MONITORING THE BASELINE UPPER AIR NETWORK (BUAN)

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1. INTRODUCTION

During the feasibility study to be undertaken in 1988 all the stations in the Baseline Upper Air Network (BUAN) (for further information see the preceding paper on the BUAN by J. Neilon in these proceedings) are expected to provide with a high reliability upper-air soundings which are expected to be of good quality and to reach high into the atmosphere. The target there is to reach the 10 hPa level at least 60 per cent of the time.

The geographical coverage and the previously recorded reliability of the data had been taken into account when the stations in the BUAN were selected (see Table 1 in paper by J. Neilon). In order to update this information, new monitoring statistics were produced for the stations in the BUAN and the results are summarised below. It should be noted that these statistics are for the month of November 1987 before the actual start of the feasibility study. It is therefore possible that the average performance of the BUAN, but in particular the performance at individual stations, may change during the period of the feasibility study.

2. DATA AVAILABILITY

Table 1 summarises the availability of geopotential height observations for the complete BUAN at four standard pressure levels. For comparison, the figures for the average of three well performing European national radiosonde networks during November 1987 are also shown. The lack of data in the BUAN is obvious especially at stratospheric levels, although even over Europe the availability falls off rapidly above 50 hPa. It should further be noted that from 4 out of the 84 stations in the BUAN no observations were received at ECMWF. This may be a data transmission problem or it may reflect the fact that the observations were not made.

	500 hPa	100 hPa	50 hPa	10 hPa
B U A N	74	68	57	16
3 European Networks	99	98	94	16

Table 1: Availability (in per cent) of geopotential height observations at four standard atmospheric levels, November 1987

3. DATA QUALITY

For the evaluation of the quality of the reported height observations, the data was compared with the ECMWF first-guess (6-hour forecast) at three standard pressure levels, 500, 100 and 50 hPa. Monthly averages of the mean differences (bias) and the RMS differences were computed for 00 and 12 UTC and presented as timegraphs for the 13 months from November 1986 to November 1987. Examples of the bias and the RMS differences are shown in Figs. 1 and 2 for a well performing station 02963 (Jokioinen, Finland). The bias in the troposphere (500 hPa) is small and remains at an acceptable level in the stratosphere. Also the random deviations from the first-guess which are reflected in the RMS differences, in addition to the biases, are small. Obviously the mean and RMS differences between the observations and the first-guess will depend on many components, such as the representativeness of the observations, instruments, ground equipment and procedures, but also the quality of the first-guess (for further comments see the paper by A. Radford in these proceedings).

The results, as demonstrated in Figs. 1 and 2 were studied carefully for all the stations in the BUAN. It is obvious that for the selection of the stations the quality criterion was taken into account. The performance of the BUAN as measured by comparing it with the ECMWF first-guess is above the average of the global radiosonde network.

However, several stations exhibit the typical problems encountered with many soundings in the global network:

(i) irregular reporting practice as depicted at station 98327 (Clark A.B., USA), Fig. 3;

(ii) large day and night biases as depicted at station 70308 (St. Paul, USA), Fig. 4;

(iii) large random deviation from the first-guess in addition to the bias as depicted at station 58457 (Hangzhou, China), Fig. 5. At 50 hPa the RMS differences occasionally exceed 100 m and leave the scale of the graph;

(iv) erratic behaviour, shown by irregular monthly reception rates, monthly variability in the biases and large RMS differences as demonstrated with station 61967 (Diego Garcia, USA), Fig. 6;

(v) trends in the station characteristics, which could be caused by new instrumentation, changes in the ground procedures, etc. Station 68994 (Marion Island, South Africa), Fig. 7, may serve as an example. To some extent the trend could be caused by model changes affecting the first-guess. This needs to be monitored carefully by comparison of the results with neighbouring stations.

4. CONCLUDING REMARKS

Observations from the BUAN are expected to serve as a reference for the calibration of the satellite retrievals. Good quality data is therefore of paramount importance. Regular monitoring of the BUAN and the feedback of the results to the users, NESDIS in particular, should help to improve the network and secure that best use can be made of the observations.

5. REFERENCES

Neilon, J.R. Baseline Upper Air Network (BUAN) Feasibility Study. ECMWF/WMO Workshop on Radiosonde Quality and Monitoring (1987)

Radford, A.M. ECMWF Radiosonde Monitoring Results ECMWF/WMO Workshop on Radiosonde Quality and Monitoring (1987)

