

ECMWF radiosonde monitoring
results for OWSE NA
evaluation
July 1986 to July 1987

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Centre européen pour les prévisions météorologiques à moyen

1. INTRODUCTION

Much progress has been made in recent years in numerical weather forecasting. Models and analysis techniques have been developed and refined while the rapidly increasing power of supercomputers has actually enabled the scientists to implement their schemes. However, numerical forecasting is not only a modelling but also an initial data problem. At a recent meeting on data for global models (ECMWF, 1987) the need for an improved data coverage and better quality data was stressed. Much can be gained from improvements in the Global Observing System (GOS). However, very little has happened over the last few years. Instead of an improvement there are signs of a degradation of the system, in particular in the conventional surface based observations.

In order to manifest the deficiencies in the availability and quality of the observations, ECMWF undertakes regular data monitoring and has on various occasions made the results available to the WMO, data producers and other GDPS centres. WMO/CBS has endorsed such monitoring activities and recommended the exchange of results between monitoring centres (WMO, CBS EX(85)). A recent paper demonstrated the tools ECMWF uses to monitor the global radiosonde network, concentrating in particular on the North American observations (Böttger, Radford and Söderman, 1987).

The various observing systems in operation (and planned) over the North Atlantic area are currently under evaluation during the OWSE-NA, which has been organised by the World Weather Watch Department of the WMO. Meteorological aspects of the performance of the different components of the combined observing system over the North Atlantic are monitored by ECMWF. The purpose of this paper is to present long-term trends of radiosonde observation quality over the 13-month period July 1986 to July 1987. As the ECMWF data assimilation system provides the diagnostic facilities for the data monitoring, first a brief summary of the ECMWF operational system is given.

2. ECMWF OPERATIONAL ANALYSIS AND FORECAST SYSTEM

2.1 Schedule

ECMWF produces routine global analyses for the four main synoptic hours 00, 06, 12 and 18 UTC and global 10-day forecasts based on 12 UTC data. The operational schedule with the approximate running times of the analysis and forecast suite is shown in Fig. 1. As a forecasting centre with the emphasis on the medium-range, ECMWF operates with long data collection times of between 18 hours for the 18 UTC analysis and 8 hours for the 12 UTC final analysis. This schedule ensures the most comprehensive global data coverage including the Southern Hemisphere surface data and global satellite sounding data, thus obtaining the best possible description of the initial state of the atmosphere.

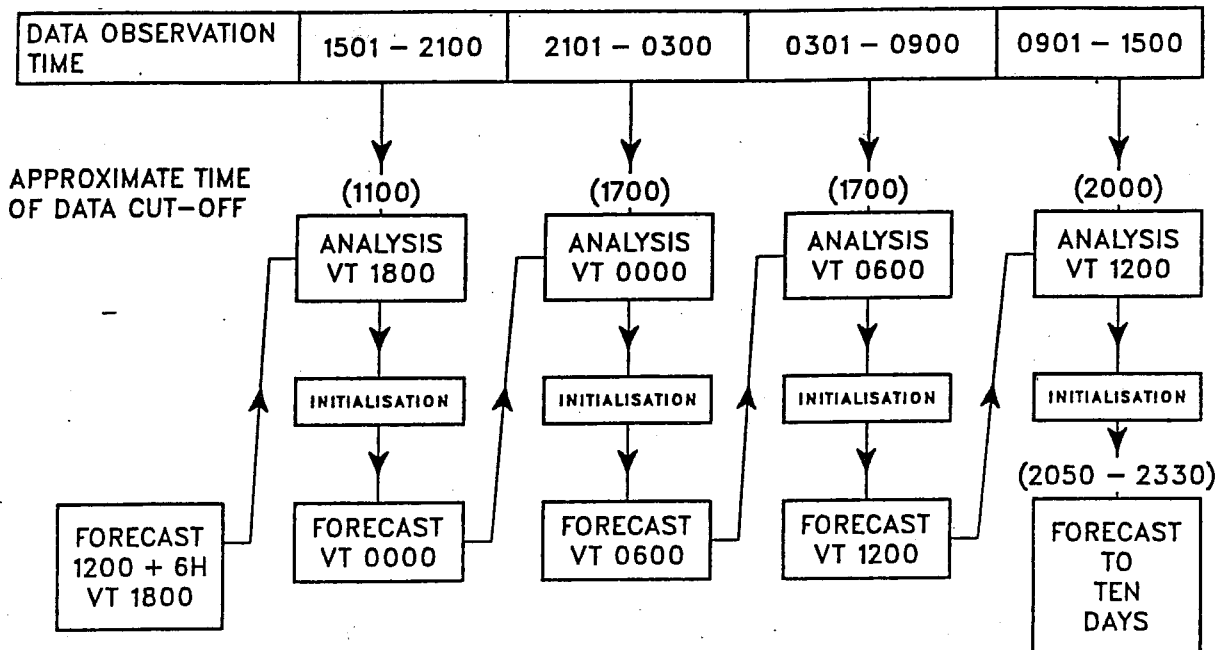


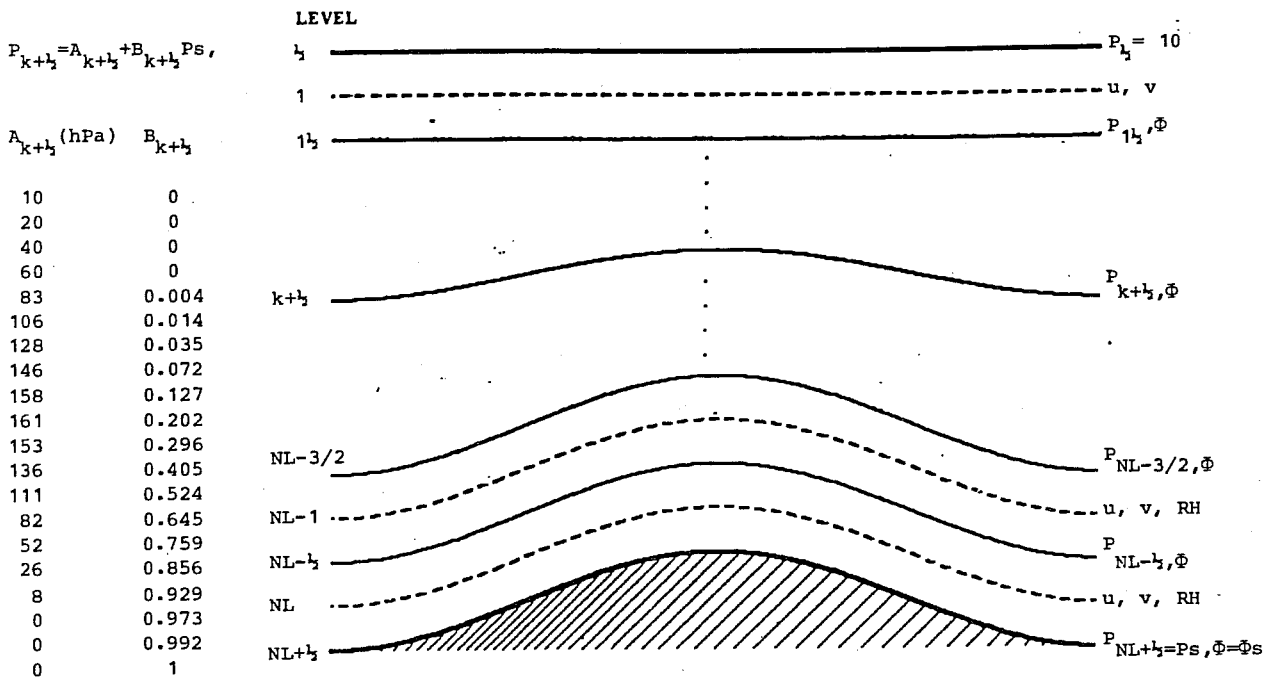
Fig. 1: ECMWF Operational Schedule

2.2 Data assimilation system

ECMWF operates a full data assimilation system with intermittent data insertion and three main steps: analysis, initialisation and 6-hour forecast to provide the first-guess for the next analysis. The system is described by Lorenc (1981) and the recent revisions of the analysis were documented by Shaw, Lönnberg and Hollingsworth (1984), and Lönnberg, Pailleux and Hollingsworth (1986). The present system is summarised in Fig. 2. A comprehensive quality control scheme for the data is included in the analysis (Lönnberg and Shaw, 1985). Prior to the use of the data in the analysis the incoming bulletins undergo telecommunications checks, decoding and simple checks on departure from rather wide climatological limits. The internal consistency of radiosonde data is controlled by applying the hydrostatic check.

2.3 The forecast model

The first-guess field is produced with the same operational forecast model that provides the main 10-day forecast. The resolution of the model is given by spectral representation which at present is truncated at wavenumber 106. Therefore features with a half wavelength of approximately 190 km can at best be expected to be resolved. Physical processes are calculated on the surface grid of the model which has a near regular resolution of 1.125 degrees in latitude and longitude. The main features of the model are presented in Fig. 3. For a more comprehensive description of the model and the physical parameterisation reference is made to Tiedtke et.al. (1979), Simmons and Jarraud (1983), Jarraud et.al. (1985), Tiedtke and Slingo (1985).



Vertical Coordinate
Table (NL=19)

Disposition of variables in the vertical

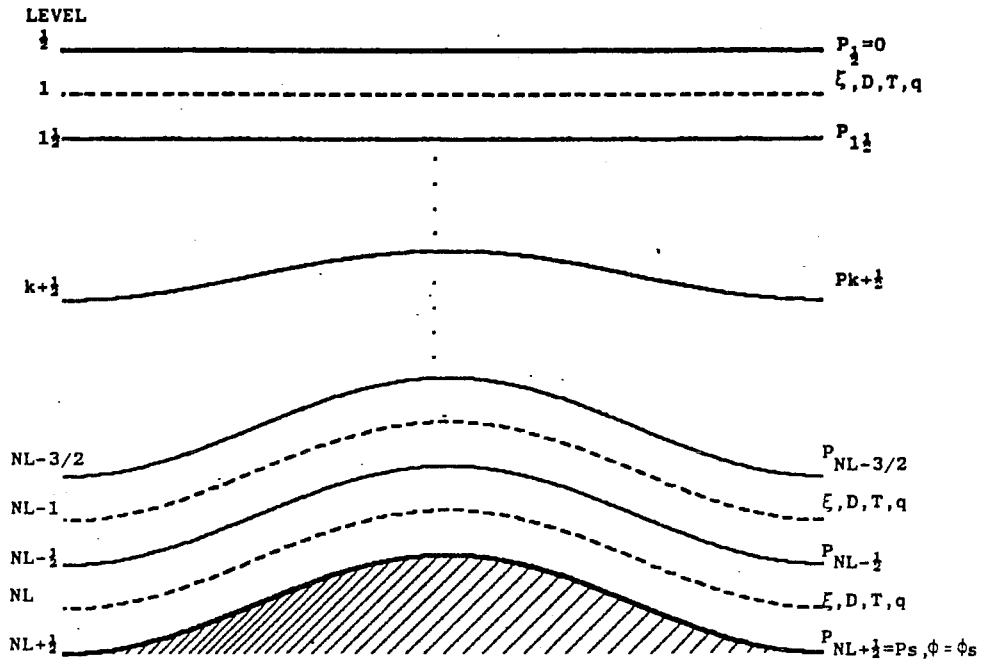
Domain	Global												
Data assimilation frequency	6-hr (\pm 3-hr observation time window)												
First guess	6-hr forecast												
Dependent variables	Ps, Φ , u, v, RH												
Vertical coordinate	Hybrid, $P_{k+l_2} = A_{k+l_2} + B_{k+l_2} P_s$, details as above												
Horizontal grid	160 x 320 points on a quasi-regular (1.125°) "Gaussian" grid												
Analysis method	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;">Mass and wind:</td> <td>3-dimensional multi-variate statistical interpolation</td> </tr> <tr> <td style="vertical-align: top;">Relative humidity:</td> <td>3-dimensional uni-variate statistical interpolation up to 250 hPa</td> </tr> <tr> <td style="vertical-align: top;">Surface:</td> <td> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;">Sea surface temperature</td> <td>from NMC analysis</td> </tr> <tr> <td style="vertical-align: top;">Soil water content</td> <td>using rainfall observations, estimated evaporation</td> </tr> <tr> <td style="vertical-align: top;">Snow depth</td> <td>using snow depth and snowfall observations</td> </tr> </table> </td> </tr> </table>	Mass and wind:	3-dimensional multi-variate statistical interpolation	Relative humidity:	3-dimensional uni-variate statistical interpolation up to 250 hPa	Surface:	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;">Sea surface temperature</td> <td>from NMC analysis</td> </tr> <tr> <td style="vertical-align: top;">Soil water content</td> <td>using rainfall observations, estimated evaporation</td> </tr> <tr> <td style="vertical-align: top;">Snow depth</td> <td>using snow depth and snowfall observations</td> </tr> </table>	Sea surface temperature	from NMC analysis	Soil water content	using rainfall observations, estimated evaporation	Snow depth	using snow depth and snowfall observations
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Sea surface temperature	from NMC analysis												
Soil water content	using rainfall observations, estimated evaporation												
Snow depth	using snow depth and snowfall observations												
Initialisation method	Non-linear normal mode, 5 vertical modes, non-adiabatic												

Fig. 2: ECMWF Analysis System

$$P_{k+\frac{1}{2}} = A_{k+\frac{1}{2}} + B_{k+\frac{1}{2}} P_s,$$

$A_{k+\frac{1}{2}}$ (hPa)	$B_{k+\frac{1}{2}}$
0	0
20	0
40	0
60	0
83	0.004
106	0.014
128	0.035
146	0.072
158	0.127
161	0.202
153	0.296
136	0.405
111	0.524
82	0.645
52	0.759
26	0.856
8	0.929
0	0.973
0	0.992
0	1

Vertical Coordinate
Table (NL=19)



Disposition of variables in the vertical

Domain	Global
Initial data time	12Z
Dependent variables	$\xi, D, T, q, \ln(P_s)$
Vertical coordinate	Hybrid, $P_{k+\frac{1}{2}} = A_{k+\frac{1}{2}} + B_{k+\frac{1}{2}} P_s$, details as above
Vertical representation	Finite-difference, energy and angular-momentum conserving
Horizontal representation	Spectral, with triangular truncation at wavenumber 106
Horizontal grid	160 x 320 points on a quasi-regular (1.125°) Gaussian grid
Time integration	Leapfrog, semi-implicit ($\Delta t = 15$ min), time filter ($\tau = 0.1$)
Horizontal diffusion	Linear, fourth-order ($K = 1 \times 10^{15} \text{ m}^4 \text{ s}^{-1}$)
Orography	Grid-scale average from high resolution data set, enhanced by one standard deviation of sub-grid scale orography, spectrally-fitted
Vertical boundary conditions	Kinematic
Physical parameterisation	<ul style="list-style-type: none"> (i) Boundary eddy fluxes dependent on local roughness length and stability (Monin-Obukov). (ii) Free-atmosphere turbulent fluxes dependent on mixing length and Richardson number. (iii) Gravity wavedrag scheme. Stresses due to orographically-forced gravity waves. (iv) Kuo convection scheme. Shallow convection parameterised by an eddy mixing scheme. (v) Interaction between radiation and model-generated clouds. Albedo dependent on model snow cover. (vi) Large-scale condensation when grid-square saturated. Evaporation of precipitation. (vii) Computed land temperature with diurnal cycle (3 layers in soil). (viii) Computed soil moisture and snow cover. (ix) Fixed, analysed sea-surface temperature.
Statistical correction of forecasts	None

Fig. 3: ECMWF Forecast Model

3. OBSERVATION QUALITY MONITORING BY DATA ASSIMILATION

Hollingsworth et.al. (1986) provided the rationale for using modern data assimilation systems as the appropriate tools for monitoring the quality of observations. There is good evidence that in mid-latitude areas, where an adequate observational network ensures a sufficient data coverage, the 6-hour forecast error (first-guess error) is quite low and allows the evaluation of the data quality by comparison with the first-guess. North America, Europe and most parts of Asia are suitable areas for such evaluations. In data sparse areas, however, a more cautious approach is required, before any conclusions on the data quality are drawn from the comparison with the first-guess alone, as the model errors might be dominating. Only if additional independent comparisons, such as results from collocation statistics of radiosonde ascents and atmospheric soundings derived from satellite radiance measurements corroborate the data versus first-guess findings may they be accepted with confidence. ECMWF has developed such additional tools and applies them whenever possible to confirm monitoring results for radiosondes in data sparse areas, e.g. the Southern Hemisphere and mid-Pacific Islands.

4. MONITORING RESULTS

Information on data reception and quality of radiosonde stations operating in the North Atlantic area between July 1986 and July 1987 is presented in Annex A. The station list used is as defined in Annex H2 of the Operational Evaluation Plan for OWSE-NA (WMO, 1987). In addition, the three Ocean Weather Ships and those ASAP ships reporting in the North Atlantic area have been included. The figures show the evolution of the mean monthly differences between observations and first-guess over the 13 month period July 1986 to July 1987. Separate curves for 500 hPa, 100 hPa and 50 hPa are shown; 00 UTC and 12 UTC data are displayed in different figures. The number of observations shown above the time graph box are the number of 500 hPa height reports received during each month. The latitude and longitude shown for TEMP SHIPS corresponds to the first reported position.

These figures are particularly useful in highlighting any changes (transient or otherwise) in the performance characteristic of a radiosonde station.

5. REFERENCES

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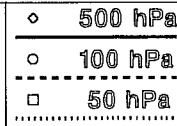
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A N N E X A

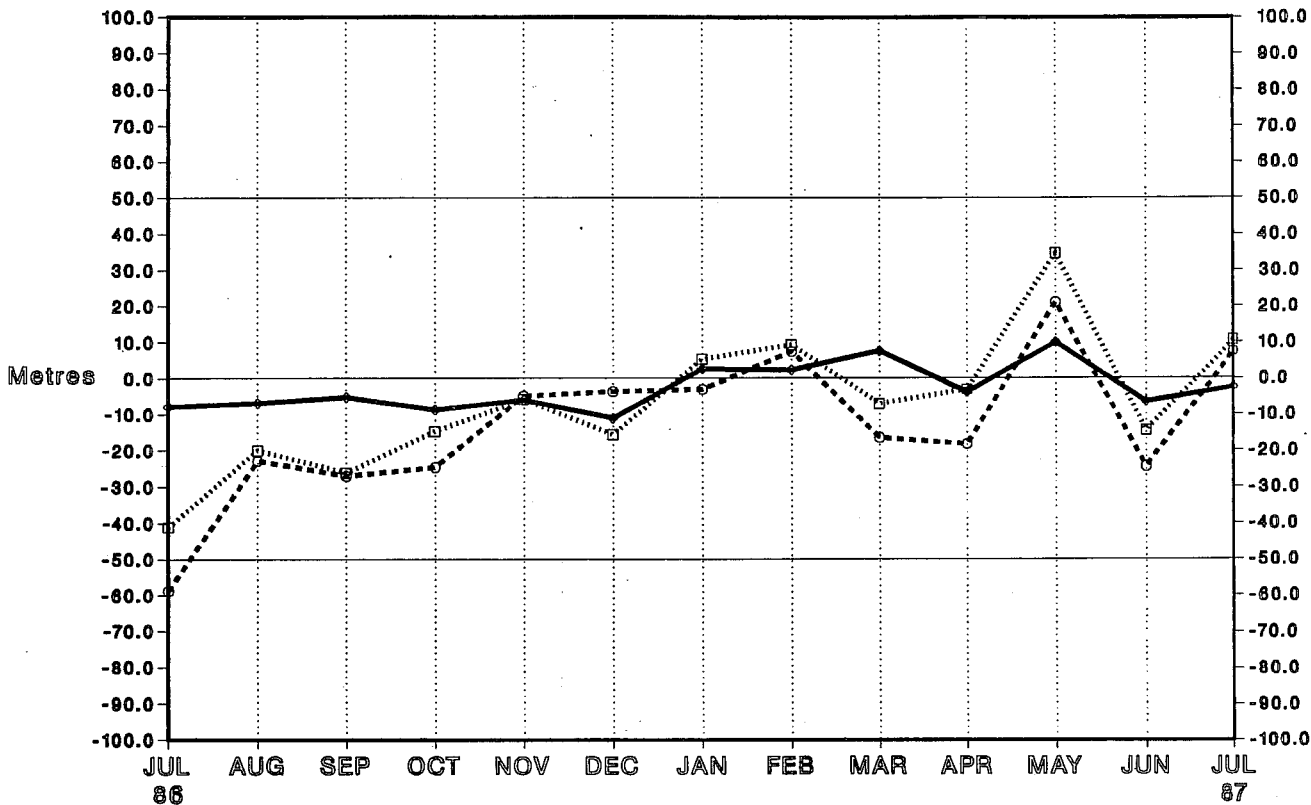
Station C7C (53N 035W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



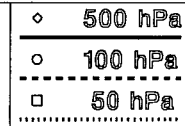
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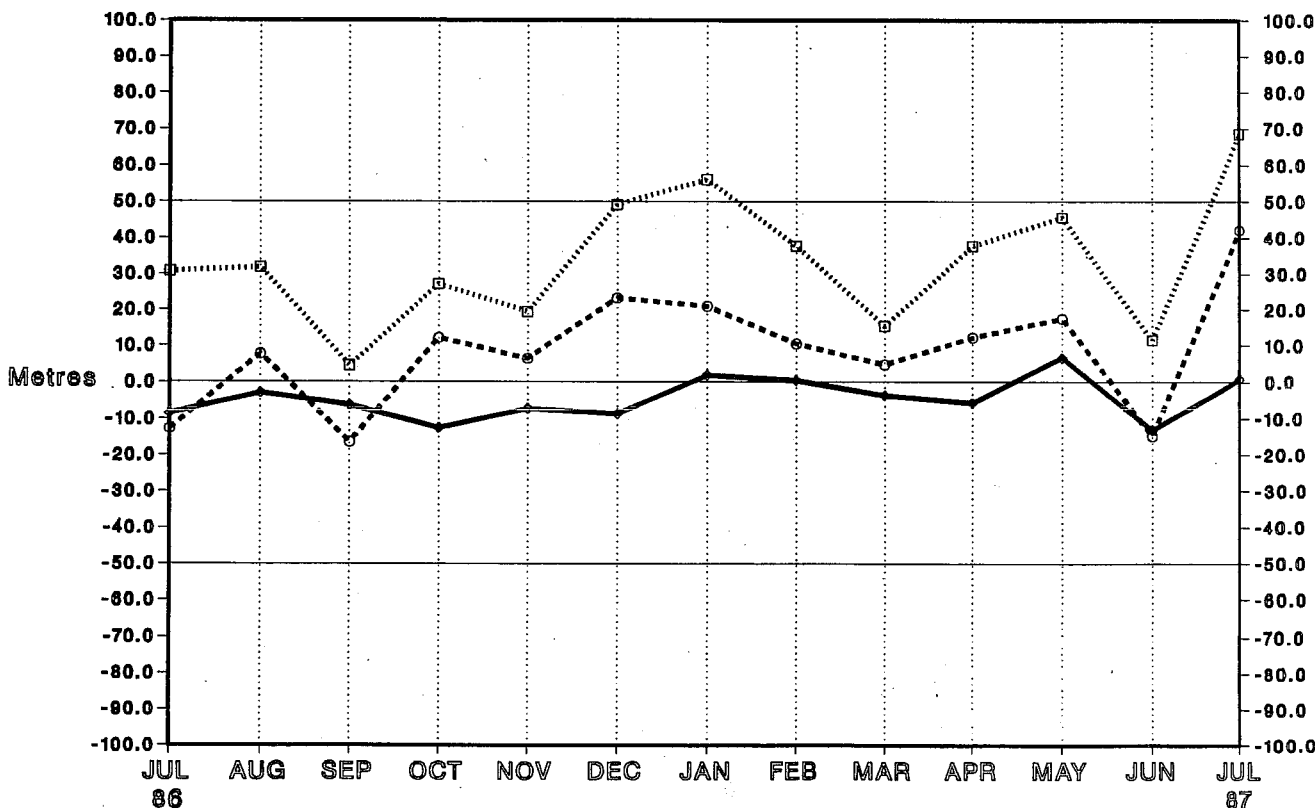
Station C7C (53N 035W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



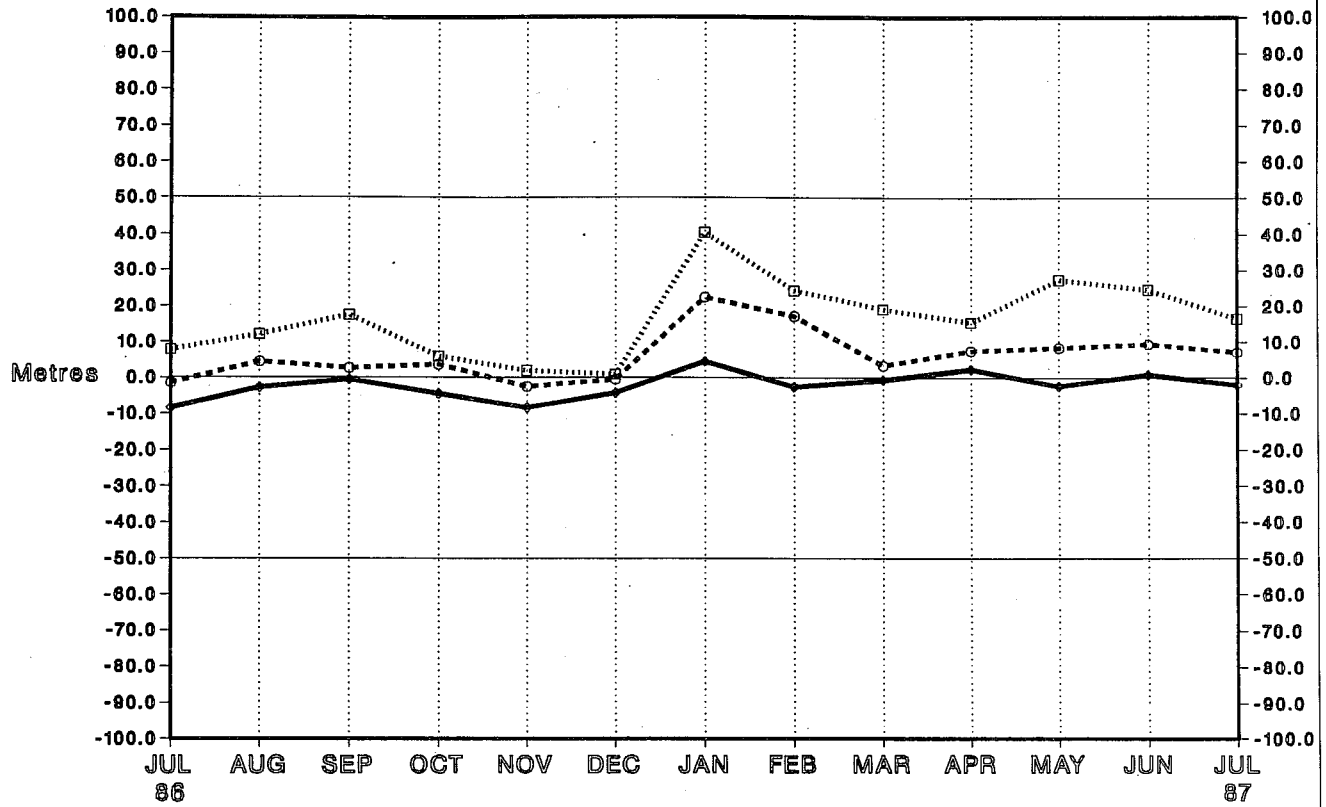
No. Obs : 31 30 27 26 25 26 31 25 31 30 30 30 31



Station C7L (57N 020W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
- 500 hPa

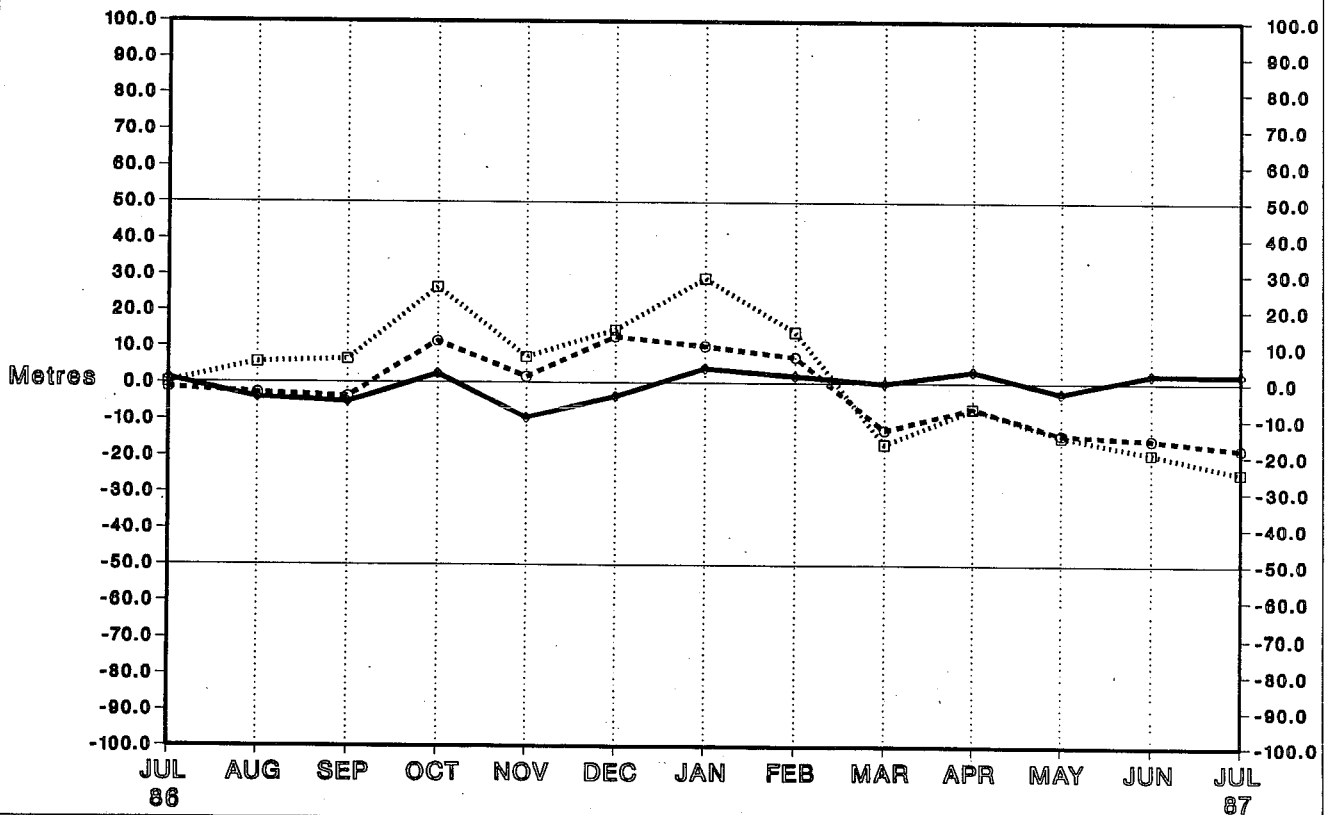
No. Obs : 26 17 23 24 24 27 29 22 25 24 26 24 25



Station C7L (57N 019W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
- 500 hPa

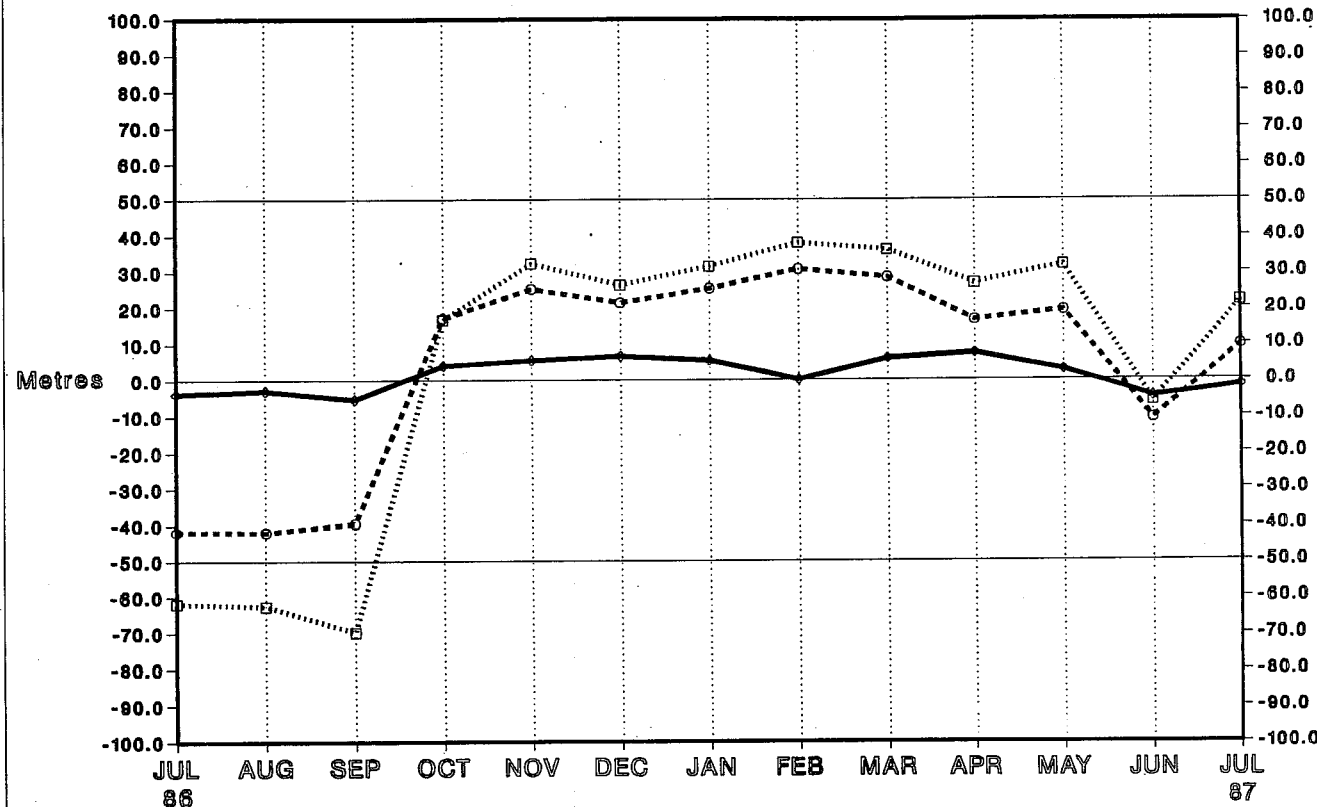
No. Obs : 26 18 22 24 24 26 30 21 24 25 25 24 25



Station C7M (66N 002E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

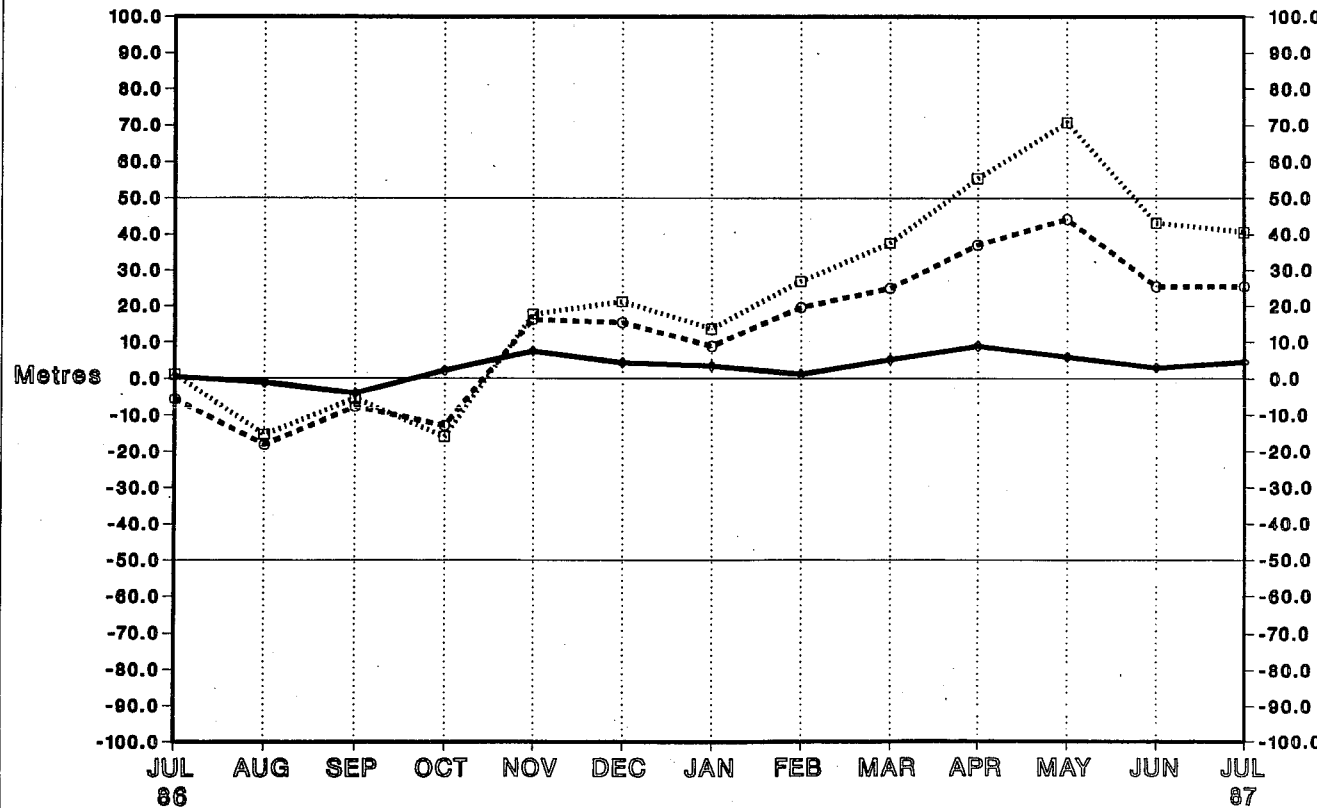
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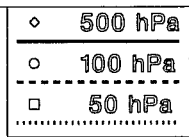
Station C7M (66N 002E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

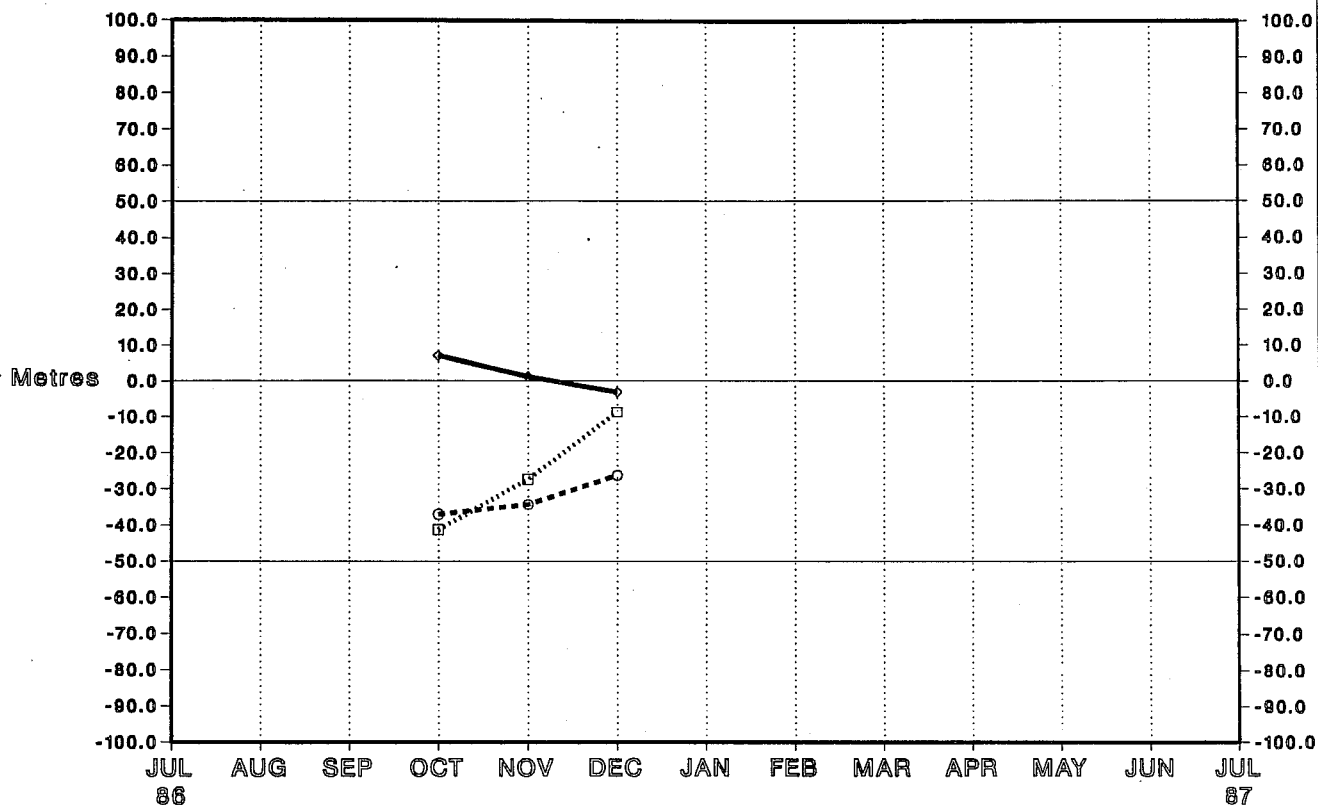
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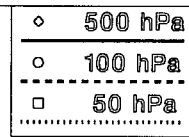
Station DBBH (35N 020W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



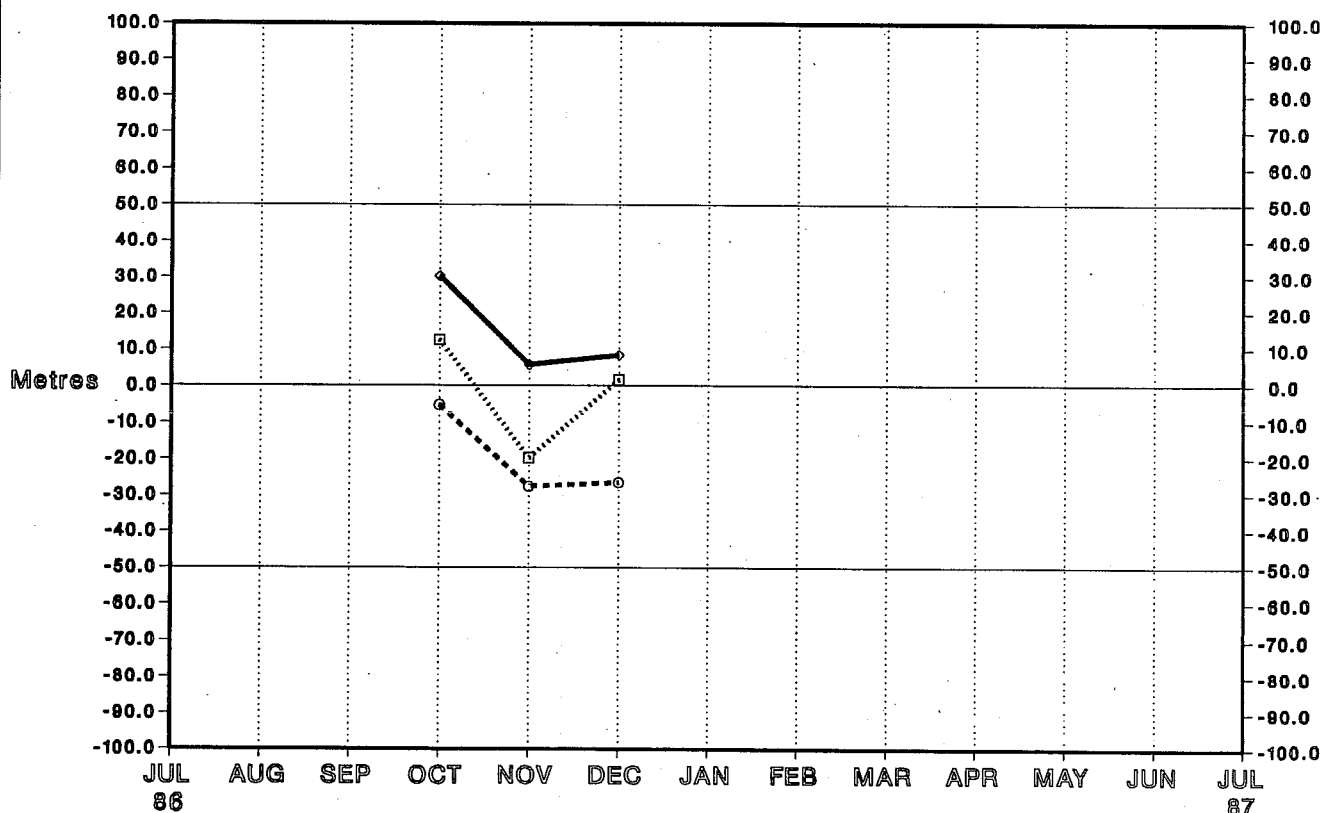
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Station DBBH (37N 018W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

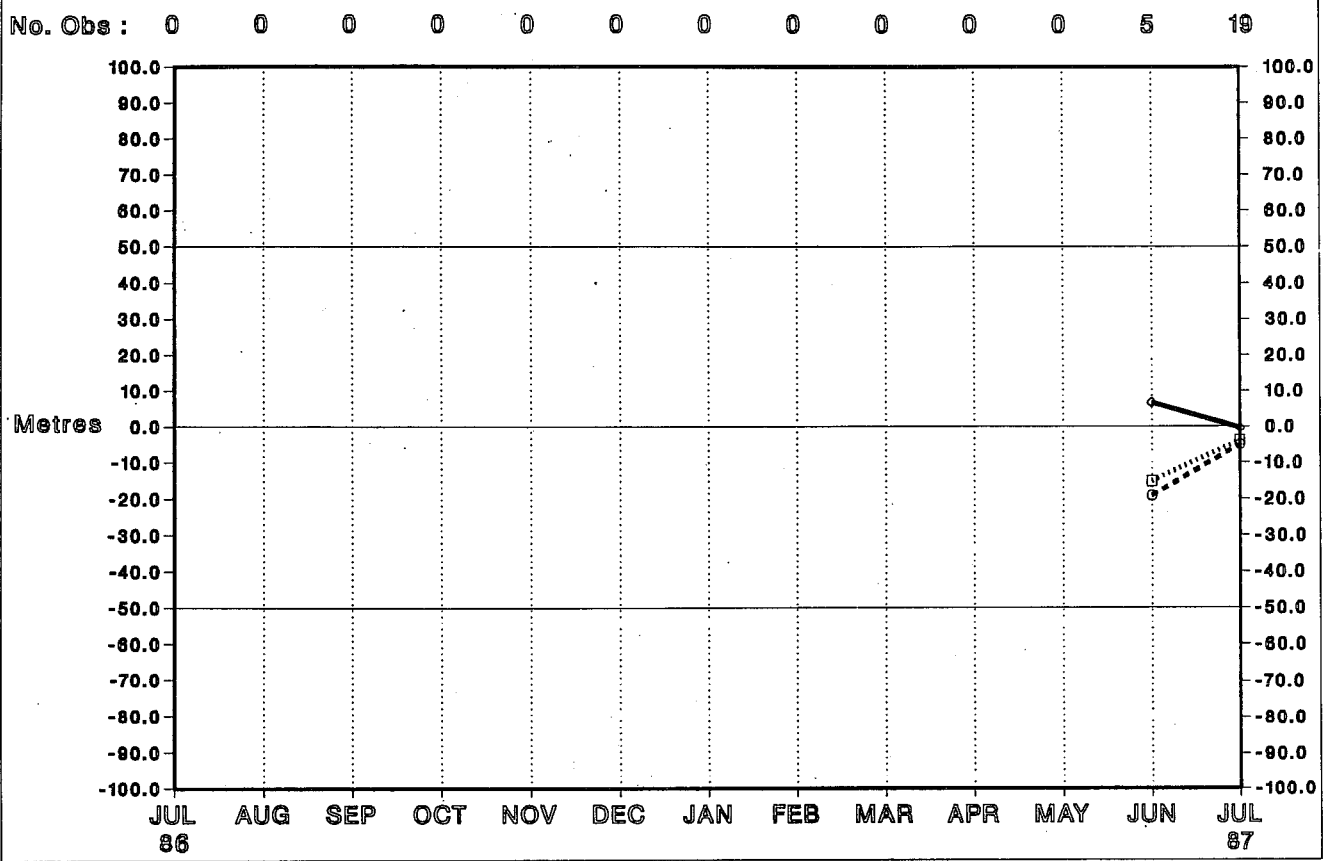


No. Obs : 0 0 0 2 24 4 0 0 0 0 0 0 0



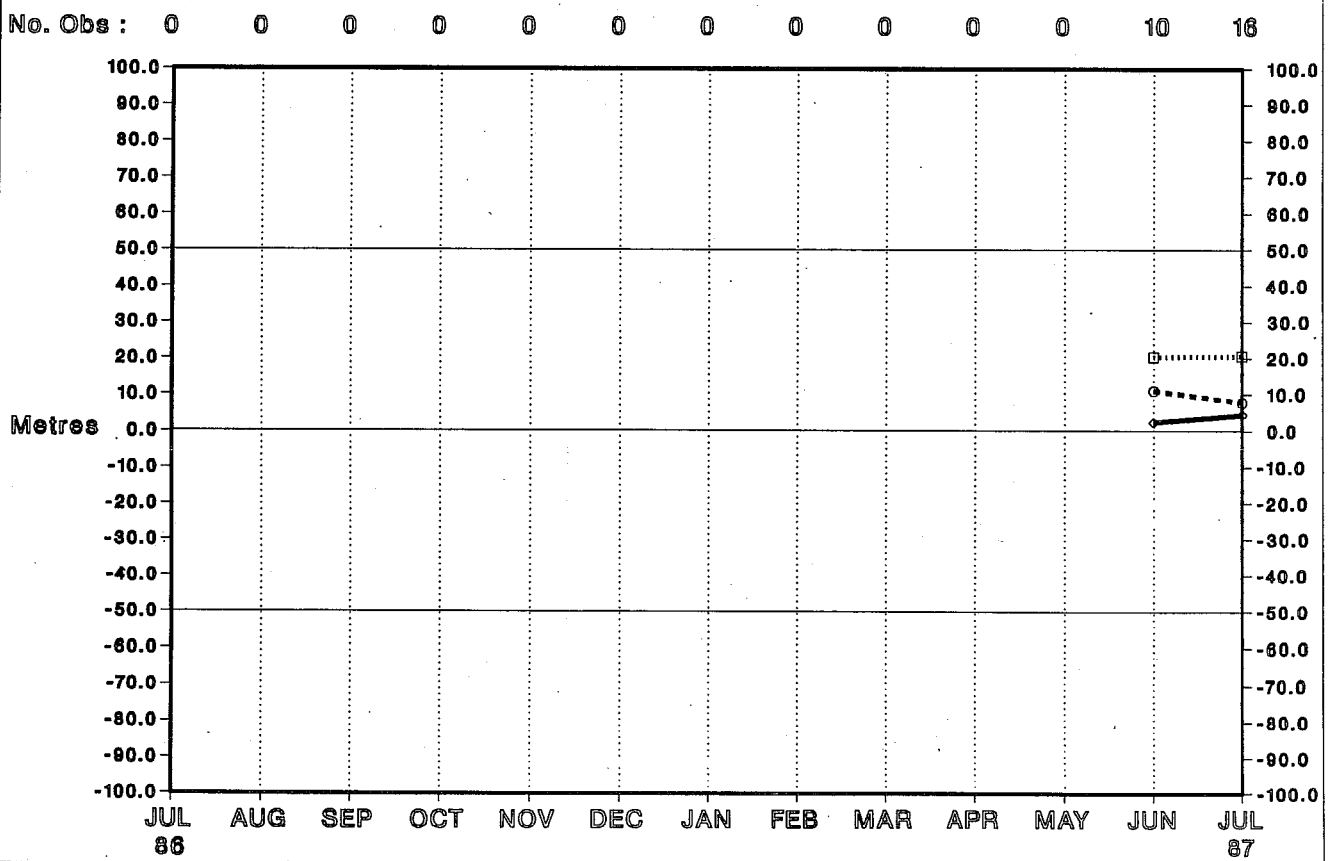
Station DBFM (66N 029W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
-



Station DBFM (66N 029W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

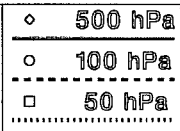
- ◊ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
-



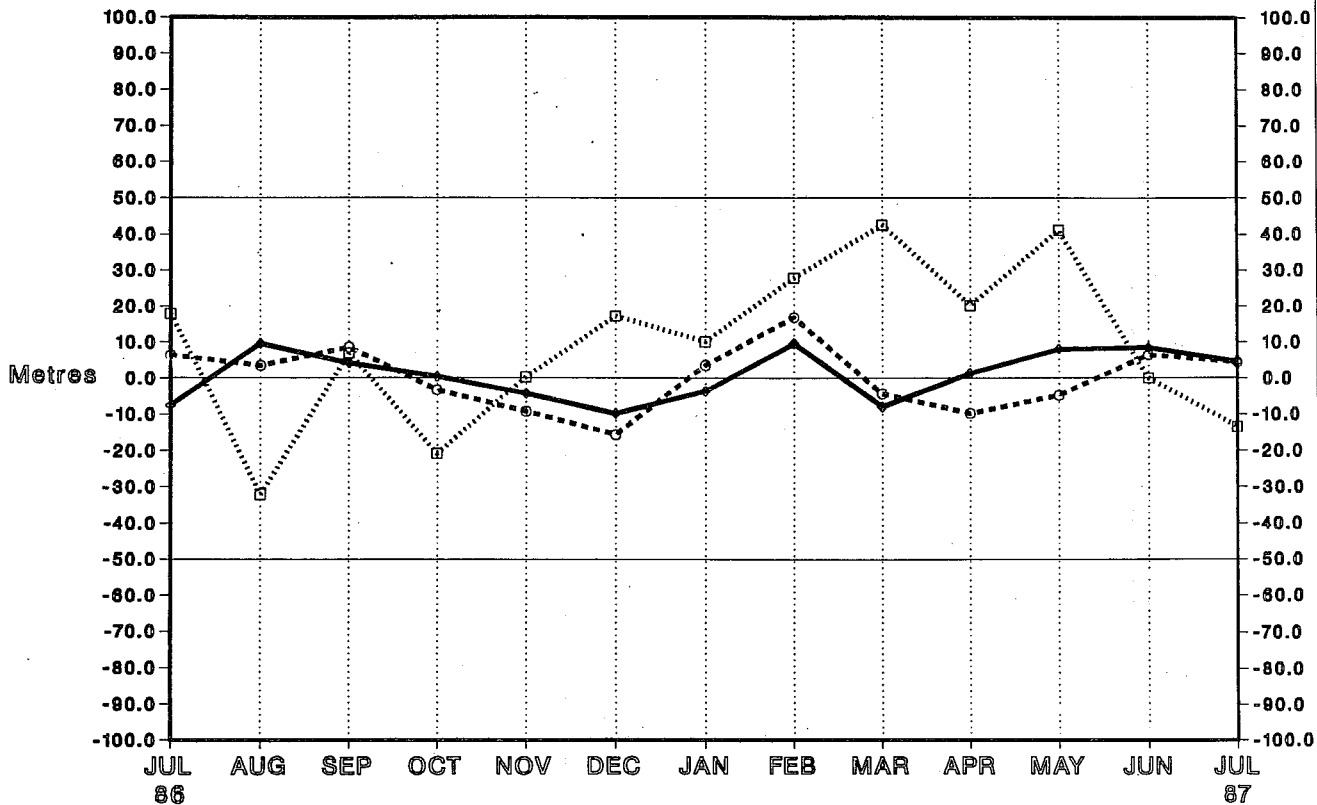
Station FNOR (33N 035W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



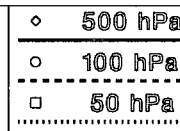
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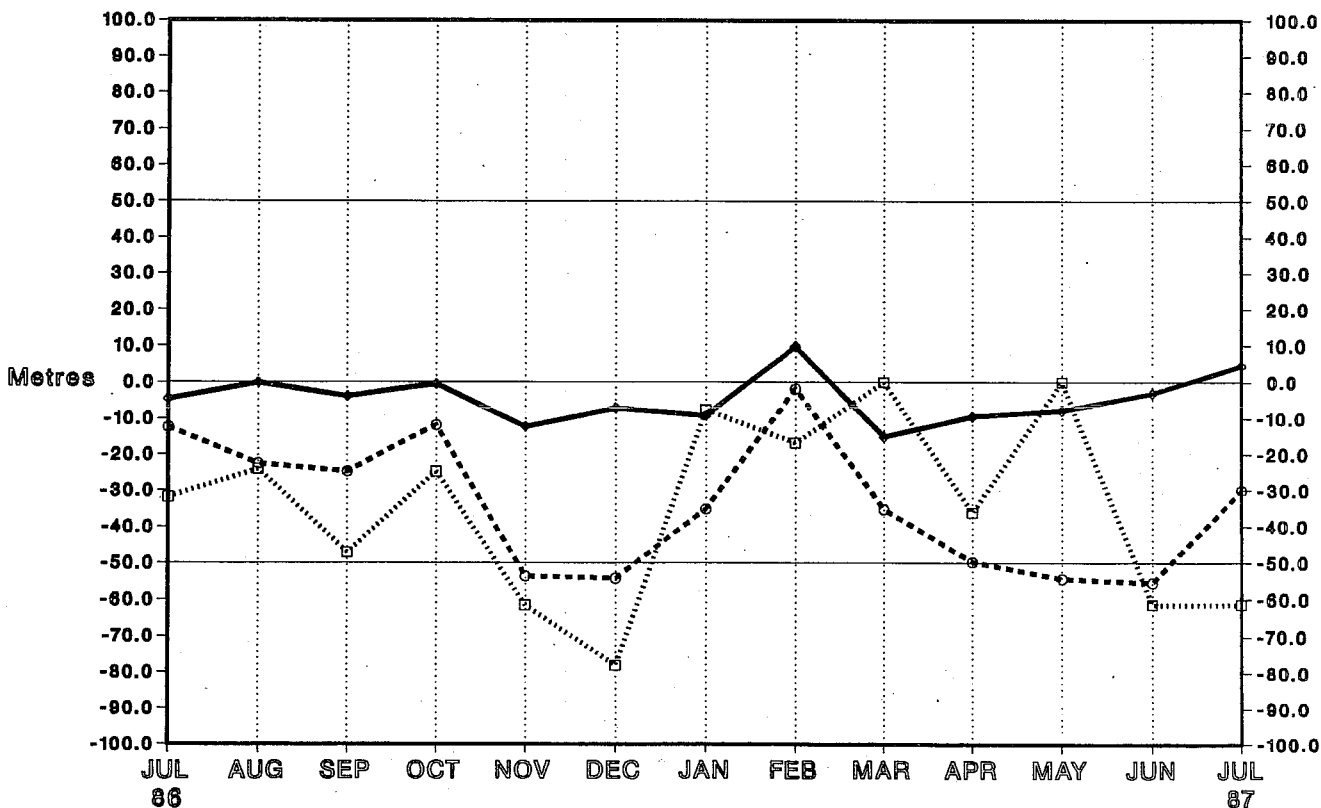
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Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



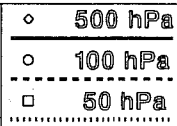
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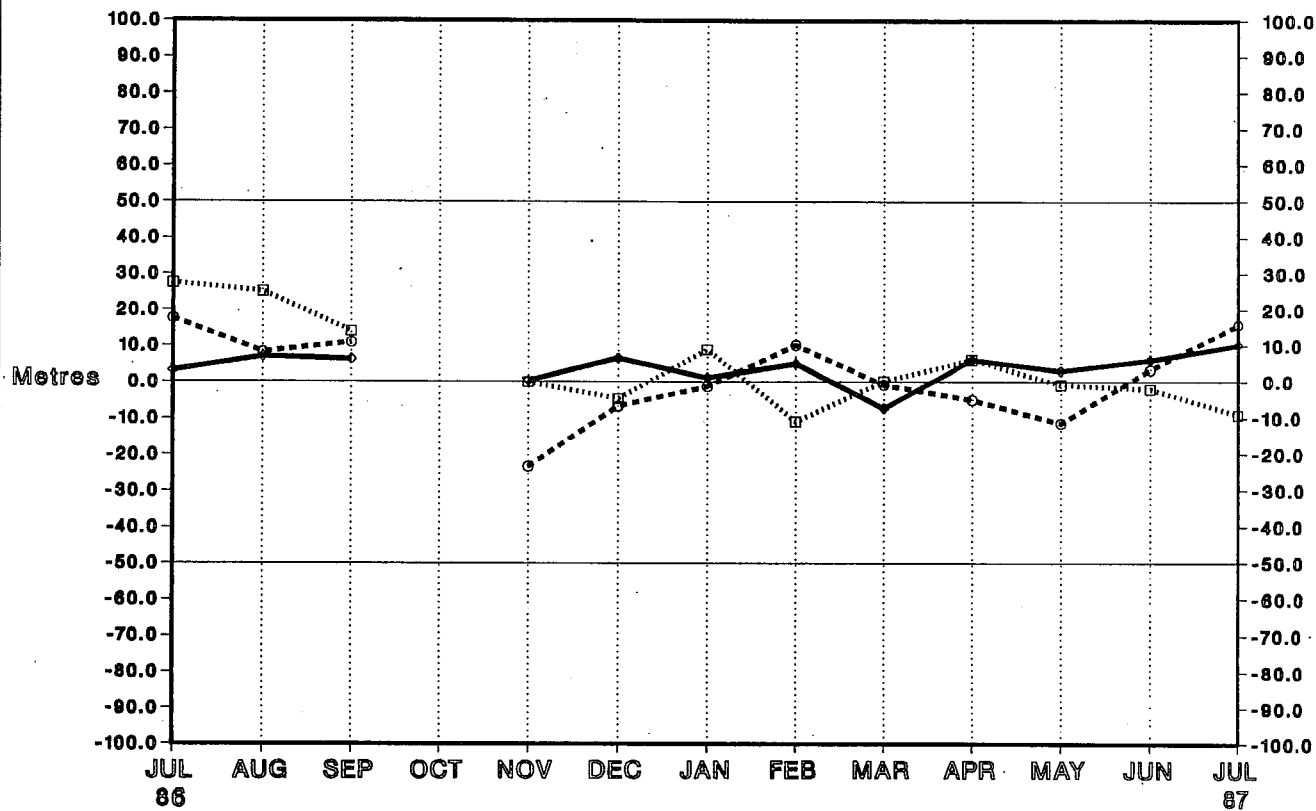
Station FNOU (34N 040W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



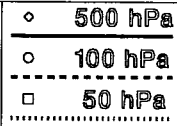
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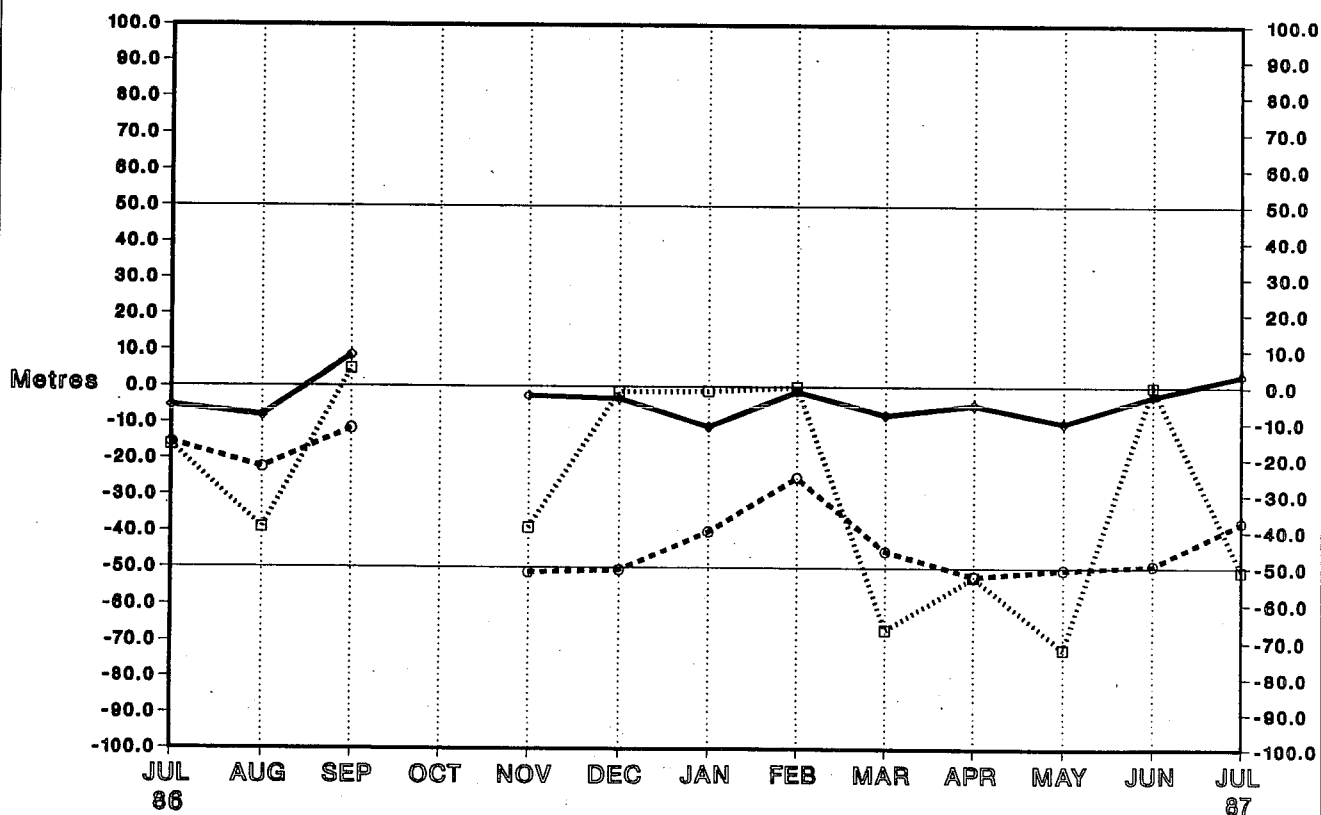
Station FNOU (37N 037W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



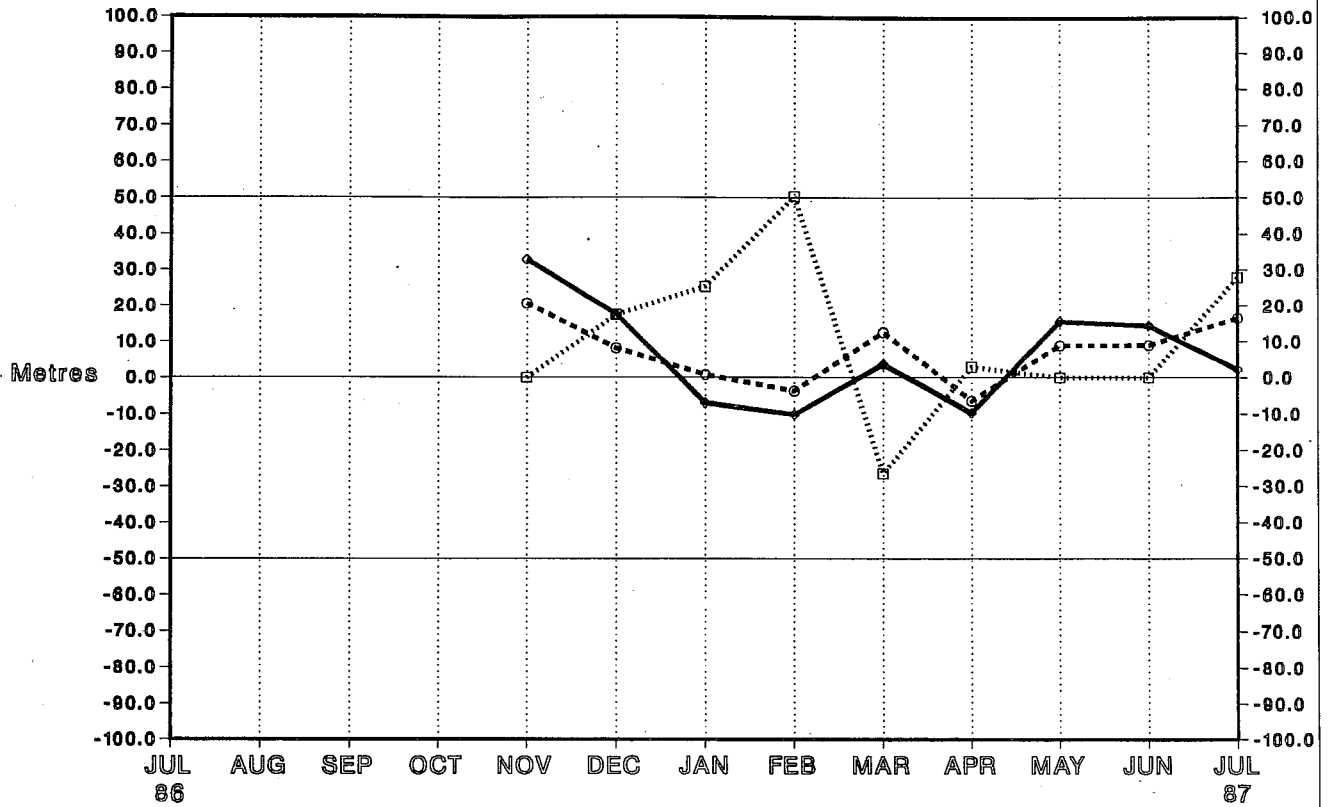
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Station FNPB (47N 009W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

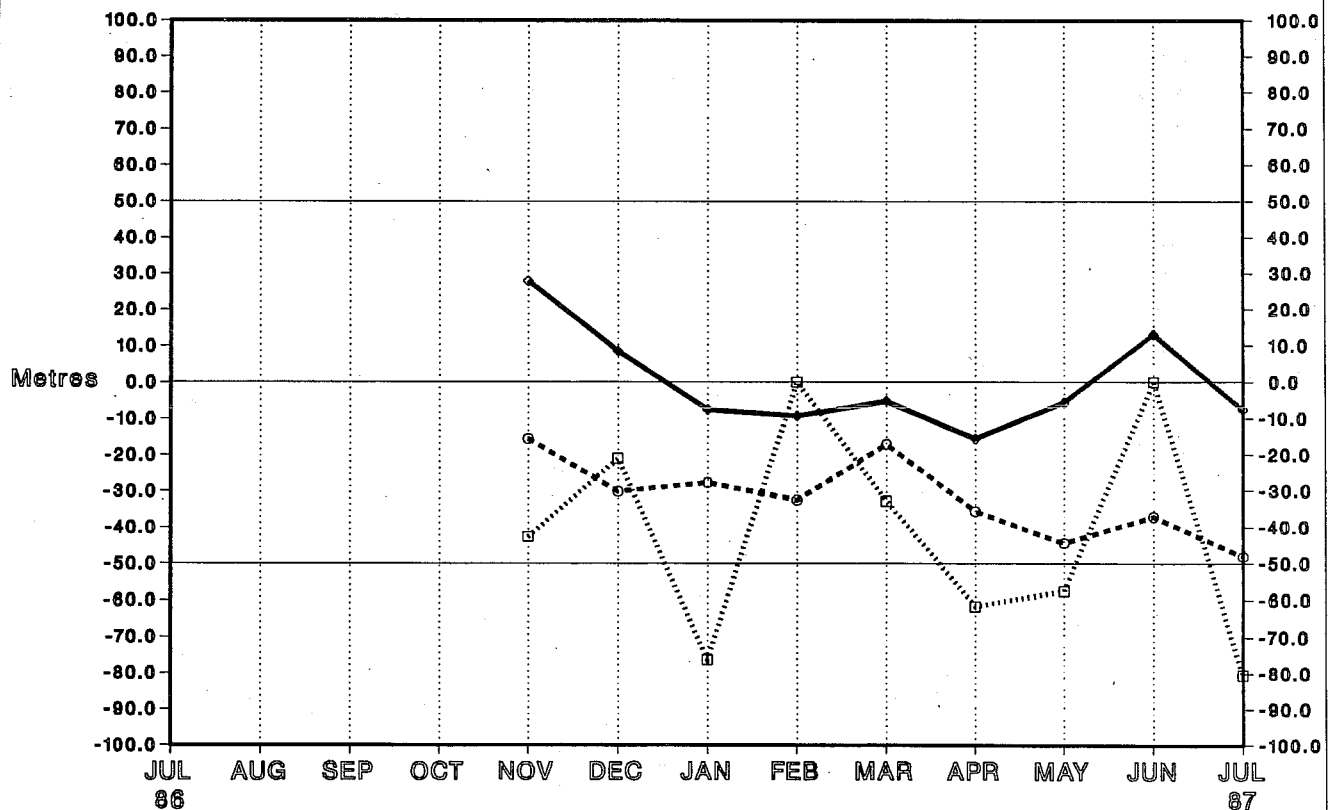
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Station FNPB (45N 013W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 0 0 0 0 6 8 9 6 8 6 10 3 11



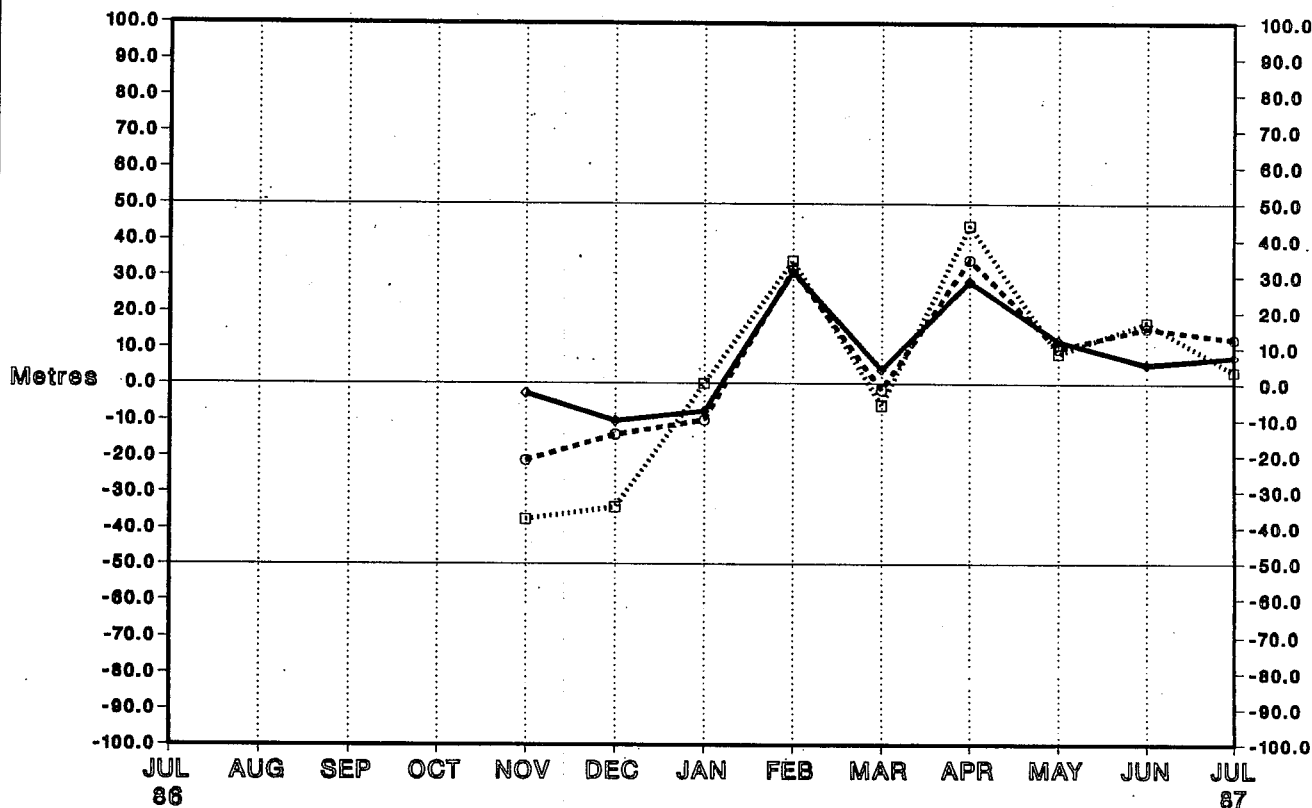
Station FNRS (25N 052W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

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- 100 hPa
- 50 hPa

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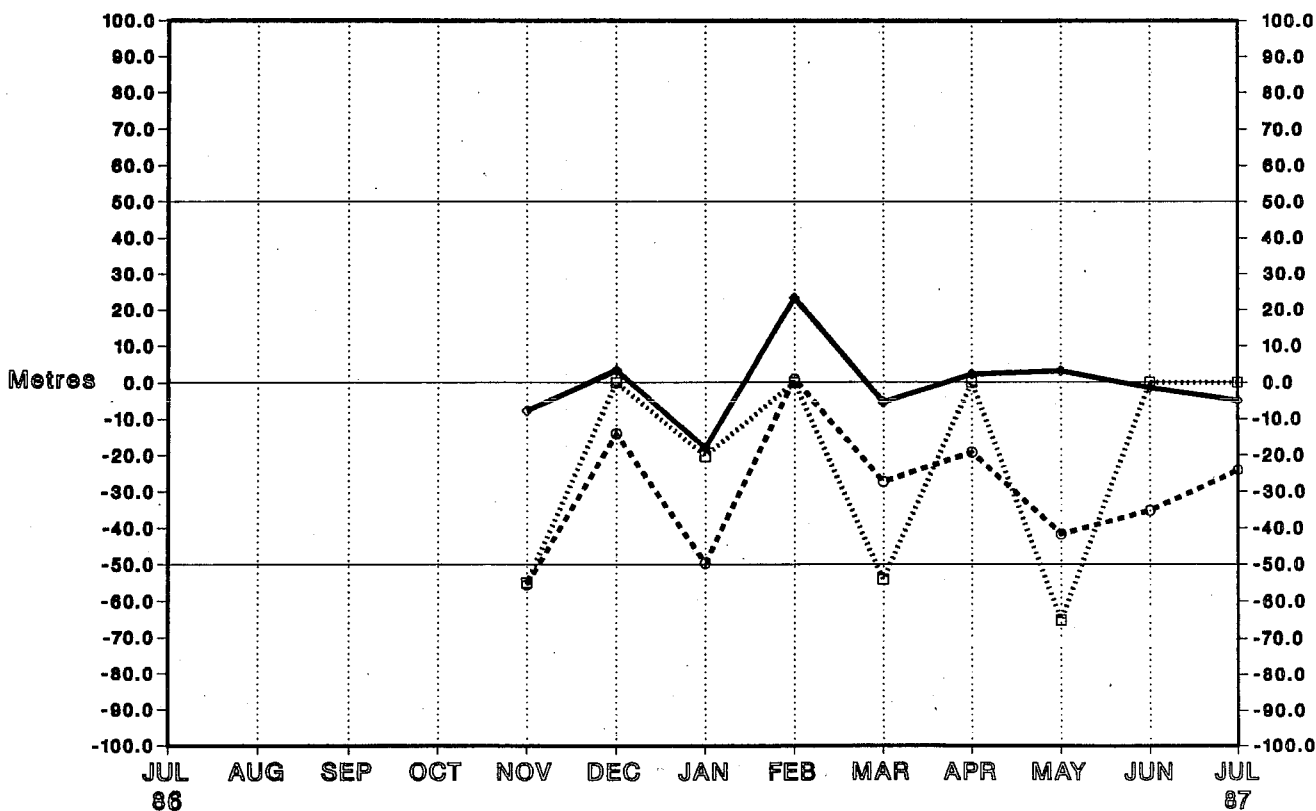
Station FNRS (27N 049W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

