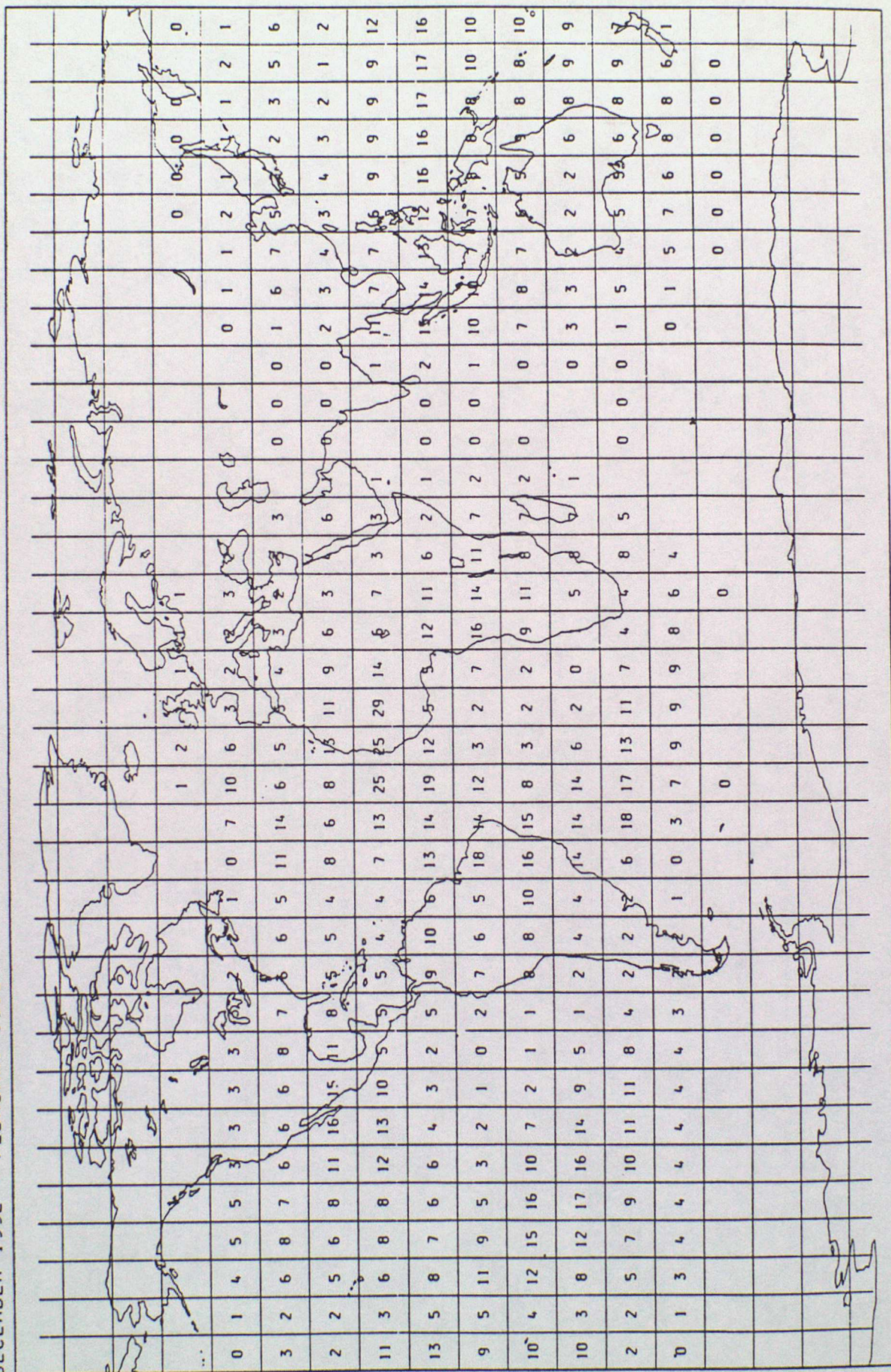
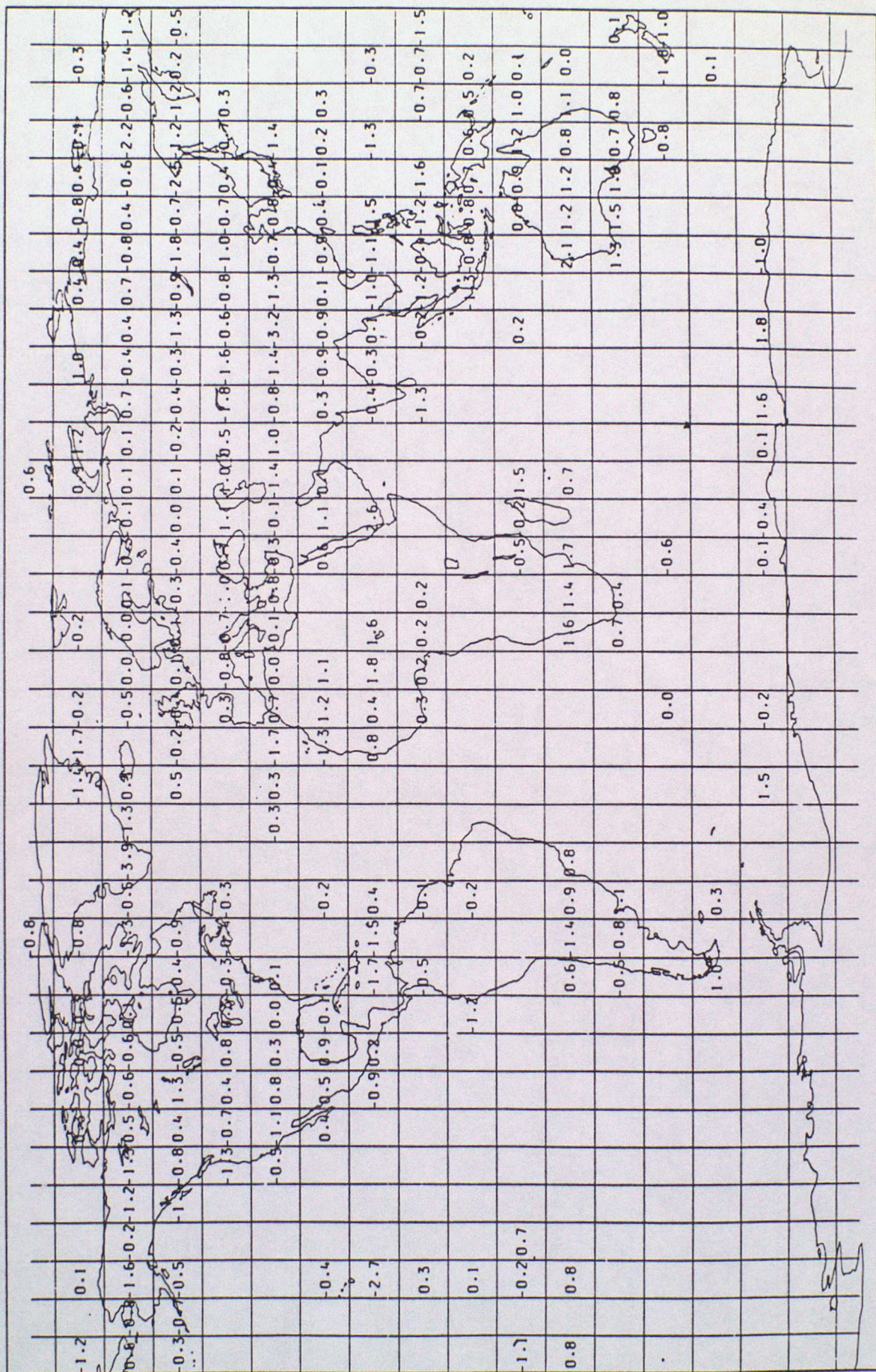
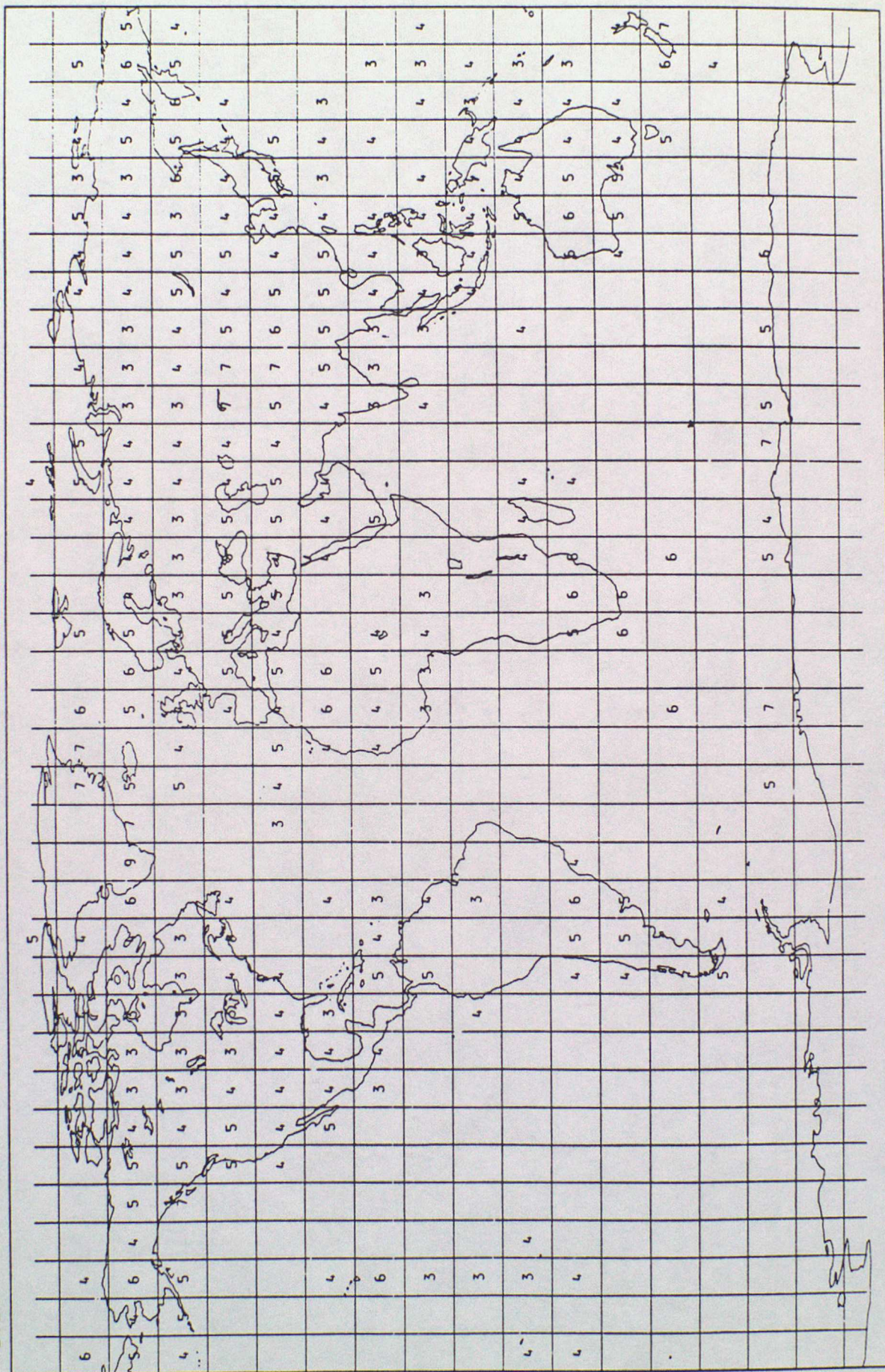


FIGURE 29



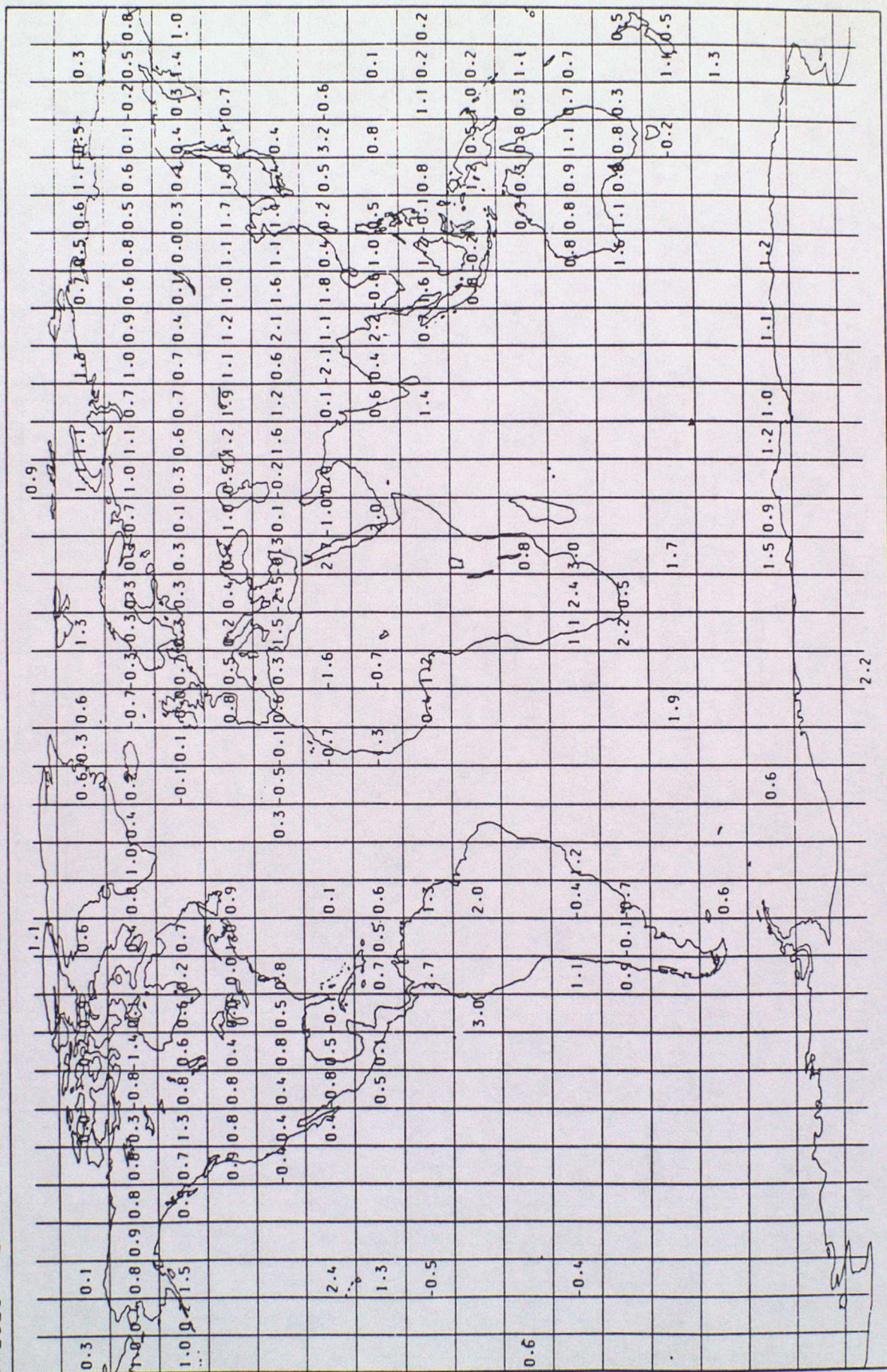