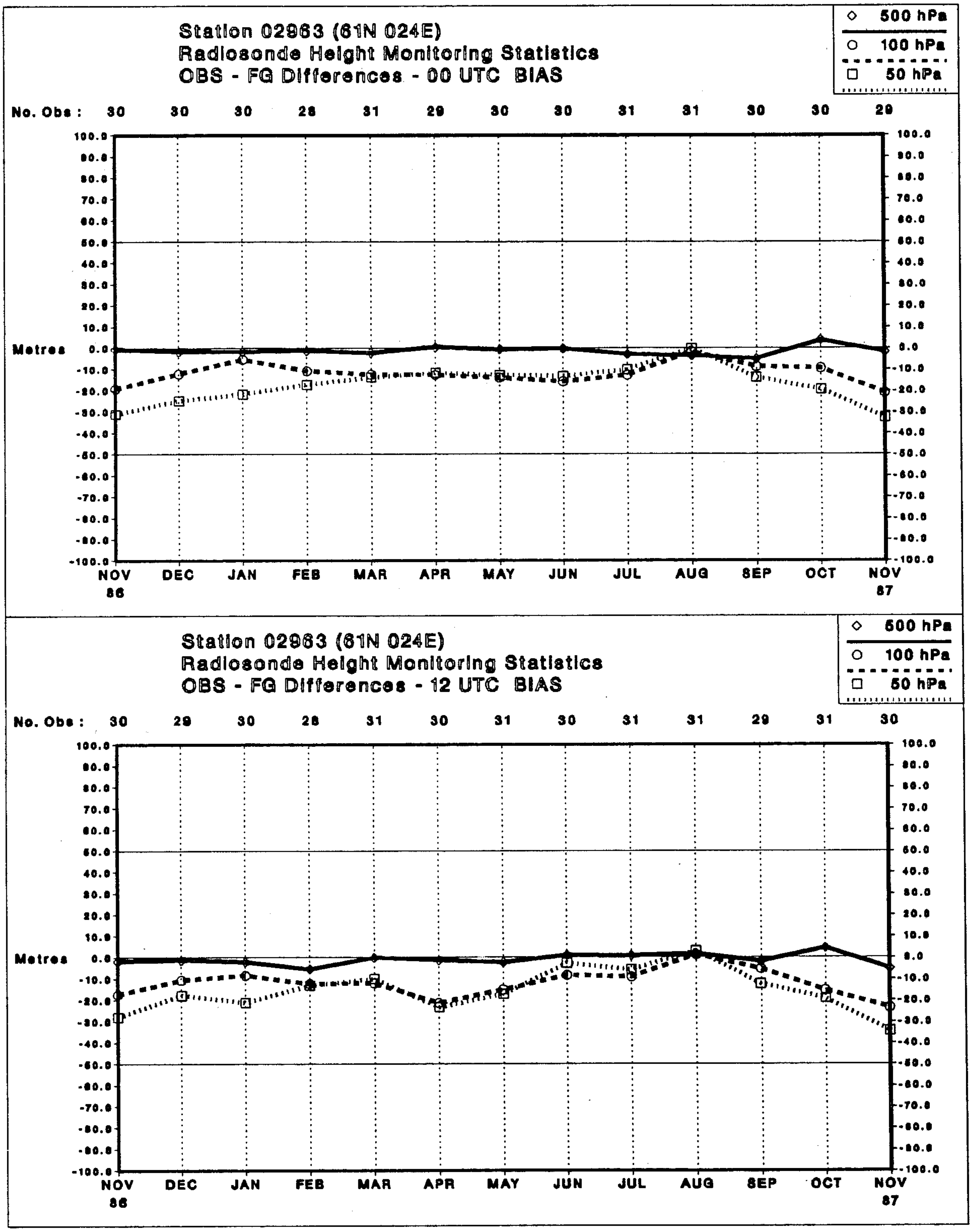
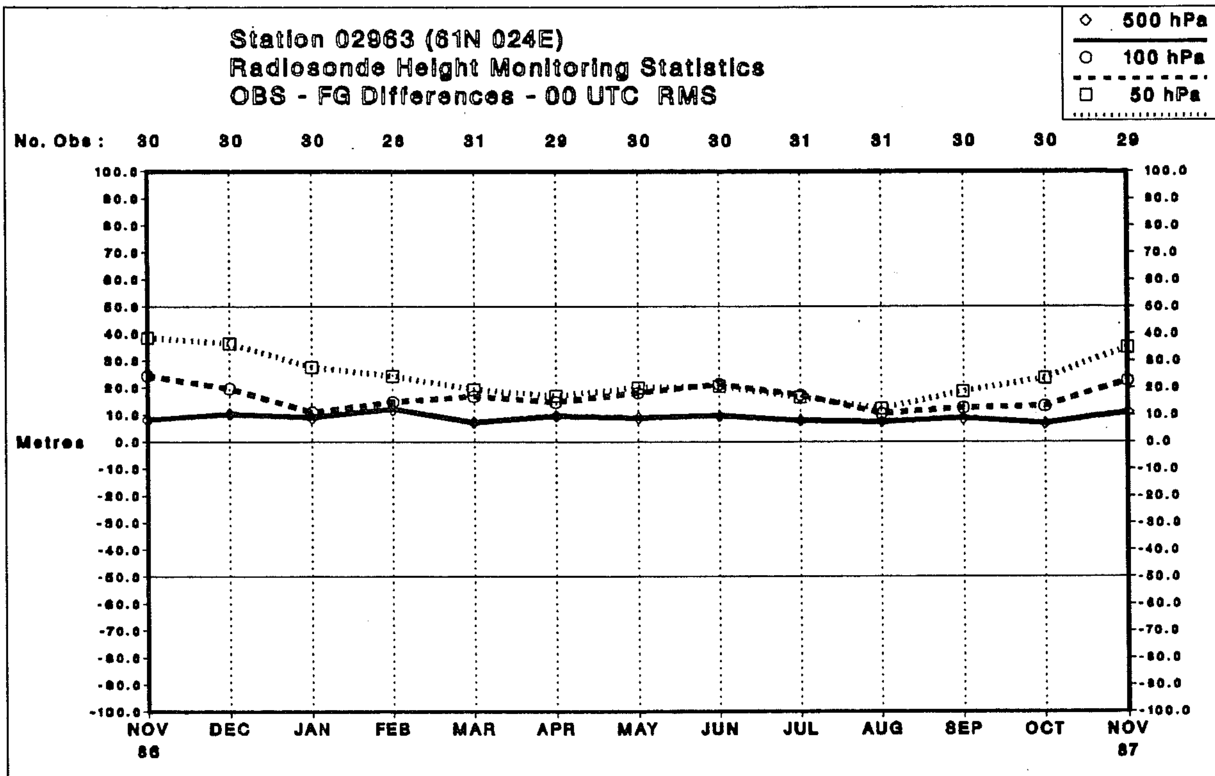


