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CENTRAL FORECASTING MONITORING NOTE NO. 18  
MONITORING STATISTICS FOR SATEMs AND SATOBs

September 1993 - November 1993

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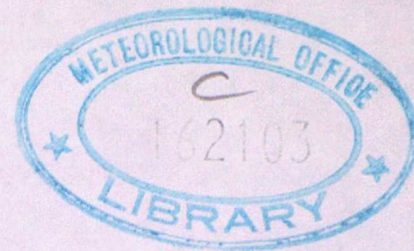
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## 1 Introduction

This monitoring note continues a series of monitoring results from SATEMs and SATOBs. This note covers the quarterly period September 1993 - November 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 global model.

Only significant features are commented upon for each chart and comparisons will be made with the previous Central Forecasting Monitoring Note No. 17, "Monitoring Statistics For SATEMs and SATOBs (June 1993-August 1993)", referred to as P1.

## 2 Temperatures

Notes:-

1. LASS data continued to be discarded from the analysis during this period.
2. The bands used for TEMPs are not the same as those used for SATEMs due to the form of the data archive.

### 2.1 SATEMs (figs 1 - 7)

Compared with P1, mean O-B temperature differences in the layer 850-1000 hPa (figure 1) are generally slightly higher over most of the globe.

Comparing the 30-50 hPa layer of mean O-B temperature differences (figure 5) with P1, the large differences found in the mid-Pacific between 20°S - 30°S have decreased this quarter as have those in the Southern Indian Ocean. Mean O-B temperature differences in the central and western Pacific, north of 10°S have increased.

RMS O-B temperature differences (figure 6) have increased in the Western Pacific north of 10°S, and in the equatorial regions of the Indian Ocean and the Atlantic.

### 2.2 TEMPs (figs 8 - 13)

The large differences found in P1 over the Middle East and W. Africa in the 801-1000 hPa band of Sonde O-B temperature differences (figure 8) have reduced markedly this quarter. There are large negative differences over central-southern North America, Mexico and Chile, and large positive differences over parts of north-east Asia.

As in P1 these areas of large mean O-B temperature differences contribute to high RMS O-B temperature differences (figure 9).



The large O-B temperature differences in the layer 101-300 hPa evident in P1 over south-east Asia have decreased slightly this quarter (figure 10). The corresponding RMS O-B temperature differences (figure 11) have also decreased slightly.

Comparing with P1, the O-B temperature differences between 11-100 hPa (figure 12) over Alaska, N.America, Canada and CIS have decreased with corresponding lower RMS O-B temperature differences (figure 13). Areas in central Asia have higher biases this quarter with corresponding high RMS O-B temperature differences.

### 2.3 AIREPs (figs 14 - 15)

The mean O-B temperature differences between 101-300 hPa for AIREPs (figure 14) show a strong negative bias over the southern Indian Ocean with corresponding high RMS O-B temperature differences (figure 15).

### 2.4 LASS (figs 16 - 18)

Lass mean O-B temperature differences at 850 hPa (figure 16) show large positive biases off eastern Greenland. Over most other areas, compared with P1, the biases have shifted in a negative sense leading to rather high negative differences over the Mediterranean.

At the 250-150 hPa band (figure 17) the very small differences found in P1 have continued into this quarter over the entire area.

Compared with P1, almost all the mean O-B temperature differences in the 50-30 hPa band (figure 18) have been reduced or have remained the same this quarter while in an area to the west of Greenland they have increased.



### 3 Winds

#### Notes:-

1. Winds derived from the METEOSAT water vapour channel were assimilated in error into model runs as infra-red channel data during the period 4-15 November 1993 due to a change in SATOB code. This additional data has been archived with the infra-red channel data and used in the statistics for this report.

Throughout the period of this report, SATOBs from the following platforms were discarded:-

|                 | GMS       | Meteosat               | GOES                   | INSAT |
|-----------------|-----------|------------------------|------------------------|-------|
| Poleward of 20° | > 500 hPa | > 500 hPa<br>over land | > 500 hPa<br>over land | All   |
| 20°N-20°S       | None      | None                   | None                   | All   |
| Poleward of 20° | > 500 hPa | > 500 hPa<br>over land | > 500 hPa<br>over land | All   |

#### 3.1 SATOBs (figs 19 - 28)

The high mean O-B speed differences between 701-1000 hPa (figure 21) found over the last two quarters along the W.African coast have decreased slightly this quarter and off the west coast of South America have remained much the same. Also differences over the Indian Ocean are very large with corresponding large RMS O-B vector differences (figure 22).

As in P1 and previous quarters the mean O-B vector wind differences in the band 101-400 hPa (figure 25) show a strong meridional component in the tropics. This feature has been found in monthly statistics generated by ourselves and other monitoring centres but there is no evidence of this signal in monthly AIREP vector wind difference charts.

Mean O-B speed differences in the band 101-400 hPa (figure 26) over the Atlantic south of 30°N and between 50°W and 50°E i.e. most of the METEOSAT area, have shifted in a positive direction leading to large positive differences in the band 20°N - 20°S. There are also large positive mean O-B speed differences in the mid-Pacific.

The number of observations in the METEOSAT area has substantially increased this quarter (figure 28) compared with P1. This was partly caused by the assimilation of the water vapour channel data as noted above, but monthly statistics showed an increase also in October.



### 3.2 TEMPs/PILOTs (figs 29 - 32)

Mean O-B speed differences between 701-1000 hPa (figure 29) show large negative differences over Hawaii, S. America, Greenland, Saudi Arabia, Tasmania and Antarctica.

In the 101-400 hPa band (figure 31) excepting parts of N.America, the Mediterranean and Central Africa there are generally positive mean O-B speed differences with a large positive mean O-B speed difference over S.America.

### 3.3 AIREPs (figs 33 - 35)

As in P1 there are generally positive mean O-B speed differences in the band 101-400 hPa (figure 33) over all areas of data coverage with maxima of  $3.4 \text{ m s}^{-1}$  in the mid-Pacific and  $3.6 \text{ m s}^{-1}$  over southern Australia. There are also high values over east Africa and the southern Indian Ocean. Both these areas have very low observation counts (figure 35). Compared with P1 the differences of mean O-B speed are slightly higher over the Pacific and N.America and slightly lower over the Atlantic.

## 4. Summary

### SATEMs

Comparing the low level SATEMs (850-1000 hPa) (figure 1) with the TEMPs in the same height band (figure 8), shows significant differences over the eastern seaboard of the USA/Canada and areas around Japan and good agreement on the fringes of NW Europe. Generally, the SATEM differences are higher than those from the TEMPs.

In the layer 100-300 hPa (figures 3 and 10) the differences are in close agreement this quarter apart from, as in P1, over S.E.Asia where the TEMP mean O-B temperature differences (figure 10) are again high.

Aircraft reports from the upper level (101-300 hPa) (figure 14) show rather higher differences this quarter compared with the SATEMs (figure 3).

At the highest levels, compared with P1, the SATEM (30-50 hPa) (figure 5) and TEMP (11-100 hPa) (figure 12) are in generally poorer agreement in mean O-B temperature differences this quarter with the SATEMs having rather higher differences.



## SATOBs

INSAT O-B vector wind differences in both bands covered in the report are very high, so rejection of all INSAT SATOB data remains justified.

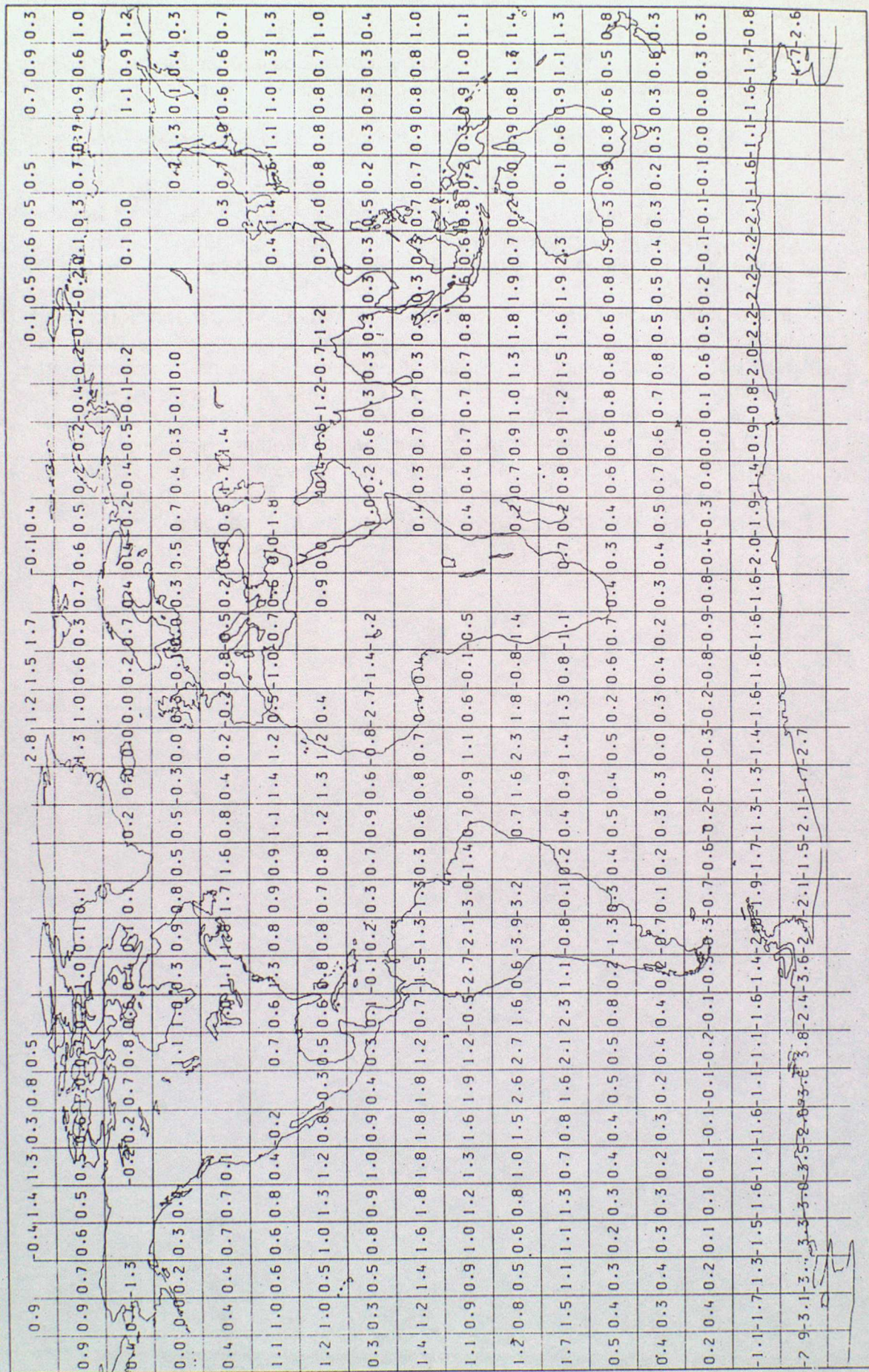
SATOBs from Meteosat, GOES and GMS continue to compare well with the background field in the lowest band.

The erroneous inclusion of water vapour channel data between 4-15 November 1993 has possibly degraded the observations from METEOSAT, which is particularly noticeable at the higher level covered by this report (figure 26).

In the upper band there is a strong divergent pattern in the mean O-B vector wind differences in the tropics. This is apparently in the opposite sense to what might be expected since the model is considered to have an overactive Hadley circulation. These differences are also found in monitoring statistics from other centres. One possible explanation may lie with the sampling problem inherent in SATOB data. Cloud-track winds can only be obtained in cloudy areas, which normally implies ascending air. In the tropics, therefore, the observations will be produced in areas of enhanced outflow at upper levels, whereas, the model background field will be representative of the average conditions.