SONDES : RMS O-B VECTOR WIND DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
 DECEMBER 1992 - FEBRUARY 1993
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 30



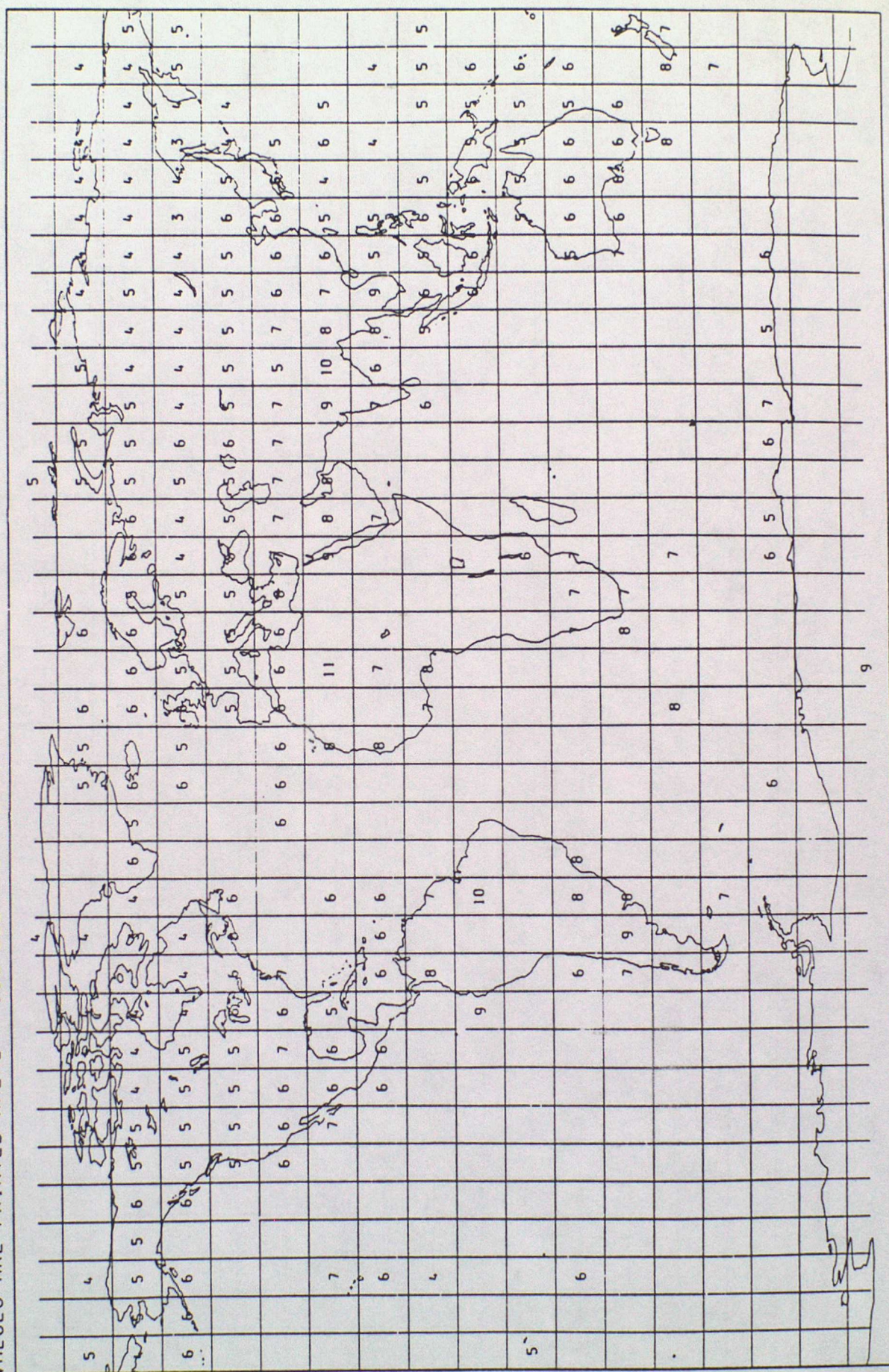
SONDES : 0-B SPEED DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 DECEMBER 1992 - FEBRUARY 1993
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 31