Fig. 1 Monthly mean height differences between the observations at Jokioinen Finland and the ECMWF 6-hour forecast (first guess), at 500, 100, 50 hPa, period November 1986 to November 1987, 00 UTC (top), 12 UTC (bottom)



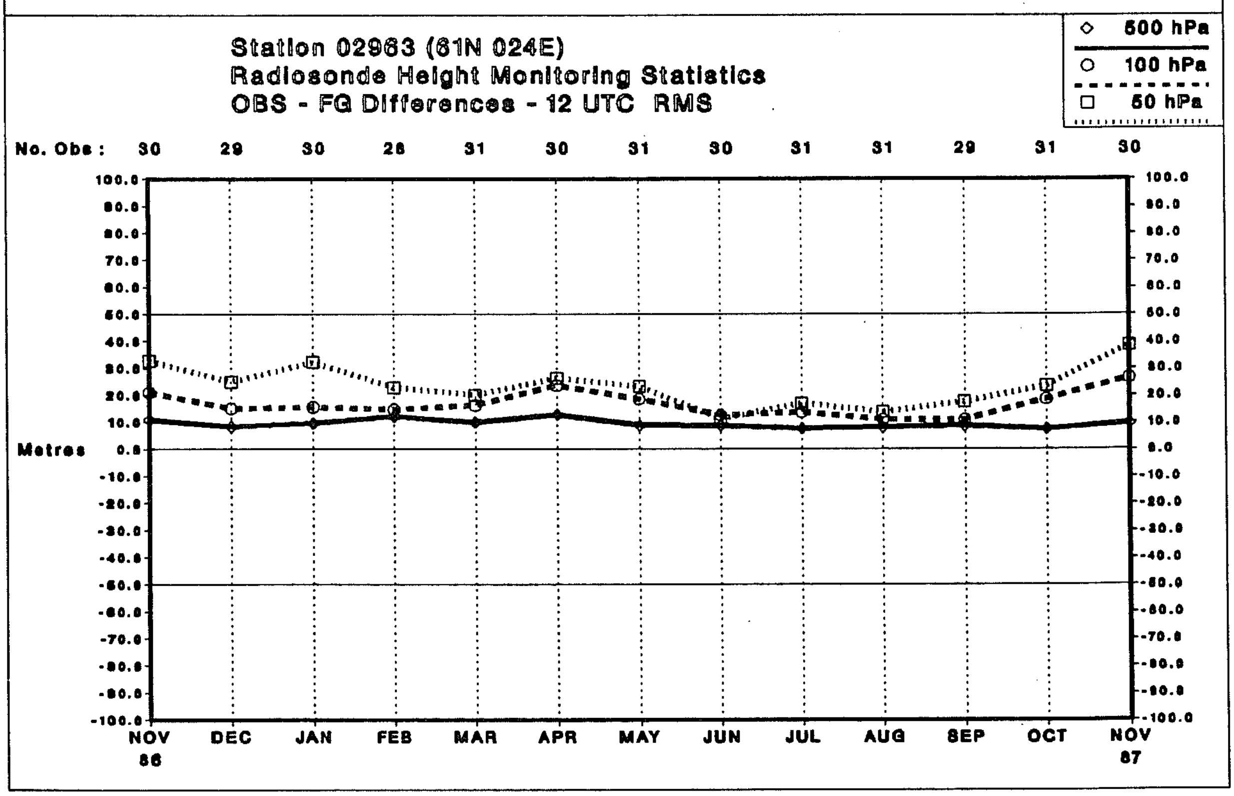
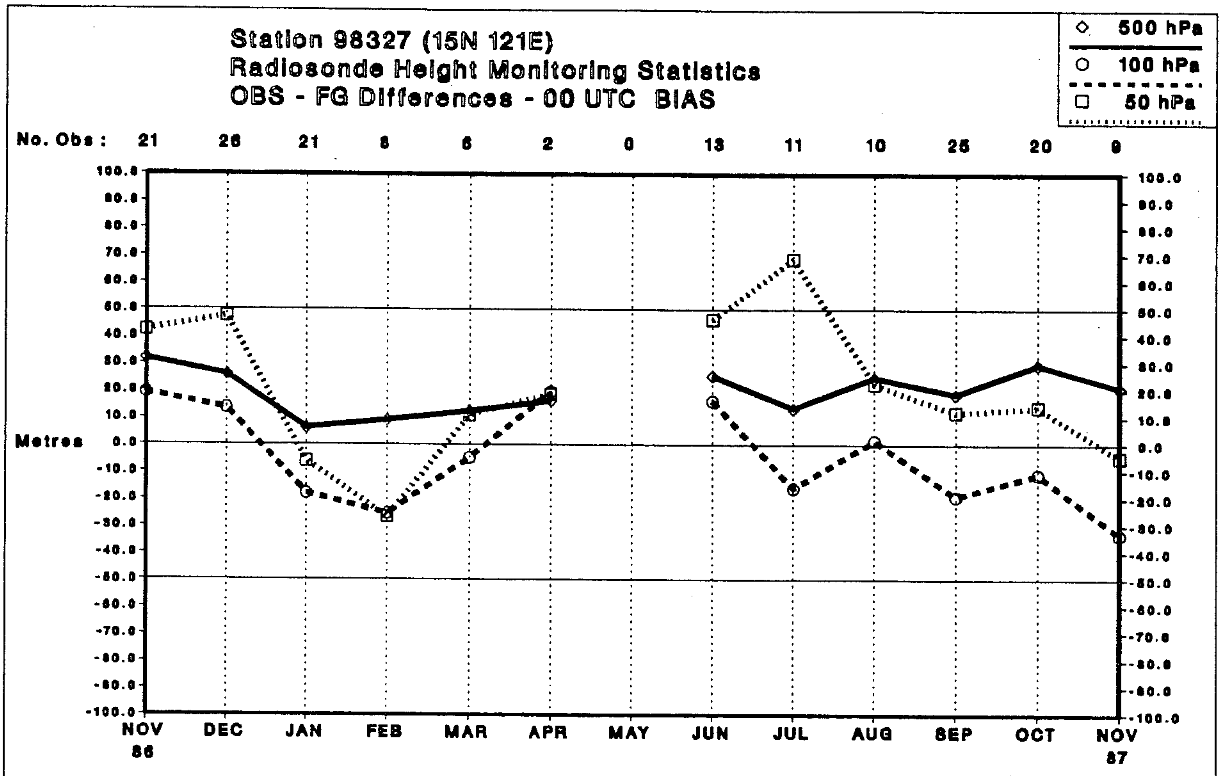