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- 100 hPa
- 50 hPa

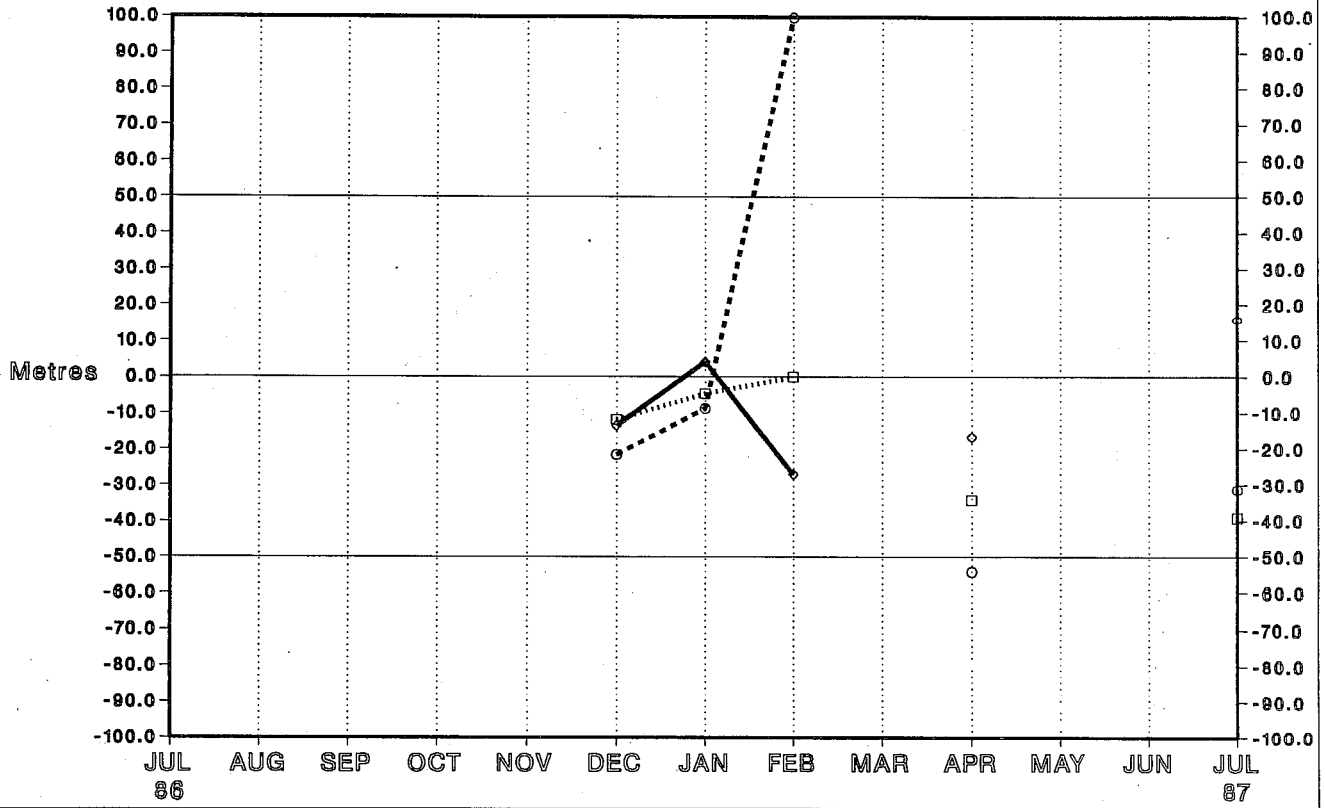
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Station VSBV (54N 032W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

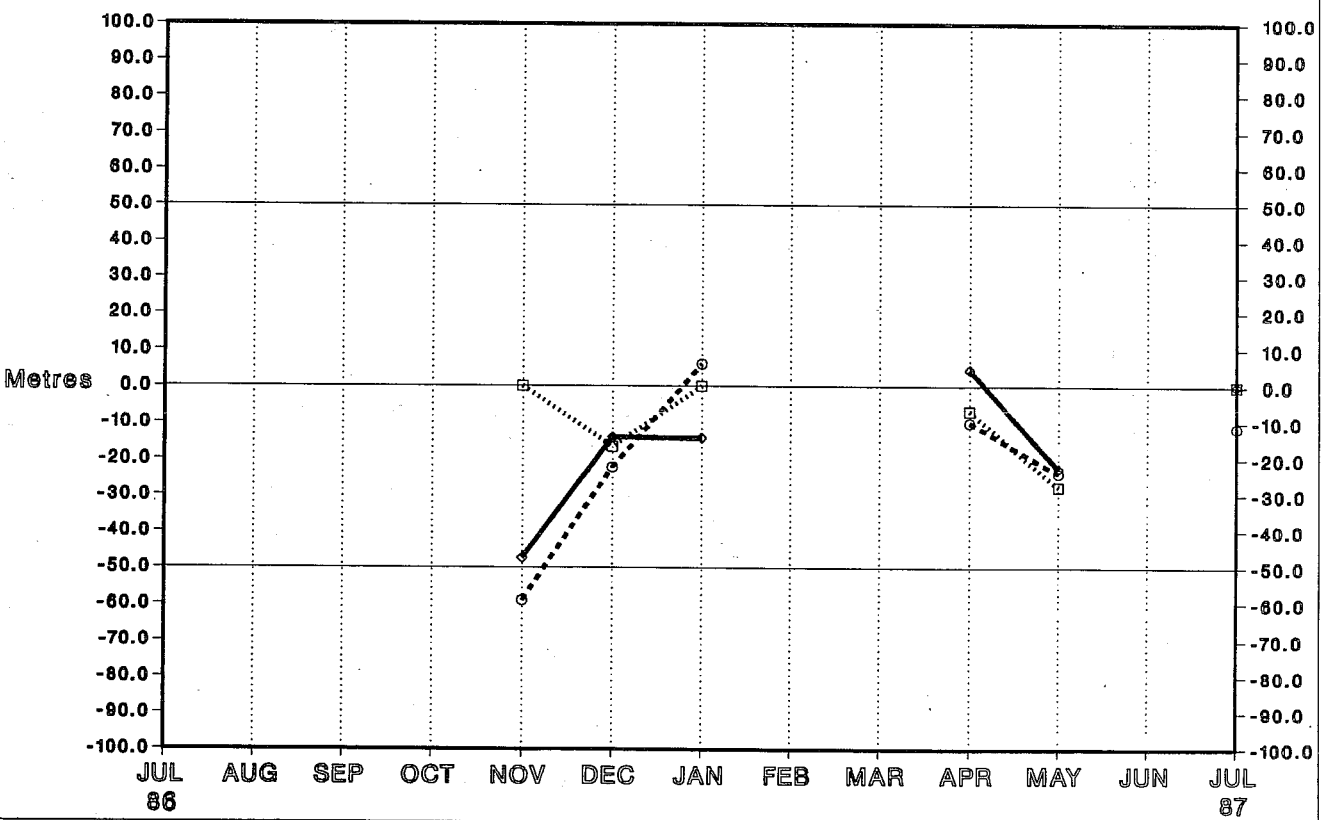
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Station VSBV (54N 037W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

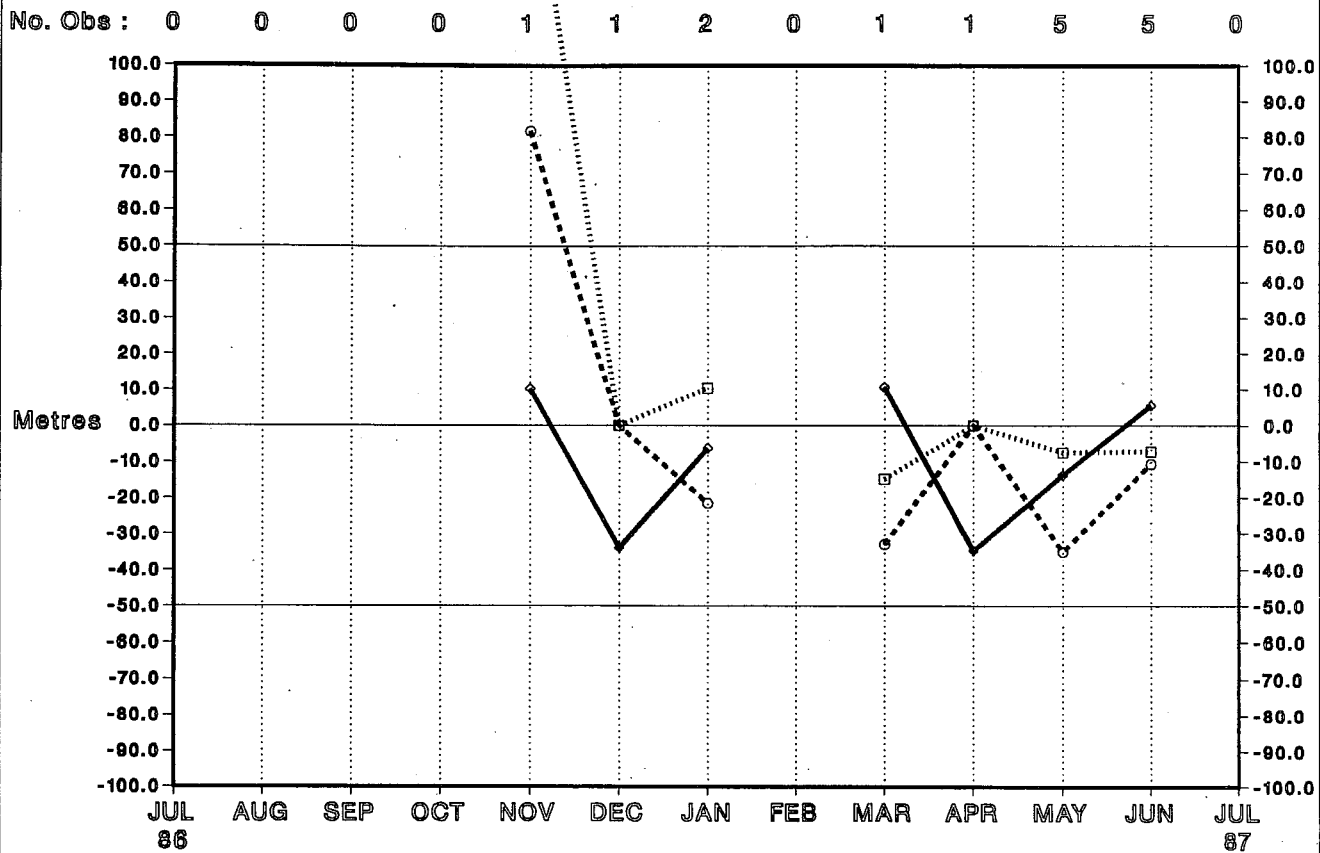
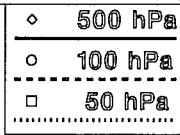
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Station VSBV3 (53N 024W)

Radiosonde Height Monitoring Statistics

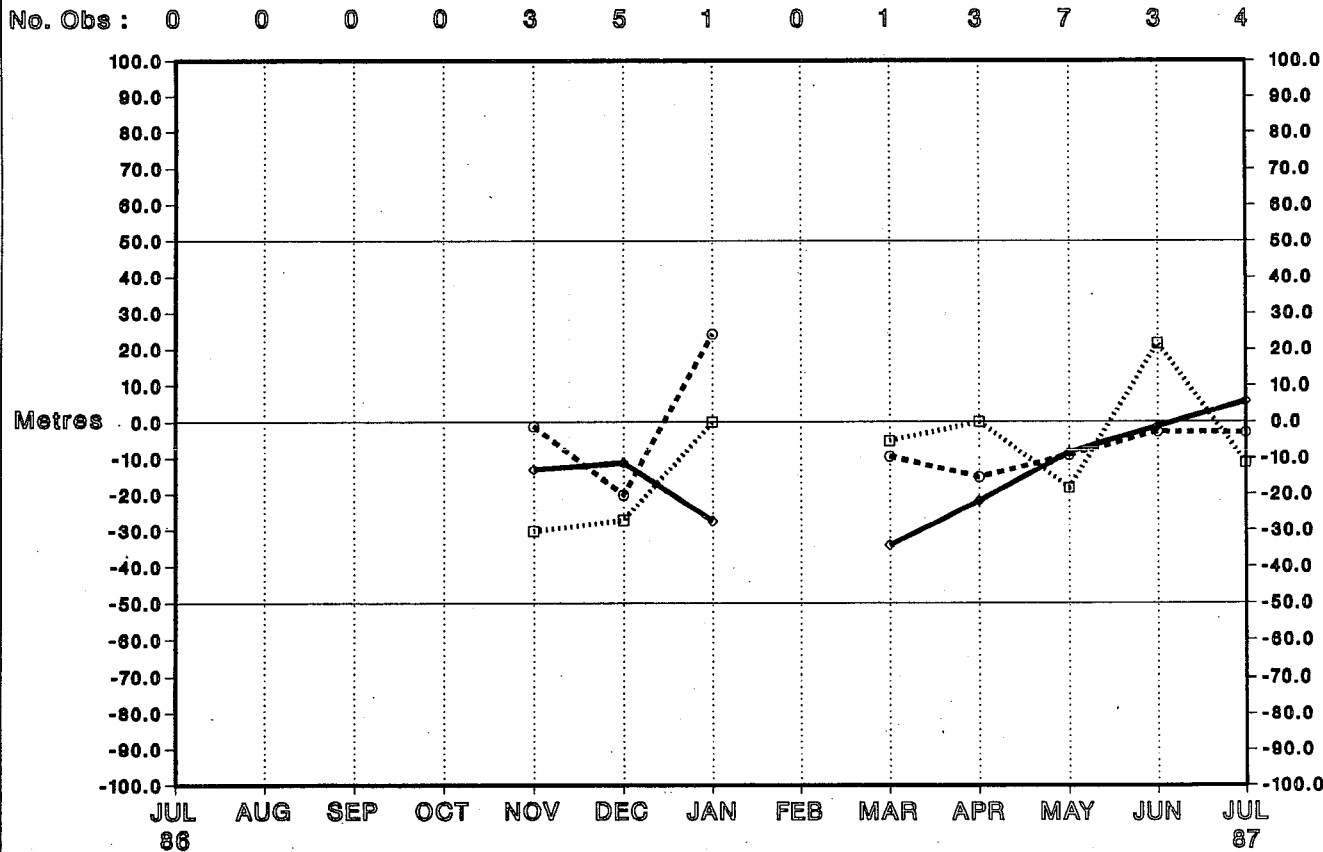
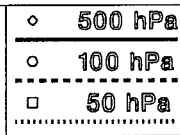
OBS - FG Differences - 00Z BIAS



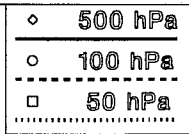
Station VSBV3 (52N 015W)

Radiosonde Height Monitoring Statistics

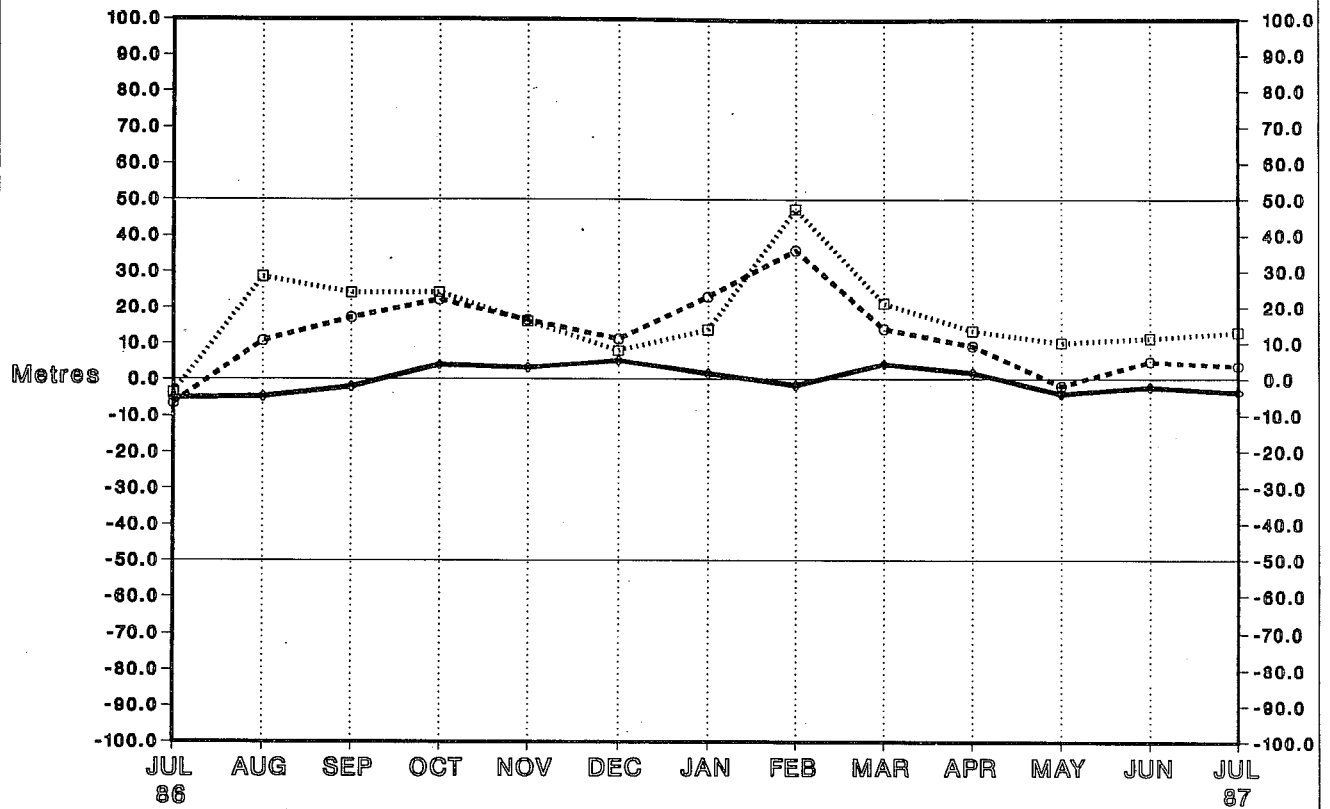
OBS - FG Differences - 12Z BIAS



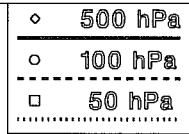
Station 01001 (71N 008W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



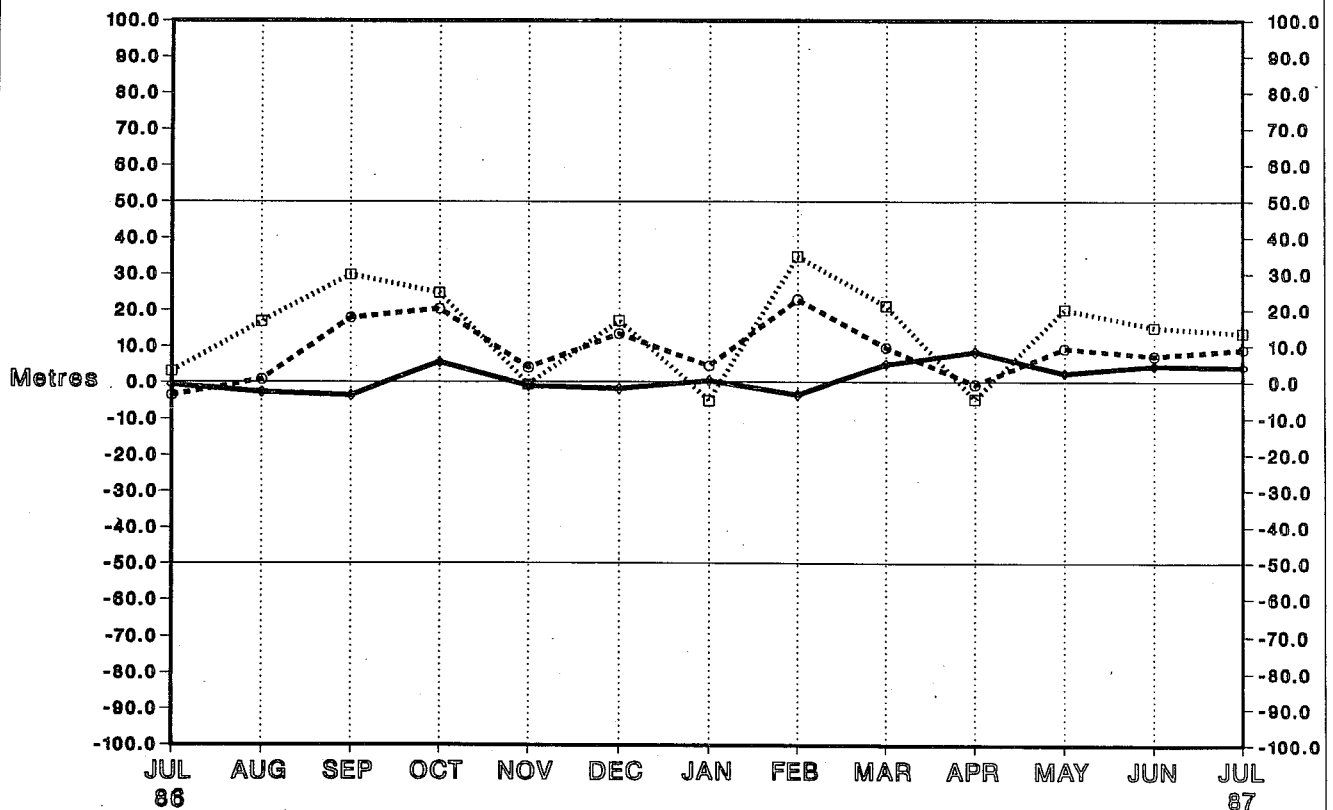
No. Obs : 31 31 30 31 29 28 30 27 31 29 31 29 31



Station 01001 (71N 008W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS



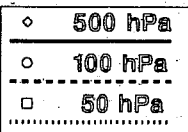
No. Obs : 30 30 30 29 29 27 29 26 30 28 31 30 31



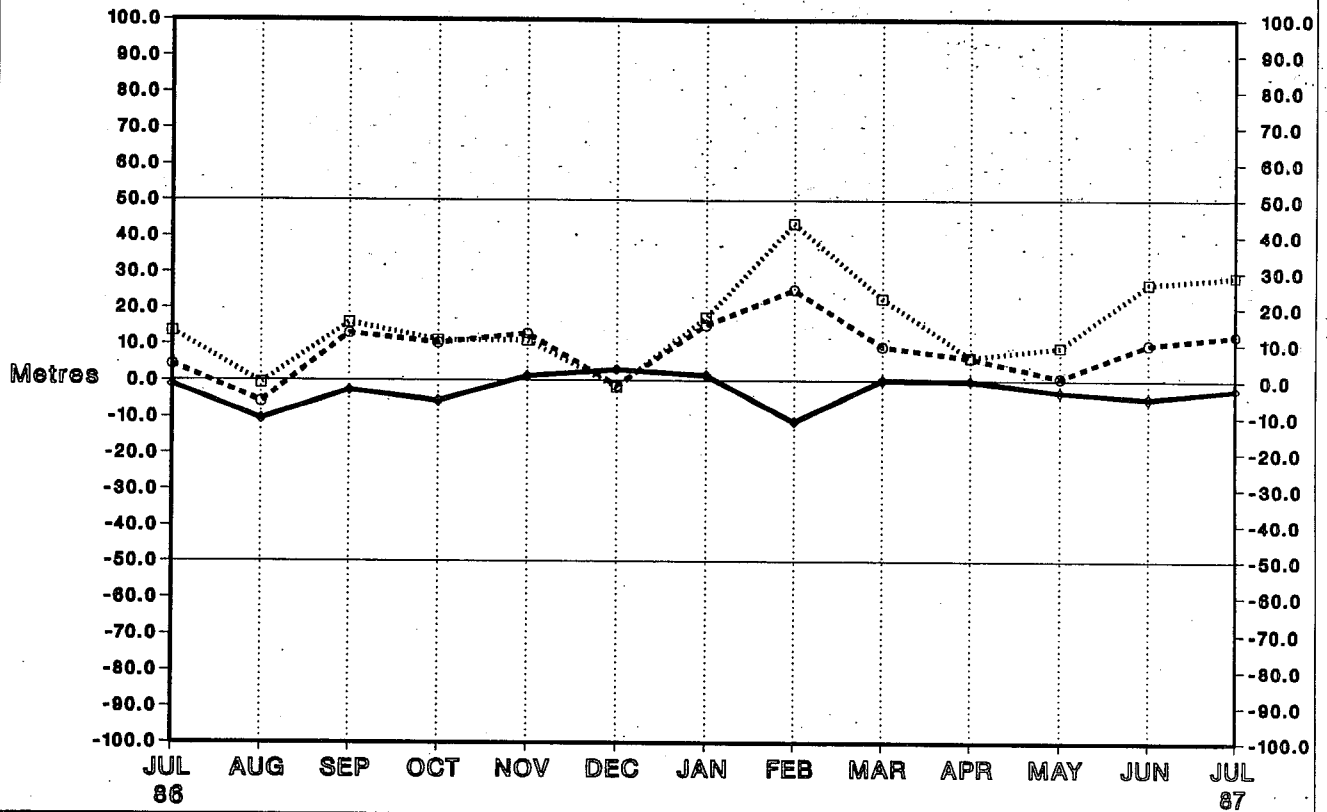
Station 01028 (75N 019E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



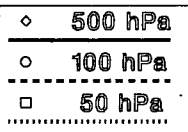
No. Obs : 31 31 30 30 30 27 31 20 31 29 31 30 31



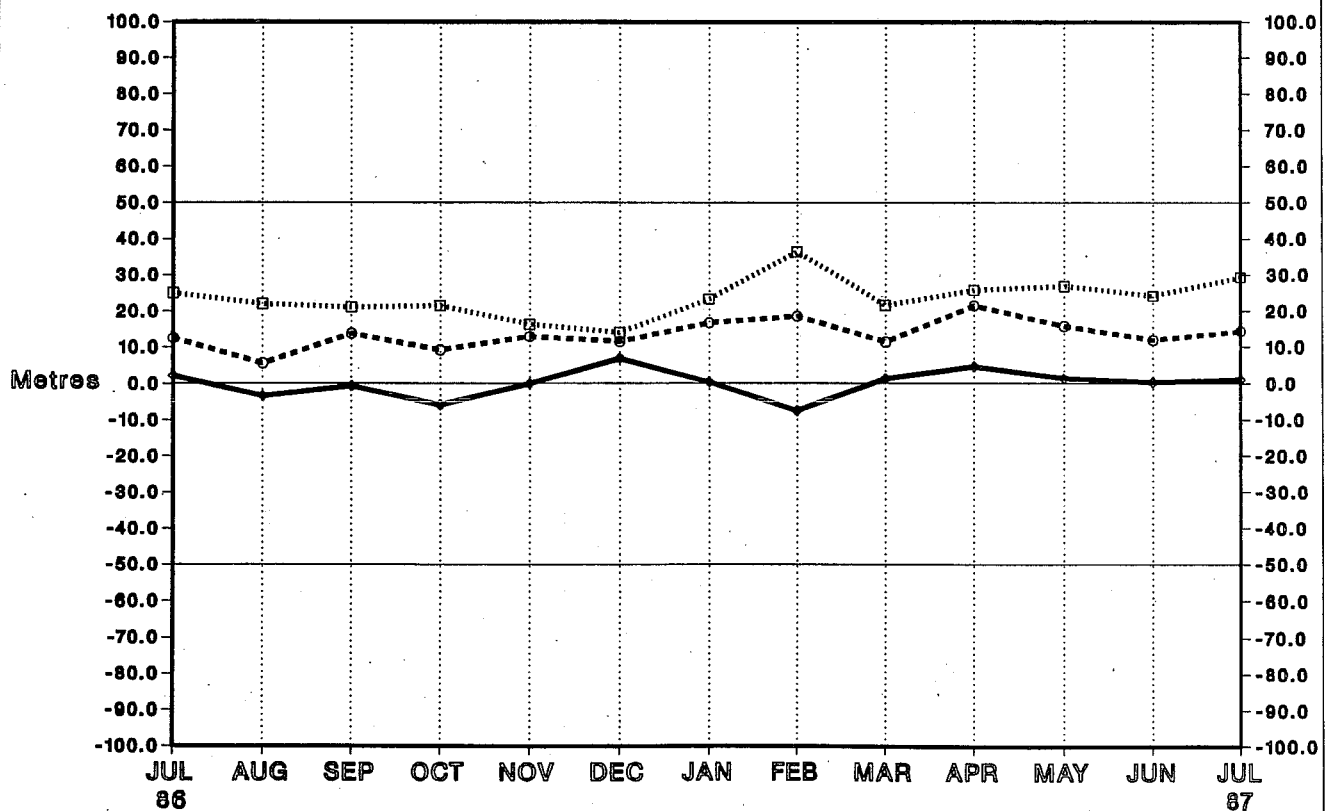
Station 01028 (75N 019E)

Radiosonde Height Monitoring Statistics

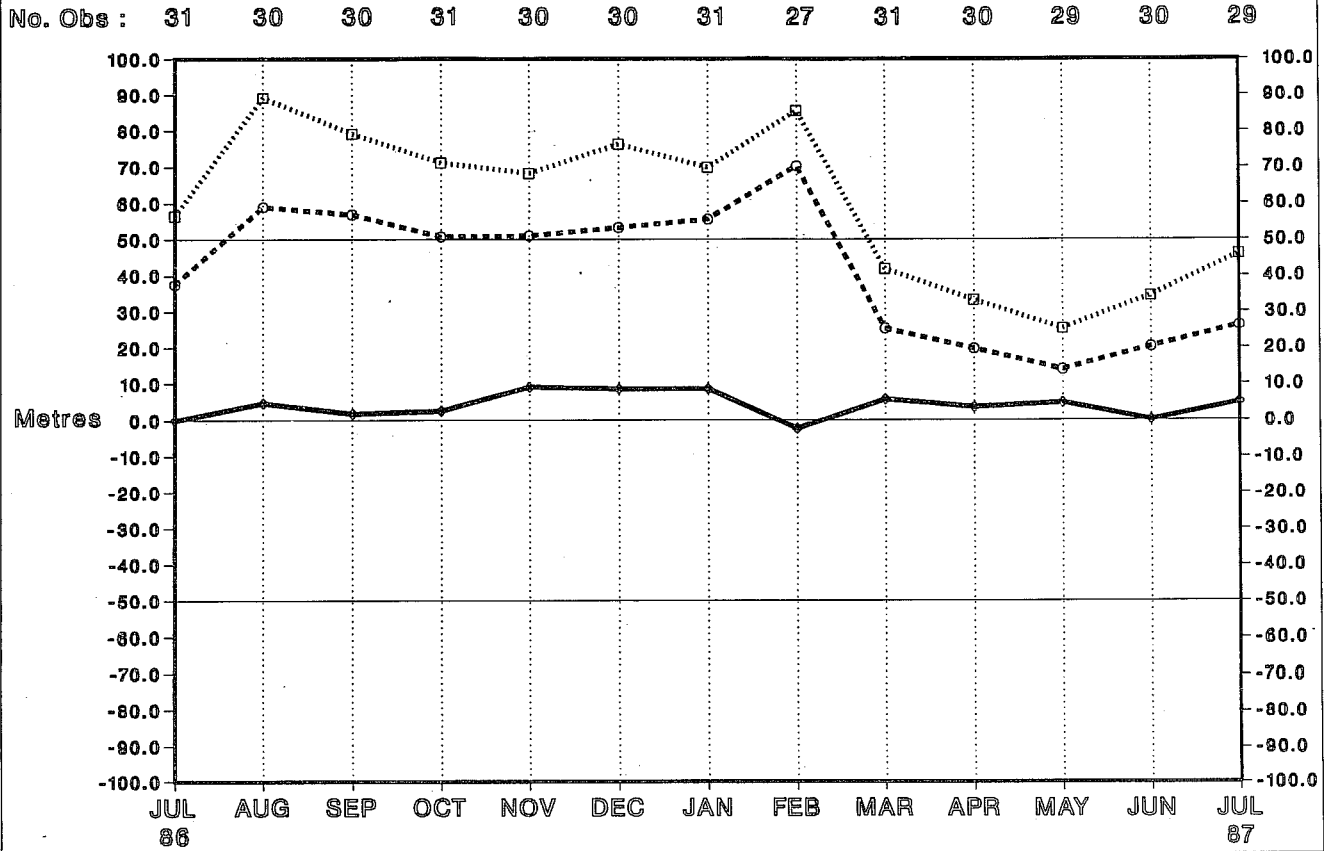
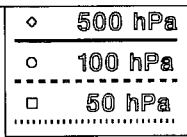
OBS - FG Differences - 12Z BIAS



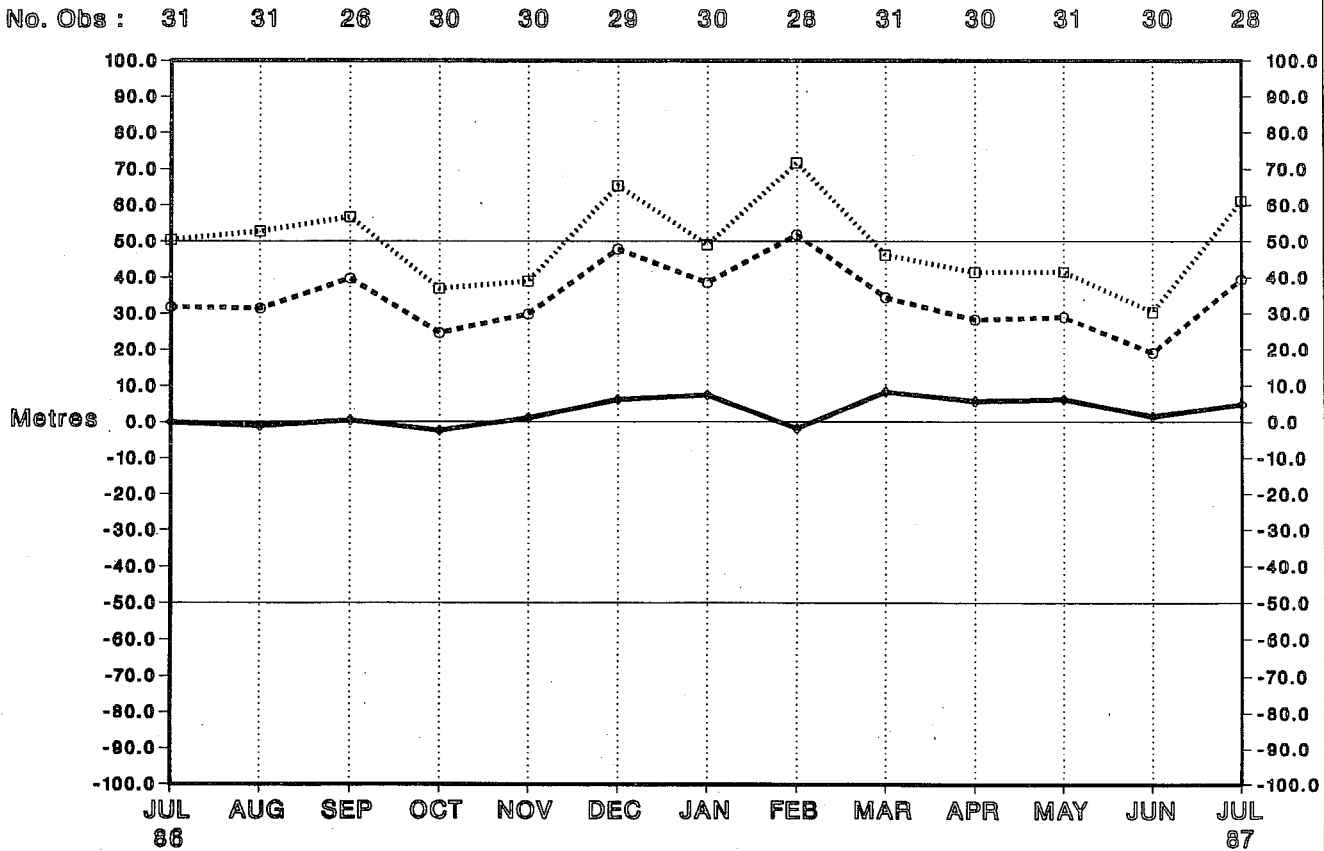
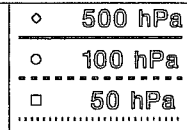
No. Obs : 30 28 30 30 30 28 30 24 31 29 30 30 31



Station 01152 (67N 014E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



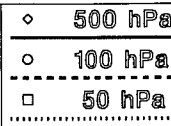
Station 01152 (67N 014E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS



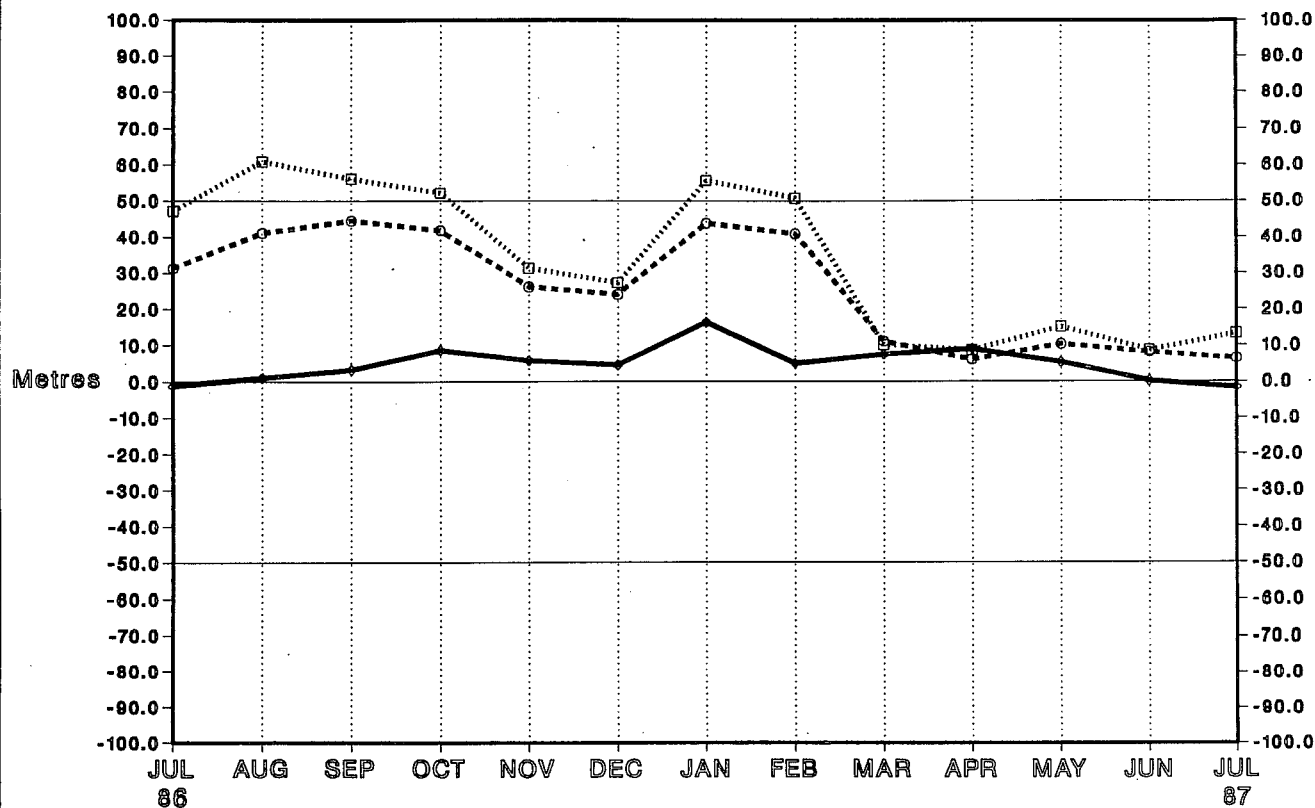
Station 01241 (64N 010E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



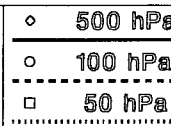
No. Obs : 31 29 29 31 29 31 31 27 31 29 31 29 31



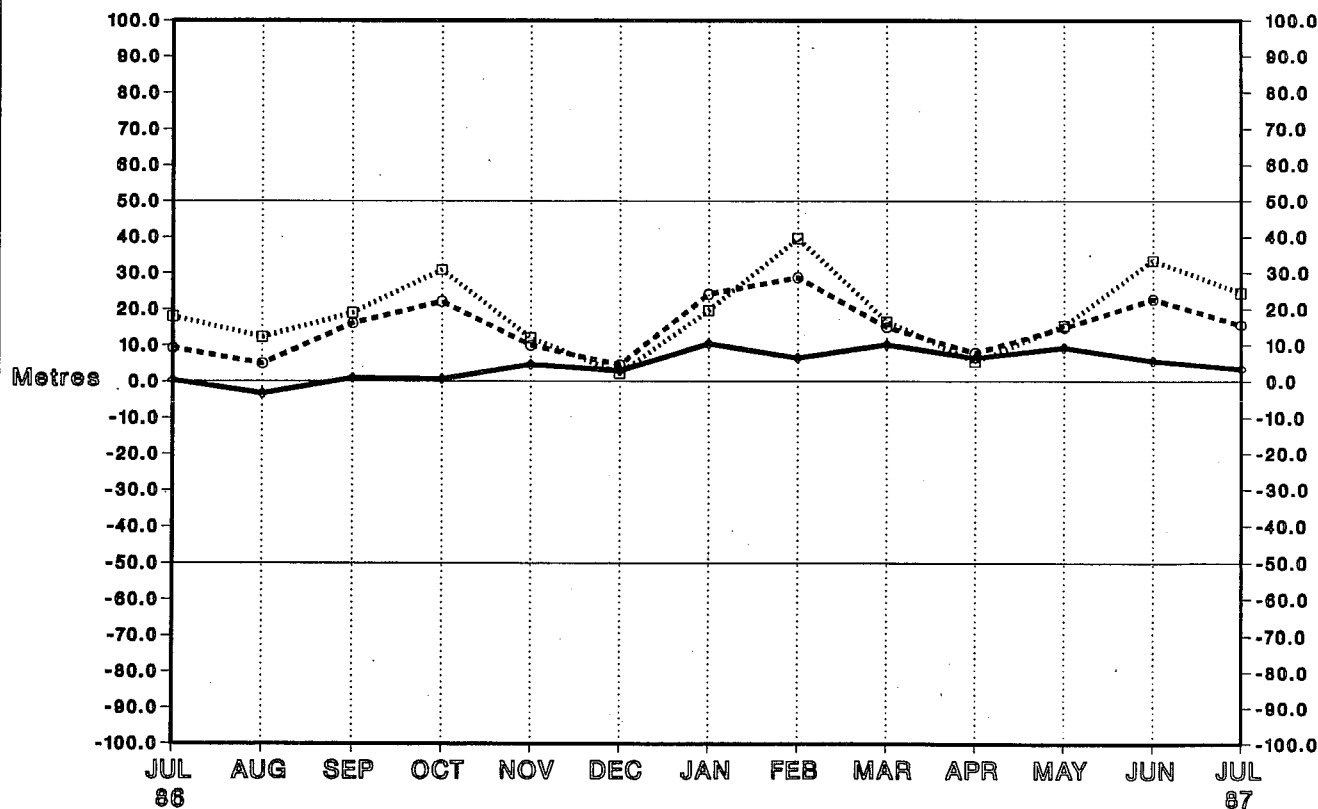
Station 01241 (64N 010E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

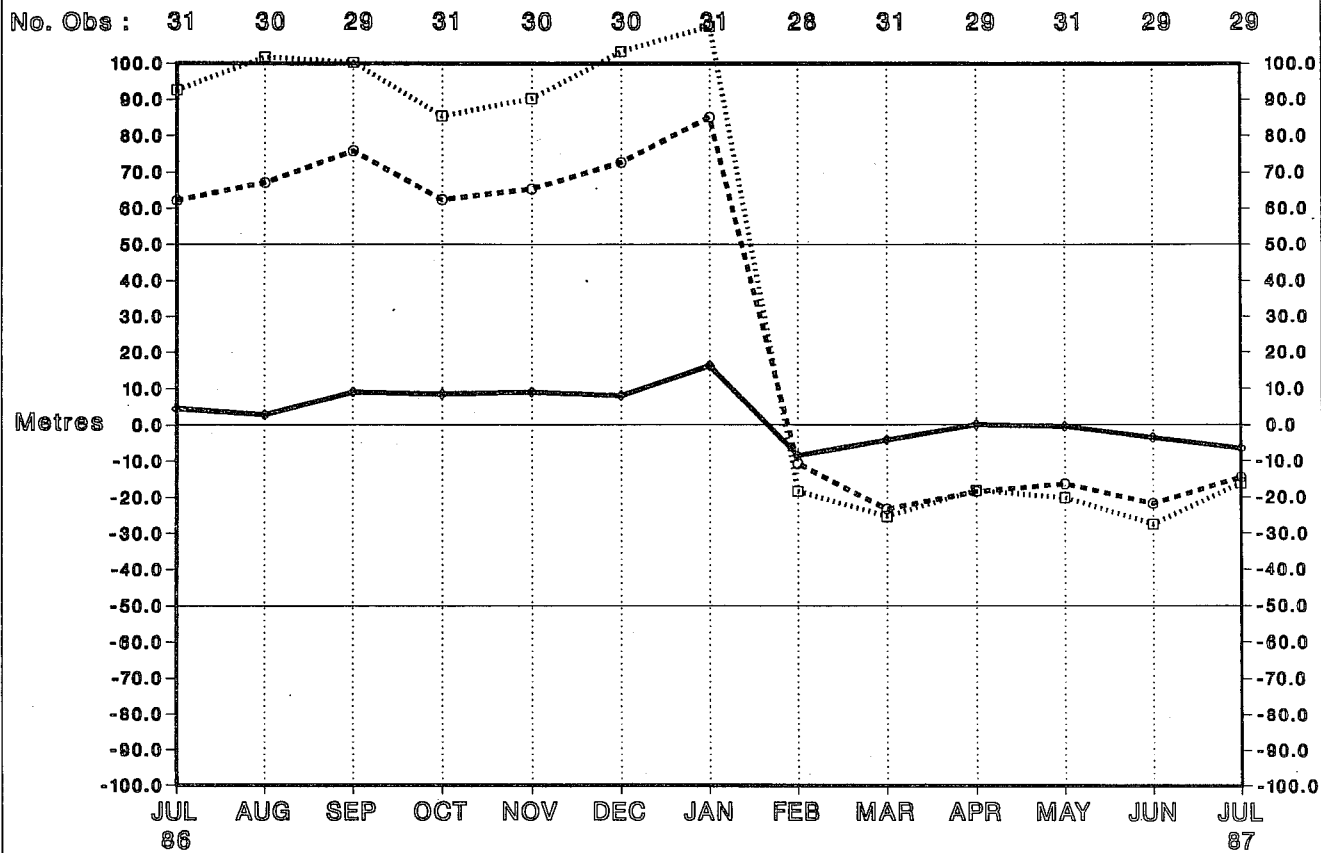


No. Obs : 31 31 27 31 28 29 29 28 31 30 31 30 29



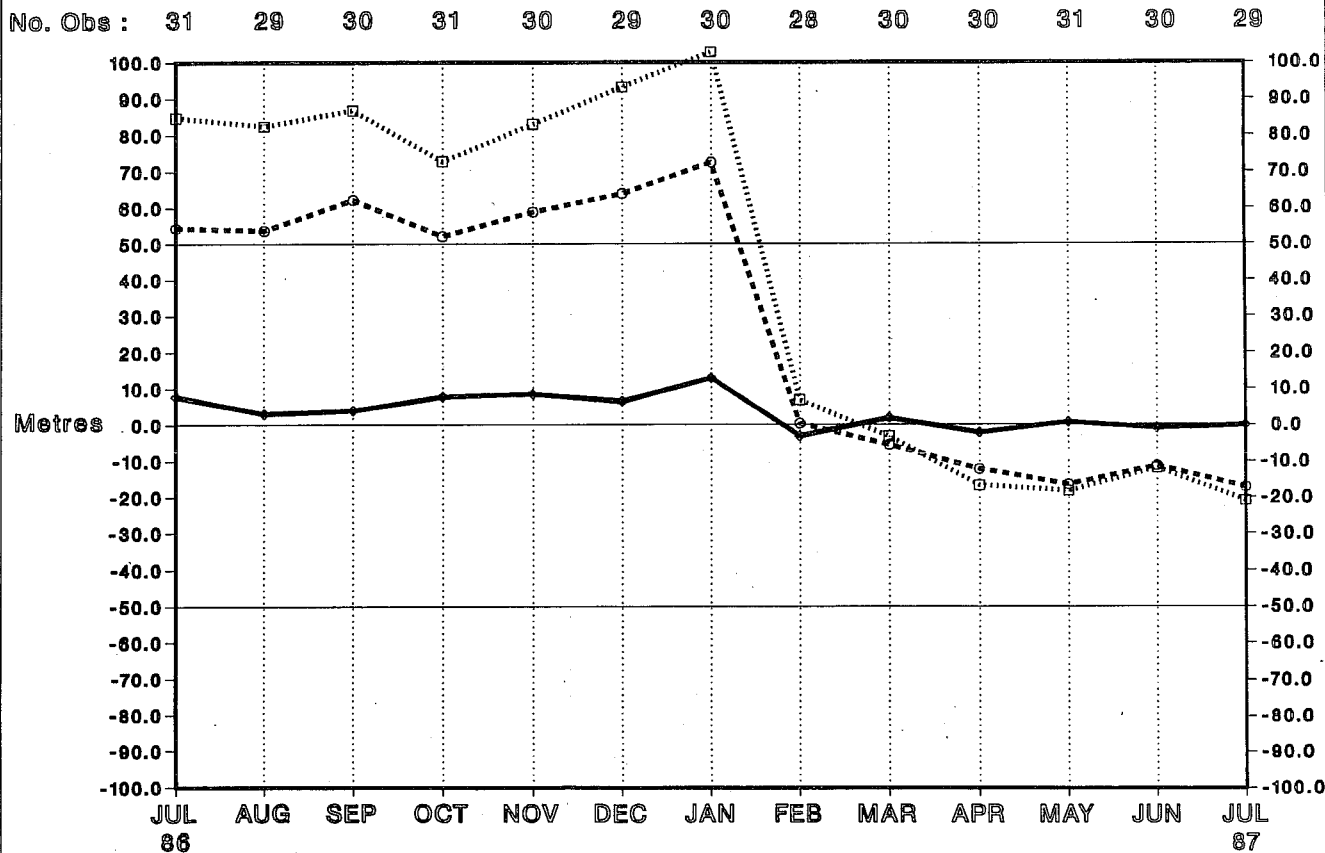
Station 01384 (60N 011E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 01384 (60N 011E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

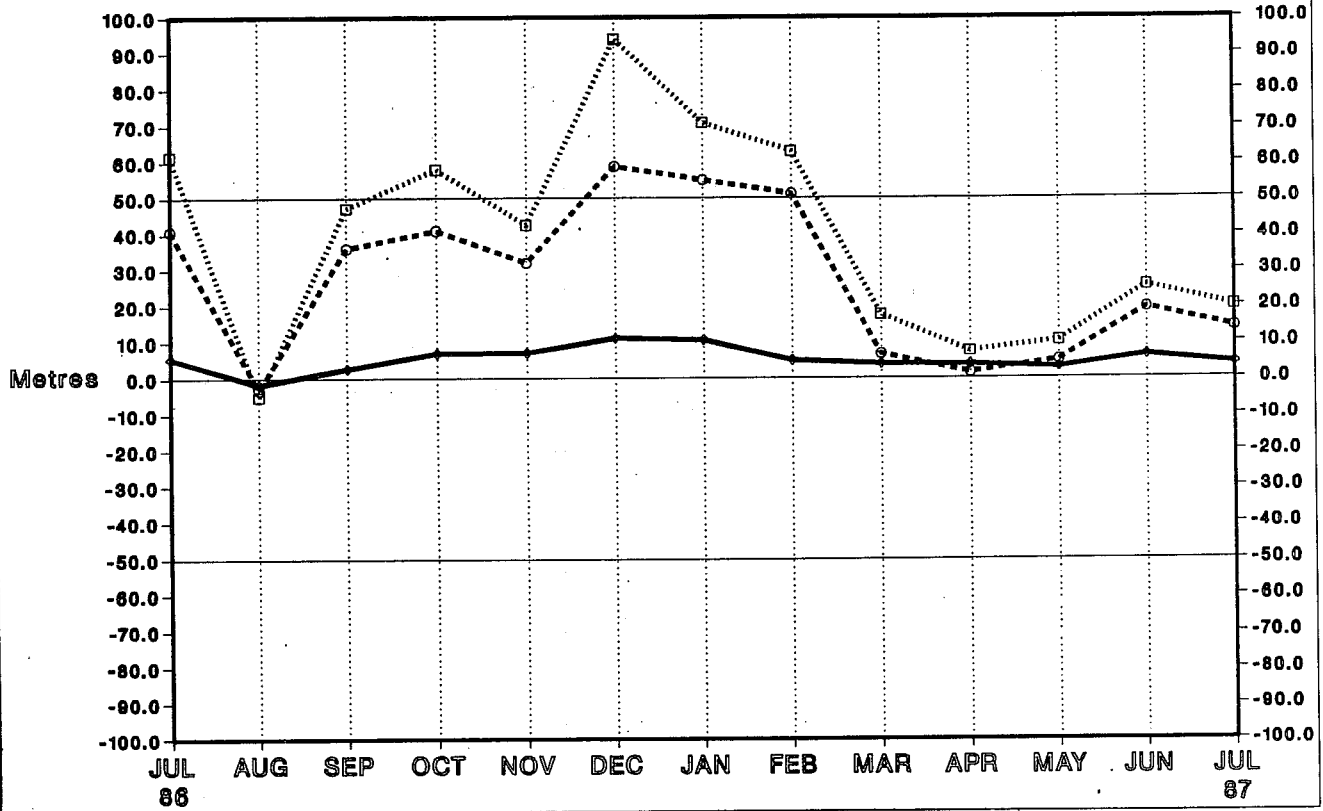
- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 01415 (59N 006E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◇ 500 hPa
 ○ 100 hPa
 □ 50 hPa

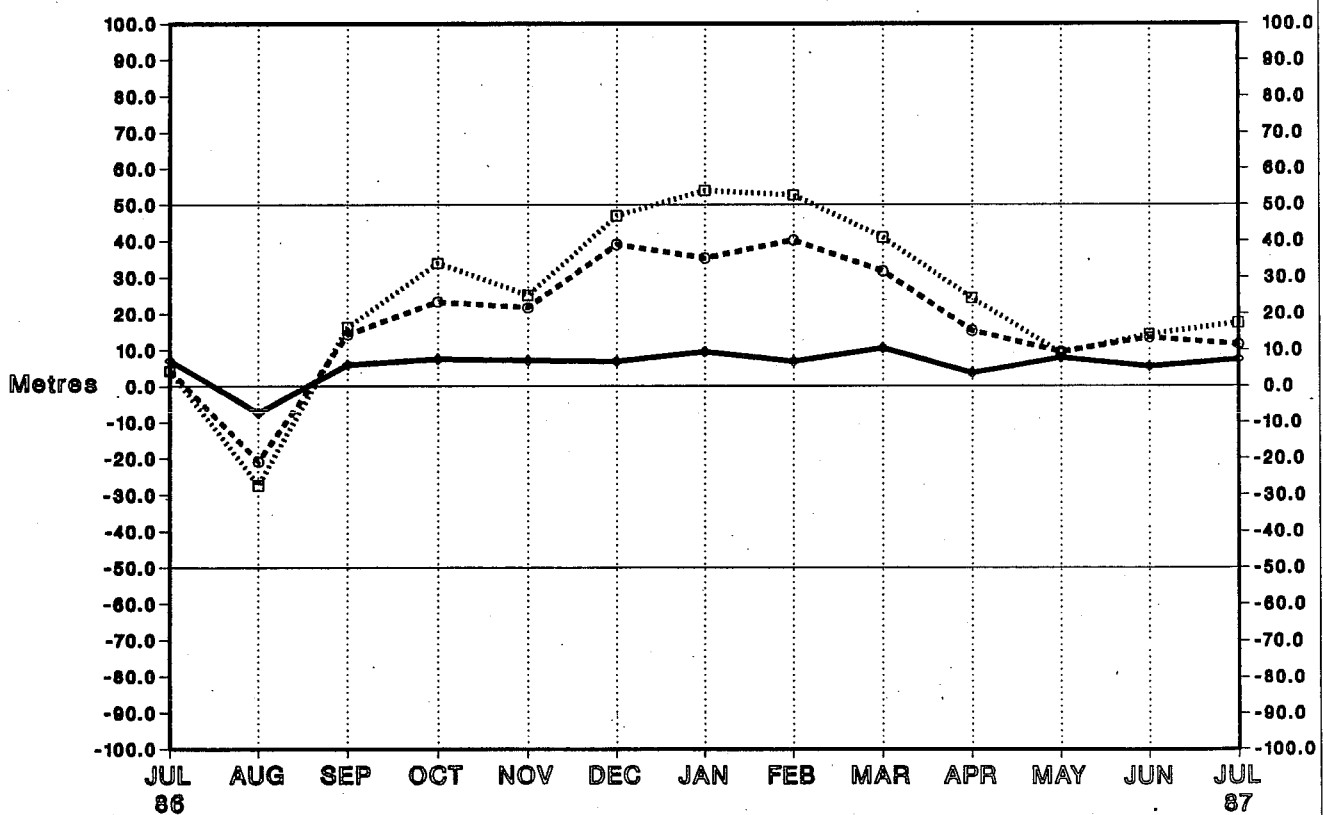
No. Obs : 31 28 30 30 29 30 30 28 31 27 31 29 30



Station 01415 (59N 006E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◇ 500 hPa
 ○ 100 hPa
 □ 50 hPa

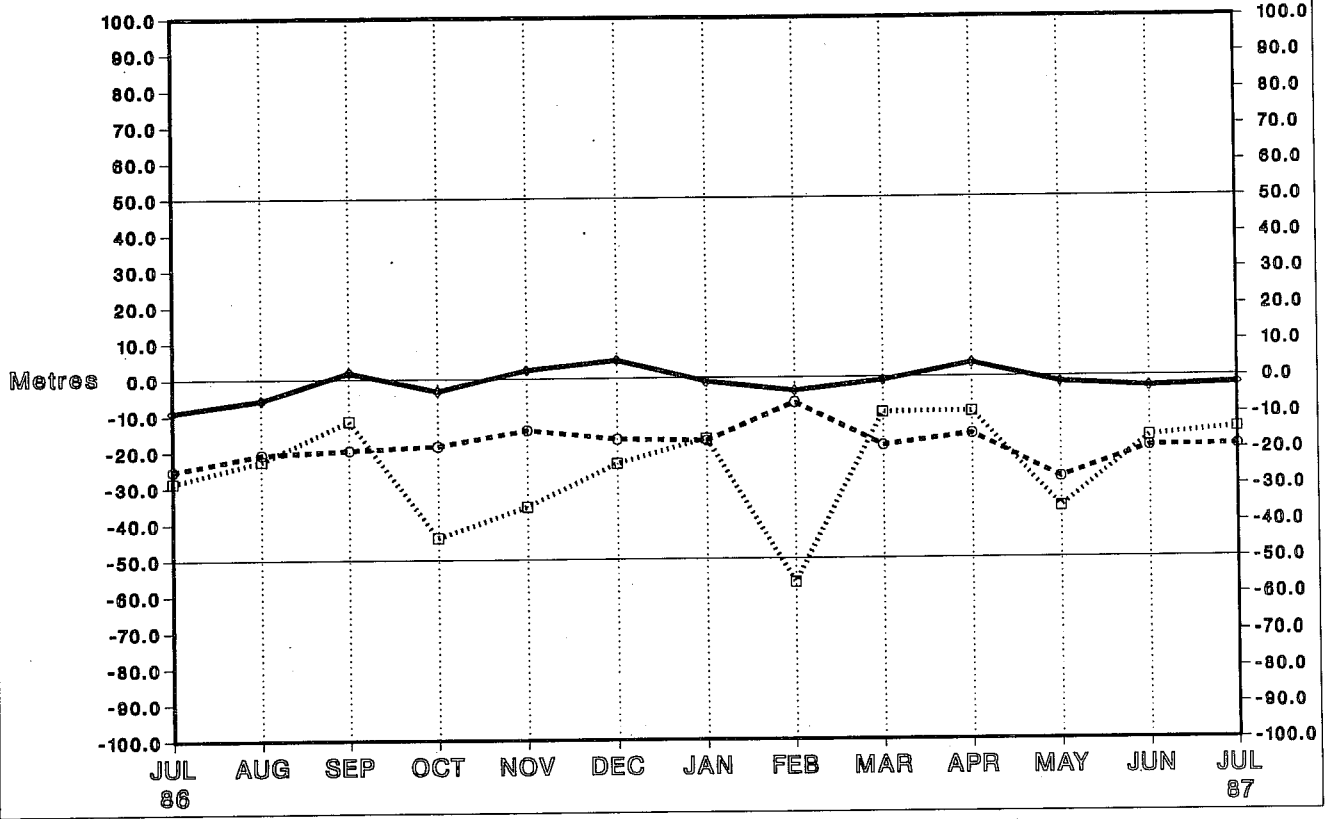
No. Obs : 30 30 29 30 28 29 30 28 30 30 31 30 29



Station 02185 (66N 022E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

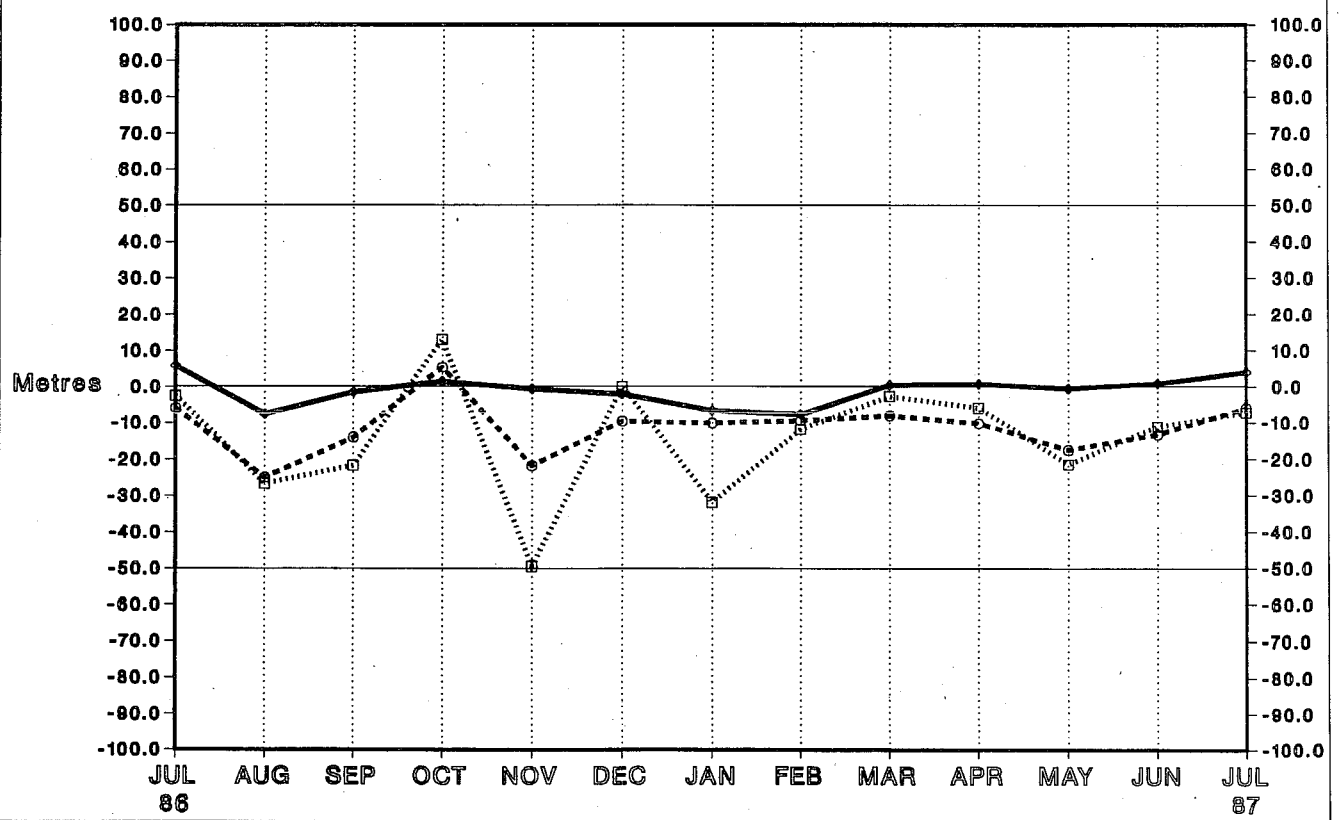
No. Obs : 31 31 27 30 29 31 26 26 31 27 31 27 28



Station 02185 (66N 022E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

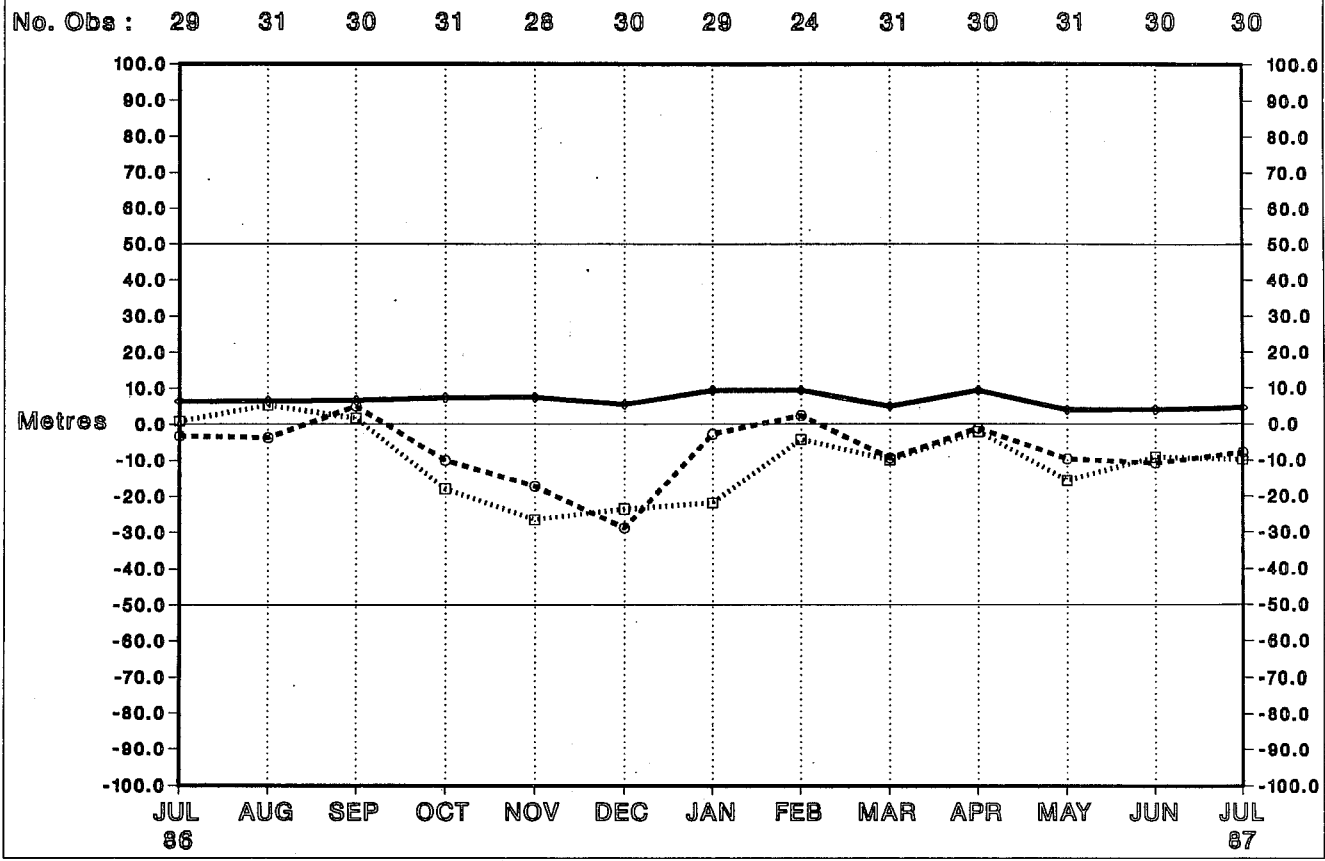
◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

No. Obs : 31 31 29 30 30 28 27 26 31 27 31 29 30



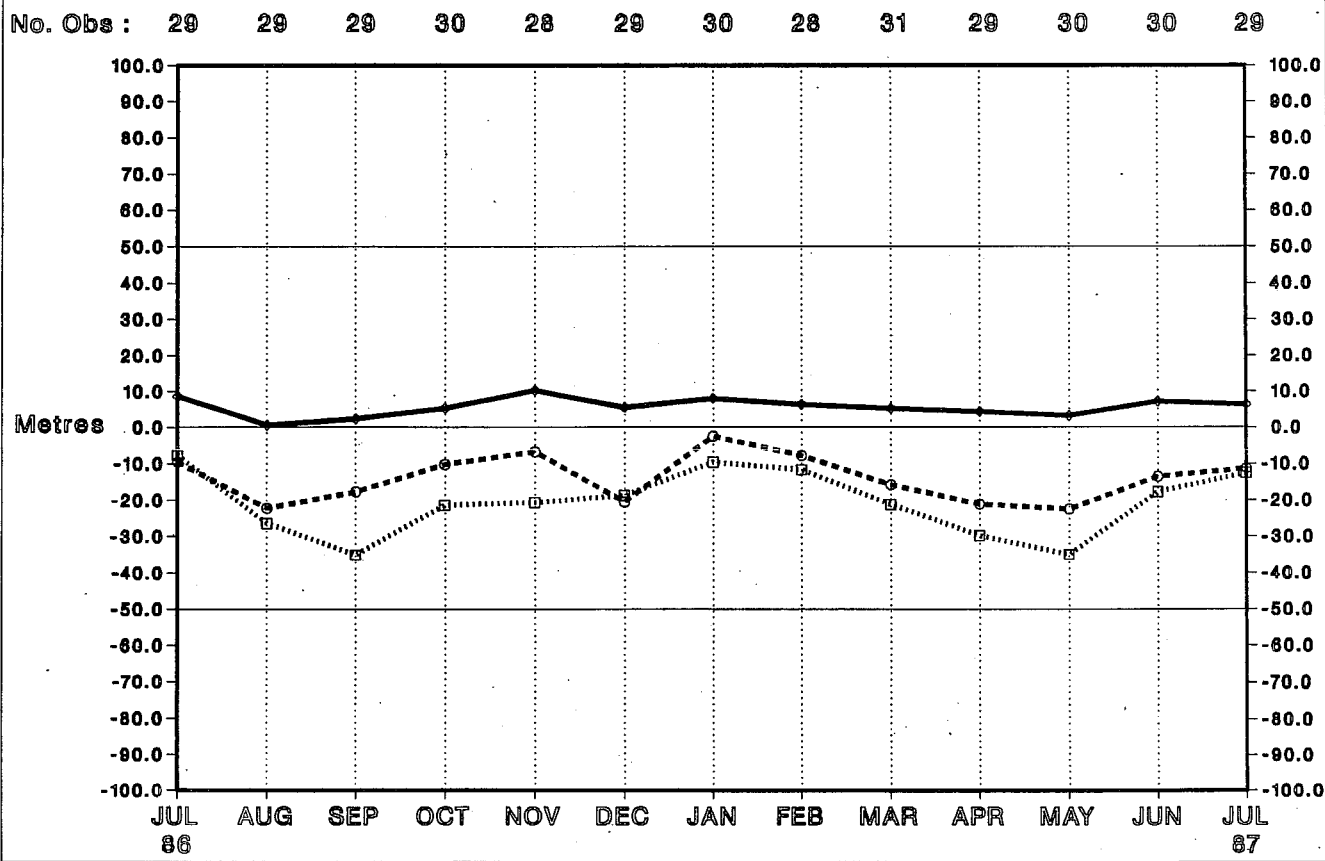
Station 02365 (63N 017E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 02365 (63N 017E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

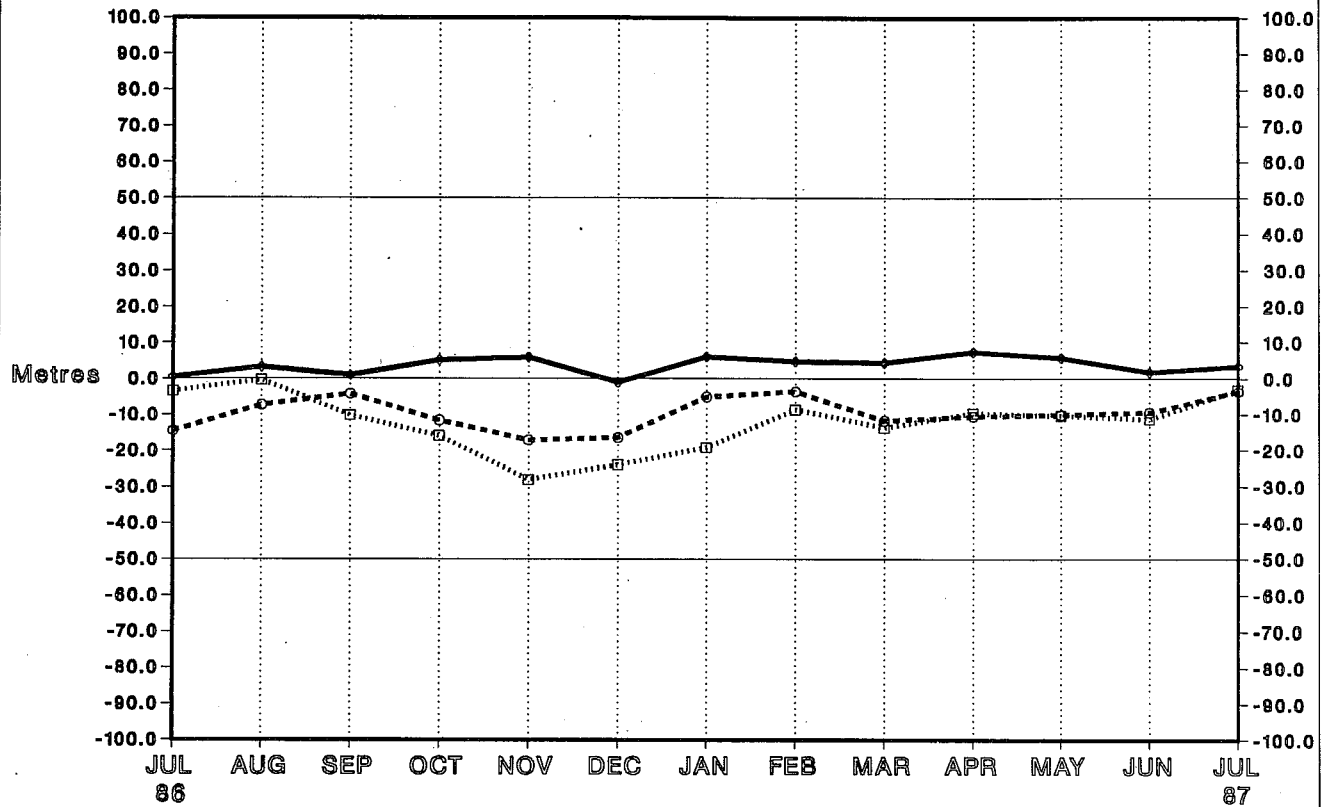
- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 02465 (59N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-

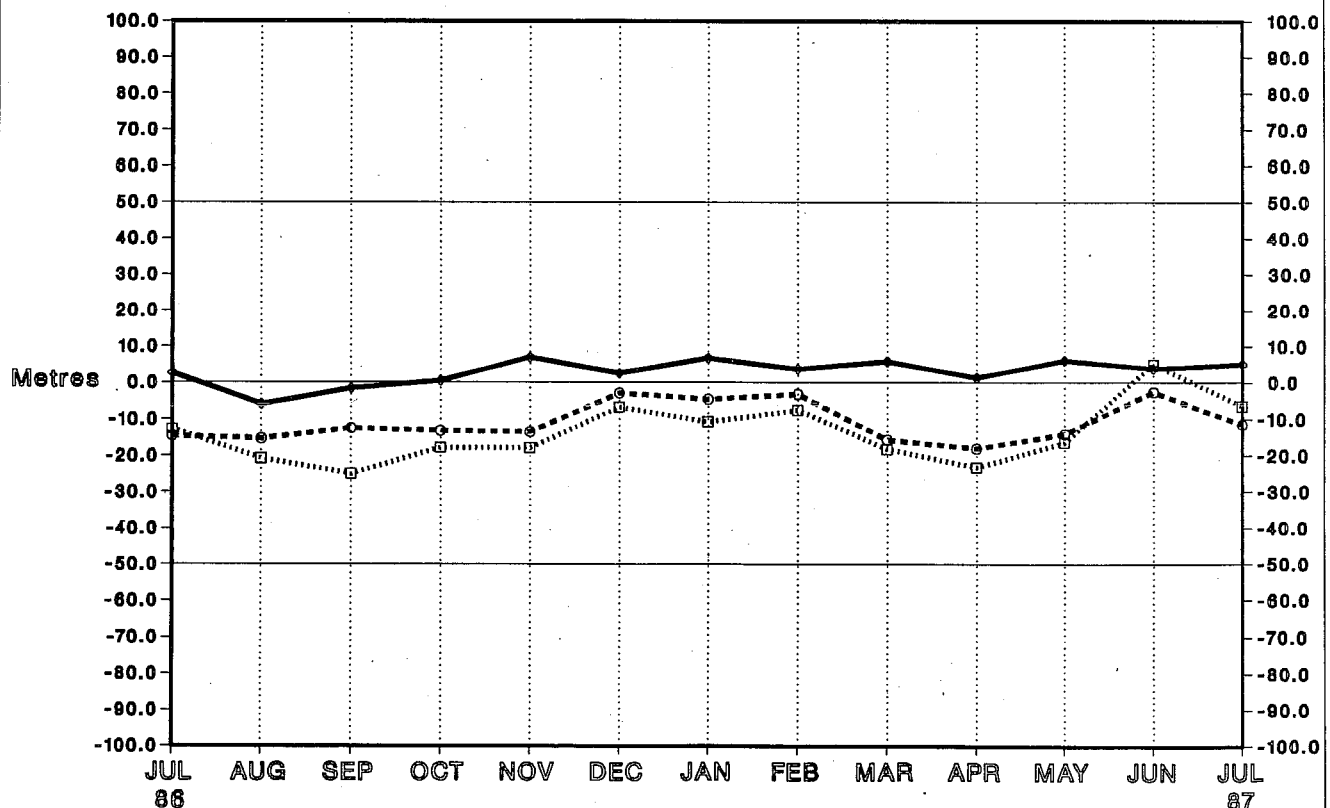
No. Obs : 31 30 30 31 29 30 31 28 29 30 31 29 30



Station 02465 (59N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-

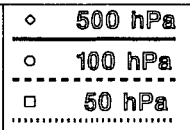
No. Obs : 31 30 30 31 30 29 30 27 30 30 31 30 31