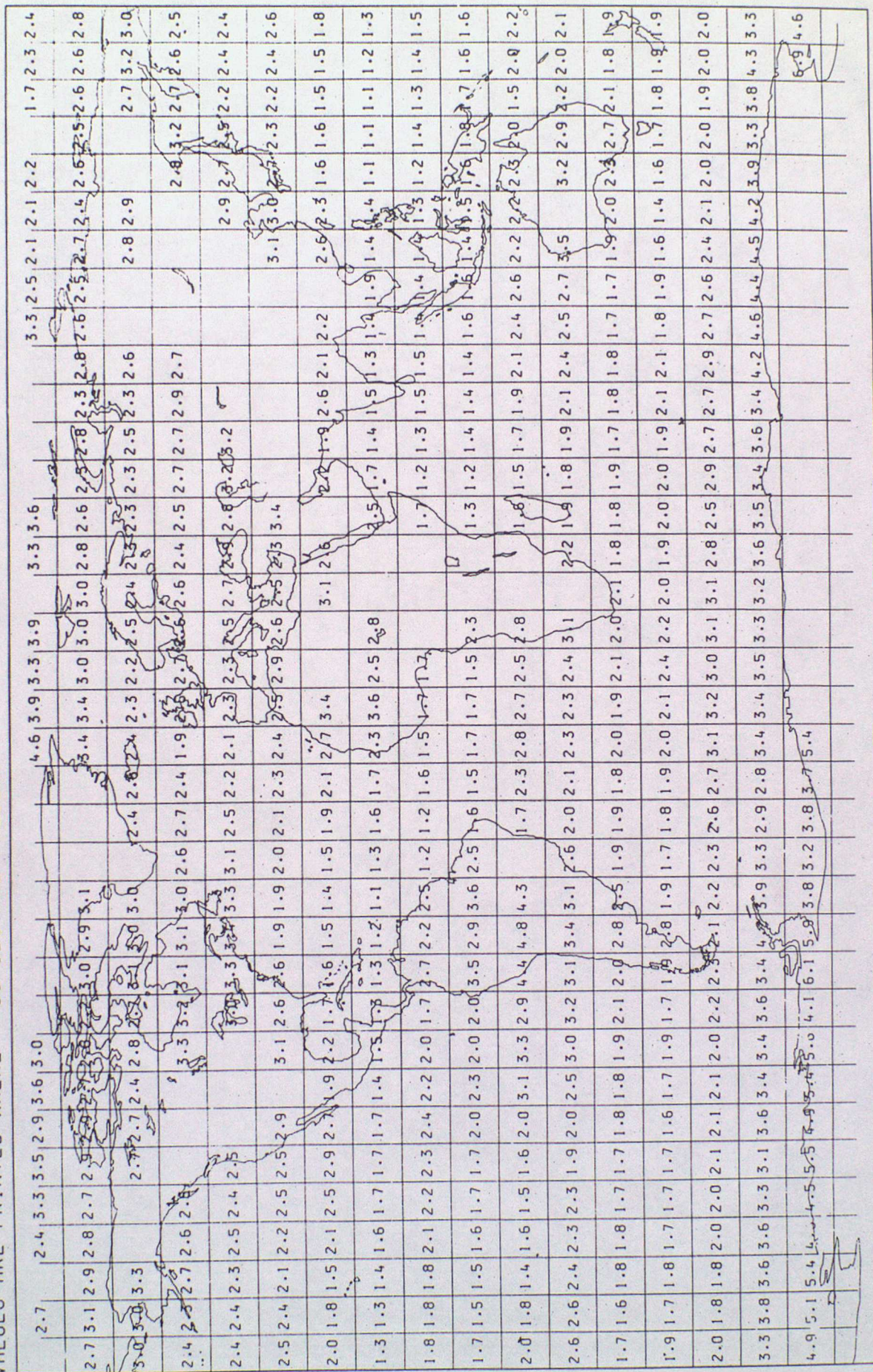


500 KM SATEMS : MEAN O-B TEMPERATURE DIFFERENCES (DEC C) : 850 TO 1000 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 NOAA-11 AND NOAA-12 STATISTICS COMBINED  
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT





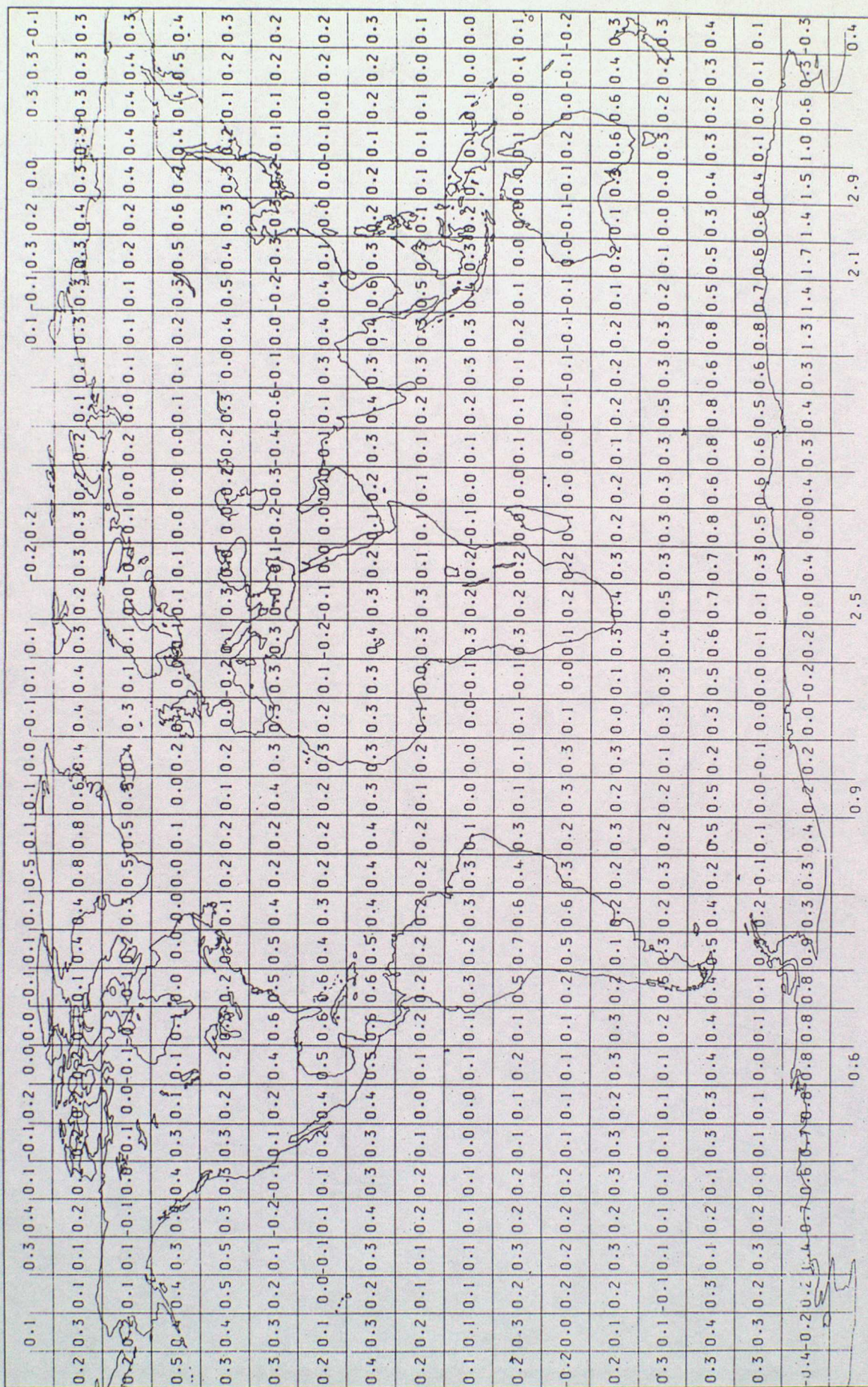
500 KM SATEMS : RMS 0-8 TEMPERATURE DIFFERENCES (DEG C) : 850 TO 1000 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 NOAA-11 AND NOAA-12 STATISTICS COMBINED  
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT





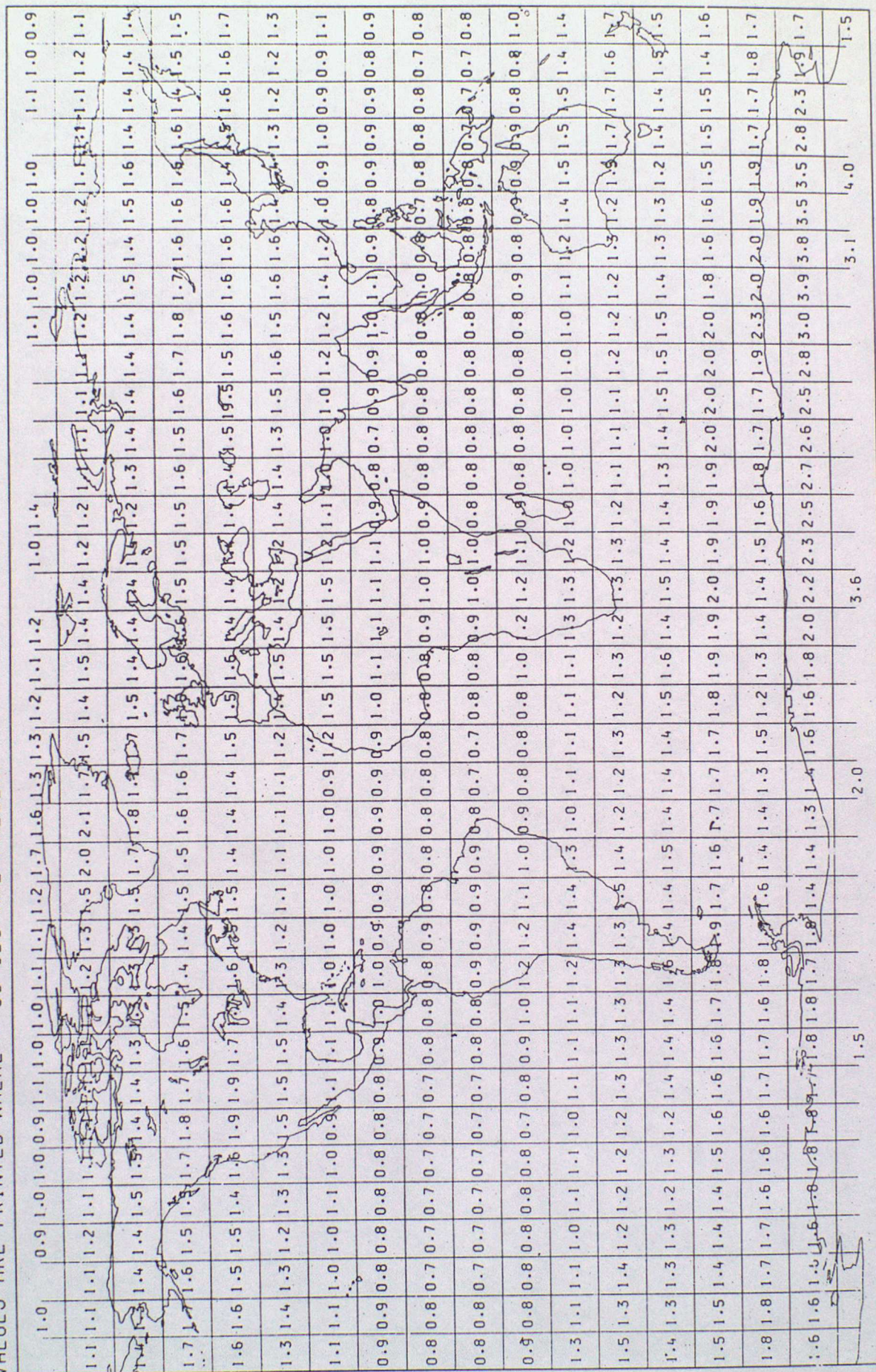
500 KM SATEMS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) : 100 TO 300 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 NOAA-11 AND NOAA-12 STATISTICS COMBINED  
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 3