Fig. 2 As Fig. 1 but for the rms differences



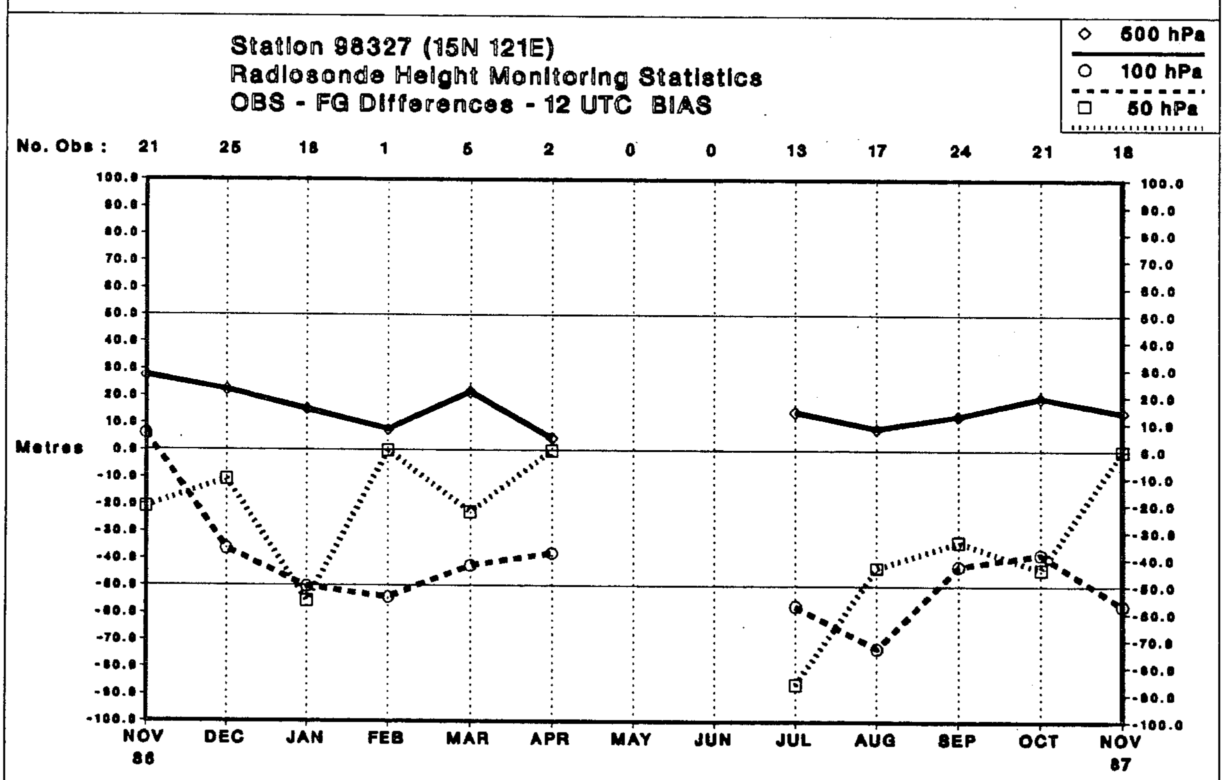
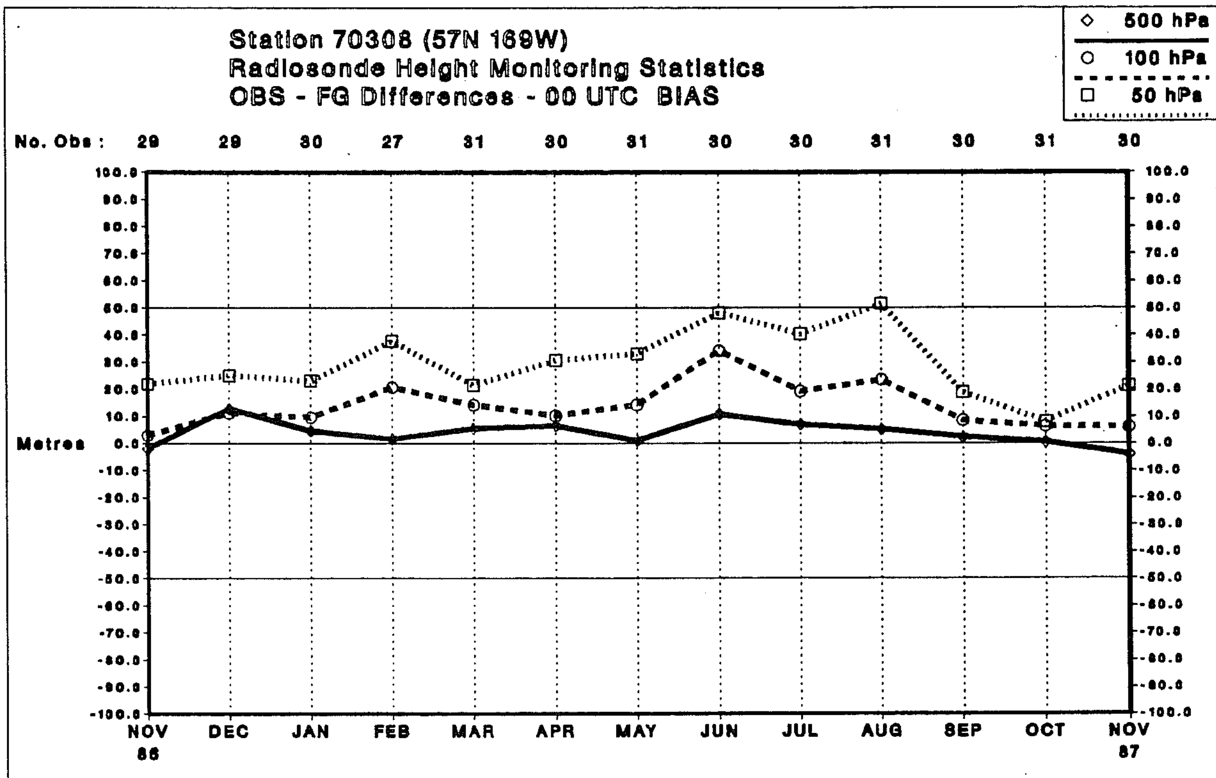


