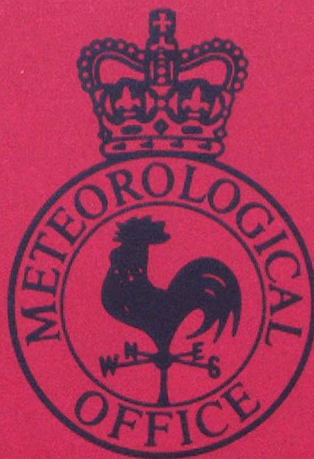


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CENTRAL FORECASTING MONITORING NOTE NO. 12
MONITORING STATISTICS FOR SATEM_s AND SATOB_s

September–November 1992

J.R. Leighton

Central Forecasting Division

March 1993

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METEOROLOGICAL OFFICE.

Central Forecasting Monitoring Note No.12

Monitoring statistics for SATEMs and SATOBs,
September-November 1992. By LEIGHTON, J.R.

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1 Introduction

This monitoring note, the fifth in a series, continues monitoring results from SATEMs and SATOBS for the quarterly period September-November 1992.

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 monitoring note "Monitoring Statistics For SATEMs and SATOBS (June-August 1992)" referred to as P1.

2 Temperatures

During the last week of September SATEMs above 100 hPa were often flagged, especially south of 60S, due to a cold bias in the model background fields.

A truncation bug in the LASS temperatures was corrected in mid-October. Previous to this levels above 850 hPa would have been slightly too warm. From 15th October LASS data were permanently rejected from model input due to a cold background field at high levels feeding back into the data assimilation.

Due to a change in model version (to v2.7) on October 27th some of the chart periods have been split in two - September-October and November. The distinction between the two periods is that the background model temperatures above 300 hPa were colder than the observations during the first period and warmer during the second period. Where the charts have been split the first period will be labelled (a) and the second (b).

LASS data were missing from the database between mid-October and mid-November.

2.1 SATEMs (figs 1 - 7)

Compared with P1 between 850-1000 hPa (fig 1) many biases are more positive especially in the southern hemisphere. There are large positive biases over the North West Atlantic, tropical South Atlantic and south Indian Ocean. Biases in the Pacific have reduced from P1 values.

The RMS temperature differences (fig 2) are similar to those in P1 with lower extremes apart from the areas mentioned above, where the RMS values are correspondingly higher.

The Mean Temperature differences between 100 and 300 hPa (fig 3) show a generally weak positive bias and closer to neutral than P1.

At the 30-50 hPa band, temperature differences (fig 5) show a marked increase compared to P1 showing the models' cold bias. The corresponding RMS values also show a marked increase.

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.

The O-B temperature differences compare in pattern and value with that of P1 over most areas but with larger positive values over Eastern Europe and Asia at the lowest level (fig 8).

At mid-levels (fig 10) there are weaker biases over the globe compared with P1, generally between ± 0.3 deg C.

The upper level (fig 12a) for the period September-October shows the pattern and values similar to P1 but for the second period (fig 12b) the warm bias in the background temperature field is evident over the entire globe.

Compared with upper level SATEMs (fig 5) the bias is in the opposite sense in November due to the SATEM background temperature being derived from the thickness field, not the temperature field.

2.3 AIREPS (figs 14 - 15)

There are positive differences of O-B temperatures over most of the globe with very few negative biases.

2.4 LASS (figs 16 - 18)

LASS data shows little change from P1 but for the upper level at 50-30 hPa for November (fig 18b) the warm background has significantly biased the values over the whole area.

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, but no data were received from 10th October.

3.1 SATOBS (figs 19 - 28)

Wind speed differences in the 701-1000 hPa band (fig 22) are generally smaller over the whole globe compared to P1 with the exception of the Gulf of Guinea, where they are higher ($>2 \text{ m s}^{-1}$) and further south along the west coast of Africa where differences exceed $+3 \text{ m s}^{-1}$. This is consistent with other monitoring centres, probably indicating an observing problem and leading to high RMS vector differences. The SONDE data in this area does not support these observation - background differences (fig 29).

101-400 hPa speed differences over the tropical eastern Pacific have increased since P1 with a maximum of 5.8 m s^{-1} which leads to increased RMS vector differences in this area. However, the large

values are now concentrated in the band 10-20 S where the average number of observations is very small (fig 28).

3.2 TEMPs/PILOTs (figs 29 - 32)

The positive speed differences at 701-1000 hPa over central W.Africa are still evident with corresponding high RMS vector differences.

Large, positive speed differences south of 30 S between 101-400 hPa are again in evidence (fig 31) with corresponding high RMS vector wind differences (fig 32).

S.America, S.Africa and Australasia generally showing high positive speed differences with corresponding RMS vector wind differences indicating the models tendency to underestimate winds at these levels.

3.3 AIREPS (figs 33 - 35)

As in P1 mean speed differences are positive over almost the entire globe.

4. Summary

Although LASS data have been excluded during the period of this report monitoring will continue in future reports.

Problems with biases and inconsistencies in the model's background temperature fields has made assessment very difficult this quarter.

The impact of the exclusion of LASS data into the assimilation has been impossible to assess in this quarterly review due to the change being made mid-point through the period and a change in model version at approximately the same time.

SATOBs tend to overestimate the low-level convergence off the W.African coast there being inconsistencies between SATOB and SONDE data. Other monitoring centres have detected similar results. Monthly figures (not shown here) show these differences to decrease during the period of this report.

500 KM SATEMS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) : 850 TO 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 NOAA-11 AND NOAA-12 STATISTICS COMBINED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

Figure 1

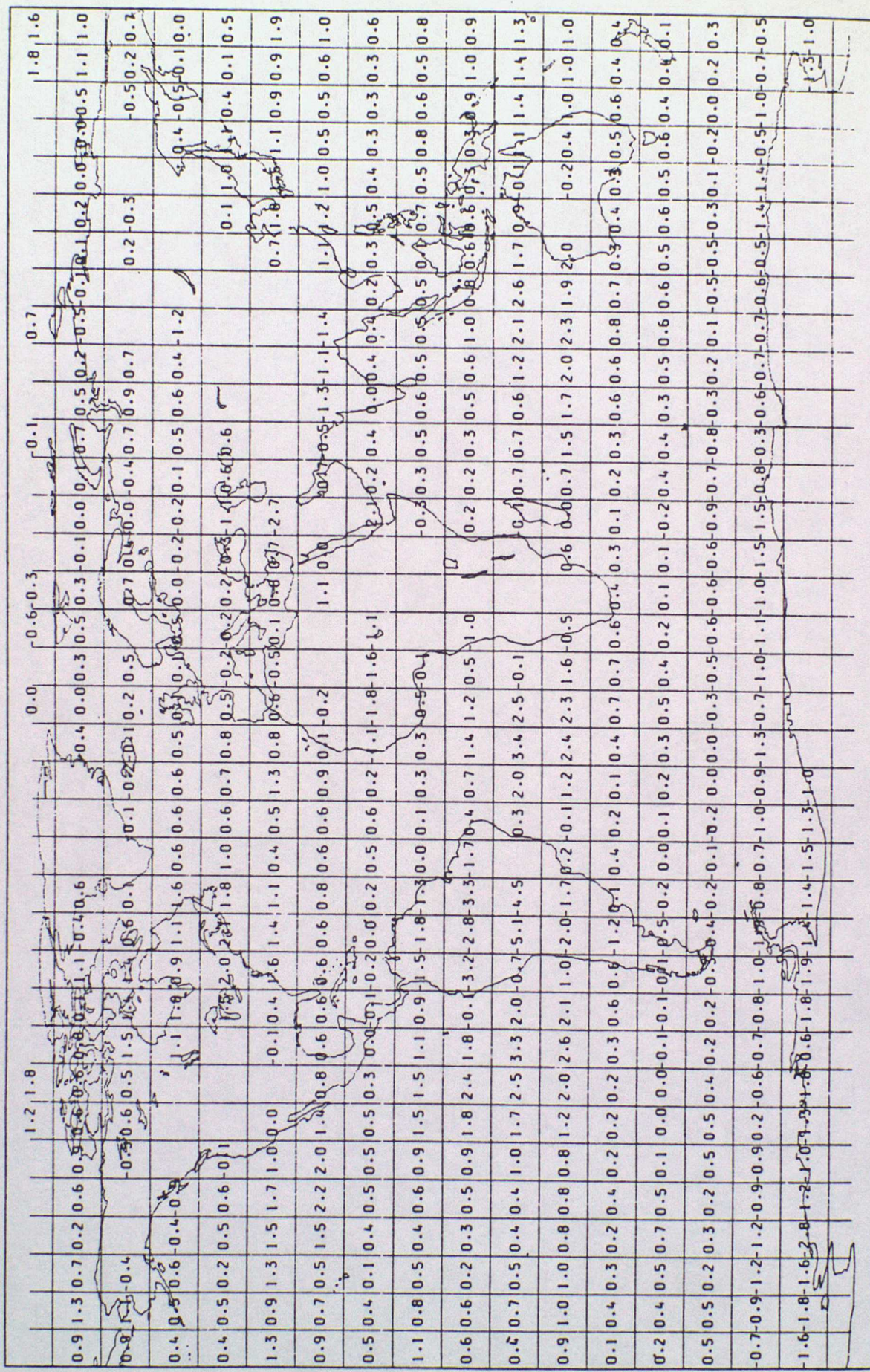
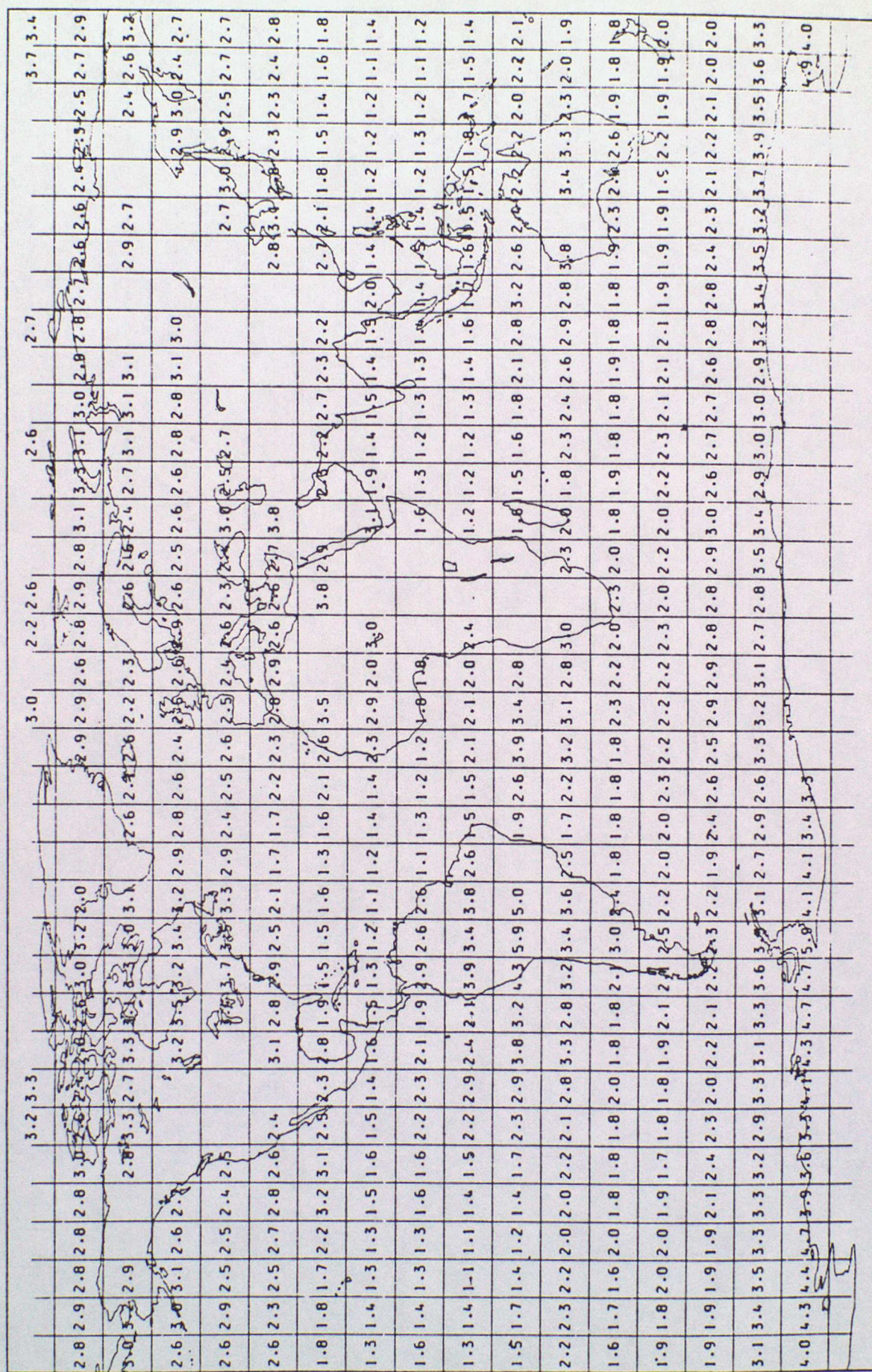
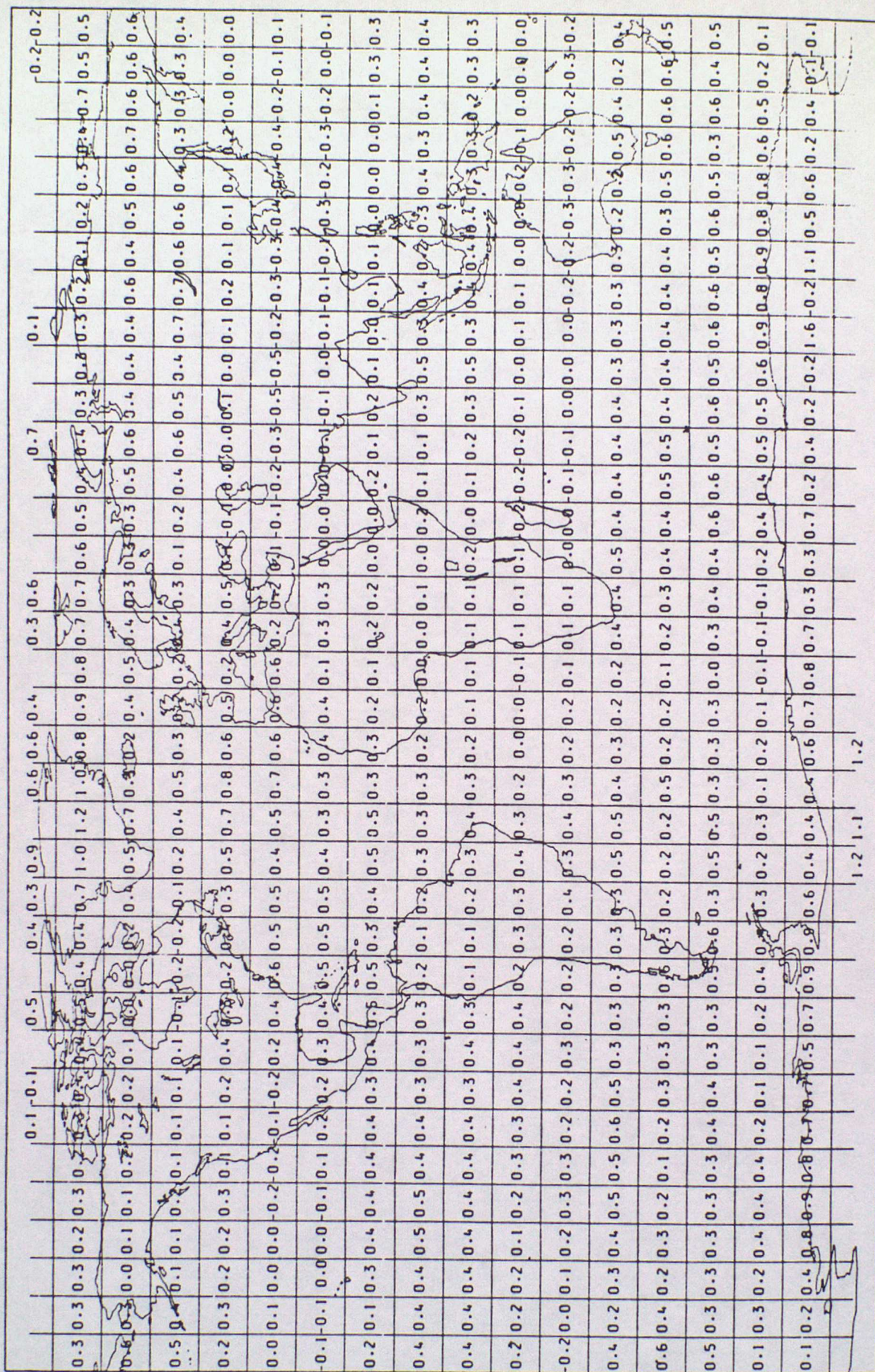
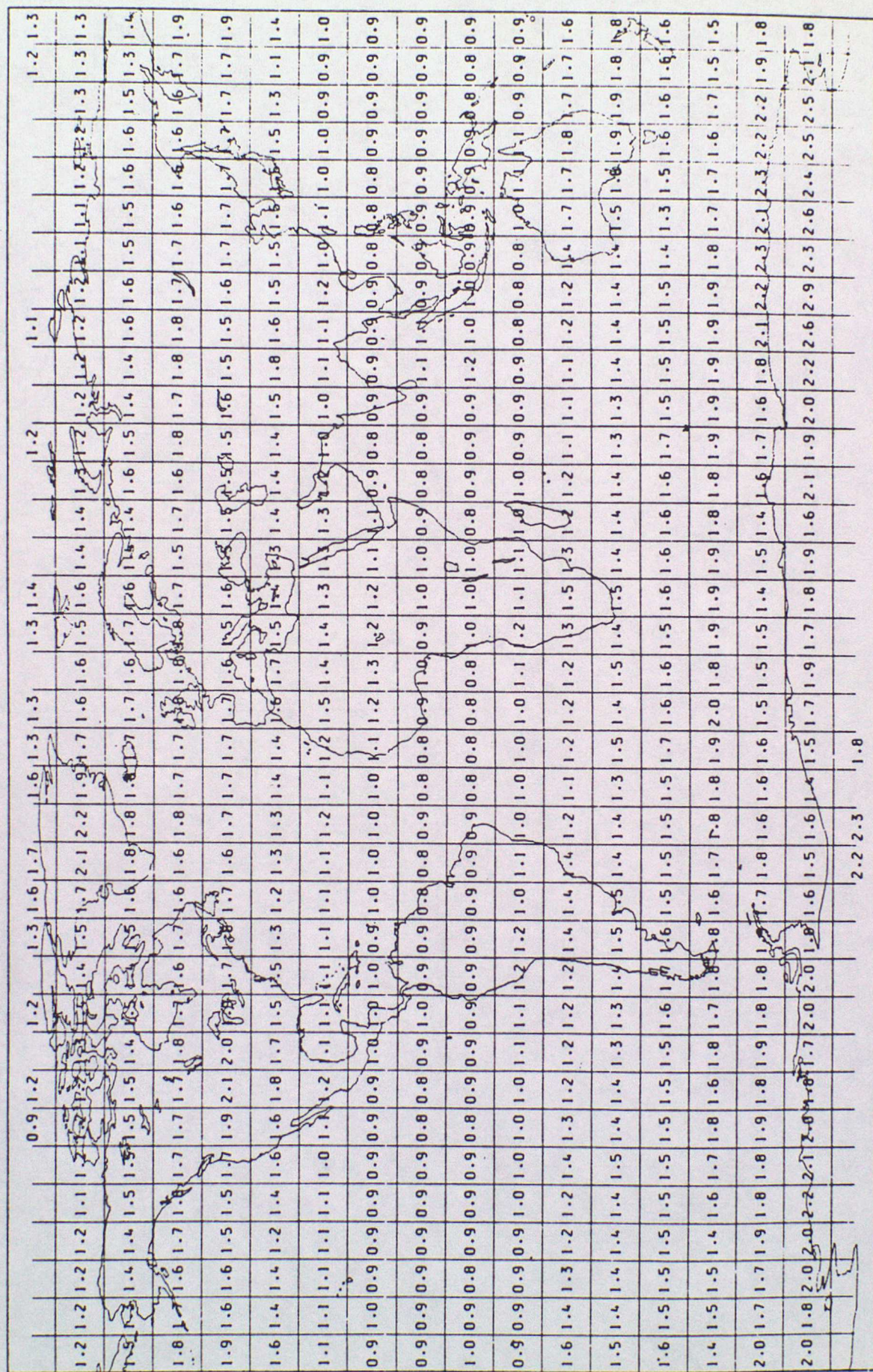