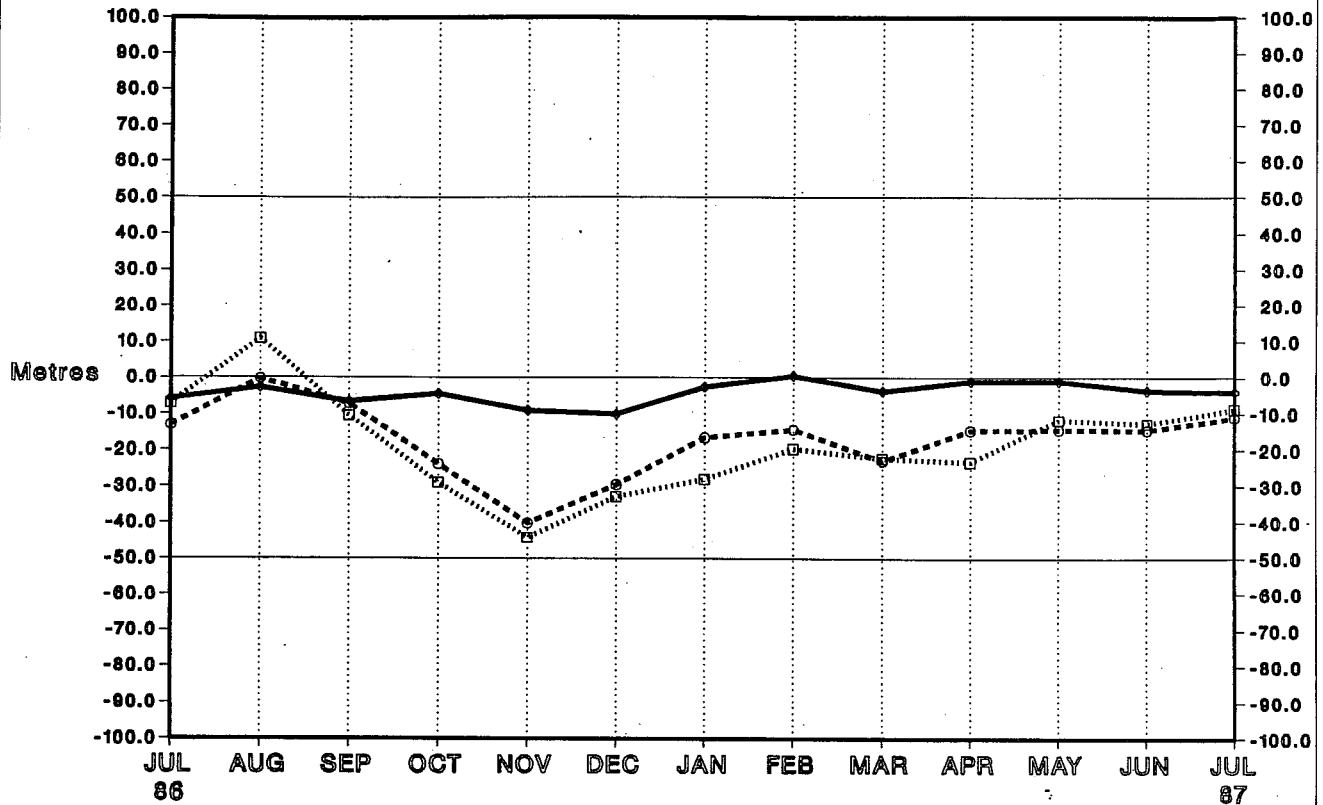
Station 02527 (58N 012E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



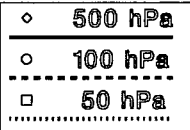
No. Obs : 29 30 28 30 30 29 31 26 29 30 31 30 30



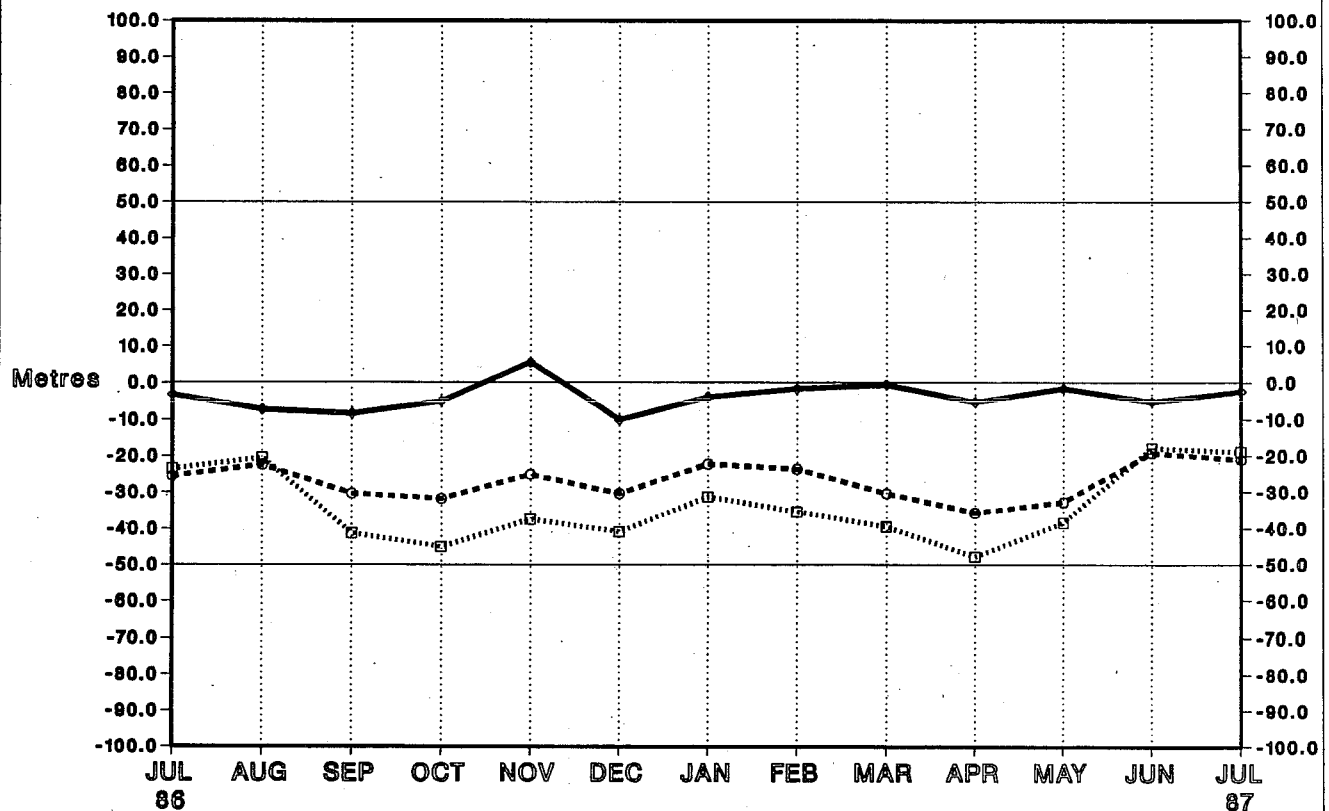
Station 02527 (58N 012E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

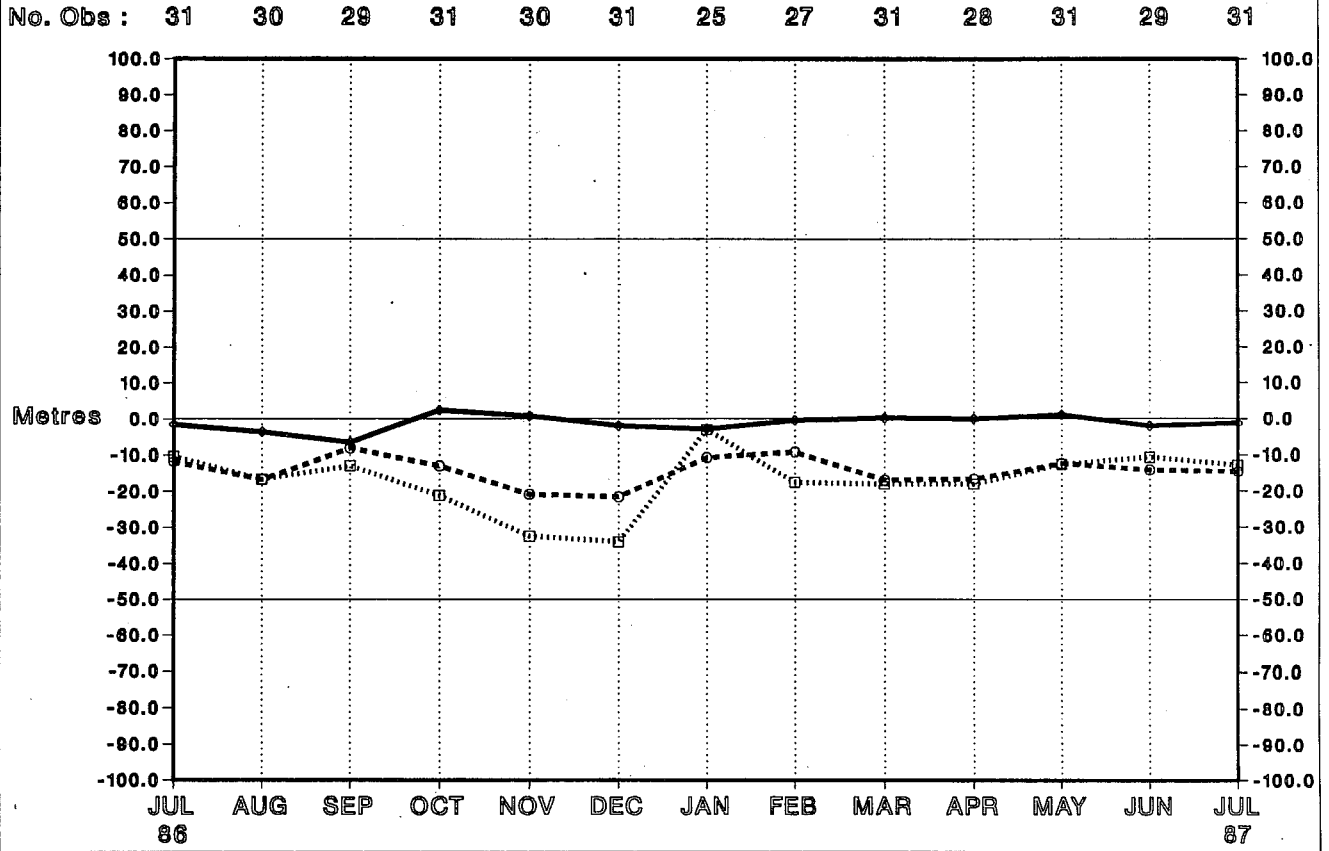


No. Obs : 31 31 30 30 30 29 28 28 30 30 31 29 31



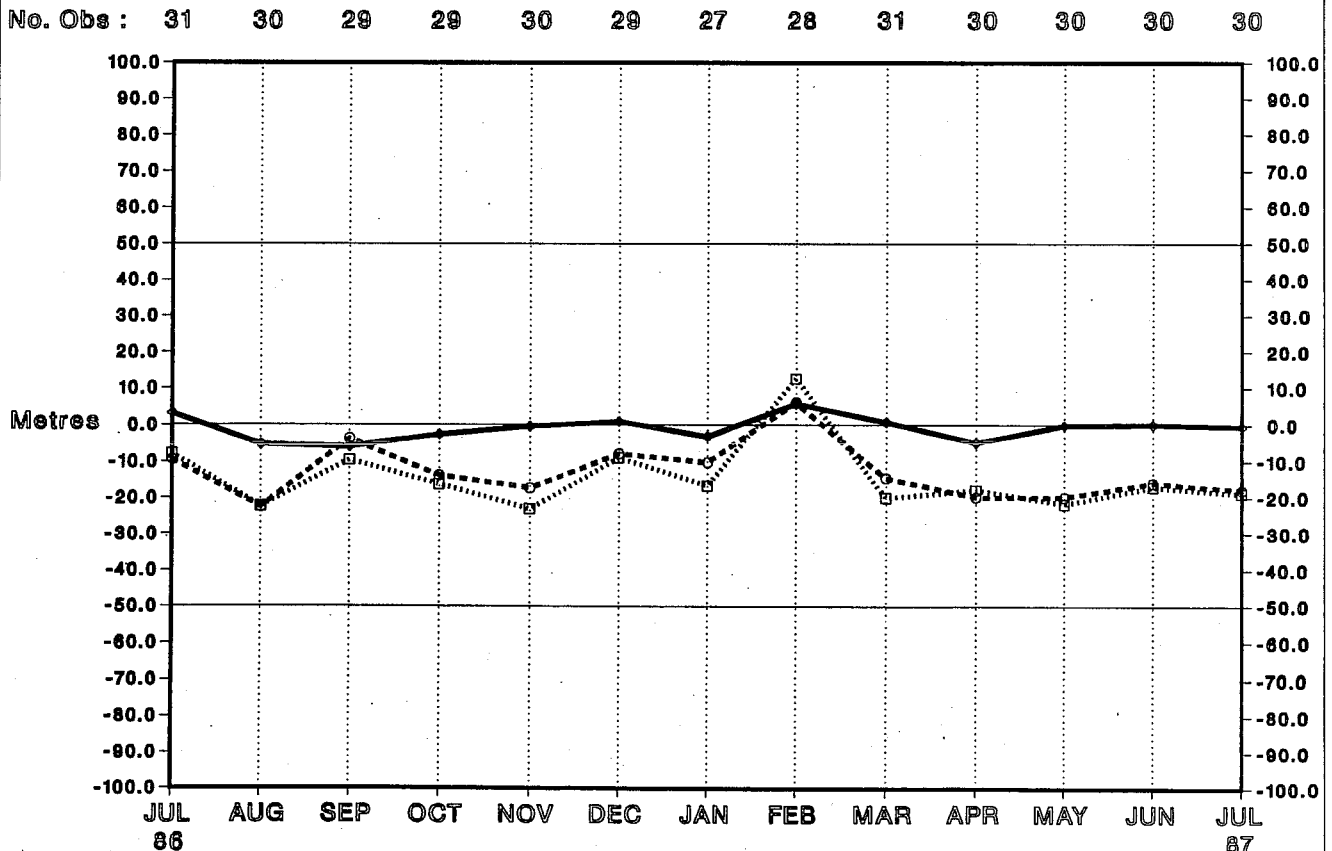
Station 02591 (58N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-



Station 02591 (58N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

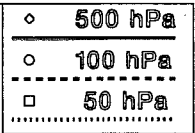
- ◇ 500 hPa
- 100 hPa
- 50 hPa
-



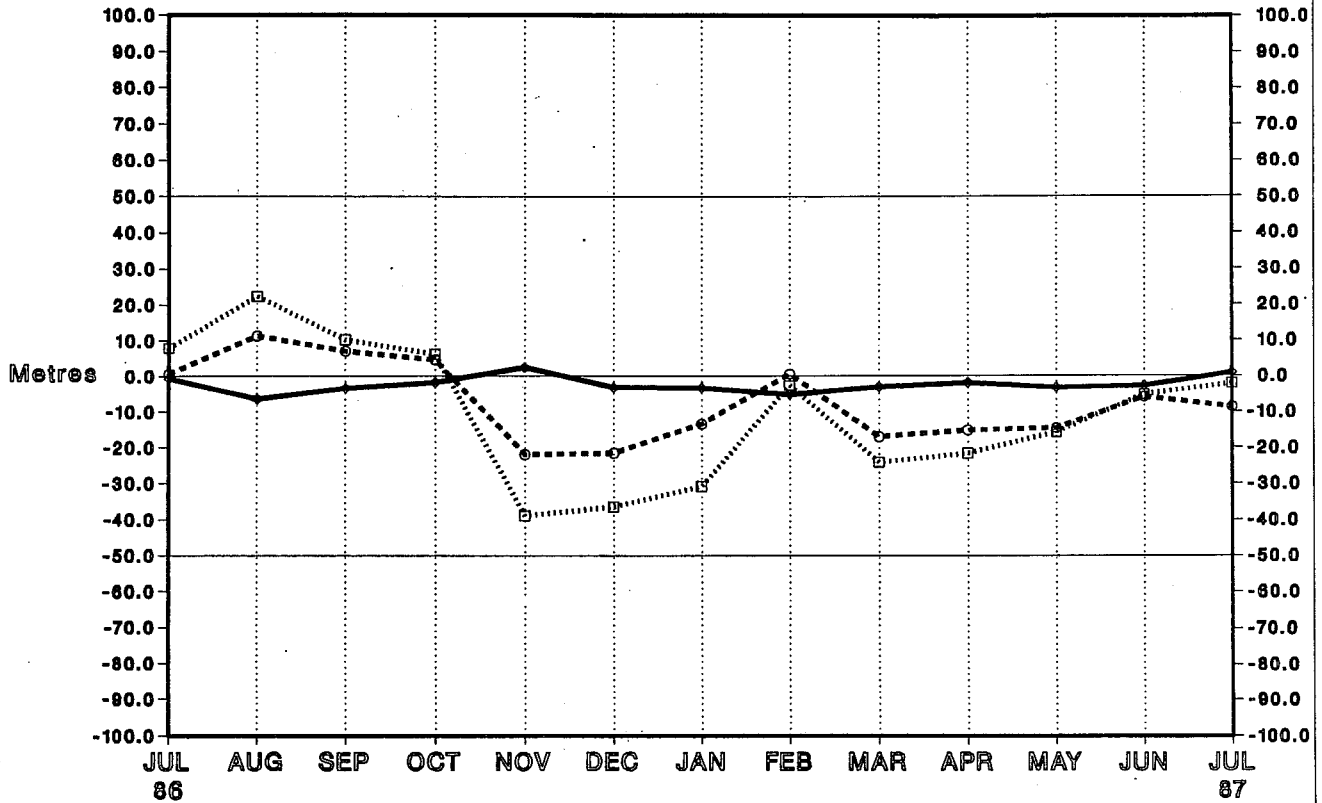
Station 02836 (67N 027E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



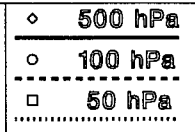
No. Obs: 31 30 30 31 30 30 31 28 31 30 31 30 30



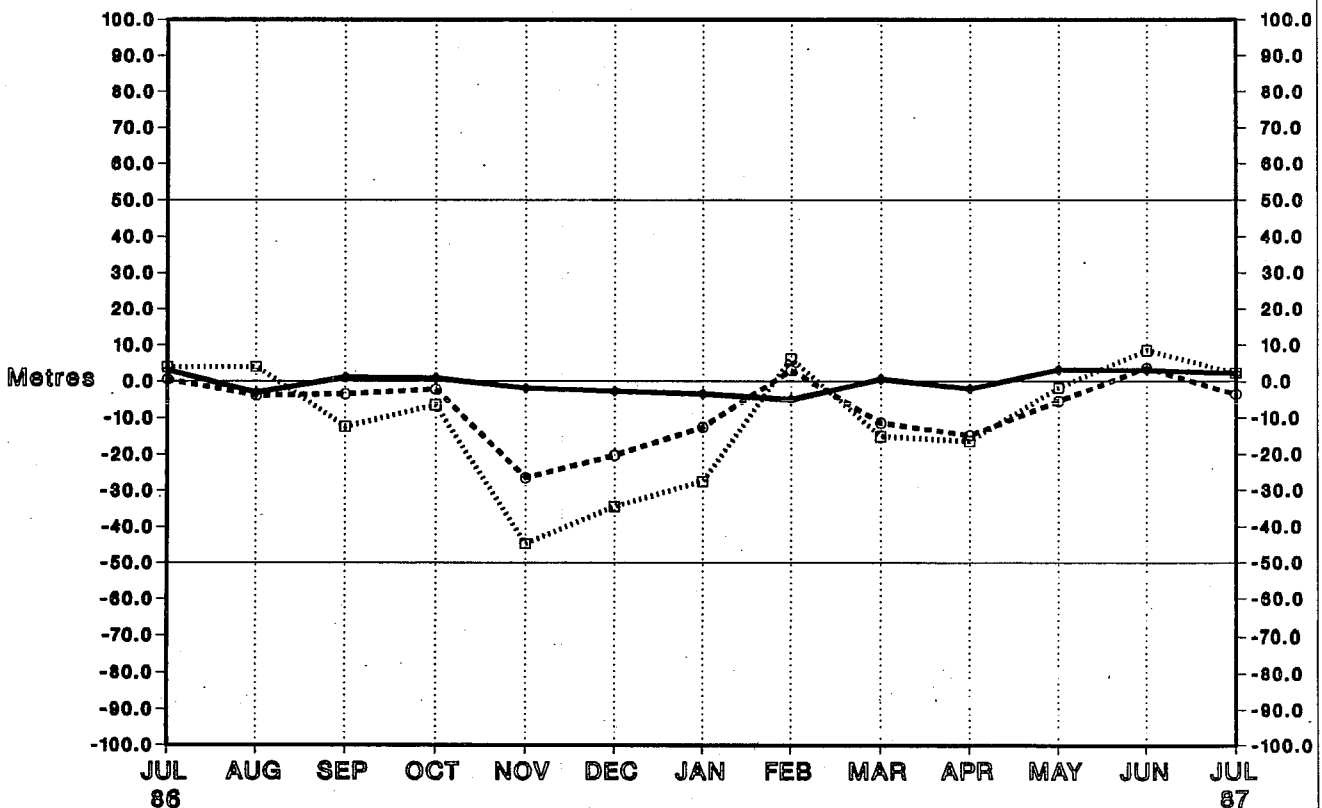
Station 02836 (67N 027E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



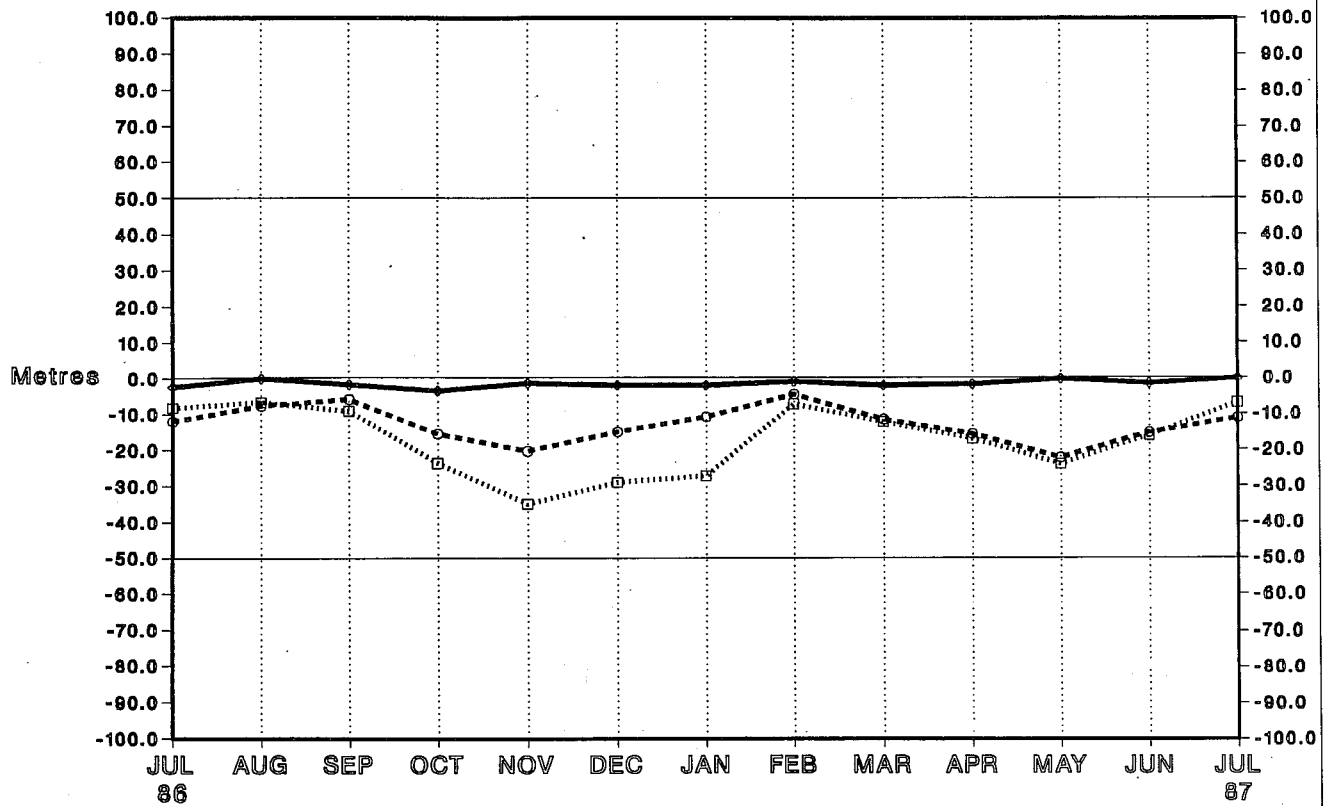
No. Obs: 31 31 29 30 30 29 30 28 31 30 31 30 31



Station 02935 (62N 026E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

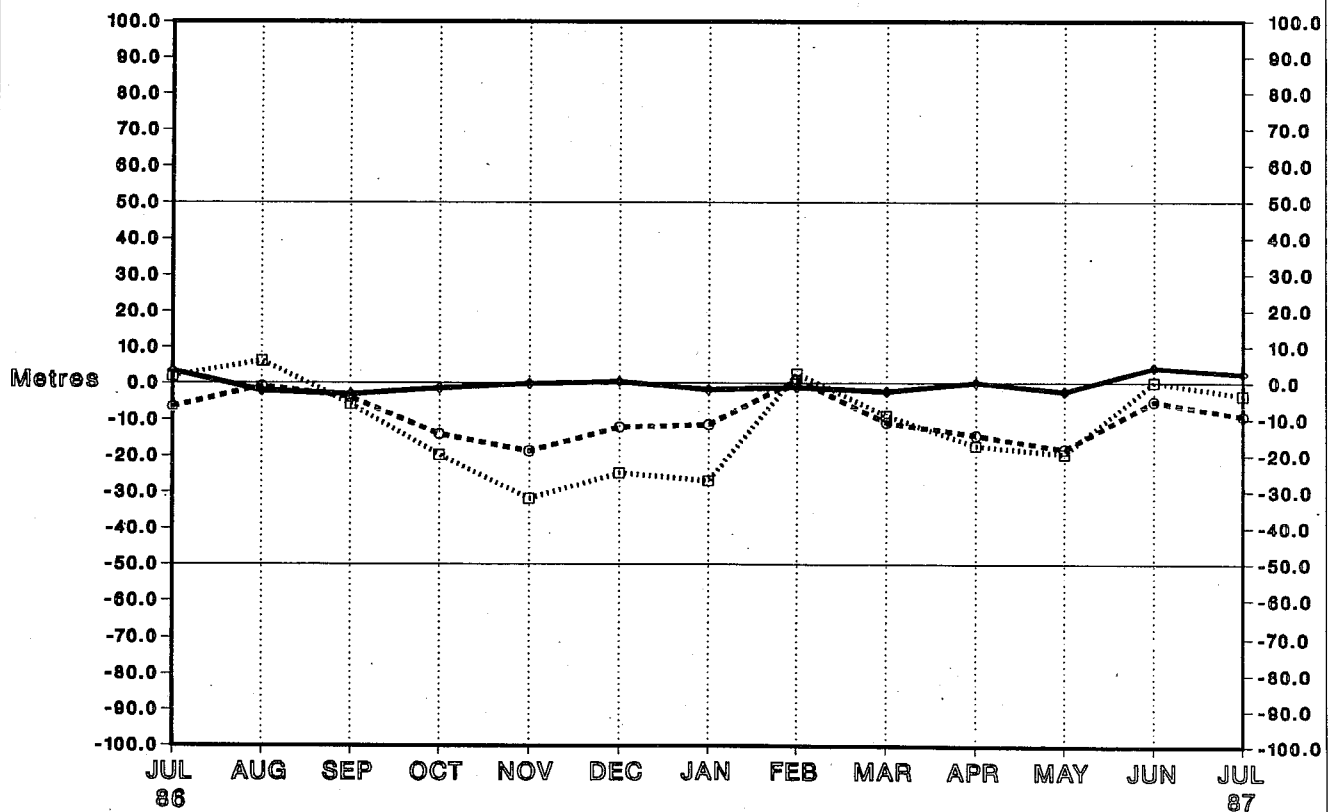
No. Obs : 31 30 30 31 30 30 30 28 31 30 31 30 31



Station 02935 (62N 026E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 29 30 28 31 30 31 30 30



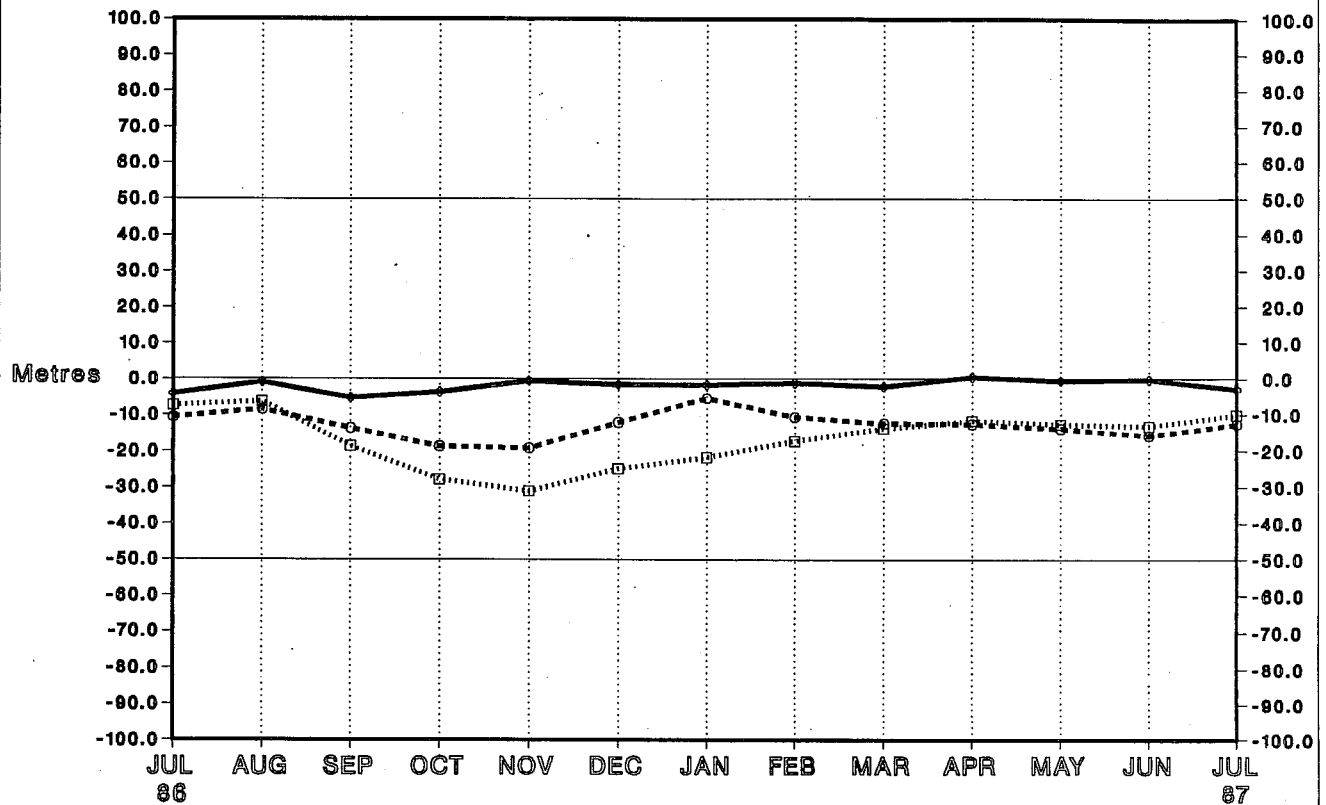
Station 02963 (61N 024E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 31 30 30 31 30 30 30 28 31 29 30 30 31



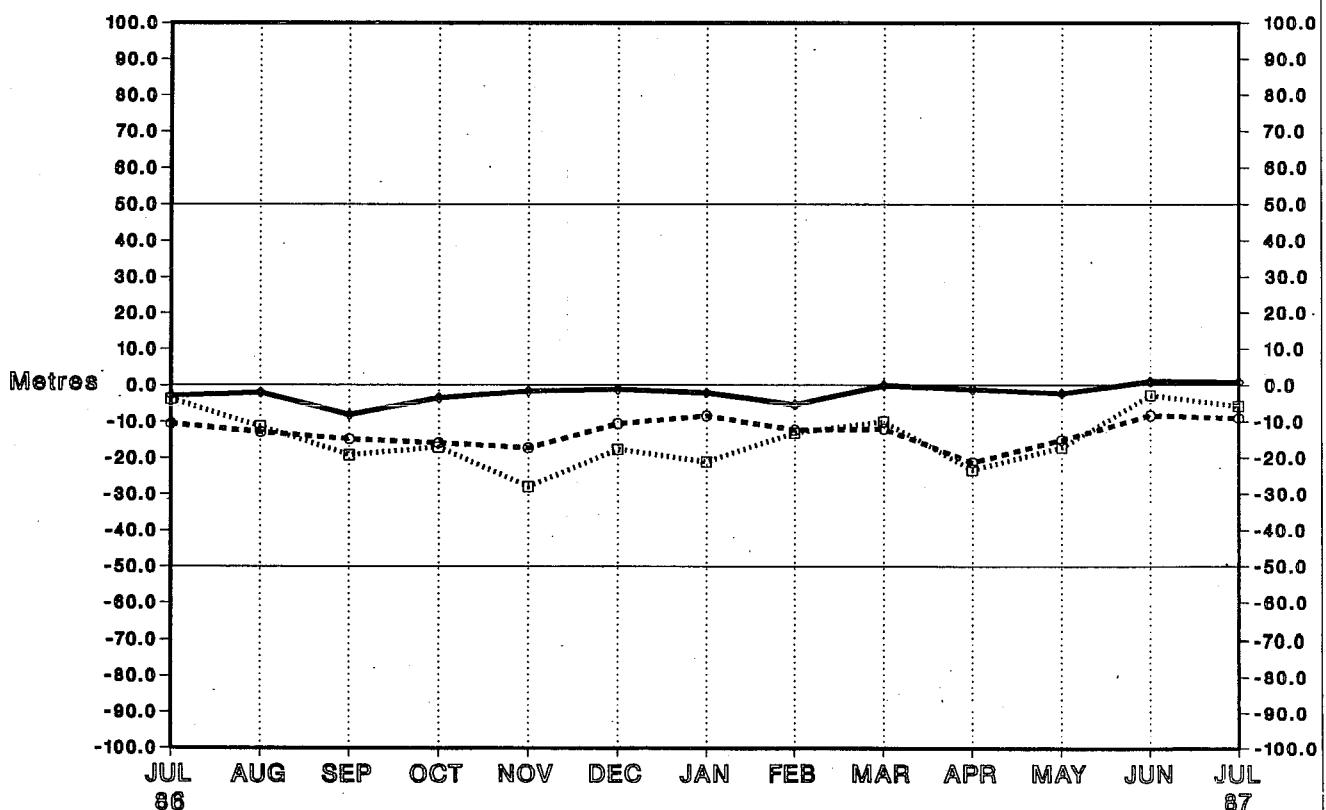
Station 02963 (61N 024E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

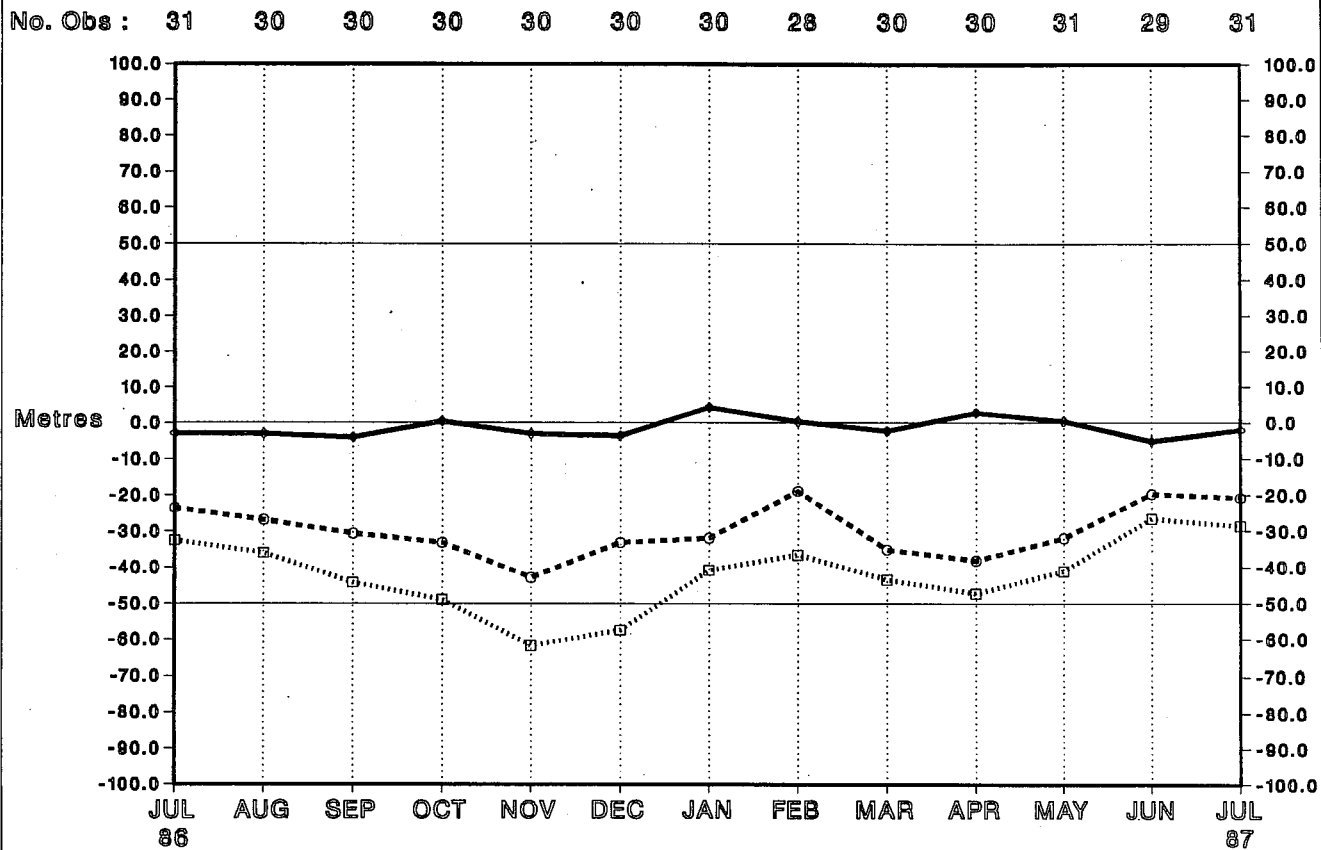
- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 31 31 29 31 30 29 30 28 31 30 31 30 31



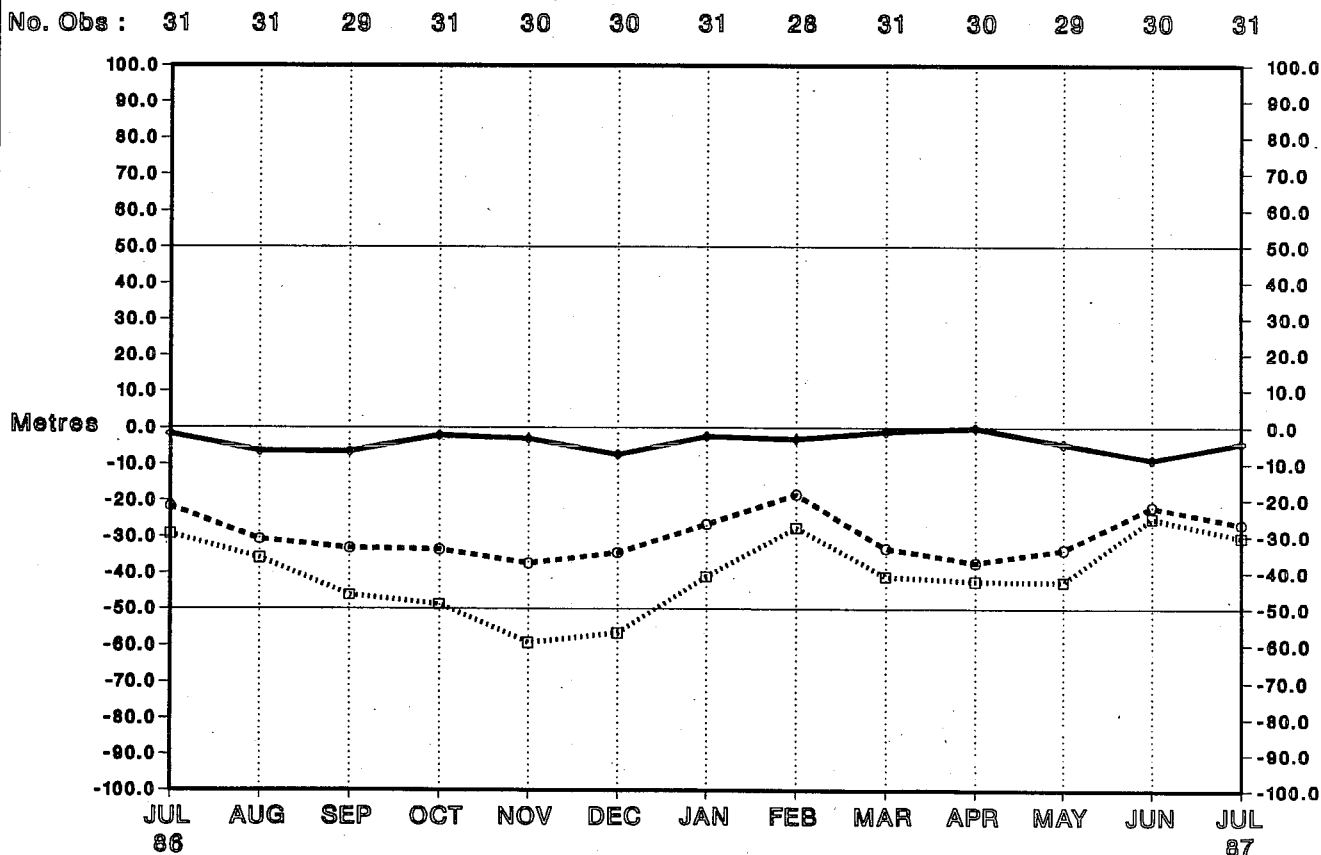
Station 03005 (60N 000E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 03005 (60N 000E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

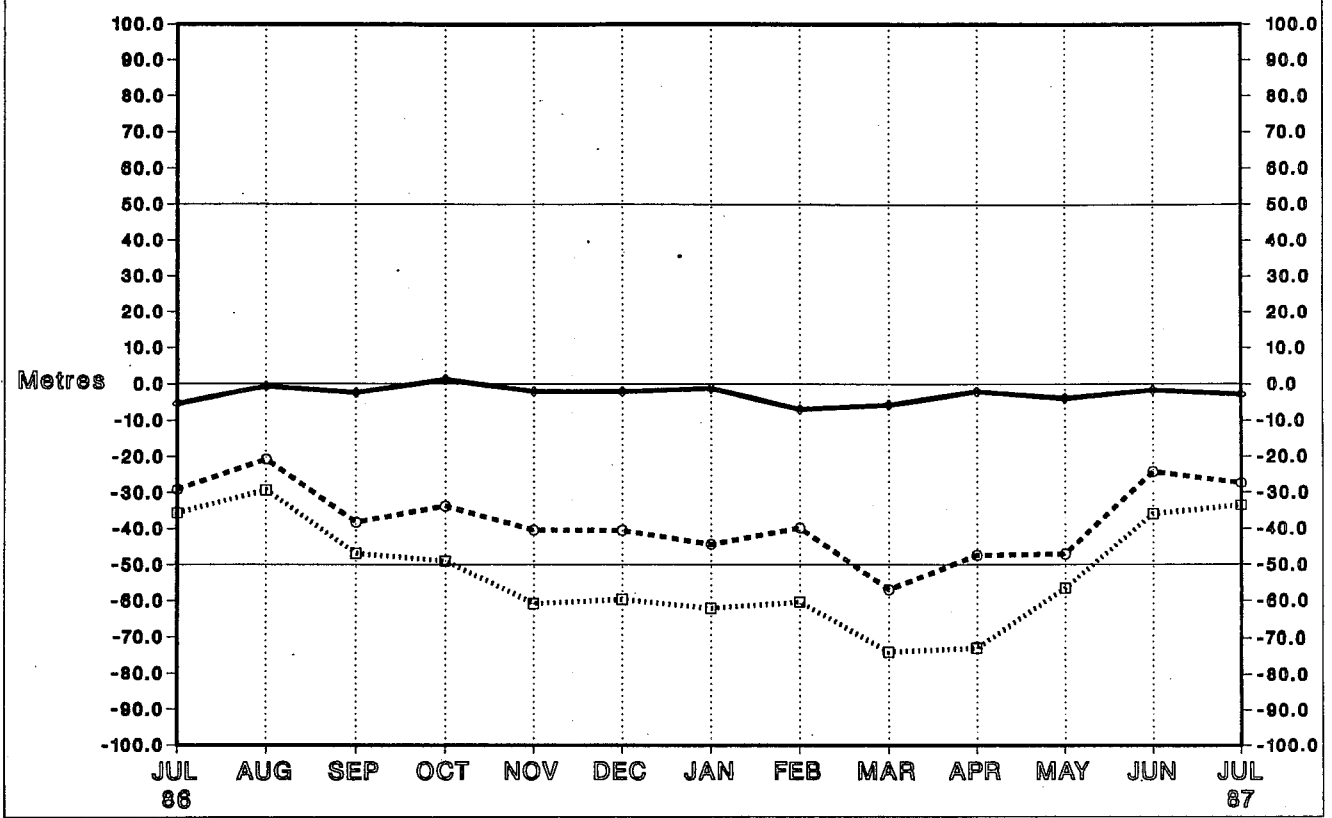
- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 03026 (58N 005W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

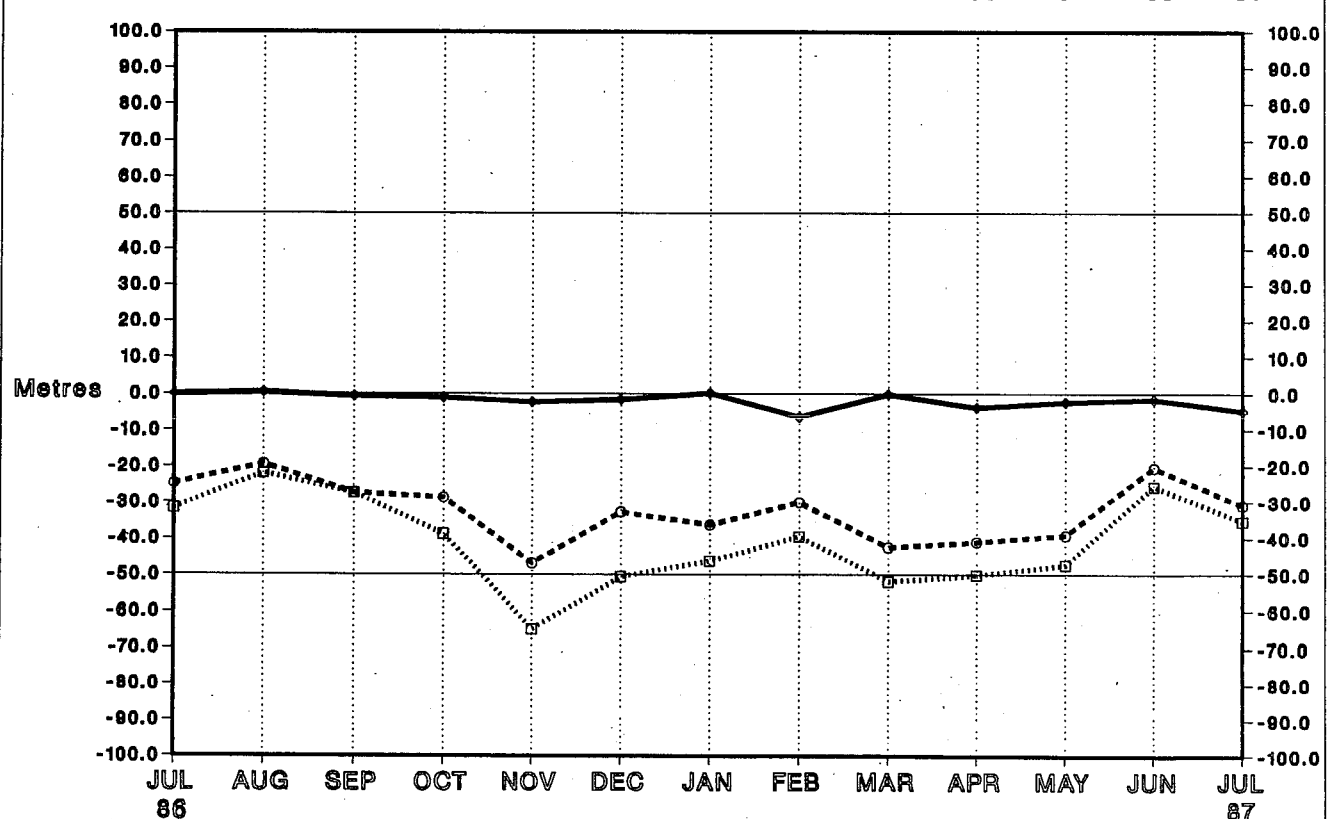
No. Obs : 31 31 30 31 30 29 31 28 31 30 31 30 30



Station 03026 (58N 005W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

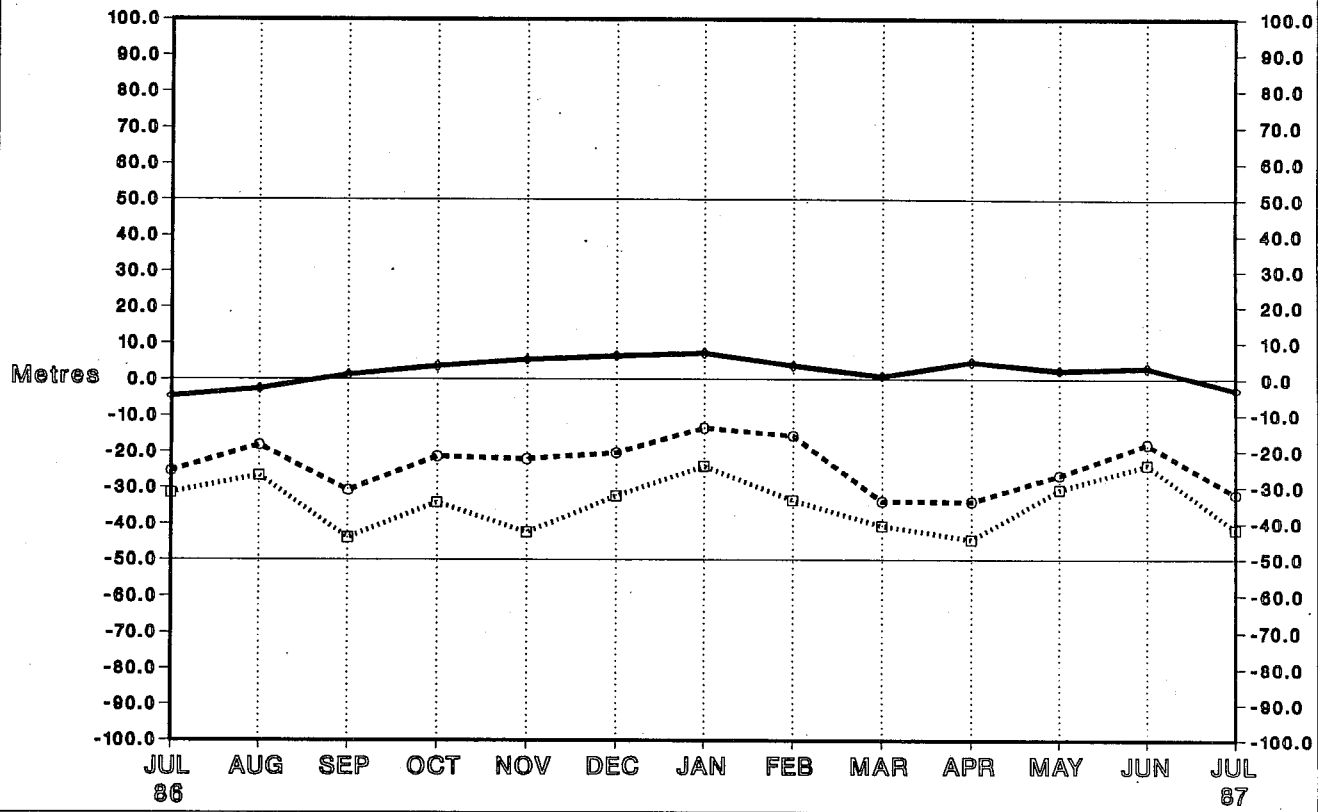
No. Obs : 31 30 29 31 29 31 31 28 31 30 31 30 31



Station 03170 (56N 002W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-

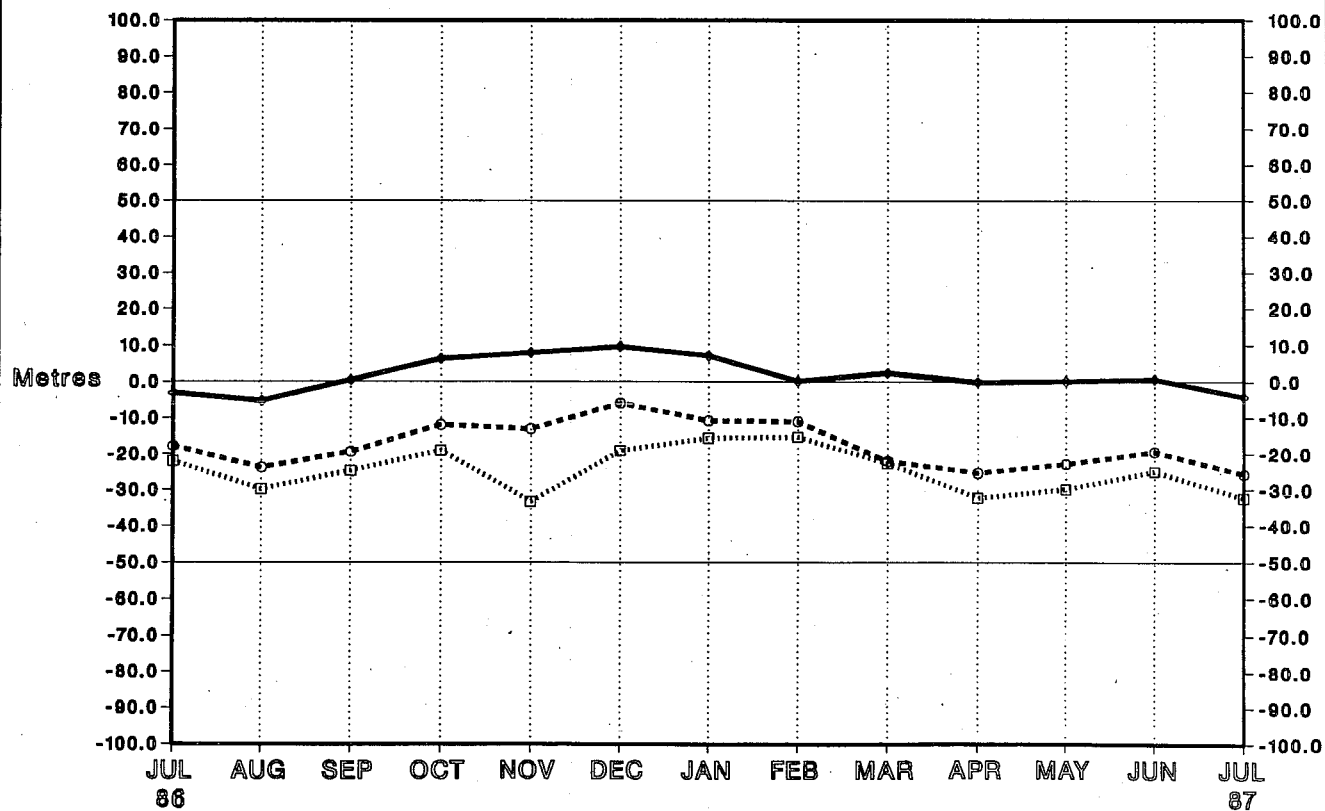
No. Obs : 30 30 30 31 30 31 31 28 31 30 31 30 31



Station 03170 (56N 002W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-

No. Obs : 31 31 29 31 30 31 31 28 31 30 31 30 31



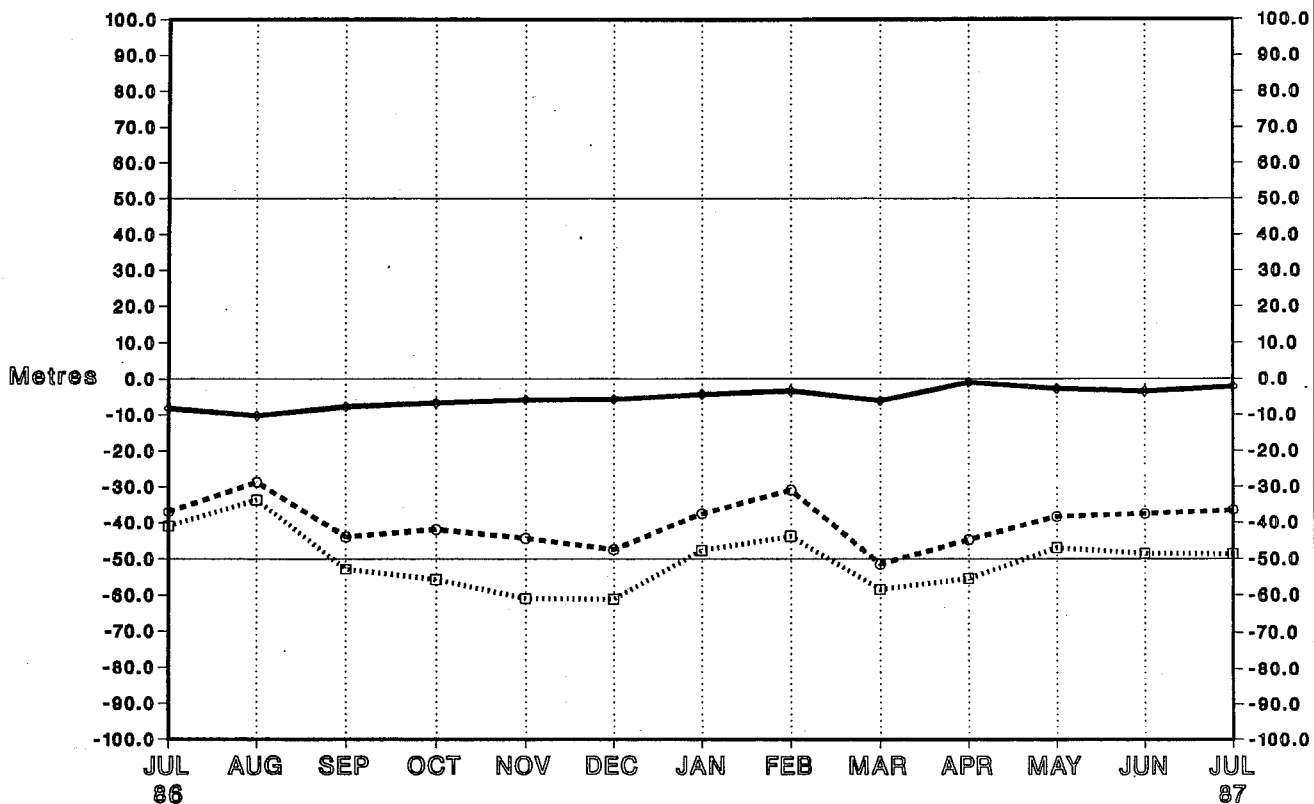
Station 03322 (54N 002W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 30 30 31 30 30 31 28 31 30 31 30 31



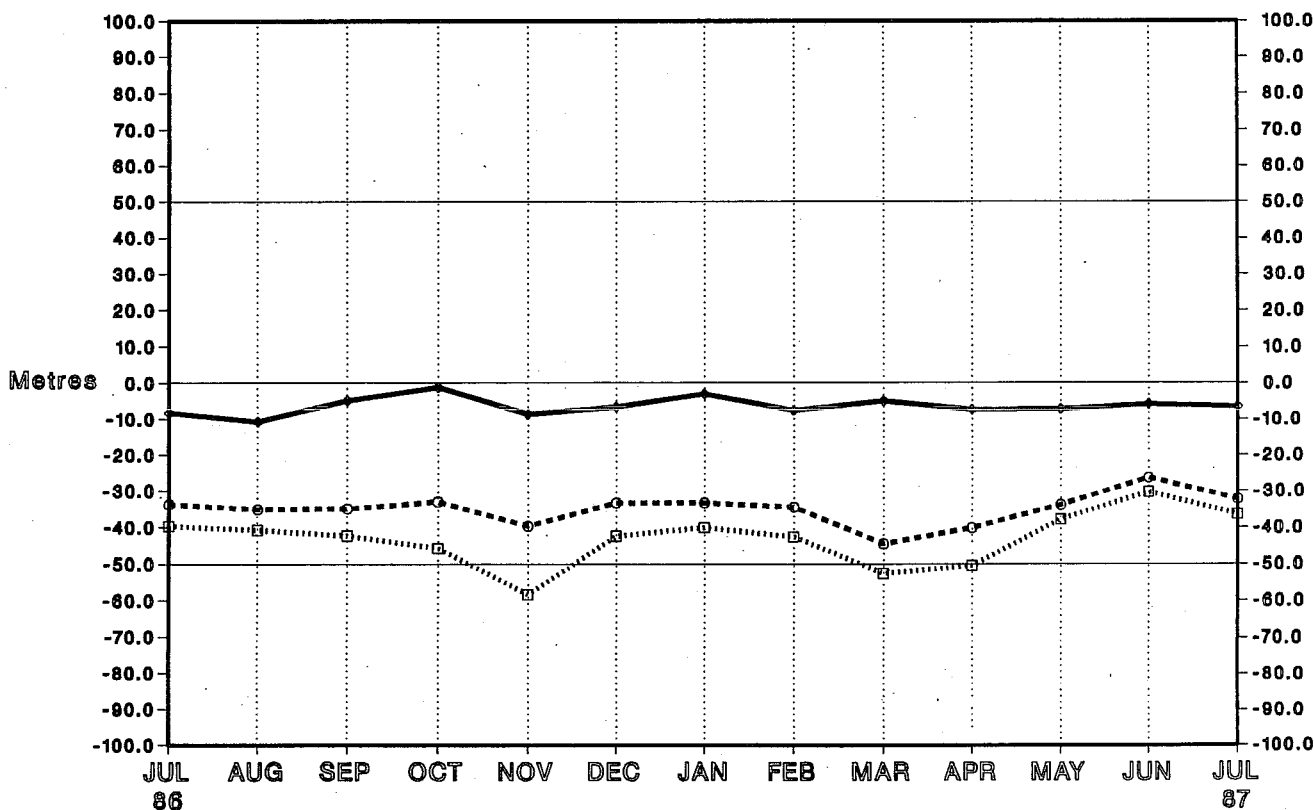
Station 03322 (54N 002W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- 500 hPa
- 100 hPa
- 50 hPa

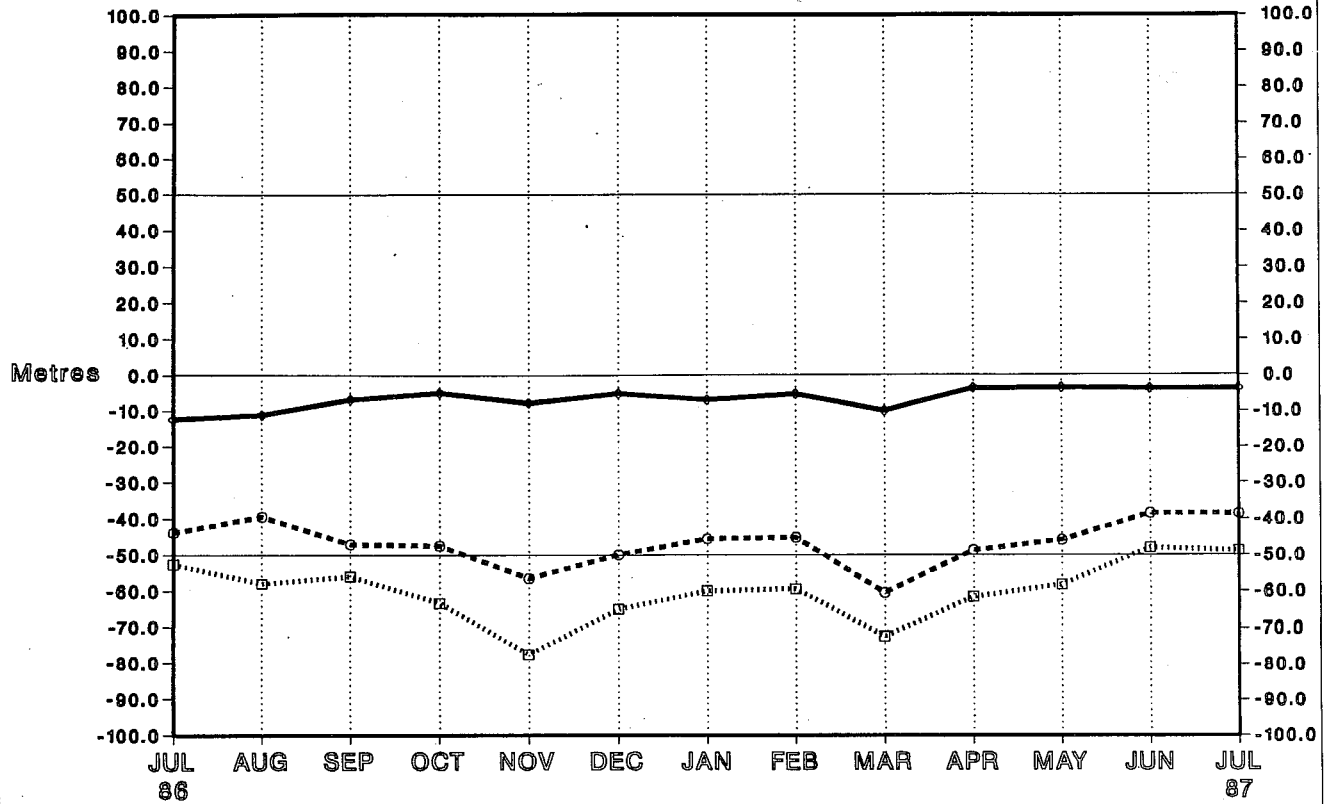
No. Obs : 31 31 29 31 30 31 31 28 31 30 30 30 31



Station 03496 (53N 002E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

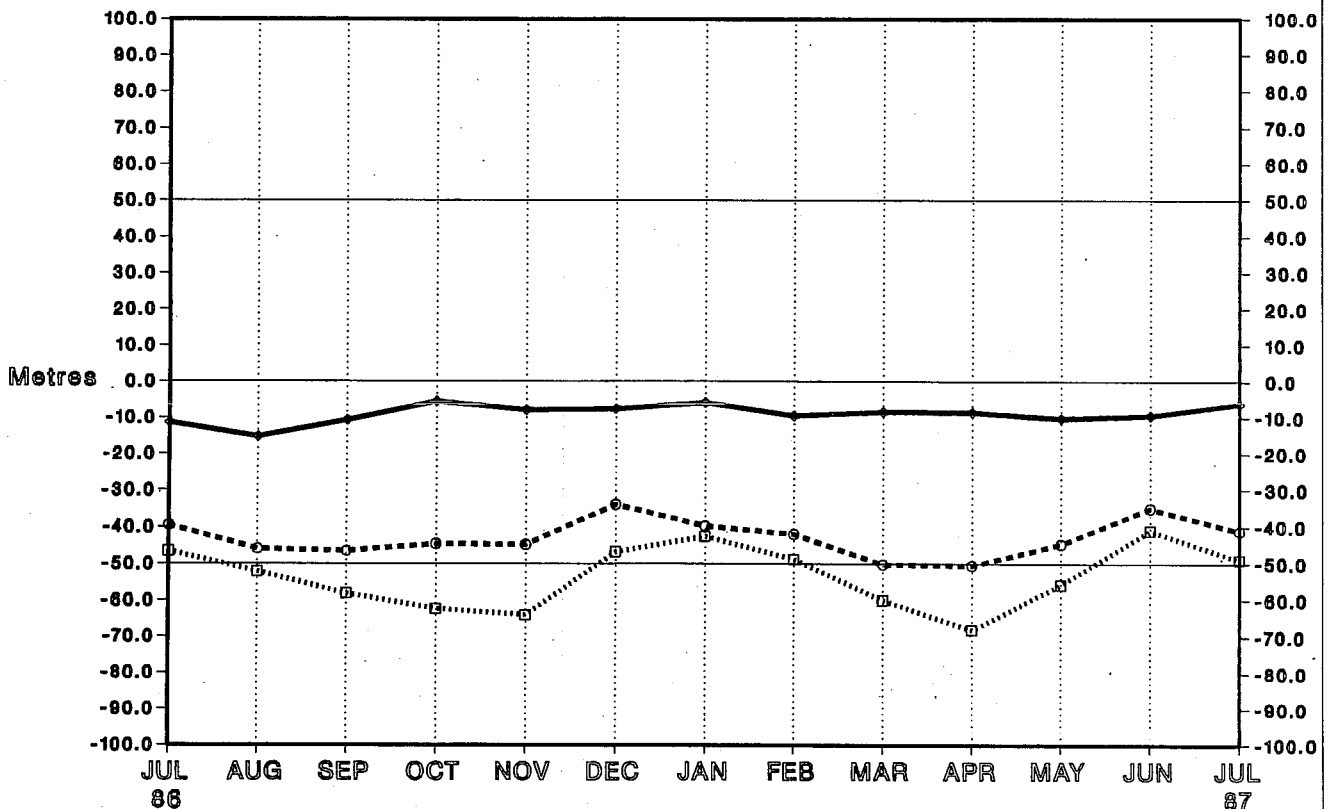
No. Obs : 31 30 30 29 30 30 31 28 31 30 31 30 31



Station 03496 (53N 002E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 28 31 30 31 31 28 31 30 31 30 31

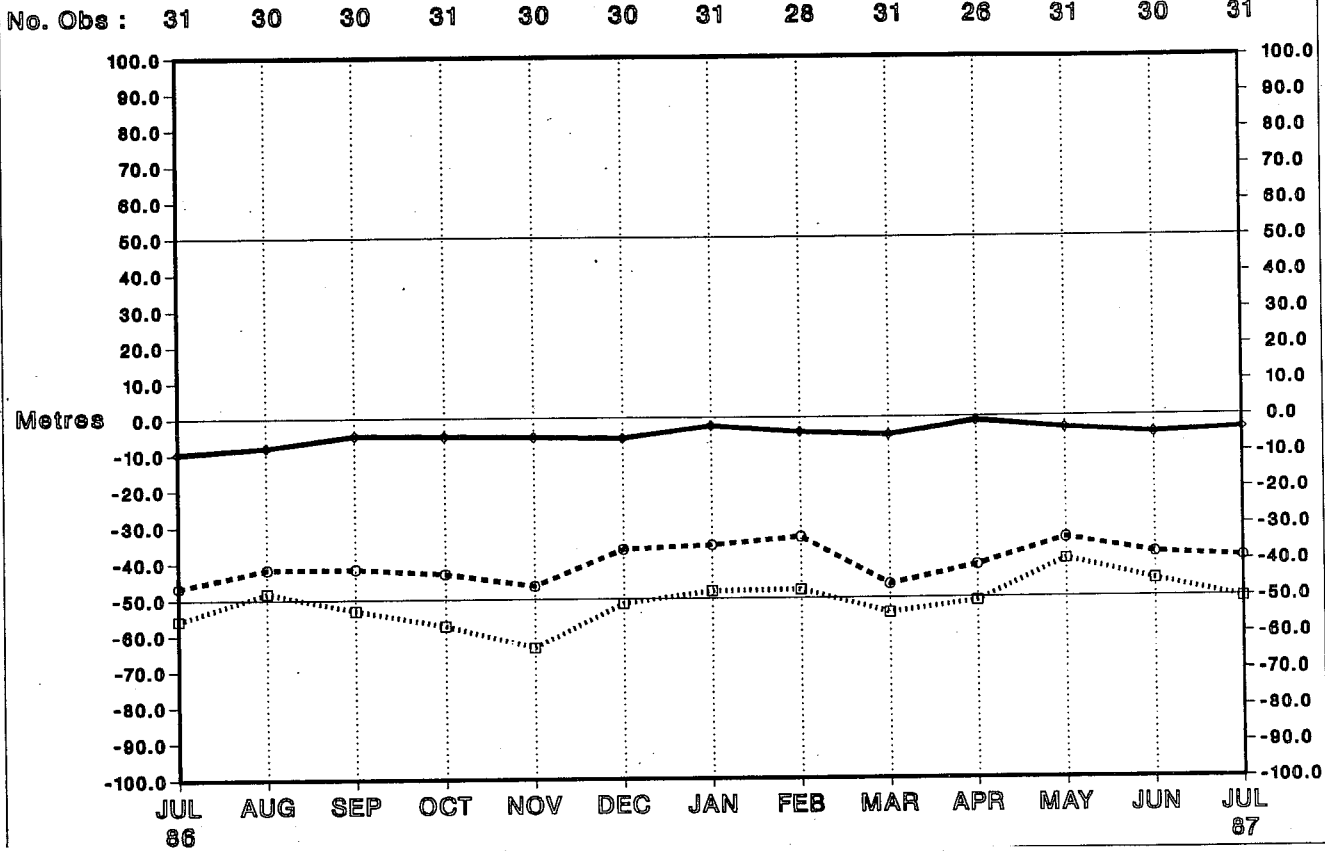


Station 03774 (51N 000E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

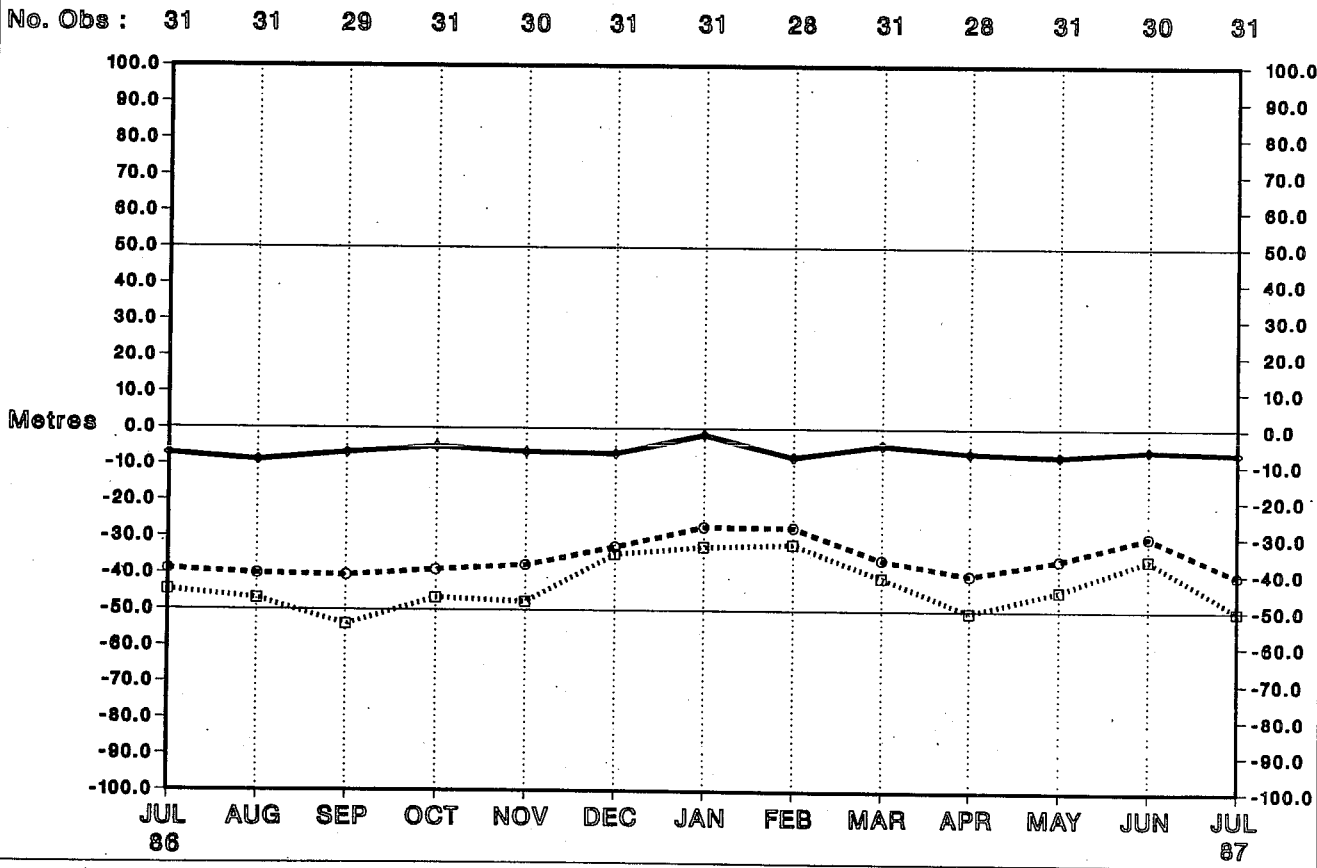


Station 03774 (51N 000E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

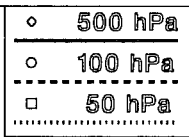
- ◊ 500 hPa
- 100 hPa
- 50 hPa



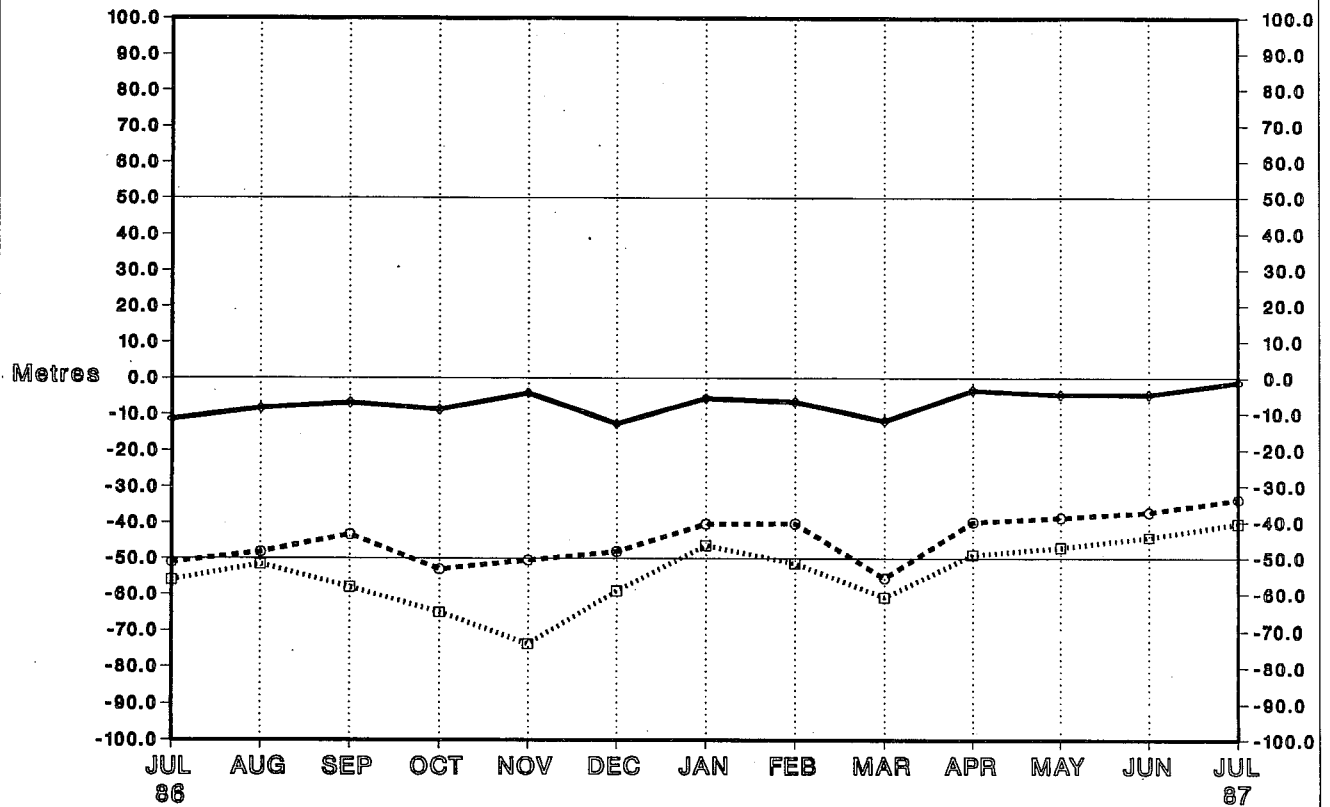
Station 03808 (50N 004W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