Fig. 3 As Fig. 1 but for Clark A.B., USA



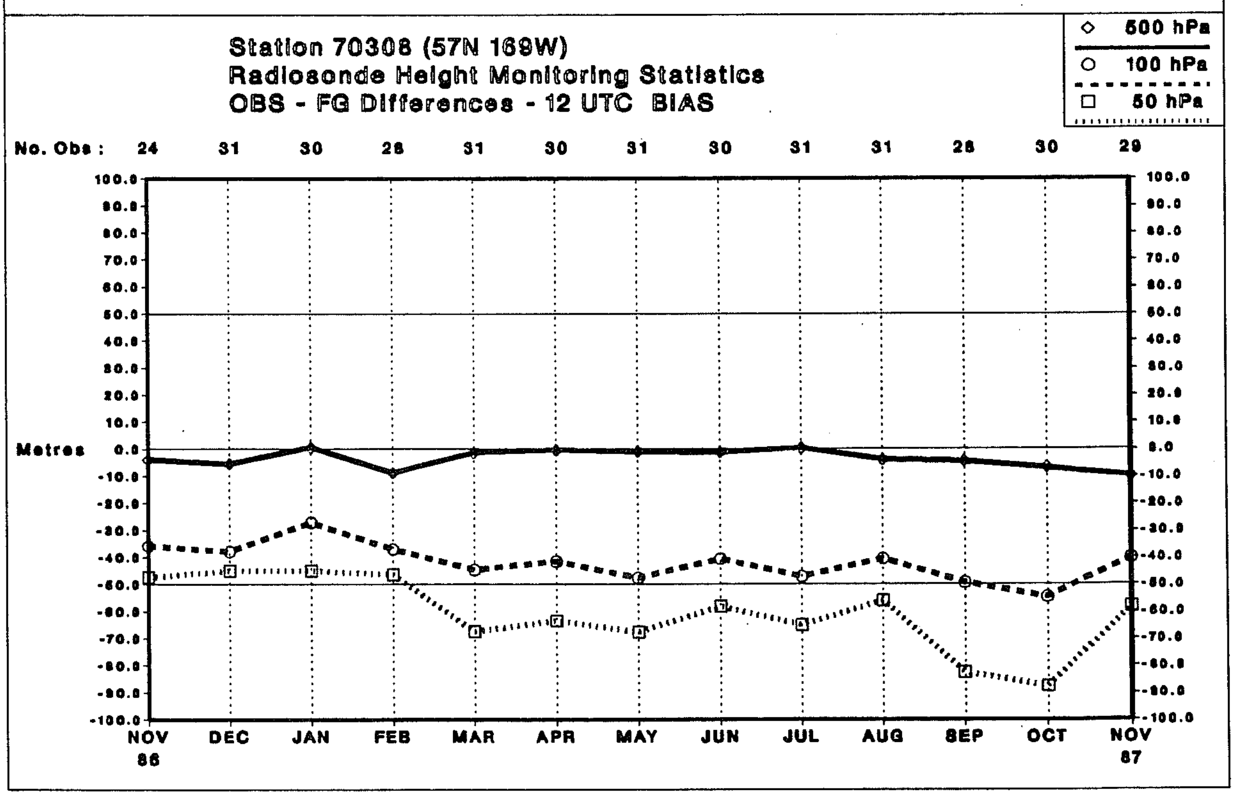


Fig. 4 As Fig. 1 