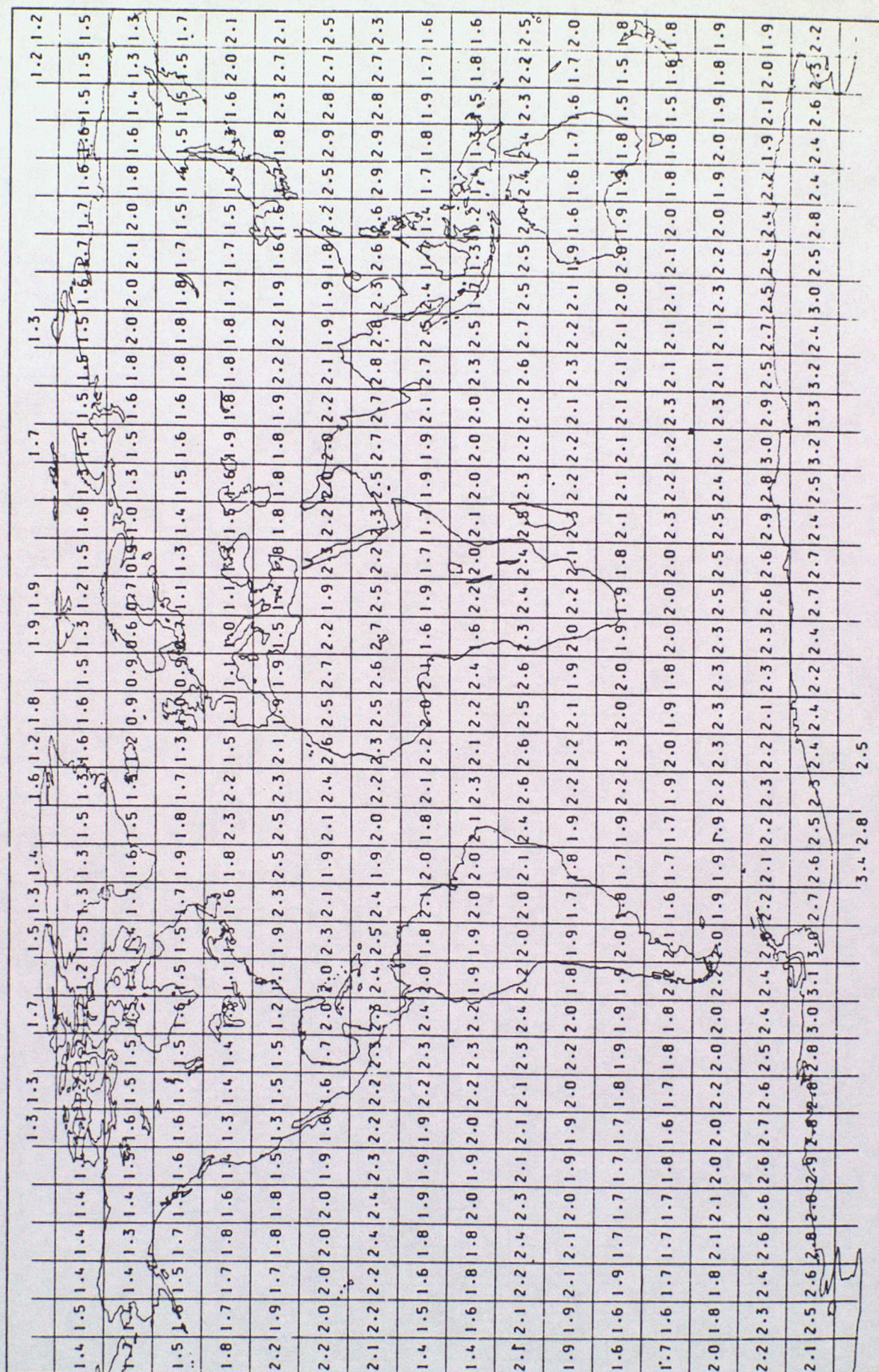
Figure 2

500 KM SATEMS : RMS O-B TEMPERATURE DIFFERENCES (DEG C) : 850 TO 1000 HPA
SEPTEMBER-NOVEMBER 1992
NOAA-11 AND NOAA-12 STATISTICS COMBINED
VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

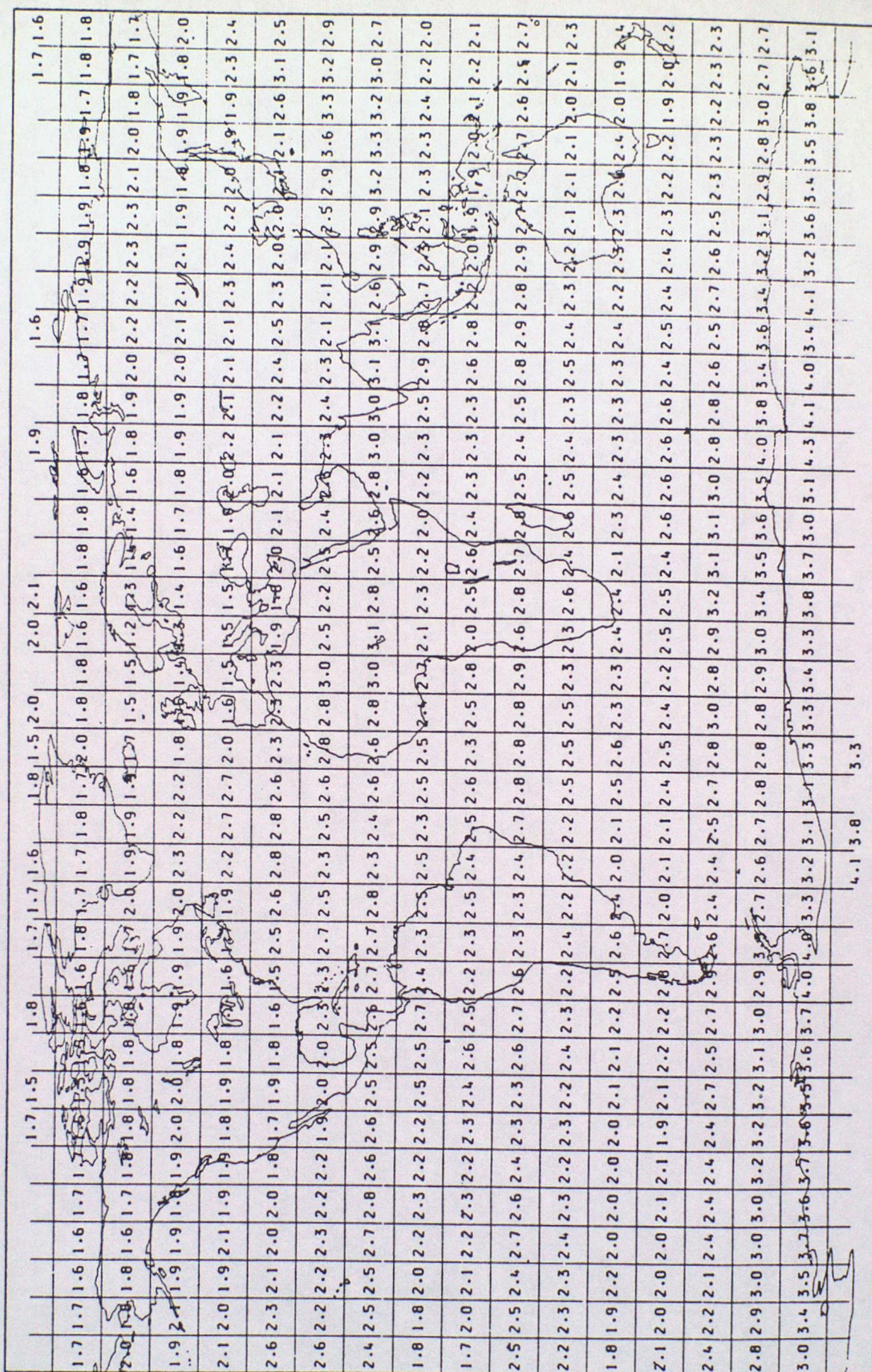






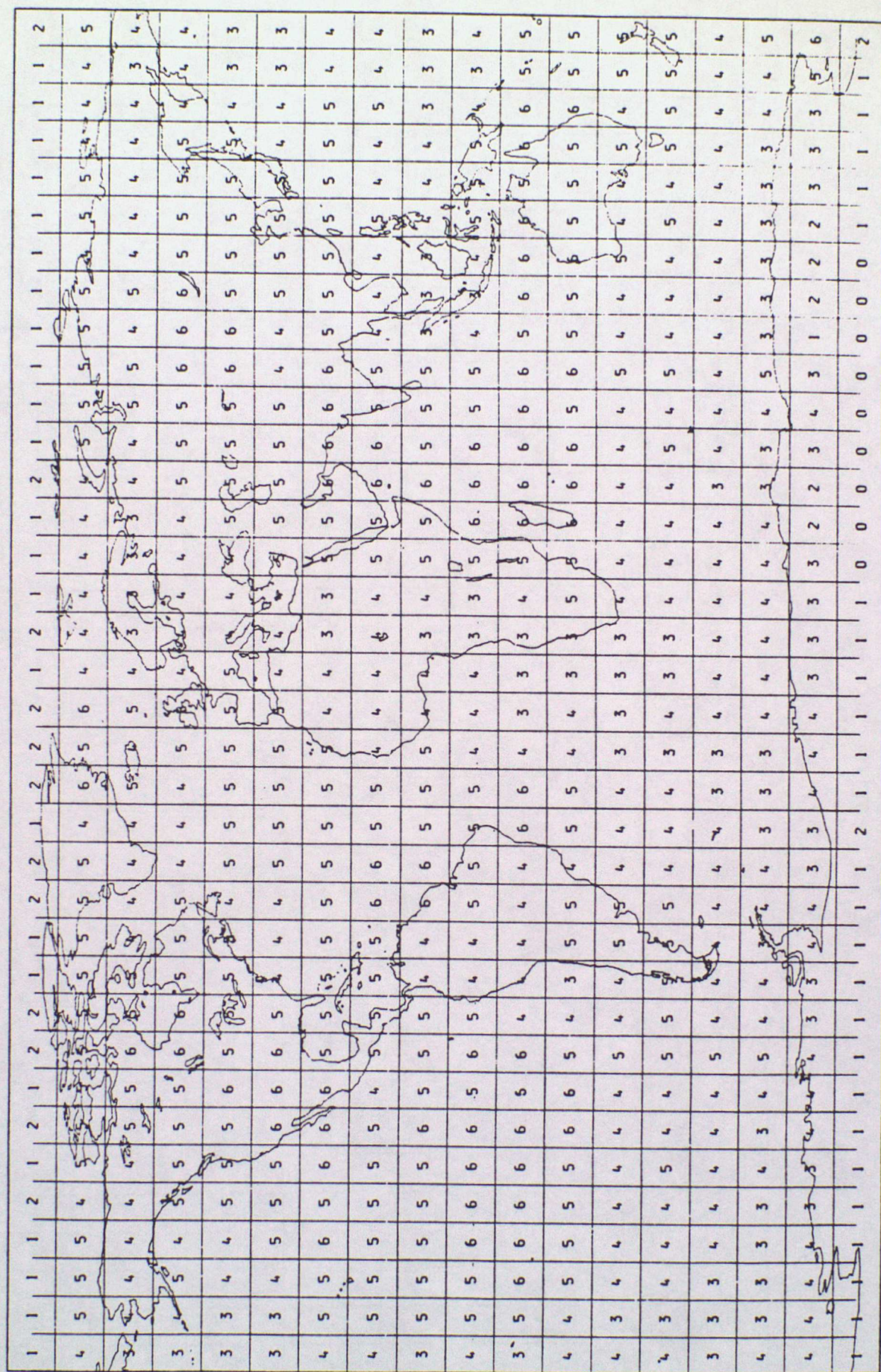


500 KM SATEMS : RMS O-B TEMPERATURE DIFFERENCES (DEG C) : 30 TO 50 HPA
 SEPTEMBER-NOVEMBER 1992
 NOAA-11 AND NOAA-12 STATISTICS COMBINED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT