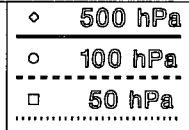
No. Obs : 31 30 30 30 30 30 31 28 31 30 31 30 31



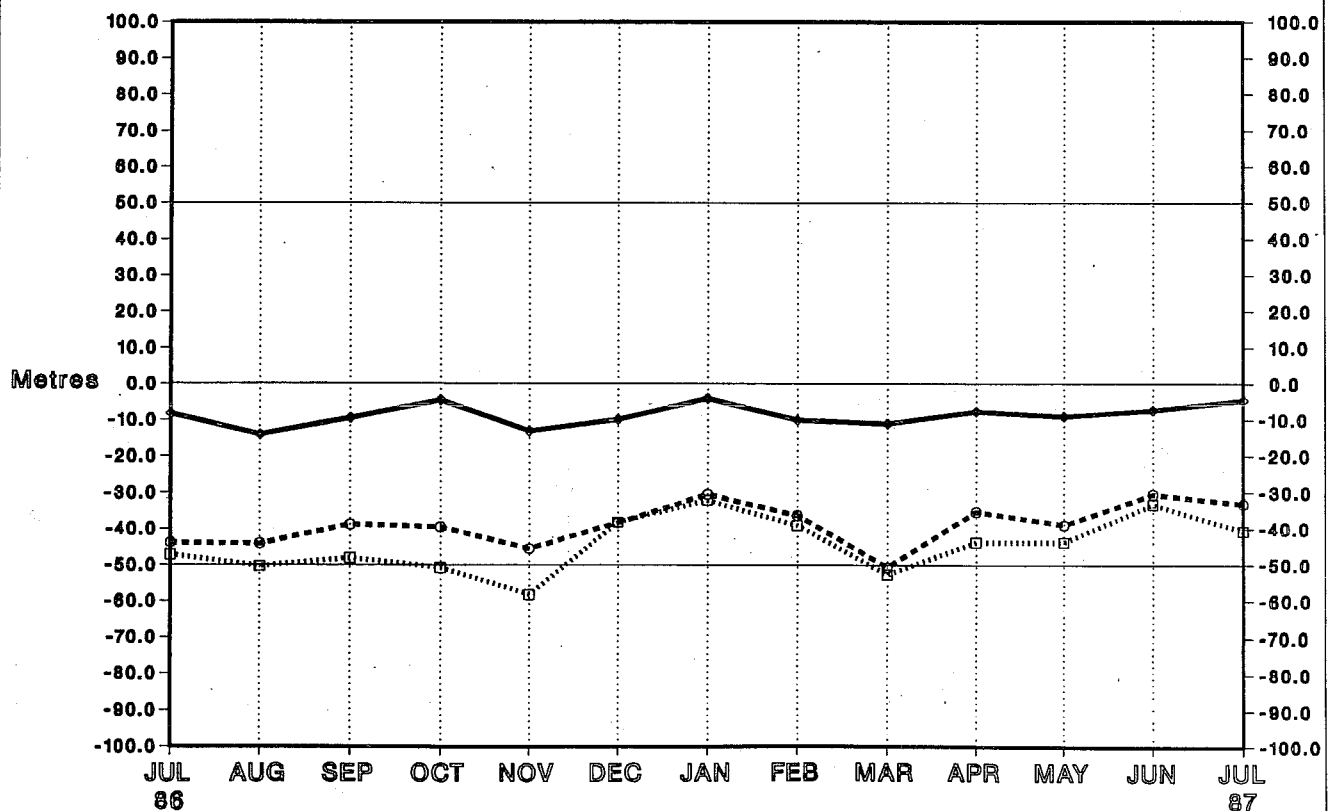
Station 03808 (50N 004W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



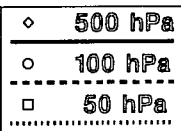
No. Obs : 31 31 29 31 30 31 31 28 31 30 31 30 31



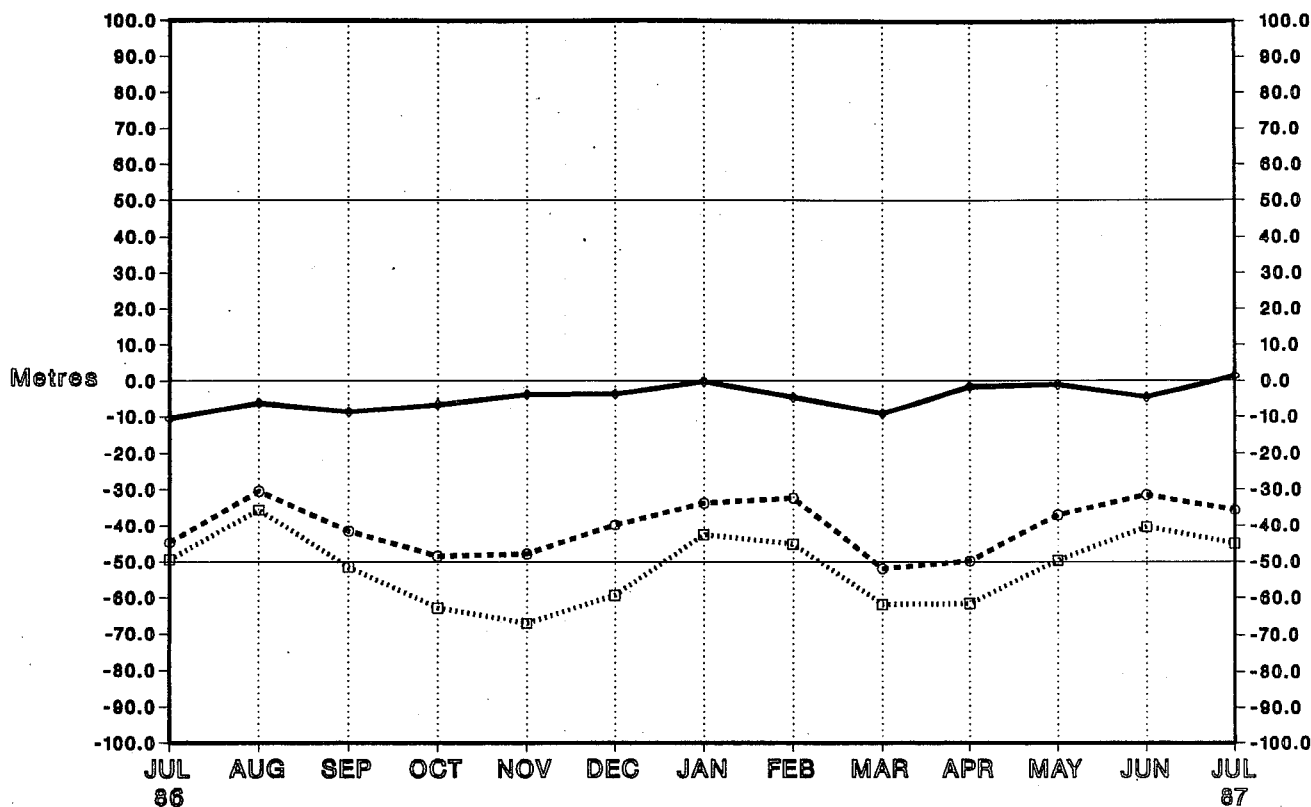
Station 03920 (54N 005W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



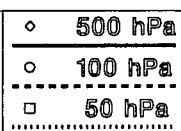
No. Obs : 30 30 30 31 30 30 31 28 31 30 31 30 31



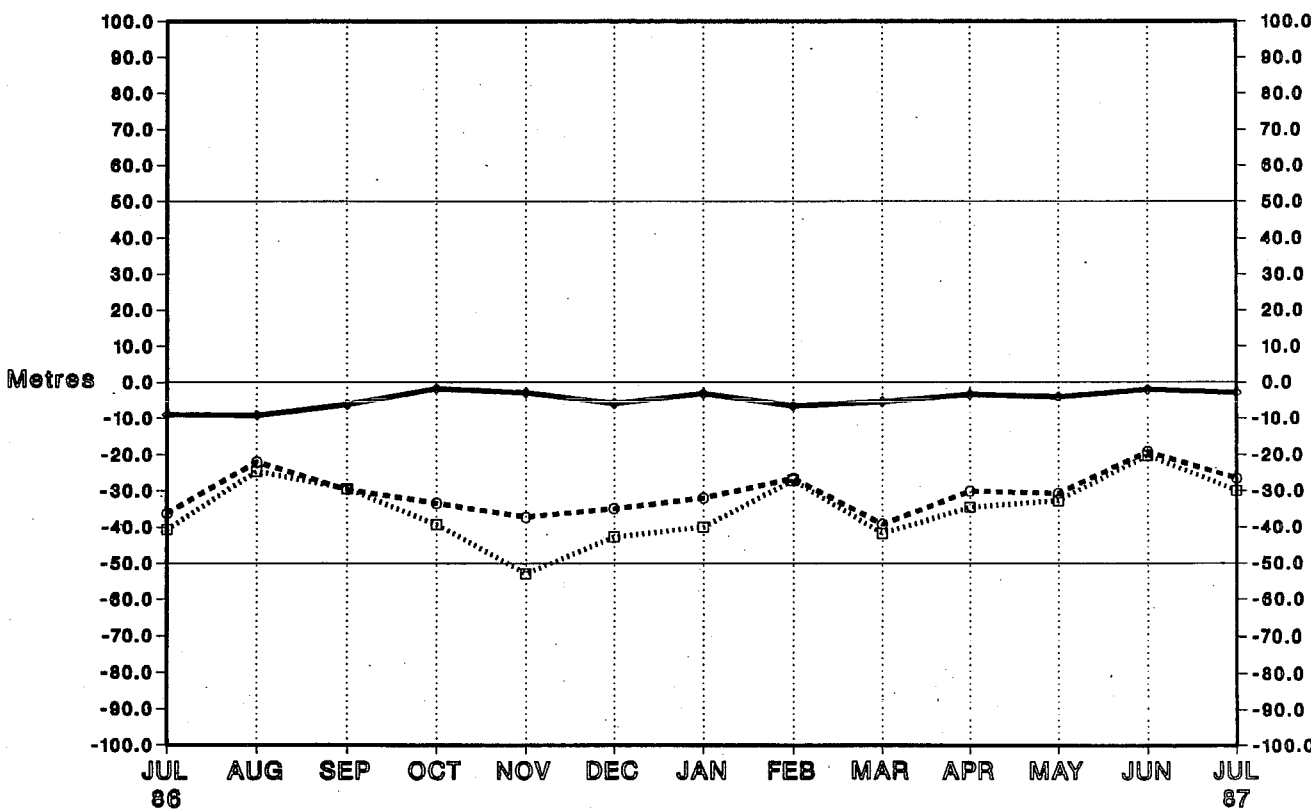
Station 03920 (54N 005W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 30 31 29 31 30 31 31 28 31 30 31 30 31



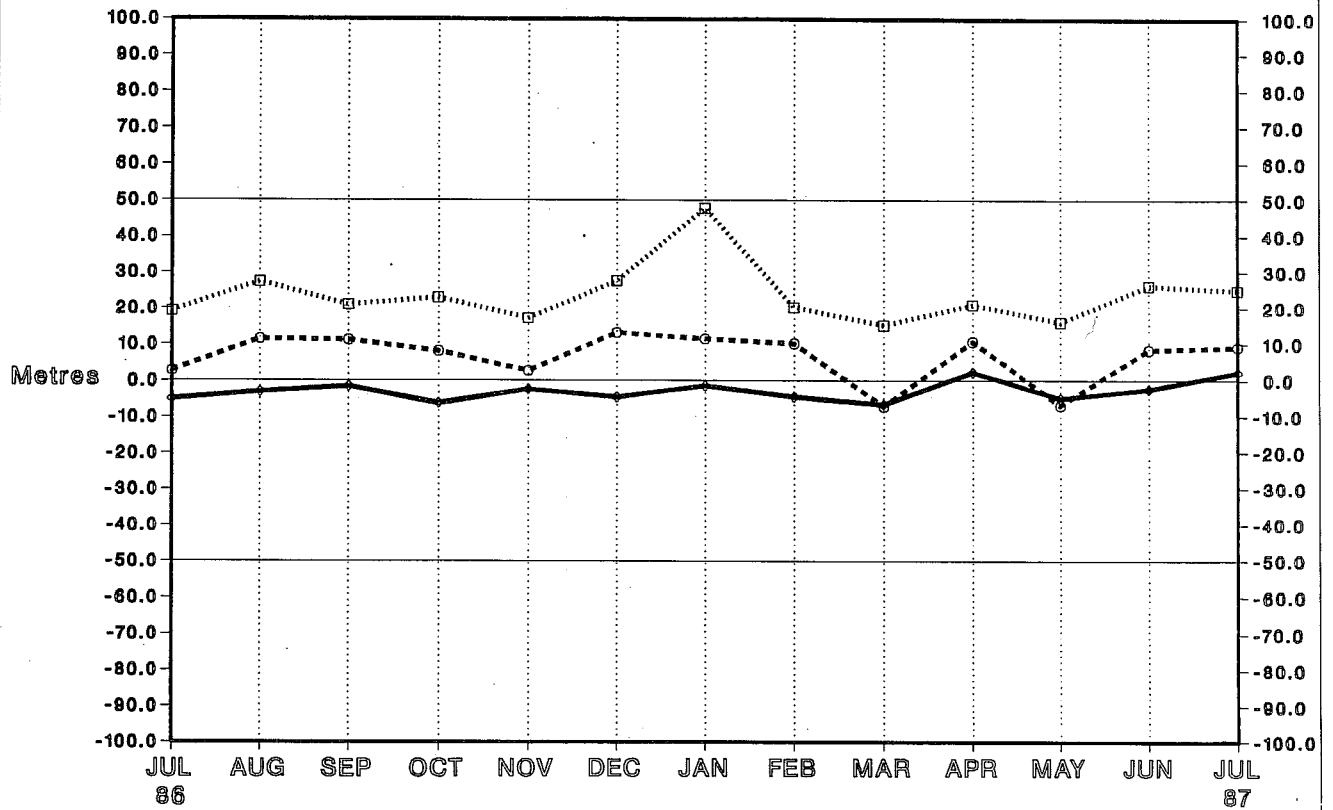
Station 03953 (52N 009W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 30 29 31 30 31 30 28 31 30 30 30 30



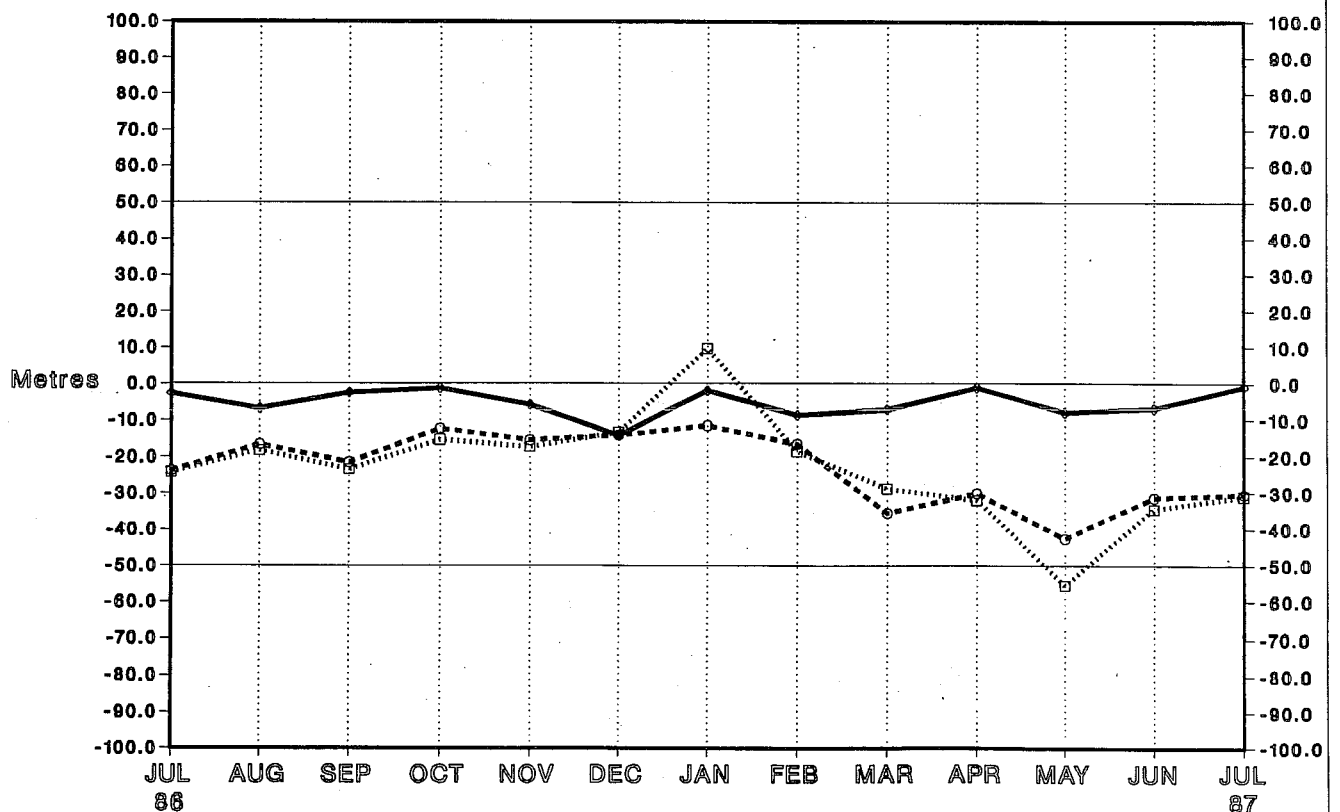
Station 03953 (52N 009W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

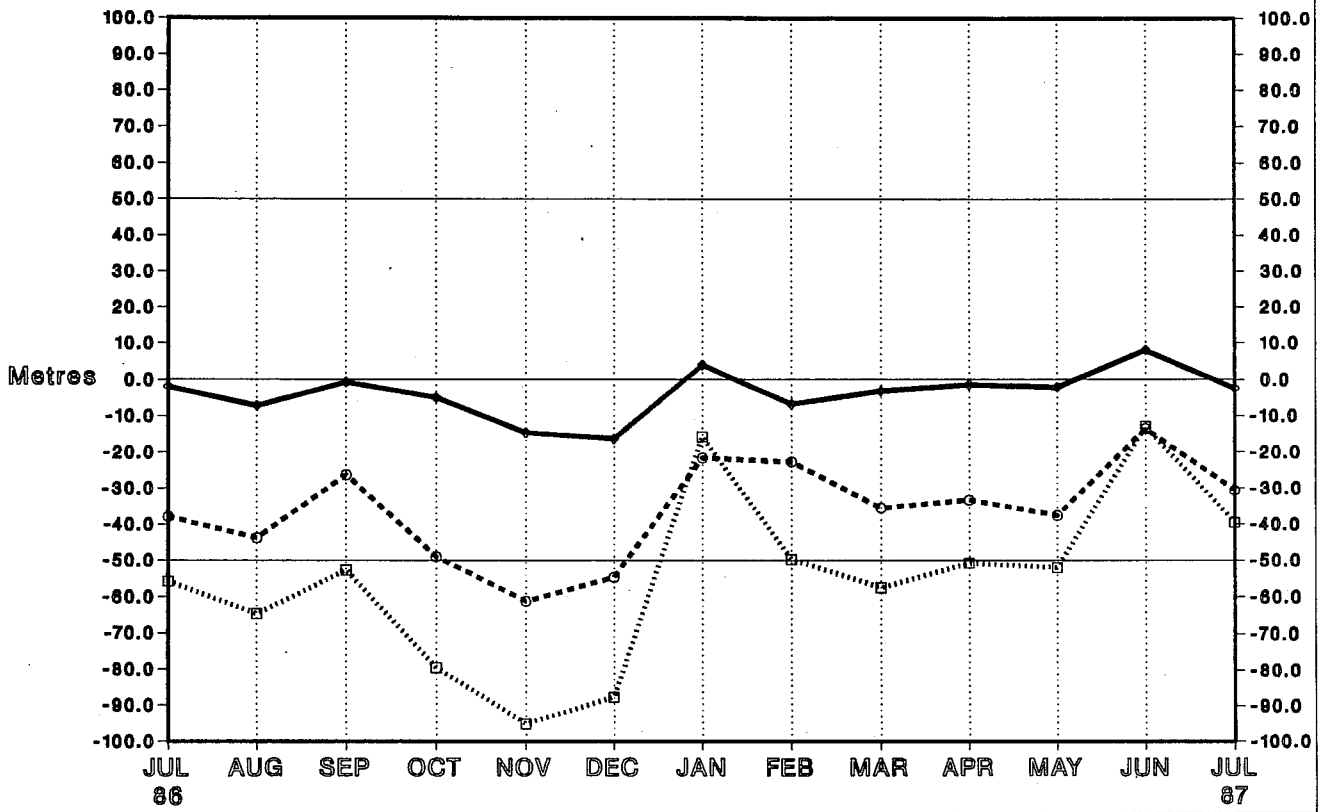
No. Obs : 31 31 29 31 30 31 31 28 31 30 31 30 31



Station 04018 (64N 022W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

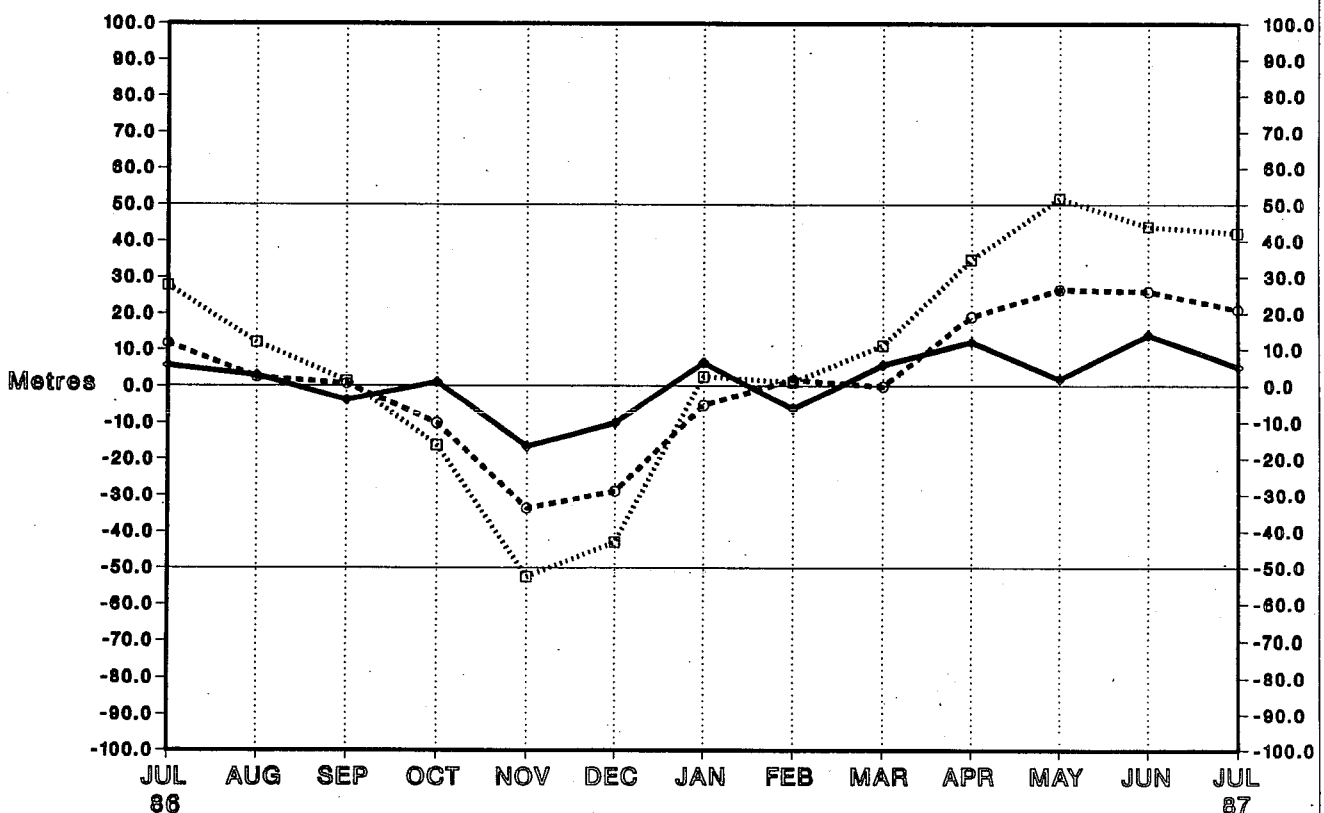
No. Obs : 31 31 30 30 29 31 31 26 31 30 31 30 30



Station 04018 (64N 022W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

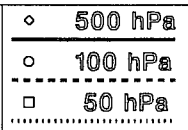
No. Obs : 31 31 29 30 30 30 31 28 31 29 31 30 31



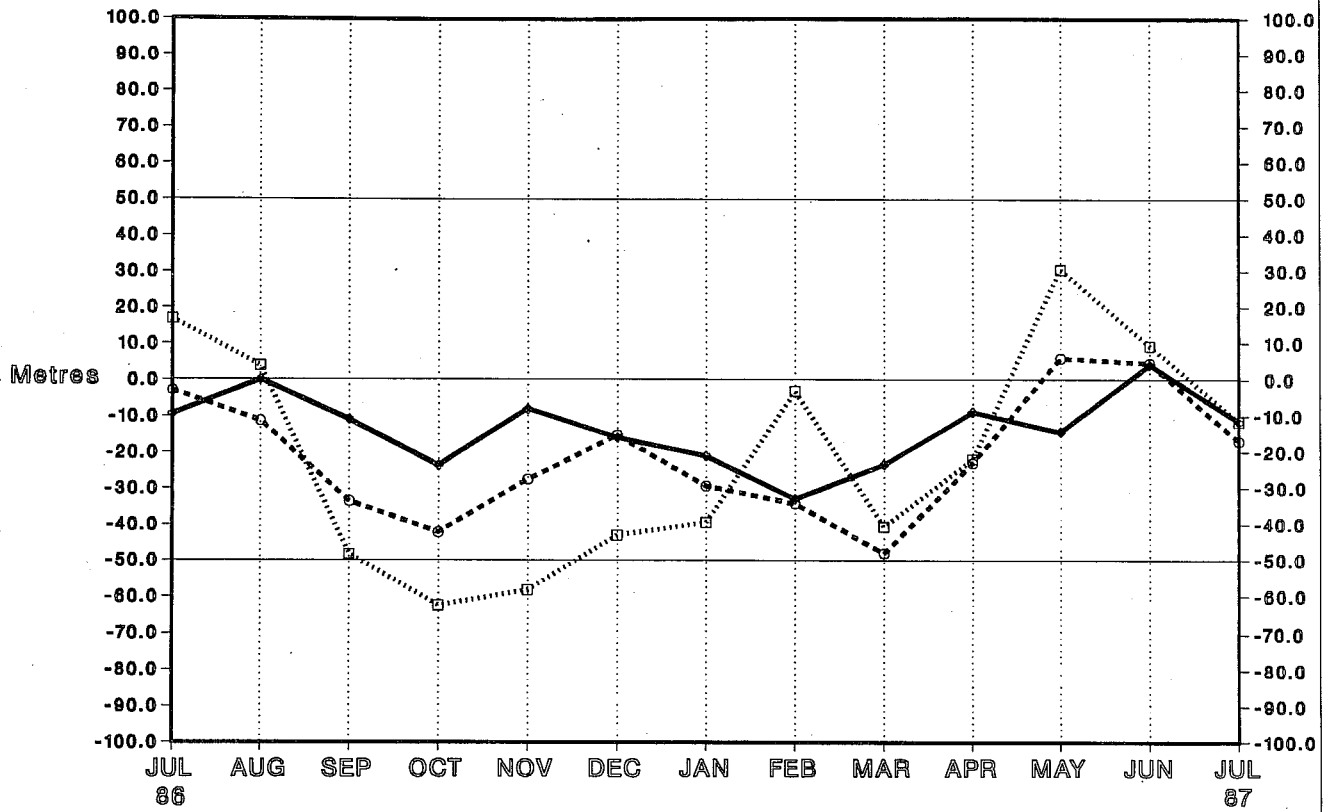
Station 04202 (77N 068W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



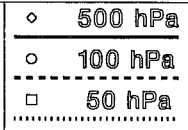
No. Obs : 21 22 23 28 27 24 21 22 25 16 29 24 26



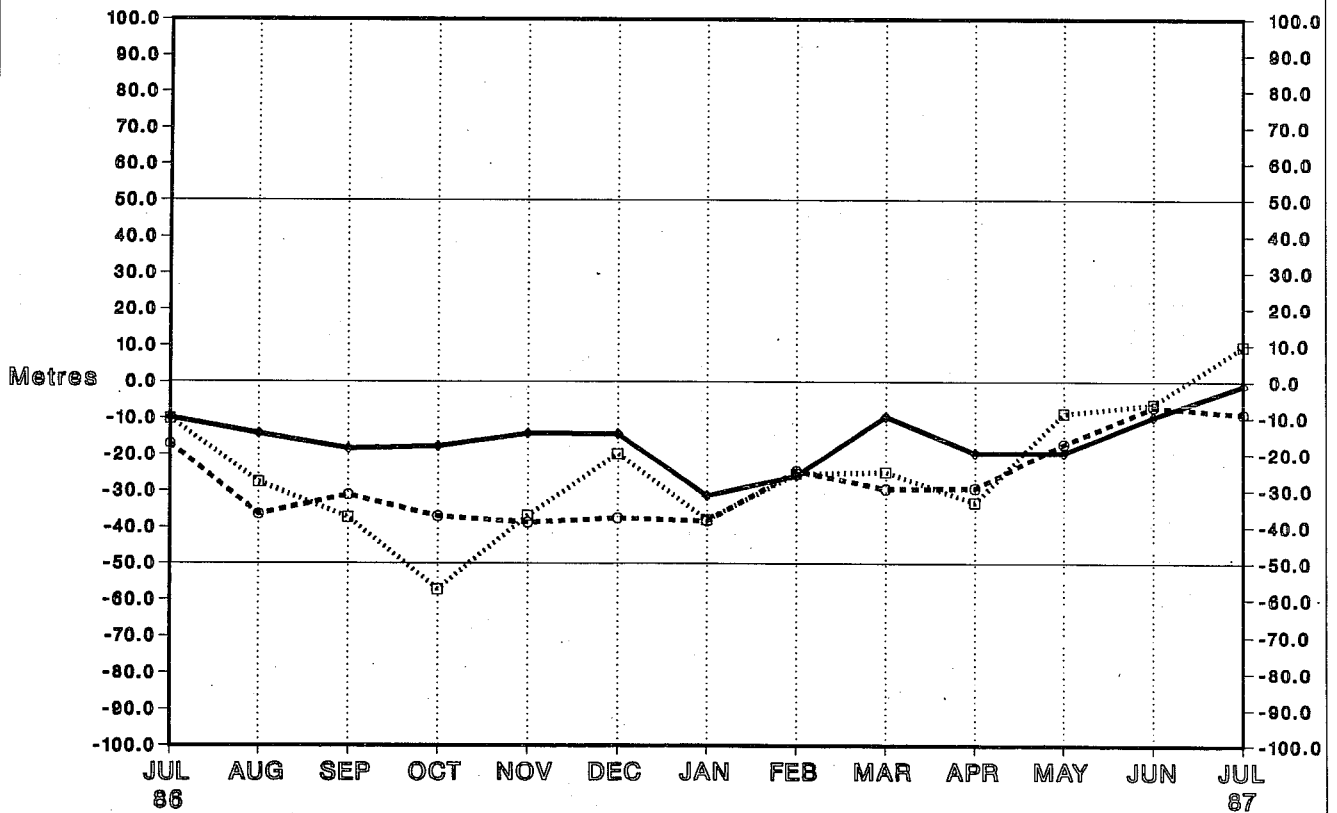
Station 04202 (77N 068W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 17 21 24 27 24 25 27 24 27 15 26 23 27

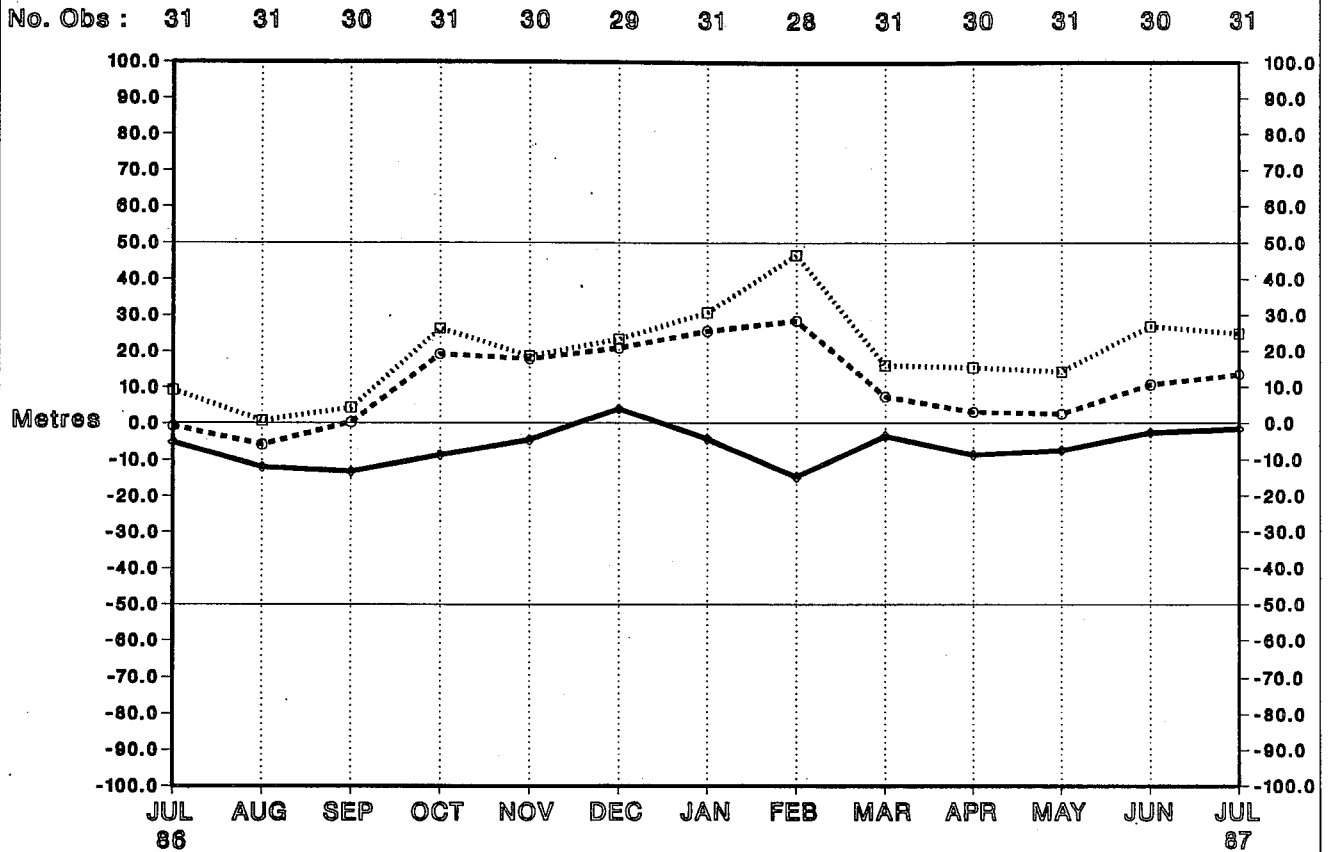


Station 04220 (69N 052W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

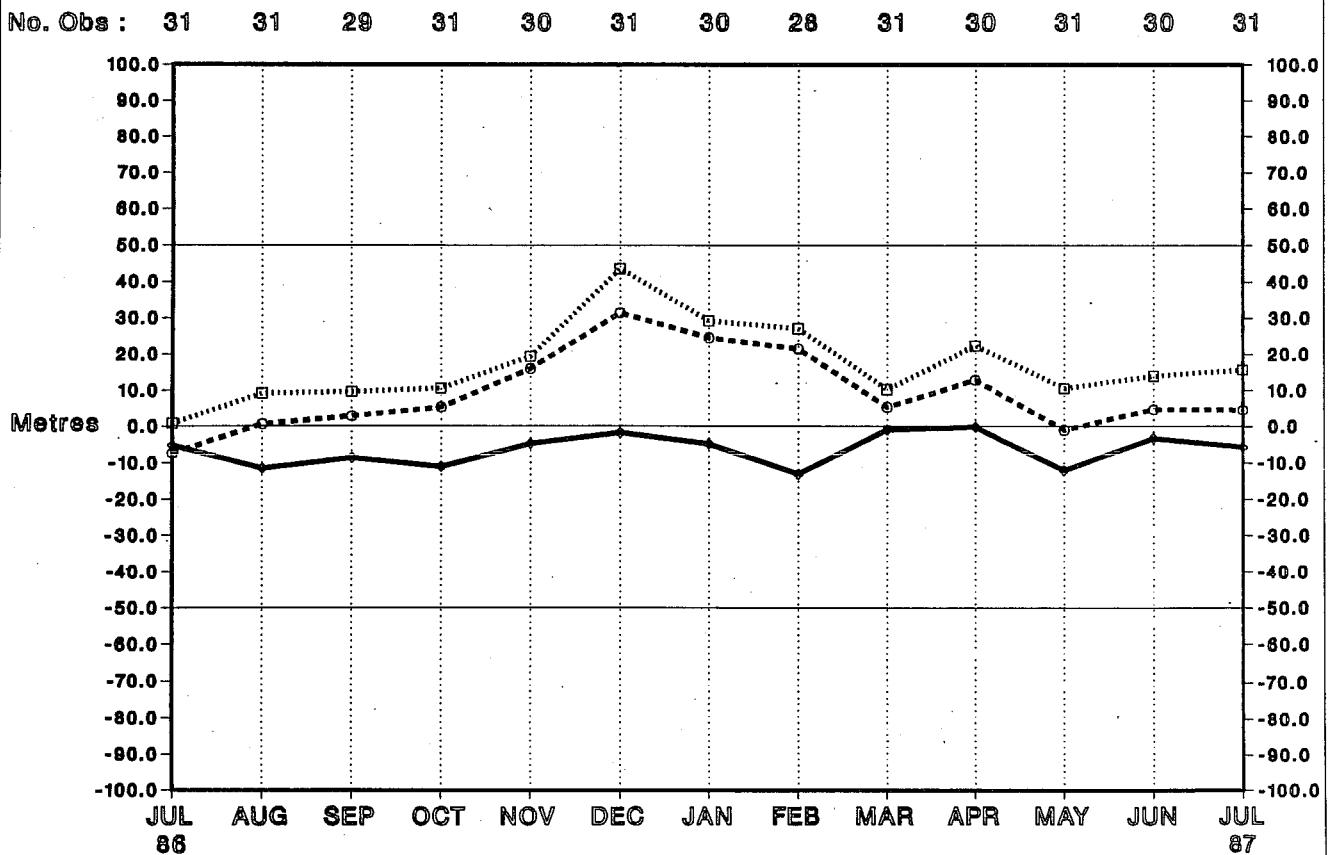


Station 04220 (69N 052W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

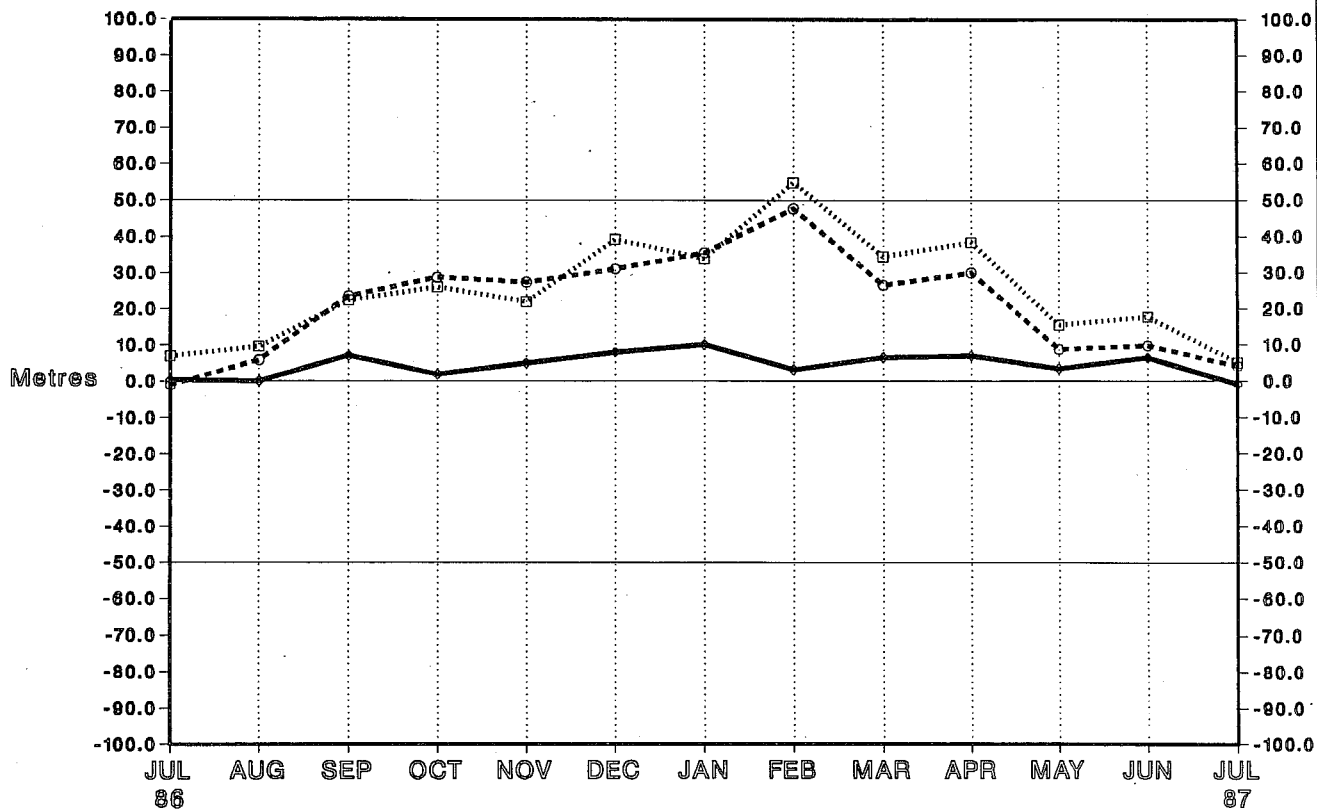
- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 04270 (61N 044W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

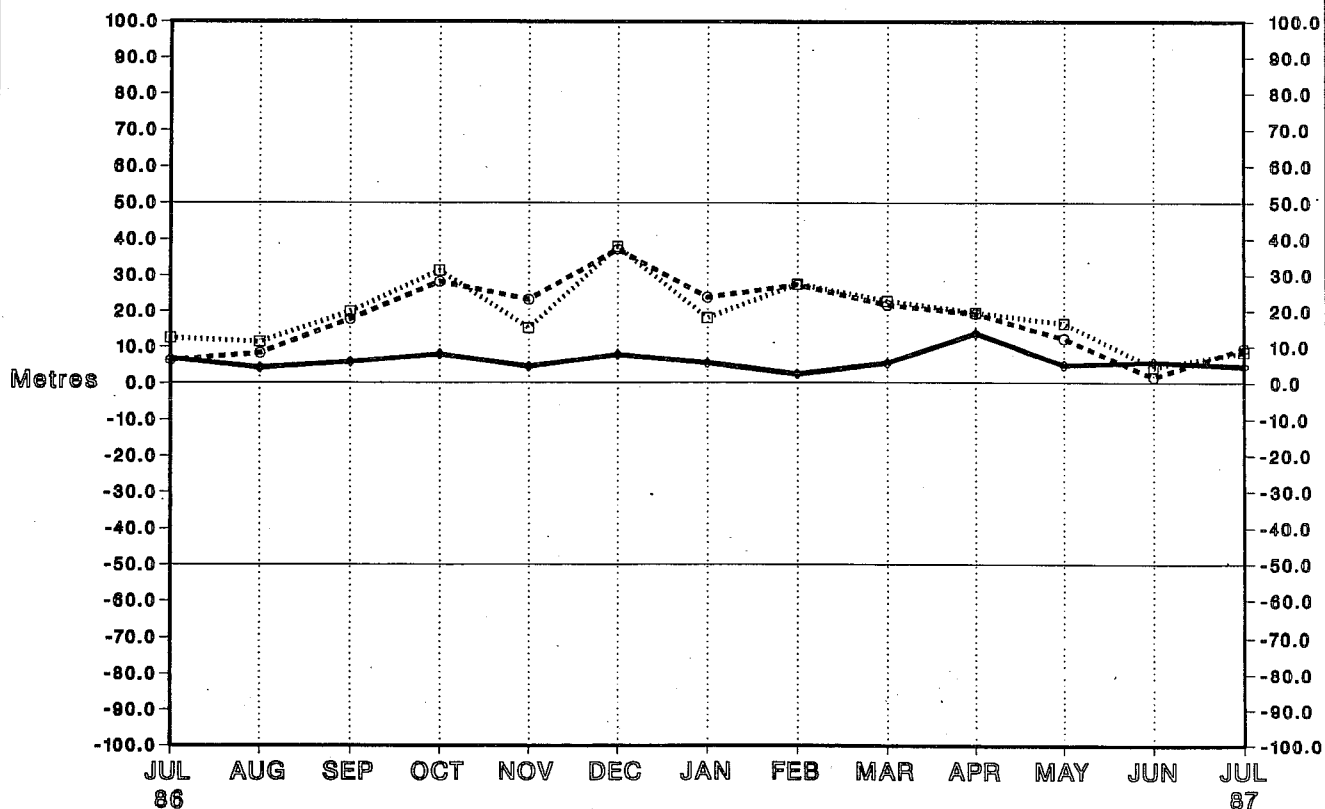
No. Obs: 31 31 29 31 30 30 31 27 31 30 29 30 31



Station 04270 (61N 044W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

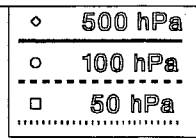
No. Obs: 31 31 29 30 29 30 30 27 31 30 31 30 31



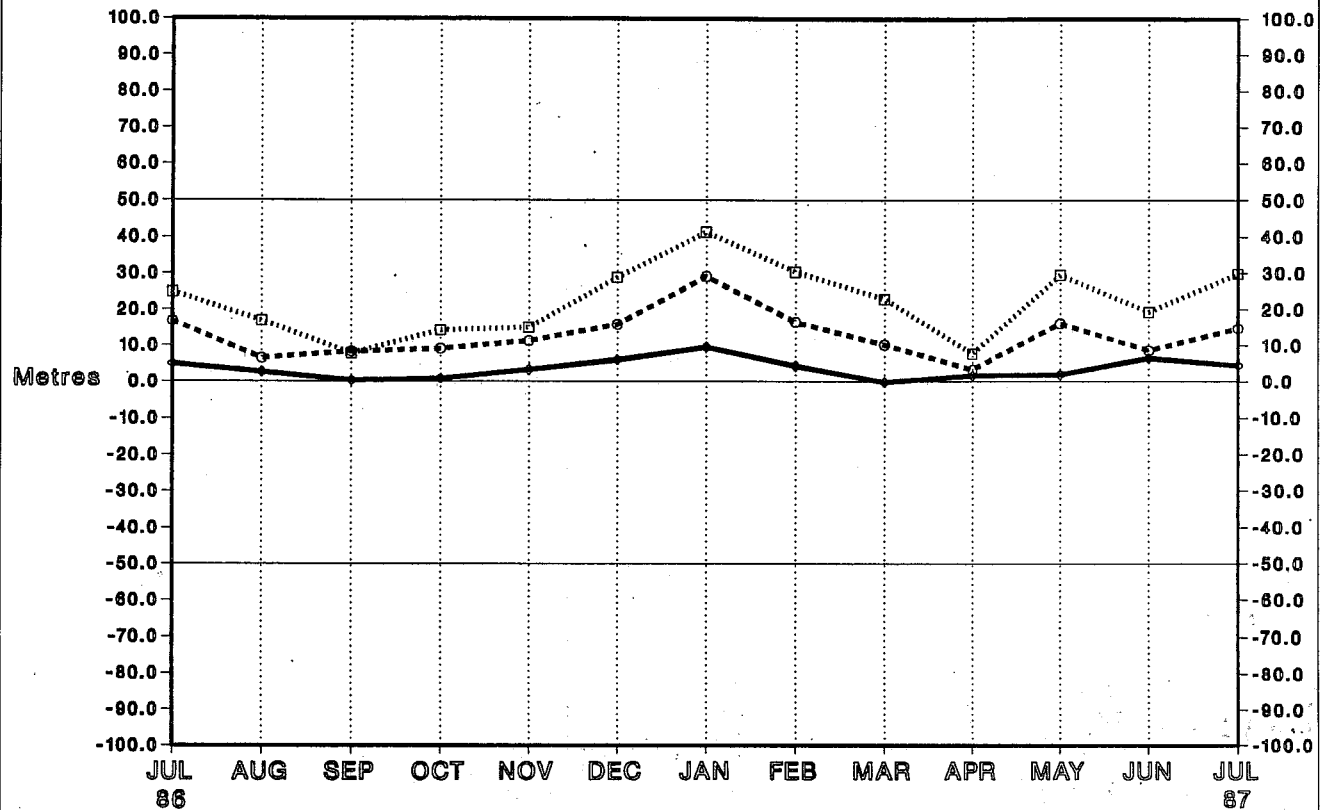
Station 04320 (77N 018W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



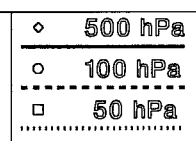
No. Obs : 31 30 30 30 28 29 29 27 28 28 30 30 28



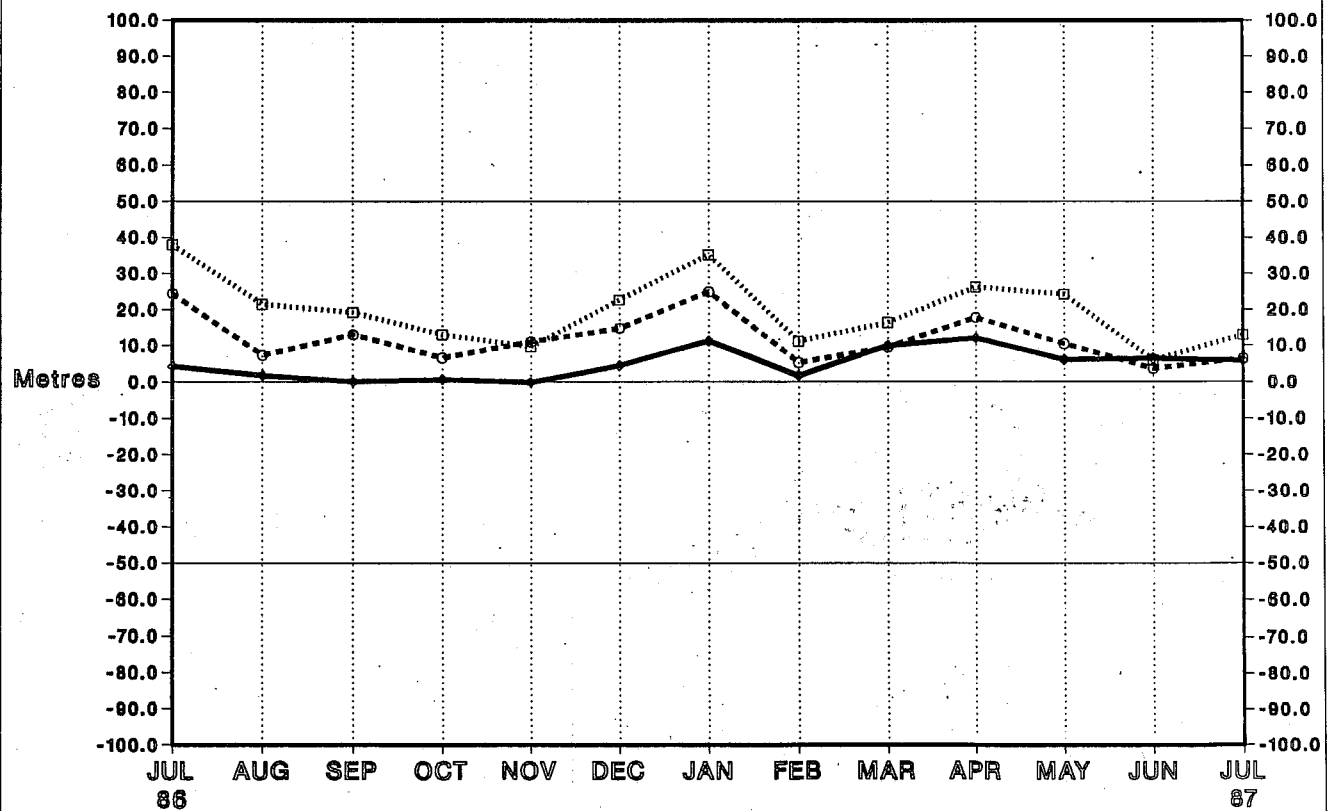
Station 04320 (77N 018W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



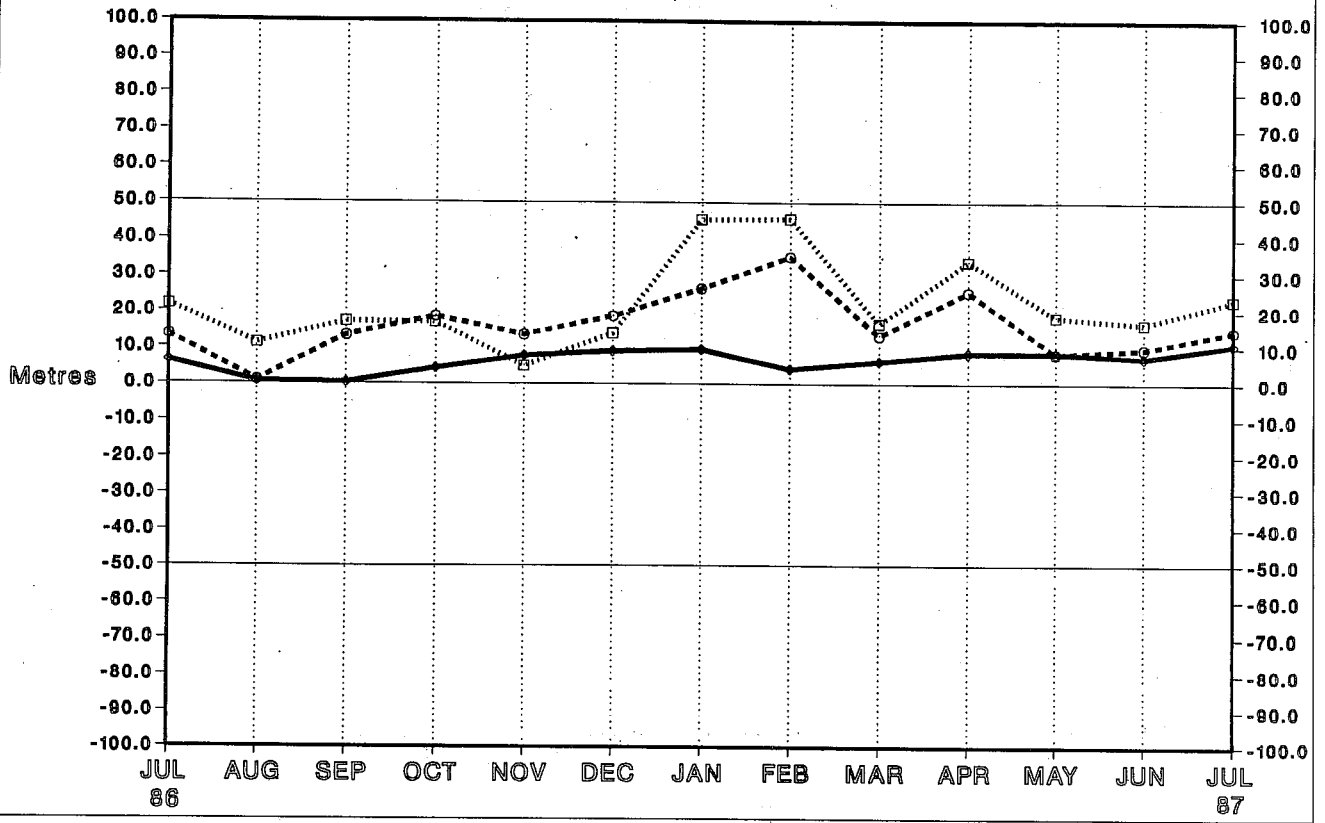
No. Obs : 31 31 27 30 30 29 30 26 30 28 30 30 31



Station 04339 (70N 021W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

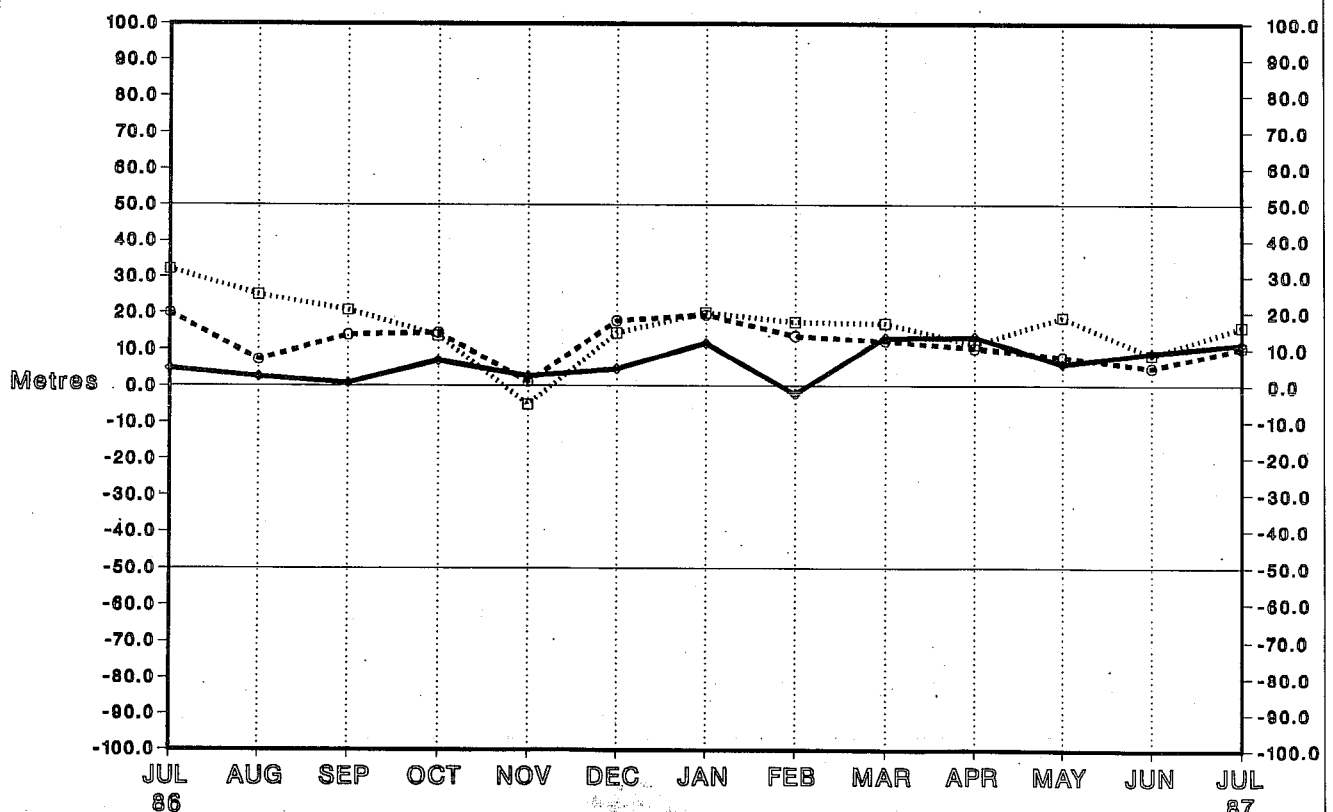
No. Obs : 31 31 30 29 28 27 31 27 28 26 31 30 29



Station 04339 (70N 021W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

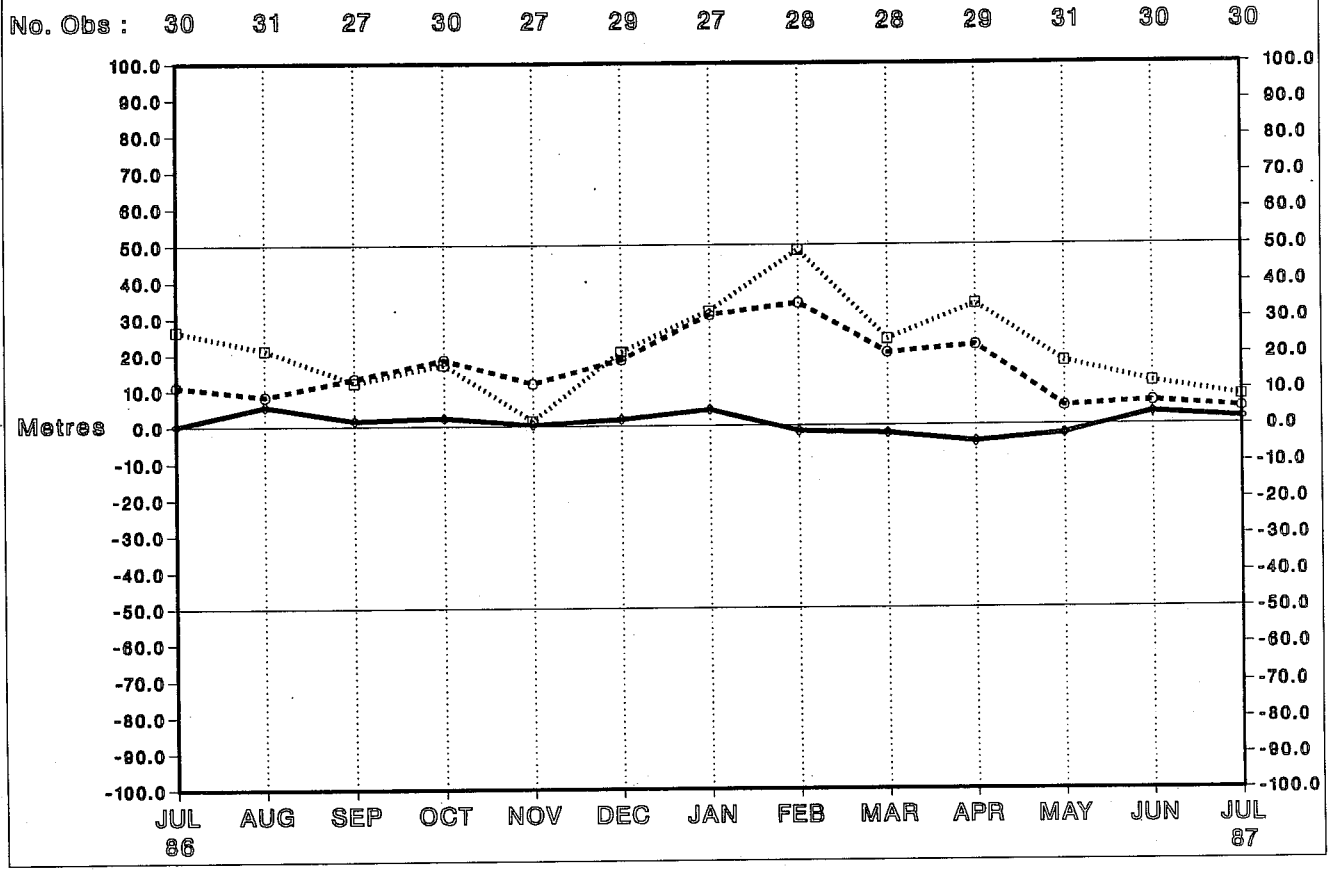
- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 30 27 31 28 27 29 28 28 29 31 29 31



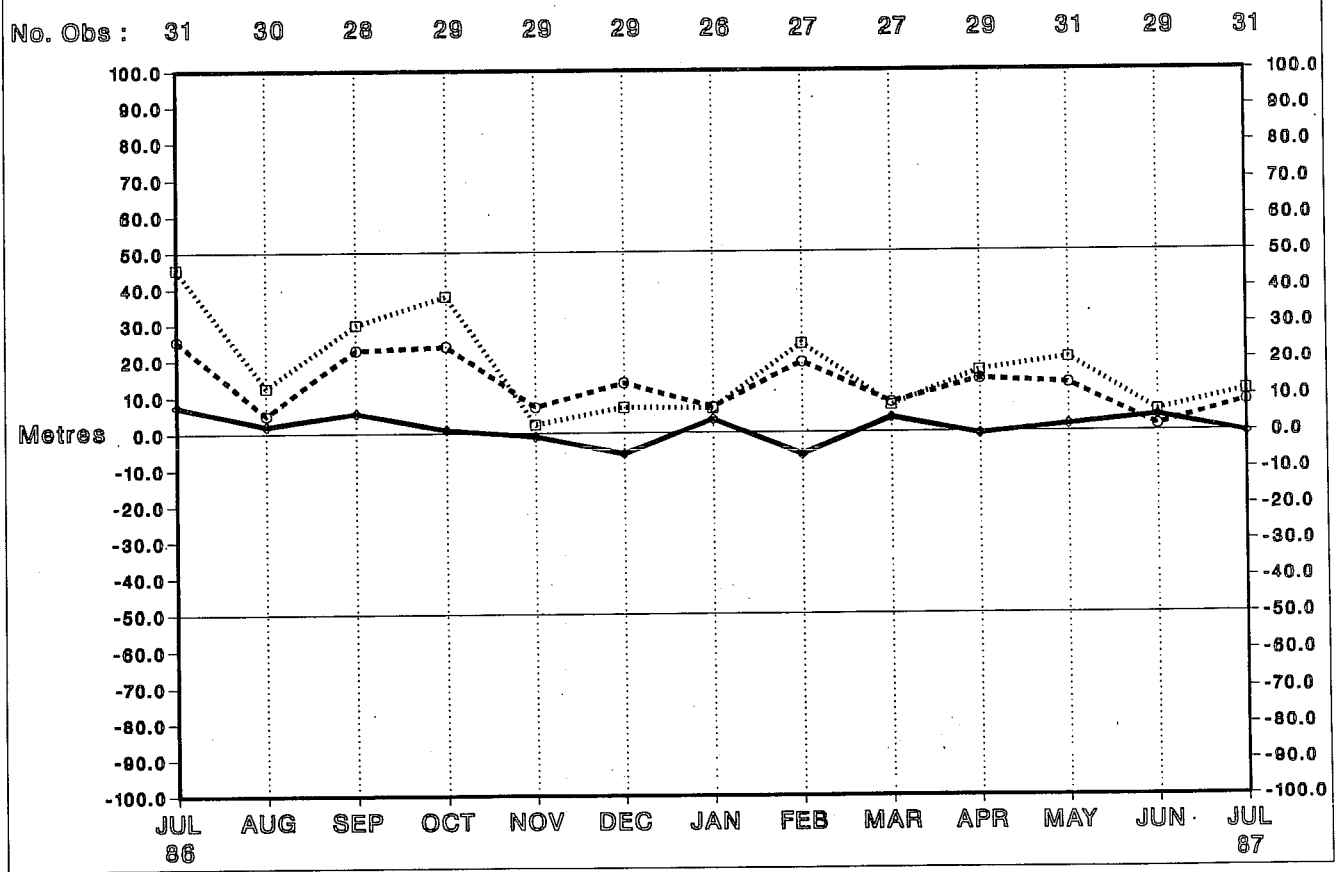
Station 04360 (66N 037W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa



Station 04360 (66N 037W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa



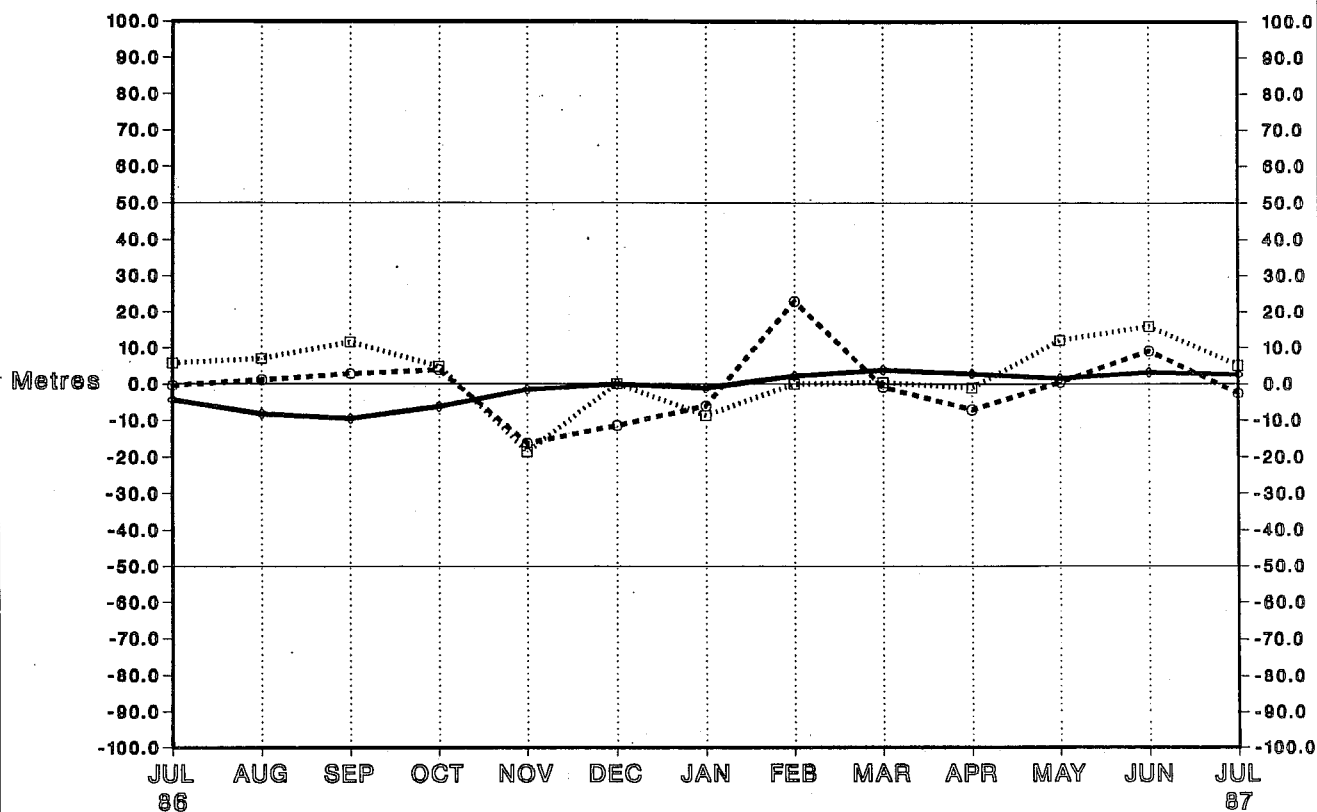
Station 06011 (62N 006W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30 31 30 29 30 29 31 28 31 30 31 30 31



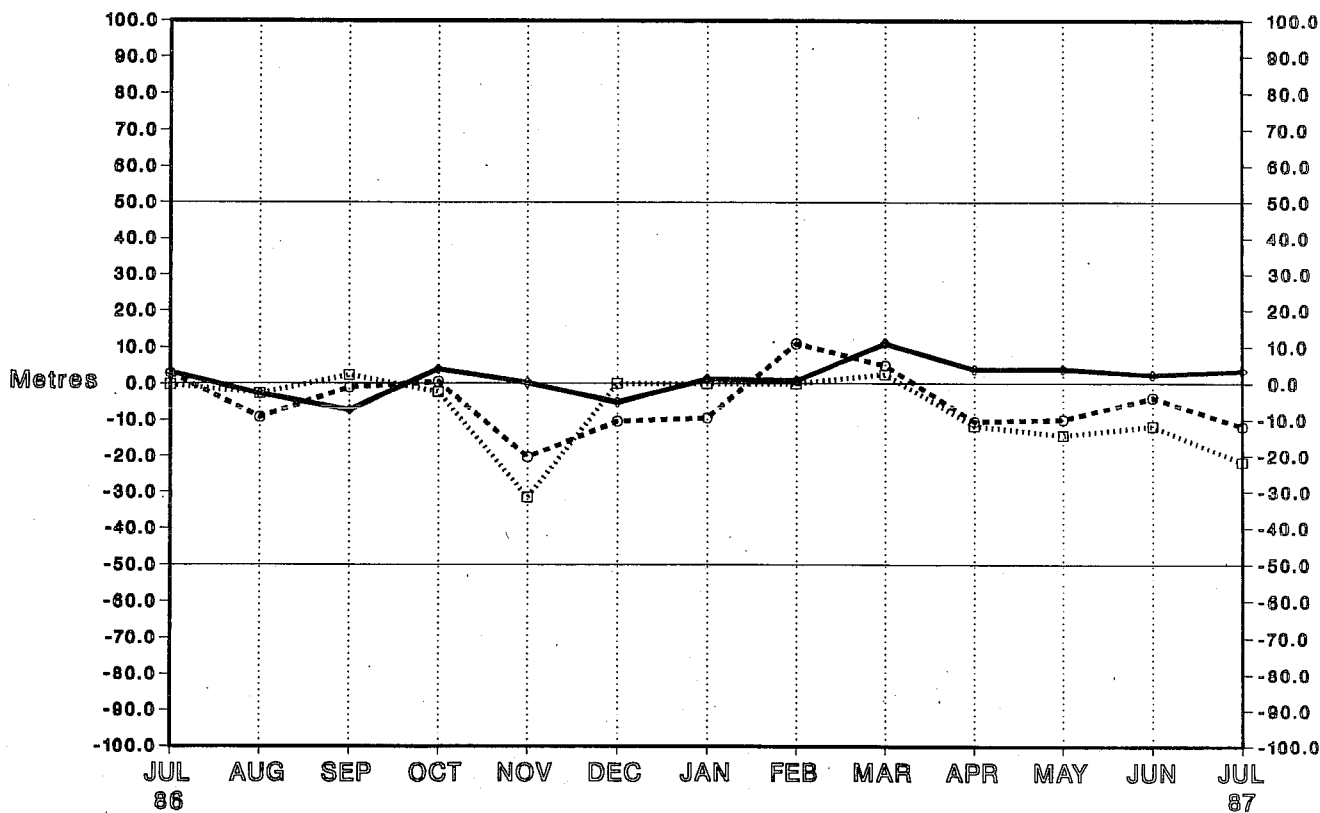
Station 06011 (62N 006W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 30 29 28 28 27 31 30 31 30 31



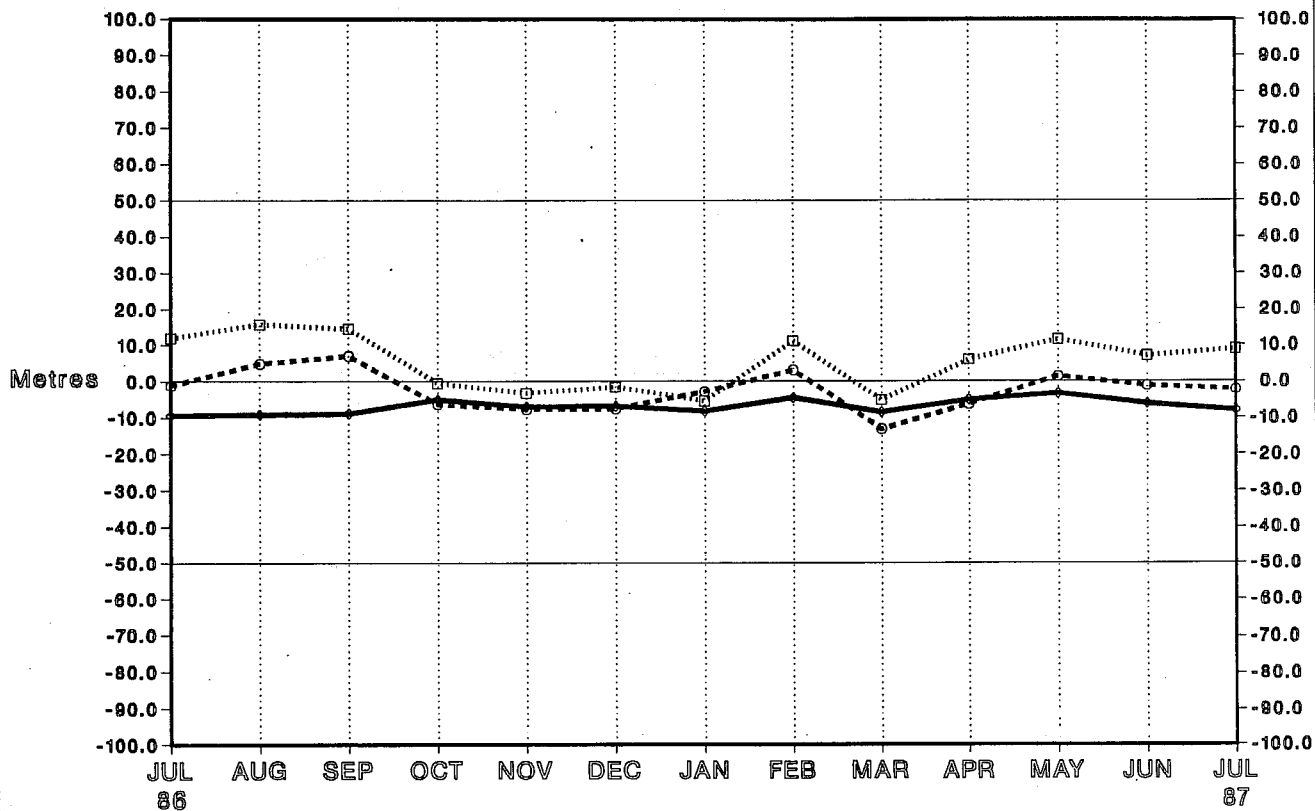
Station 06181 (56N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 30 31 28 31 29 31 30 31