500 KM SATEMS : RMS 0-B TEMPERATURE DIFFERENCES (DEG C) : 100 TO 300 HPA  
SEPTEMBER 1993 - NOVEMBER 1993  
FIGURE 10





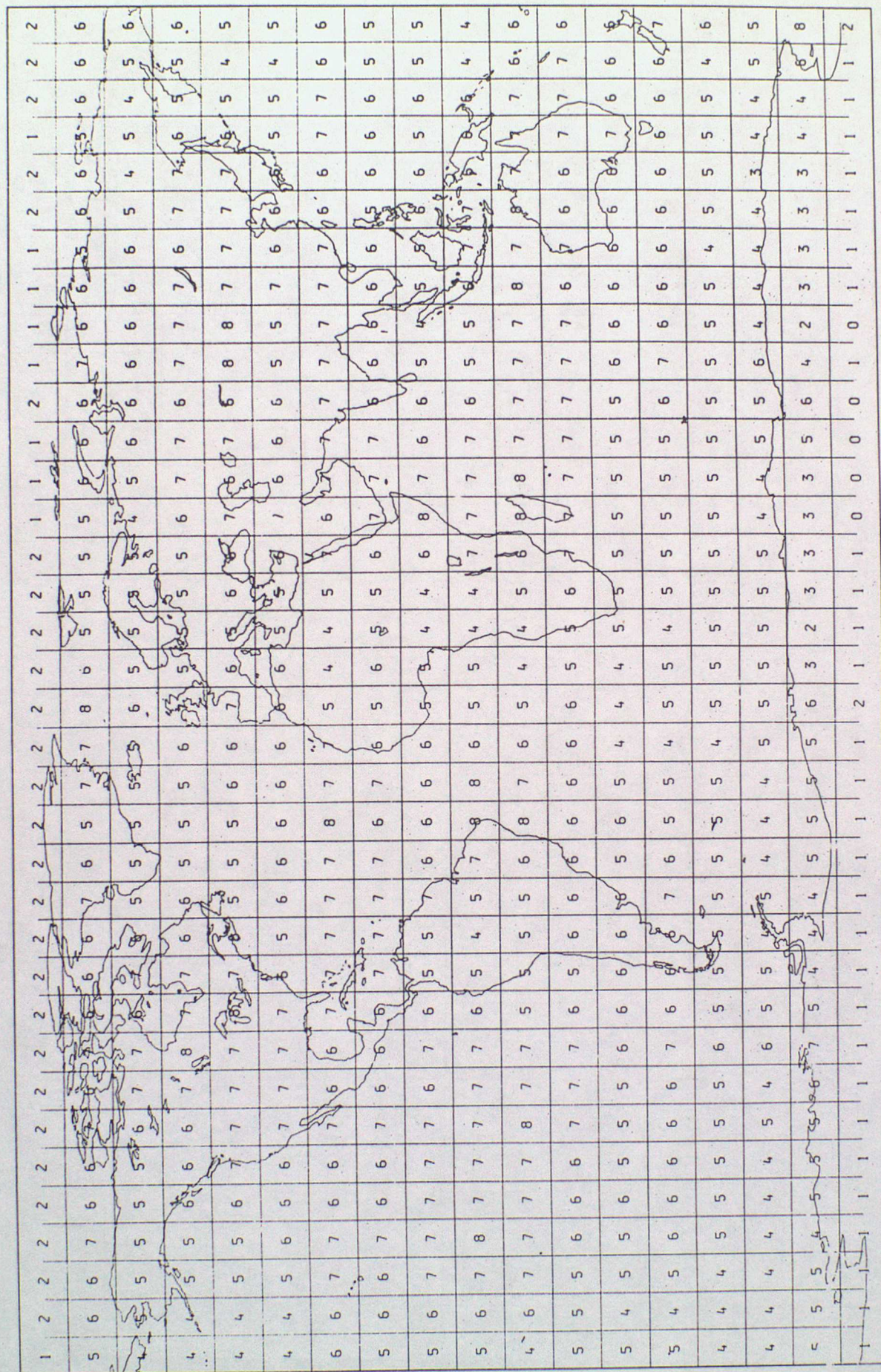








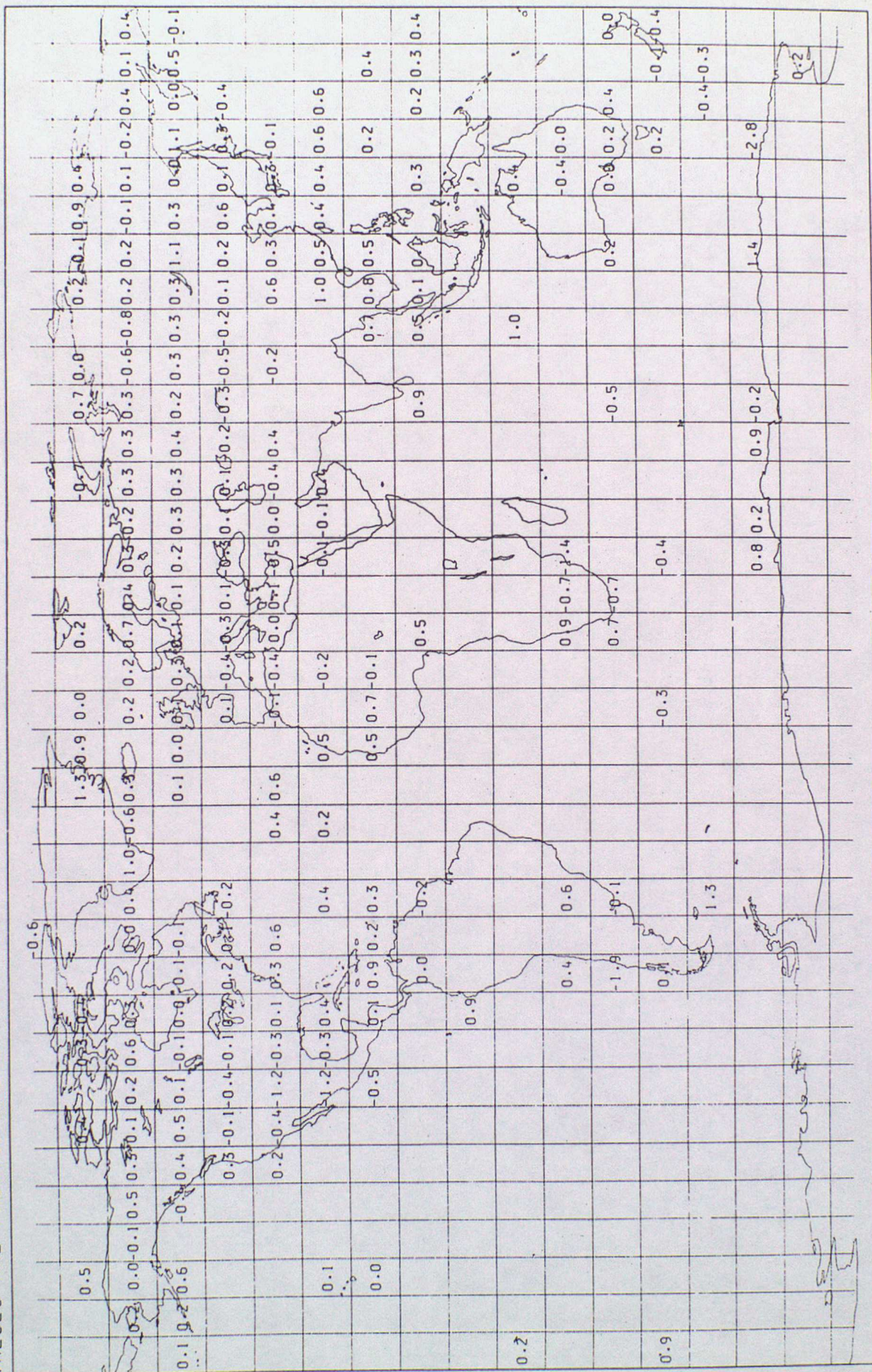
## FIGURE 7





SONDES : 0-8 TEMPERATURE DIFFERENCES (DEG C) 801 TO 1000 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 QUALITY CONTROL APPLIED  
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 8





SONDES : RMS 0-B TEMPERATURE DIFFERENCES (DEG C) 801 TO 1000 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 QUALITY CONTROL APPLIED  
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 9

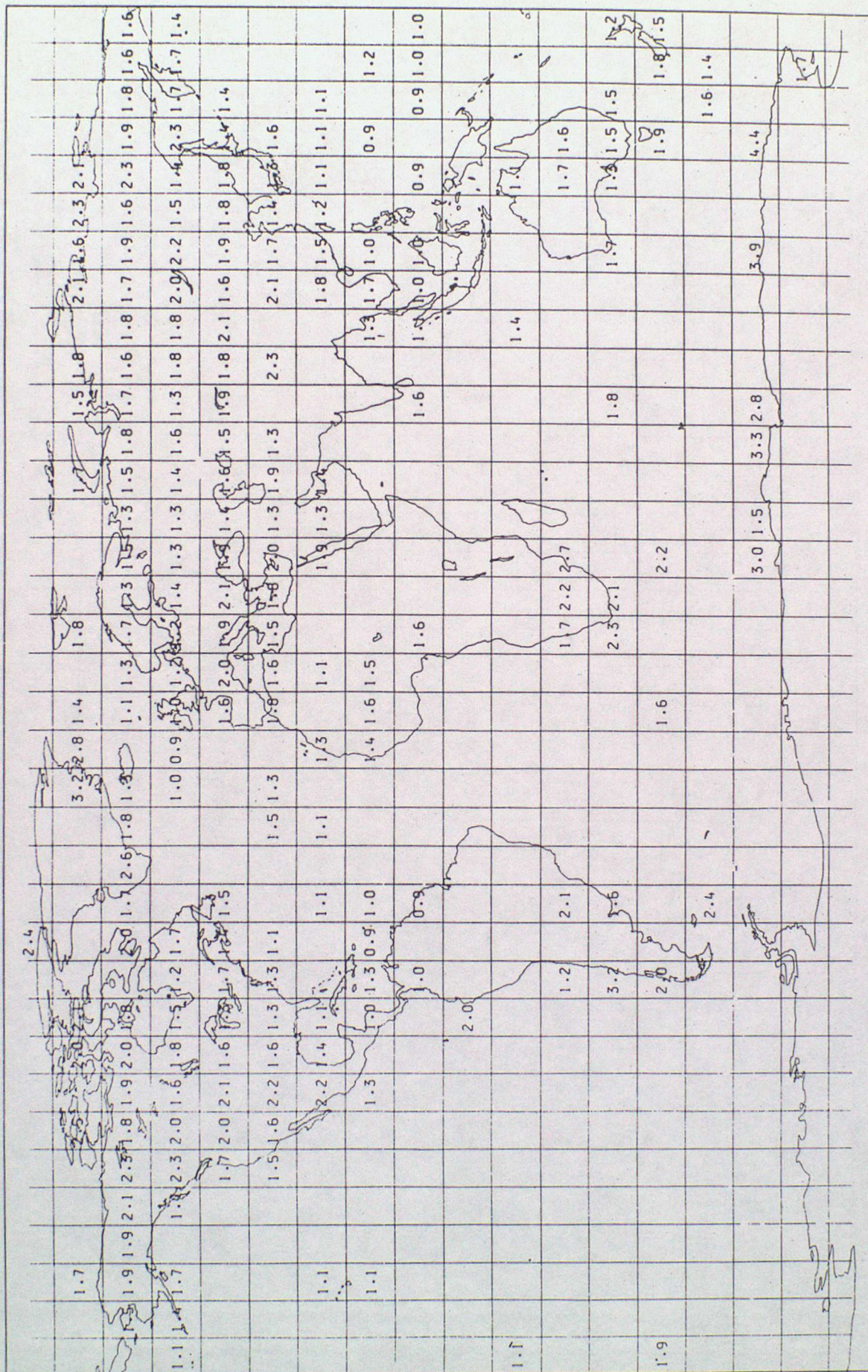
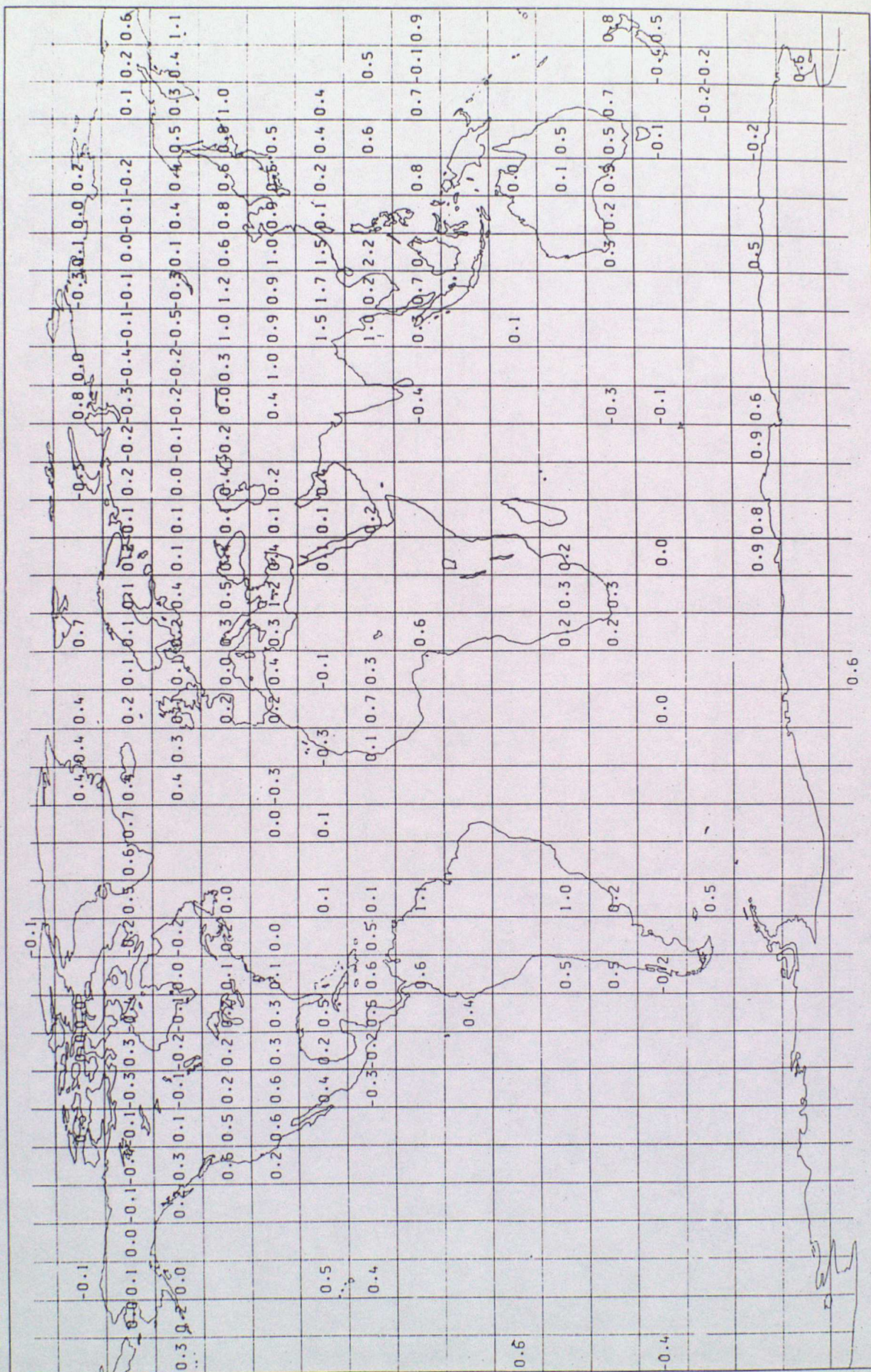