AVERAGE DAILY NUMBER OF 500 KM SATEMS
SEPTEMBER-NOVEMBER 1992
NOAA-11 AND NOAA-12 STATISTICS COMBINED

Figure 7



SONDES : 0-8 TEMPERATURE DIFFERENCES (DEG C) 801 TO 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 8

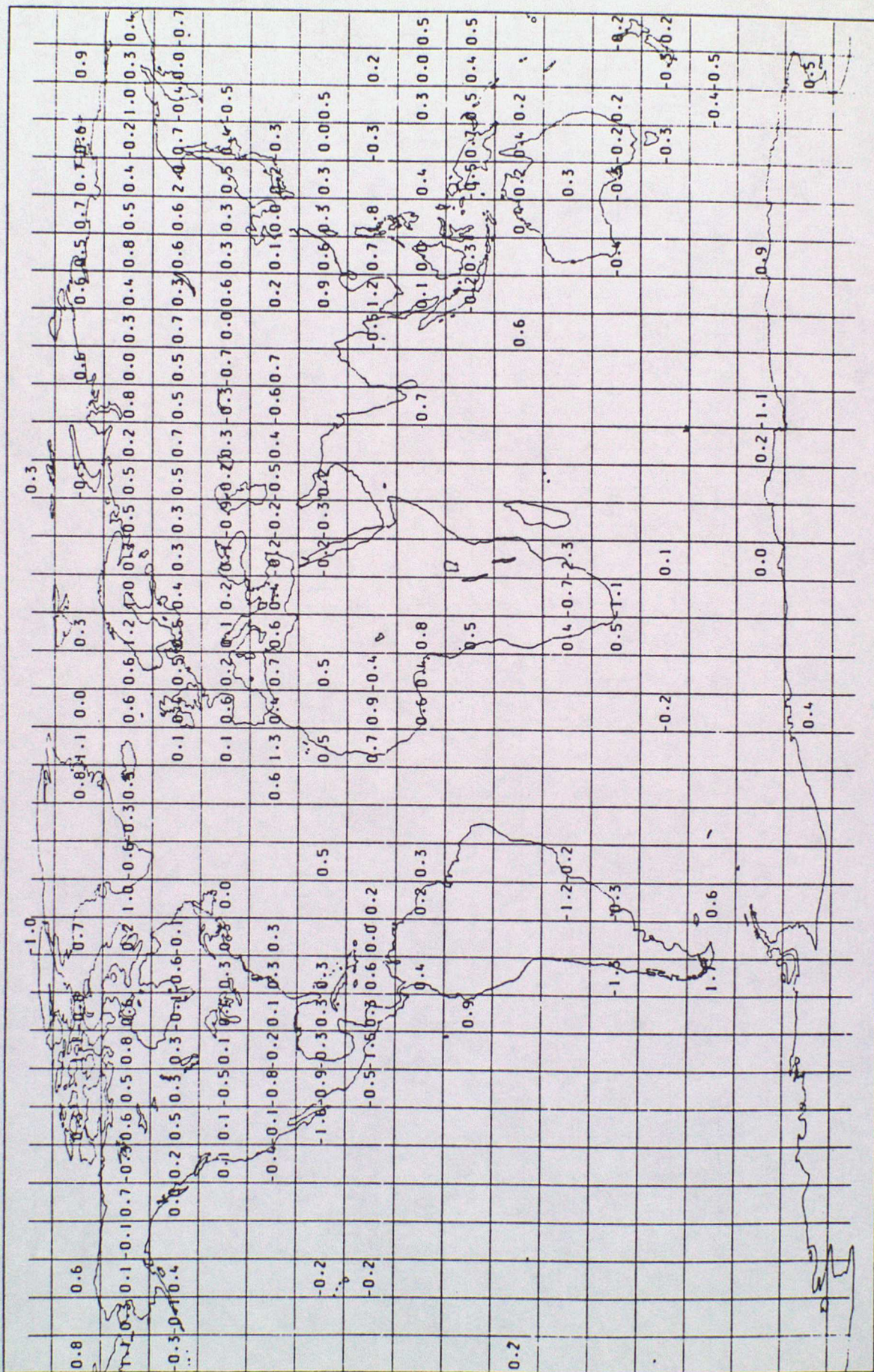


Figure 9

SONDES : RMS O-B TEMPERATURE DIFFERENCES (DEG C) 801 TO 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

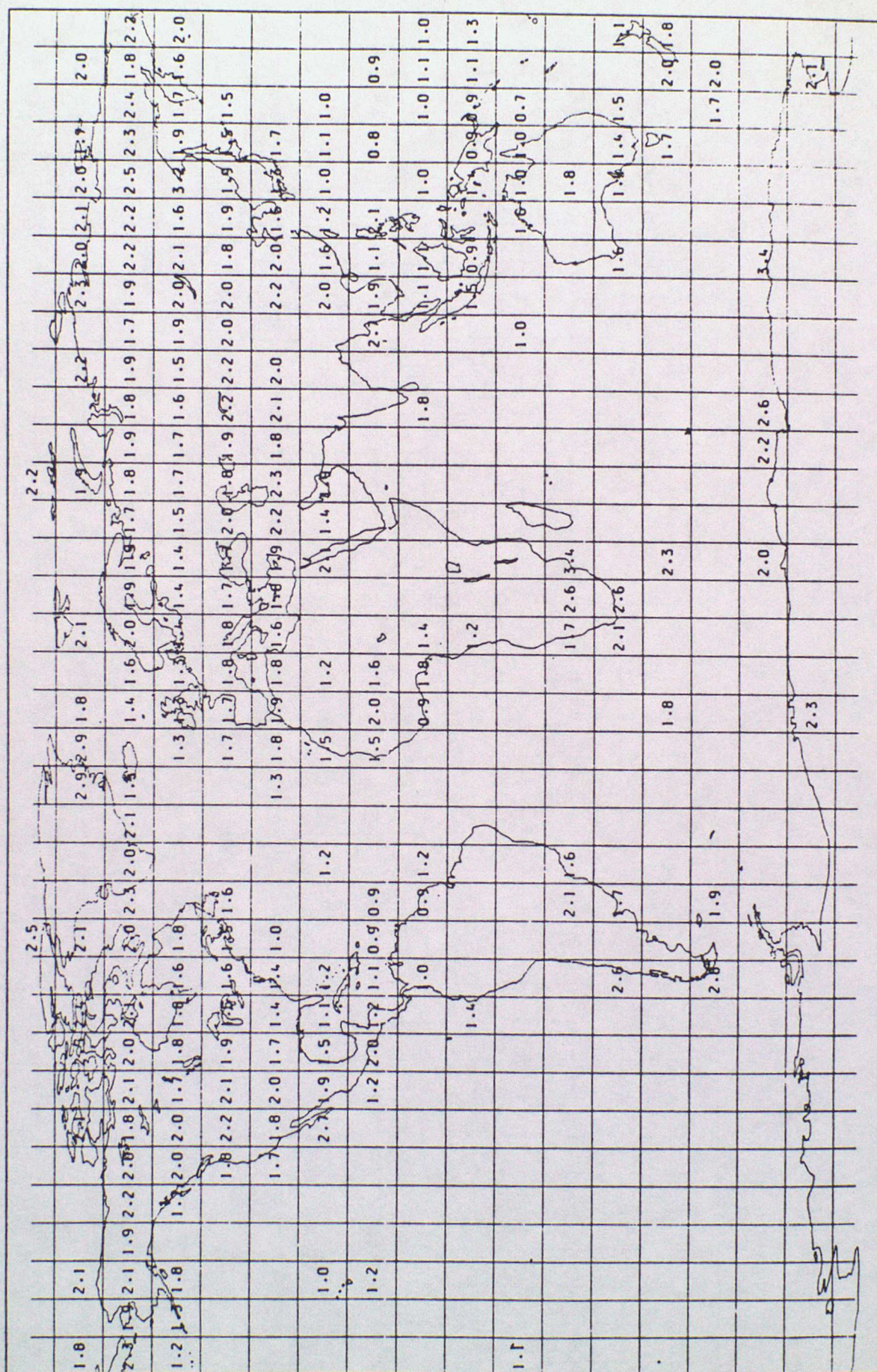
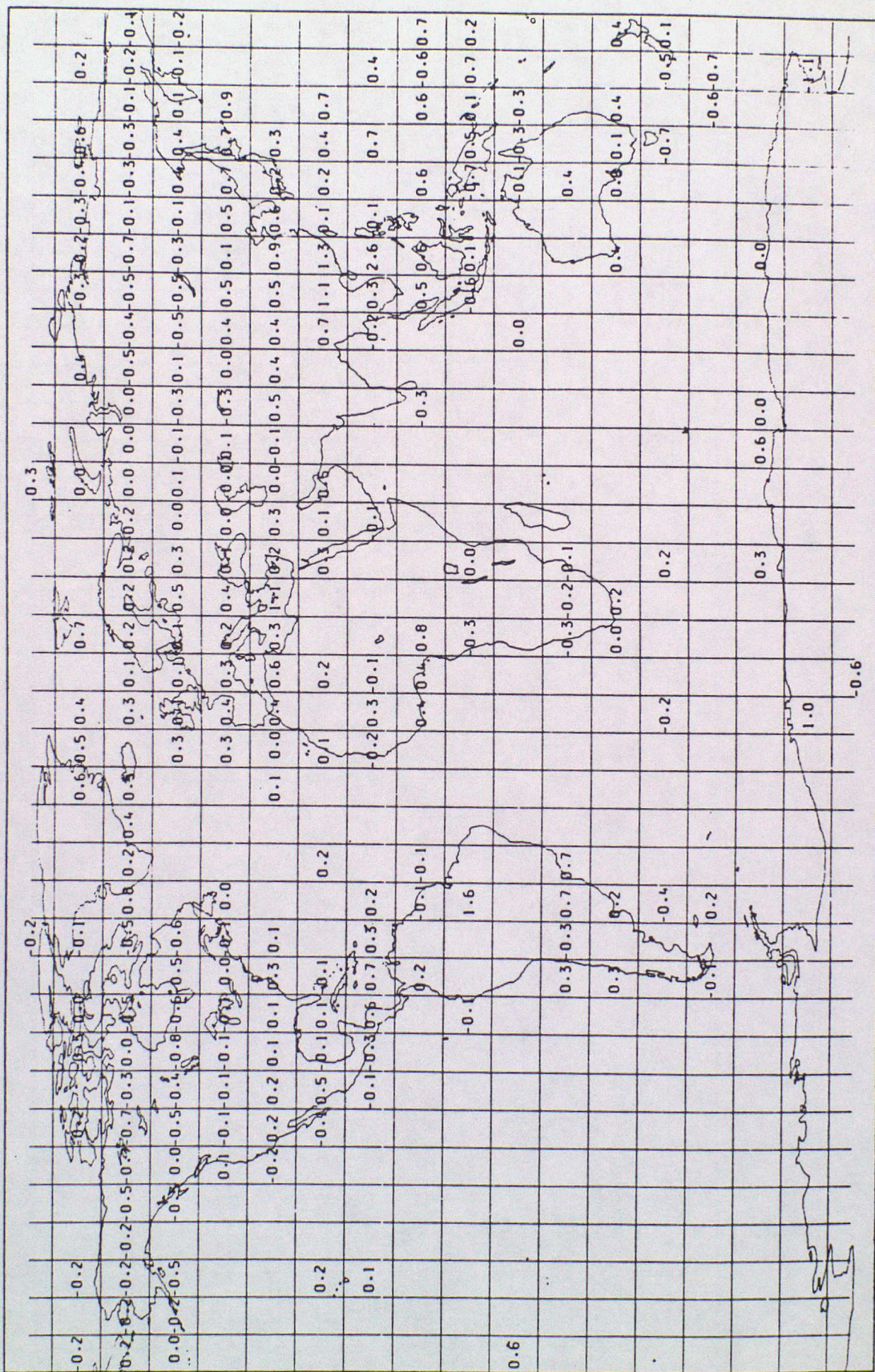


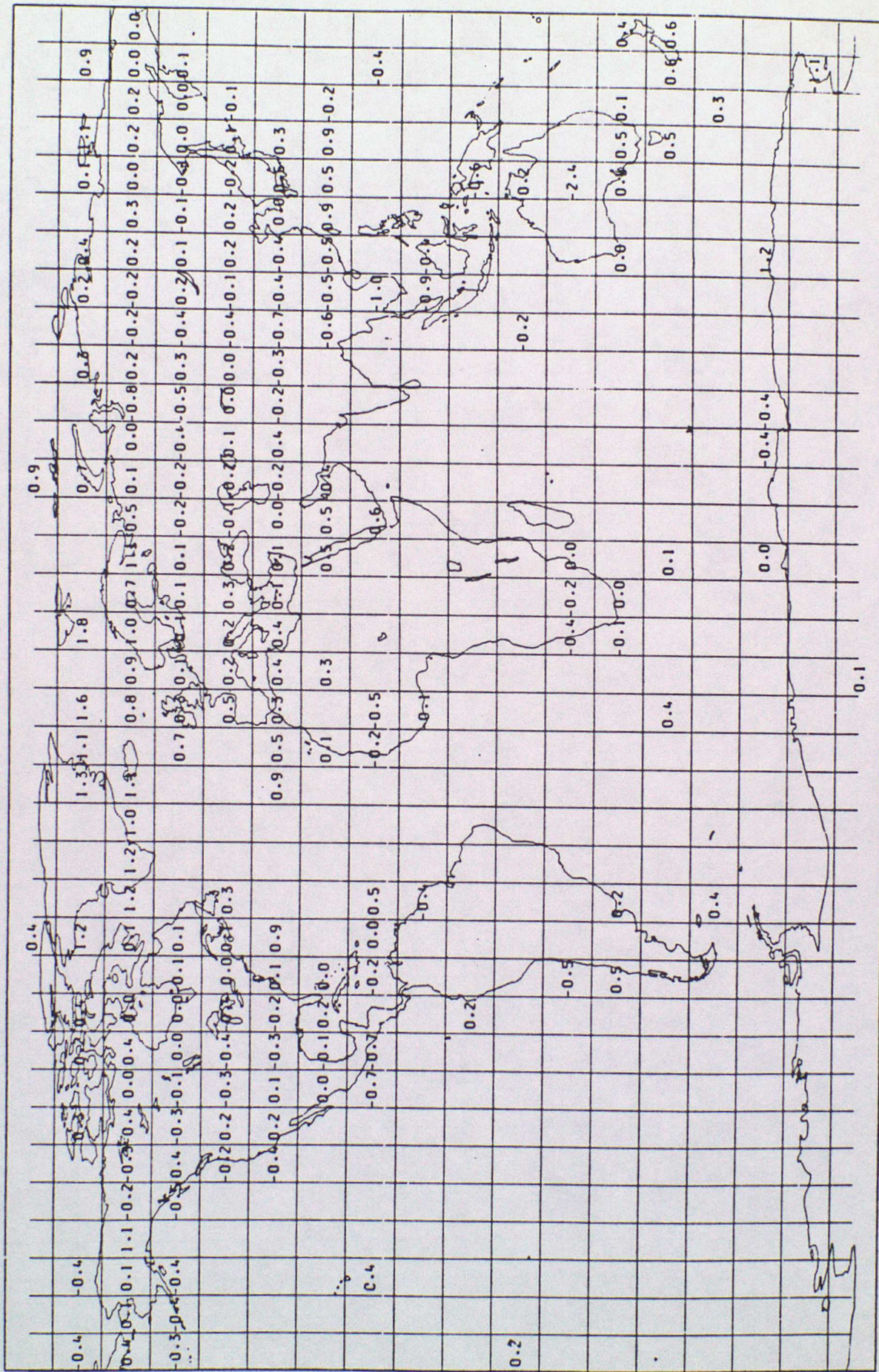
Figure 10

SONDES : 0-8 TEMPERATURE DIFFERENCES (DEG C) 101 TO 300 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