but for St. Paul, USA

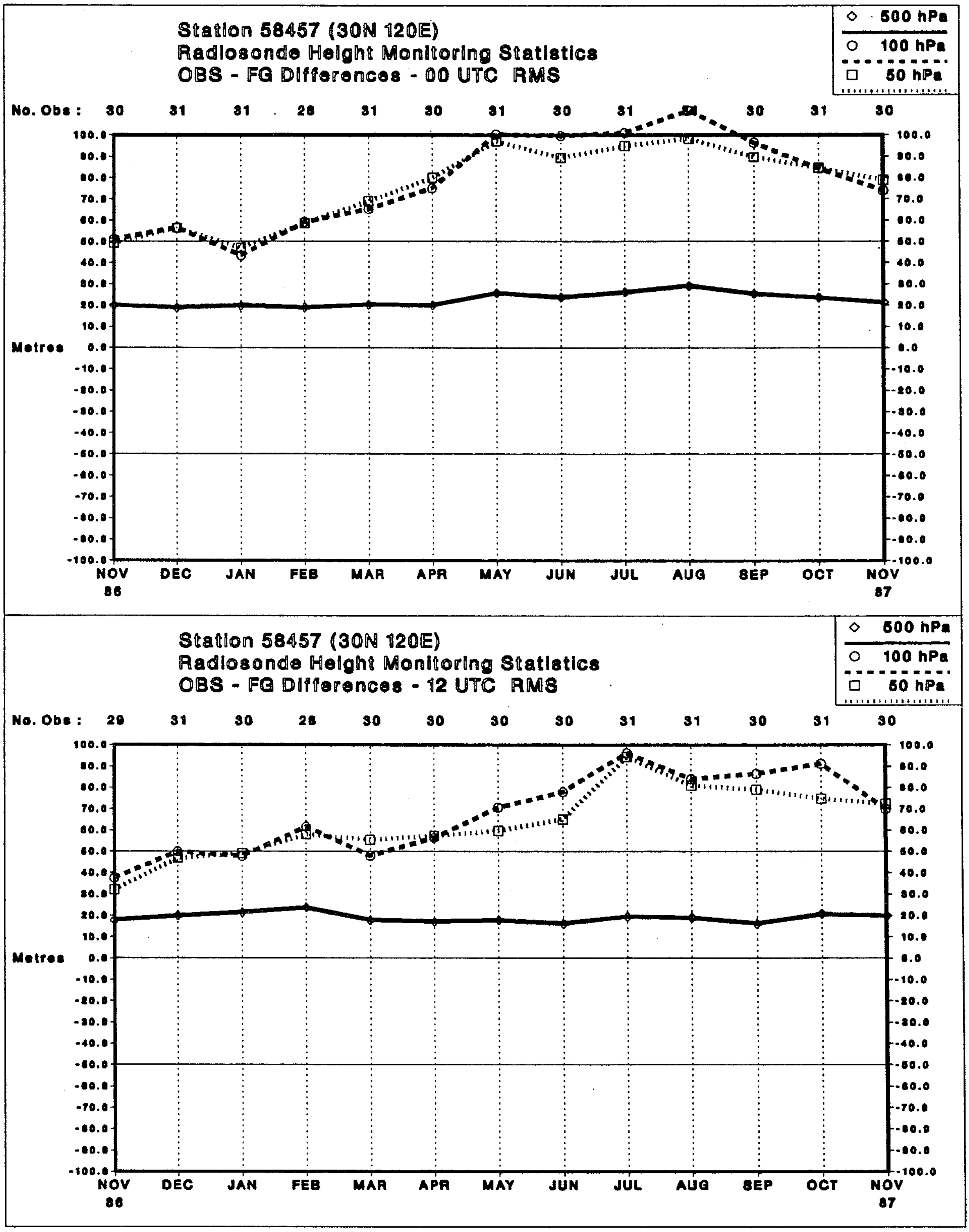
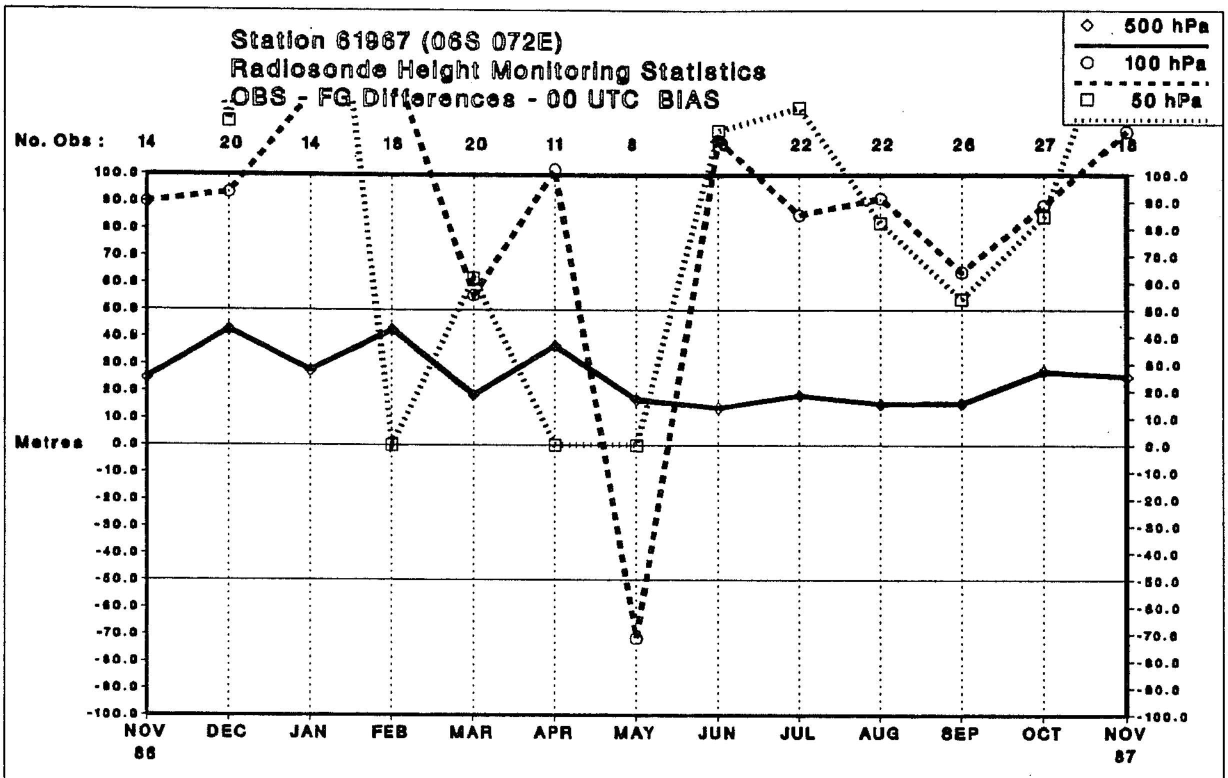