FIGURE 10





SONDES : RMS 0-B TEMPERATURE DIFFERENCES (DEG C) 101 TO 300 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 QUALITY CONTROL APPLIED  
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 11

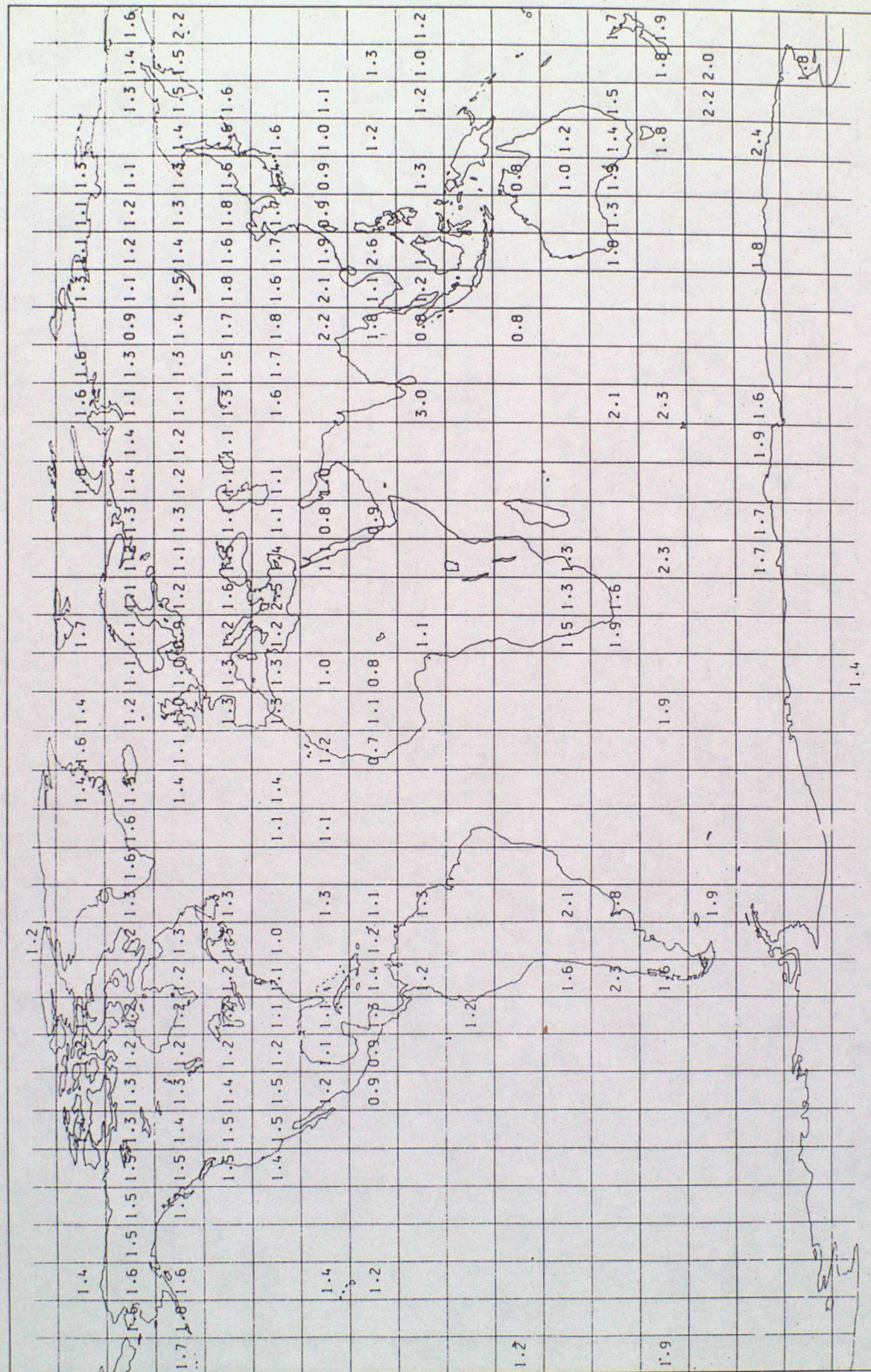








FIGURE 13

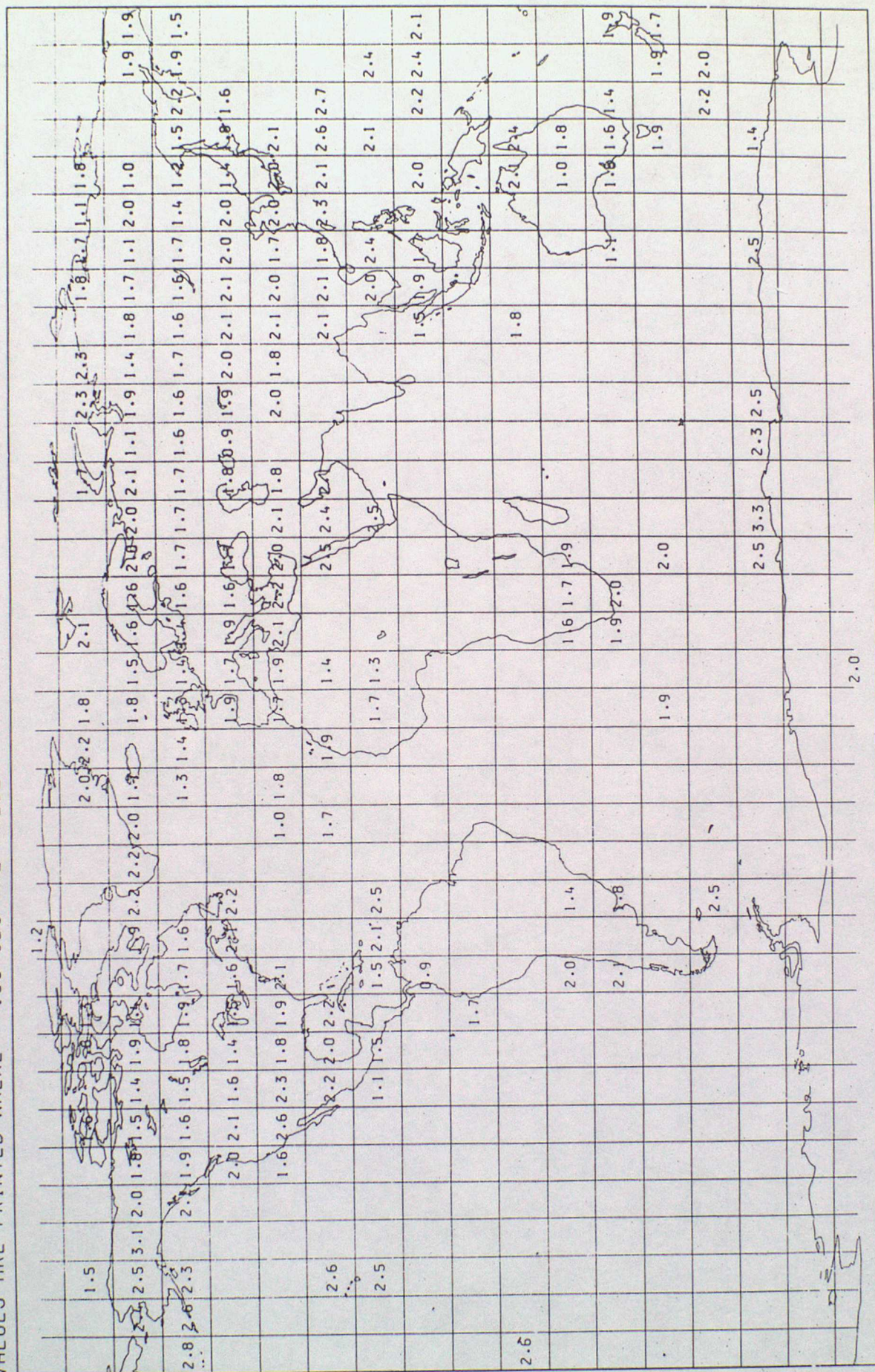
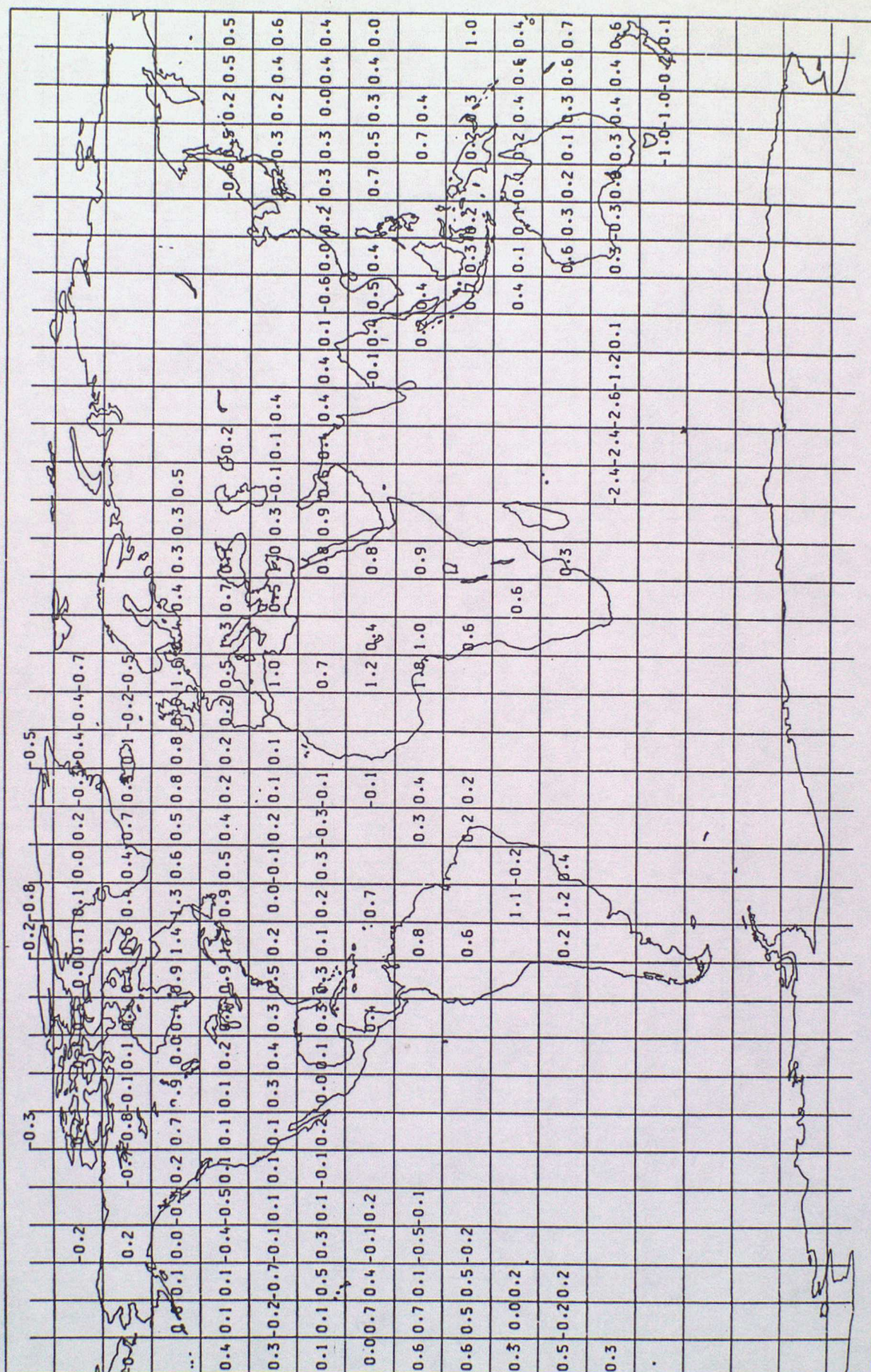




FIGURE 14

SEPTEMBER 1993 - NOVEMBER 1993. UNITS DEG C

OBSERVATIONS WITH 0-B > 10 DEG C EXCLUDED  
VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT