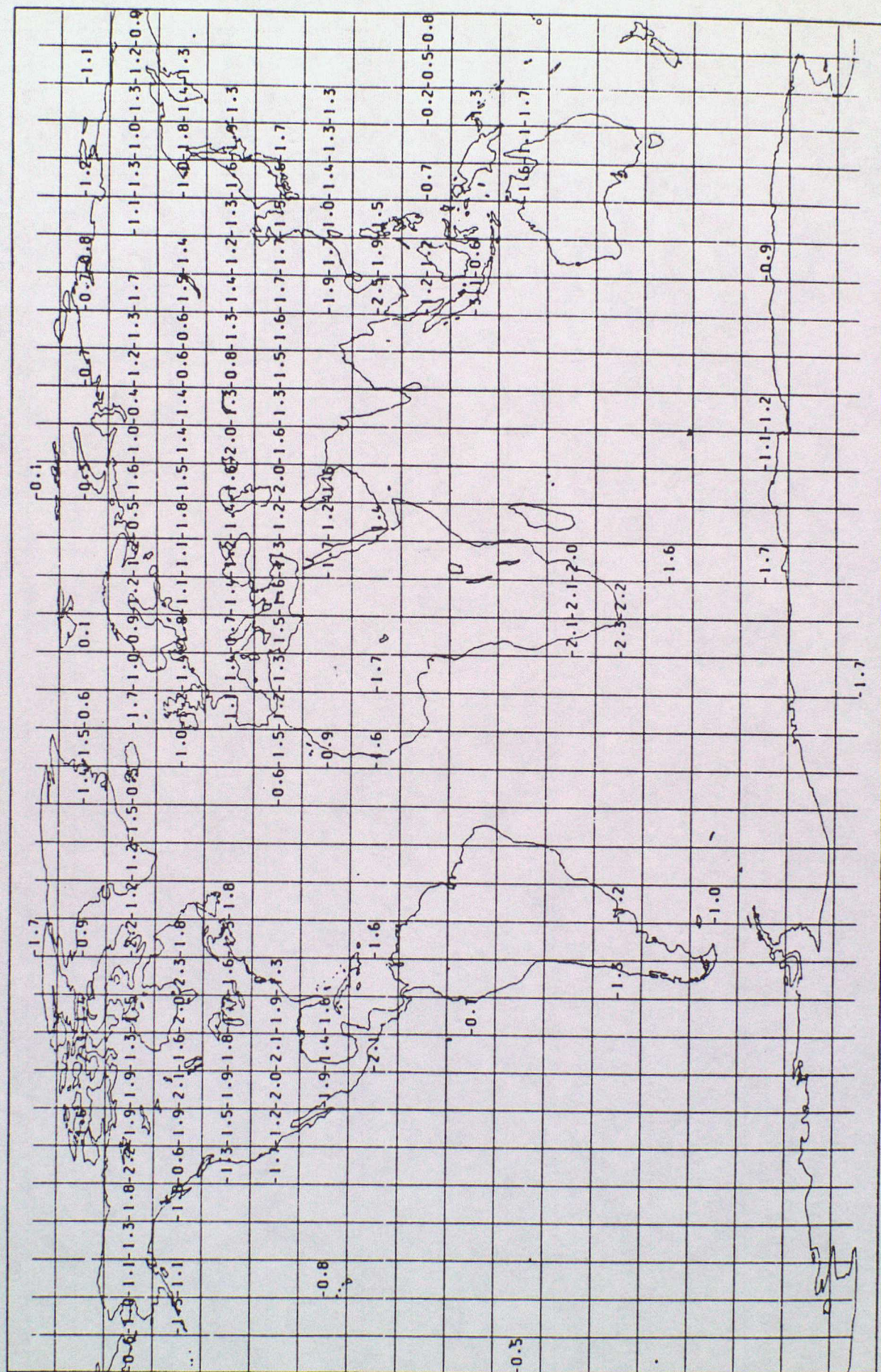


VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 12a



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

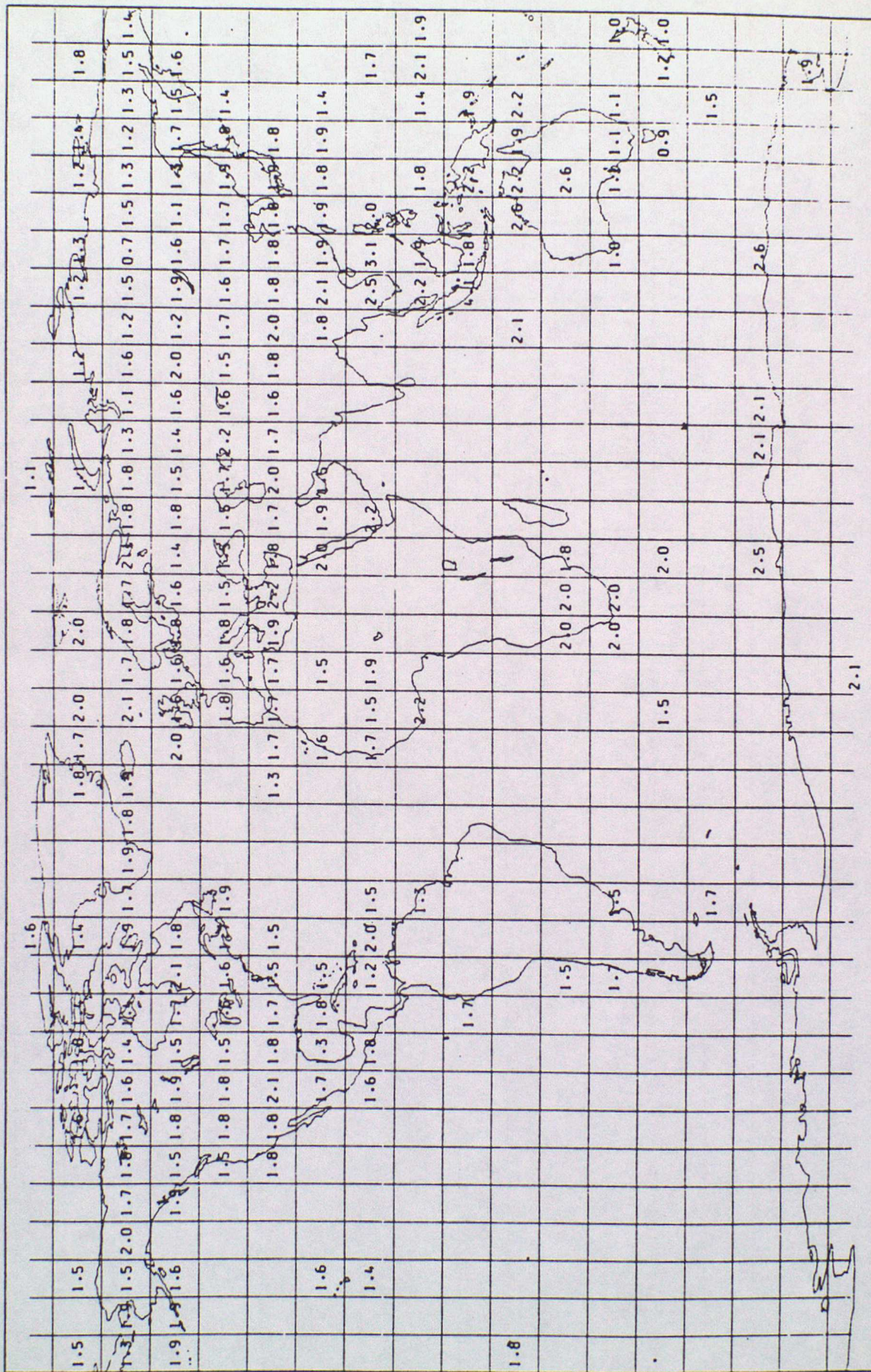


SONDES : RMS O-B TEMPERATURE DIFFERENCES (DEG C) 11 TO 100 HPA

SEPTEMBER-NOVEMBER 1992

QUALITY CONTROL APPLIED

VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT



AIREPS & ASDARS : RMS 0-B TEMPERATURES BETWEEN 101 AND 300 HPA
 SEPTEMBER-NOVEMBER 1992. UNITS DEG C
 OBSERVATIONS WITH 0-B > 10 DEG C EXCLUDED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

Figure 15

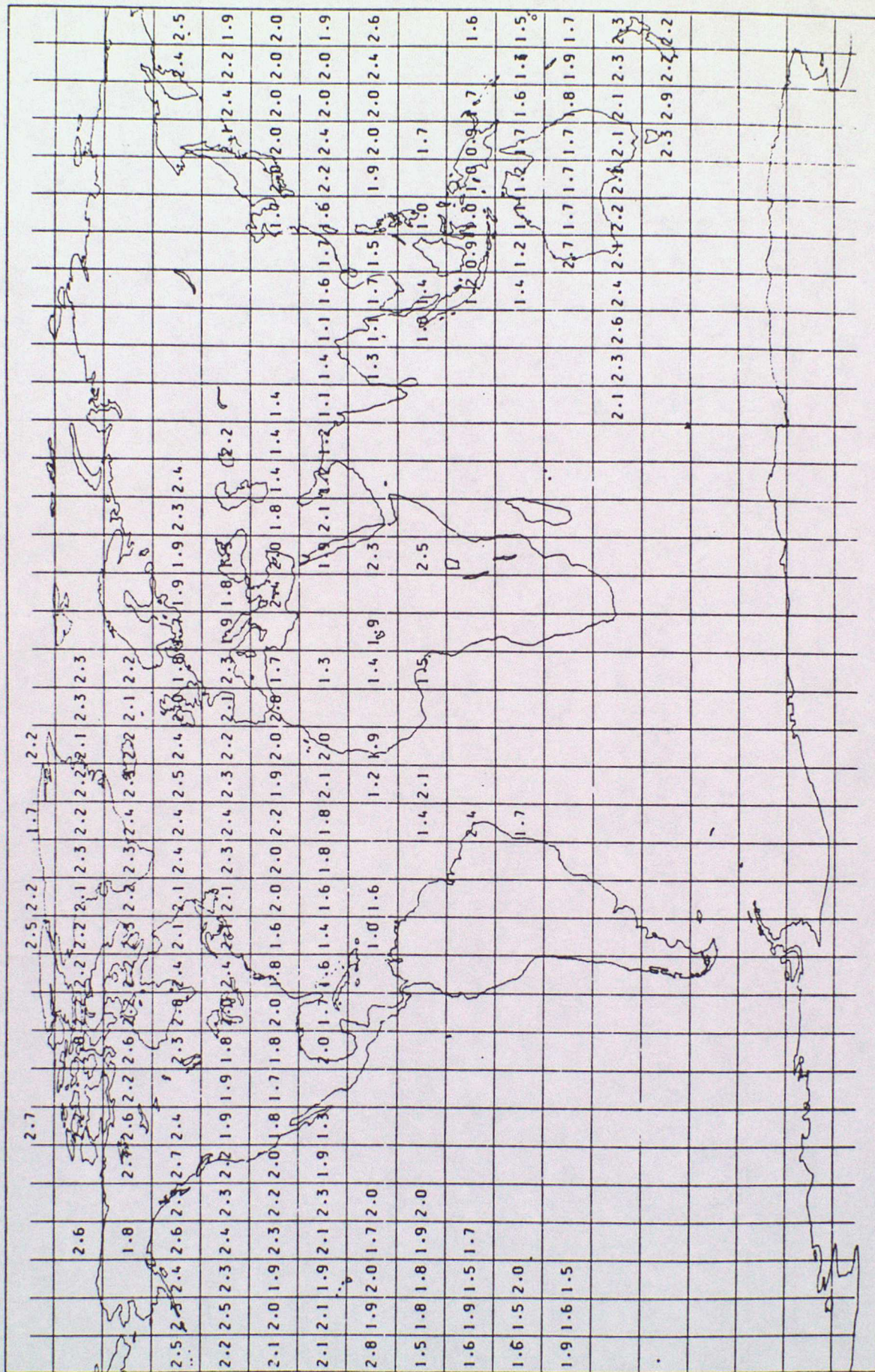


Figure 16

LASS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) AT 850 HPA

SEPTEMBER-NOVEMBER 1992

OBSERVATIONS FROM NOAA-11 AND NOAA-12

VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

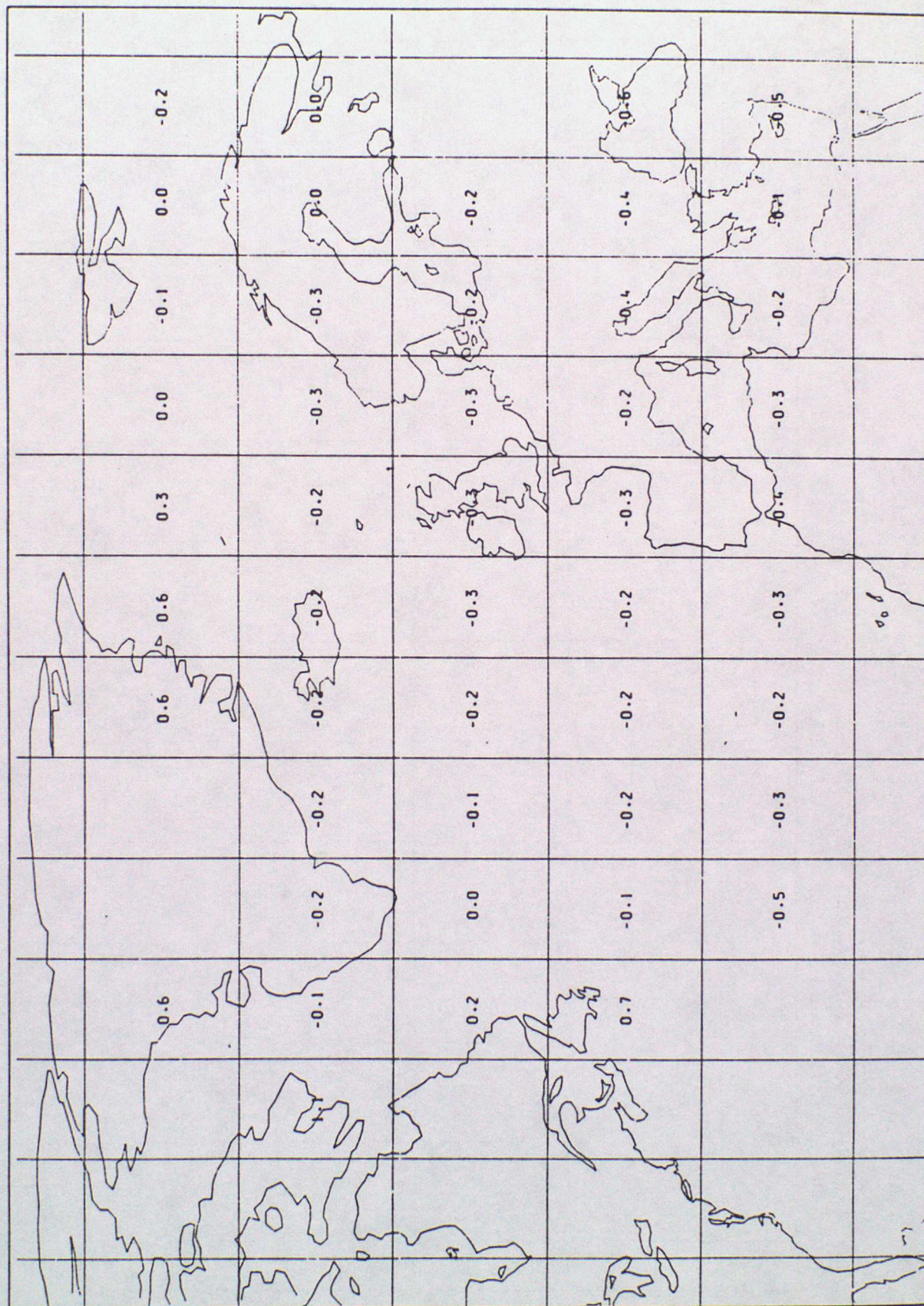


Figure 17

LASS : MEAN 0-8 TEMPERATURE DIFFERENCES (DEG C) 250 TO 150 HPA
 SEPTEMBER-NOVEMBER 1992
 OBSERVATIONS FROM NOAA-11 AND NOAA-12
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