Fig. 5 As Fig. 2 but for Hangzhou, China



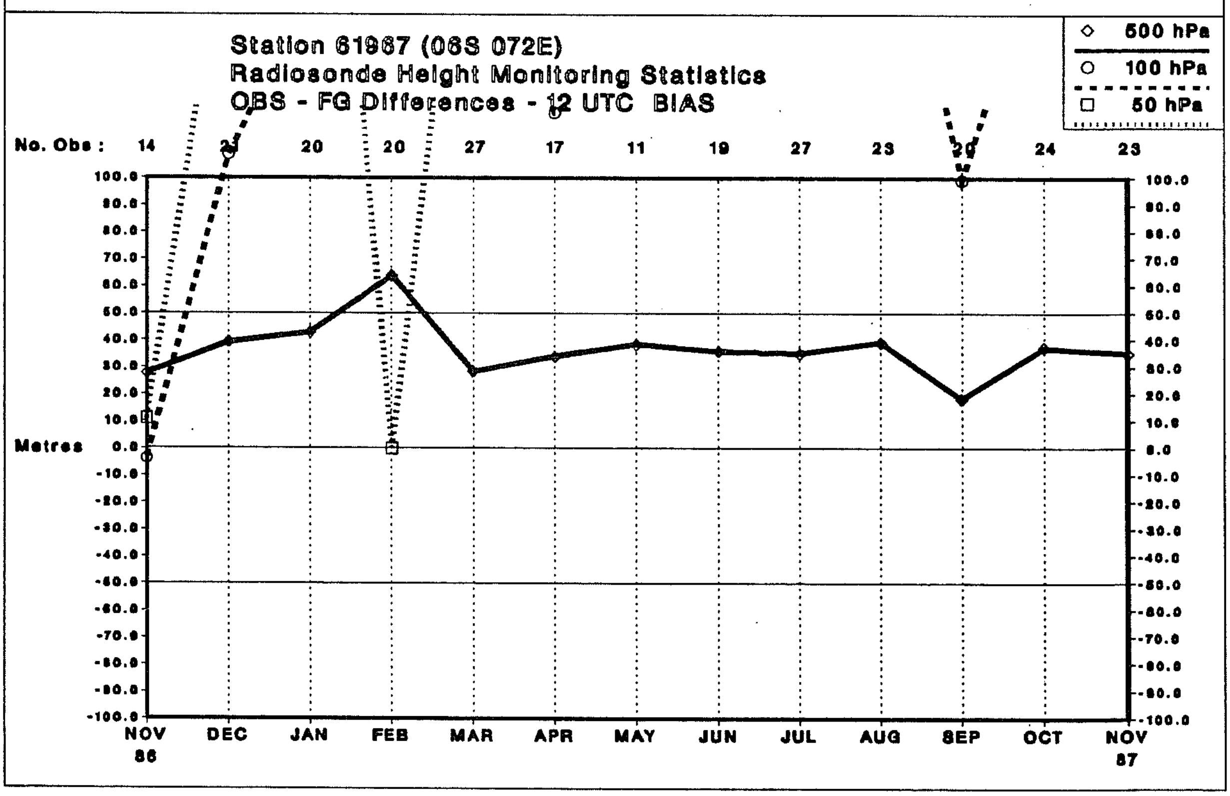


Fig. 6 As Fig. 1 but for