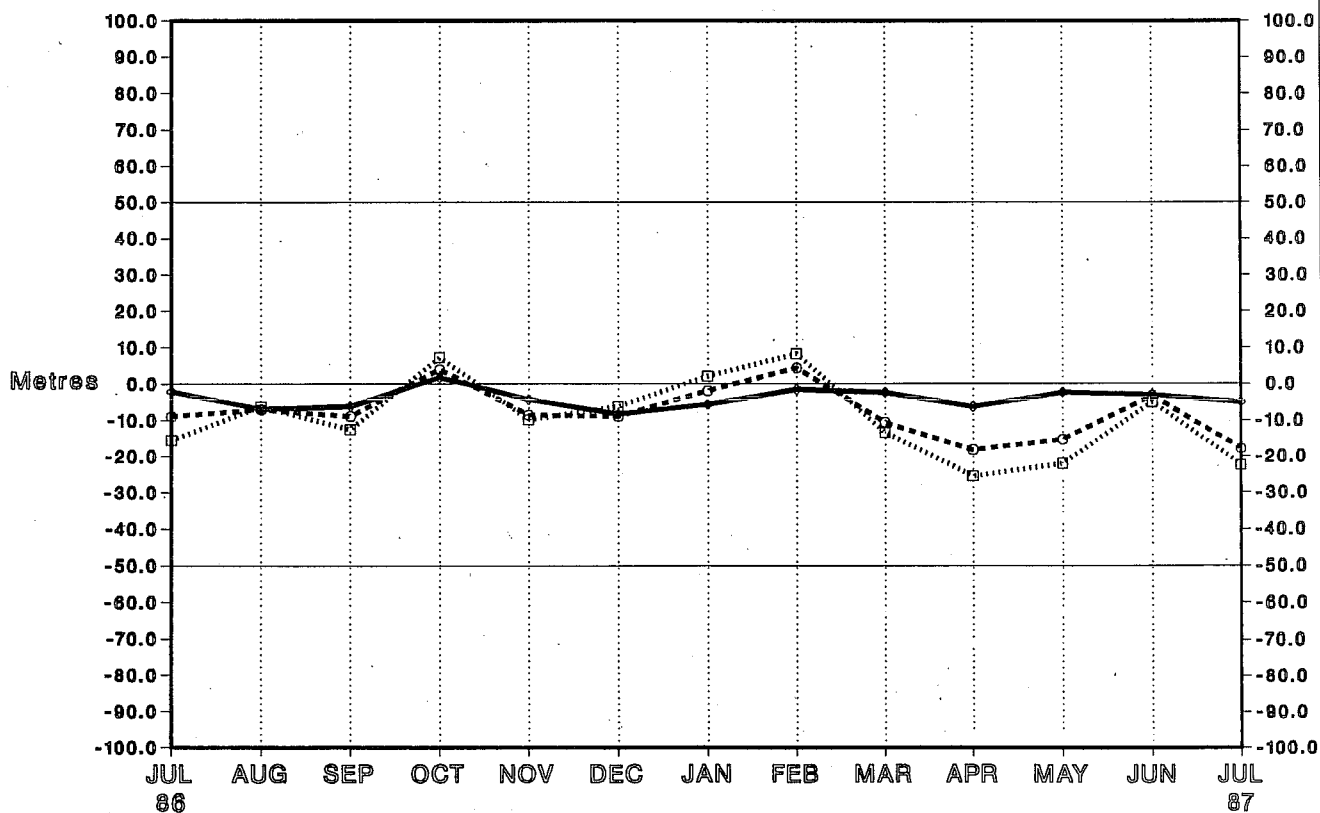
Station 06181 (56N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

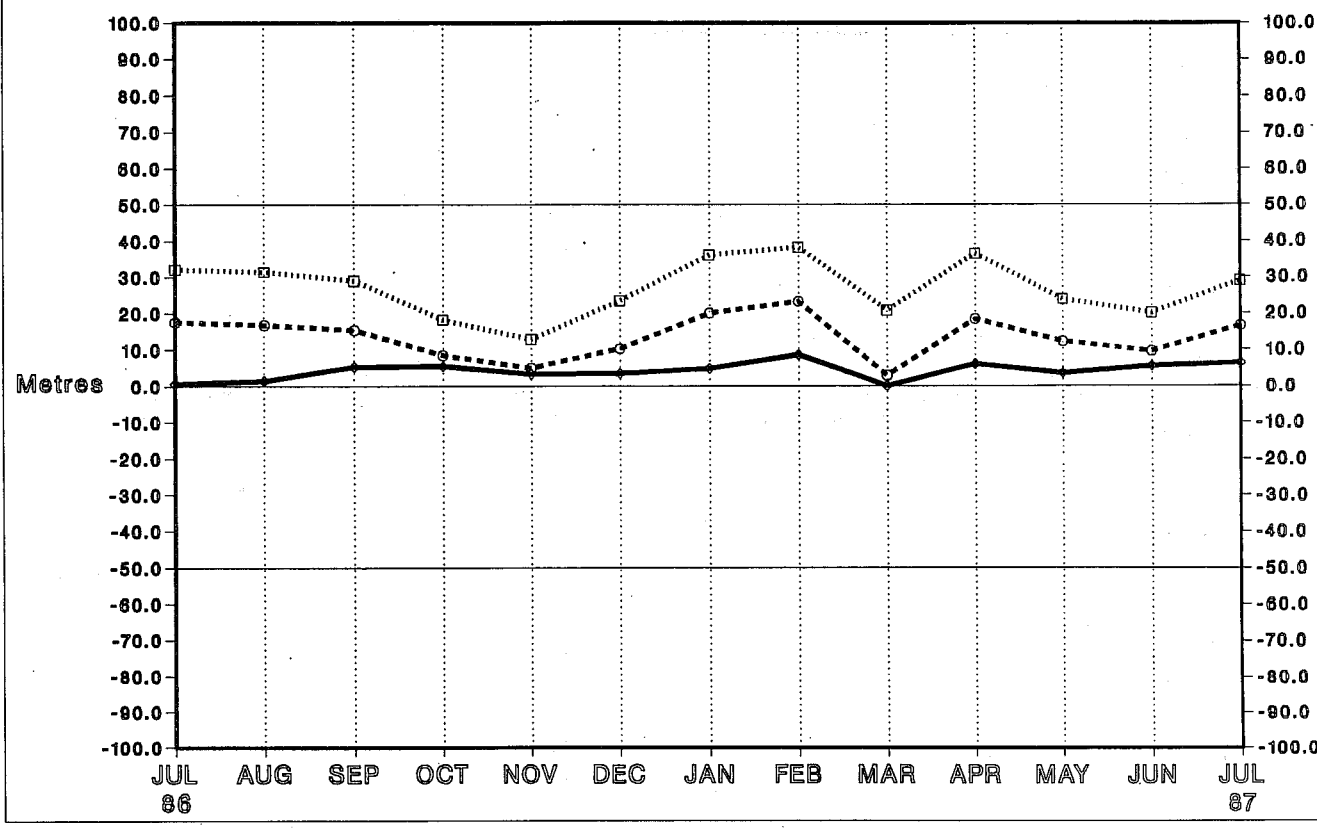
No. Obs : 31 31 30 31 29 29 30 28 31 30 31 30 30



Station 06260 (52N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

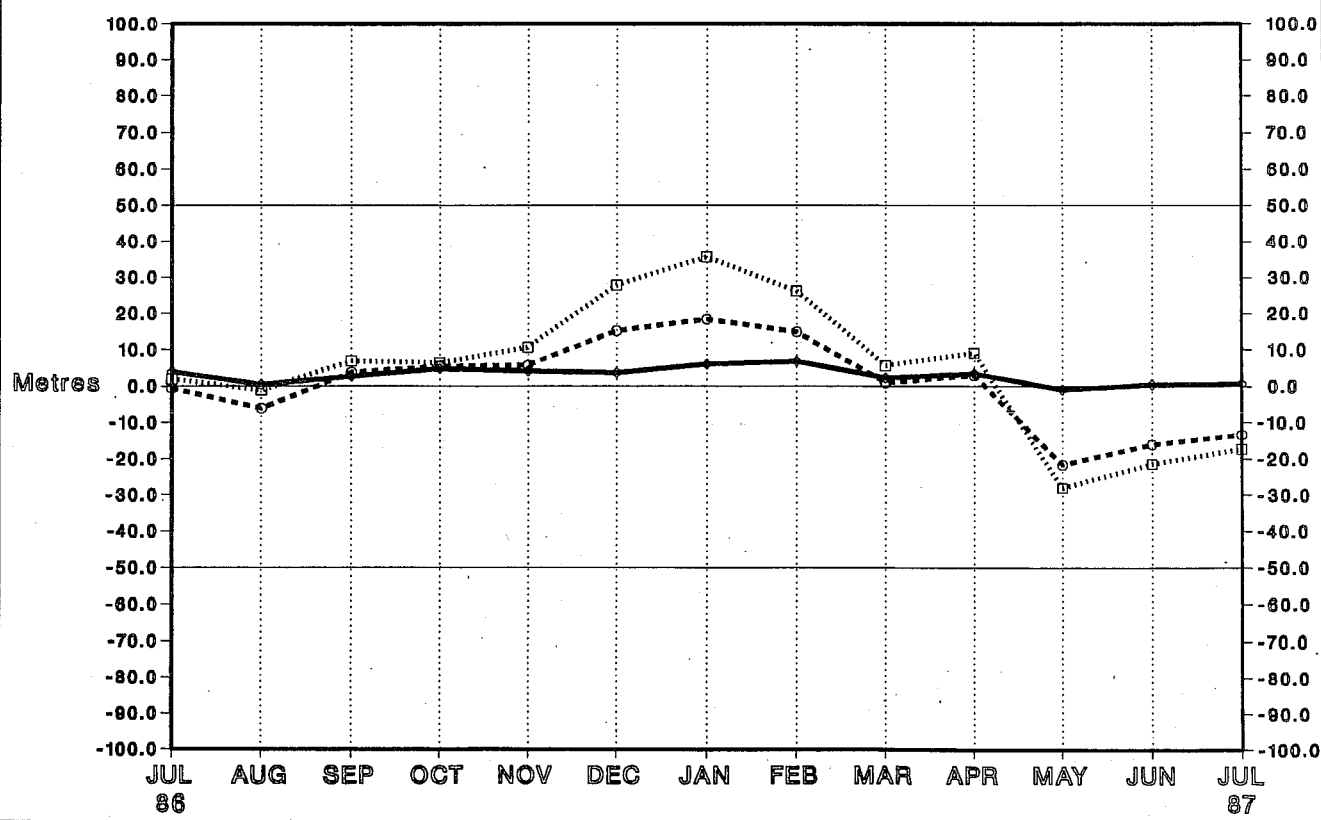
No. Obs: 31 30 30 31 30 31 30 28 31 28 31 30 31



Station 06260 (52N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

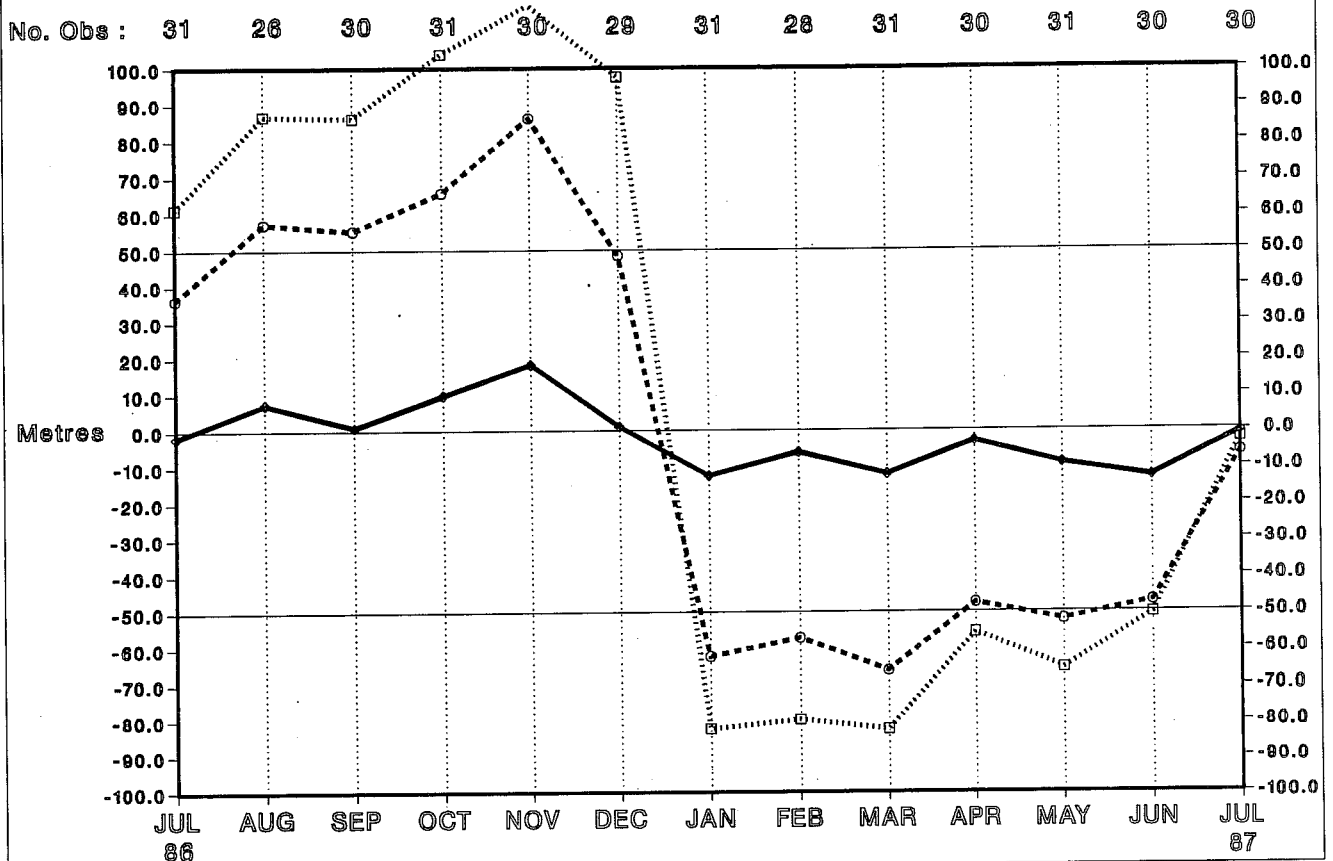
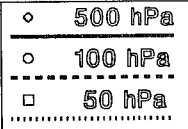
No. Obs: 31 31 29 31 30 30 29 27 31 30 31 30 31



Station 06447 (51N 004E)

Radiosonde Height Monitoring Statistics

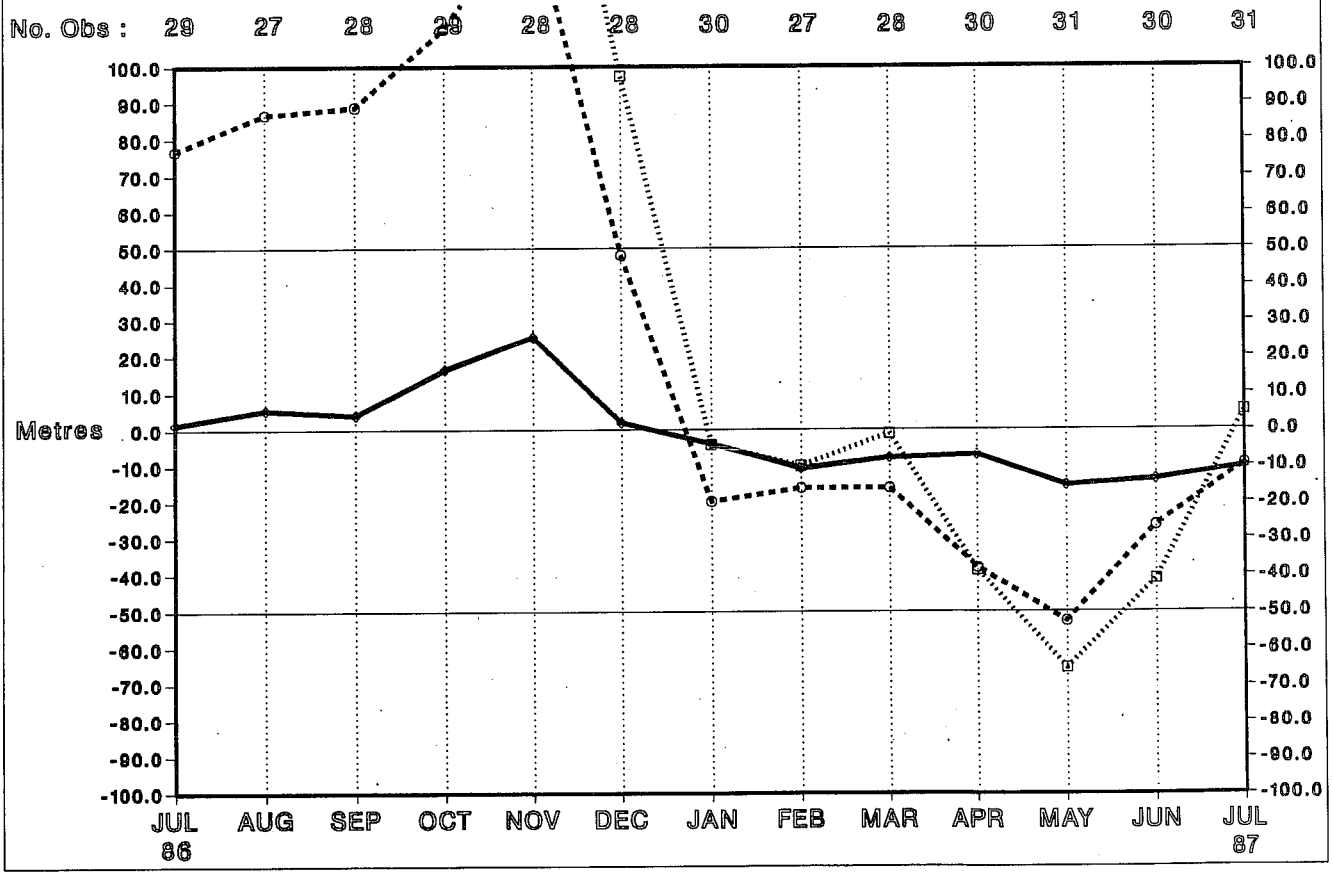
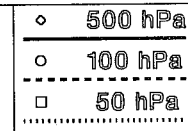
OBS - FG Differences - 00Z BIAS



Station 06447 (51N 004E)

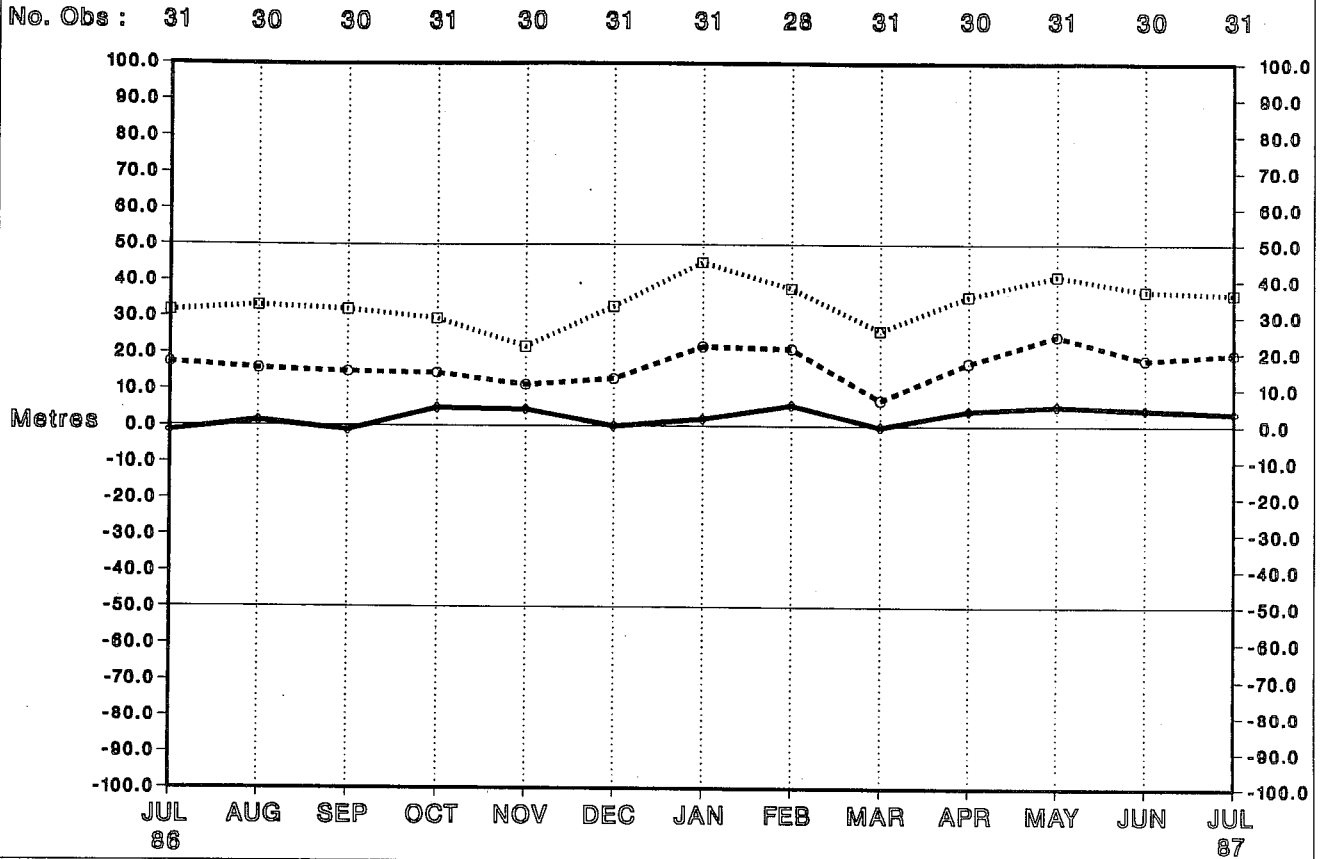
Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



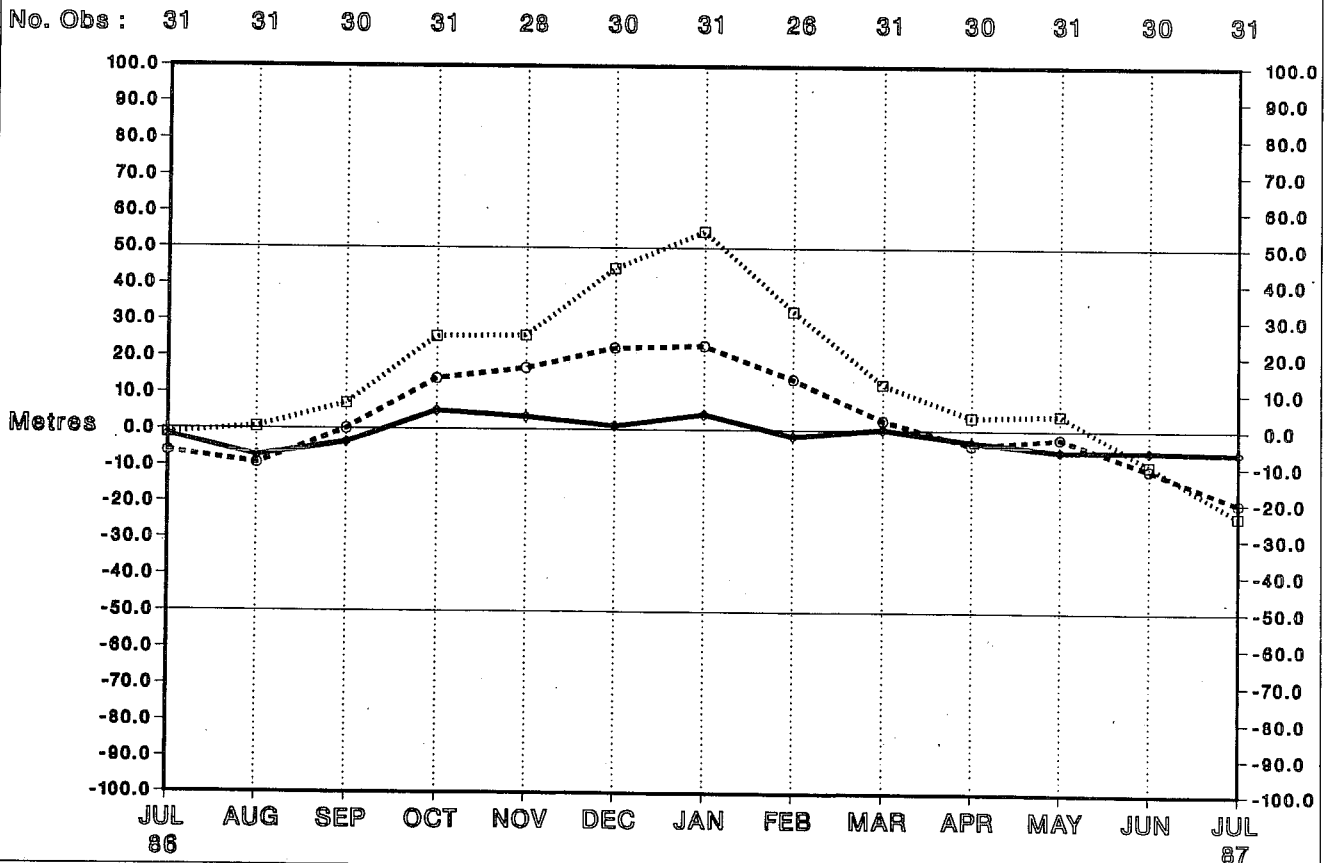
Station 06476 (50N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa
-



Station 06476 (50N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa
-



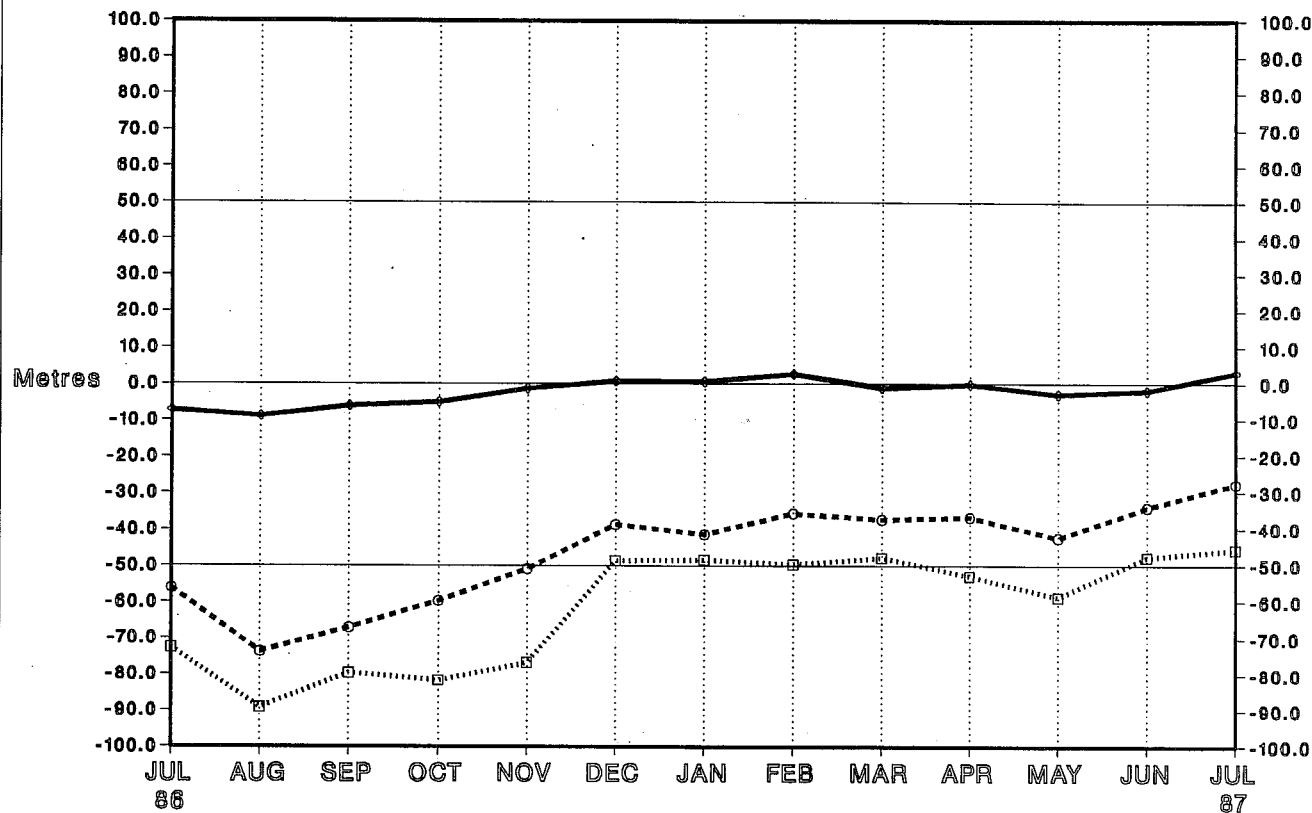
Station 06610 (47N 007E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 29 29 30 31 28 27 29 28 29 29



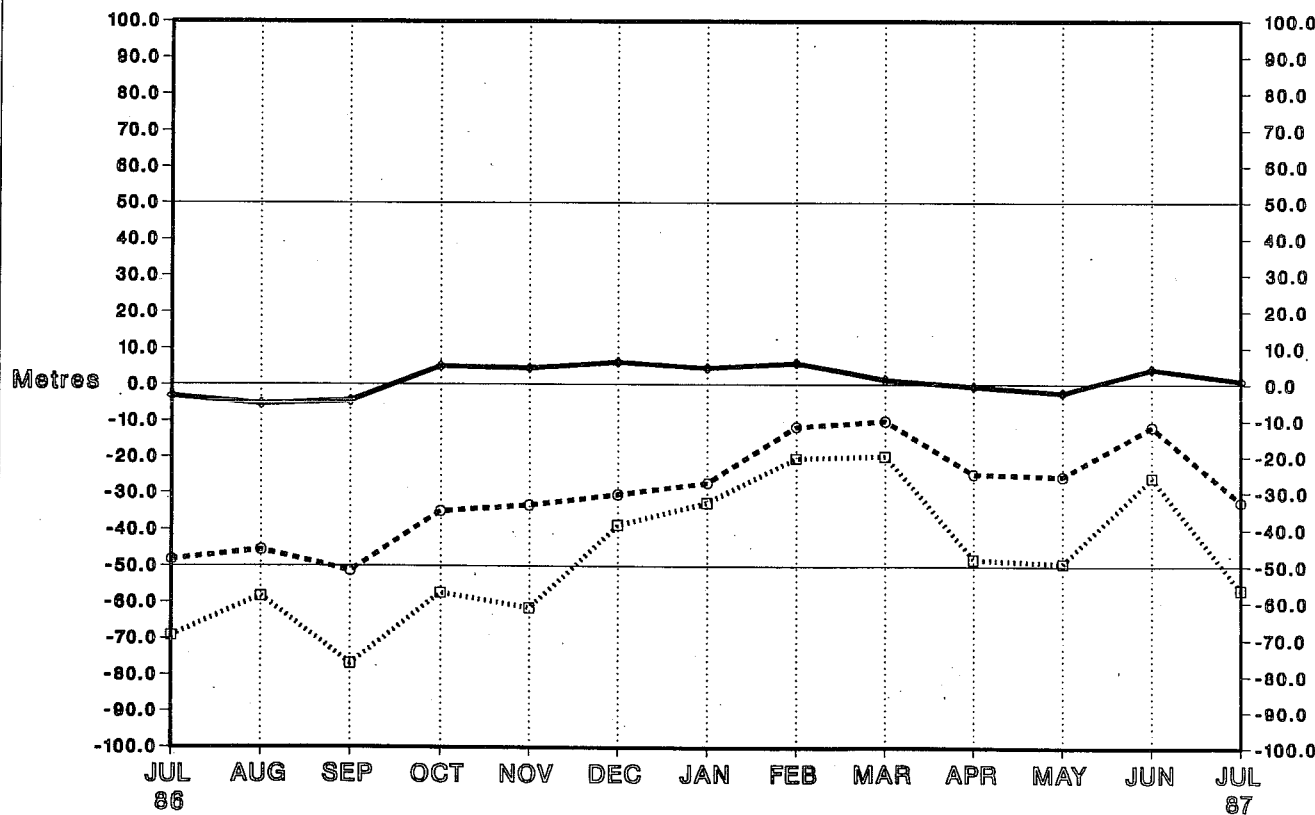
Station 06610 (47N 007E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

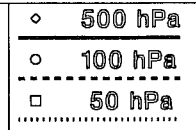
No. Obs : 31 30 29 31 28 30 31 28 26 25 25 27 25



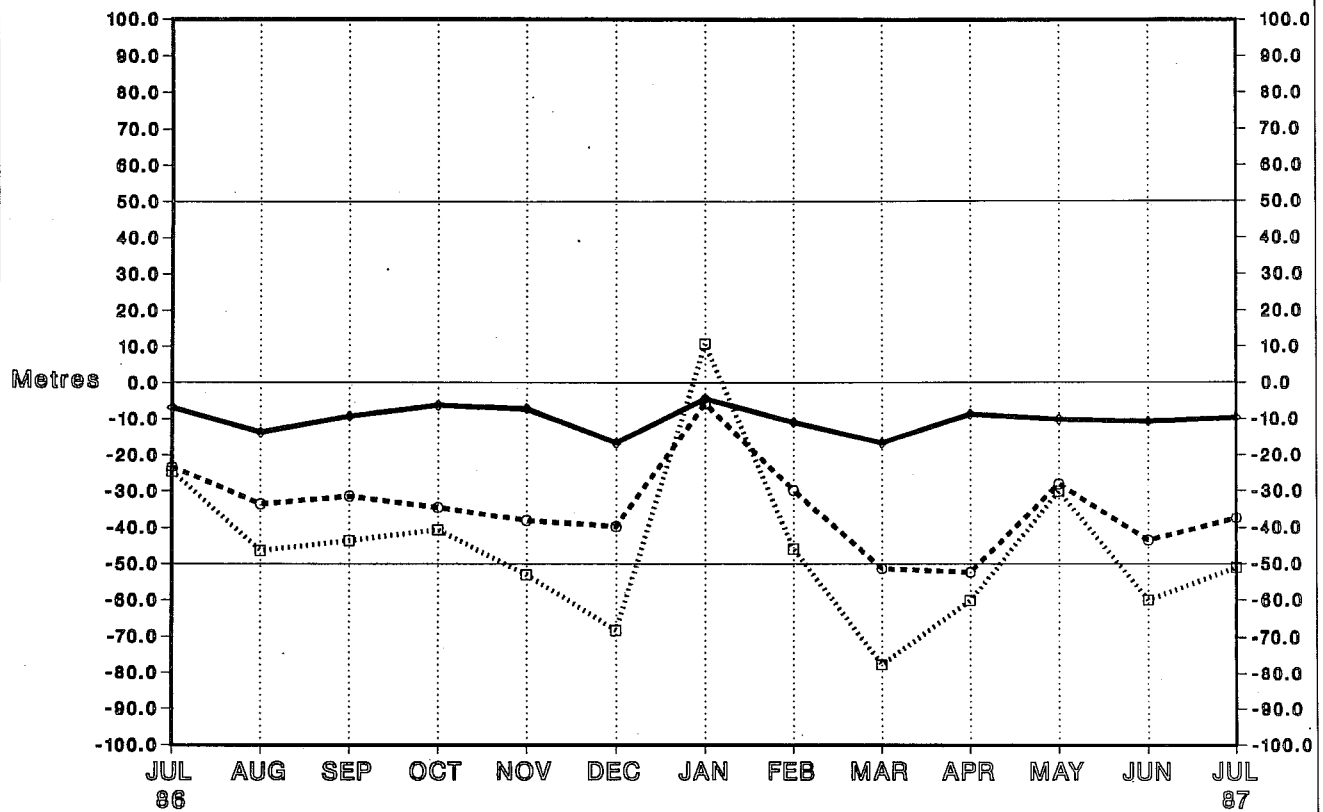
Station 07110 (48N 003W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



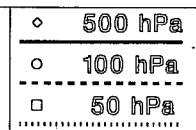
No. Obs : 29 30 30 28 26 25 22 21 29 26 29 27 28



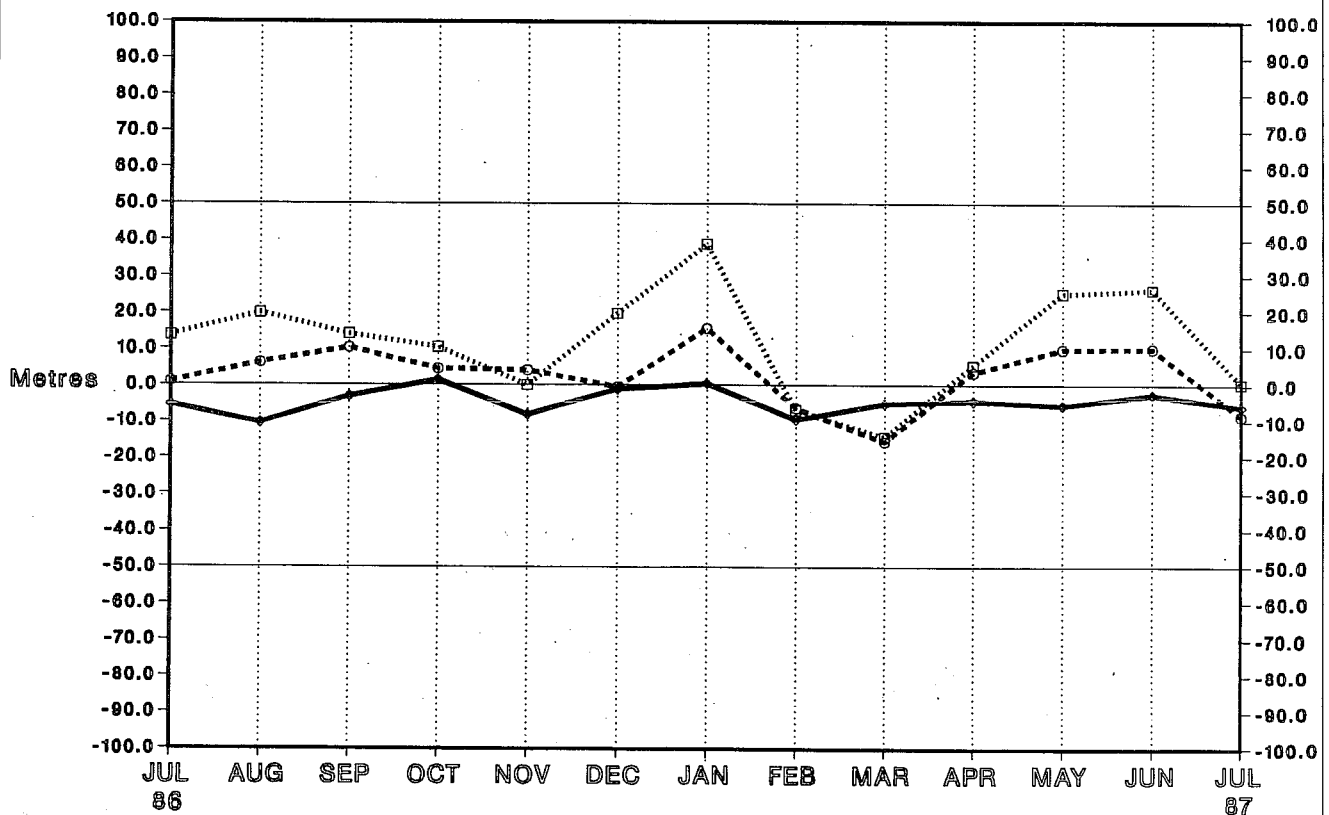
Station 07110 (48N 003W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 27 28 29 27 27 26 29 24 28 28 26 24 28



Station 07145 (49N 002E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30

28

29

27

25

30

30

25

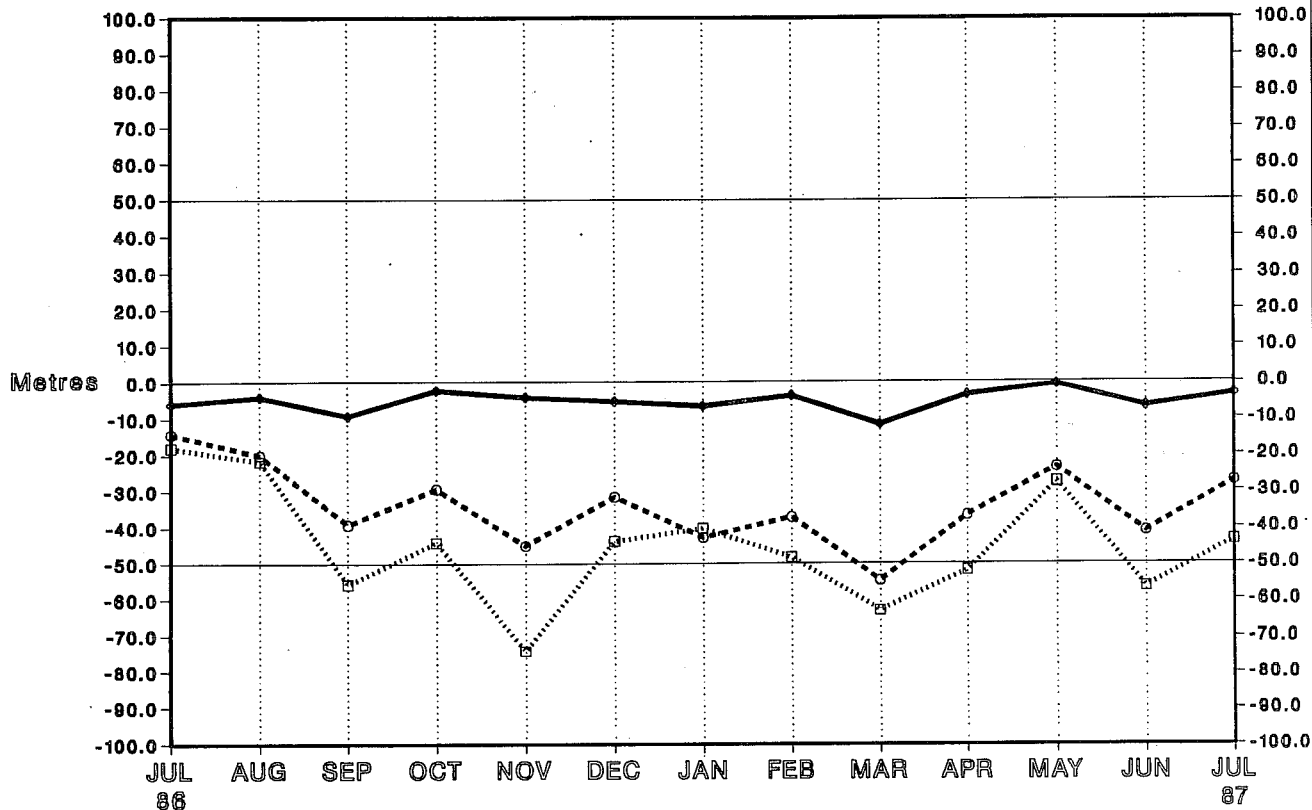
28

26

29

27

27



Station 07145 (49N 002E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30

30

27

26

25

30

30

27

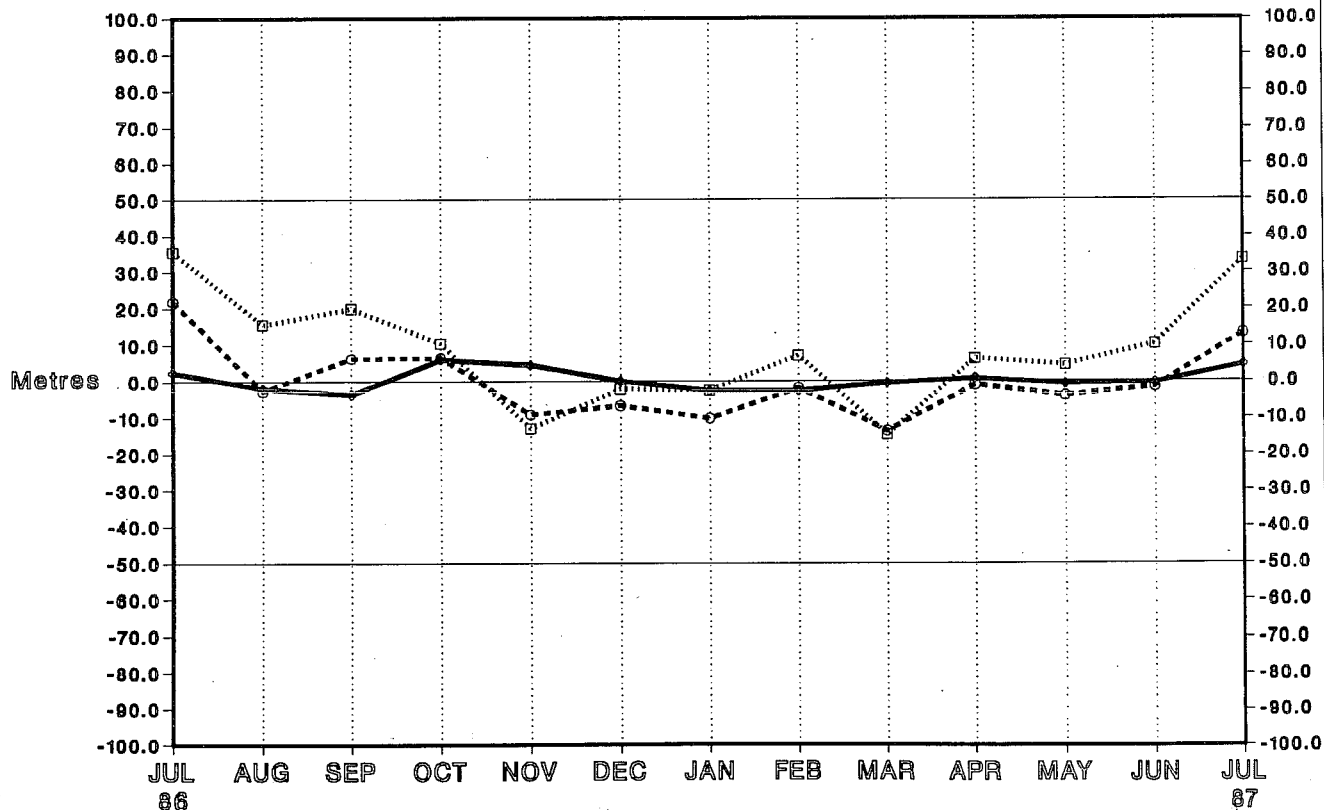
29

29

29

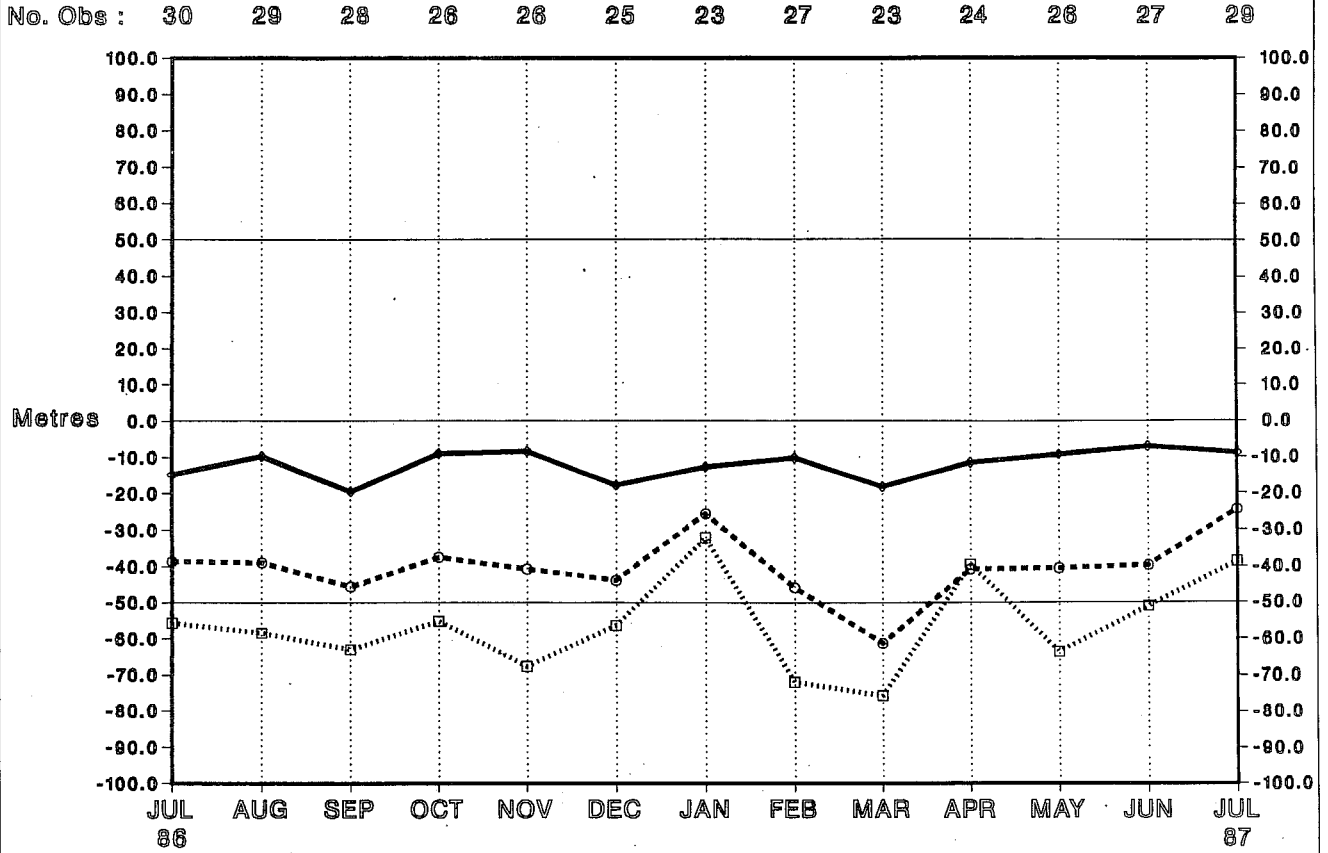
29

30



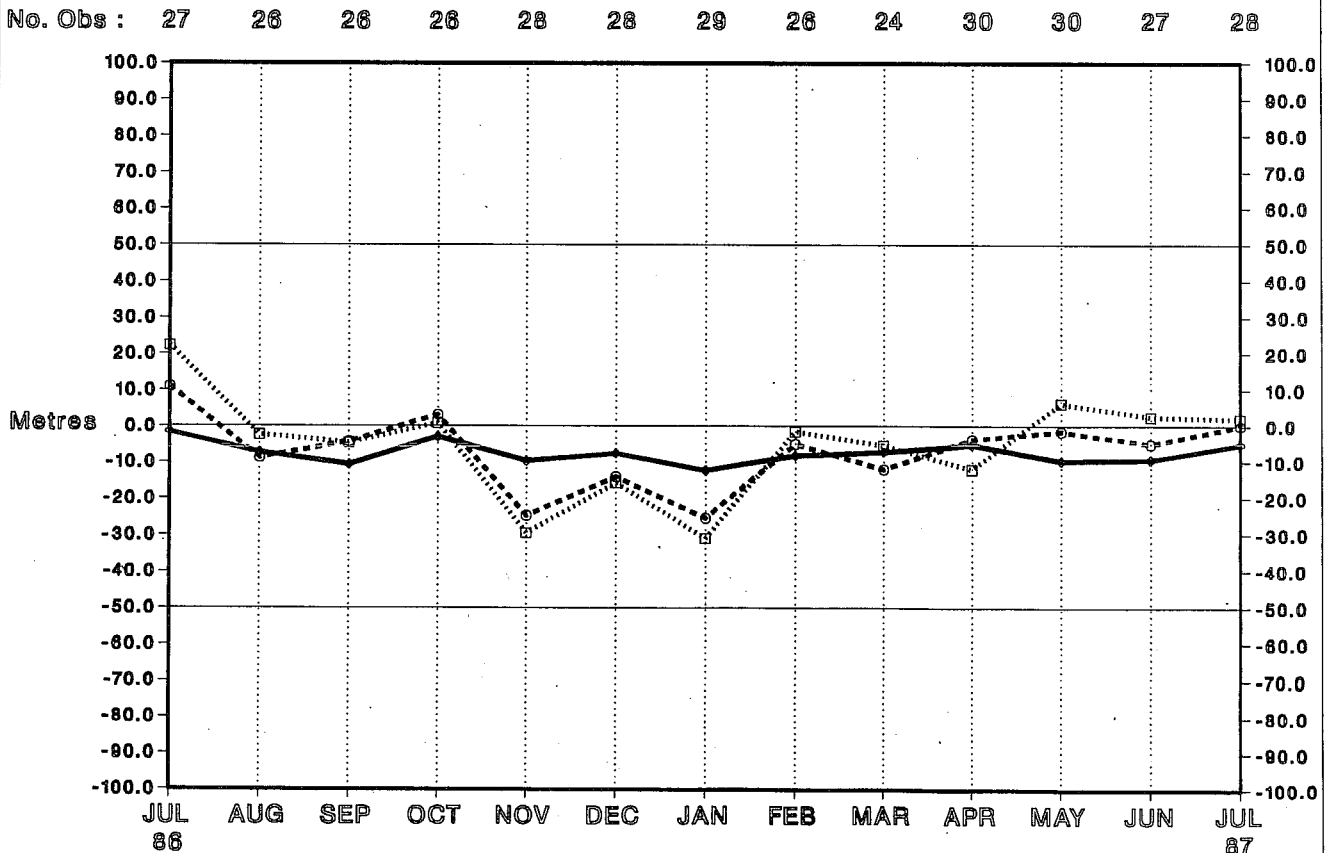
Station 07481 (46N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
- 50 hPa



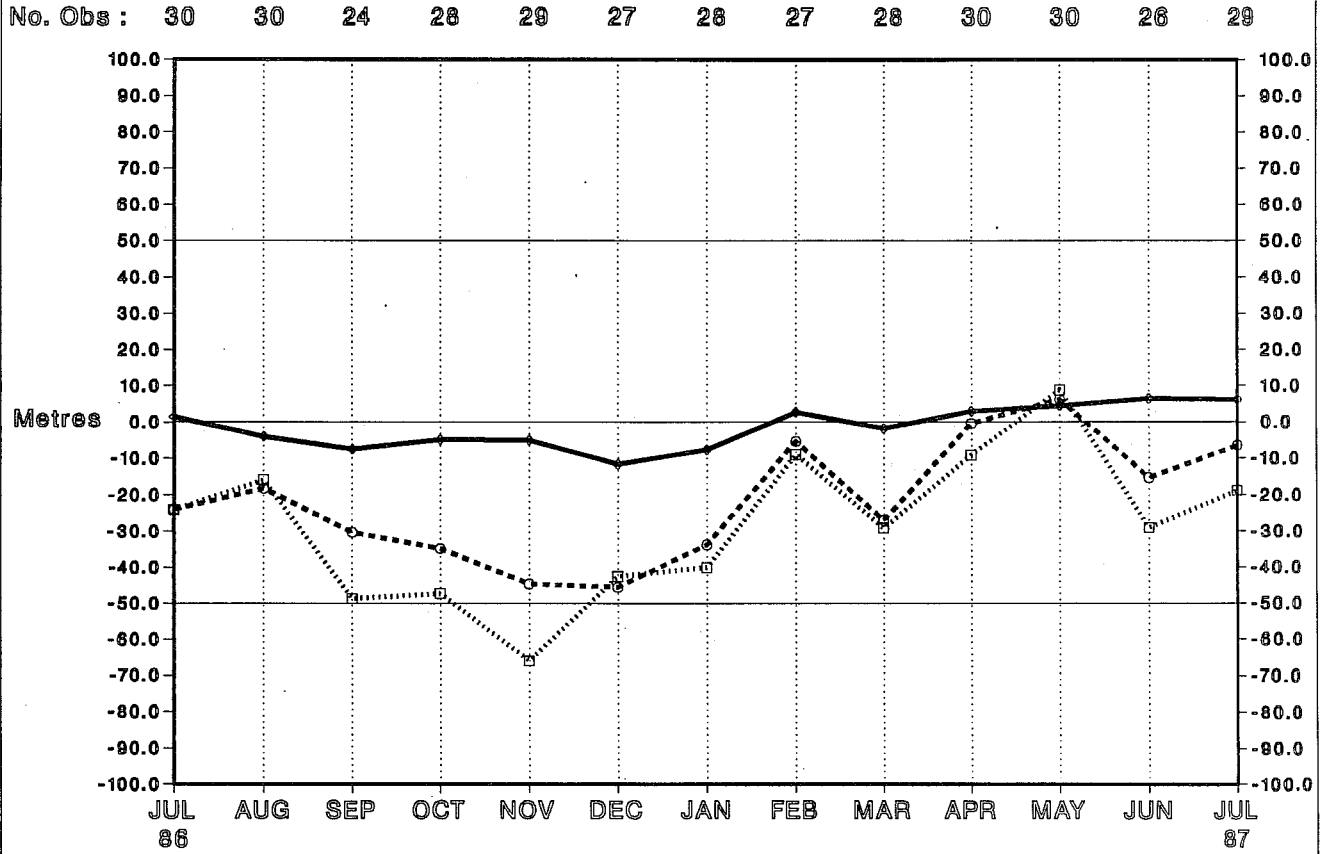
Station 07481 (46N 005E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 100 hPa
- 50 hPa
- 50 hPa



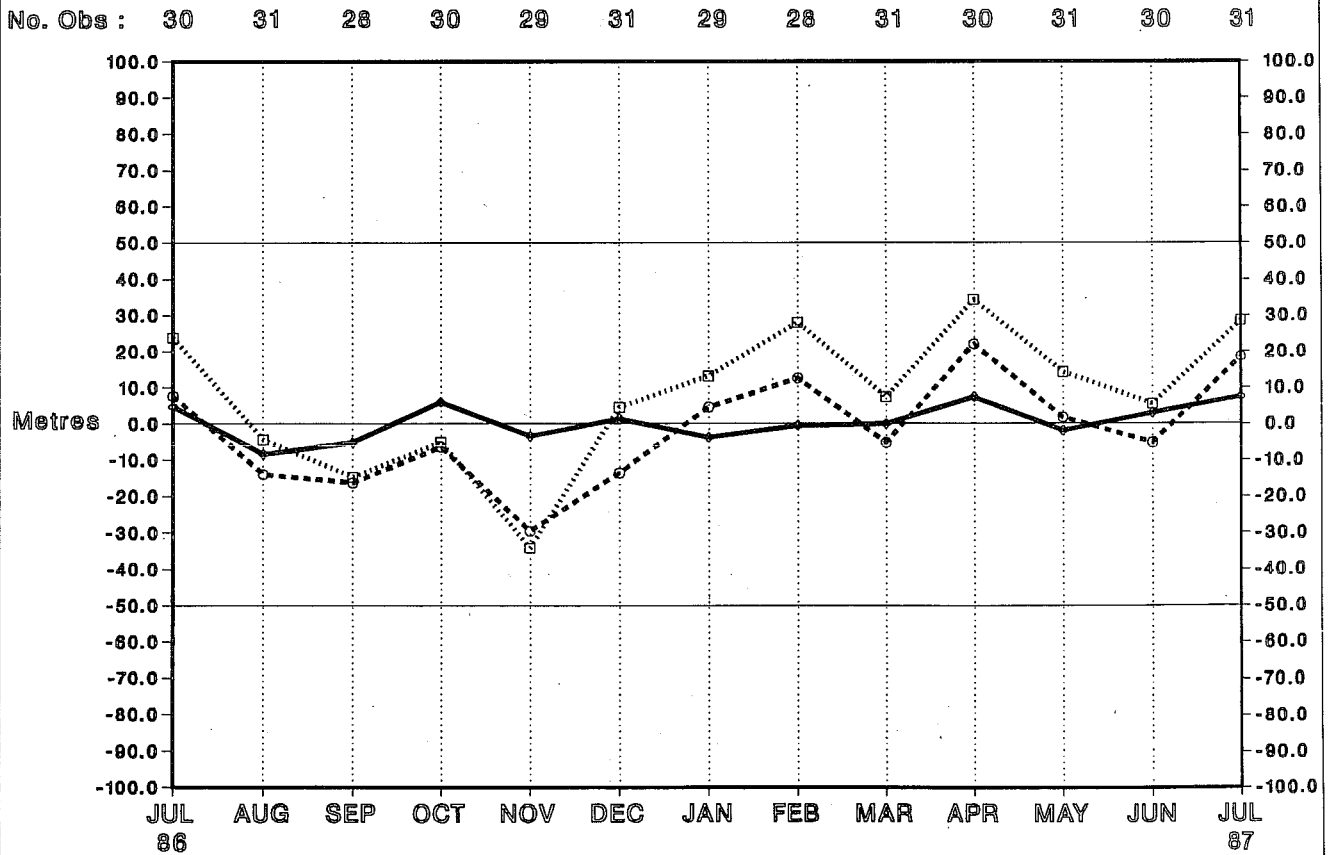
Station 07510 (45N 000E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

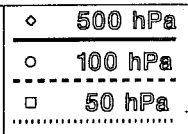


Station 07510 (45N 000E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

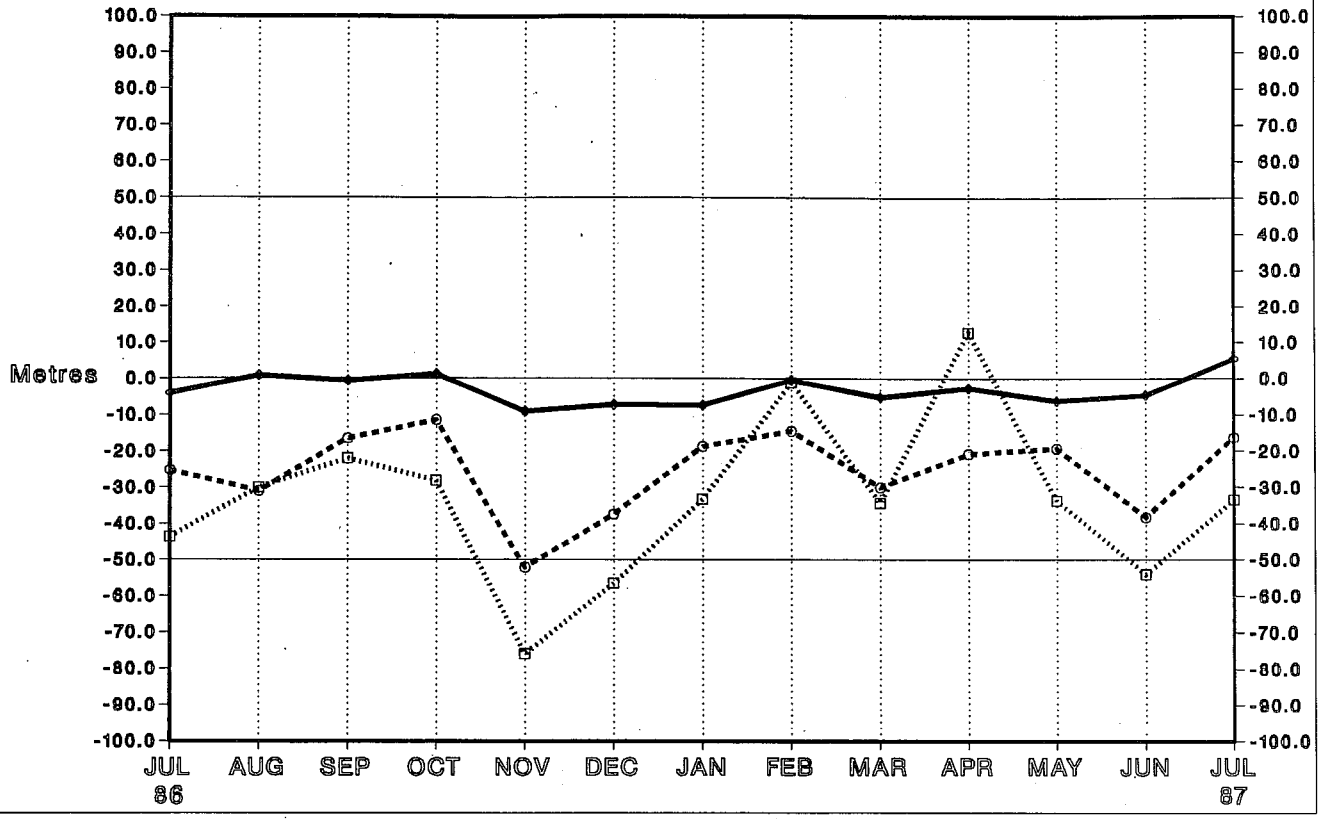
- ◇ 500 hPa
- 100 hPa
- 50 hPa



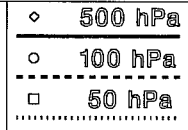
Station 07645 (44N 004E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



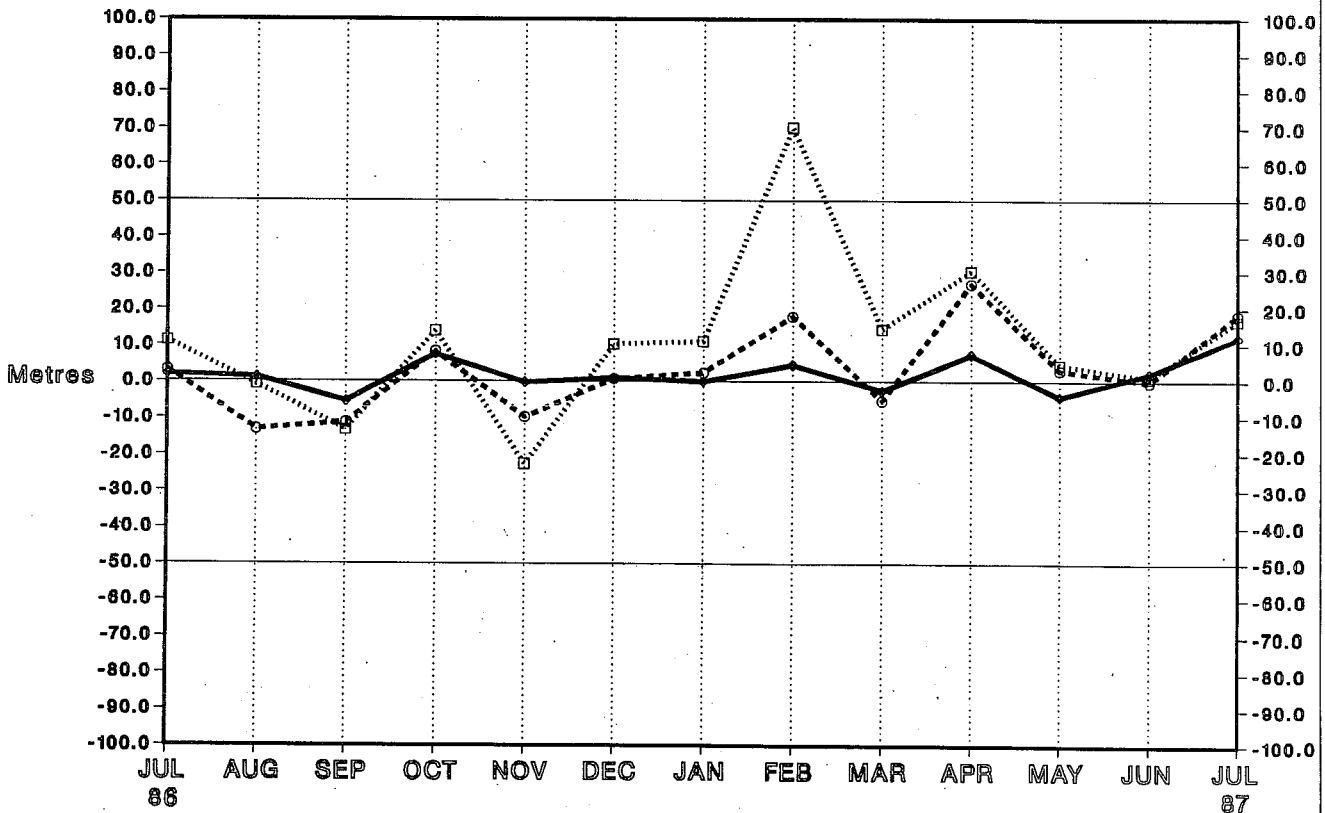
No. Obs : 26 30 27 27 26 25 28 22 29 27 27 29 30



Station 07645 (44N 004E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

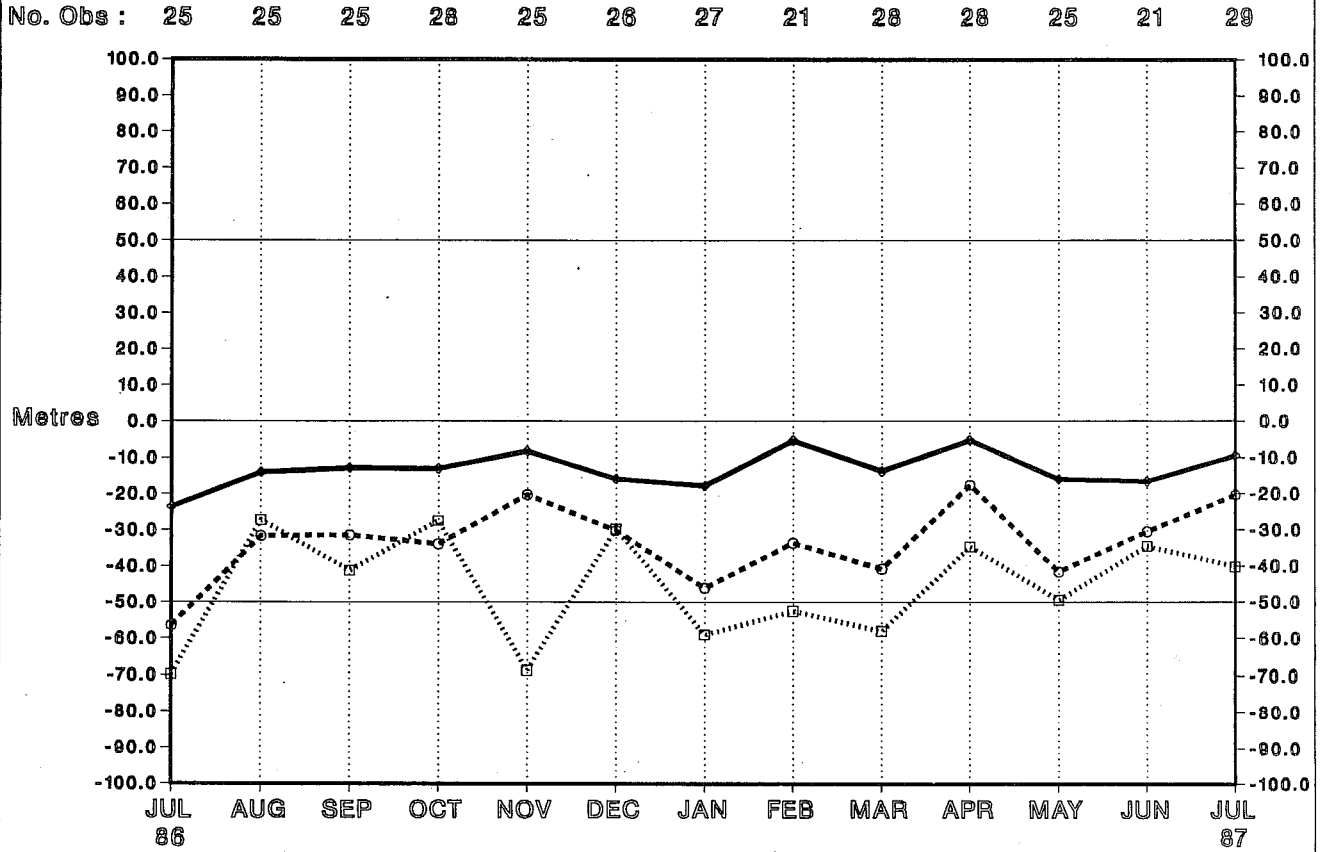


No. Obs : 28 28 27 29 24 24 25 27 24 30 29 26 29



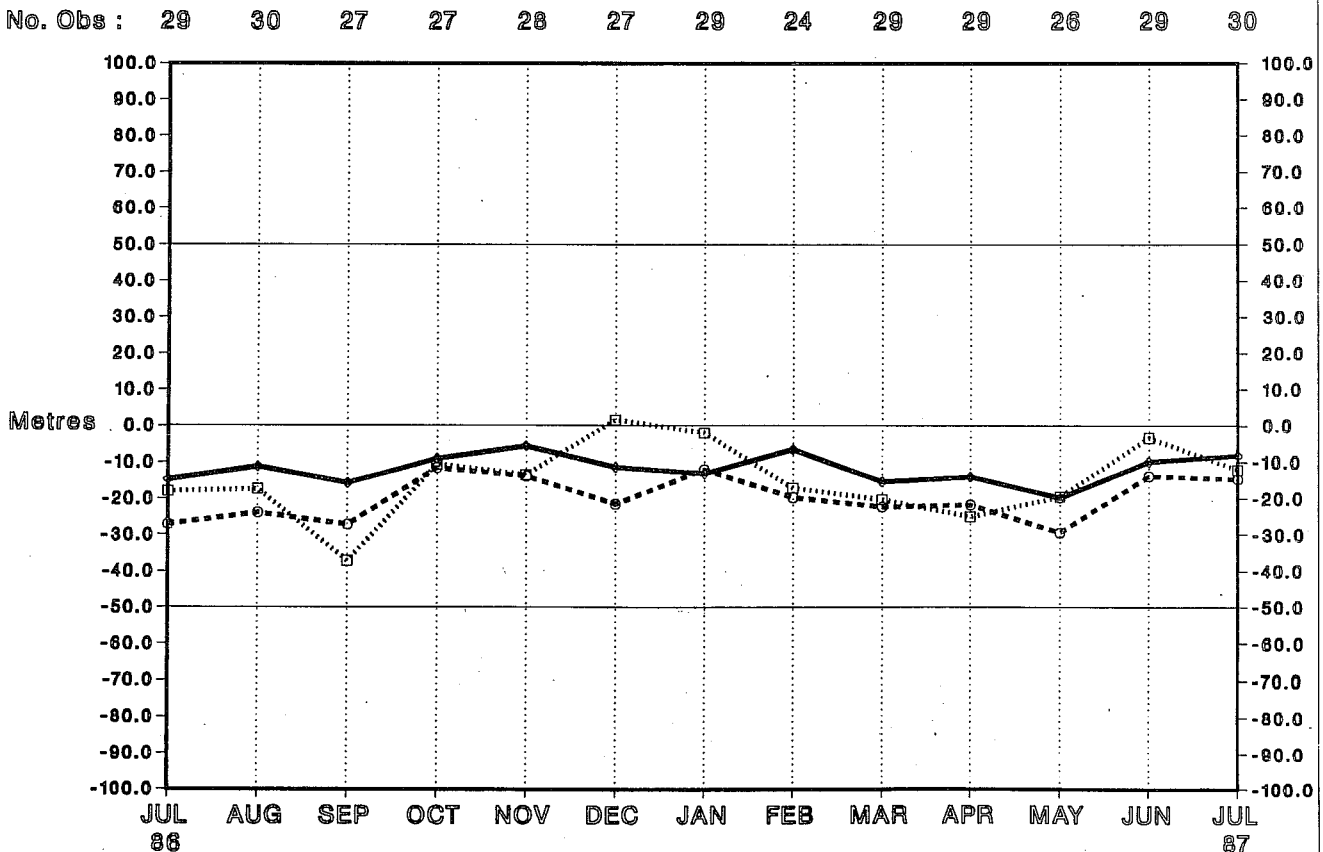
Station 07761 (42N 009E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa



Station 07761 (42N 009E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

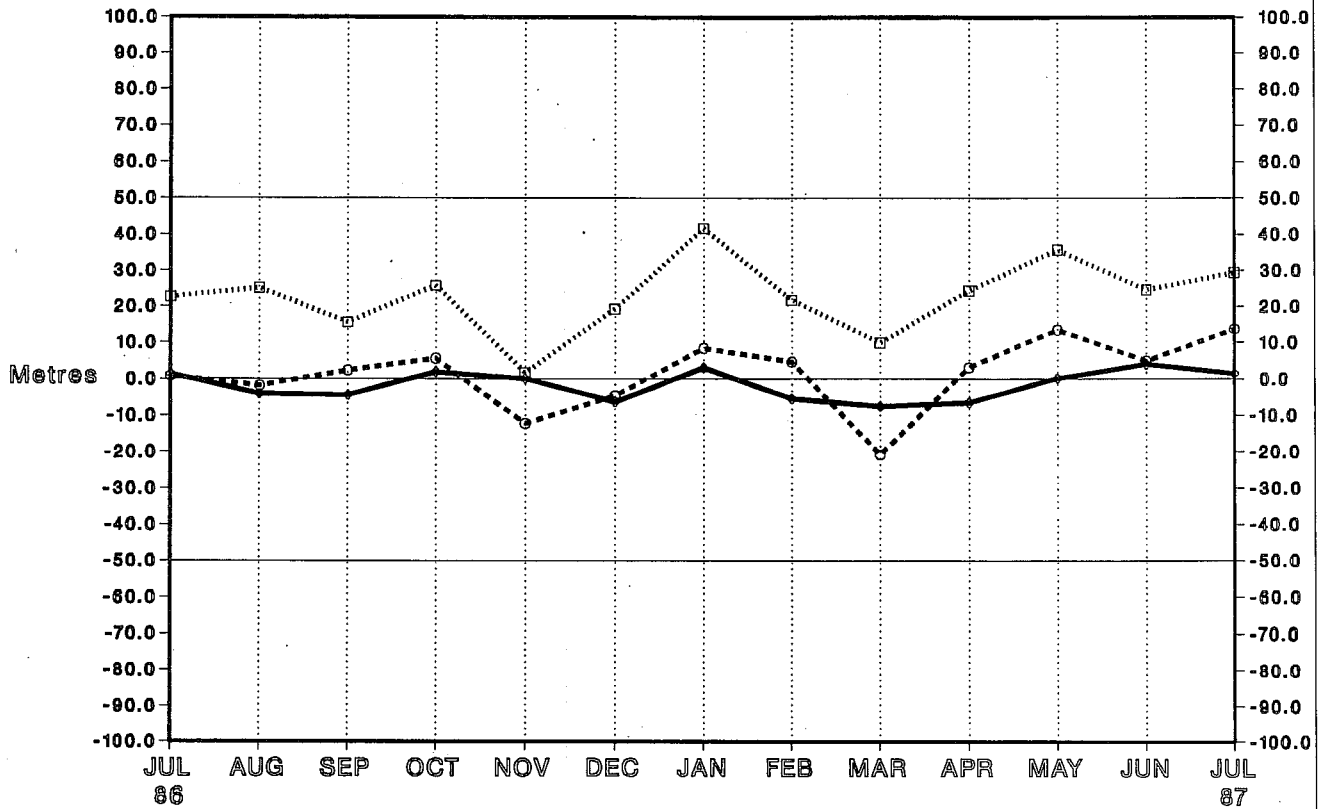
- ◊ 500 hPa
- 100 hPa
- 50 hPa



Station 08001 (43N 007W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

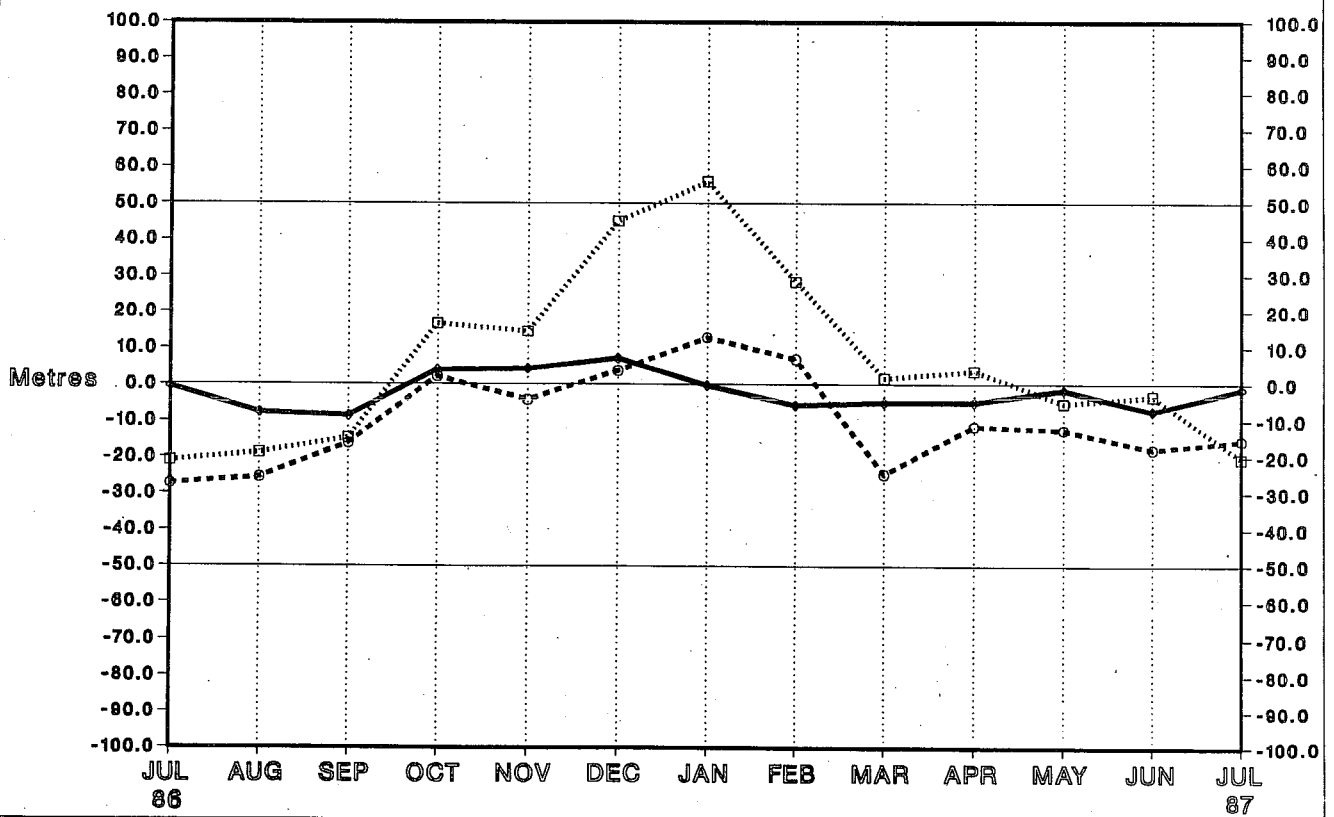
No. Obs: 29 27 30 28 29 29 27 22 29 29 29 30 30