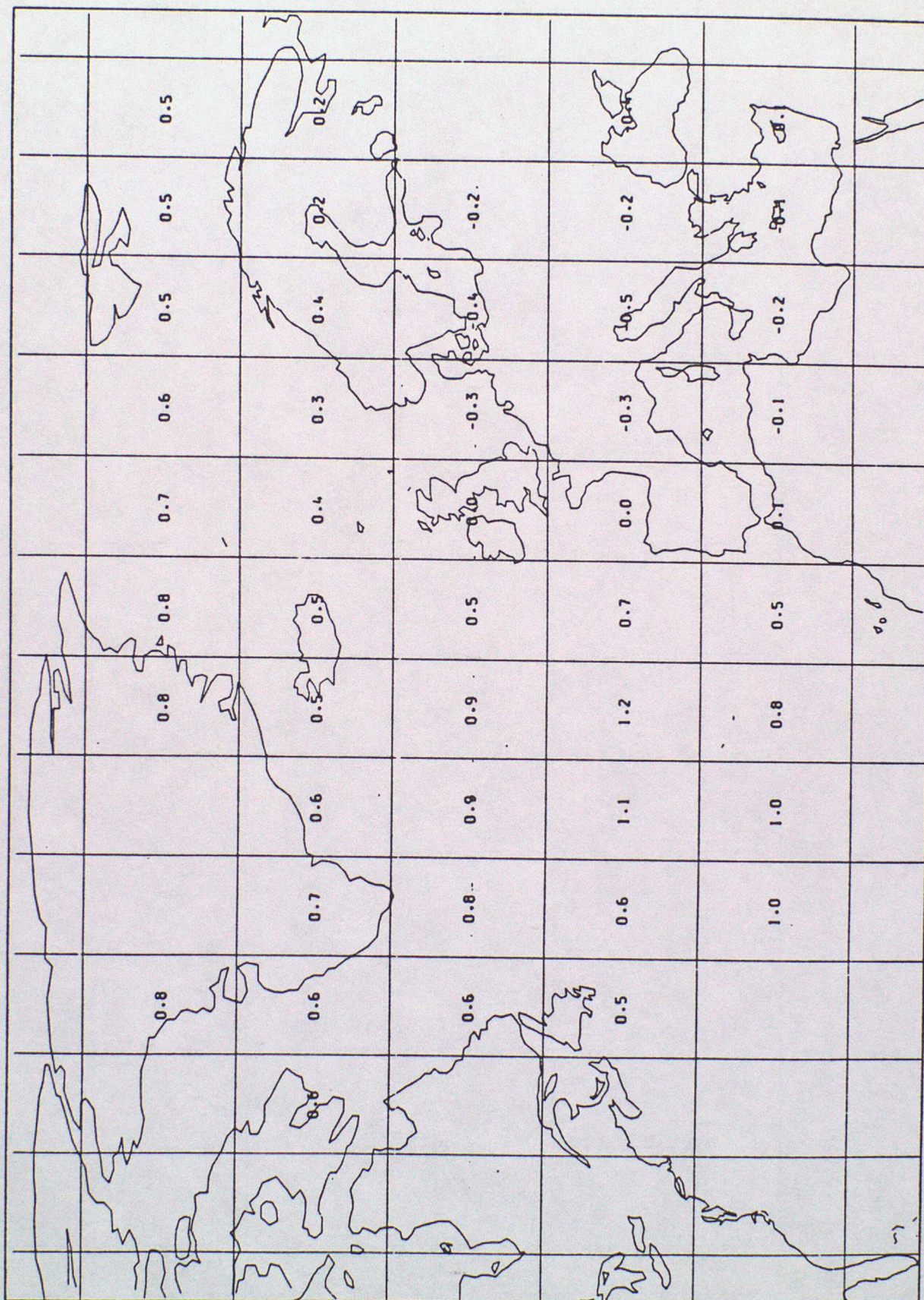


LASS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) 50 TO 30 HPA

SEPTEMBER-OCTOBER 1992

OBSERVATIONS FROM NOAA-11 AND NOAA-12

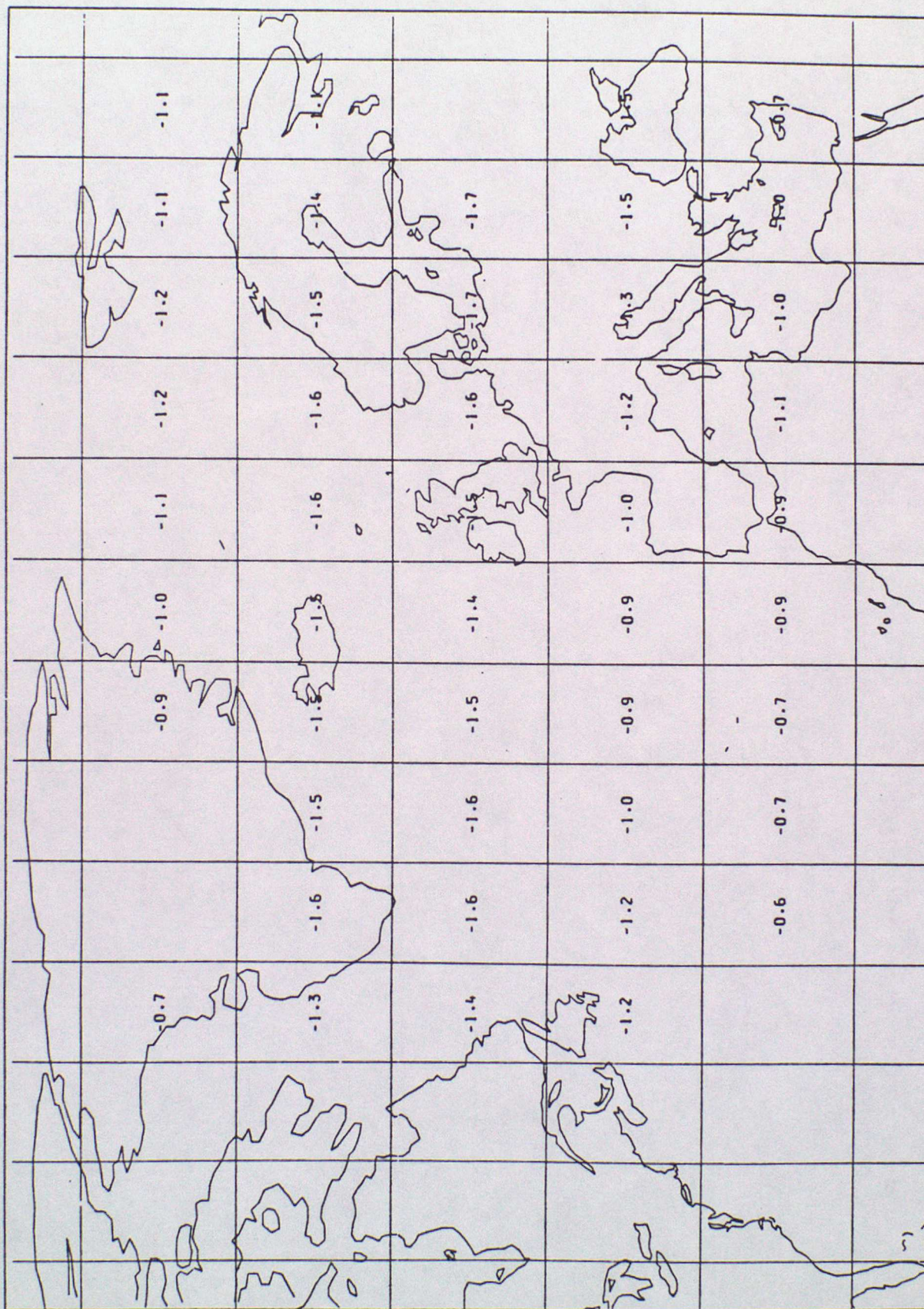
VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT