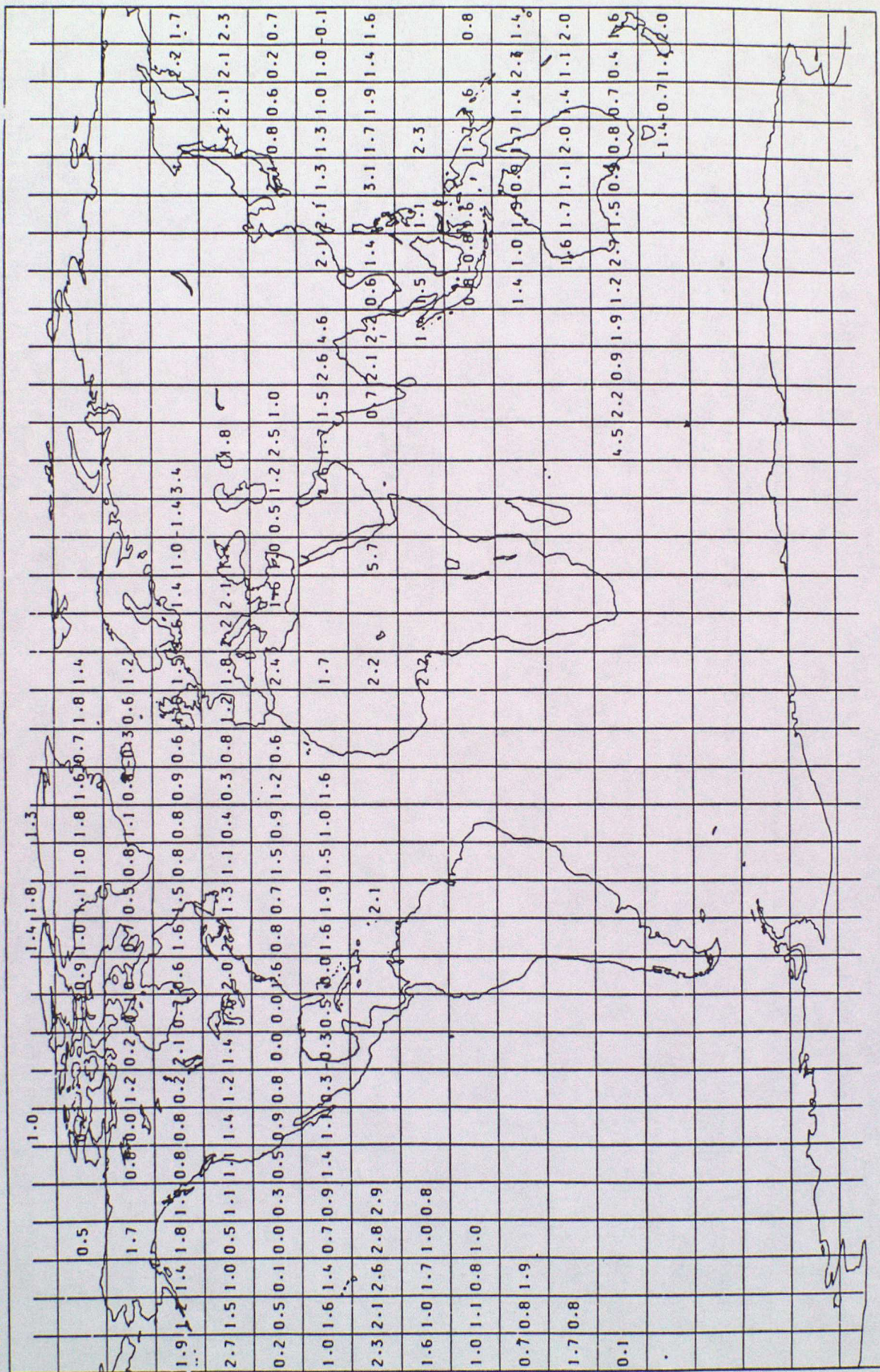
SONDES : RMS 0-B VECTOR WIND DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 DECEMBER 1992 - FEBRUARY 1993
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 32



AIREPS & ASDARS : MEAN 0-8 SPEEDS (M/S) BETWEEN 101 AND 400 HPA
 DECEMBER 1992 - FEBRUARY 1993
 OBSERVATIONS WITH RMSVW DIFFERENCE > 60 MPS EXCLUDED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 33



DECEMBER 1992 - FEBRUARY 1993
OBSERVATIONS WITH RMSVW DIFFERENCE > 60 MPS EXCLUDED