Station 08001 (43N 007W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

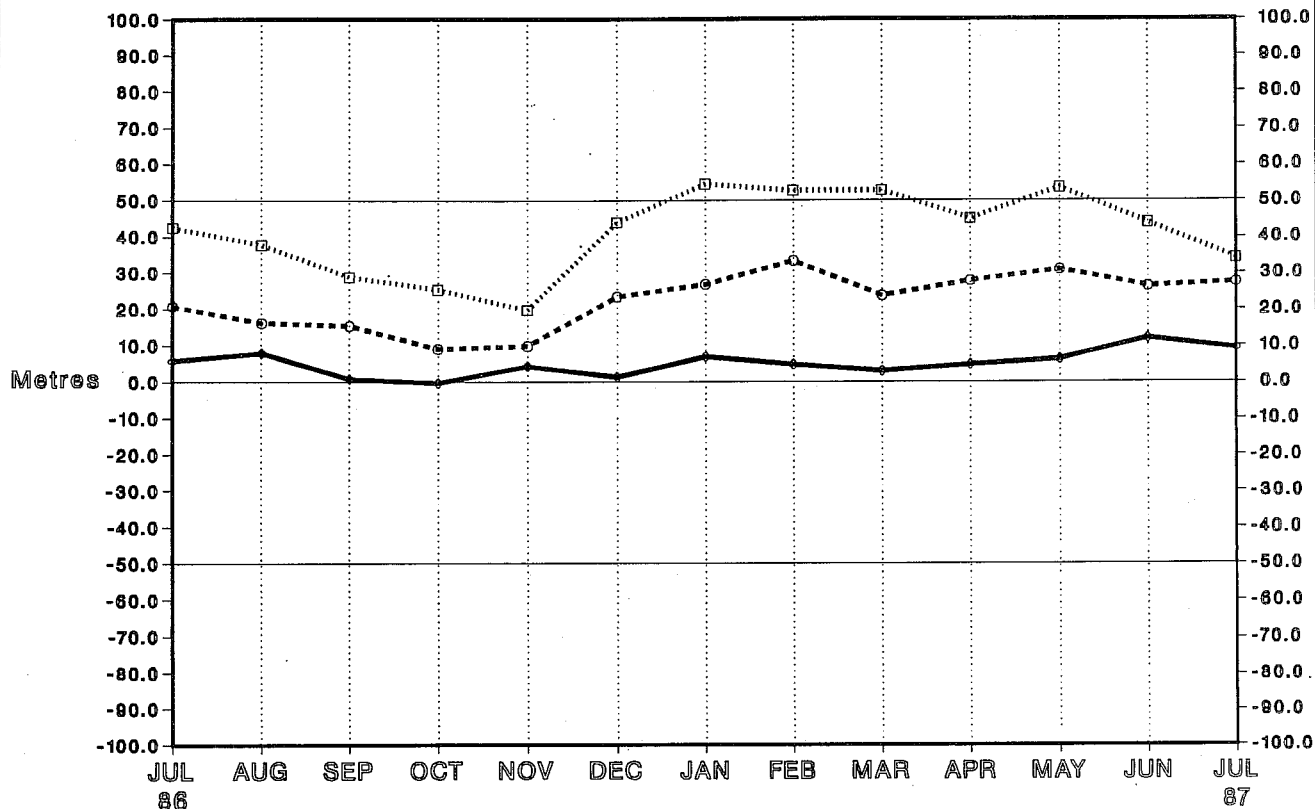
No. Obs: 28 28 29 28 28 31 31 24 29 26 28 26 28



Station 08221 (41N 003W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

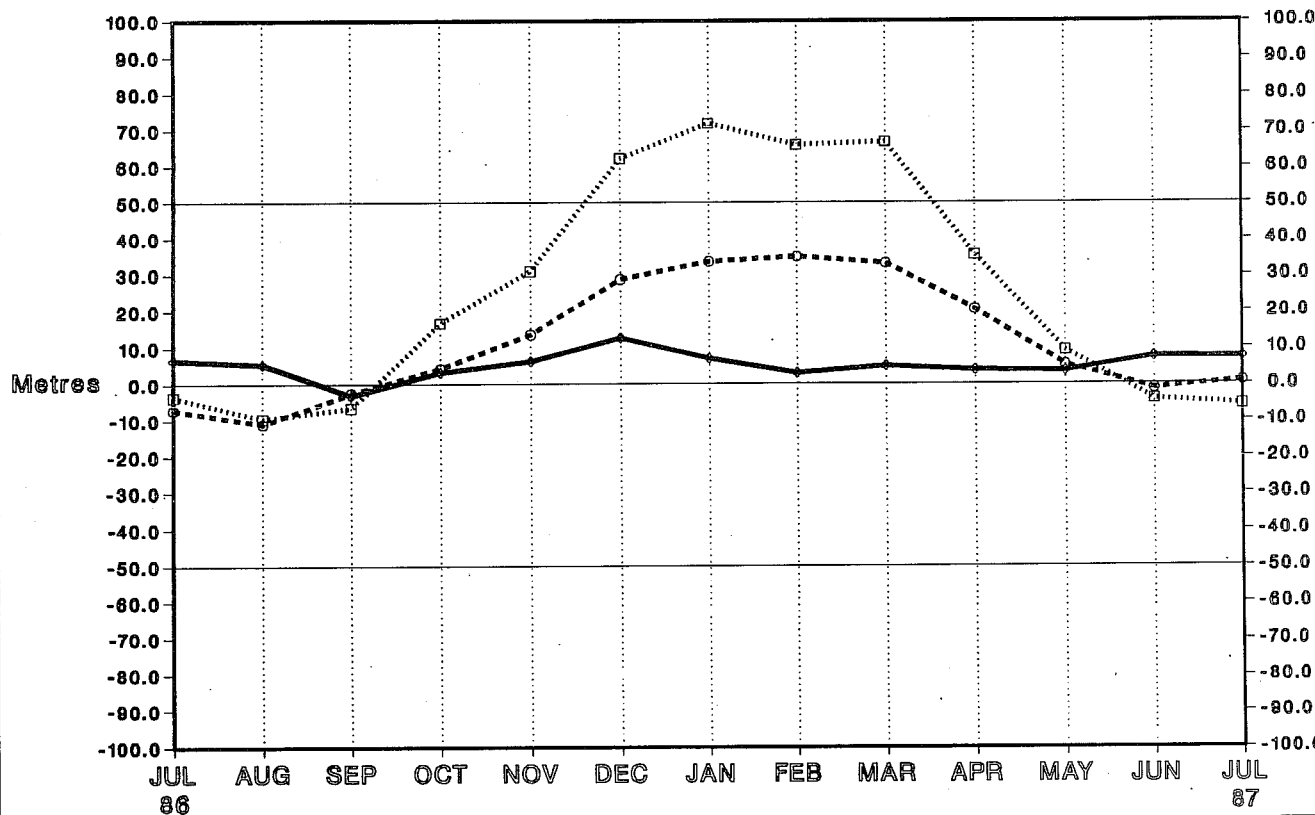
No. Obs : 31 31 29 31 29 30 29 26 30 30 31 30 30



Station 08221 (41N 003W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

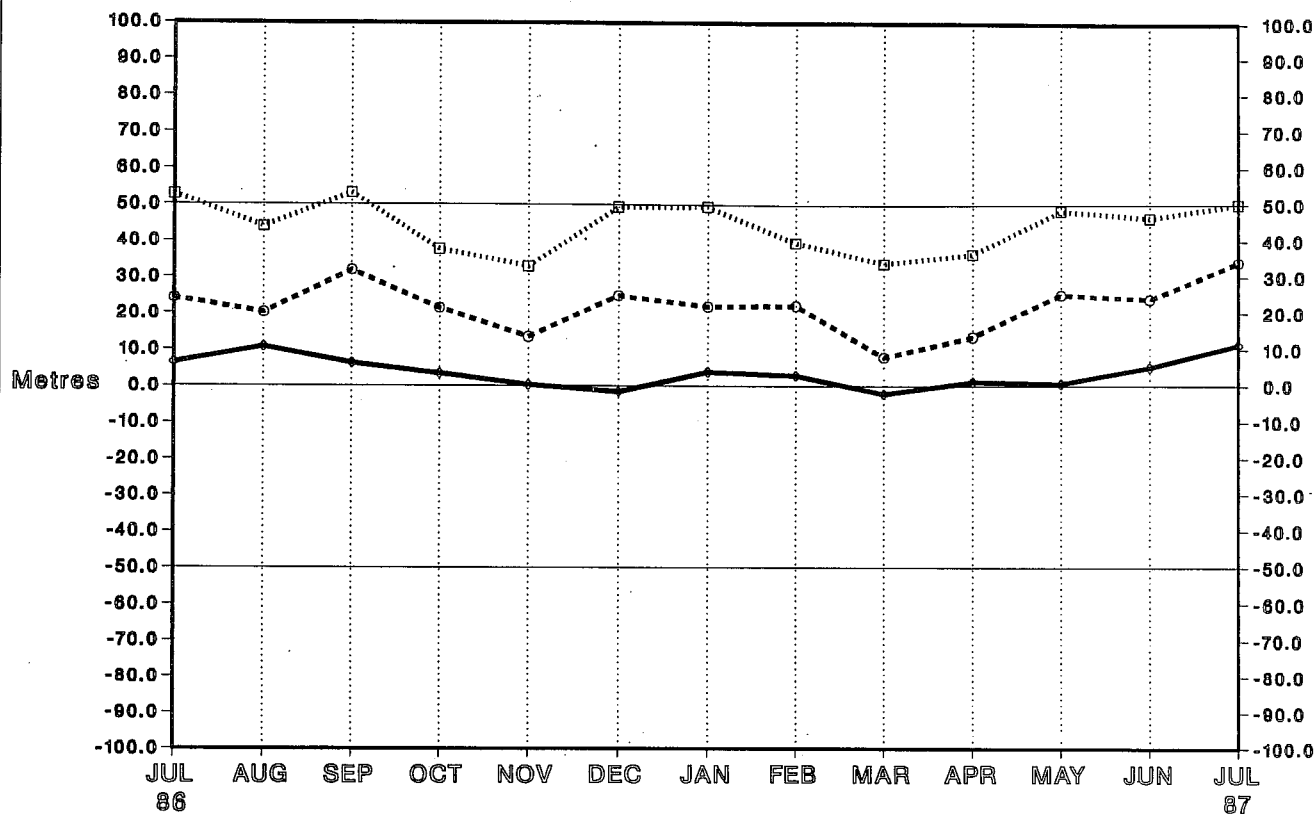
No. Obs : 31 29 29 30 29 30 31 27 29 30 31 30 31



Station 08302 (40N 003E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
- 50 hPa
- 50 hPa

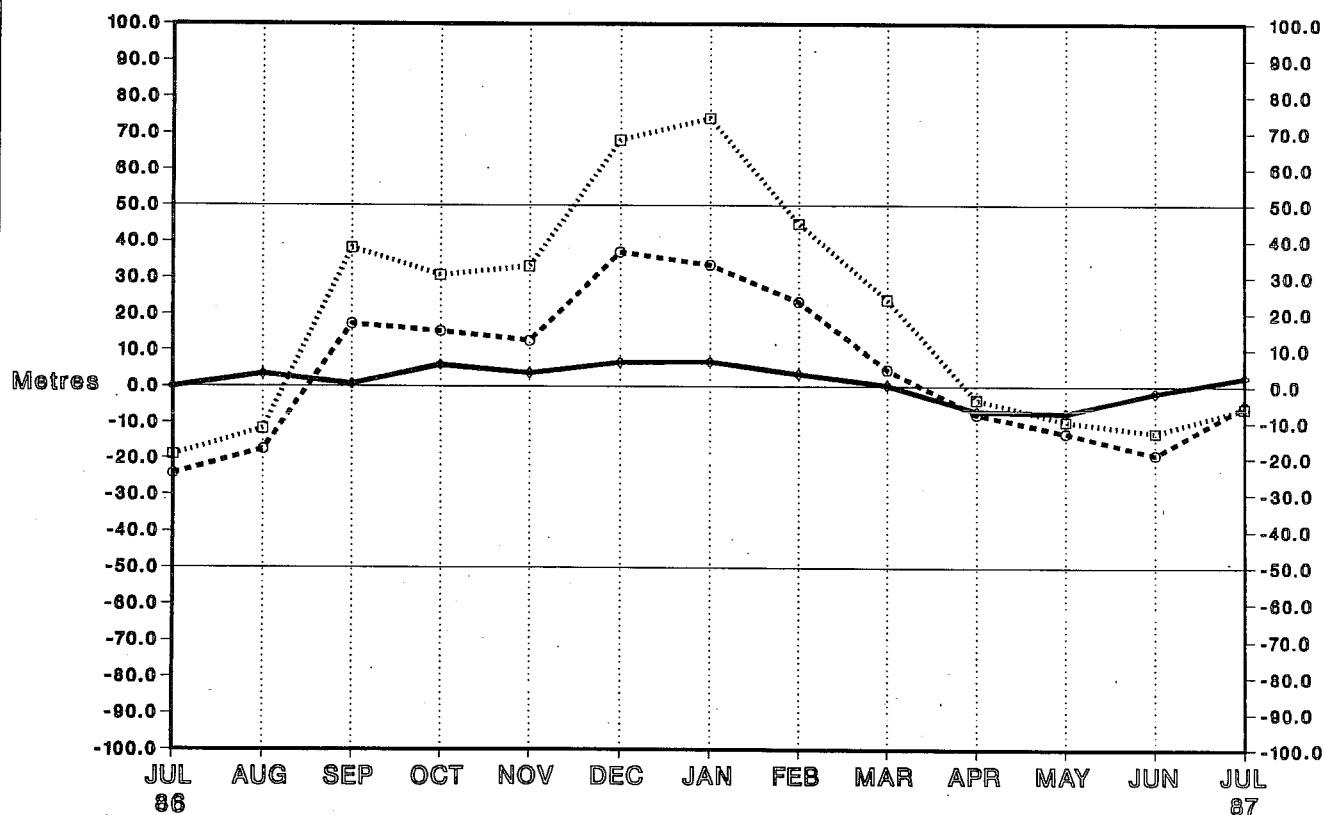
No. Obs: 28 25 29 31 30 30 29 24 30 28 29 30 25



Station 08302 (40N 003E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
- 50 hPa
- 50 hPa

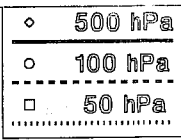
No. Obs: 27 26 28 30 29 29 28 28 29 28 31 30 27



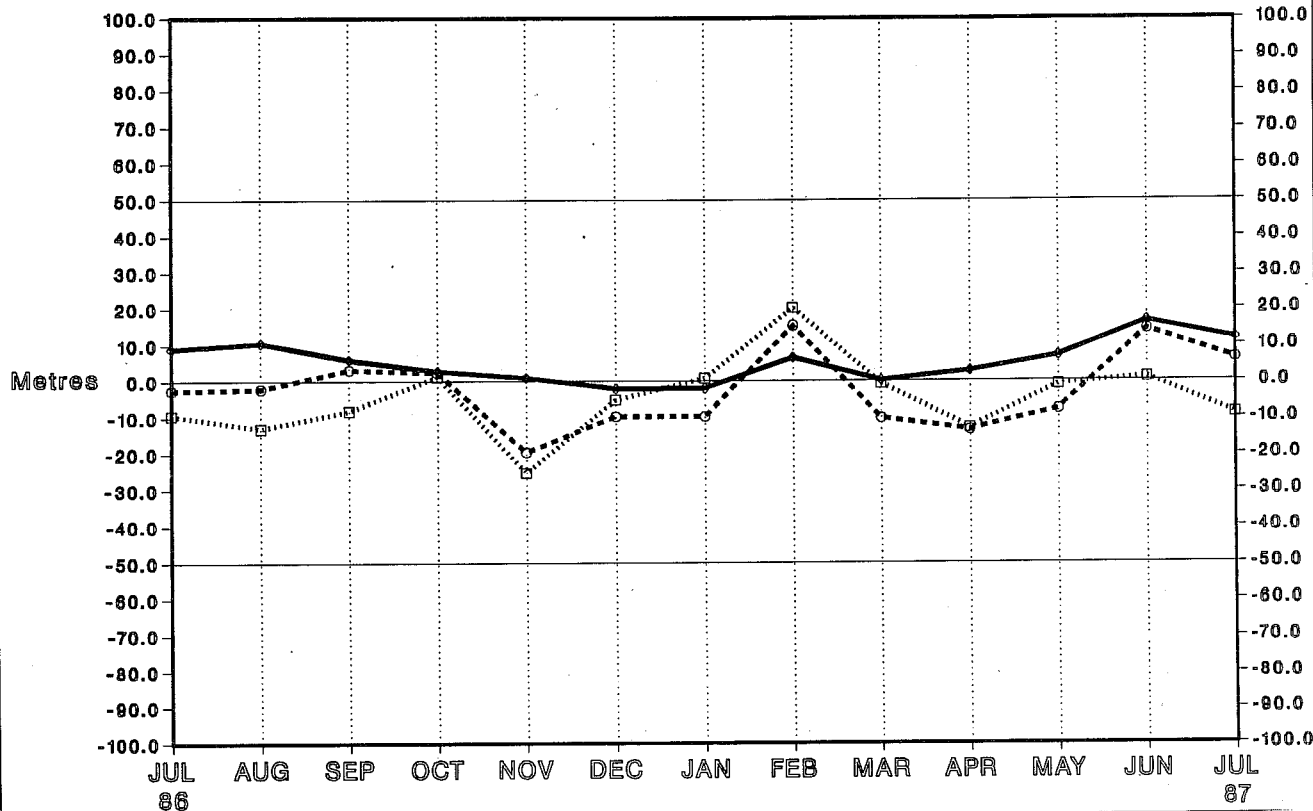
Station 08495 (36N 004W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



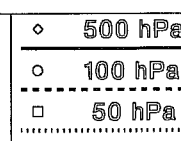
No. Obs : 30 30 30 31 30 31 31 26 31 30 30 29 31



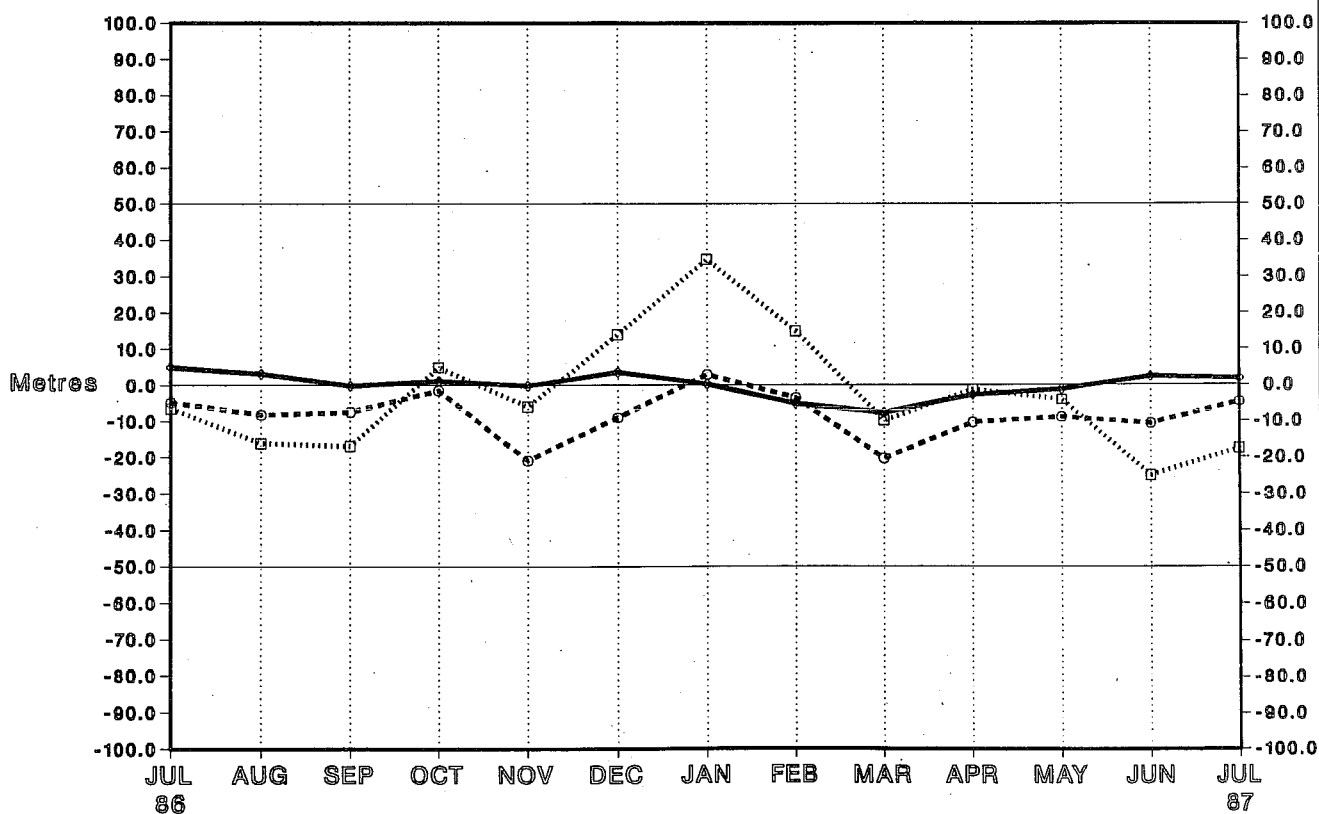
Station 08495 (36N 004W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



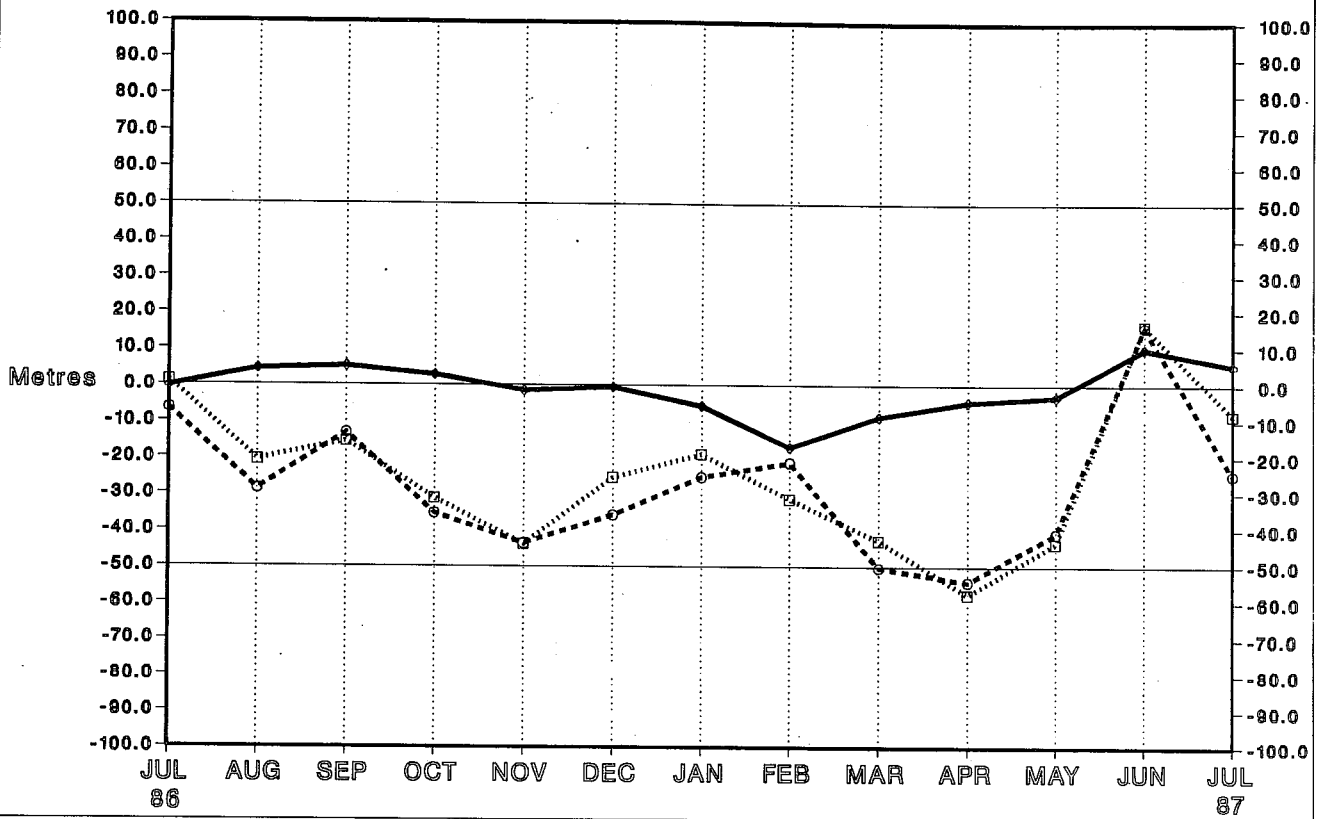
No. Obs : 30 30 29 27 29 30 31 28 31 30 28 29 31



Station 08509 (39N 026W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

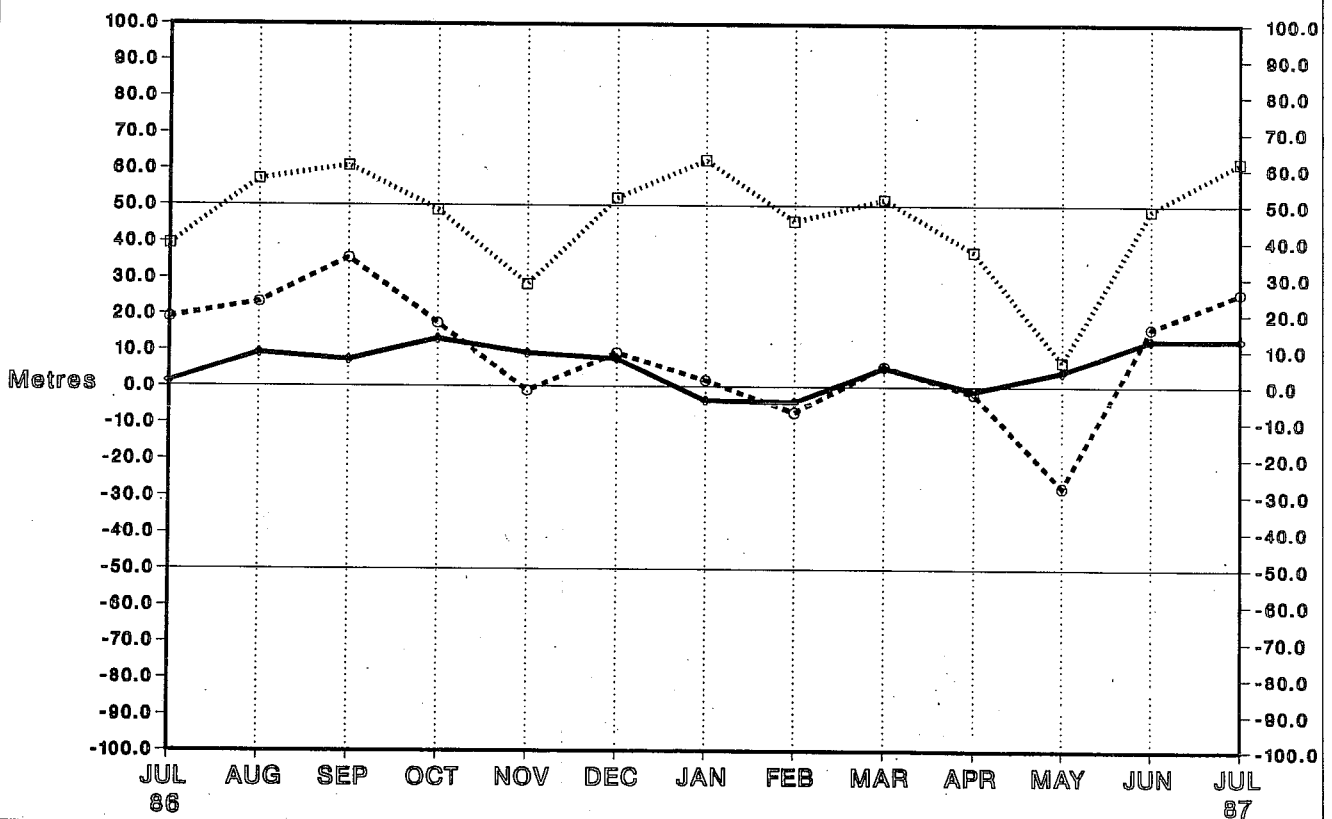
No. Obs : 31 29 26 29 28 29 20 12 29 29 11 10 6



Station 08509 (39N 026W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

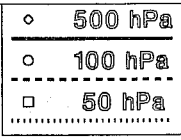
No. Obs : 31 31 29 29 29 28 18 10 27 29 12 9 6



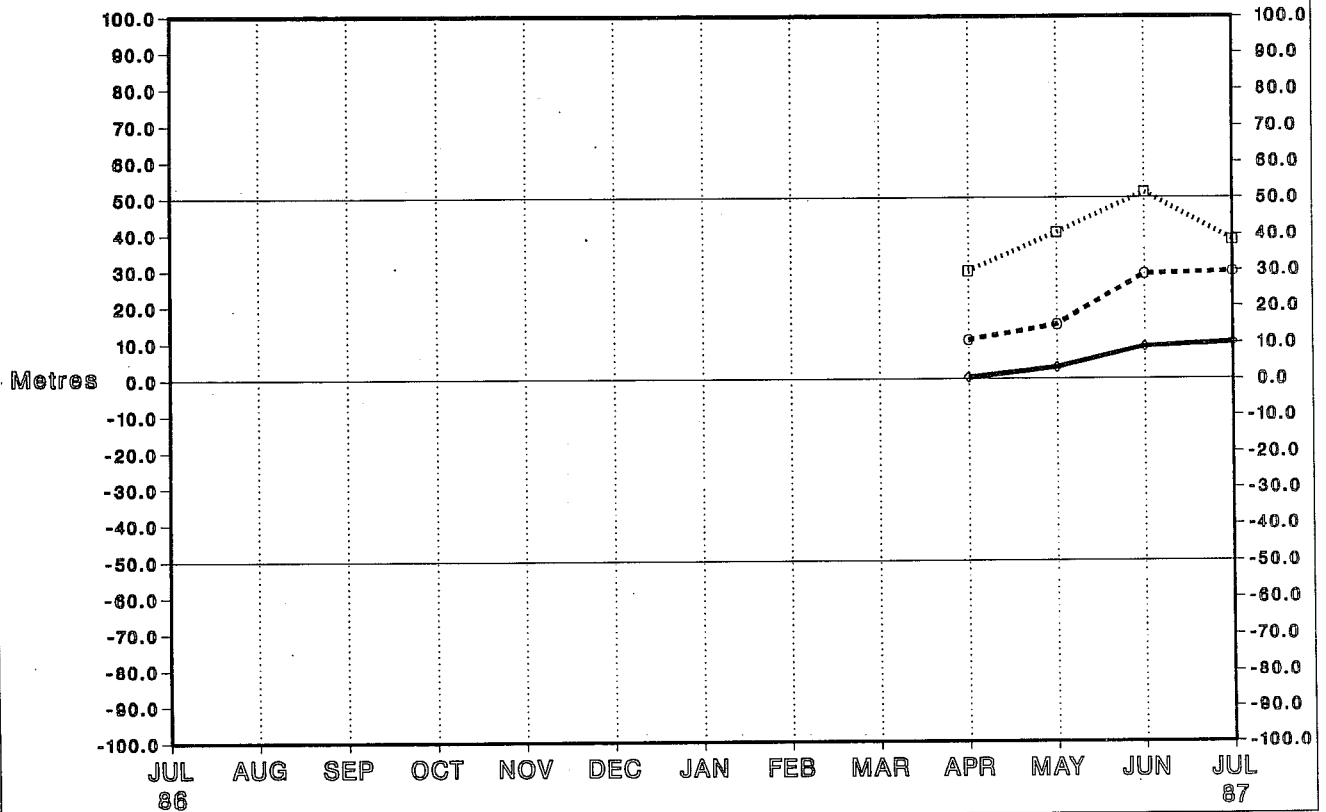
Station 08579 (39N 008W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



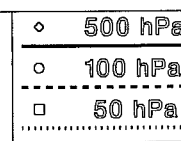
No. Obs : 0 0 0 0 0 0 0 0 0 0 29 31 30 30



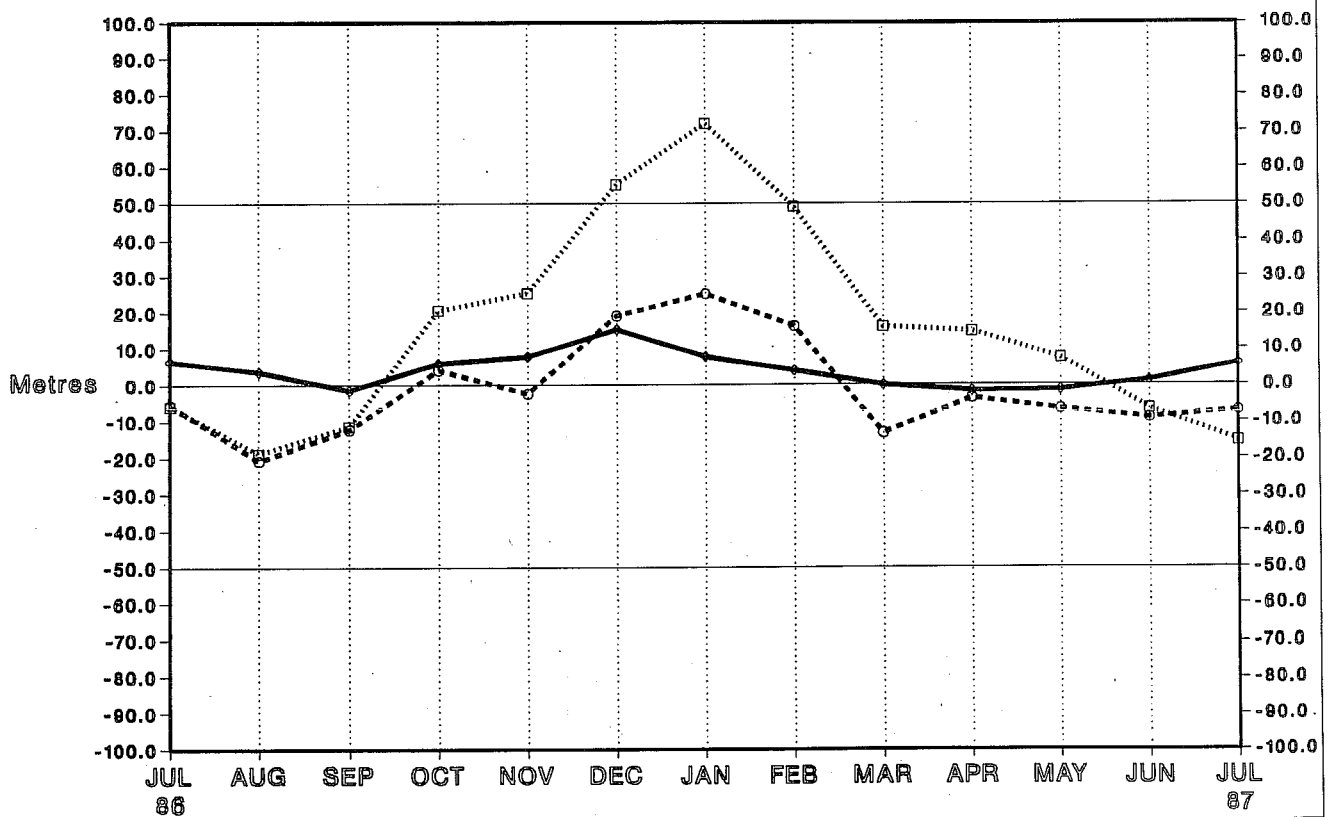
Station 08579 (39N 008W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



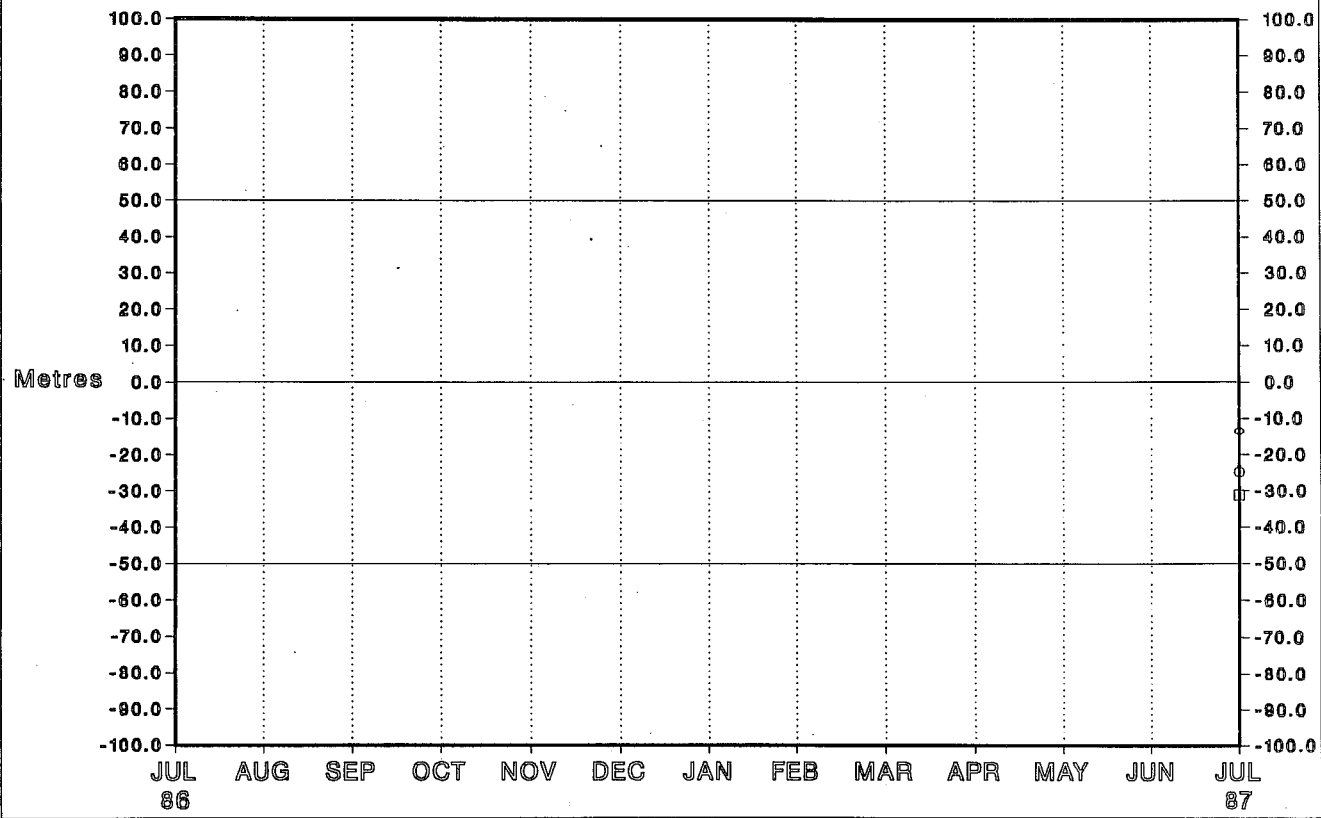
No. Obs : 31 31 30 31 30 30 31 28 31 29 31 30 31



Station 08522 (33N 016W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ = 500 hPa
- = 100 hPa
- = 50 hPa

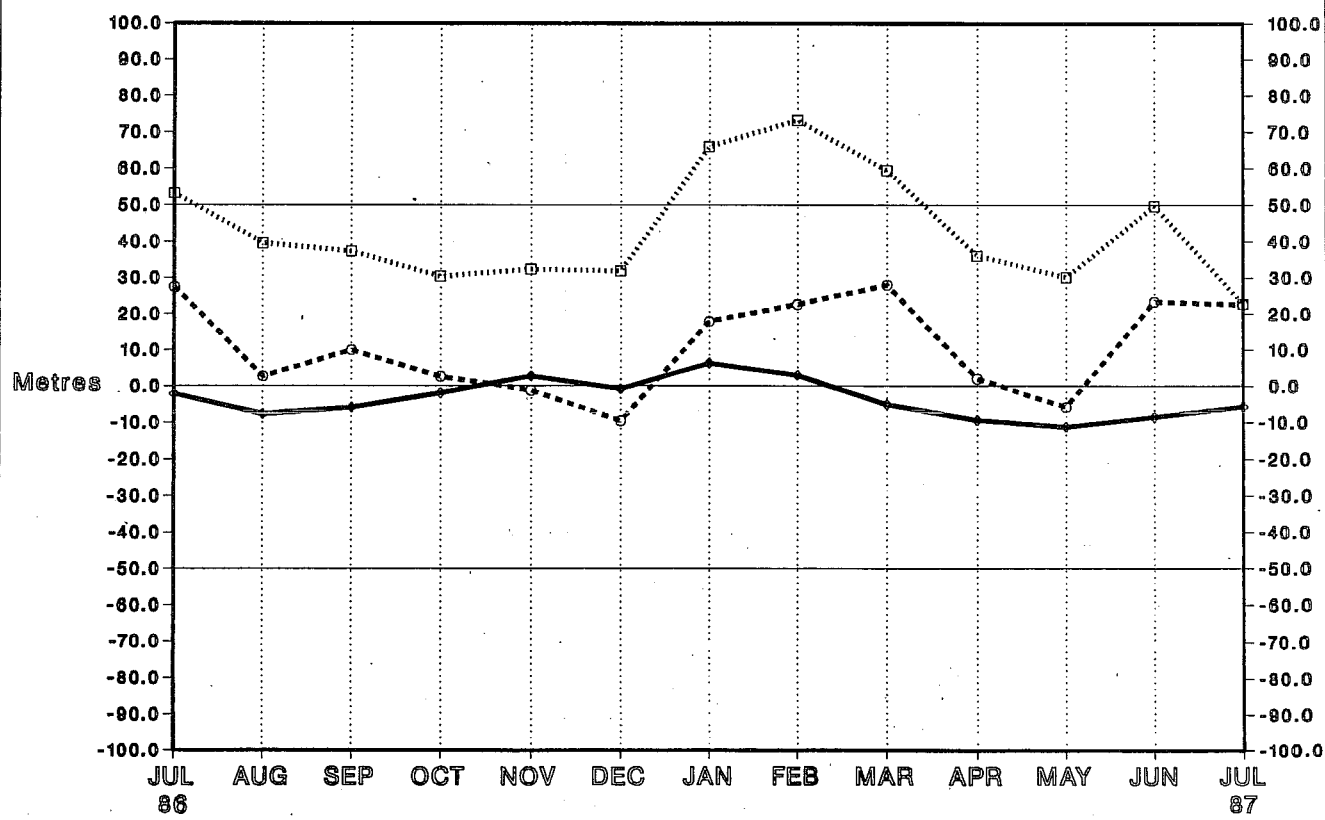
No. Obs : 0 0 0 0 0 0 0 0 0 0 0 0 26



Station 08522 (33N 016W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

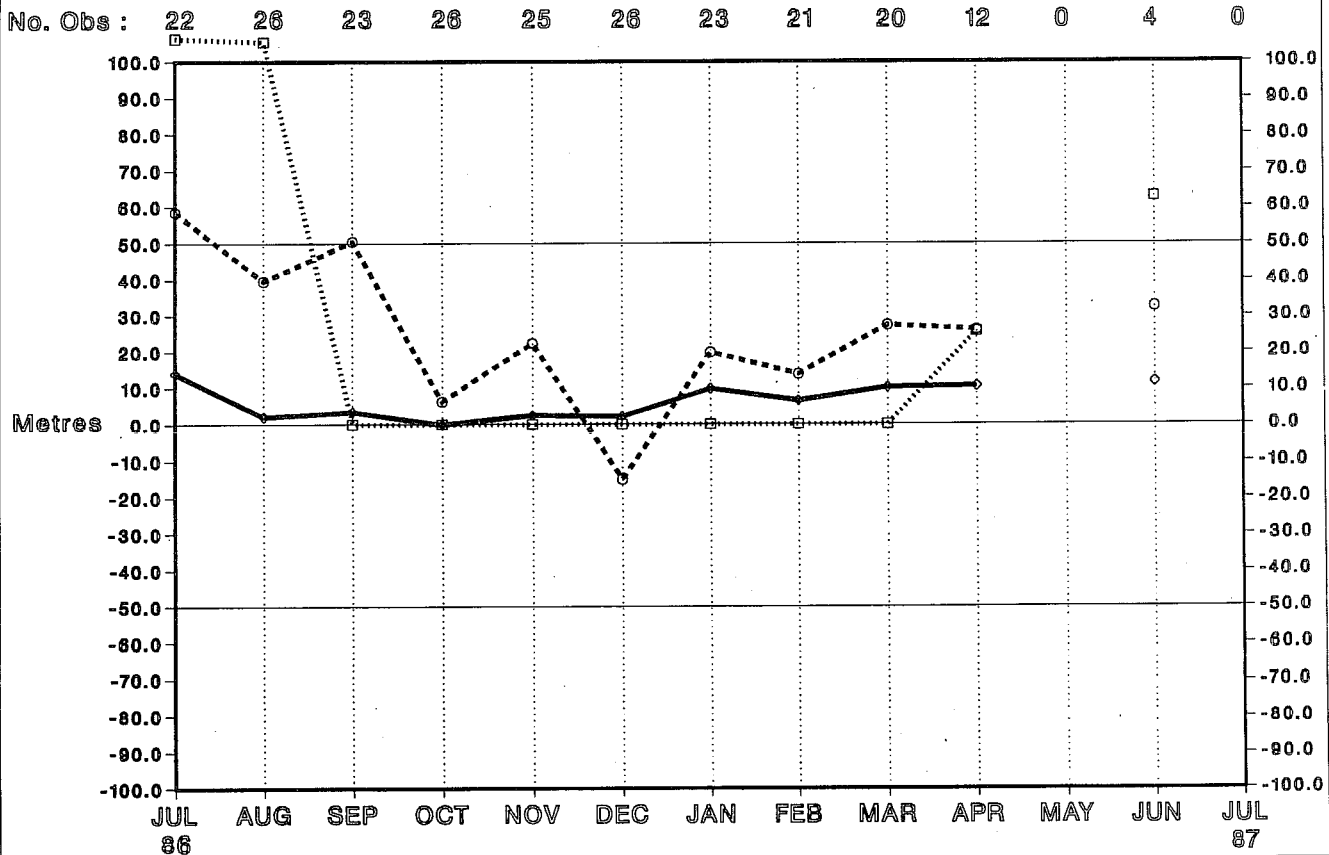
- ◇ = 500 hPa
- = 100 hPa
- = 50 hPa

No. Obs : 29 30 30 31 30 31 30 25 29 30 31 28 31



Station 08594 (17N 022W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

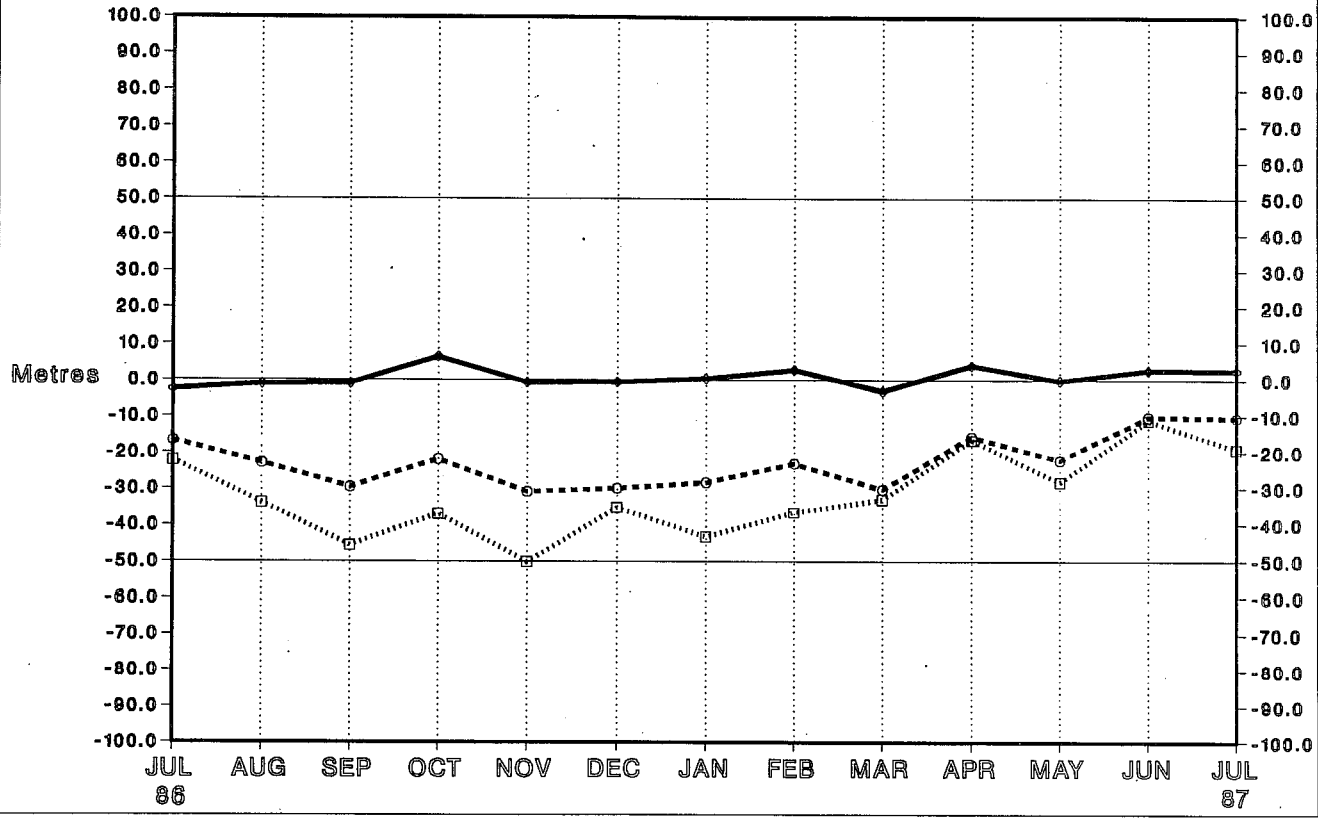
- ◊ 500 hPa
- 100 hPa
- 50 hPa
-



Station 10035 (55N 010E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

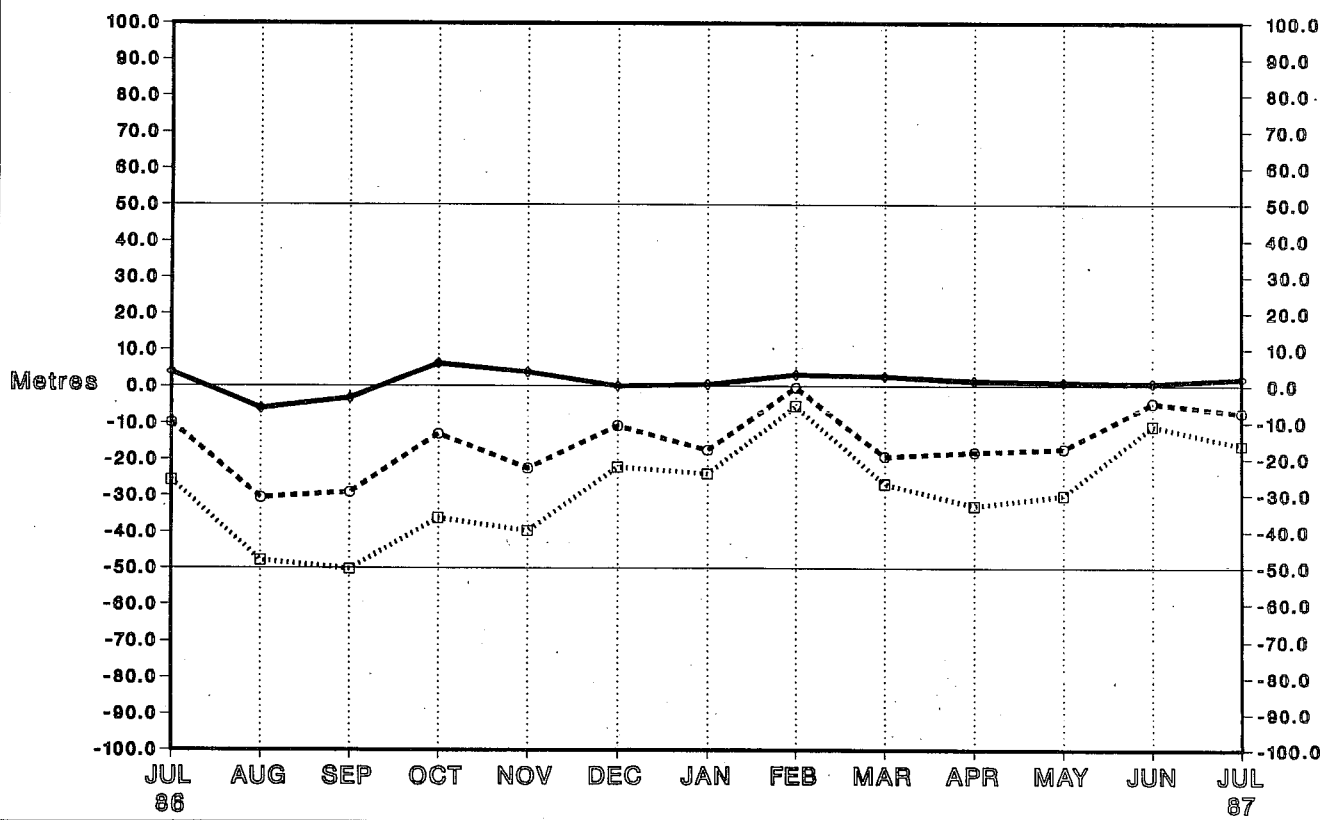
No. Obs : 31 31 30 31 30 31 31 27 31 30 31 30 31



Station 10035 (55N 010E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 31 31 28 31 30 30 30 31



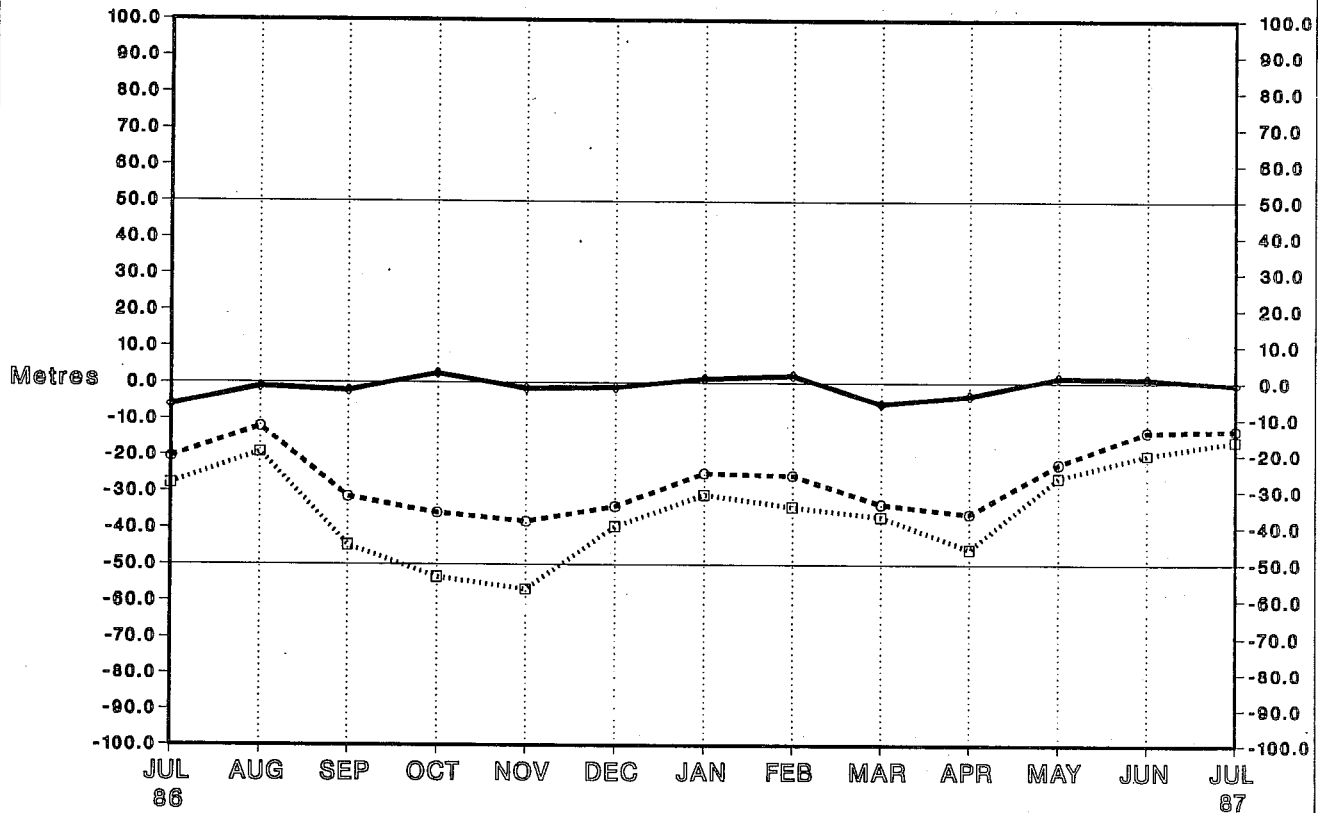
Station 10338 (52N 010E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 31 31 27 30 30 31 30 31



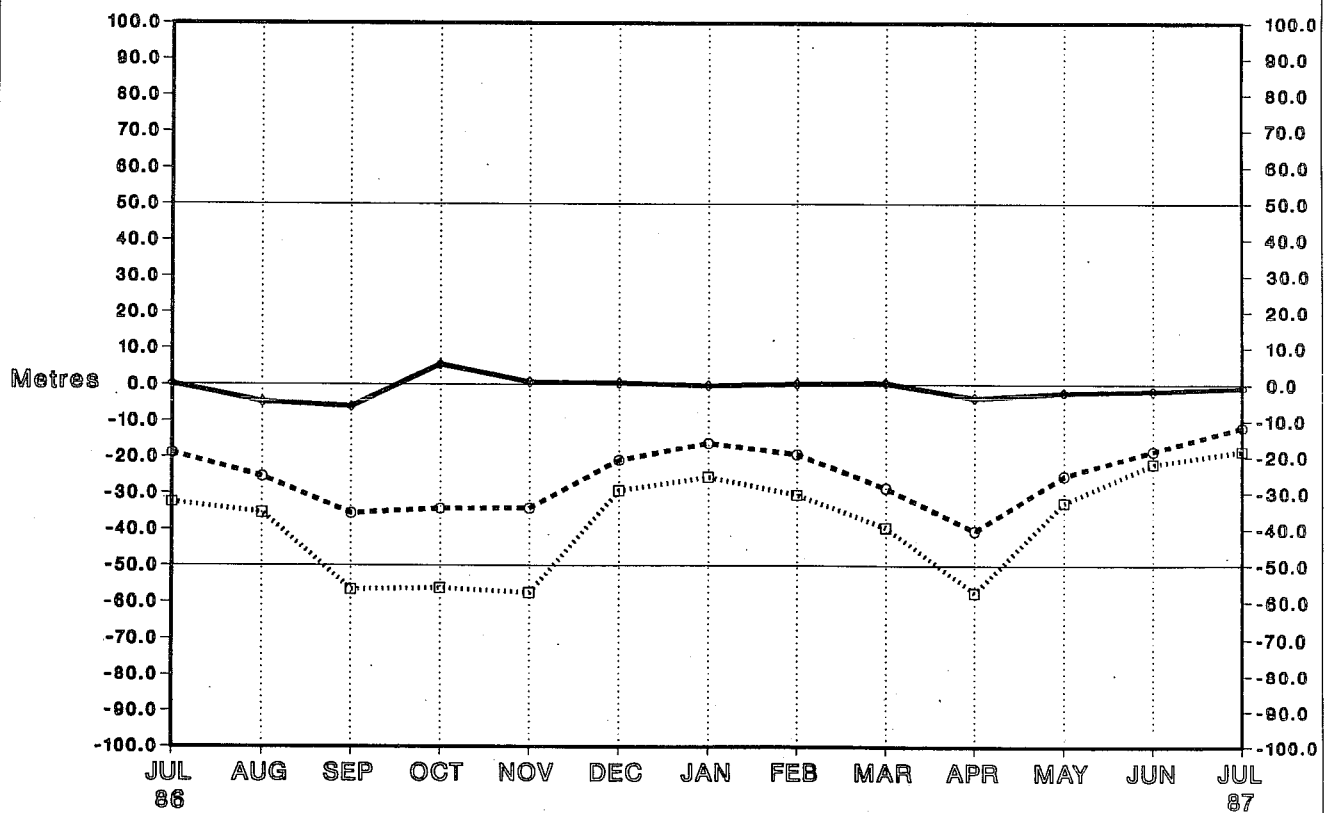
Station 10338 (52N 010E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

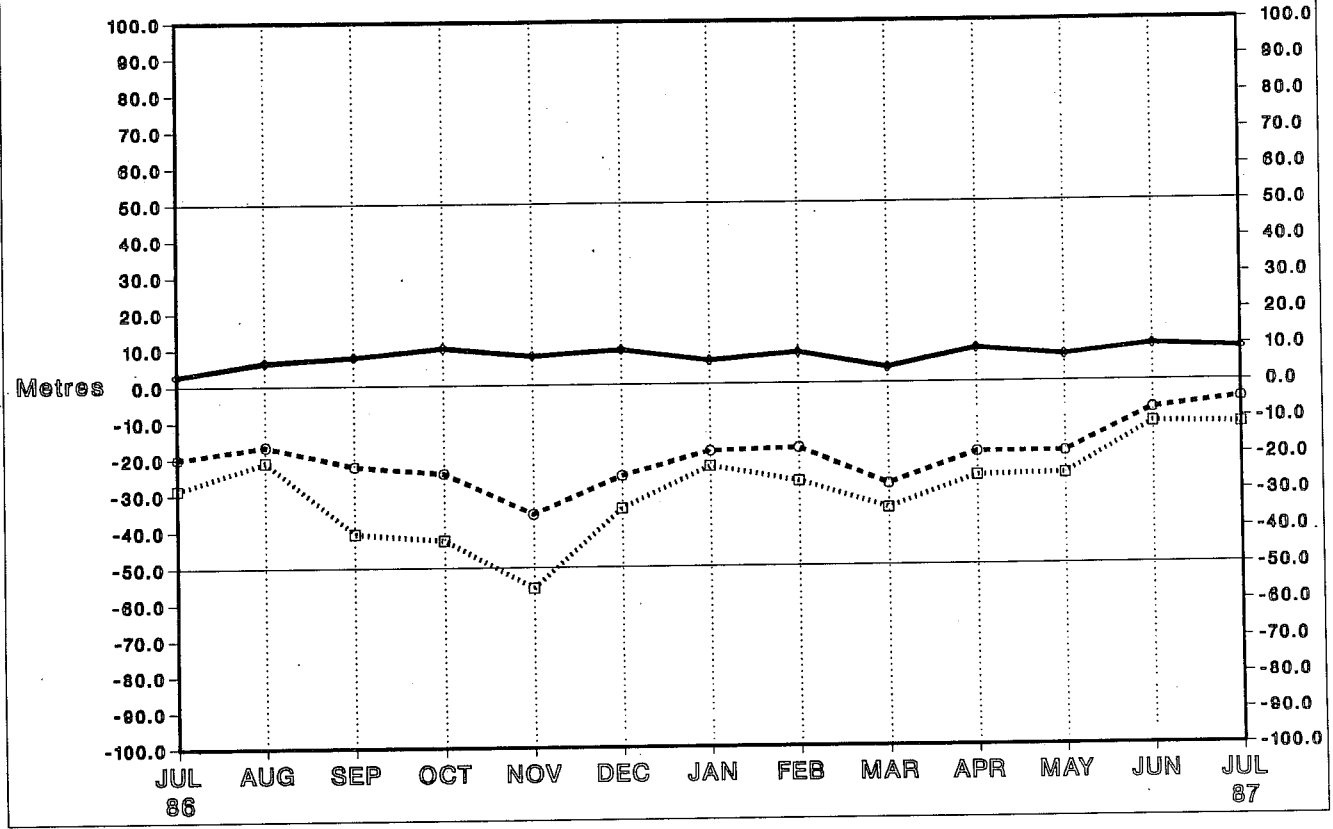
No. Obs : 31 30 30 31 30 31 31 28 31 30 31 30 31



Station 10410 (51N 007E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

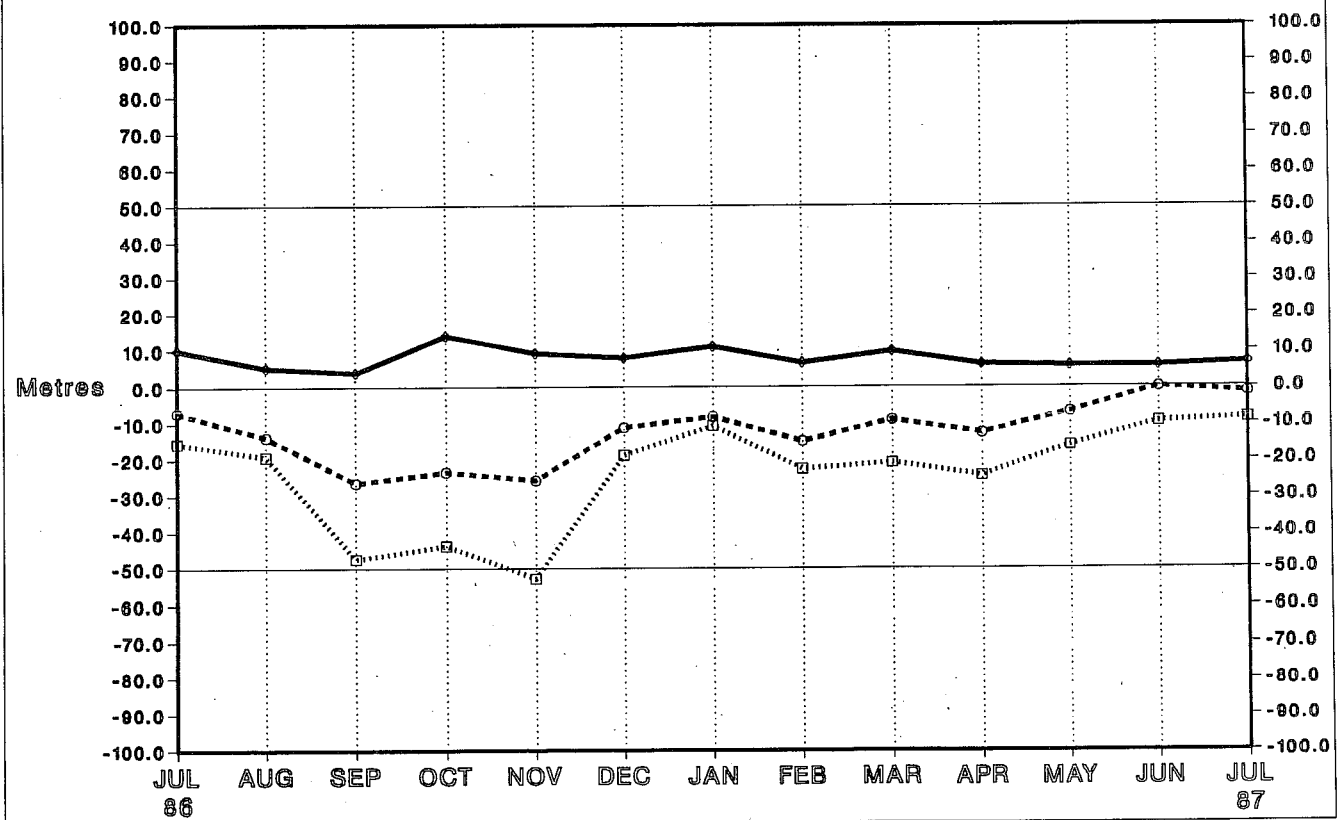
No. Obs : 31 31 30 31 30 30 31 27 31 30 31 30 31



Station 10410 (51N 007E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

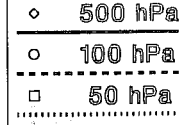
No. Obs : 30 31 30 31 30 31 31 28 31 30 31 30 31



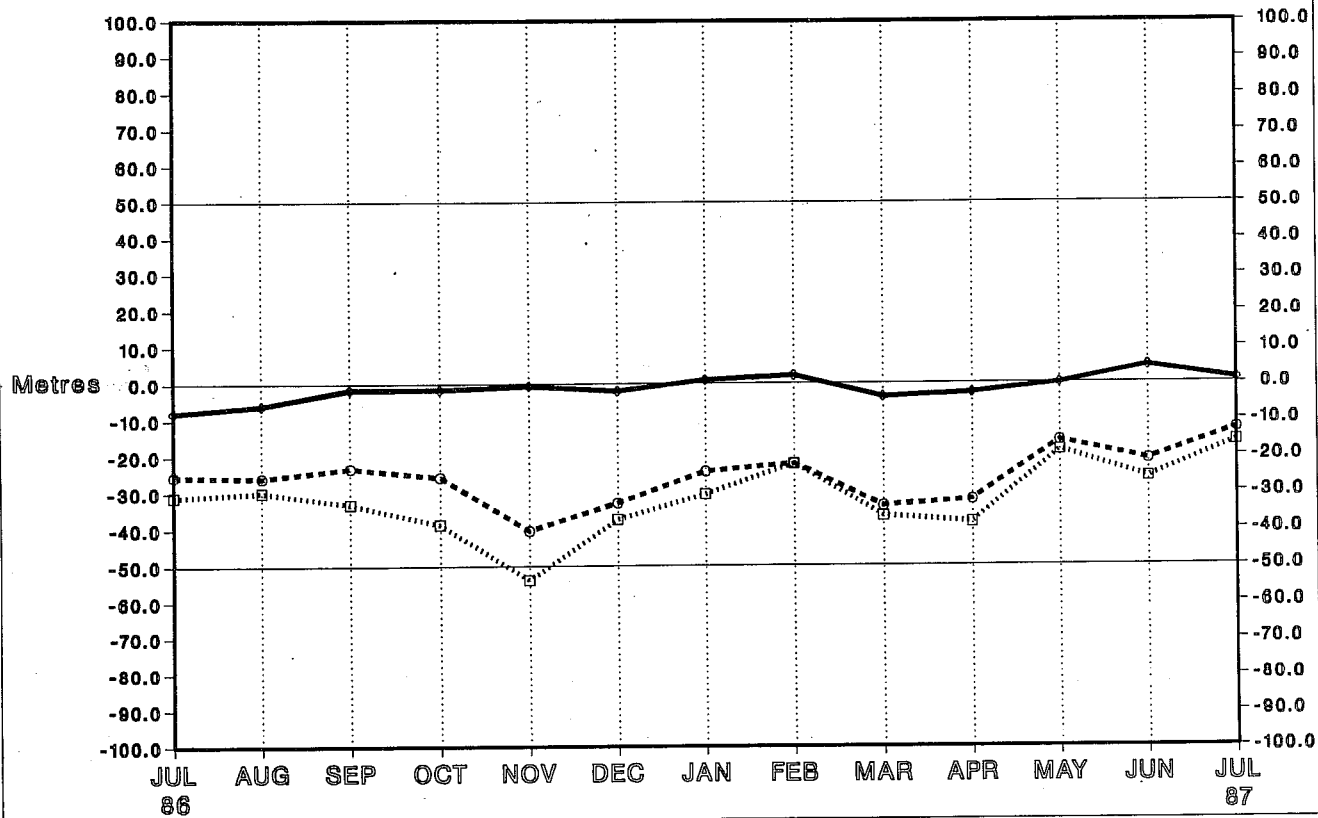
Station 10739 (49N 009E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



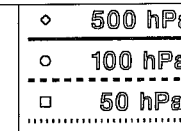
No. Obs : 31 31 30 31 29 31 31 27 31 30 31 30 31



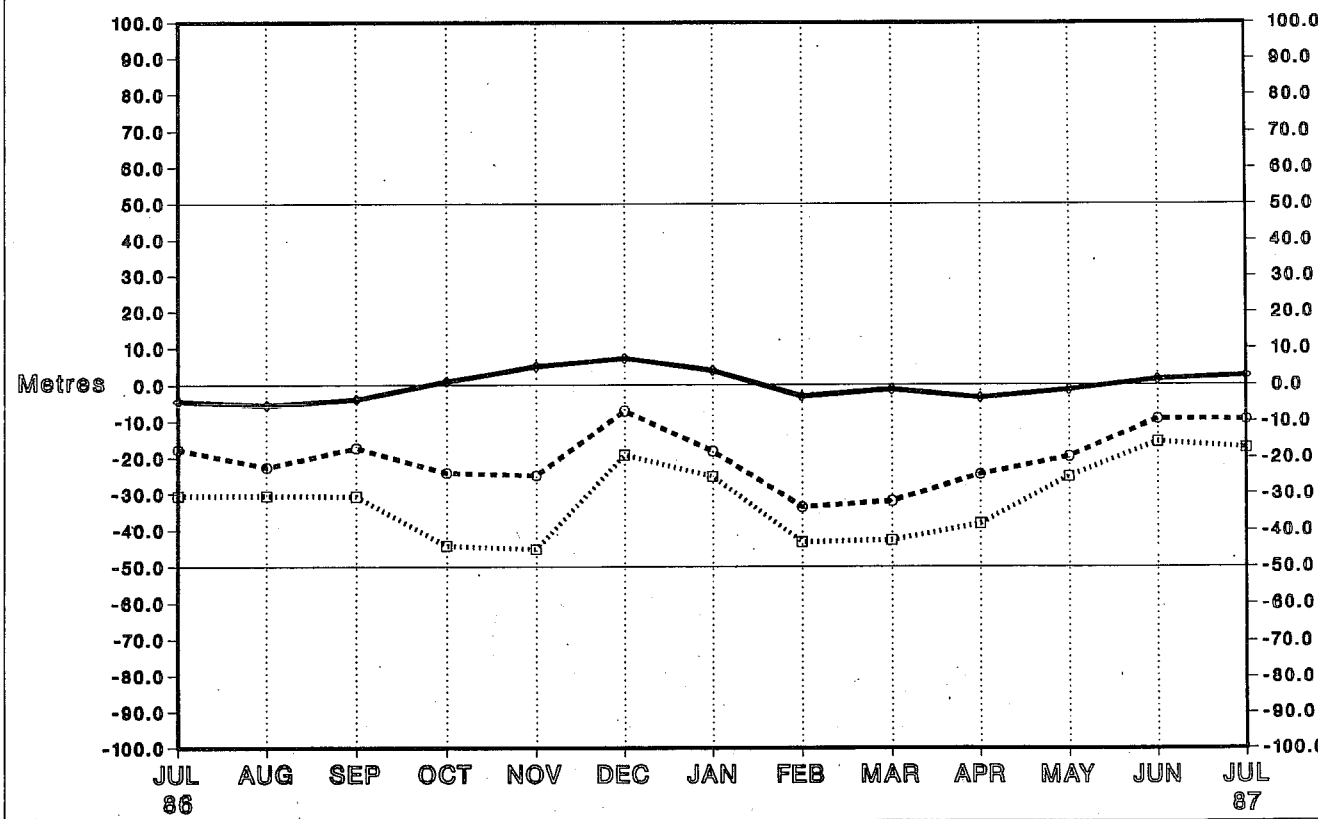
Station 10739 (49N 009E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



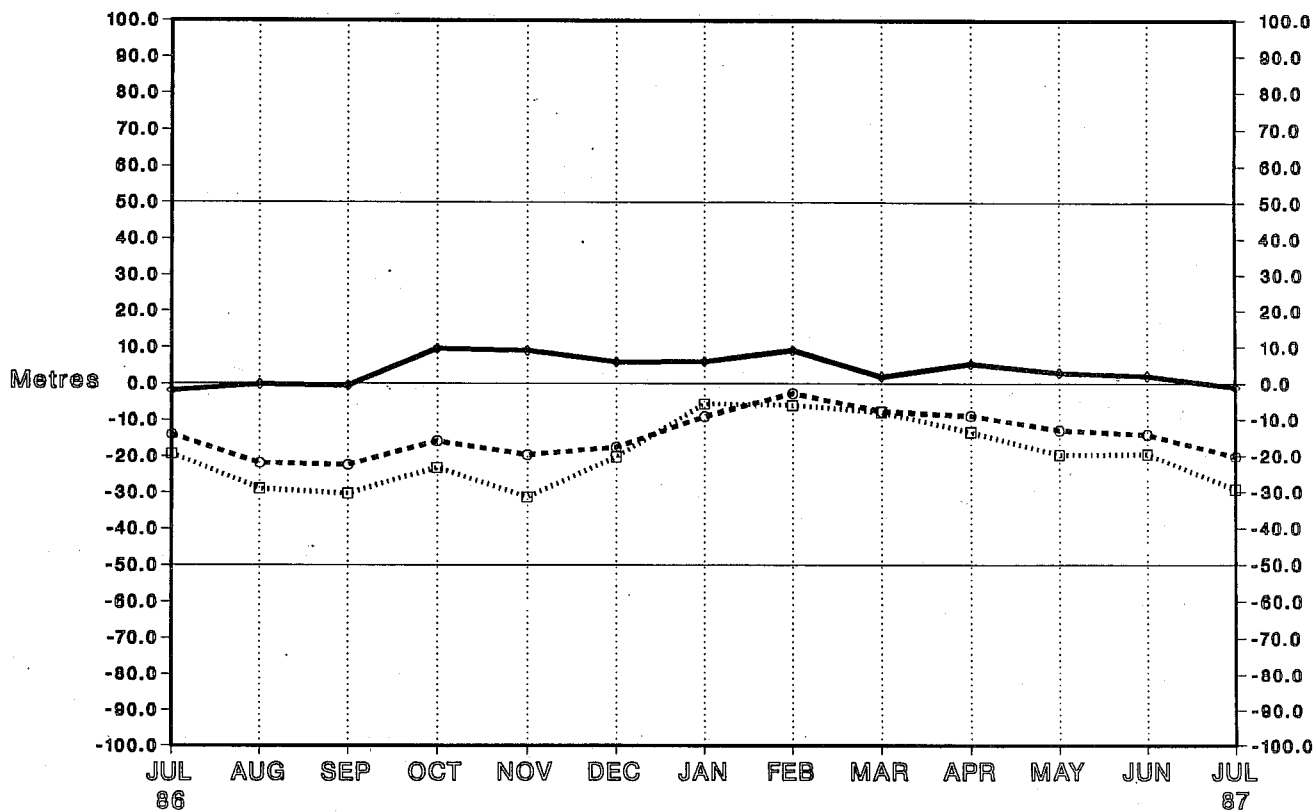
No. Obs : 30 30 30 31 30 31 31 28 31 30 31 30 31