NOVEMBER 1992

OBSERVATIONS FROM NOAA-11 AND NOAA-12

VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT



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

Figure 19

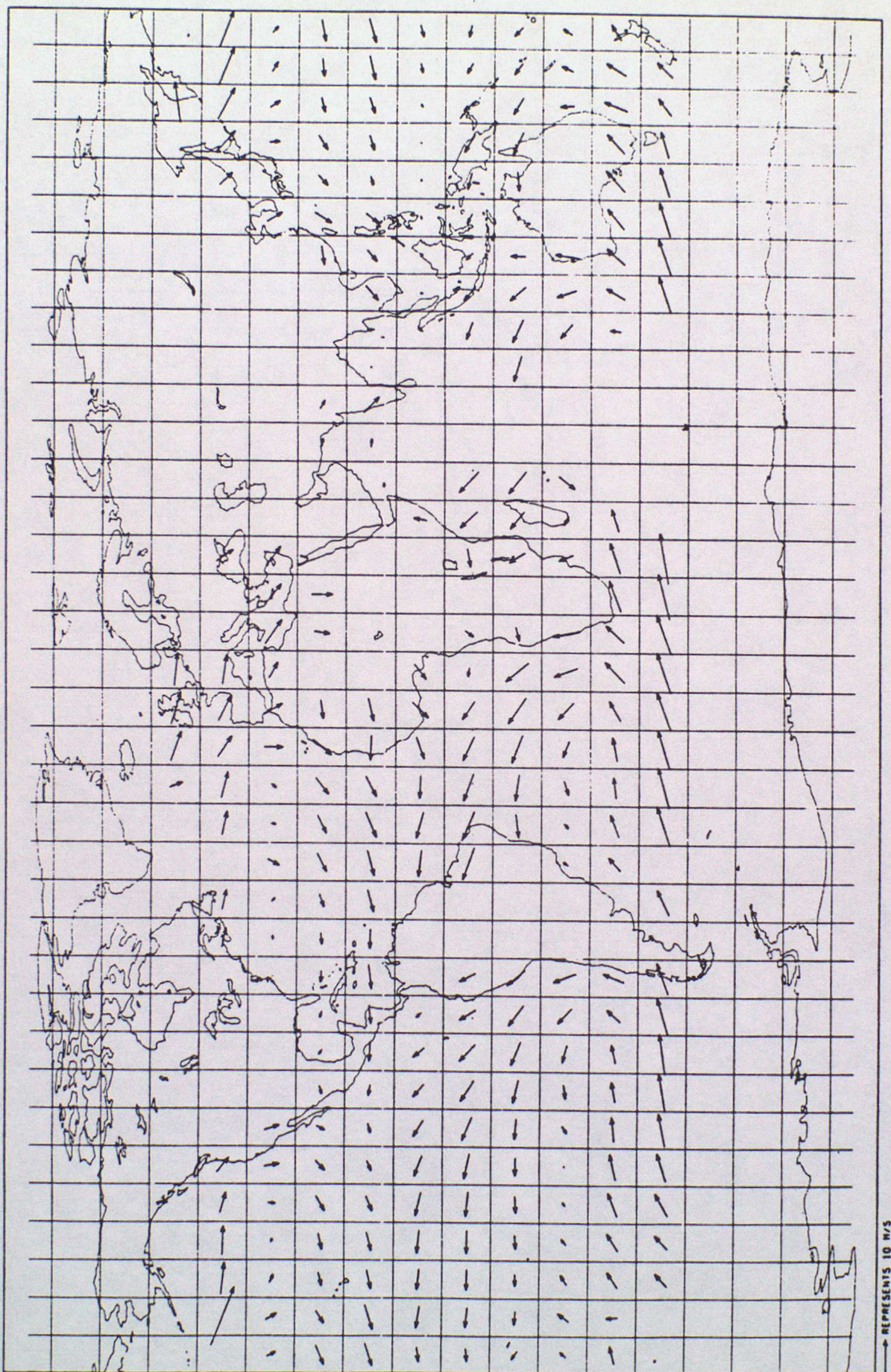


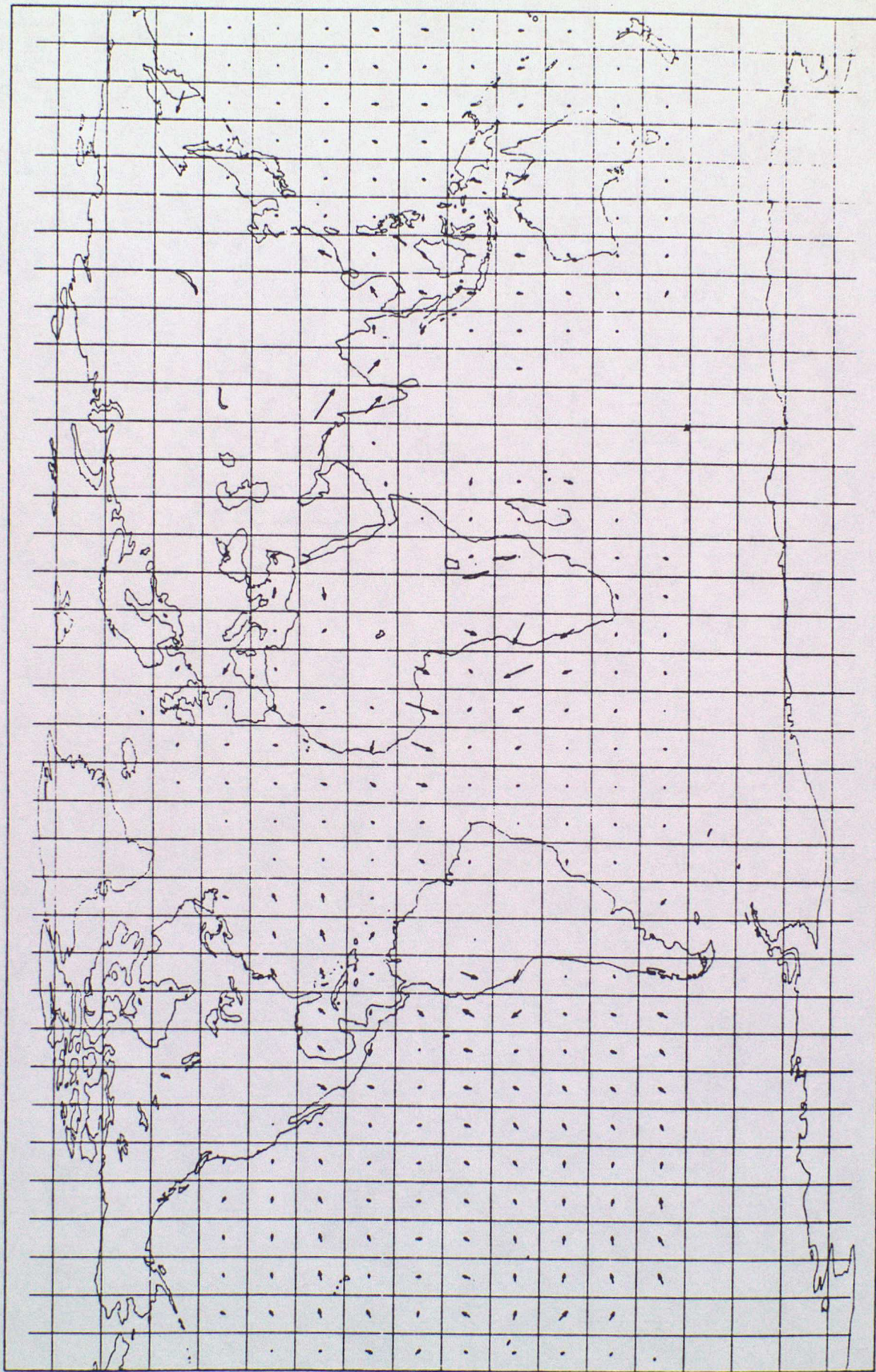
Figure 20

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

SEPTEMBER-NOVEMBER 1992

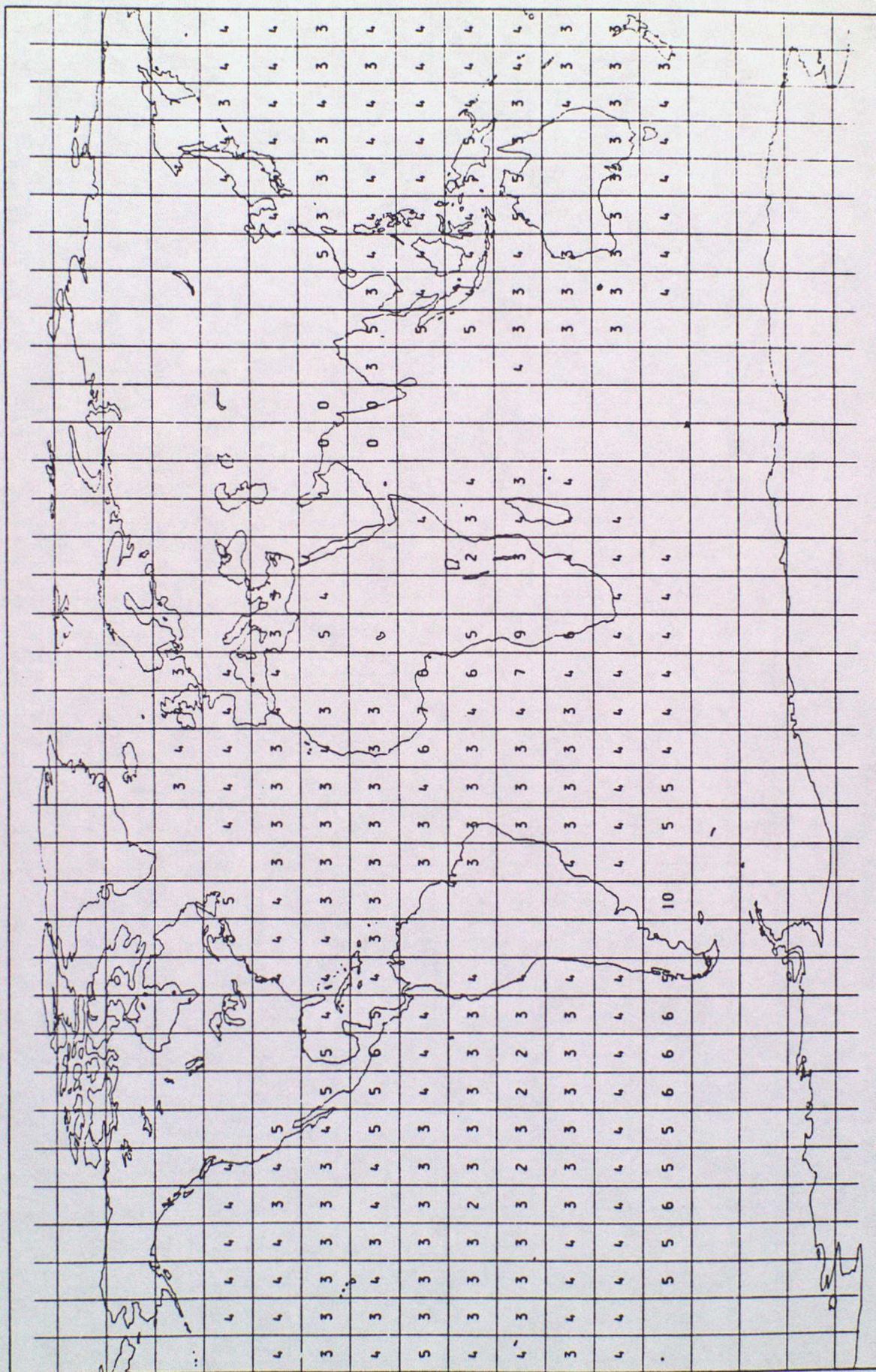
ALL OBSERVATIONS

ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT



→ REPRESENTS 5 M/S

SATOBJS : RMS 0-B VECTOR DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 USING ALL OBSERVATIONS
 VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT



AVERAGE DAILY NUMBER OF SATOB OBSERVATIONS BETWEEN 701 AND 1000 HPA
 SEPTEMBER-NOVEMBER 1992

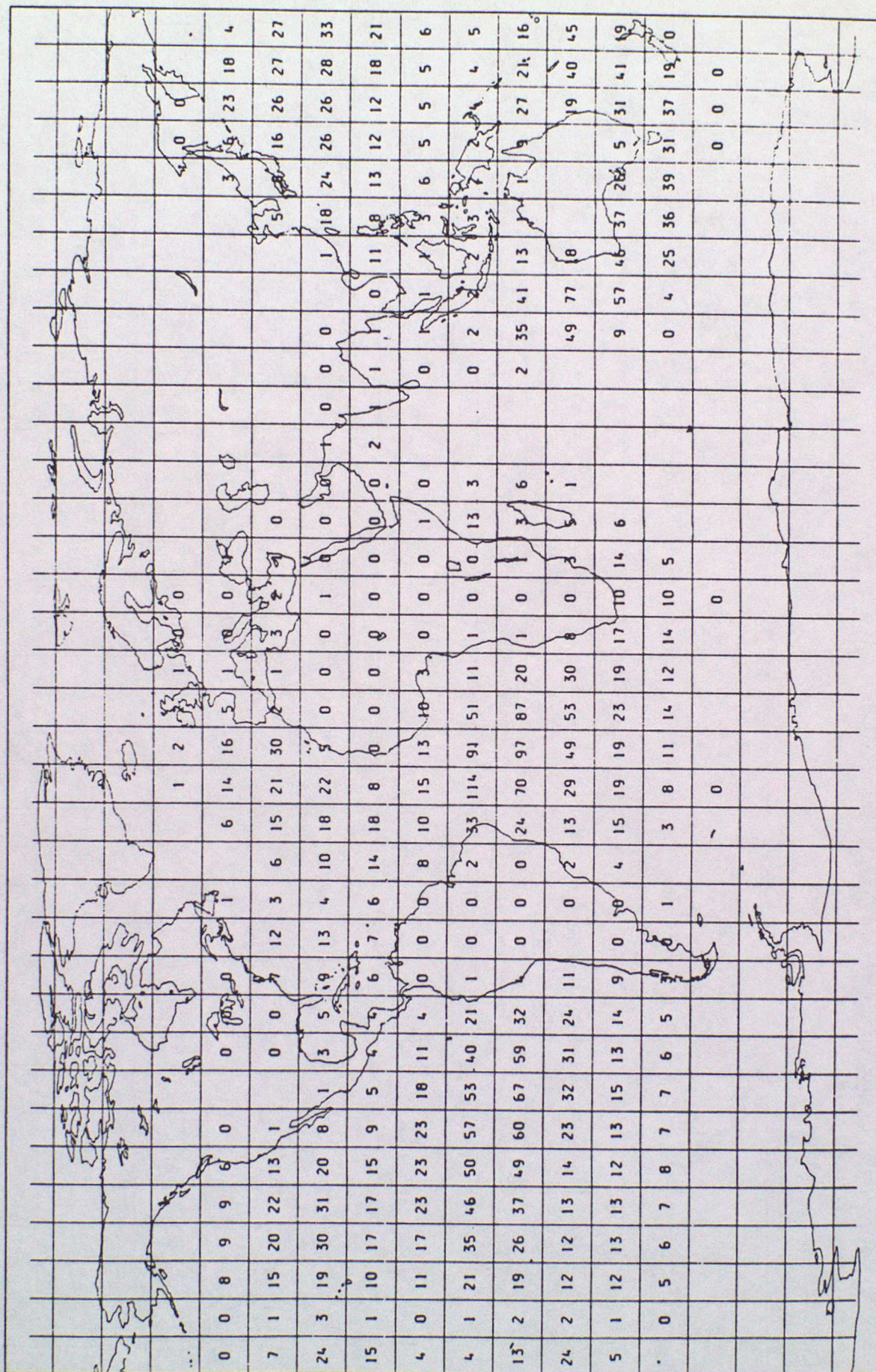
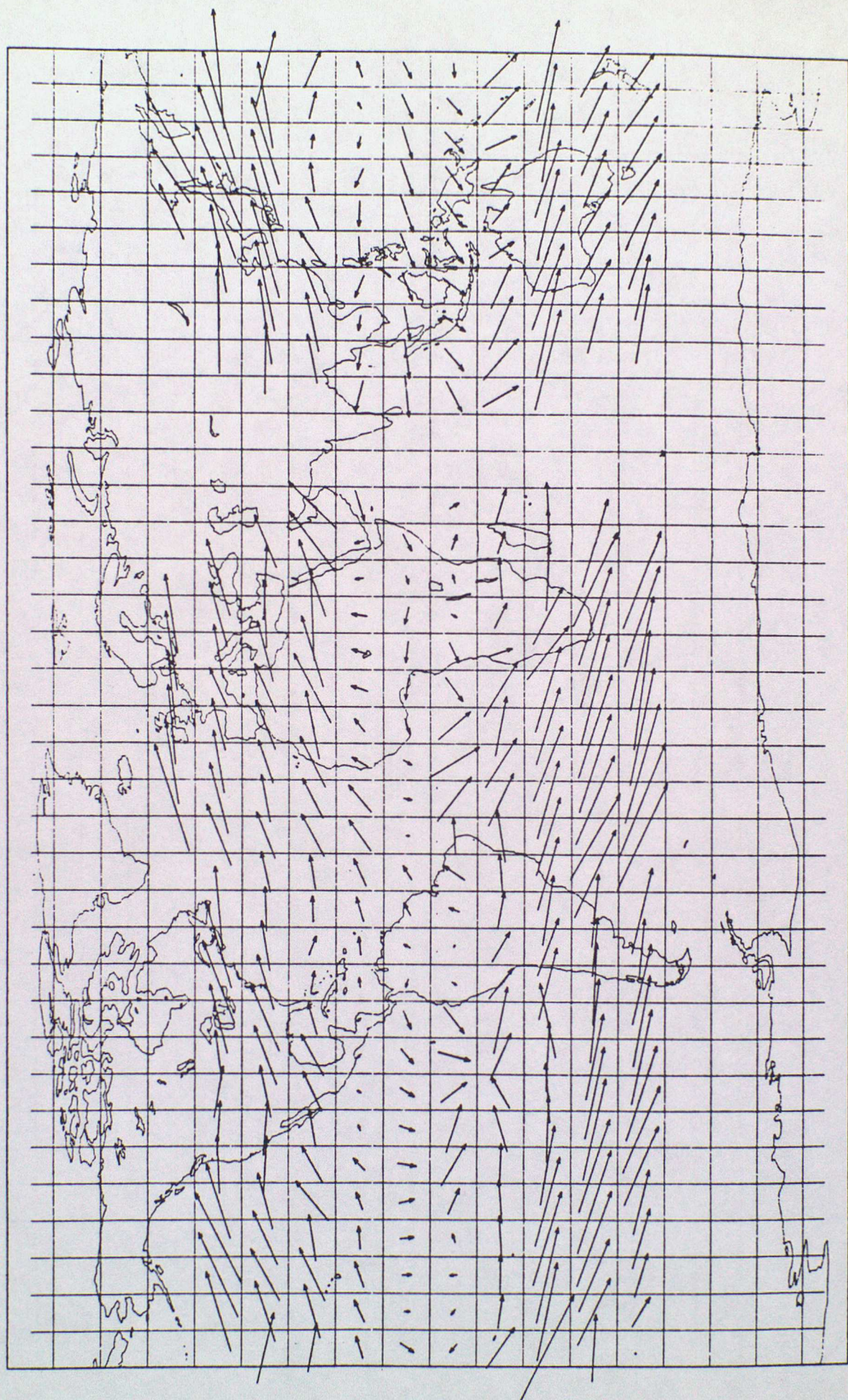


Figure 24

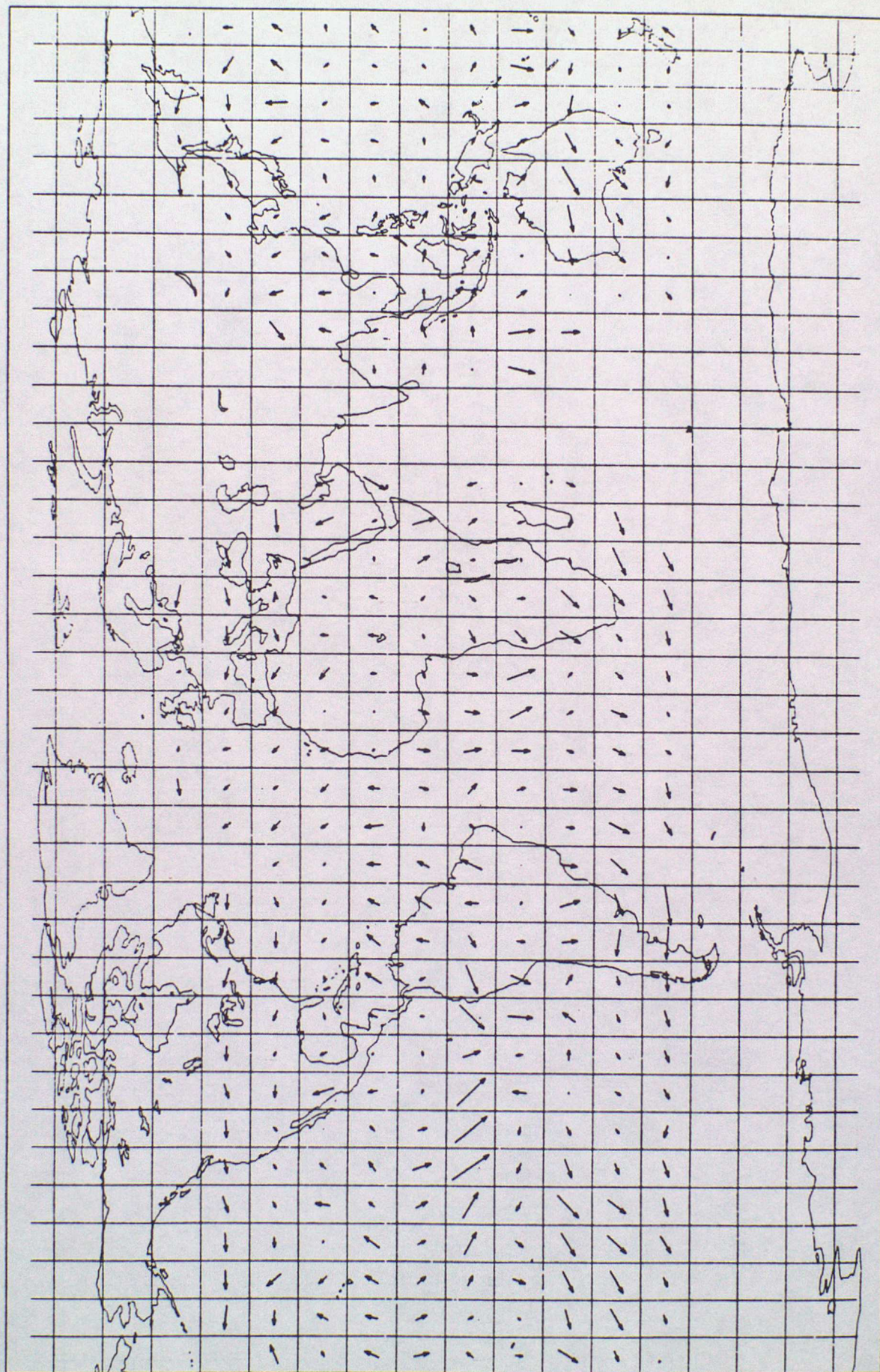
SATOB VECTOR MEAN WINDS BETWEEN 101-400 HPA
SEPTEMBER-NOVEMBER 1992
ALL OBSERVATIONS
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT