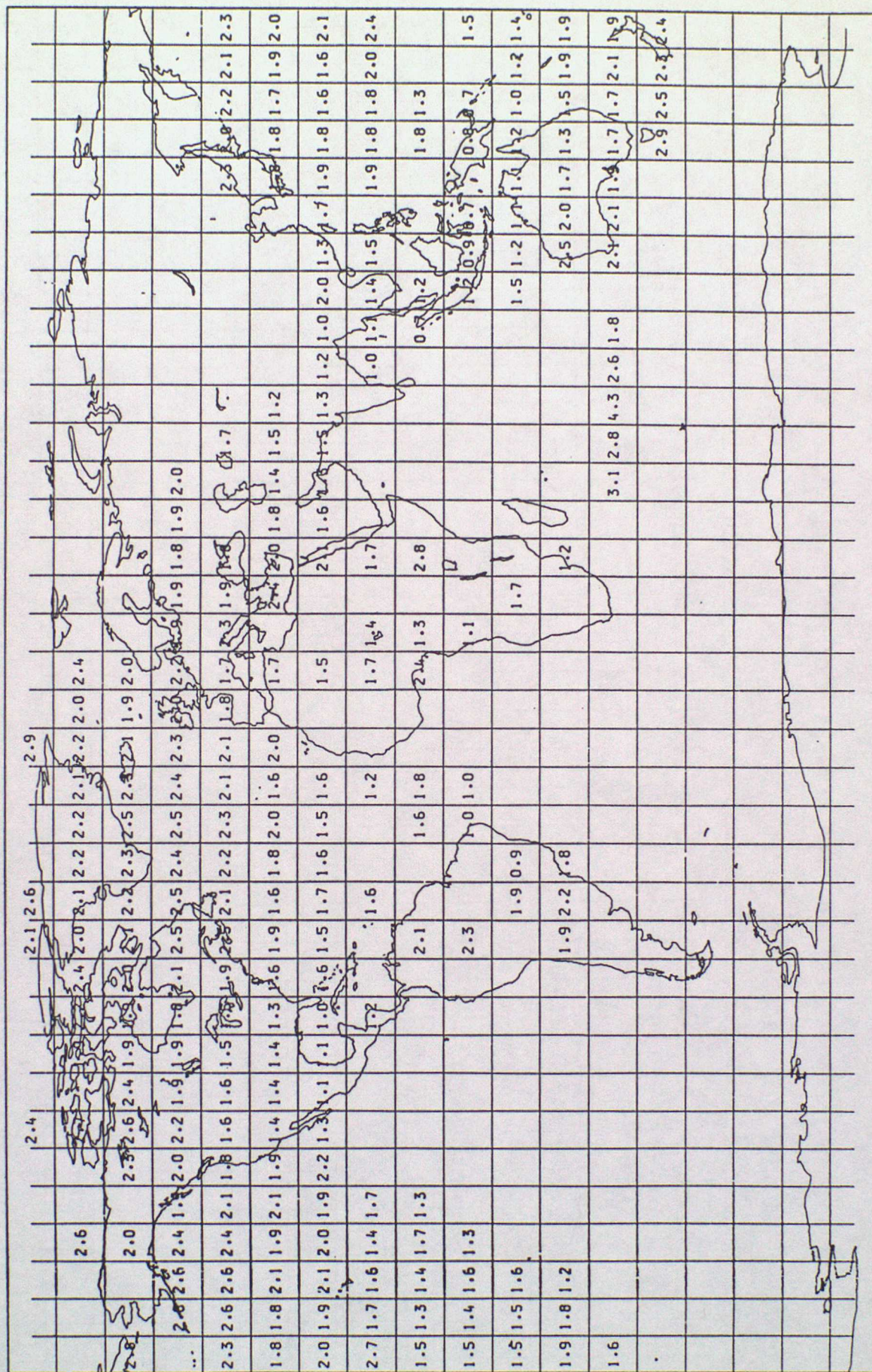
AIRCRAFT REPORTS: RMS O-B TEMPERATURES BETWEEN 101 AND 300 HPA

SEPTEMBER 1993 - NOVEMBER 1993. UNITS DEG C

OBSERVATIONS WITH O-B > 10 DEG C EXCLUDED

VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 15





LASS : MEAN 0-8 TEMPERATURE DIFFERENCES (DEG C) AT 850 HPA  
SEPTEMBER 1993 - NOVEMBER 1993  
OBSERVATIONS FROM NOAA-11 AND NOAA-12  
VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

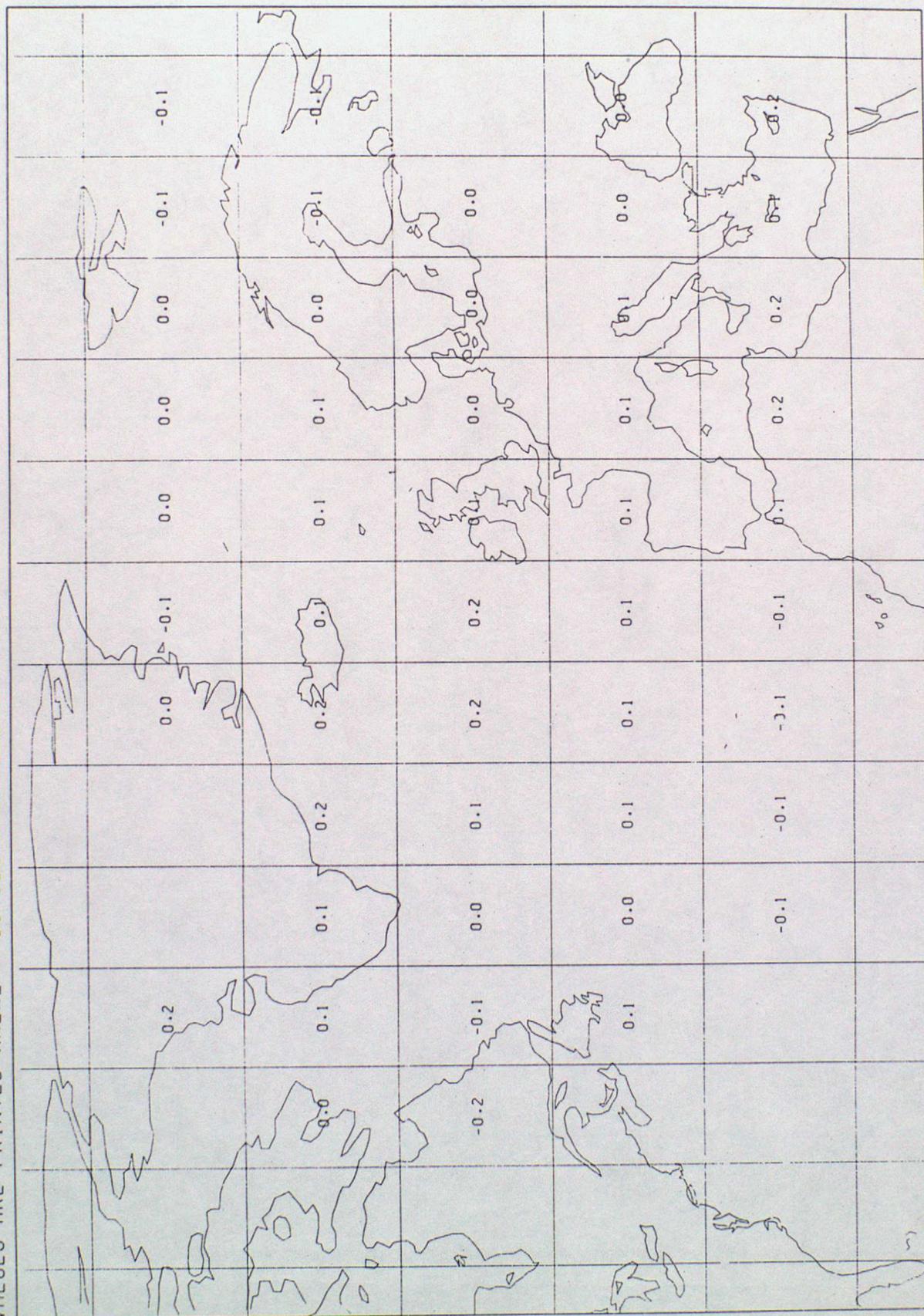
FIGURE 16





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

FIGURE 17





LASS : MEAN O-B TEMPERATURE DIFFERENCES (DEG C) 50 TO 30 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 OBSERVATIONS FROM NOAA-11 AND NOAA-12  
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