Station 10868 (48N 012E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

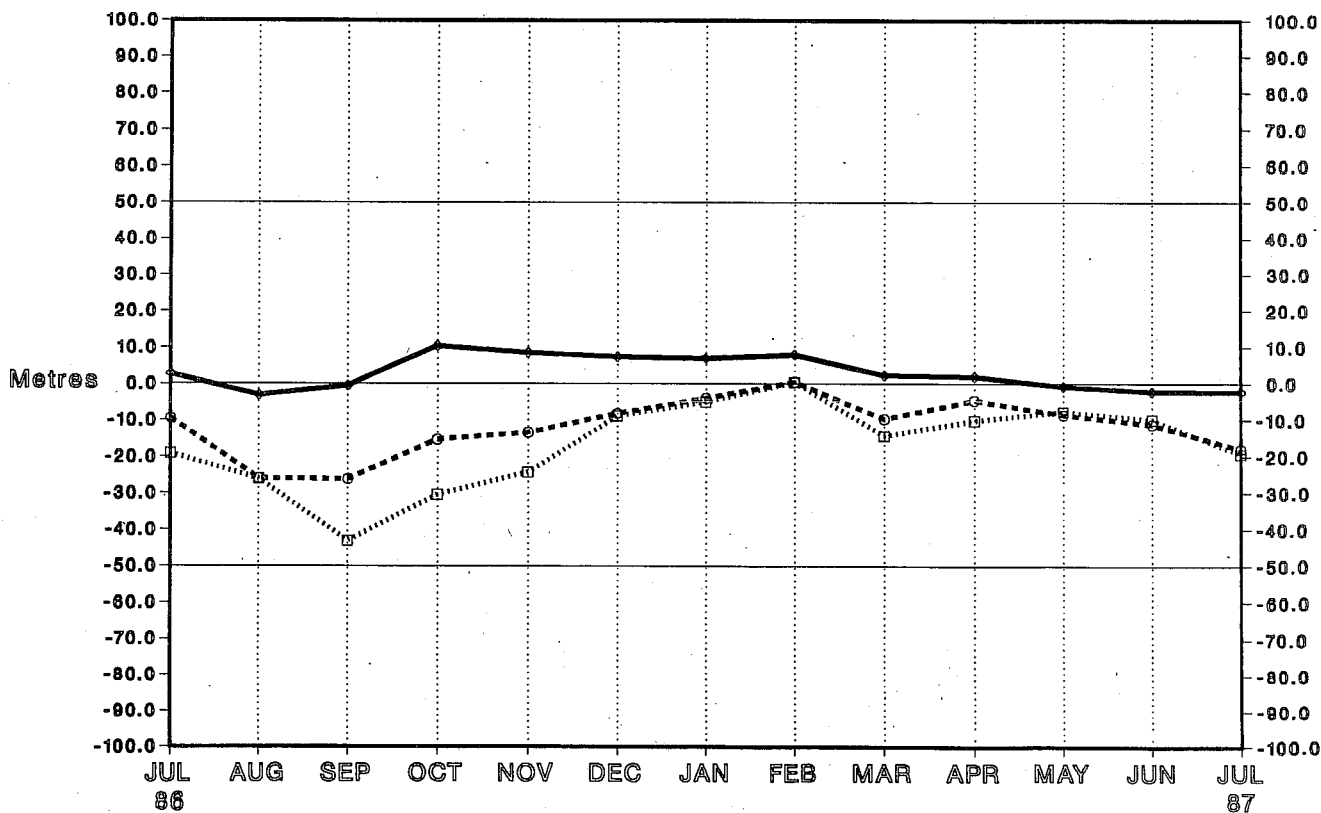
No. Obs: 31 31 30 31 30 31 31 27 31 30 30 30 31



Station 10868 (48N 012E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

No. Obs: 30 31 30 31 30 31 30 28 31 30 31 30 30



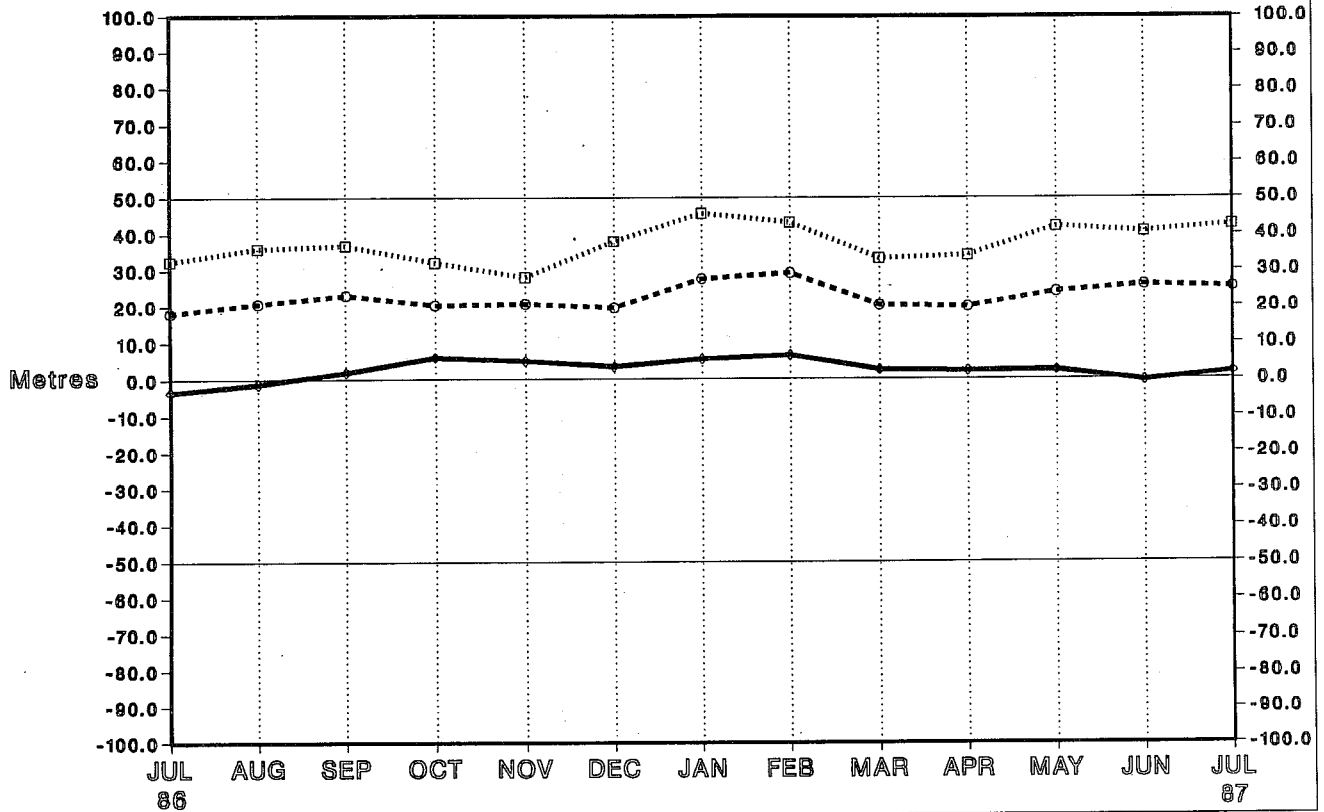
Station 16044 (46N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa
-

No. Obs : 31 30 30 31 30 30 31 28 31 29 30 30 28



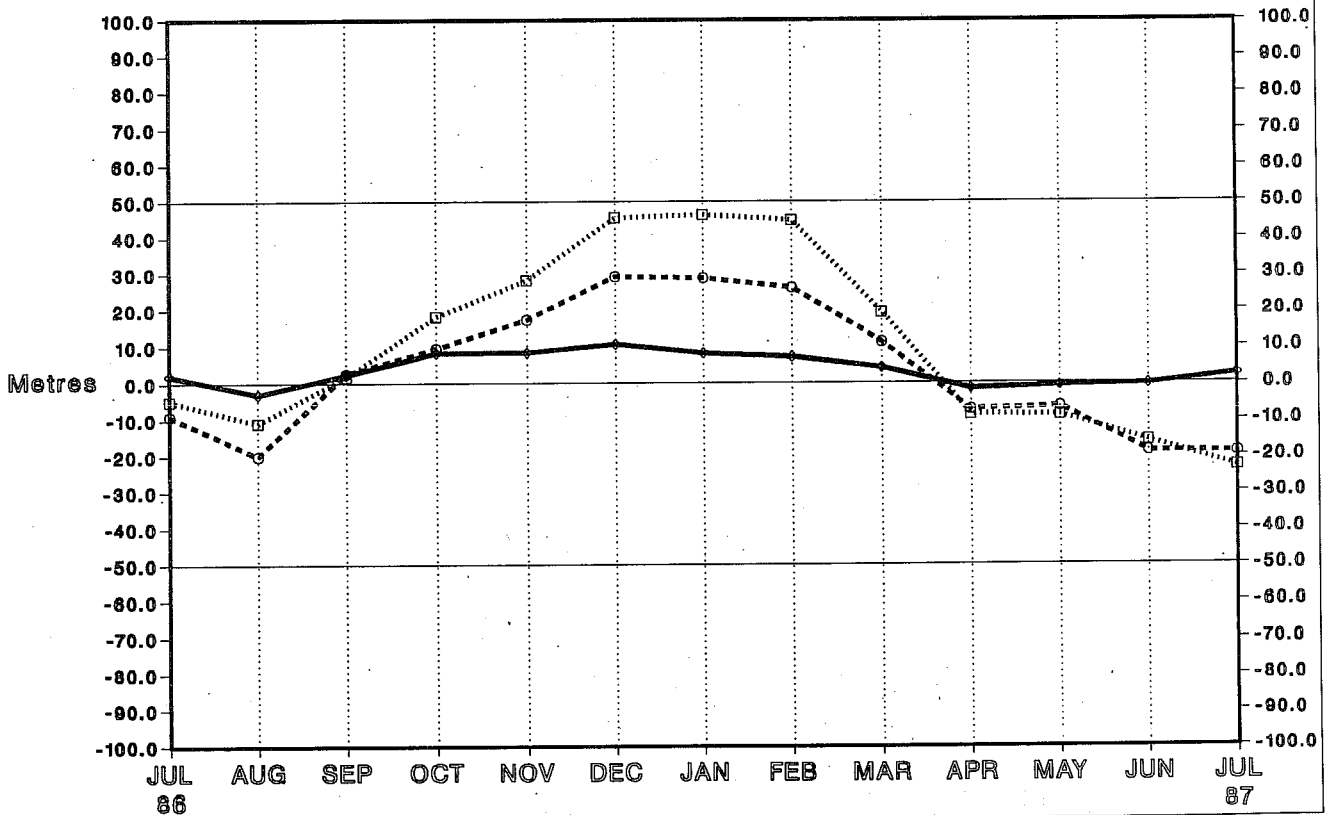
Station 16044 (46N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa
-

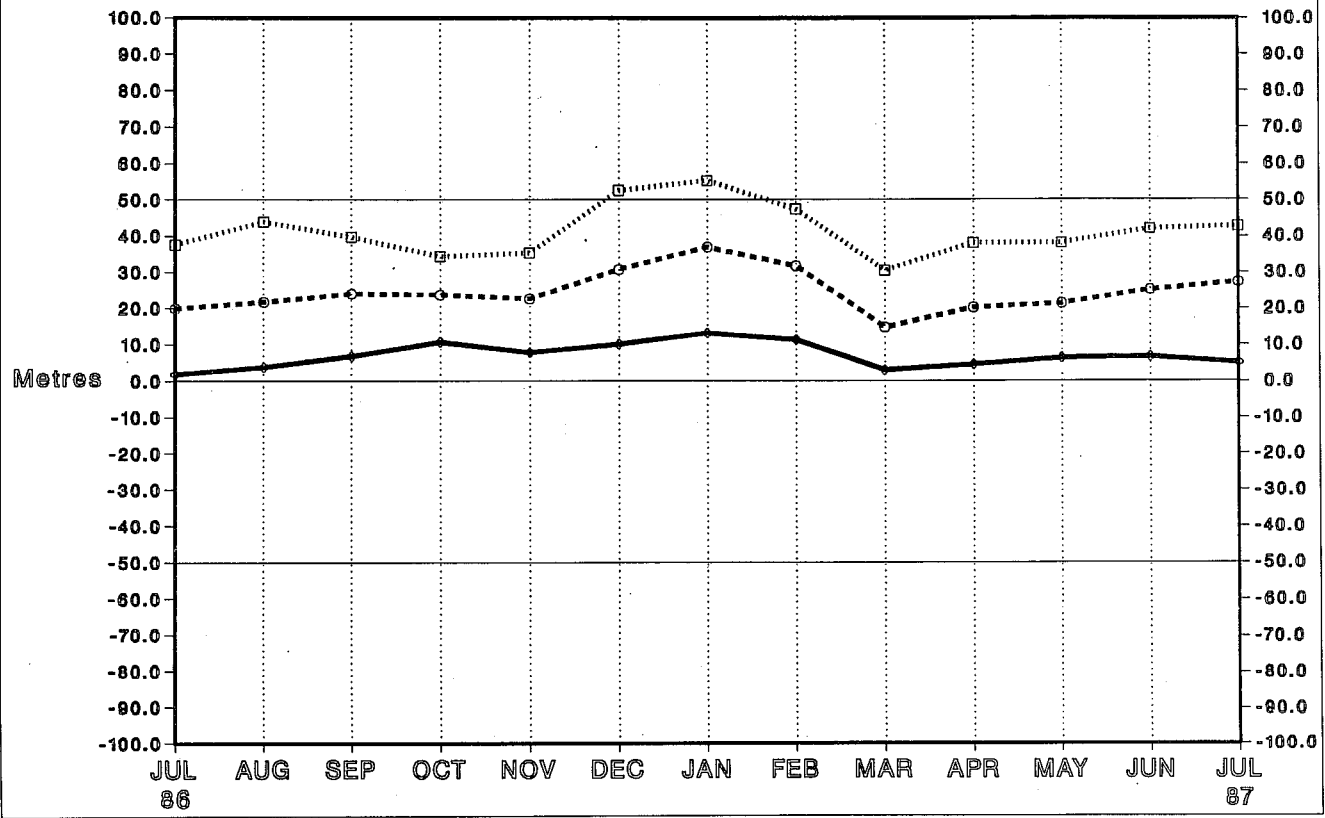
No. Obs : 31 30 28 29 30 31 29 28 31 30 31 29 26



Station 16080 (45N 009E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

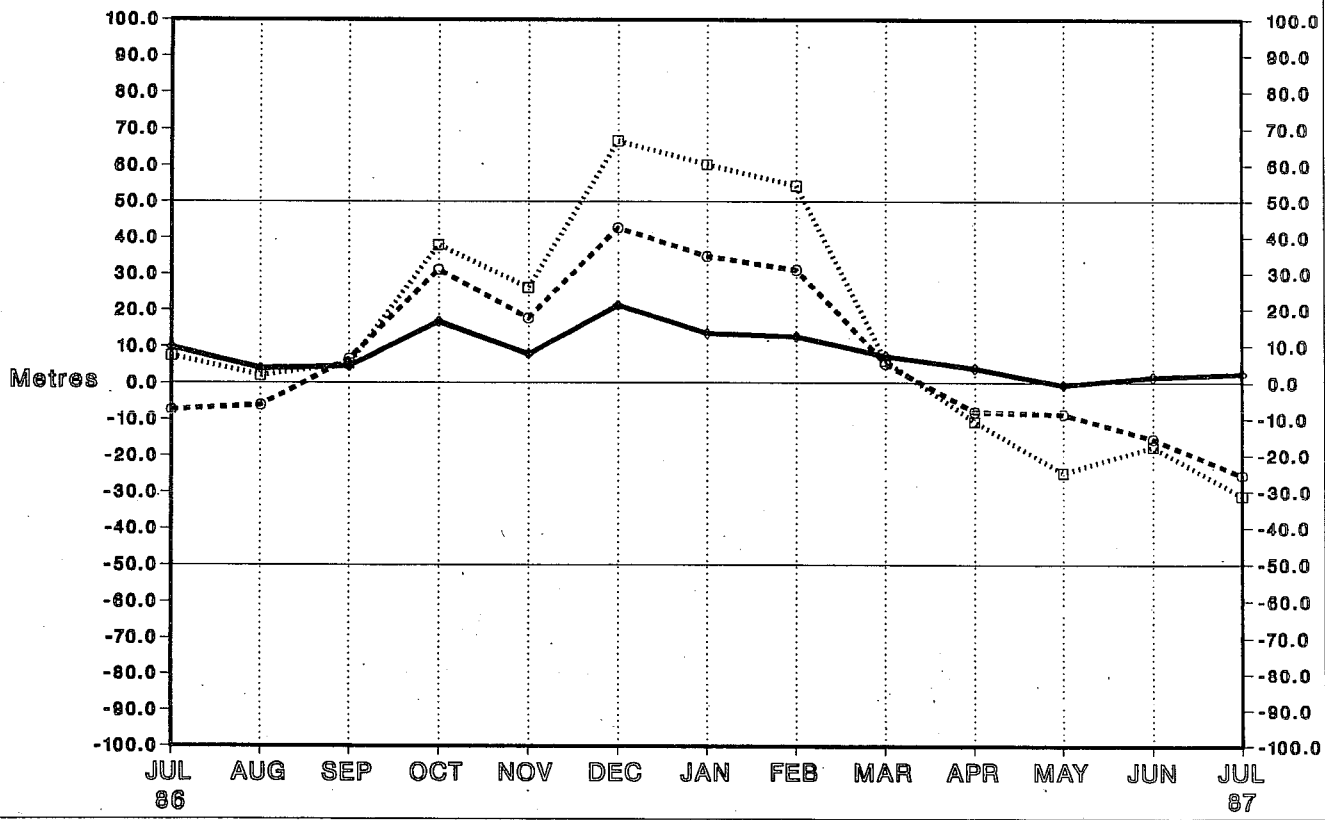
No. Obs : 31 30 30 31 30 30 30 28 31 30 30 30 29



Station 16080 (45N 009E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

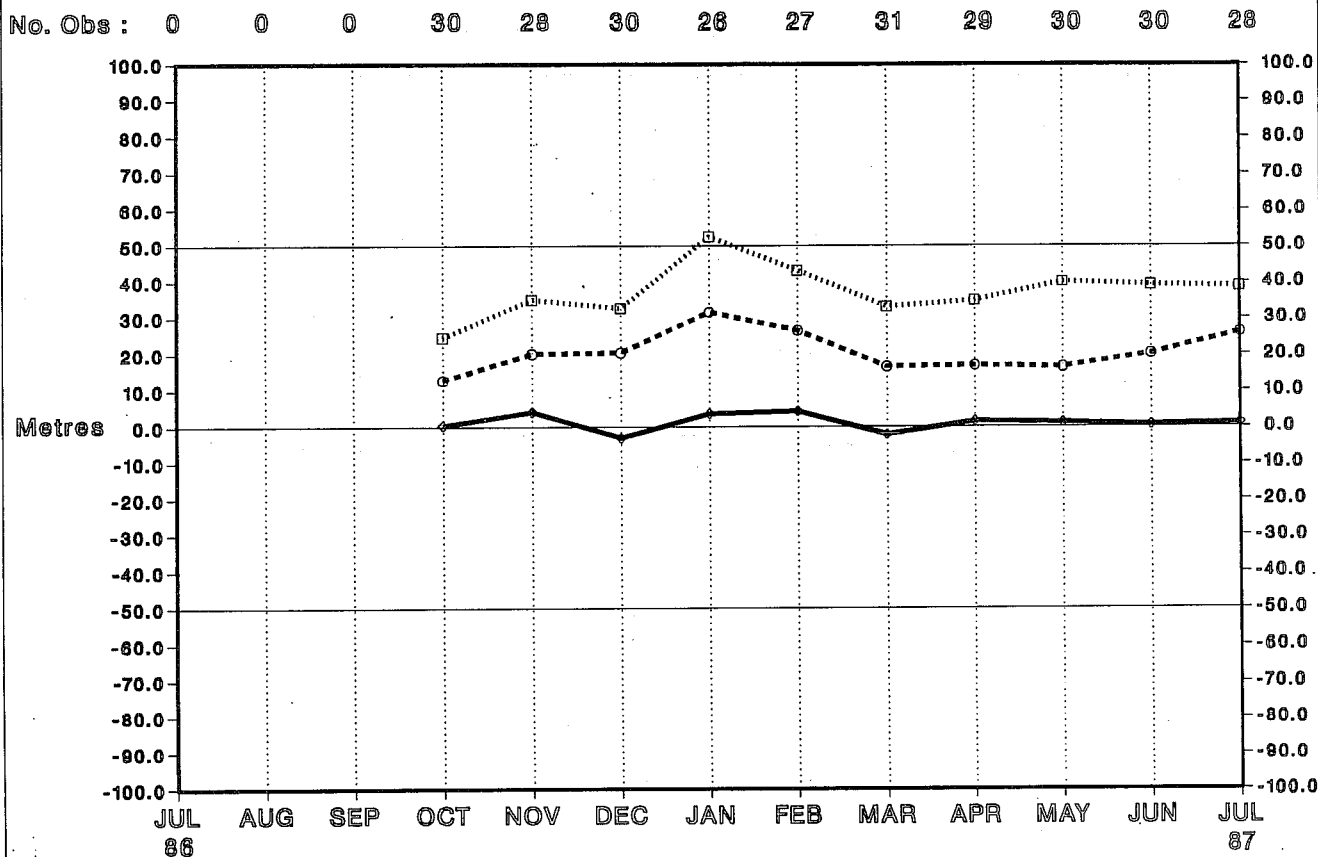
- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30 31 29 31 30 31 31 28 31 30 31 30 30



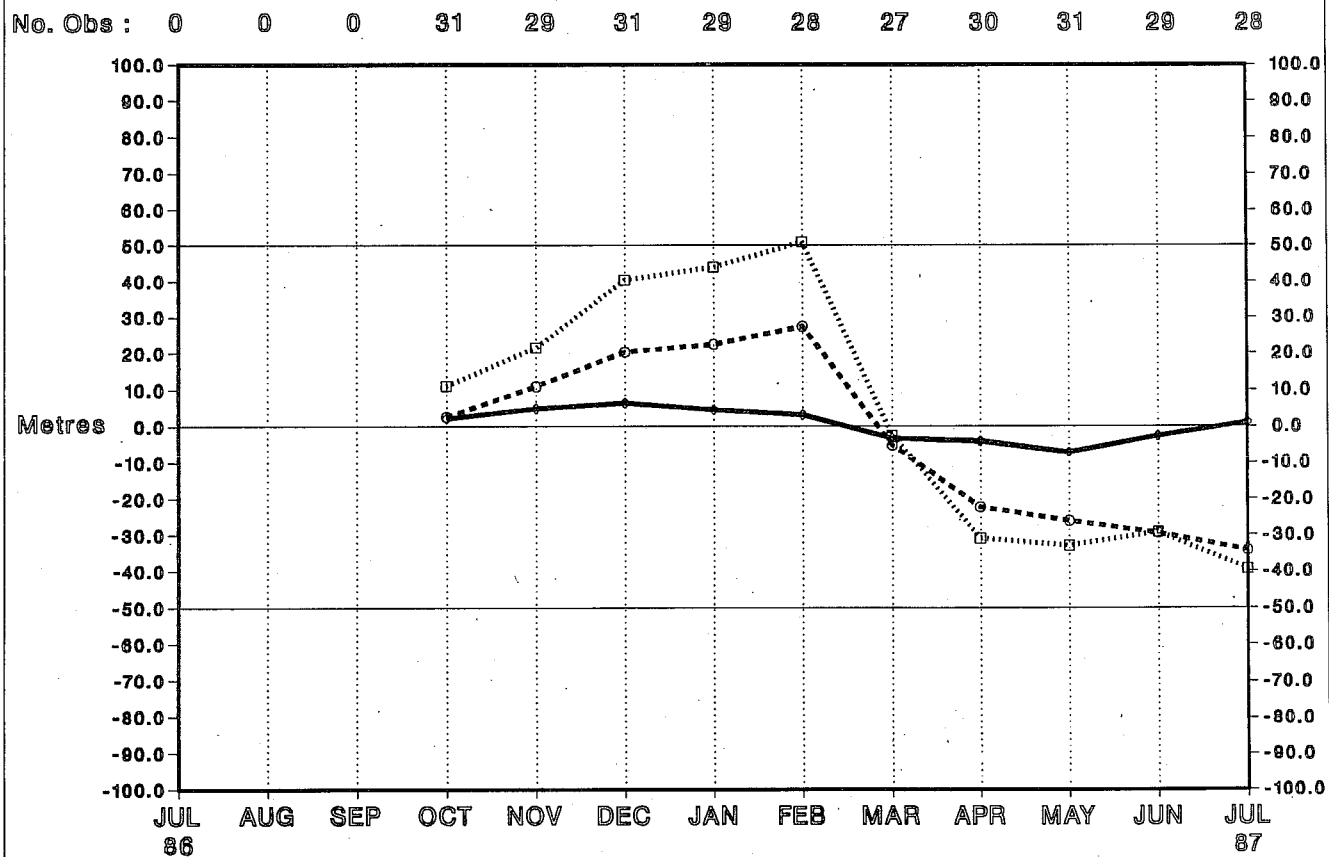
Station 16245 (42N 012E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa



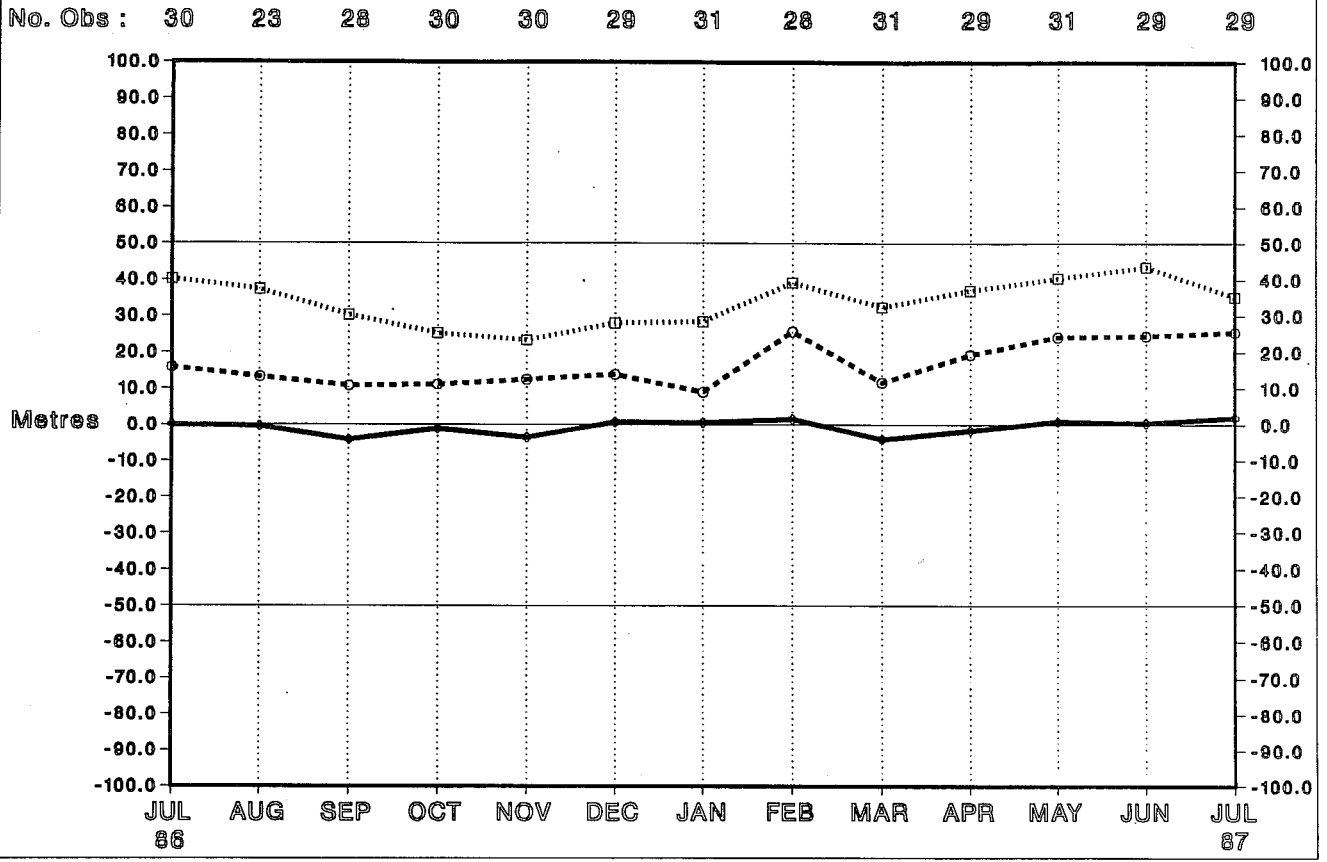
Station 16245 (42N 012E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa



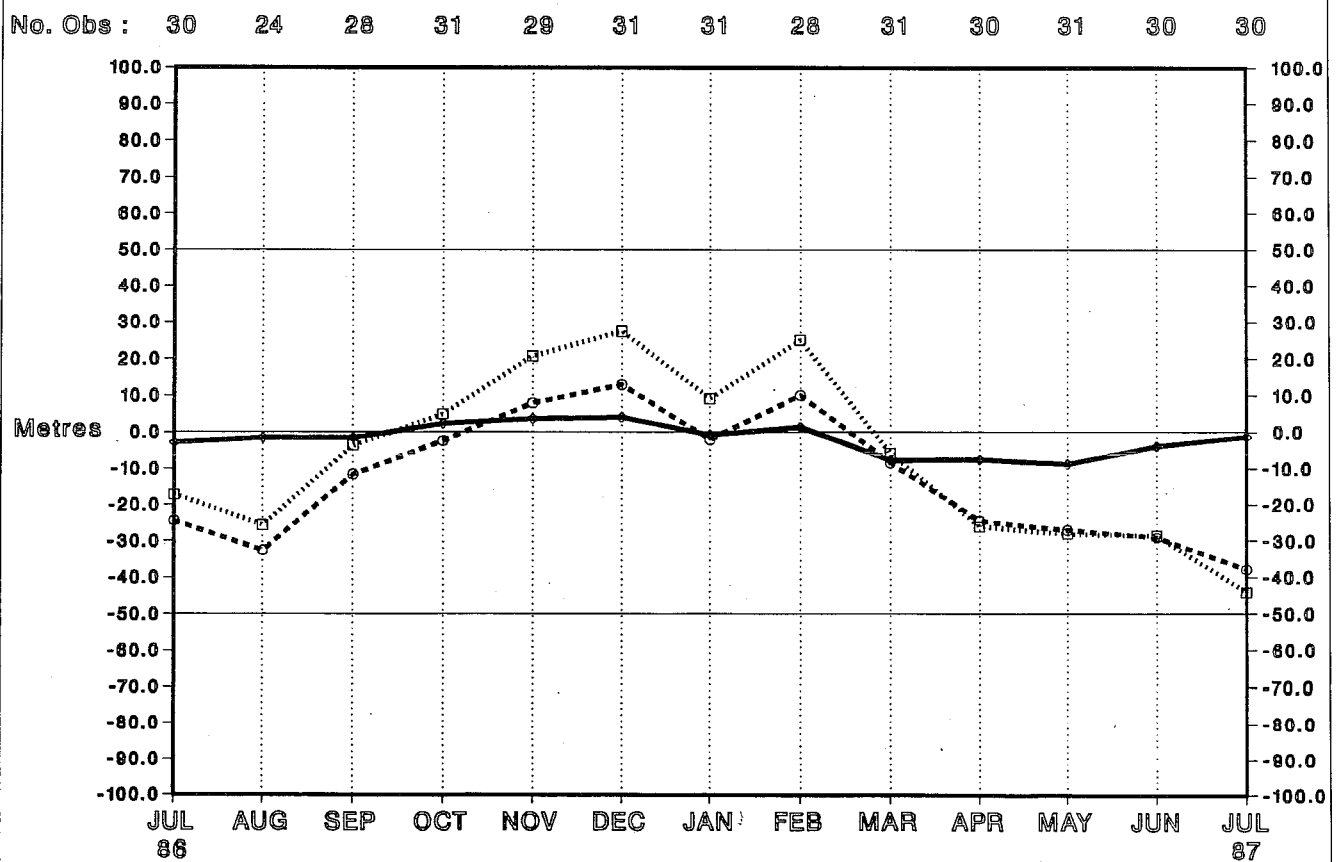
Station 16320 (41N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 16320 (41N 018E)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

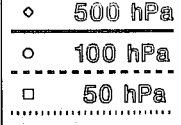
- ◇ 500 hPa
- 100 hPa
- 50 hPa



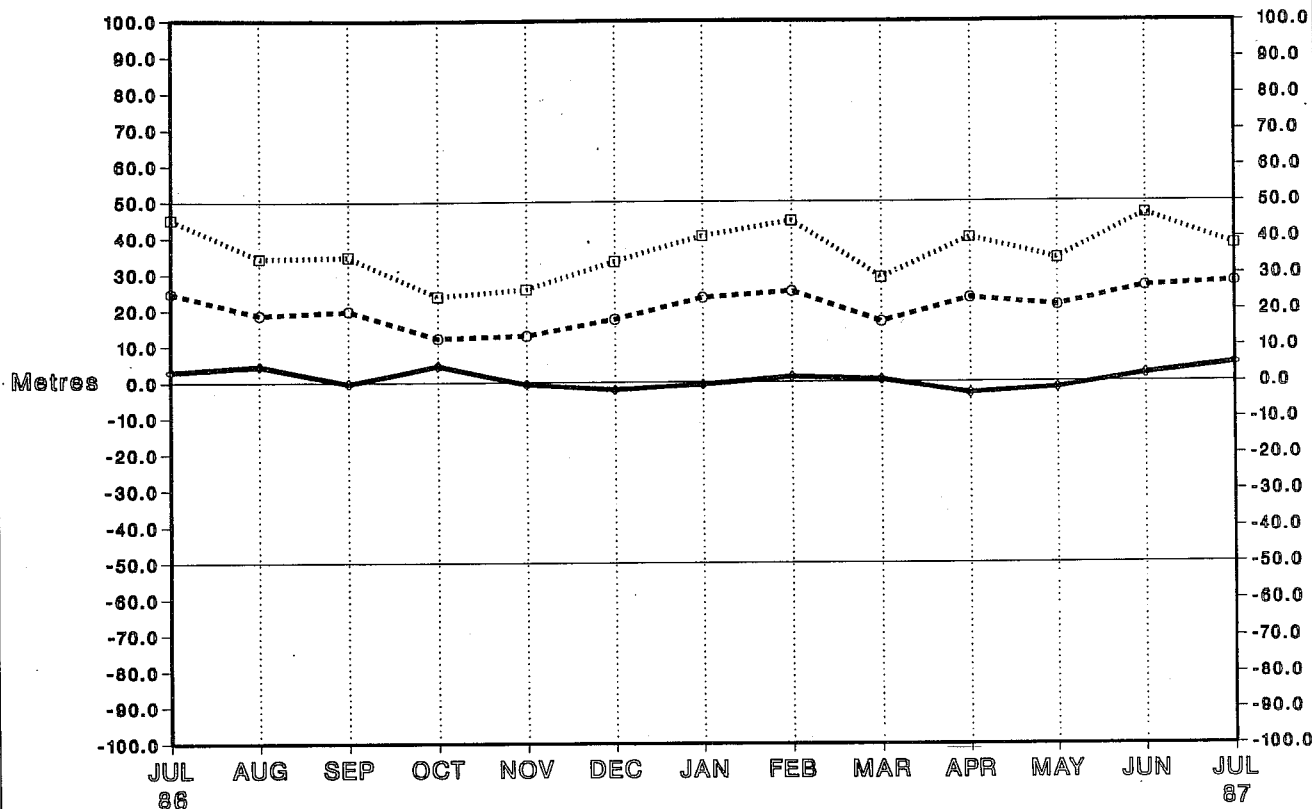
Station 16429 (38N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



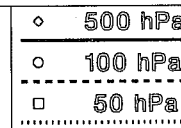
No. Obs : 29 30 30 30 30 30 30 28 30 30 30 30 28



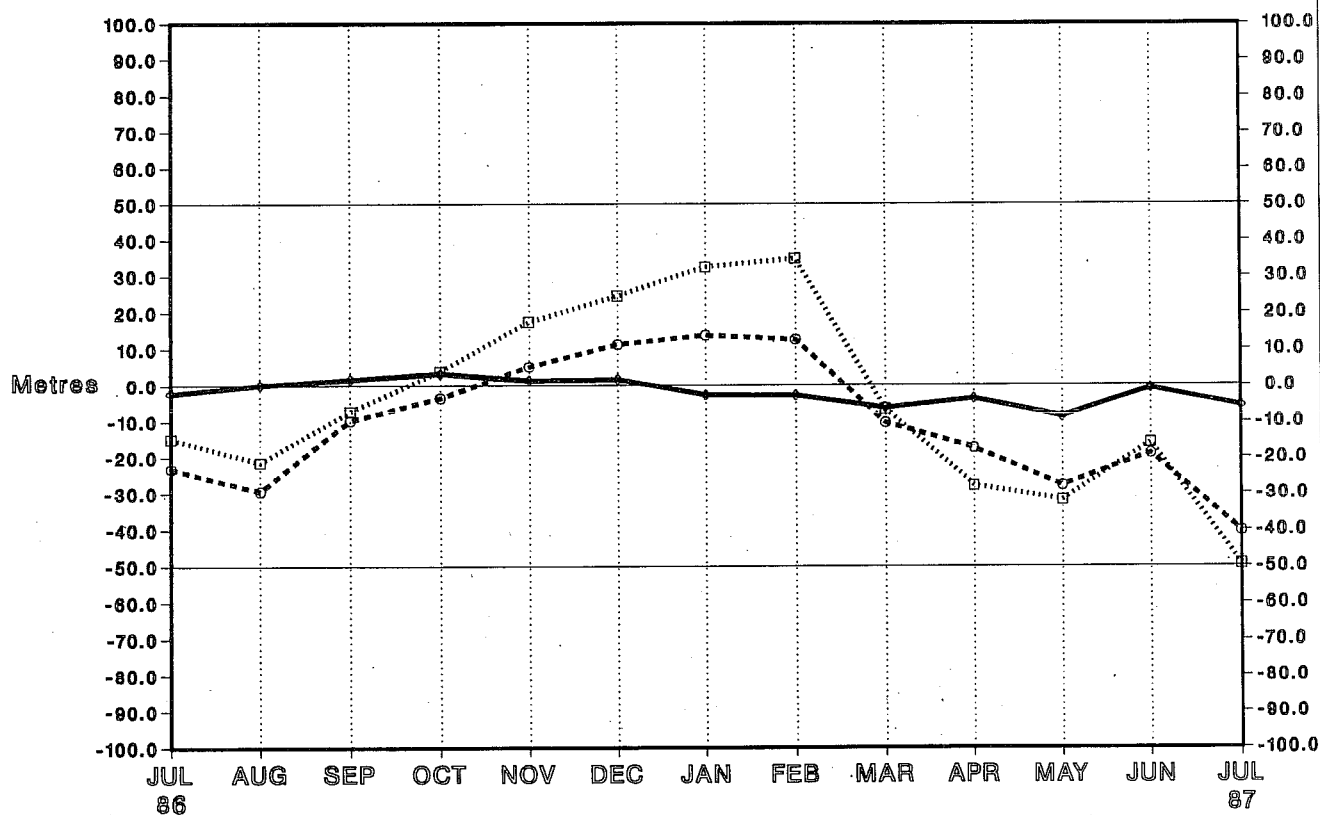
Station 16429 (38N 013E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



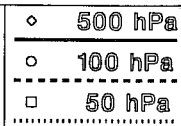
No. Obs : 31 31 29 31 30 31 31 28 29 28 31 29 26



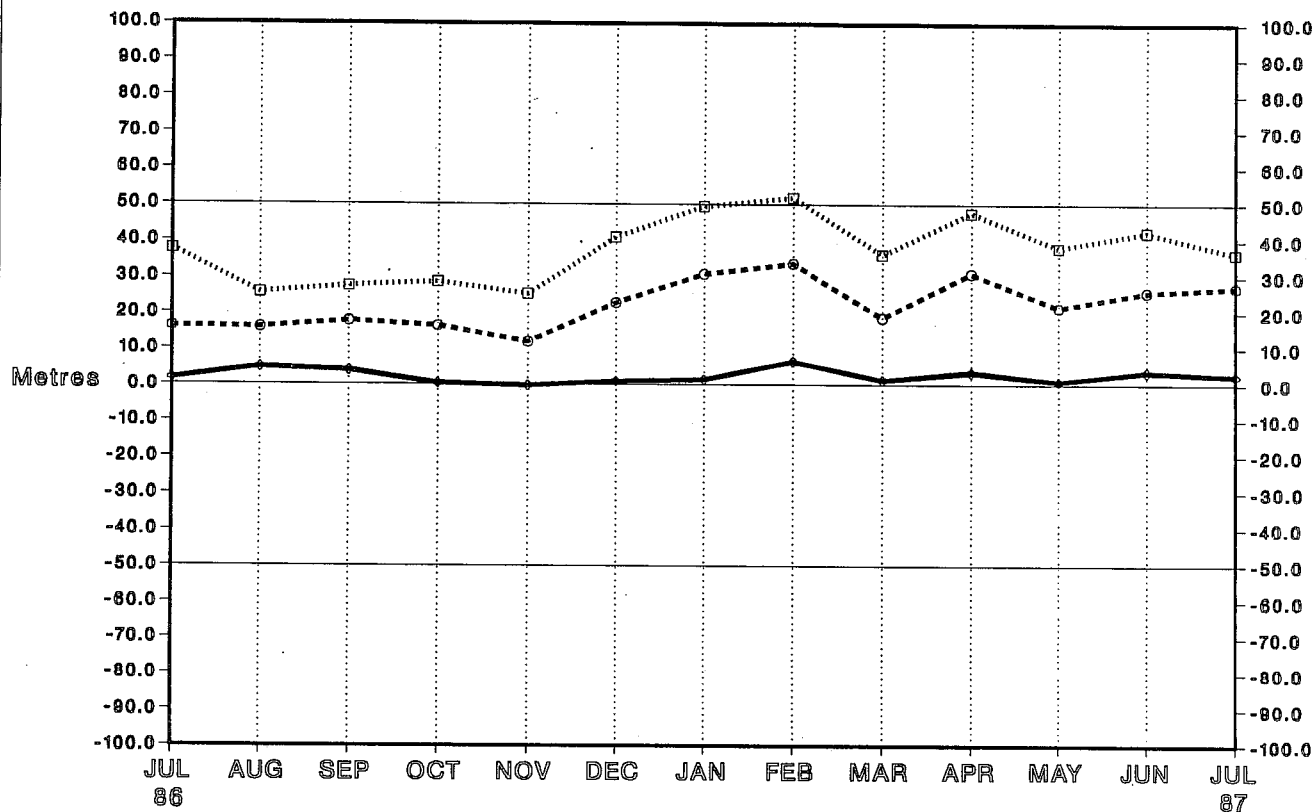
Station 16560 (39N 009E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



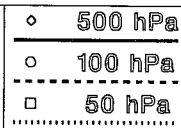
No. Obs : 31 30 30 30 29 31 31 28 31 30 30 28 29



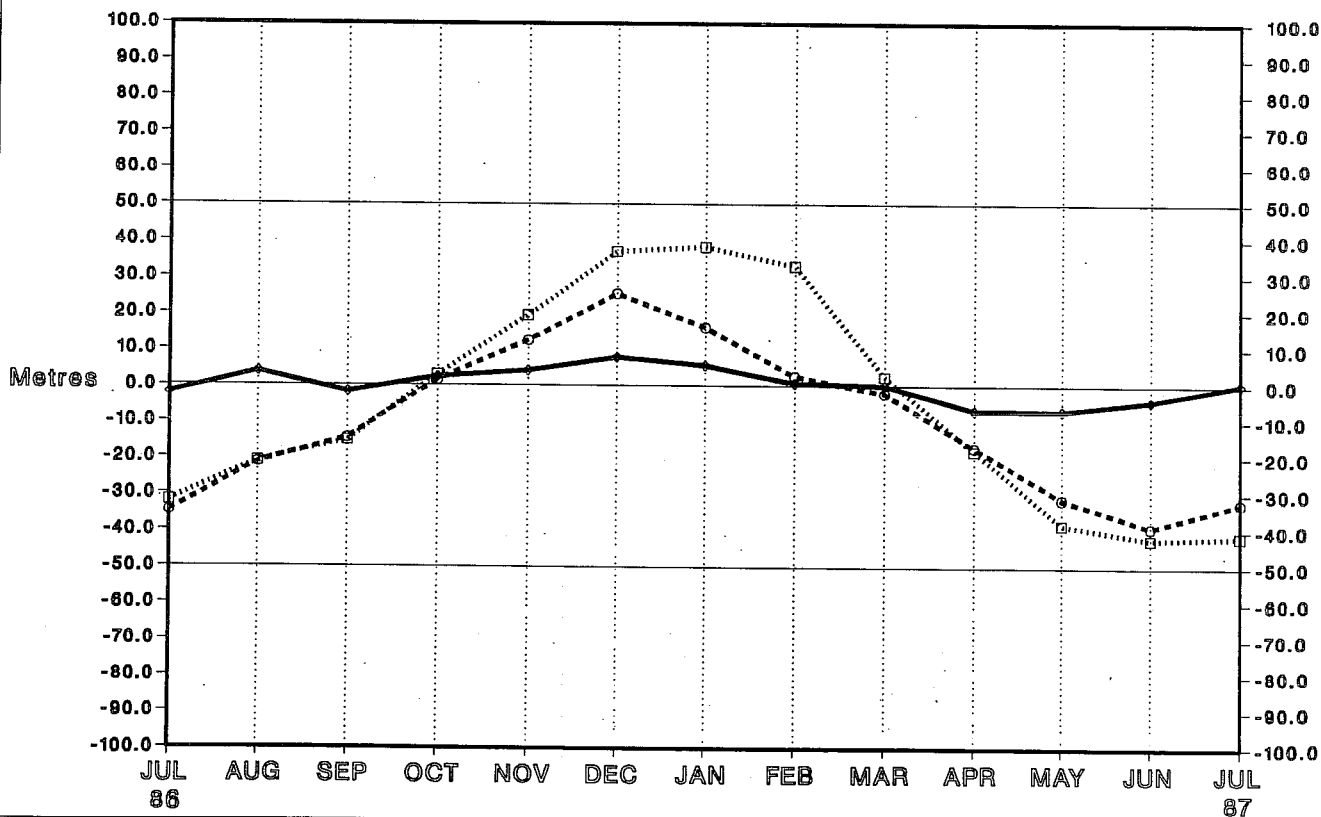
Station 16560 (39N 009E)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 31 31 28 29 30 30 30 28 31 30 31 30 29



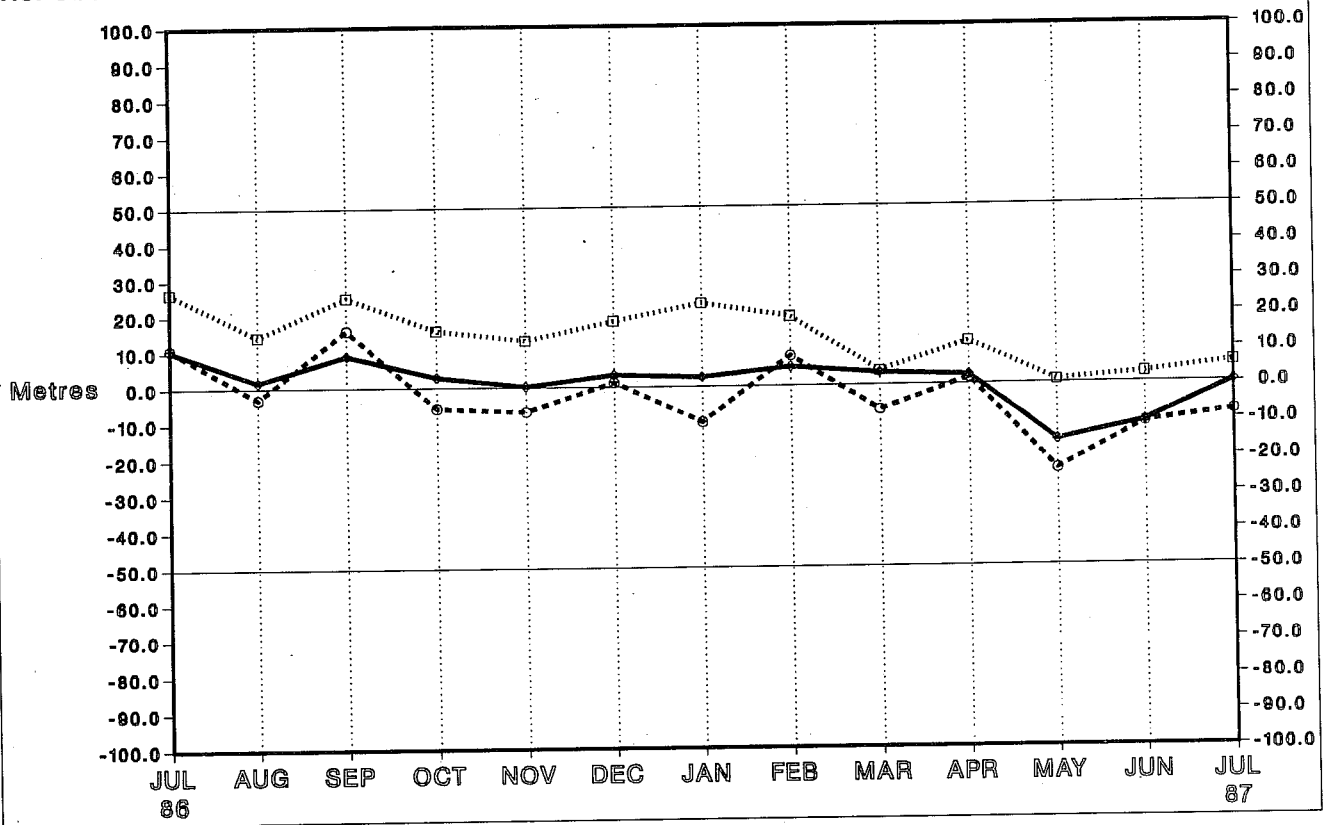
Station 60020 (28N 015W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 29 28 26 31 26 17 26 12 17 19 27 24 29



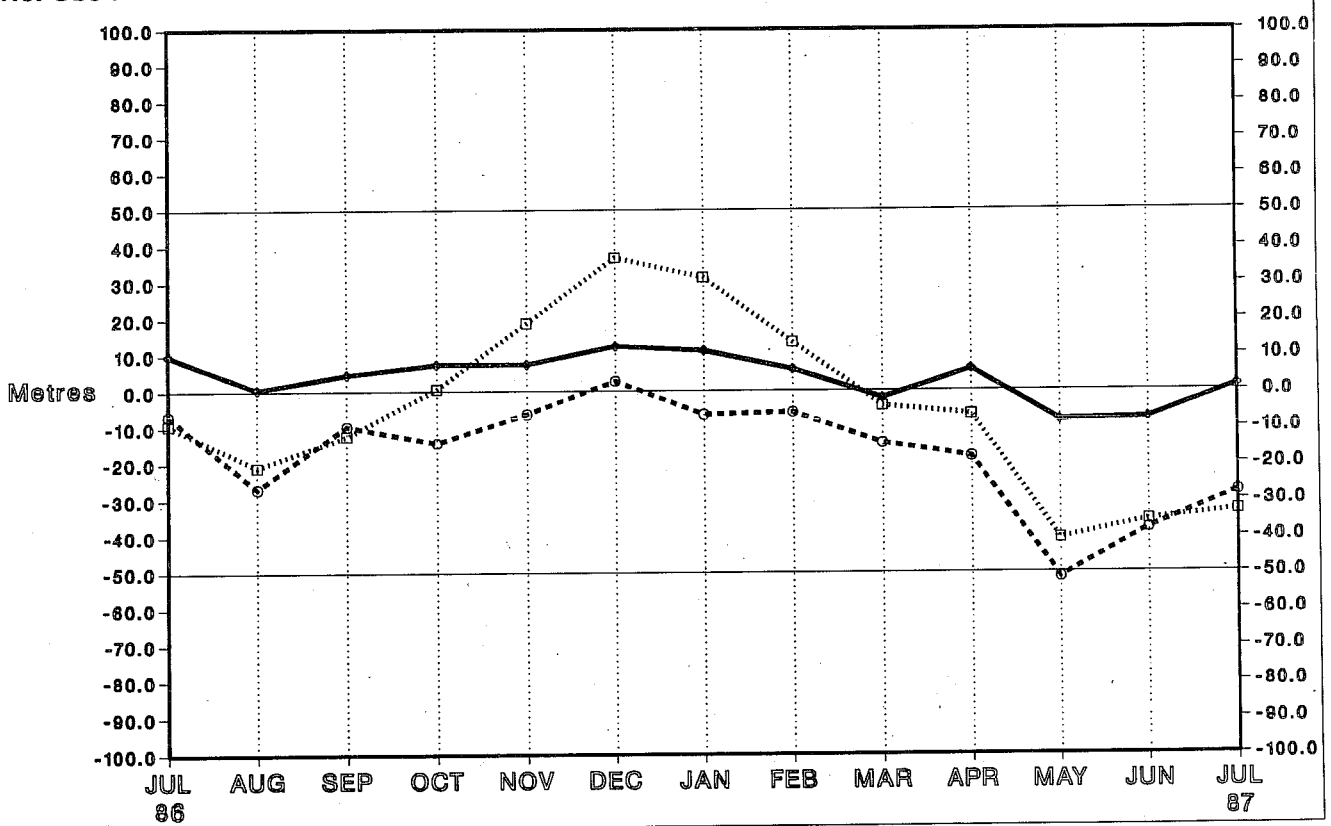
Station 60020 (28N 015W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 29 30 29 28 26 28 25 24 19 23 26 26 30



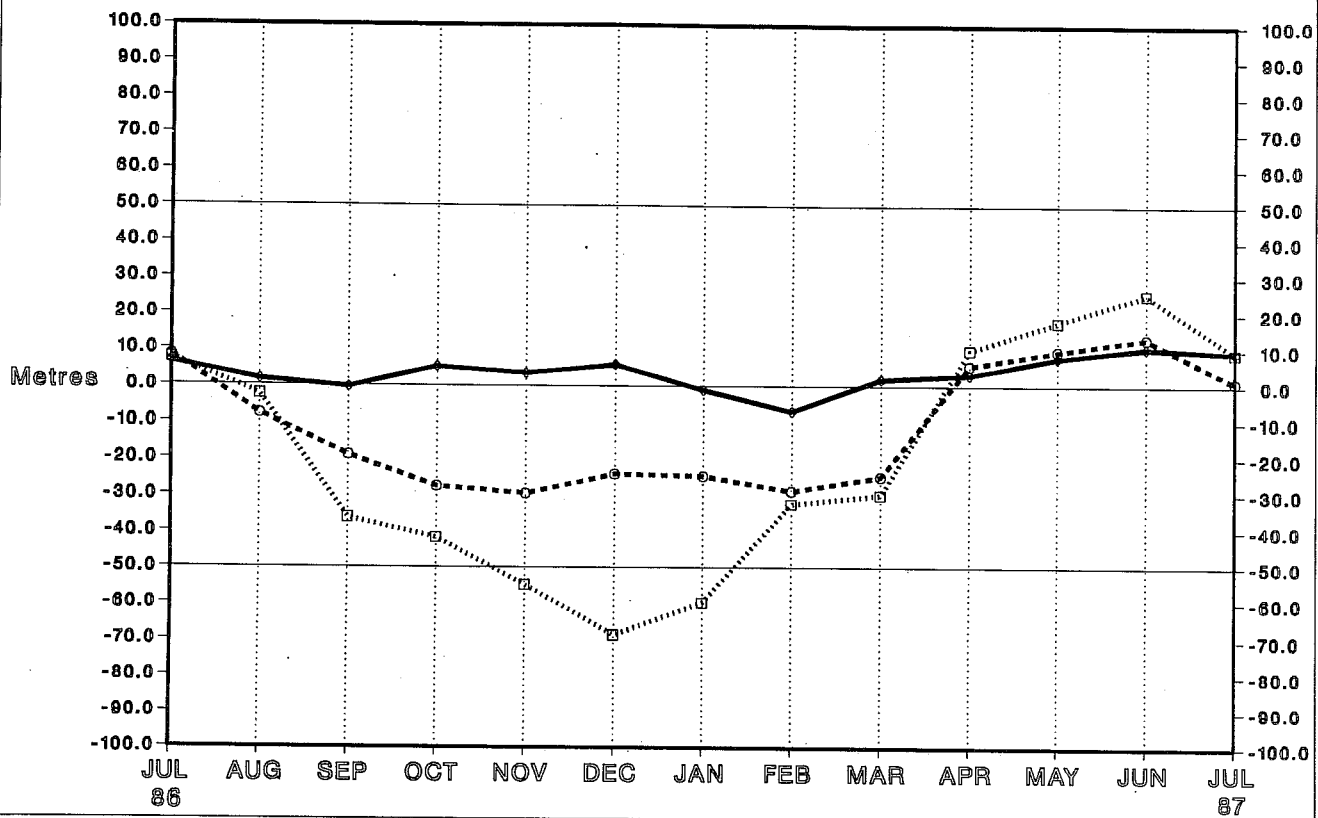
Station 71082 (83N 061W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

No. Obs : 31 31 30 31 30 29 30 28 31 30 31 30 31



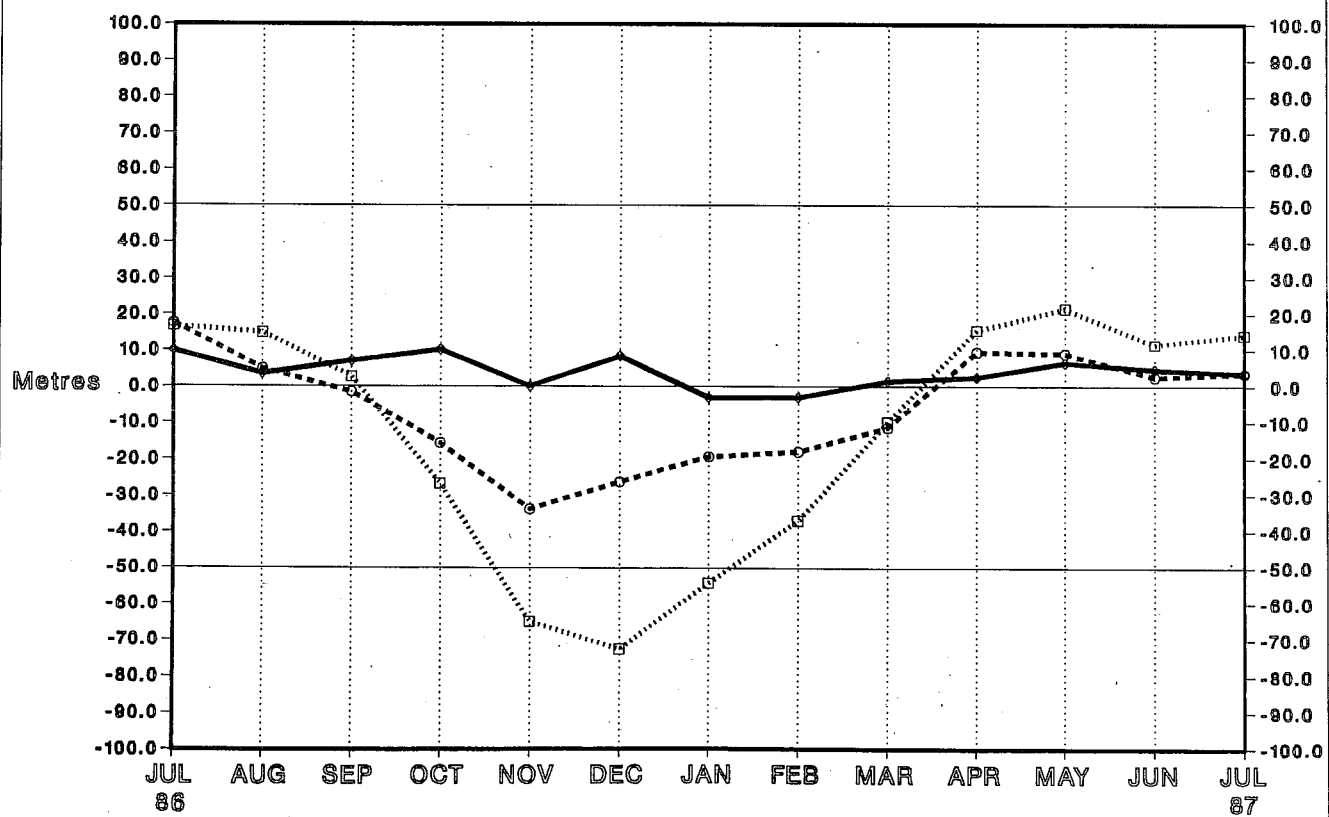
Station 71082 (83N 061W)

Radiosonde Height Monitoring Statistics

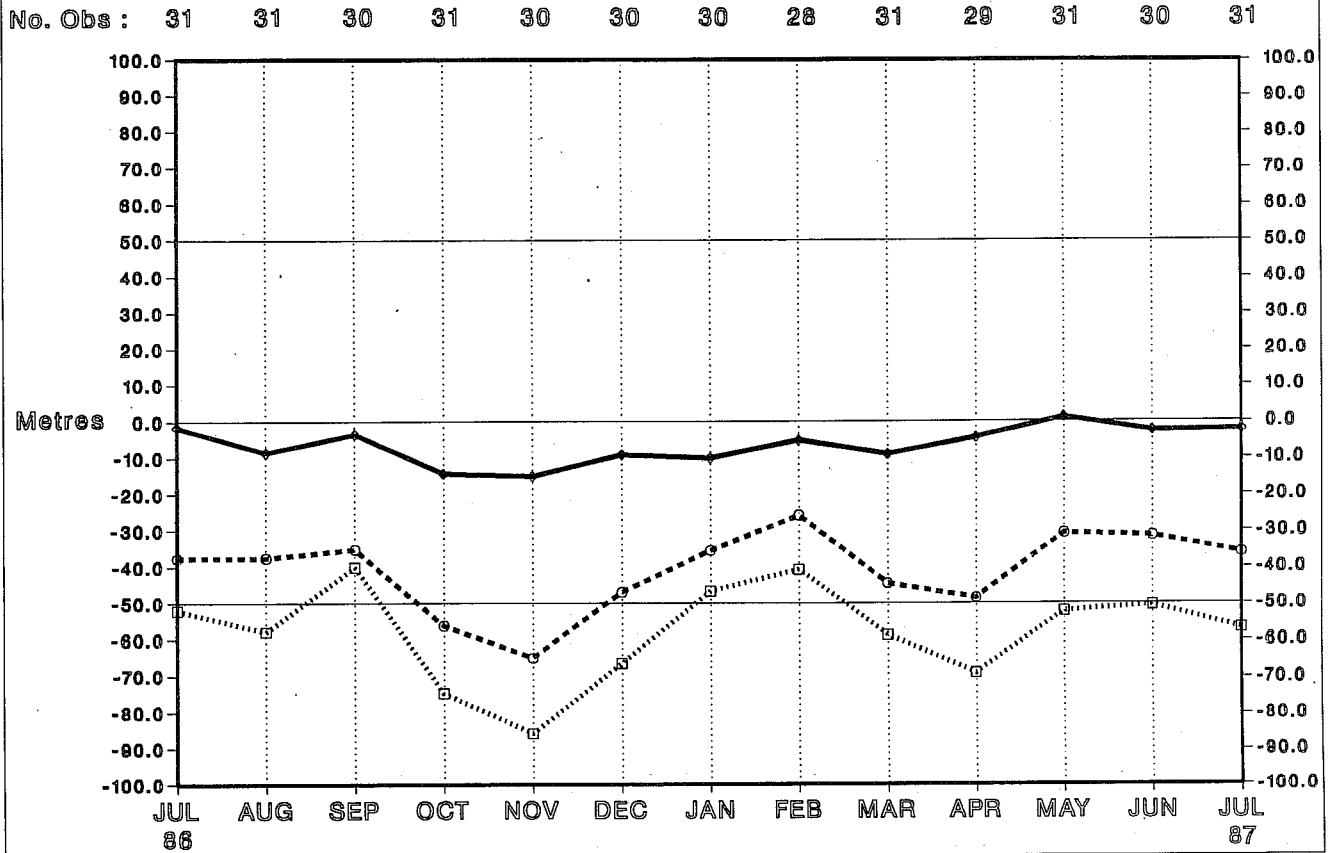
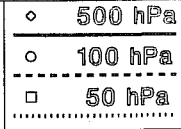
OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

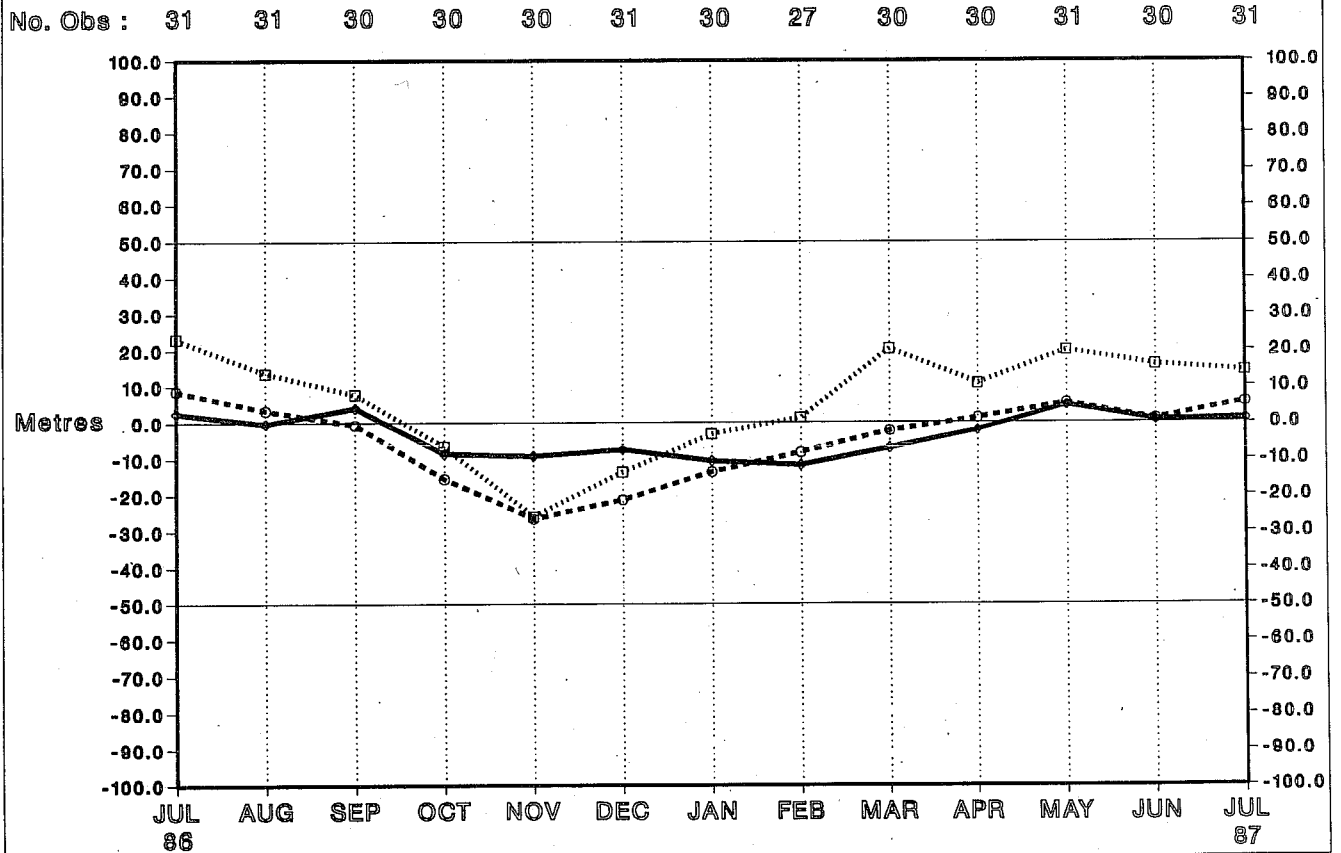
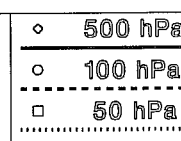
No. Obs : 30 31 29 30 30 31 30 28 29 30 31 30 31



Station 71399 (44N 064W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



Station 71399 (44N 064W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS



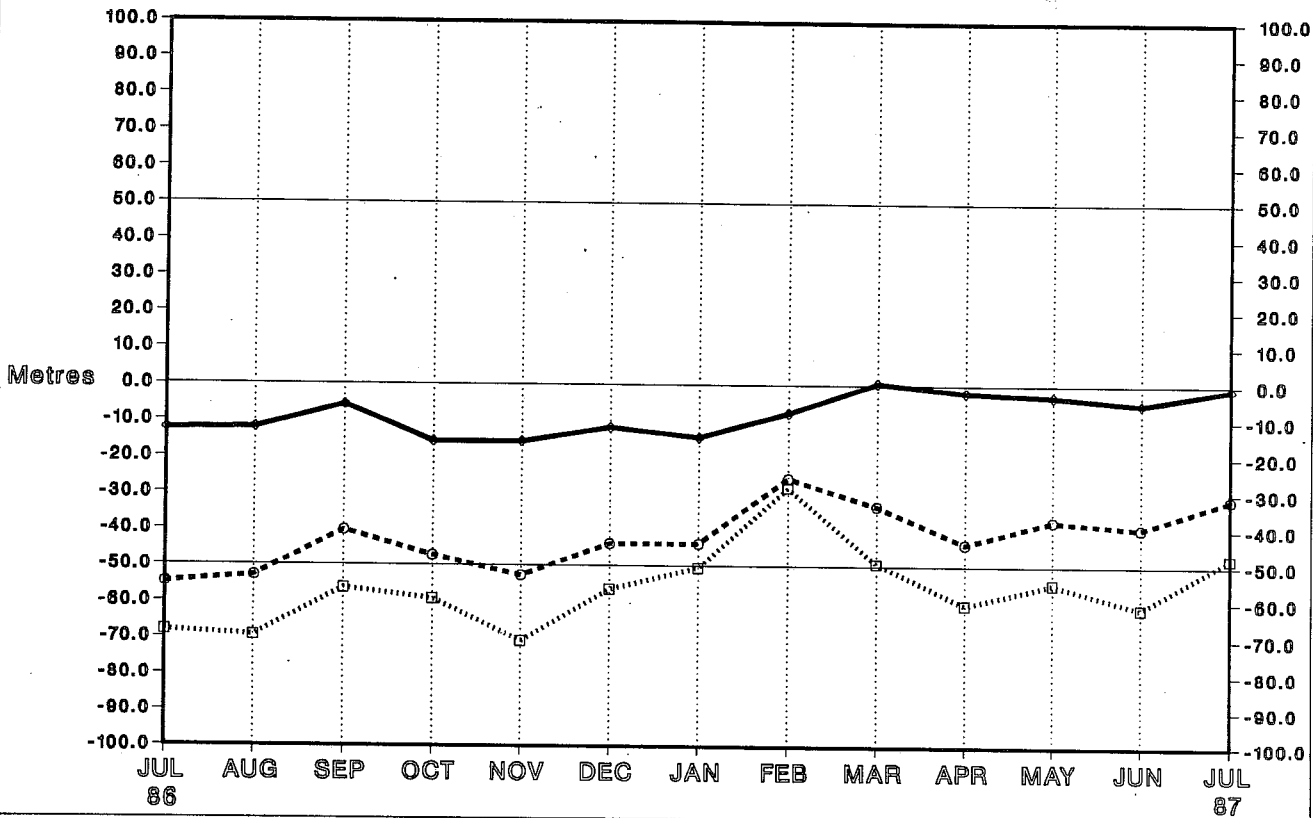
Station 71600 (44N 059W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 28 30 28 31 30 31 30 31



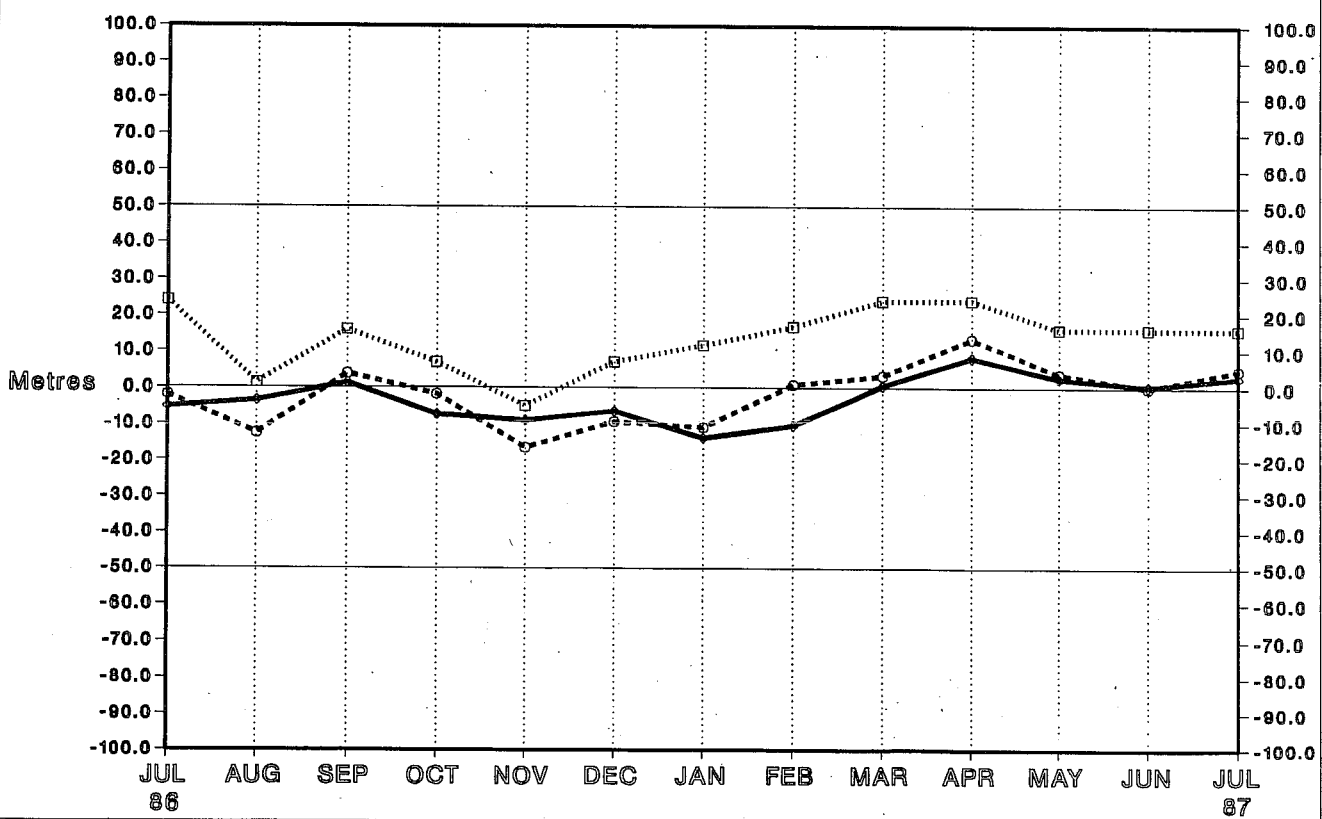
Station 71600 (44N 059W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

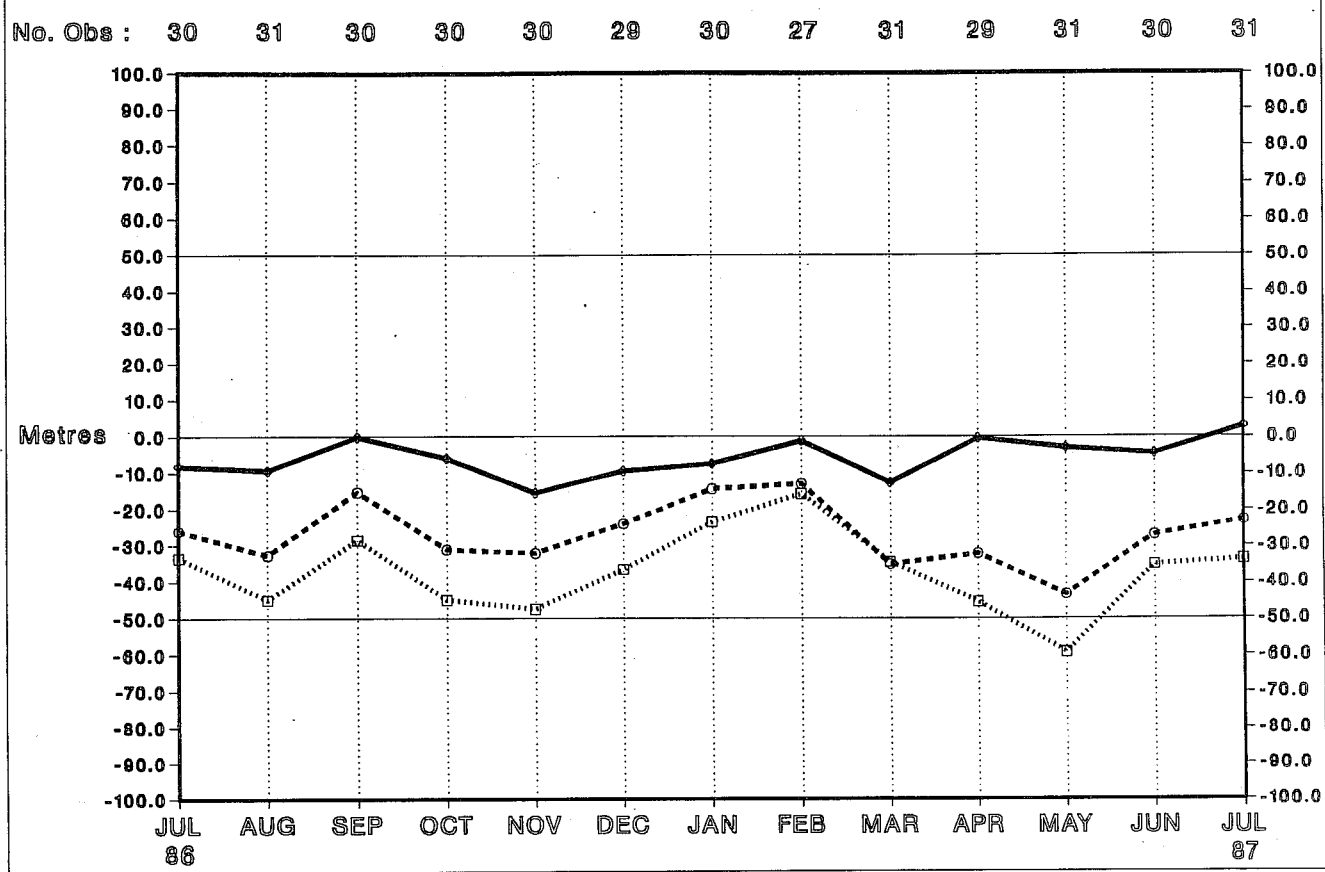
- 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 31 30 31 30 31 30 28 31 30 31 30 31