Diego Garcia, USA

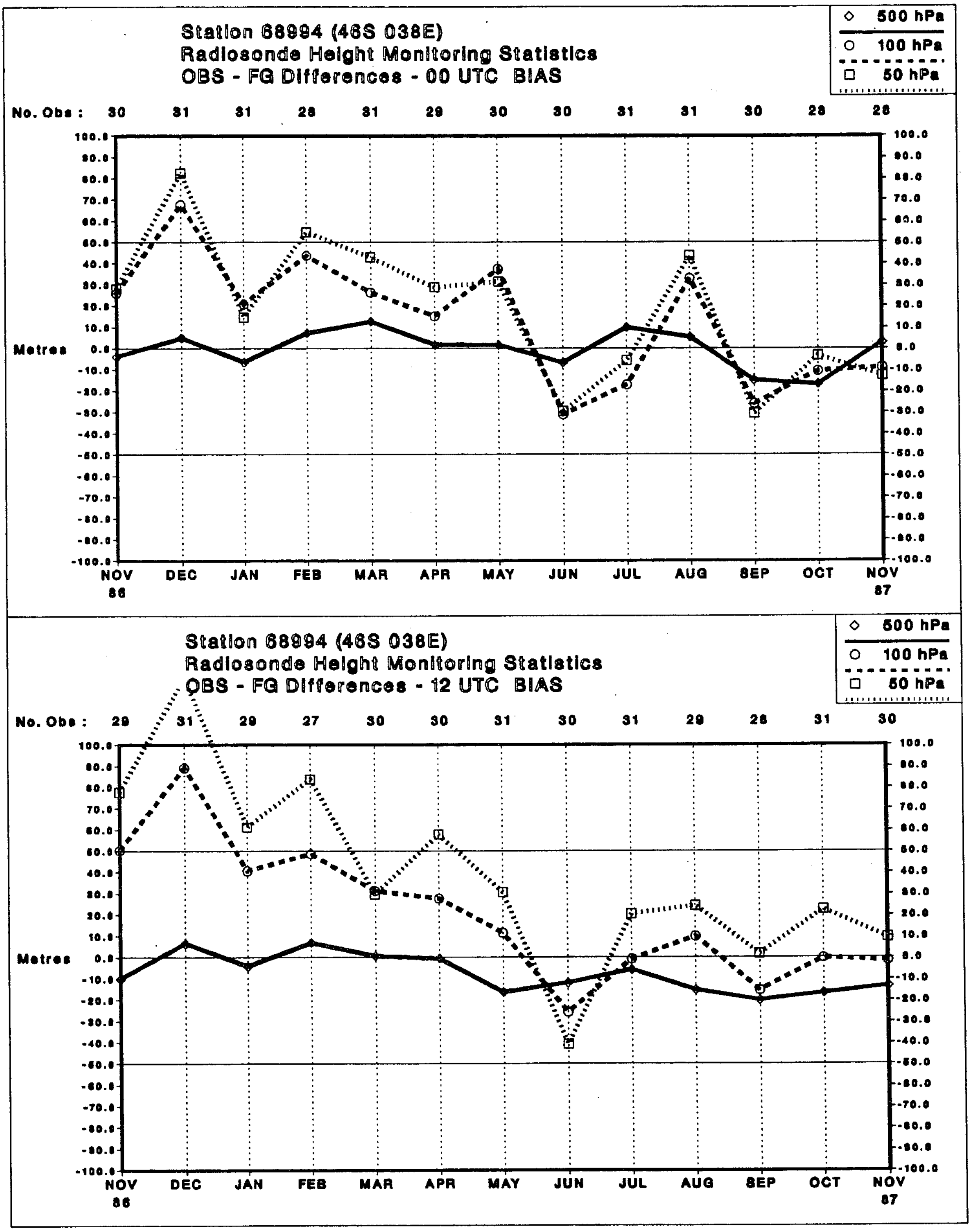


Fig. 7 As Fig. 1 but for Marion Island, South Africa