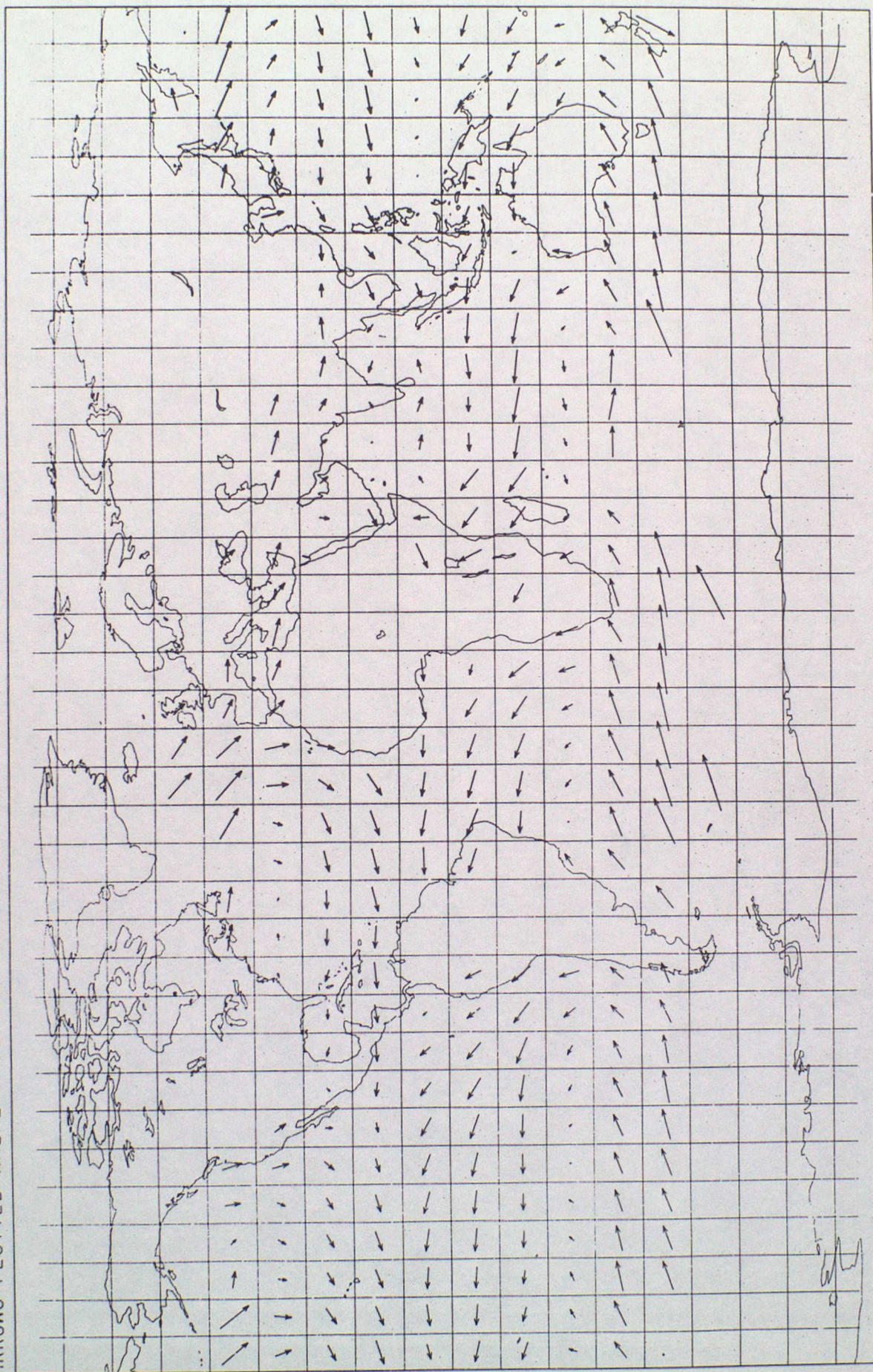
FIGURE 18





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

FIGURE 19

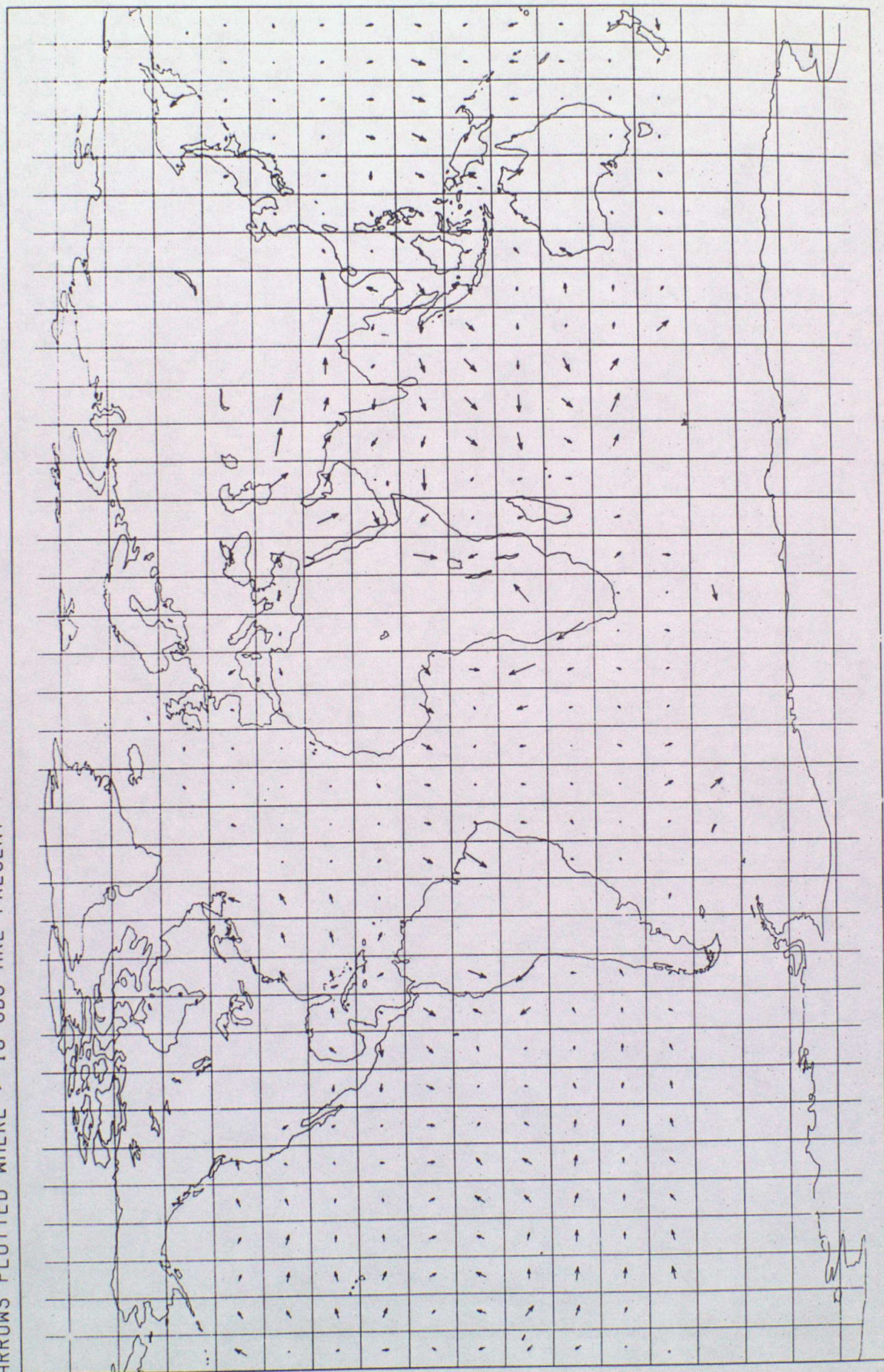


→ REPRESENTS 10 M/S



SATOB 0-B VECTOR WIND DIFFERENCES BETWEEN 701-1000 HPA  
SEPTEMBER 1993 - NOVEMBER 1993  
ALL OBSERVATIONS  
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

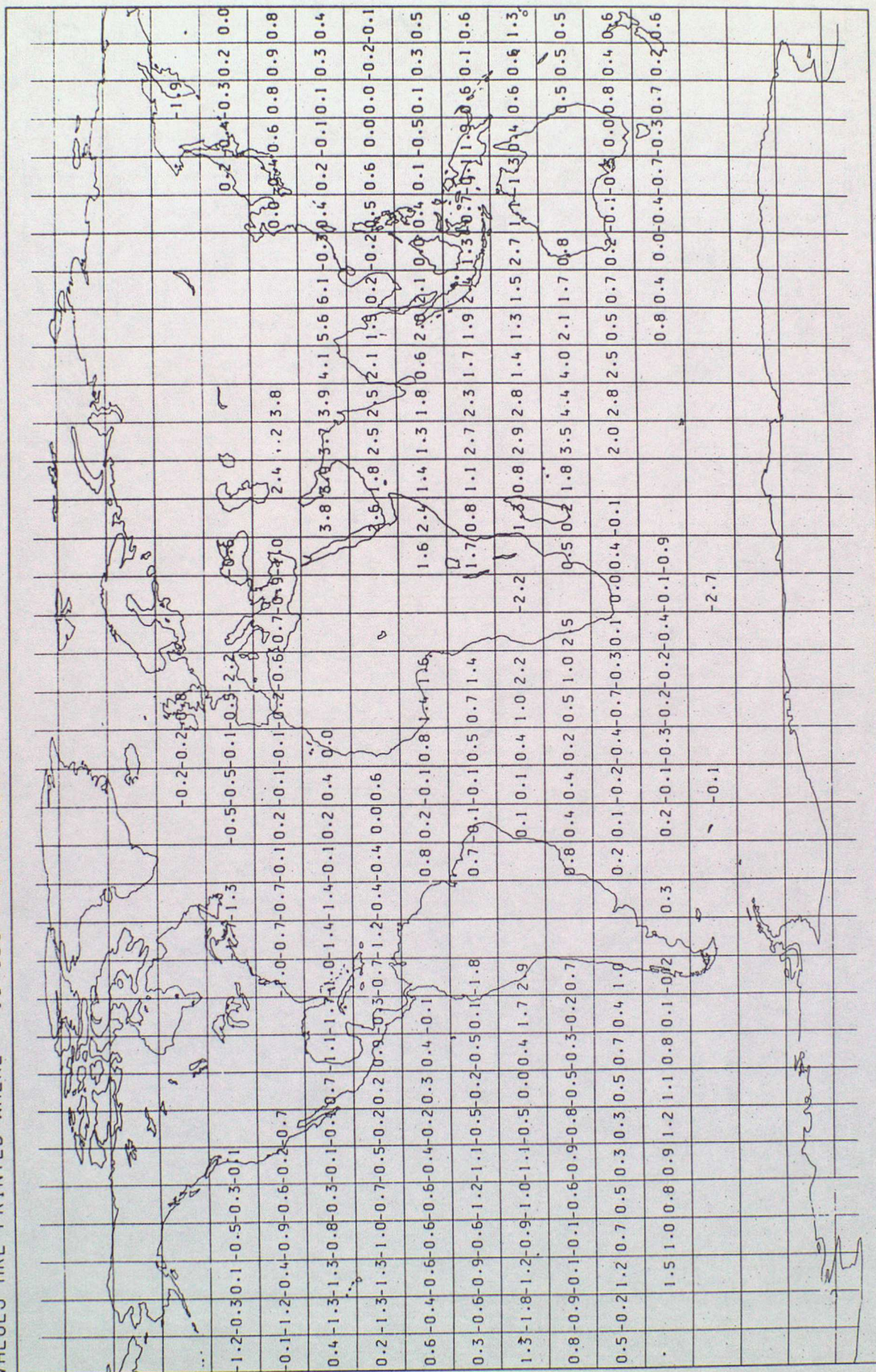
FIGURE 20





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

FIGURE 21







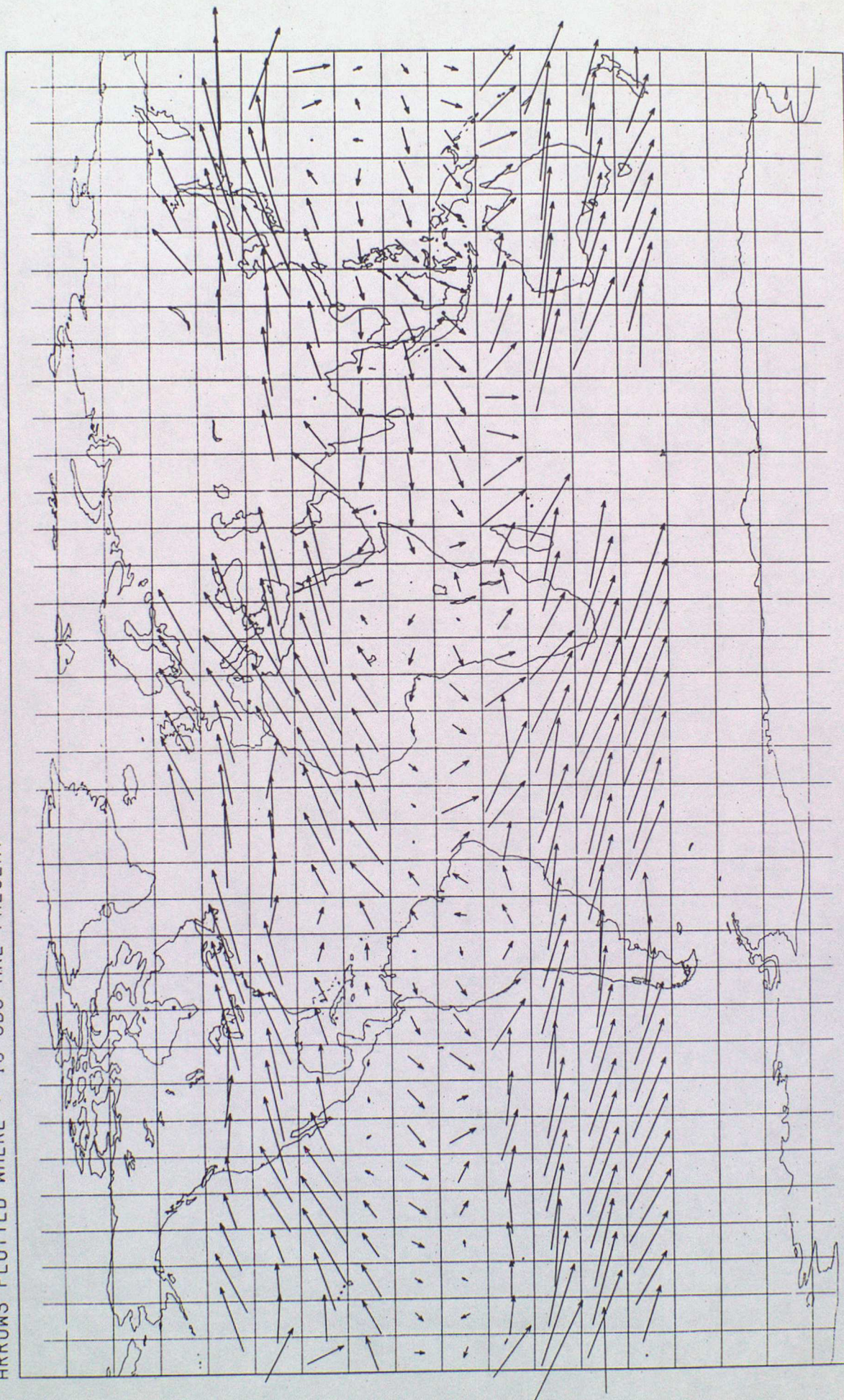






SATOB VECTOR MEAN WINDS BETWEEN 101-400 HPA  
SEPTEMBER 1993 - NOVEMBER 1993  
ALL OBSERVATIONS  
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

FIGURE 24

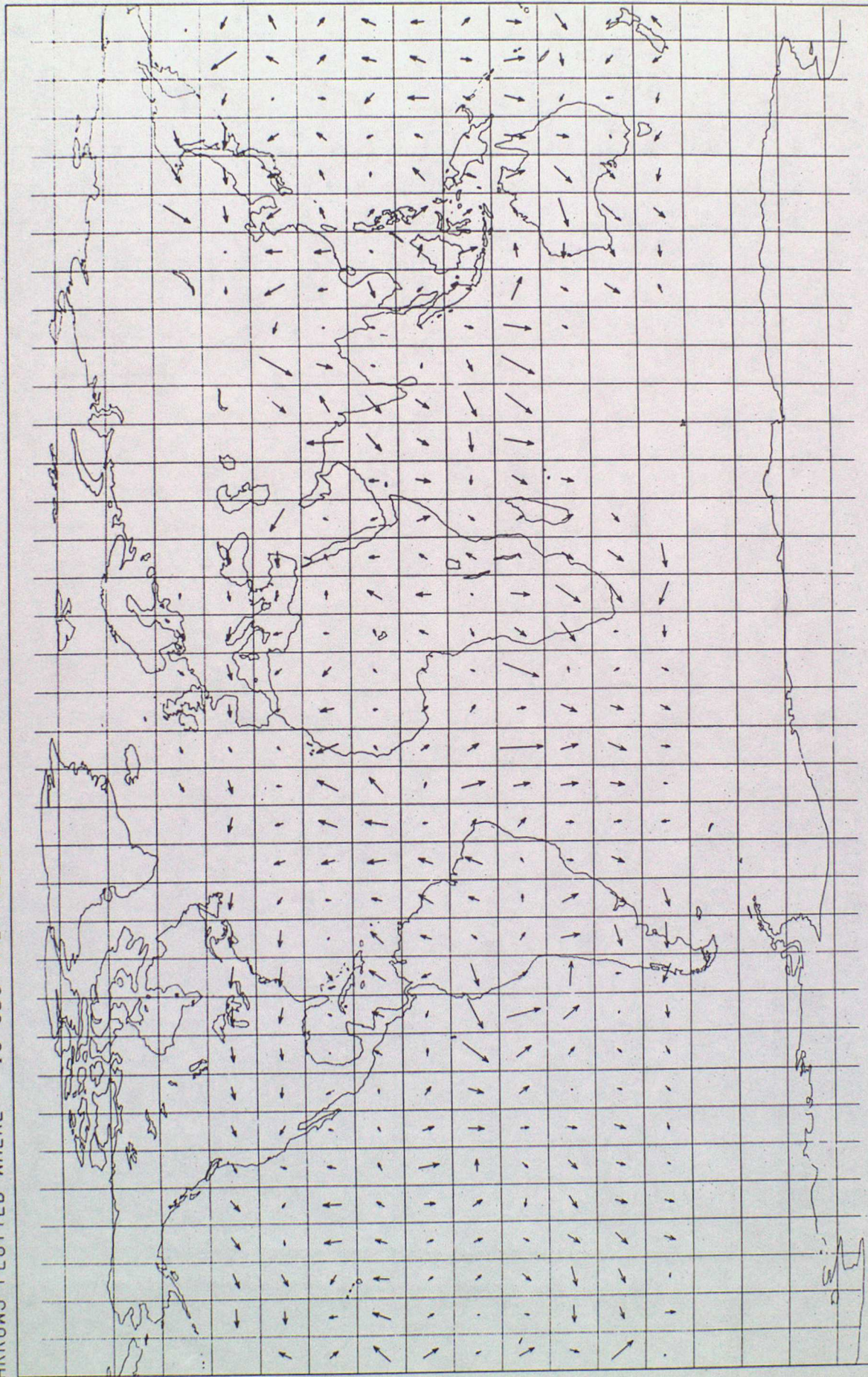


→ REPRESENTS 10 M/S



SATOB O-B VECTOR WIND DIFFERENCES BETWEEN 101-400 HPA  
SEPTEMBER 1993 - NOVEMBER 1993  
ALL OBSERVATIONS  
ARROWS PLOTTED WHERE > 10 OBS ARE PRESENT