→ REPRESENTS 10 M/S

Figure 25

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



→ REPRESENTS 5 M/S

Figure 27

SATOB5 : RMS O-B VECTOR DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 SEPTEMBER-NOVEMBER 1992
 USING ALL OBSERVATIONS
 VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT

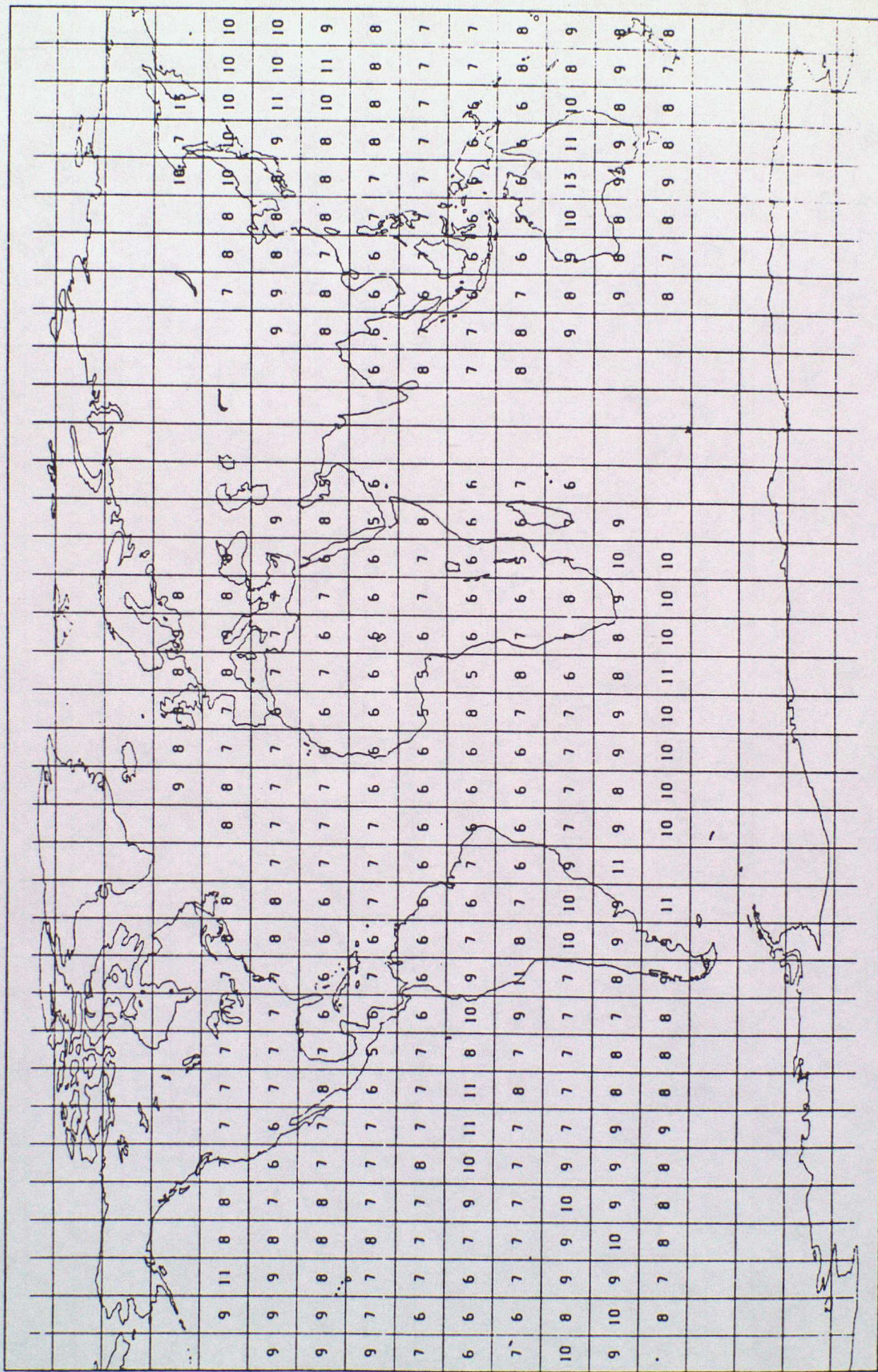
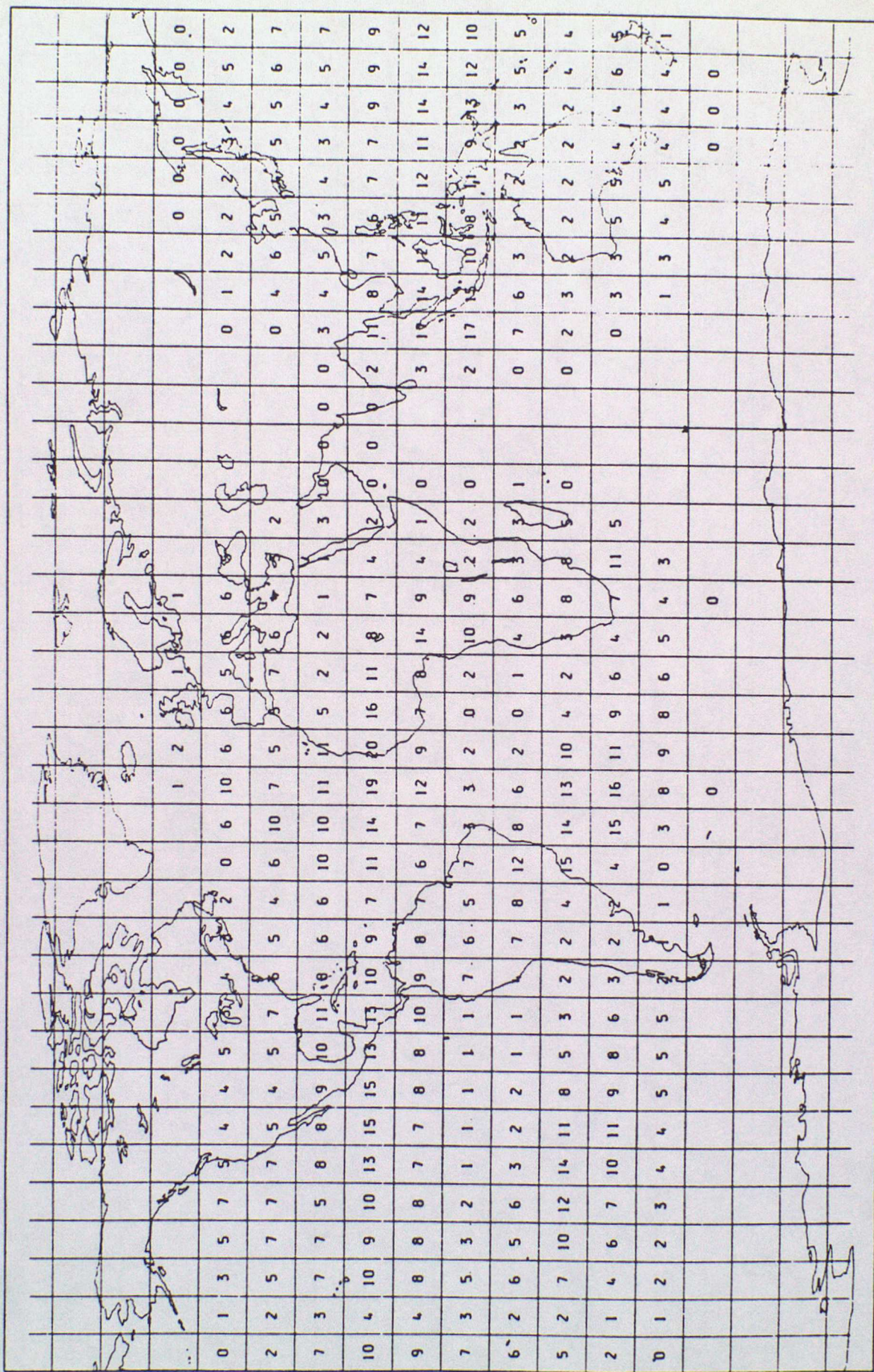


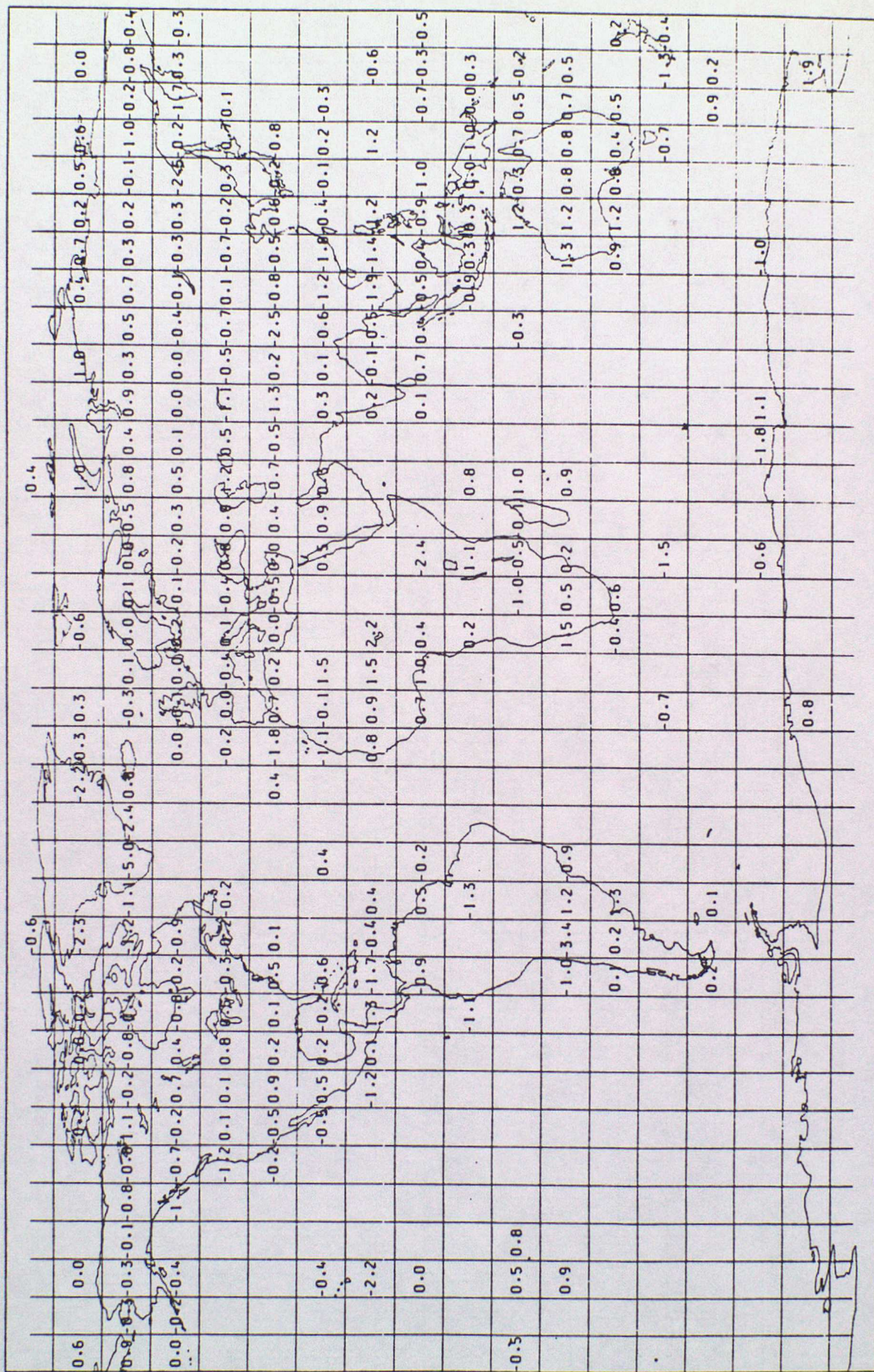
Figure 28

AVERAGE DAILY NUMBER OF SATOB OBSERVATIONS BETWEEN 101 AND 400 HPA
SEPTEMBER-NOVEMBER 1992



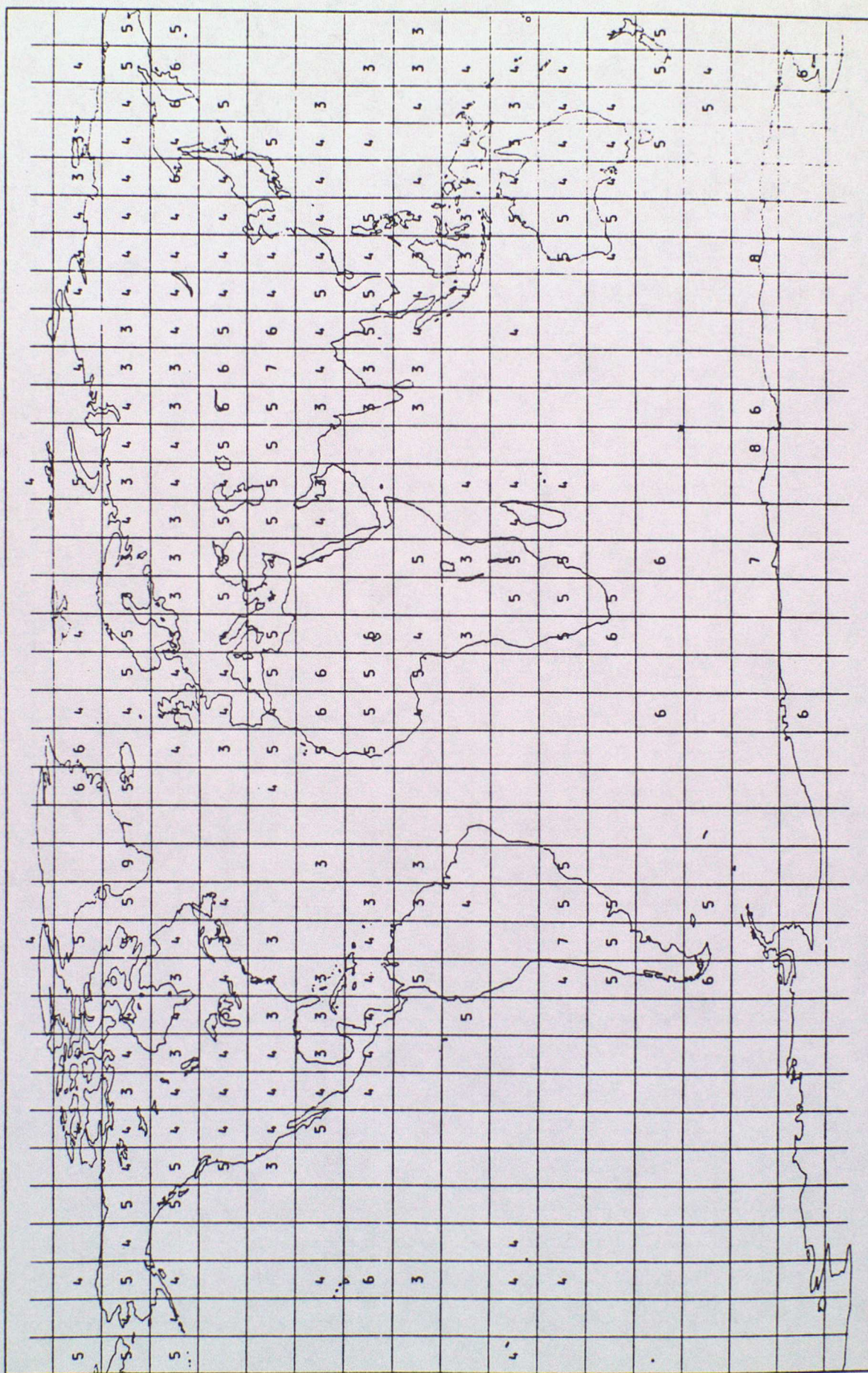
SONDES : 0-B SPEED DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 29