FIGURE 25

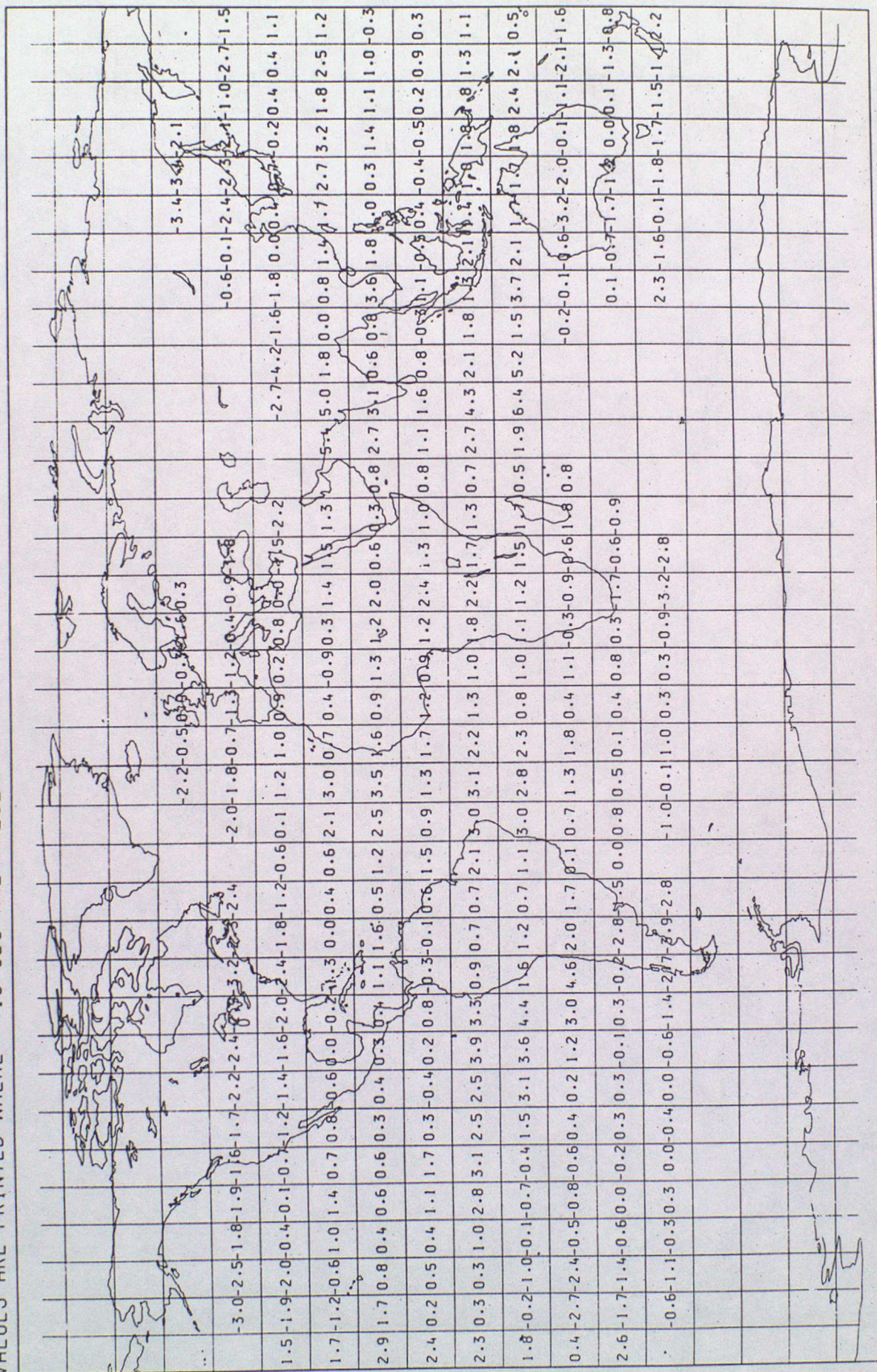


→ REPRESENTS 5 M/S



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

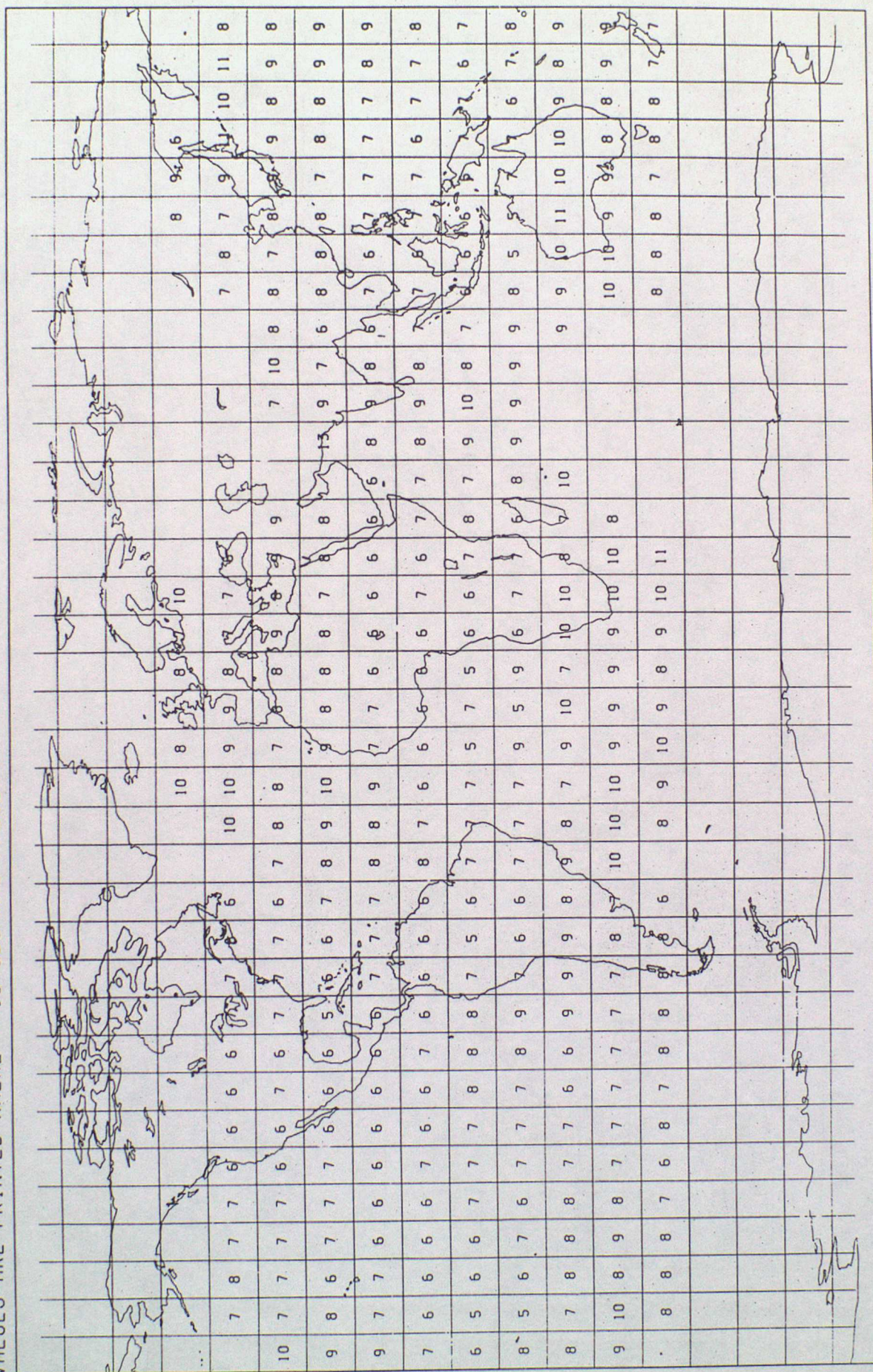
FIGURE 26





SATOB5 : RMS 0-B VECTOR DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 USING ALL OBSERVATIONS  
 VALUES ARE PRINTED WHERE > 10 OBS ARE PRESENT

FIGURE 27



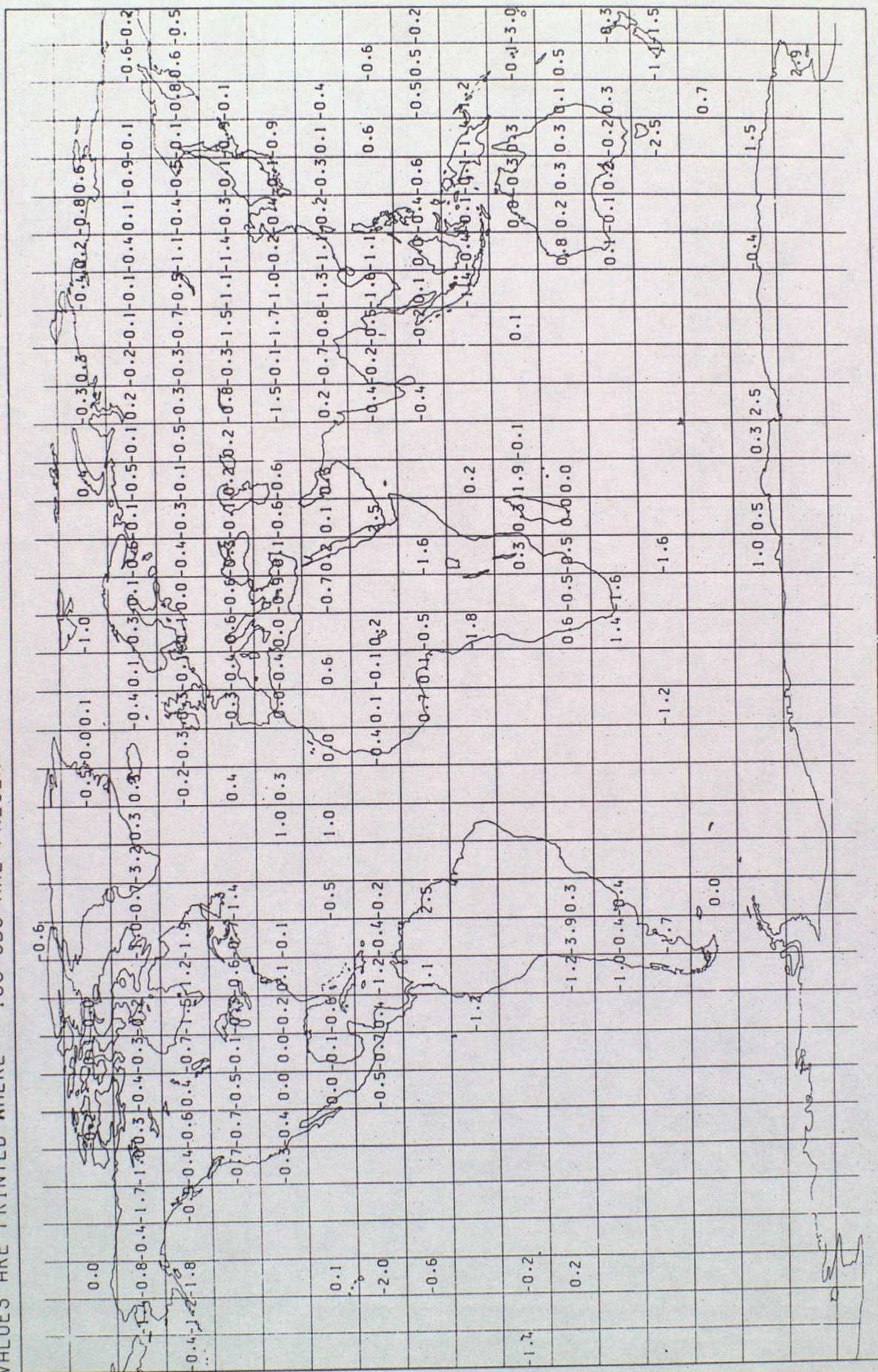






SONDES : 0-B SPEED DIFFERENCES (M/S) BETWEEN 701 AND 1000 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 QUALITY CONTROL APPLIED  
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT

FIGURE 29





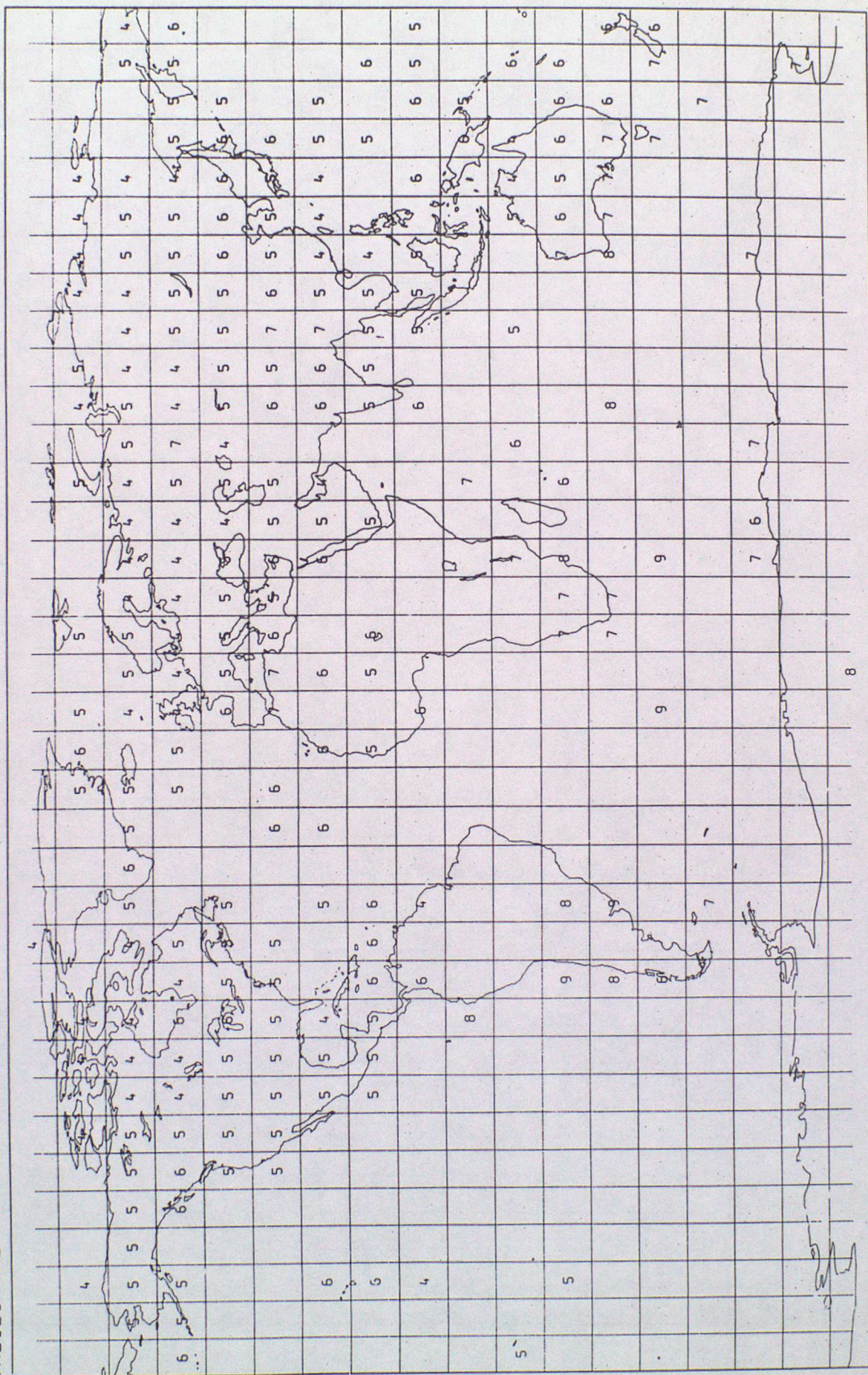








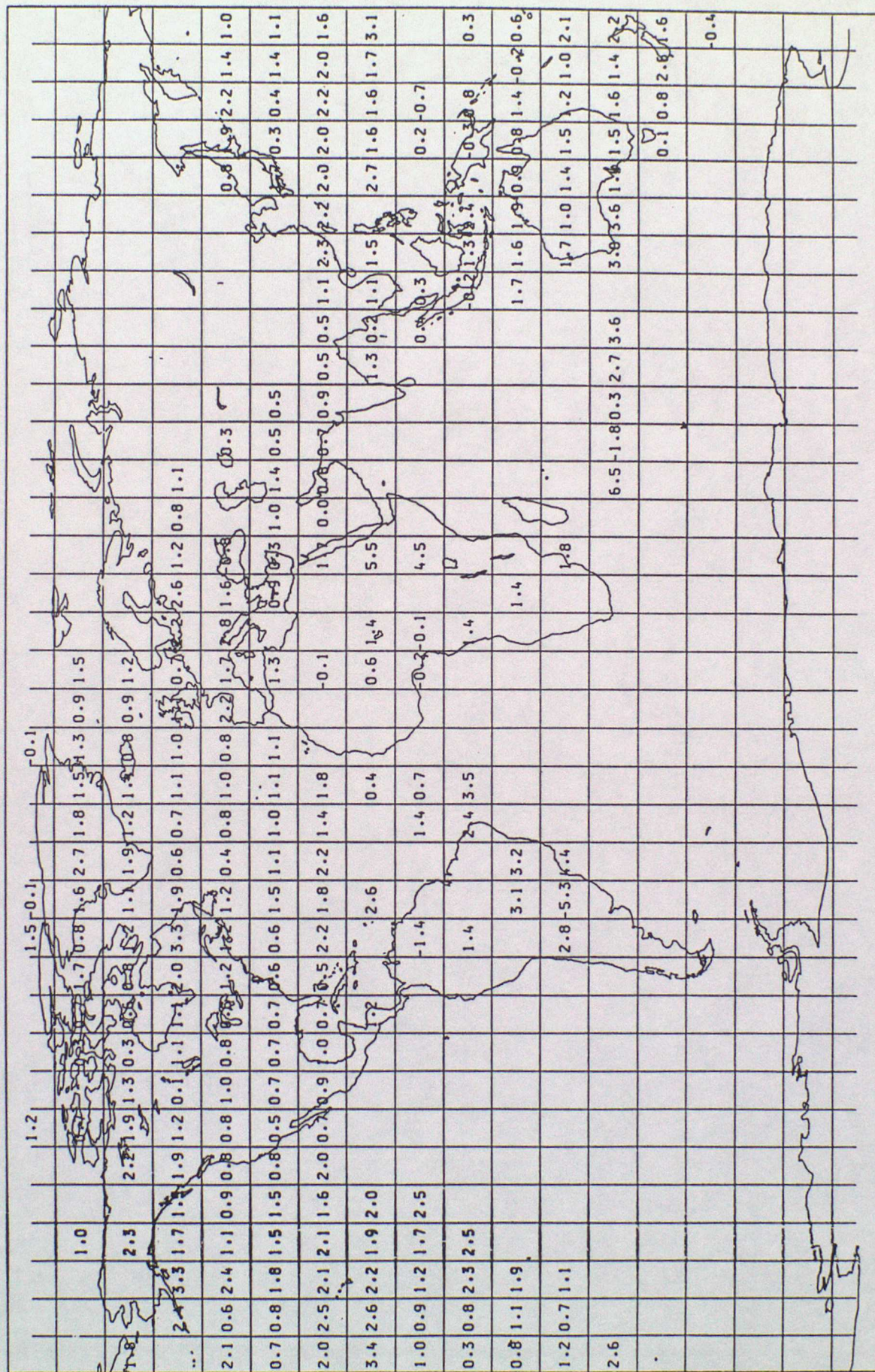
SONDES : RMS 0-8 VECTOR WIND DIFFERENCES (M/S) BETWEEN 101 AND 400 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 QUALITY CONTROL APPLIED  
 VALUES ARE PRINTED WHERE > 100 OBS ARE PRESENT





AIRCRAFT REPORTS: MEAN O-B SPEEDS (M/S) BETWEEN 101 AND 400 HPA  
 SEPTEMBER 1993 - NOVEMBER 1993  
 OBSERVATIONS WITH RMSVM DIFFERENCE > 60 MPS EXCLUDED  
 VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 33





VALUES ARE PRINTED WHERE > 30 OBS ARE PRESENT

FIGURE 34

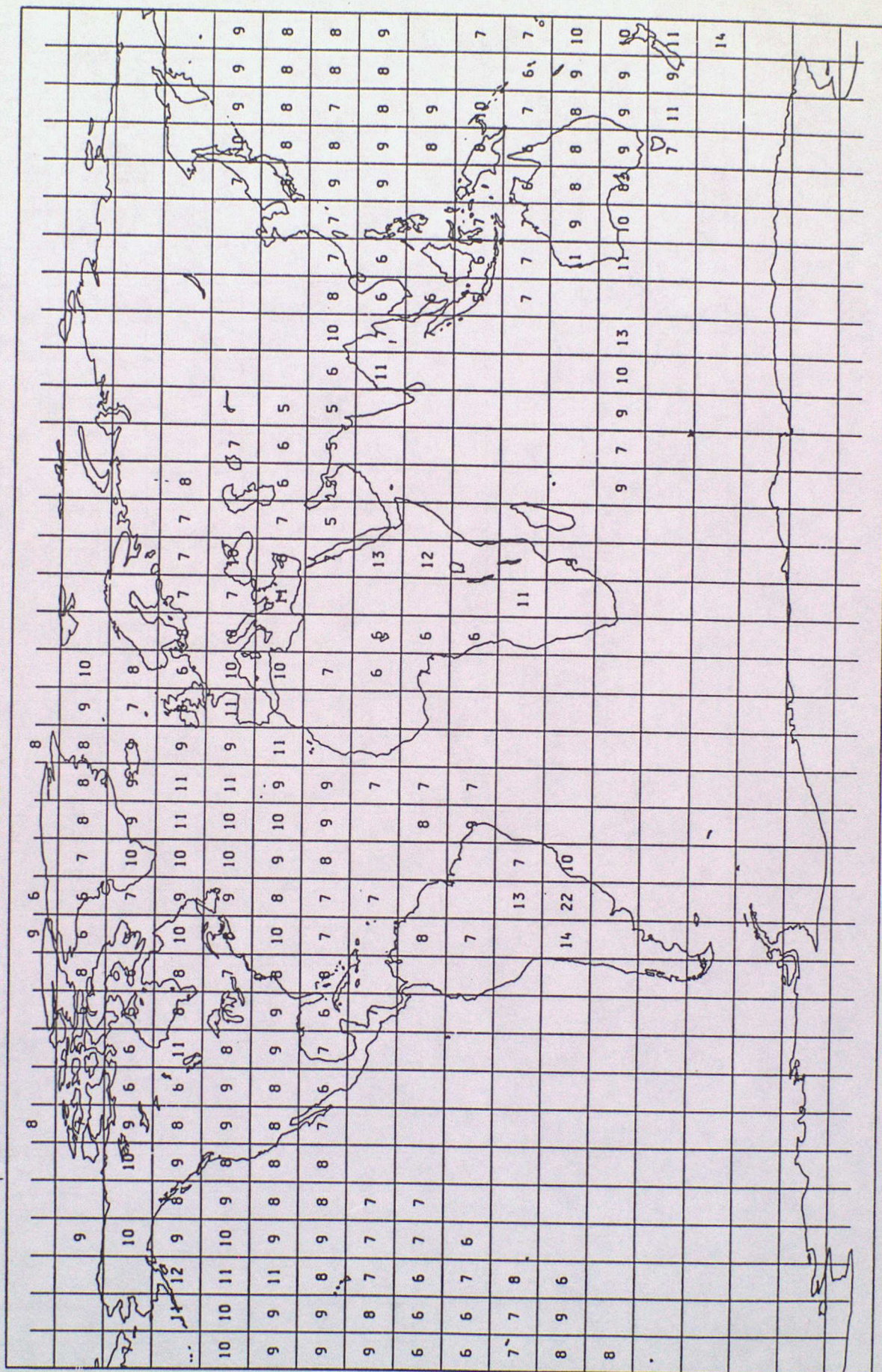




FIGURE 35