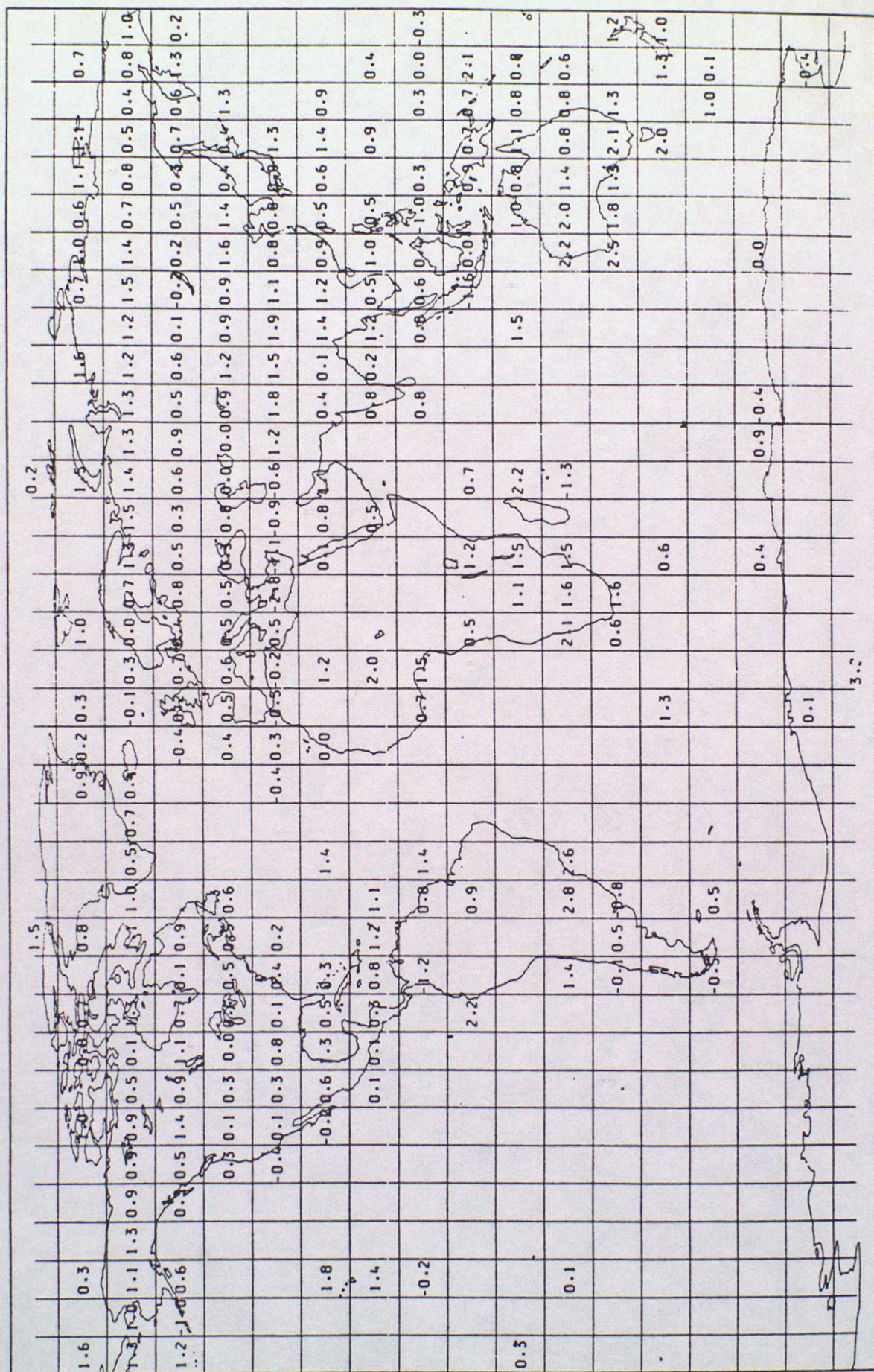
SONDES : RMS O-B VECTOR WIND DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 30



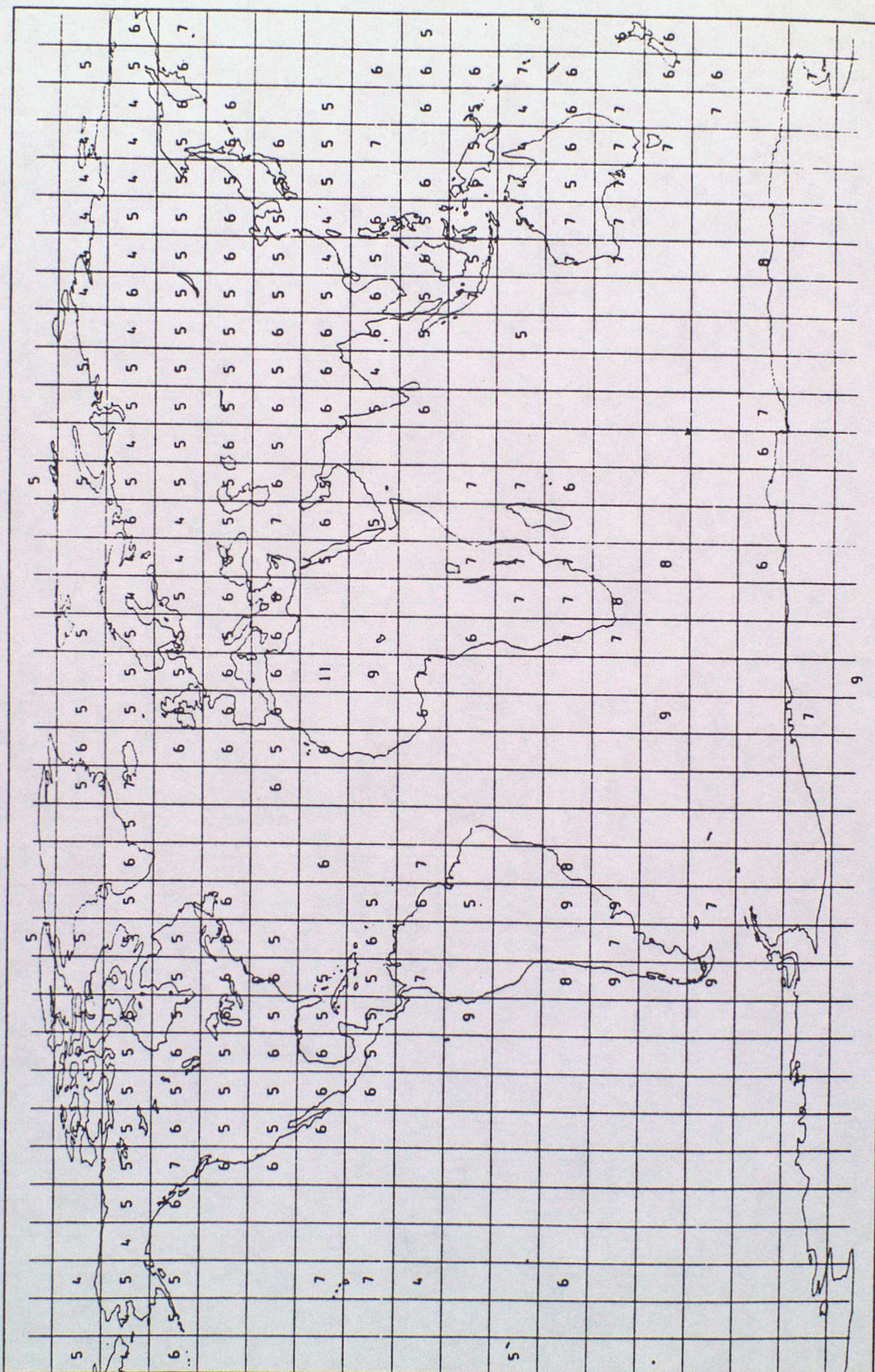
SONDES : 0-B SPEED DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 31



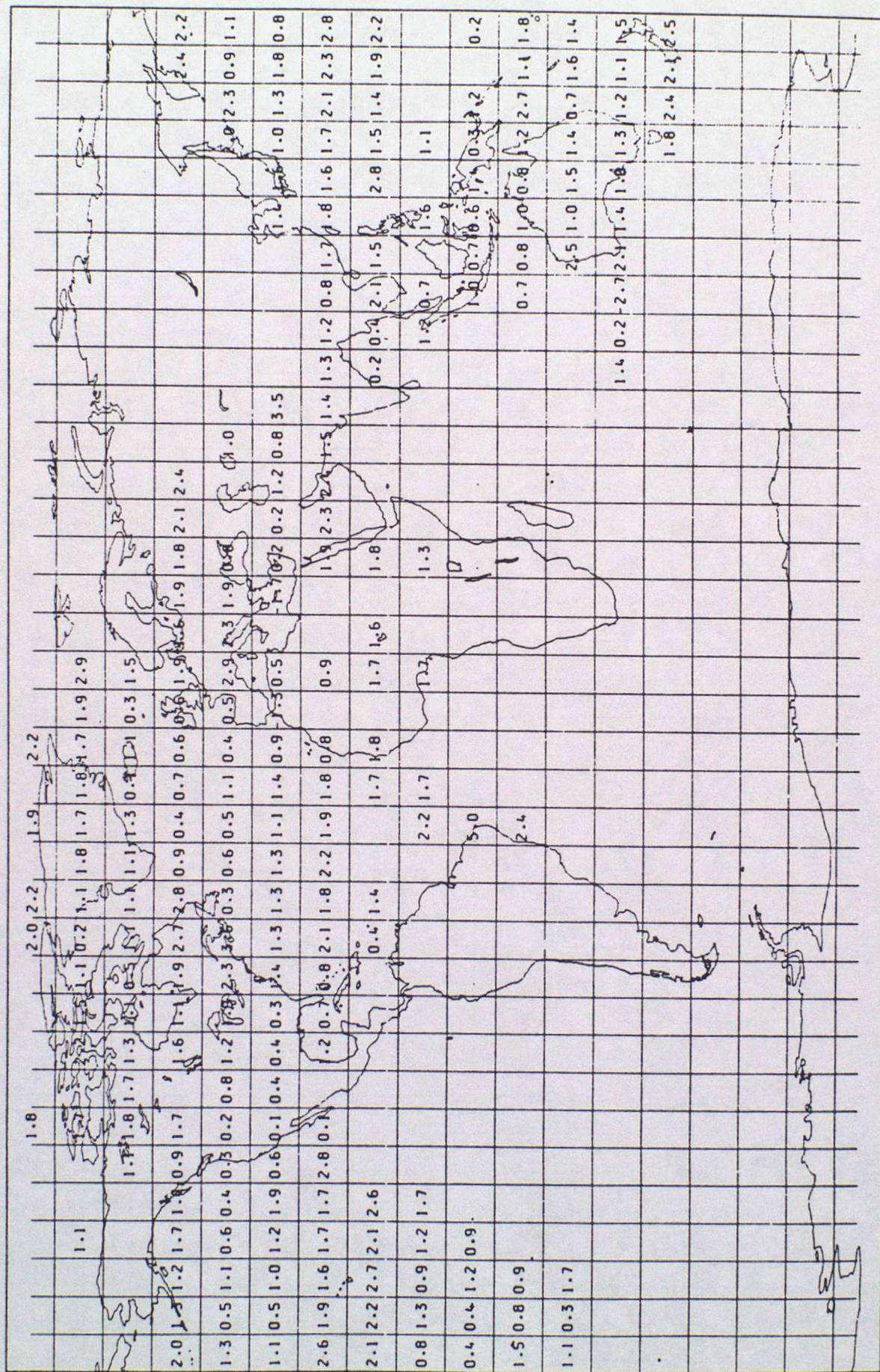
SONDES : RMS O-B VECTOR WIND DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA
 SEPTEMBER-NOVEMBER 1992
 QUALITY CONTROL APPLIED
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

Figure 32



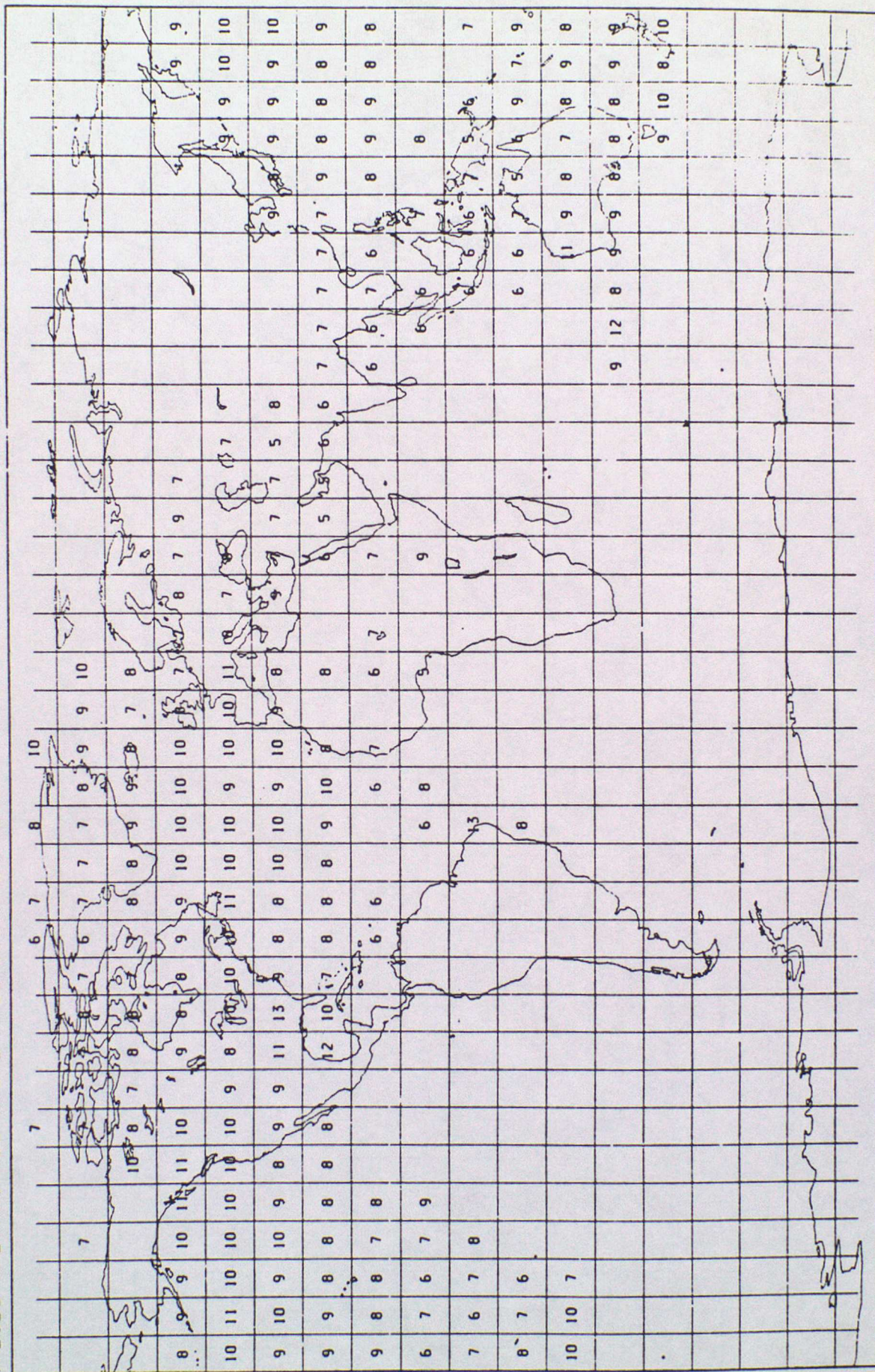
AIREPS & ASDARS : MEAN O-B SPEEDS (M/S) BETWEEN 101 AND 400 HPA
 SEPTEMBER-NOVEMBER 1992
 OBSERVATIONS WITH RMSVW DIFFERENCE > 60 MPS EXCLUDED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

Figure 33



AIREPS & ASDARS : RMS 0-B VECTOR (M/S) BETWEEN 101 AND 400 HPA
 SEPTEMBER-NOVEMBER 1992
 OBSERVATIONS WITH RMSVM DIFFERENCE > 60 MPS EXCLUDED
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

Figure 34



MEAN DAILY COUNT OF AIREPS AND ASDARS 101 - 400 HPA
SEPTEMBER-NOVEMBER 1992
OBSERVATIONS WITH RMSVW DIFFERENCE > 60 MPS EXCLUDED