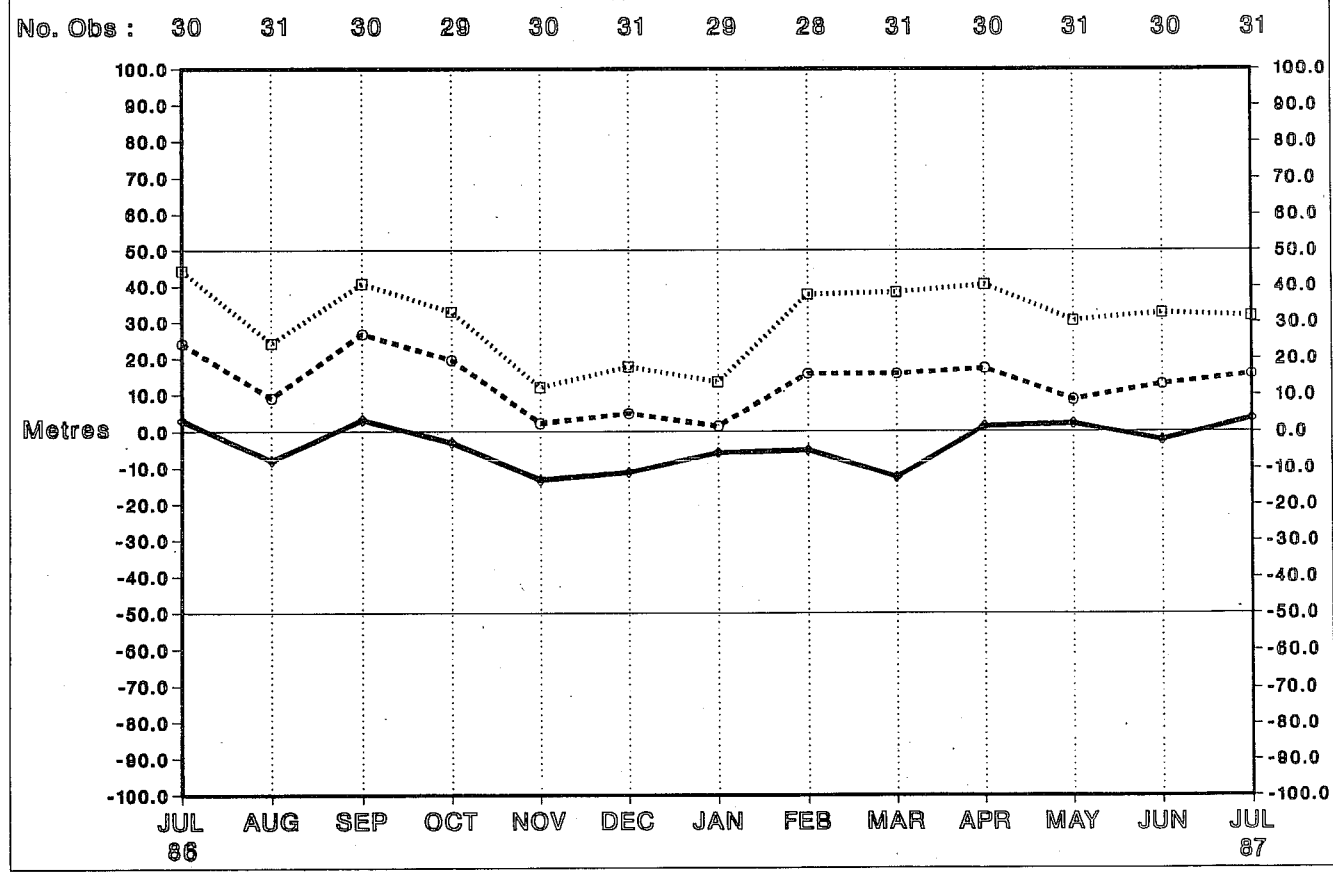
Station 71801 (48N 052W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◇ 500 hPa
 ○ 100 hPa
 □ 50 hPa

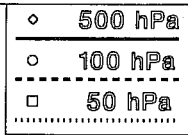


Station 71801 (48N 052W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

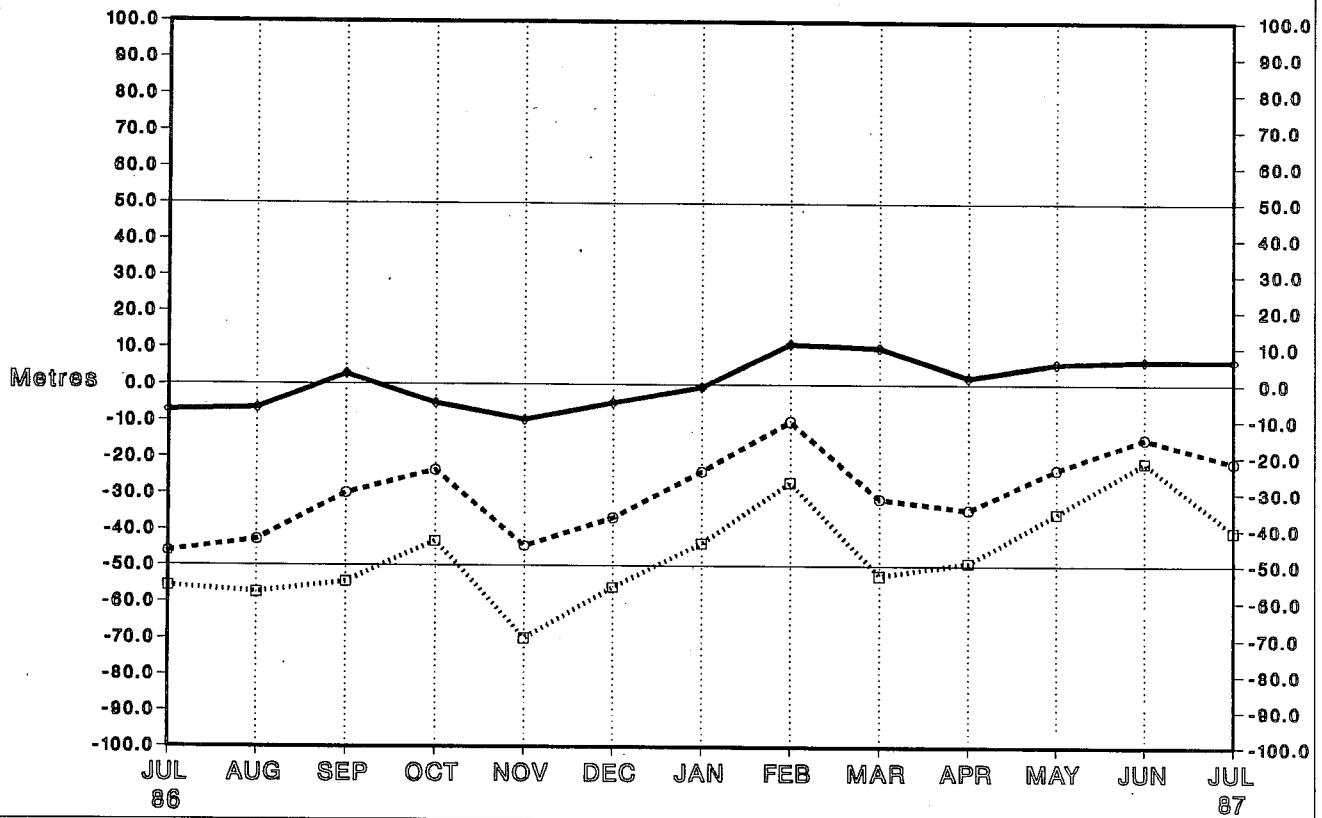
◇ 500 hPa
 ○ 100 hPa
 □ 50 hPa



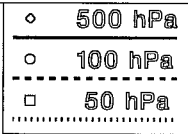
Station 71811 (50N 065W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



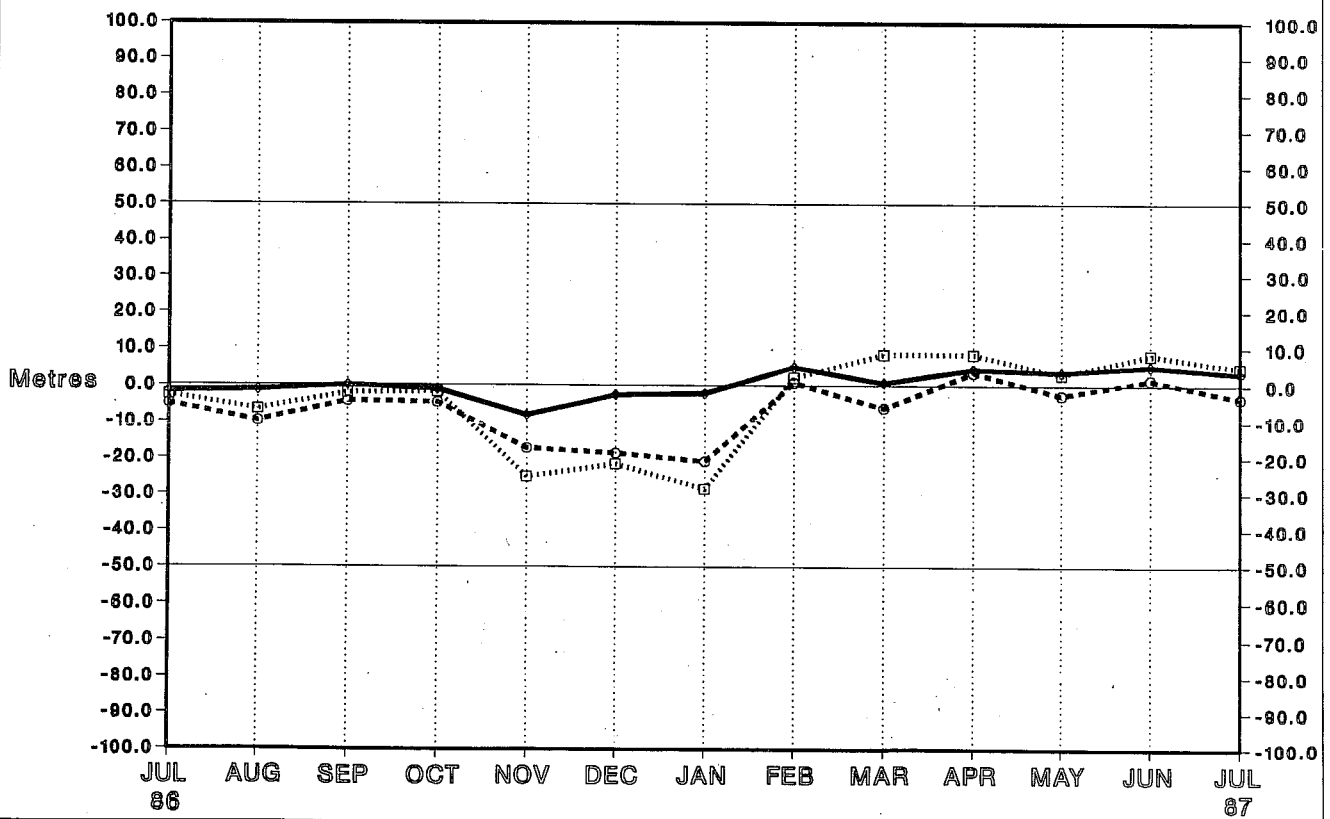
No. Obs : 31 31 30 30 30 30 29 28 31 30 31 30 31



Station 71811 (50N 065W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS



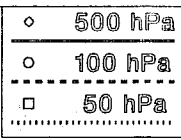
No. Obs : 30 31 30 30 30 31 30 28 31 30 31 30 30



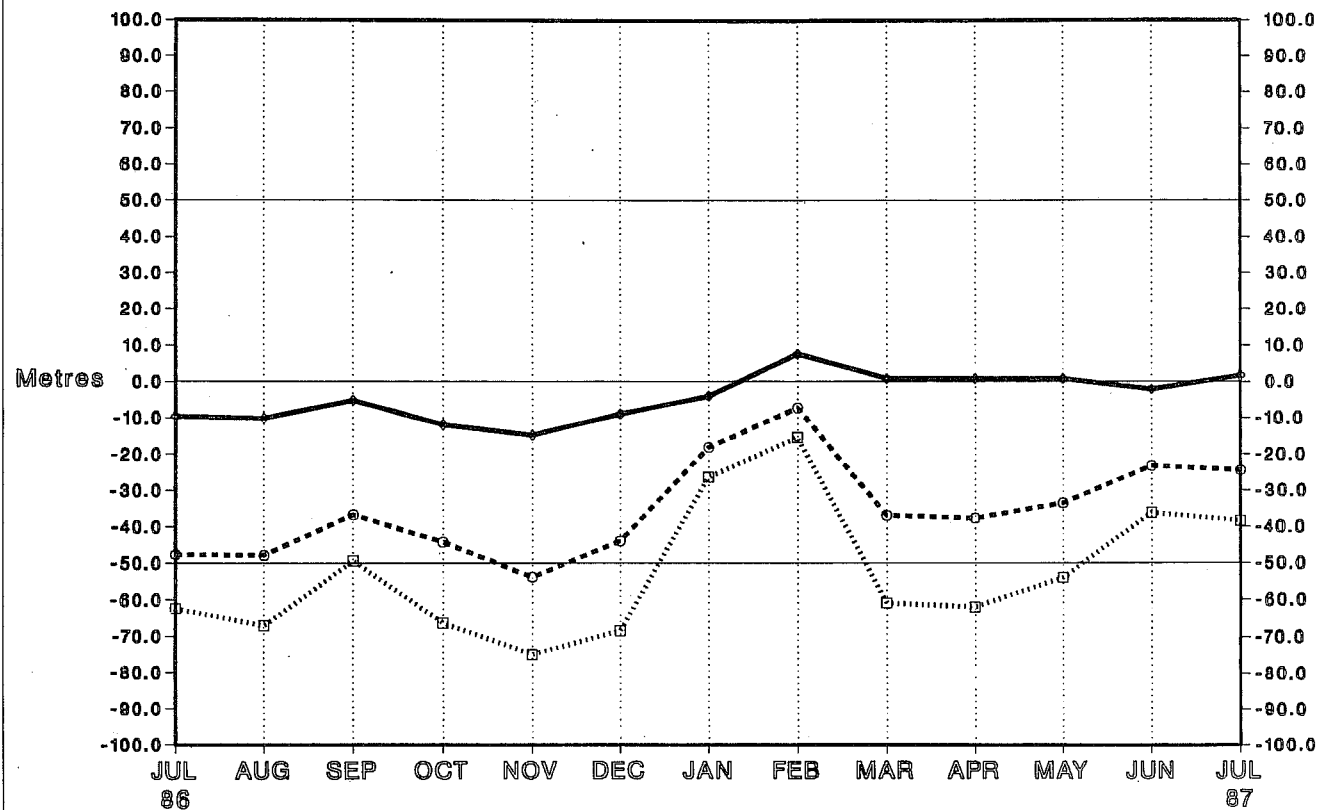
Station 71815 (49N 058W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



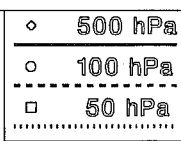
No. Obs: 31 31 30 31 30 29 30 28 31 30 31 30 31



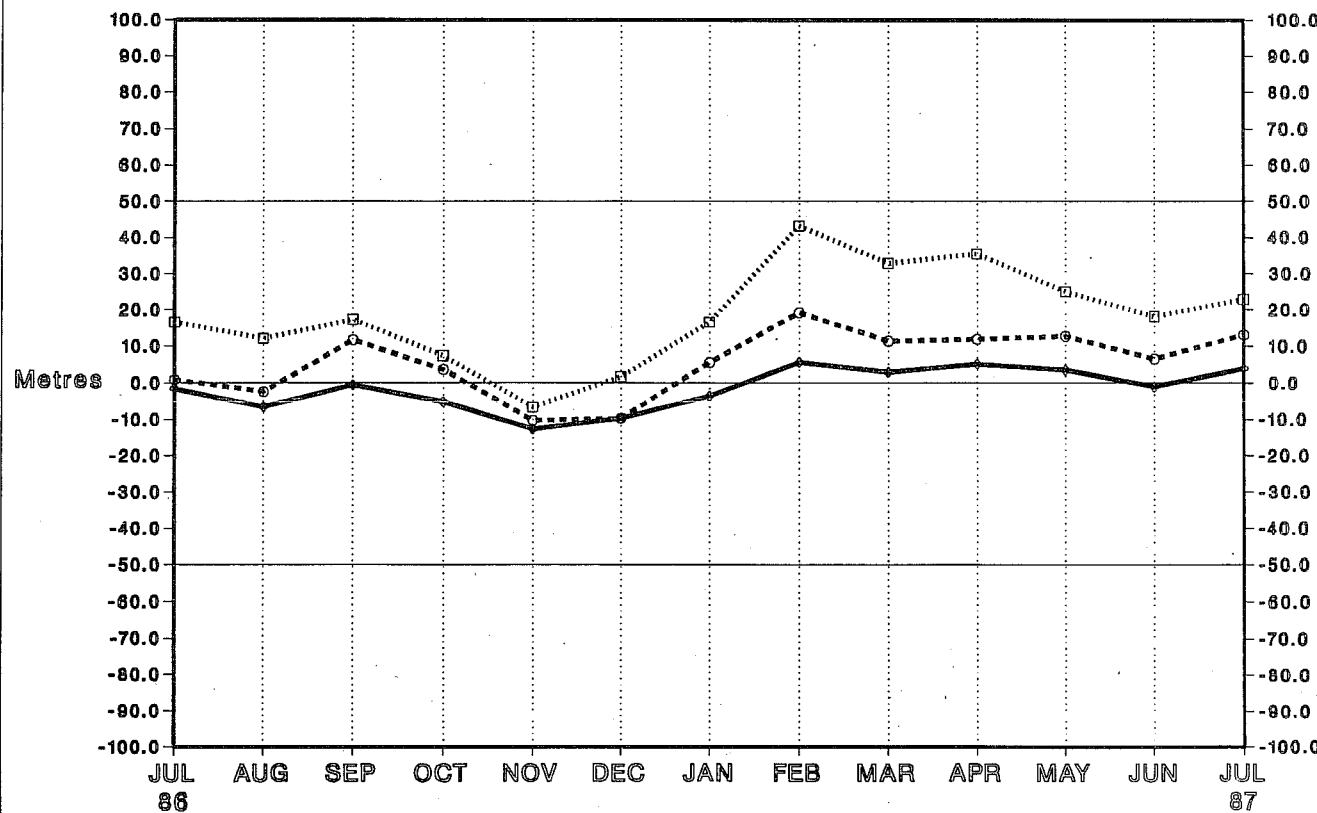
Station 71815 (49N 058W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



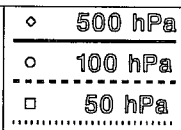
No. Obs: 30 31 30 30 30 31 30 28 31 30 31 30 31



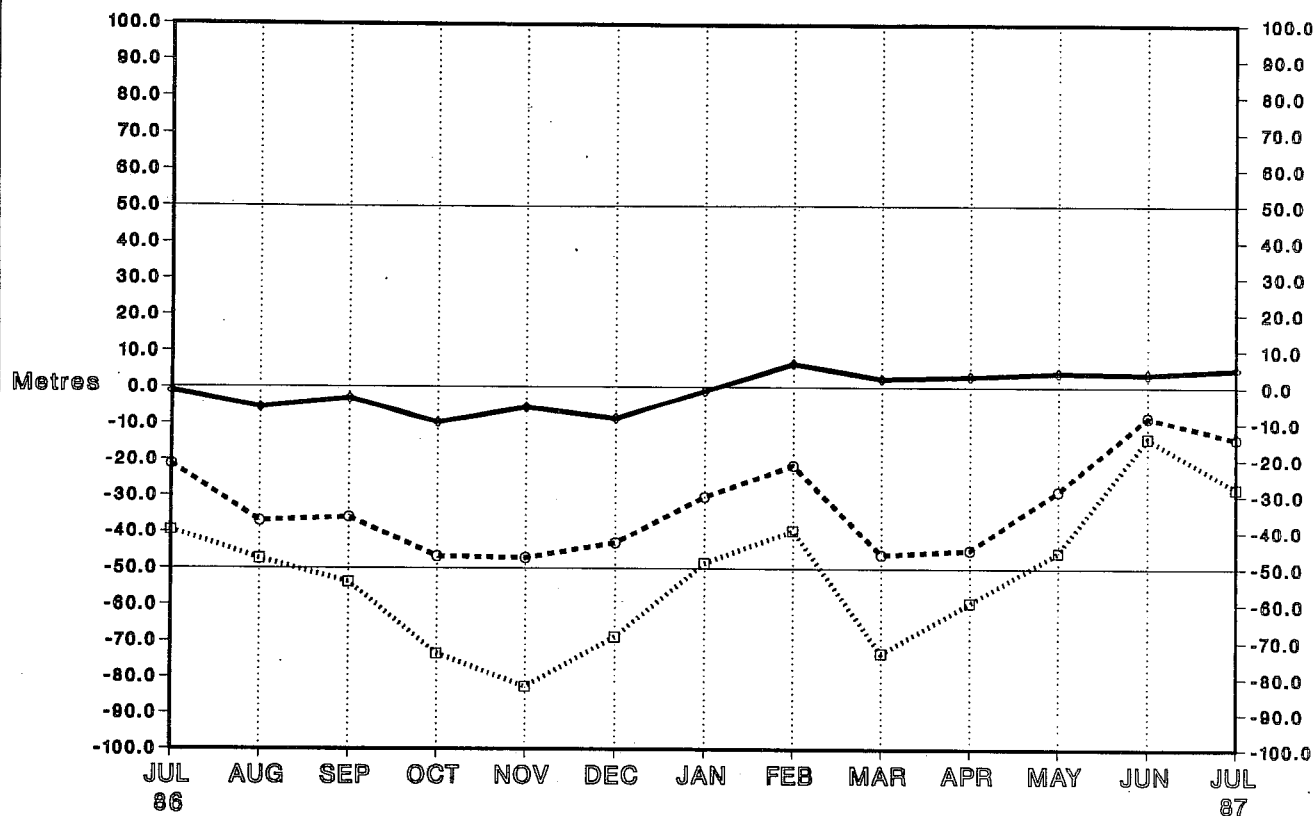
Station 71816 (53N 059W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



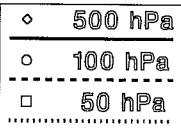
No. Obs : 31 31 30 30 30 30 30 28 31 30 31 30 30



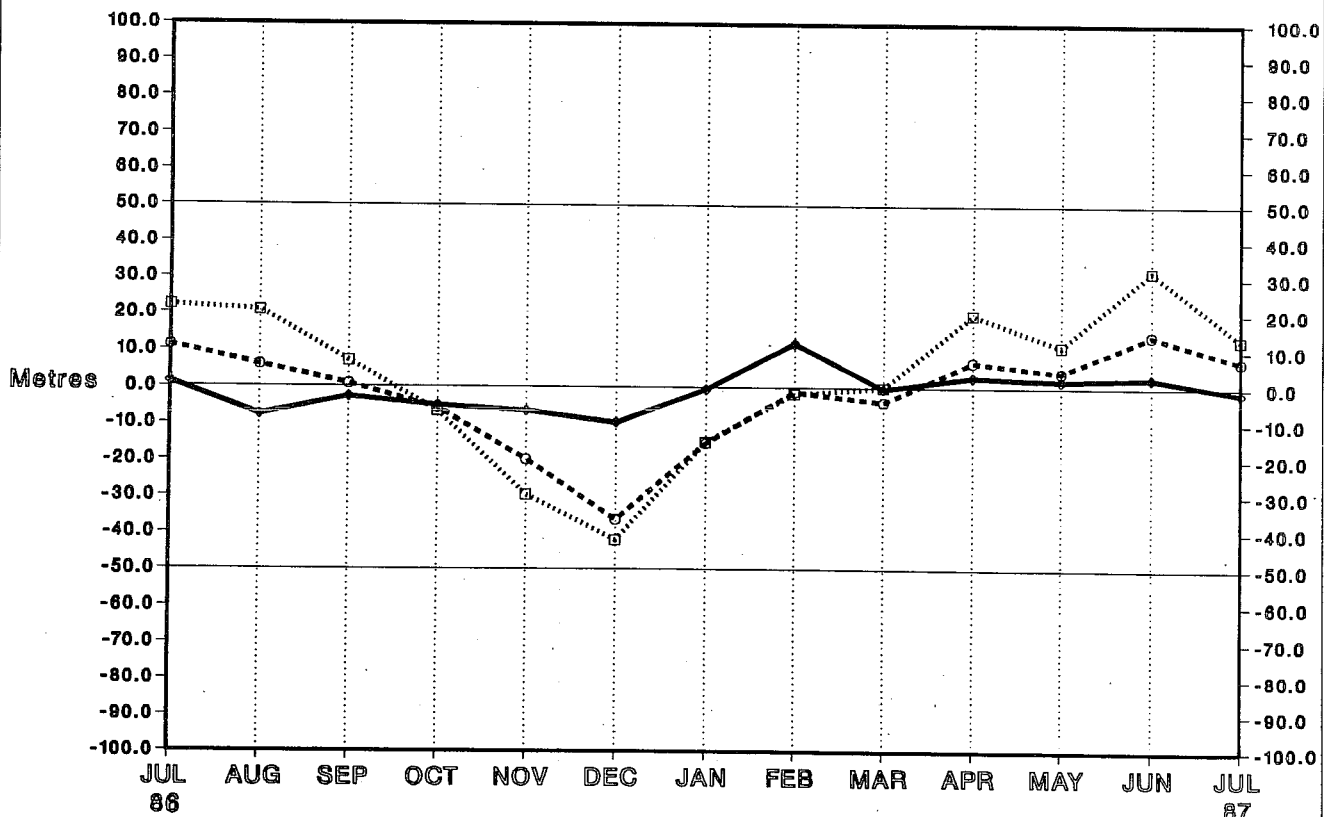
Station 71816 (53N 059W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



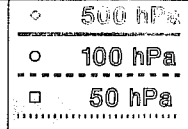
No. Obs : 30 30 30 30 29 29 30 28 31 29 31 30 31



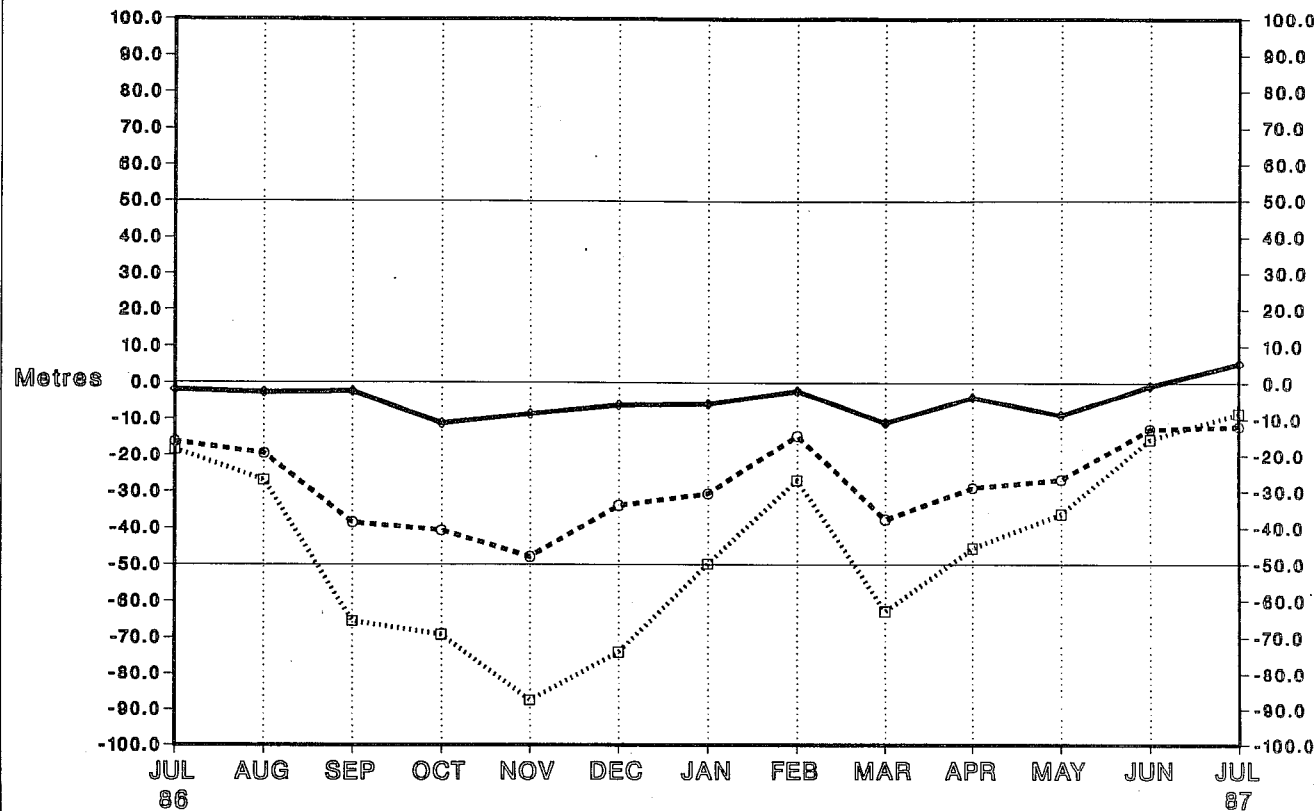
Station 71909 (64N 068W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



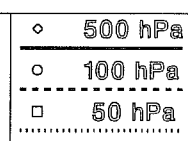
No. Obs : 30 31 30 31 30 31 28 28 31 30 31 30 30



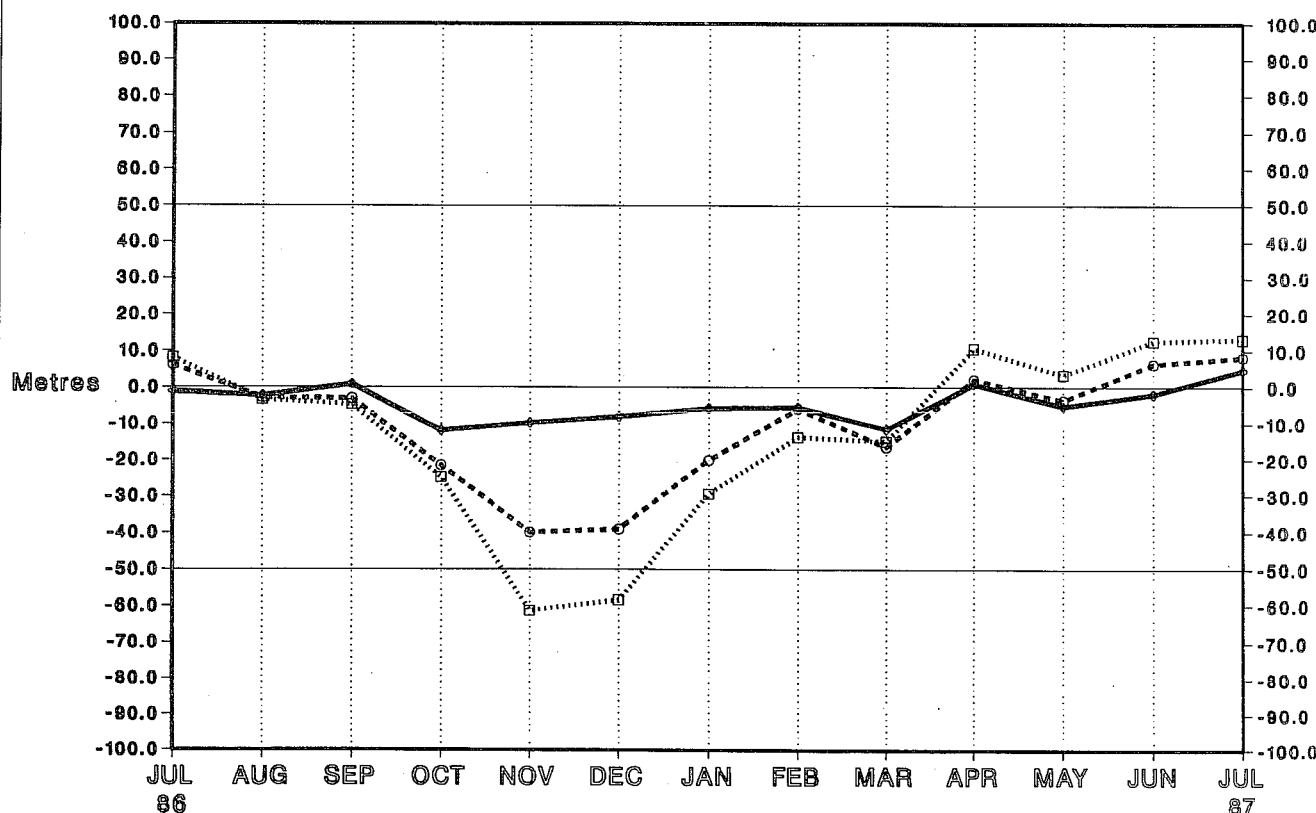
Station 71909 (64N 068W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



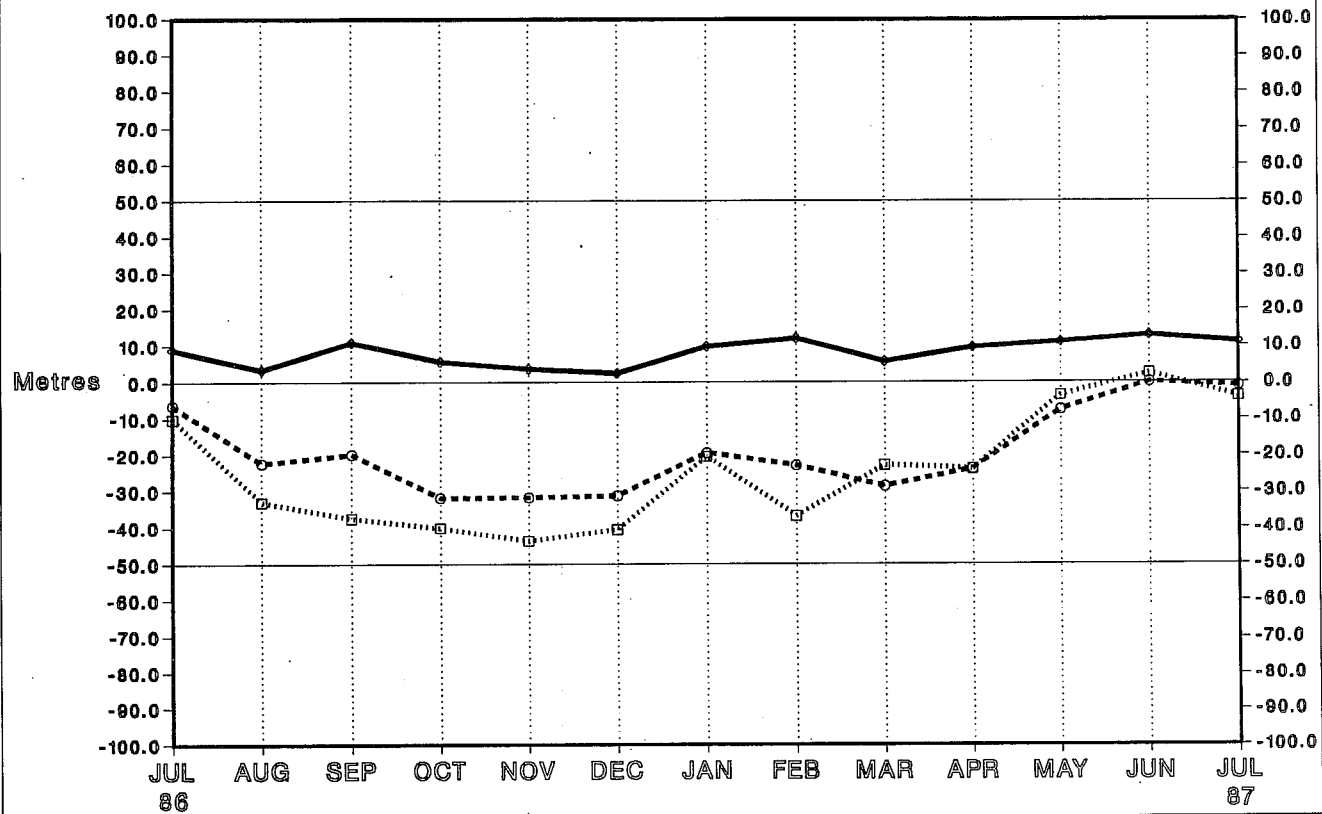
No. Obs : 28 31 30 30 30 31 30 28 31 30 31 30 31



Station 72201 (25N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

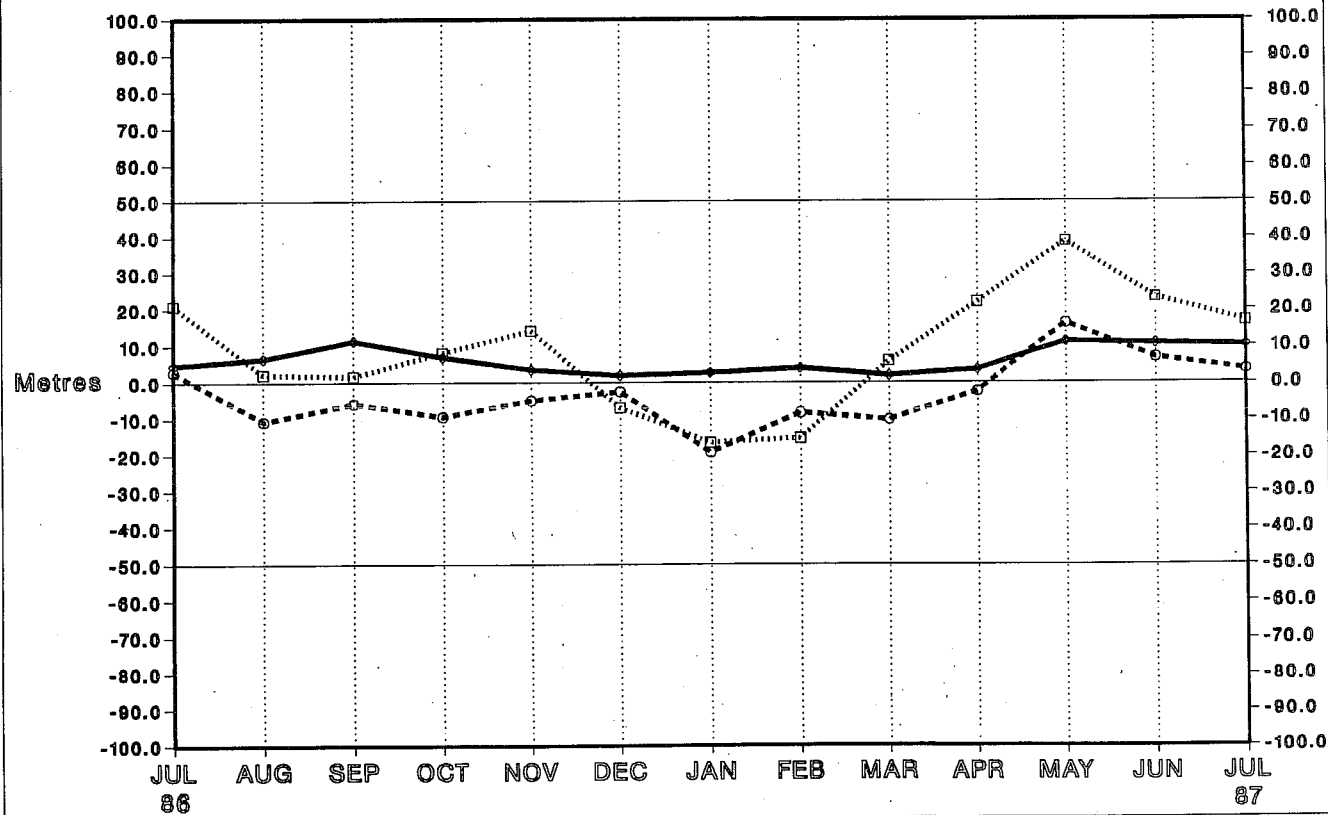
No. Obs : 29 25 30 31 30 22 31 28 31 30 27 30 31



Station 72201 (25N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

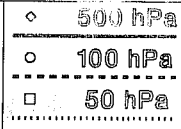
No. Obs : 29 26 30 30 29 24 31 27 29 28 25 30 31



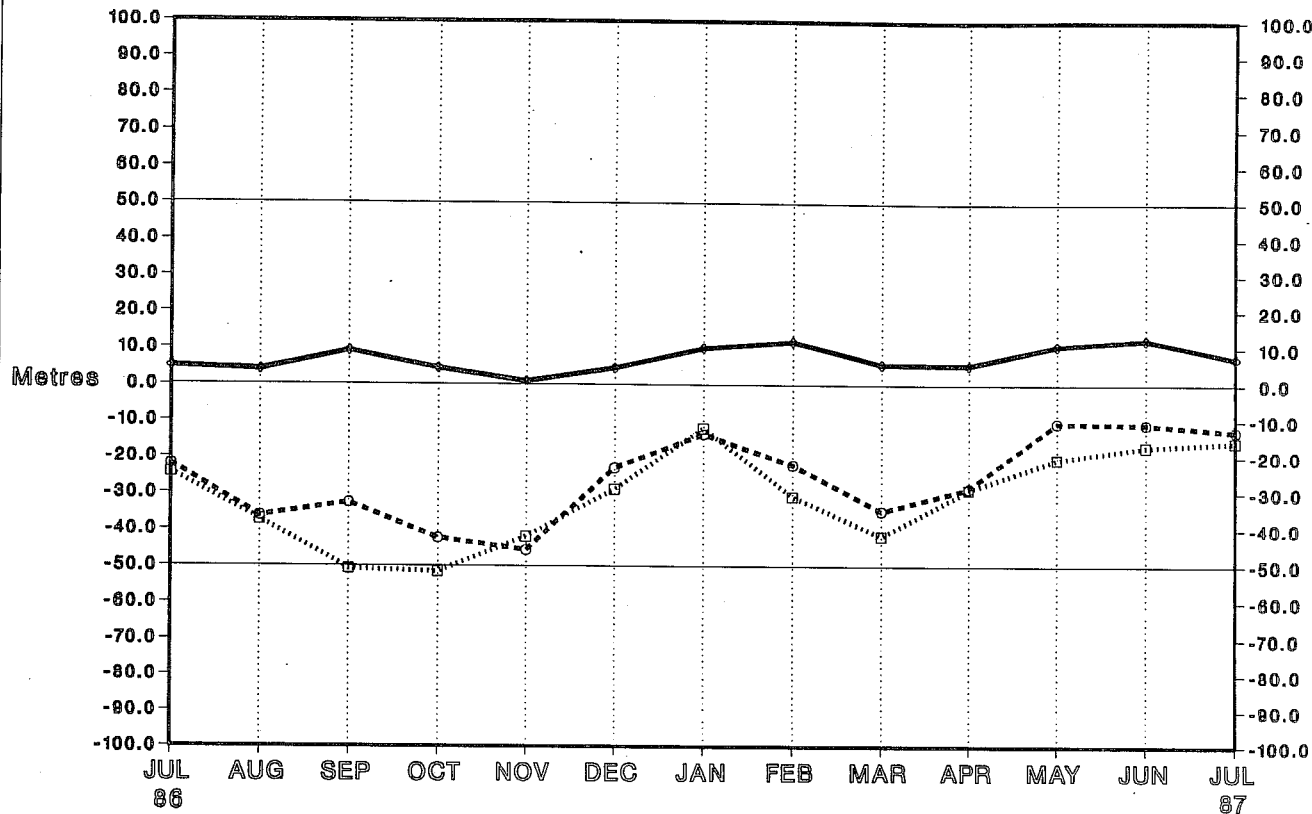
Station 72203 (27N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



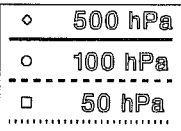
No. Obs : 27 28 30 27 30 29 31 25 31 29 30 30 29



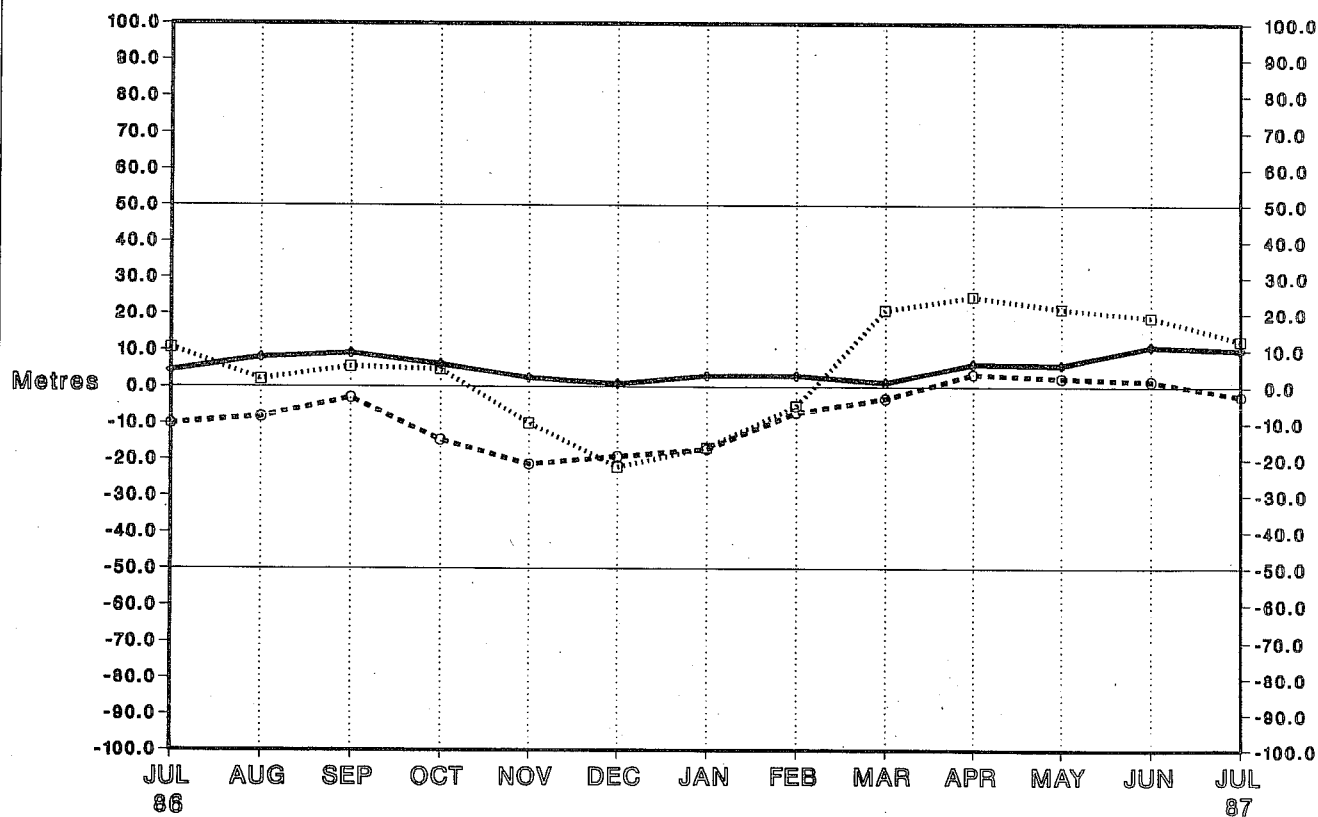
Station 72203 (27N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 31 30 29 29 30 30 31 27 31 30 31 30 29



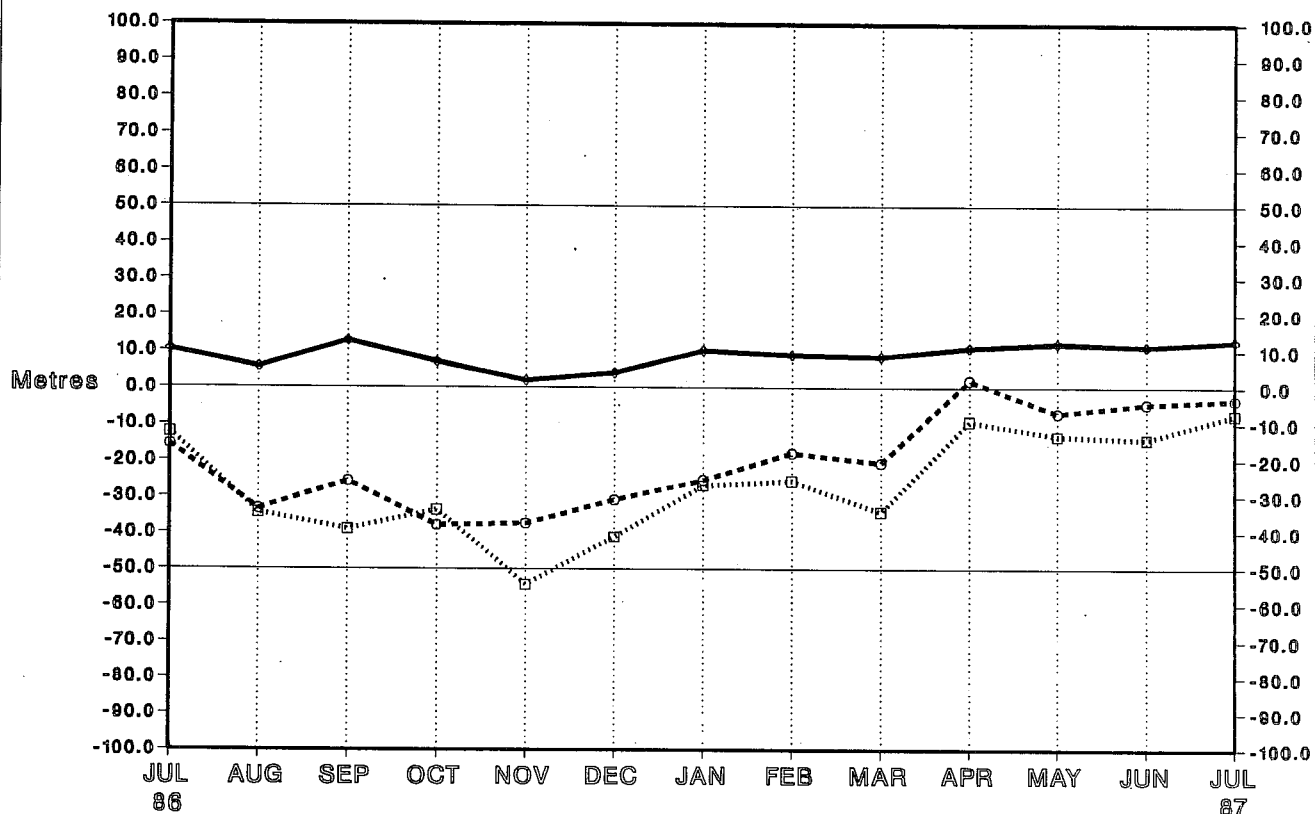
Station 72208 (33N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 29 30 30 31 29 30 31 28 31 30 31 30 28



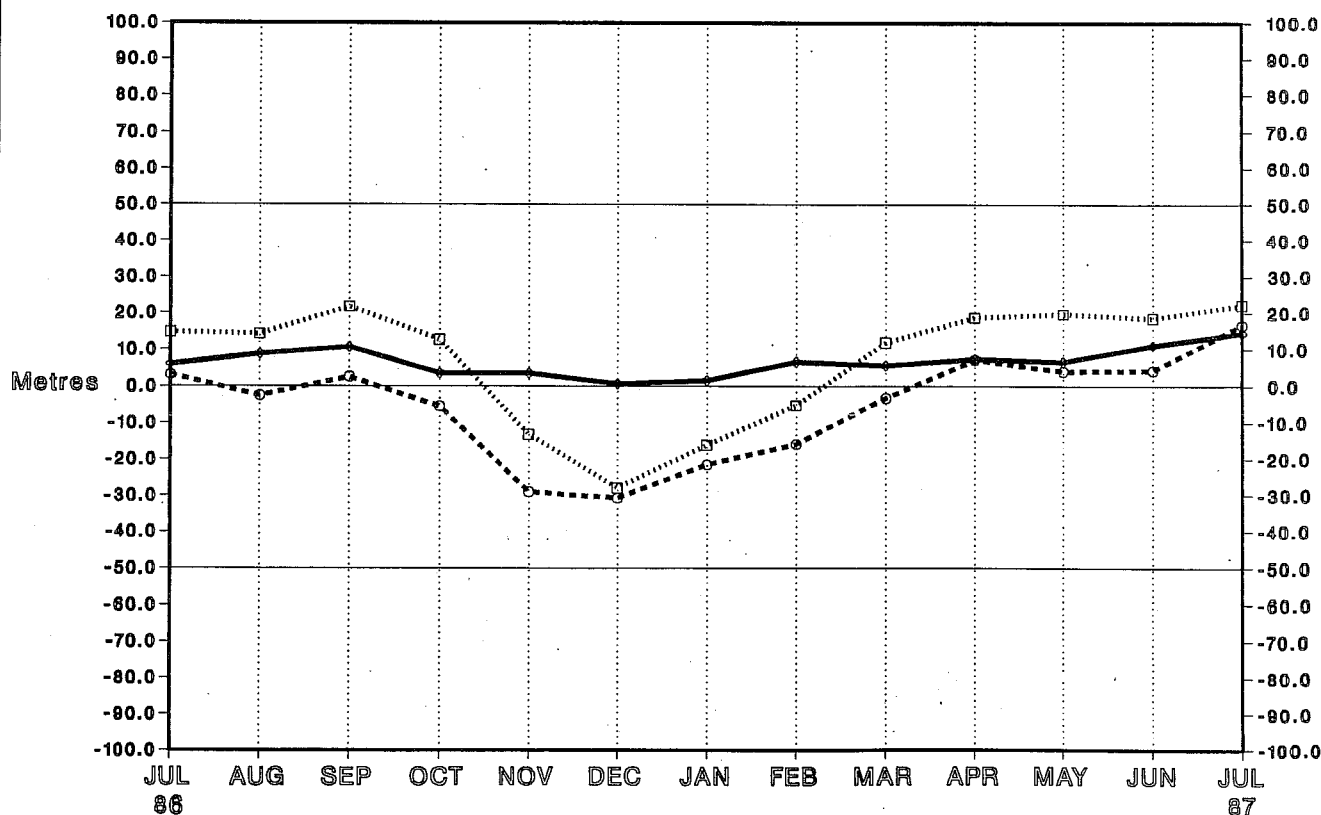
Station 72208 (33N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

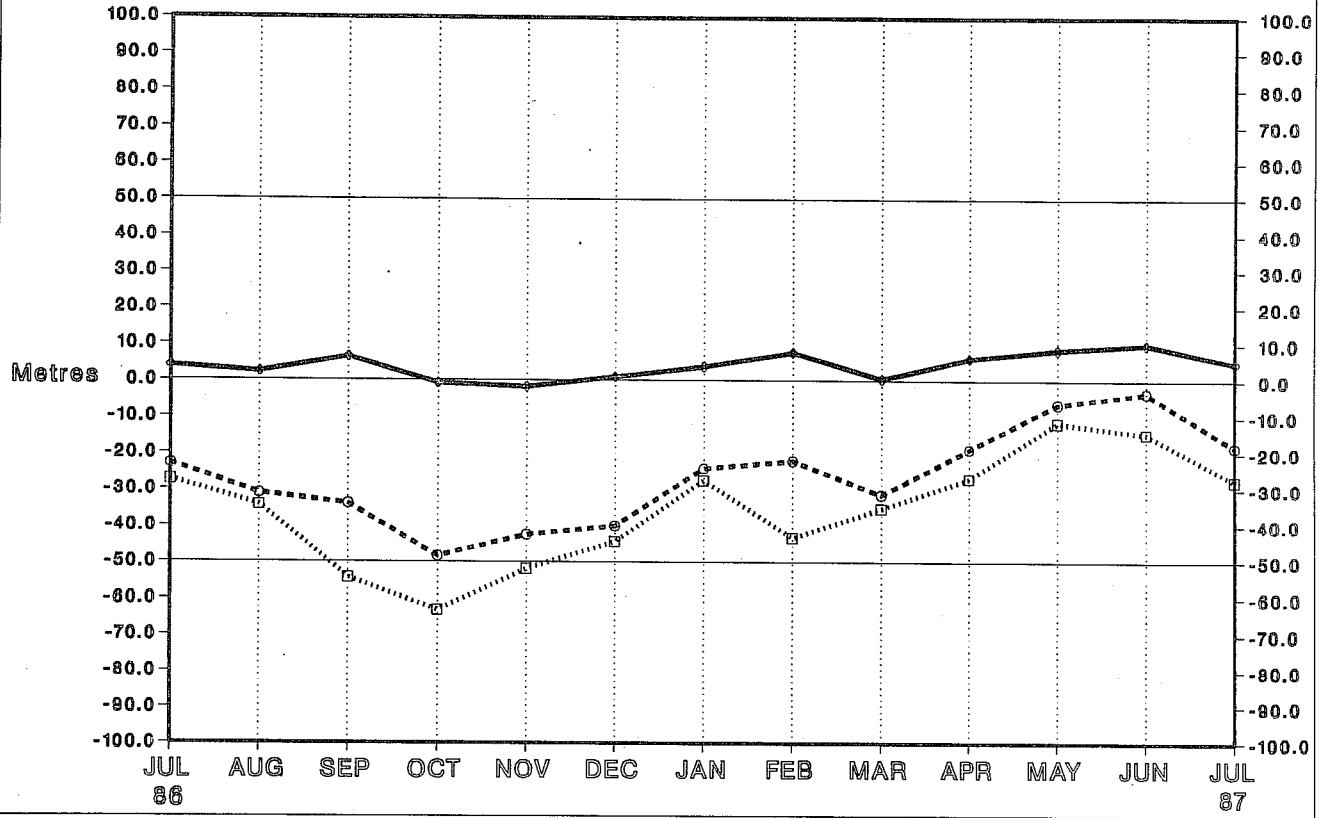
No. Obs: 31 29 30 31 30 31 31 27 31 28 31 29 29



Station 72210 (28N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

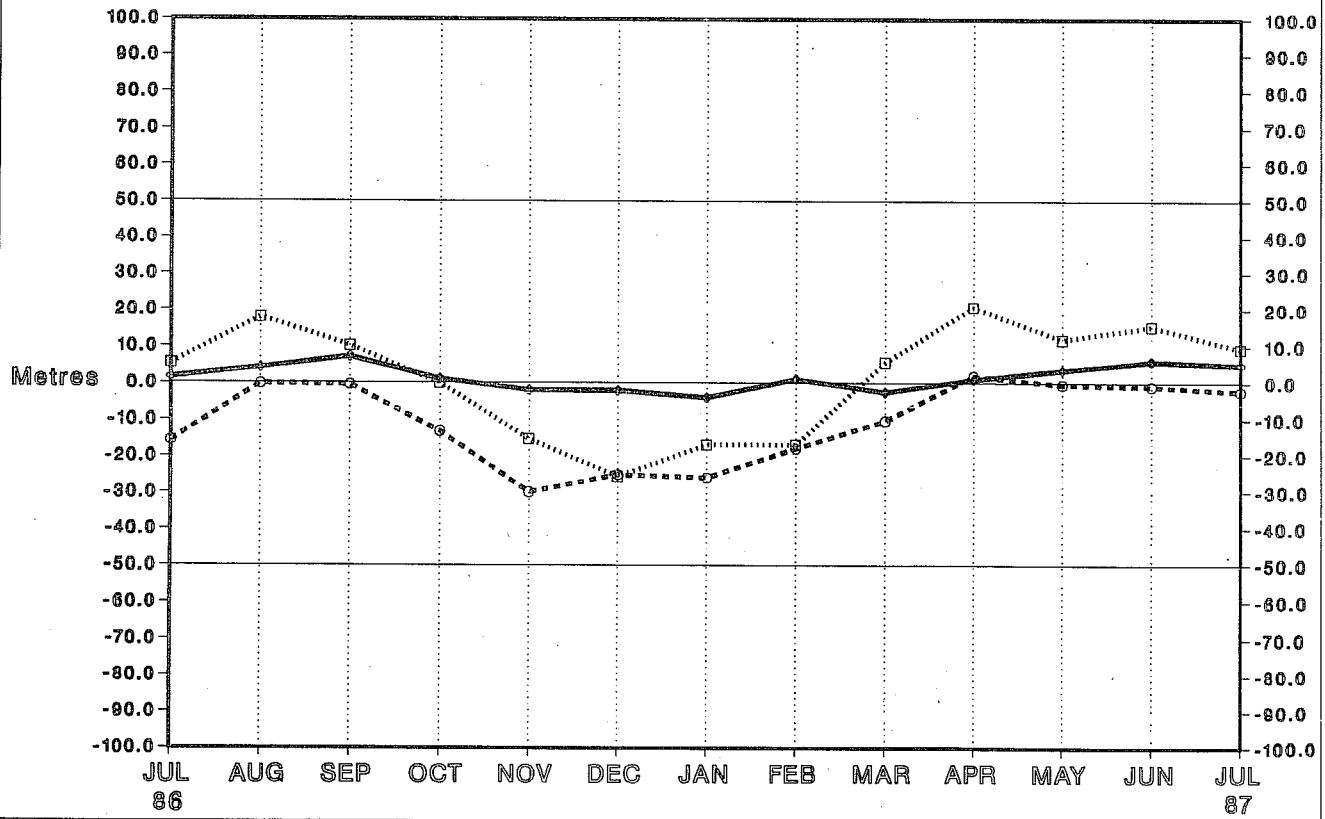
No. Obs : 31 30 30 30 30 30 31 28 30 29 31 28 31



Station 72210 (28N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

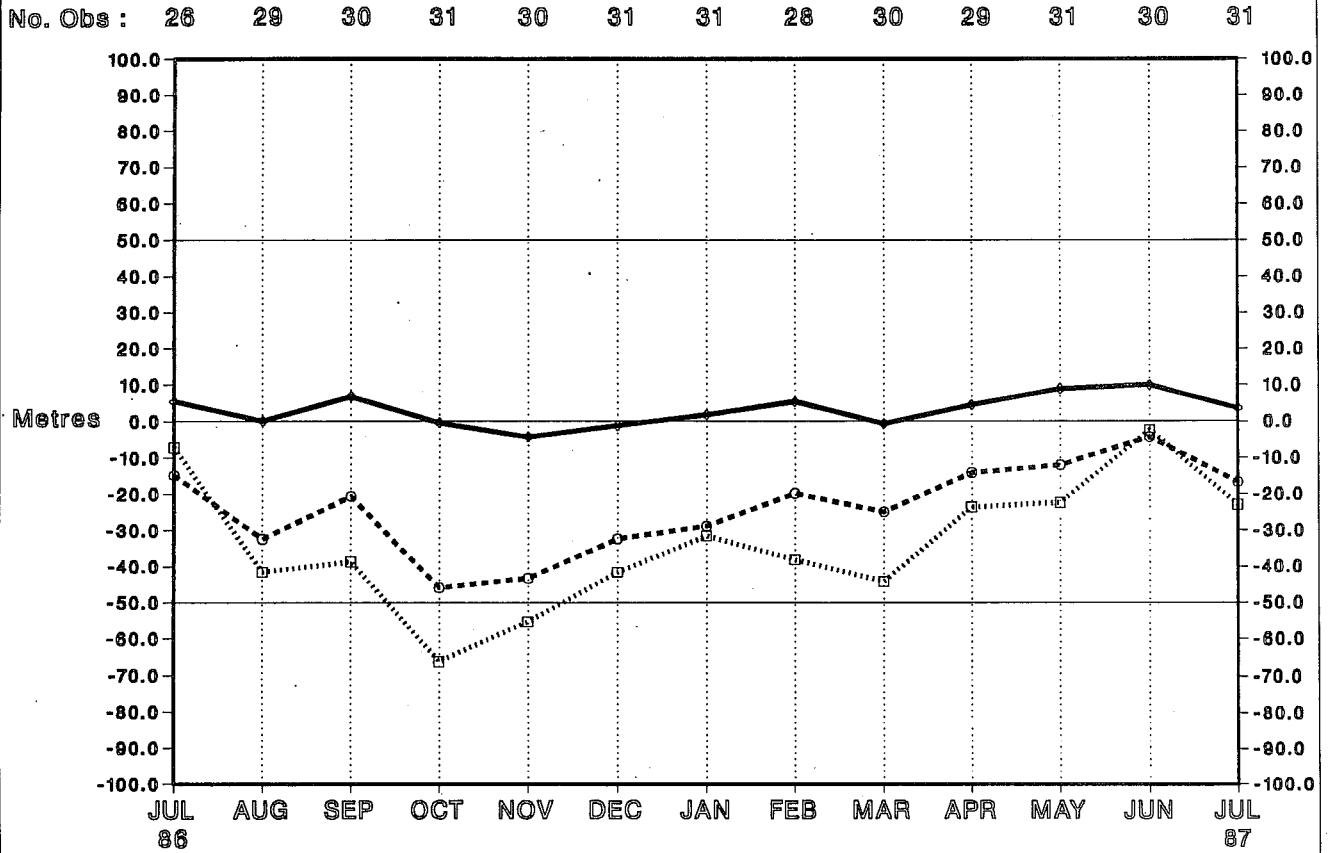
◊ 500 hPa
 ○ 100 hPa
 □ 50 hPa

No. Obs : 31 31 30 31 30 31 31 28 29 30 31 29 31



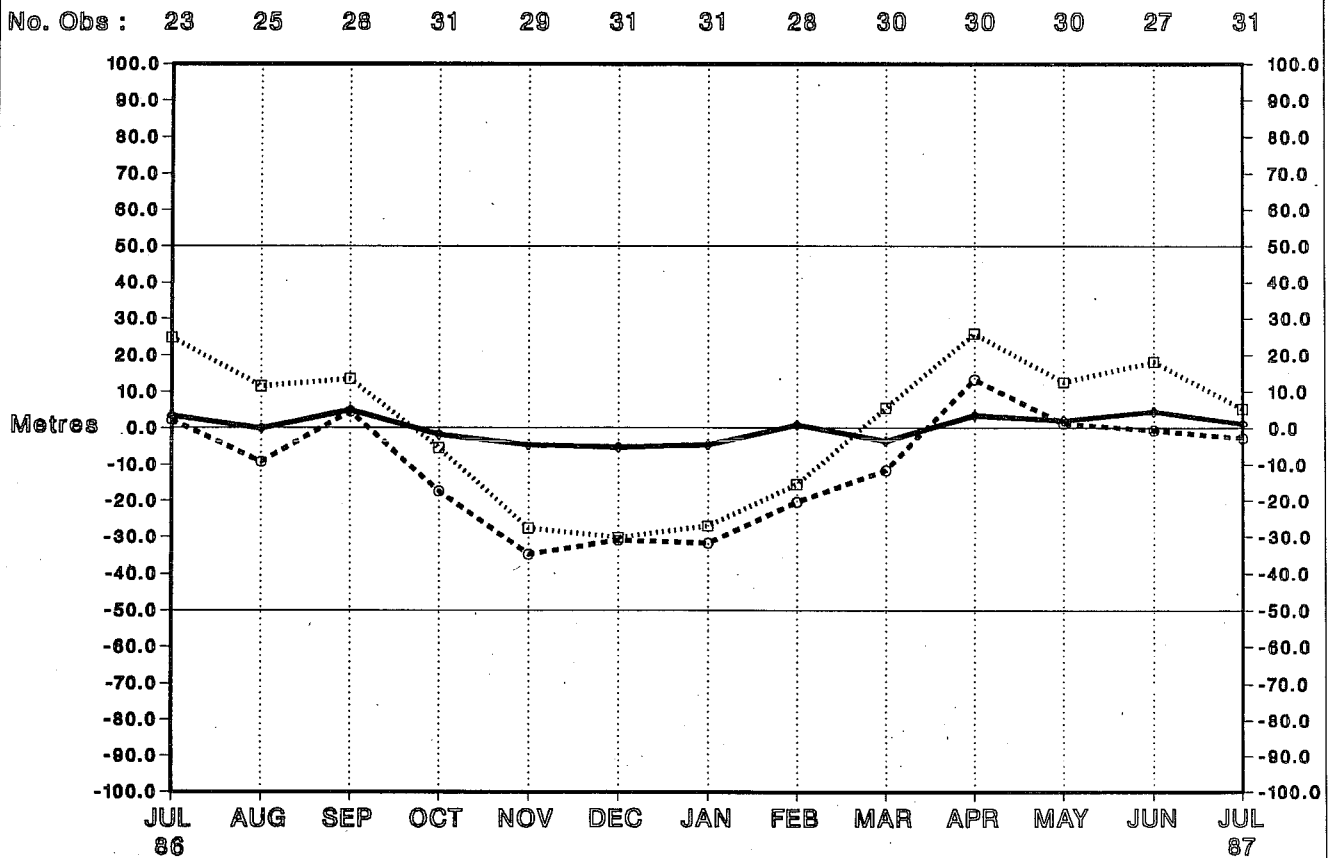
Station 72213 (31N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa
-



Station 72213 (31N 081W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

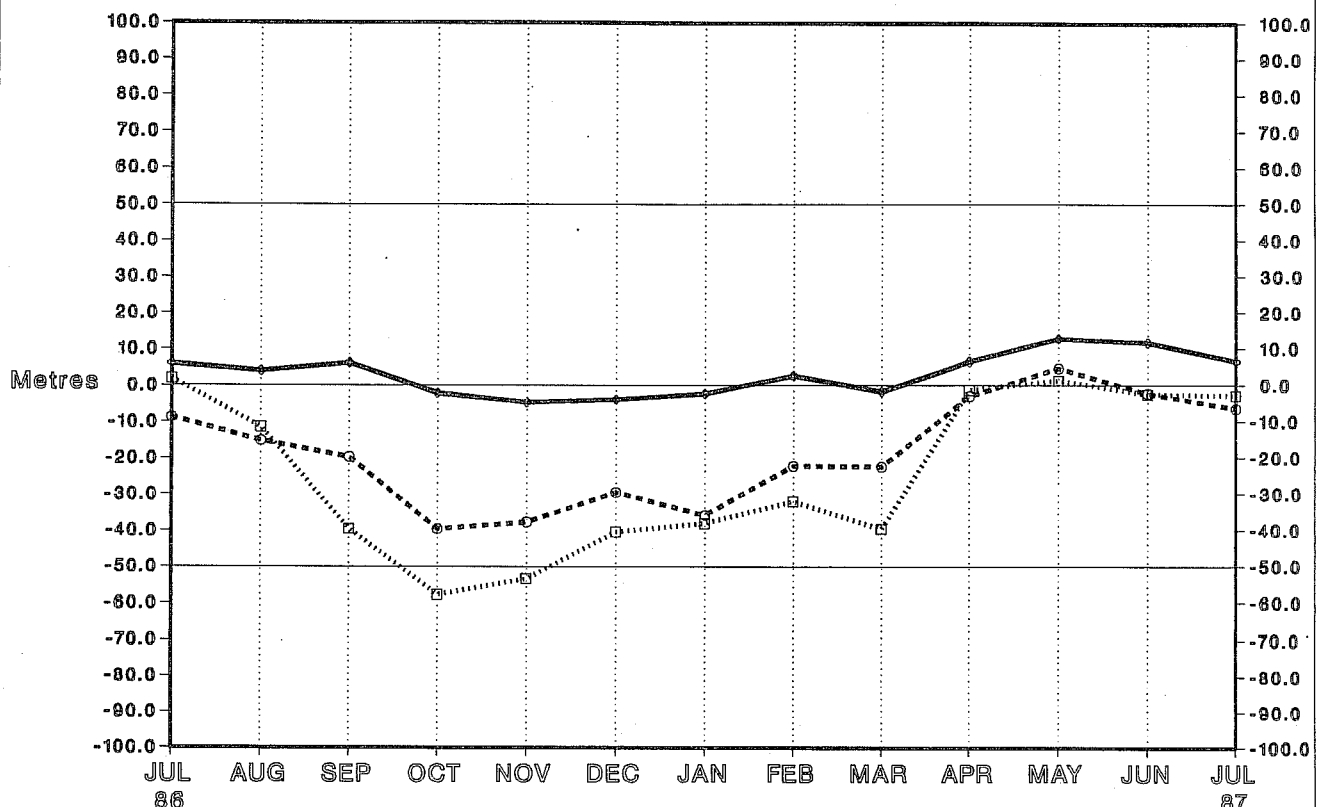
- ◇ 500 hPa
- 100 hPa
- 50 hPa
-



Station 72220 (30N 084W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

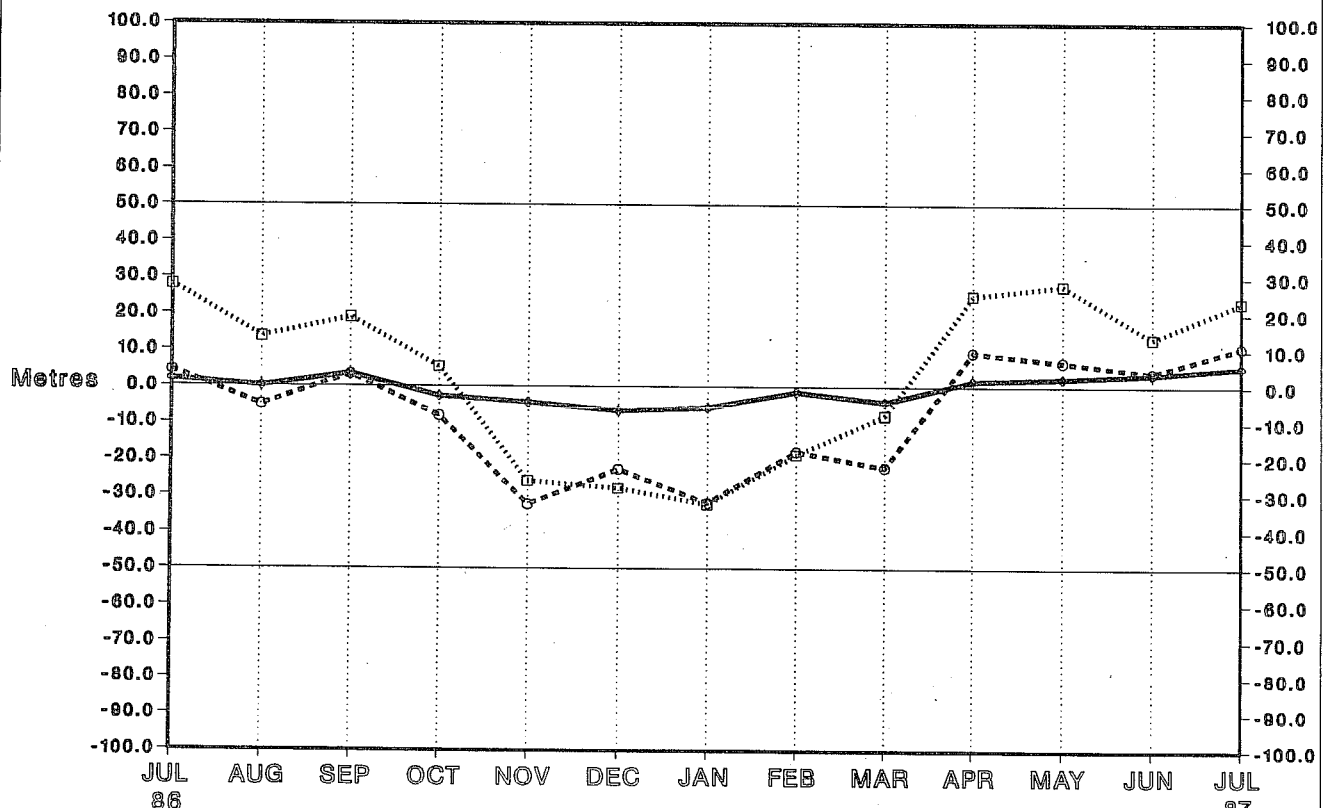
No. Obs : 30 31 29 31 28 29 31 28 29 29 30 29 31



Station 72220 (30N 084W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

◊ 500 hPa
 ○ 100 hPa
 ◻ 50 hPa

No. Obs : 29 30 30 30 30 31 31 28 29 29 31 29 31



Station 72229 (33N 086W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 19

27

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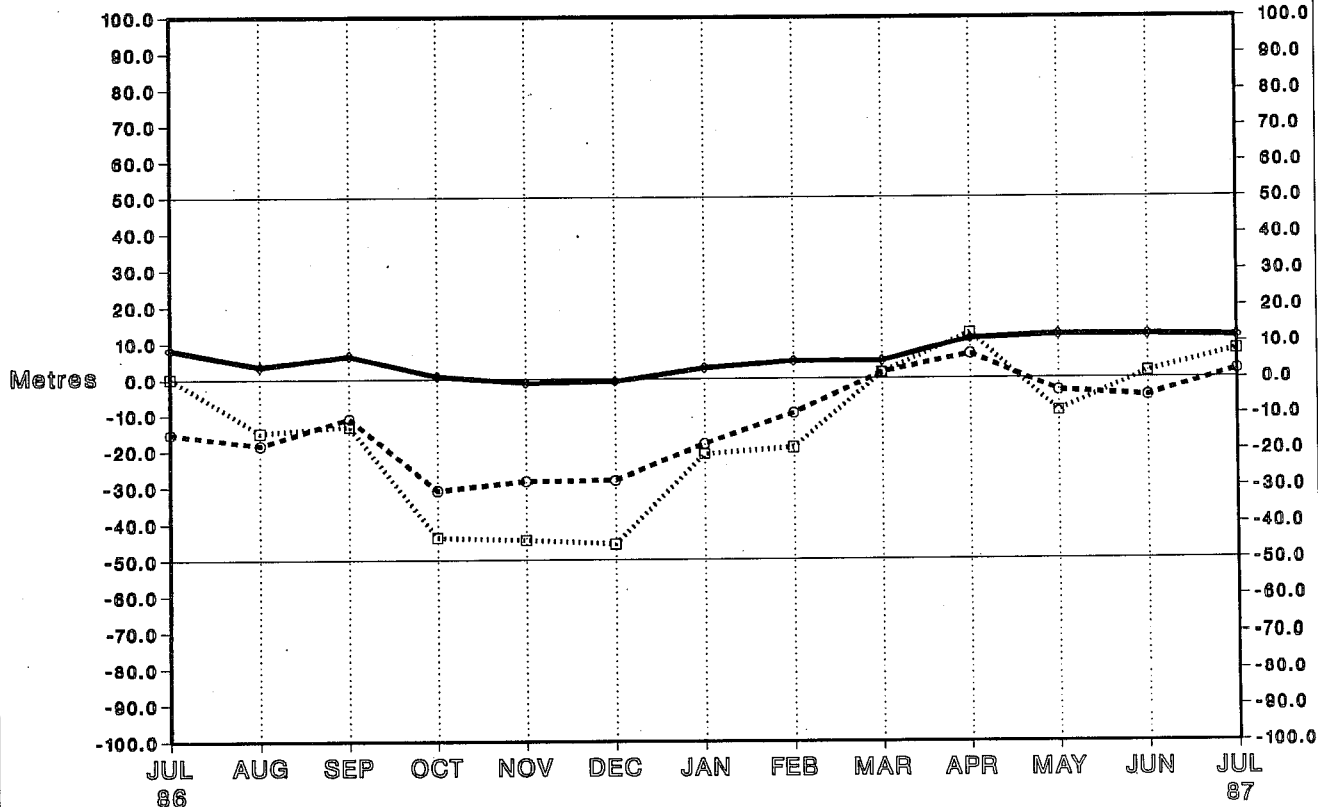
31

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Station 72229 (33N 086W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 23

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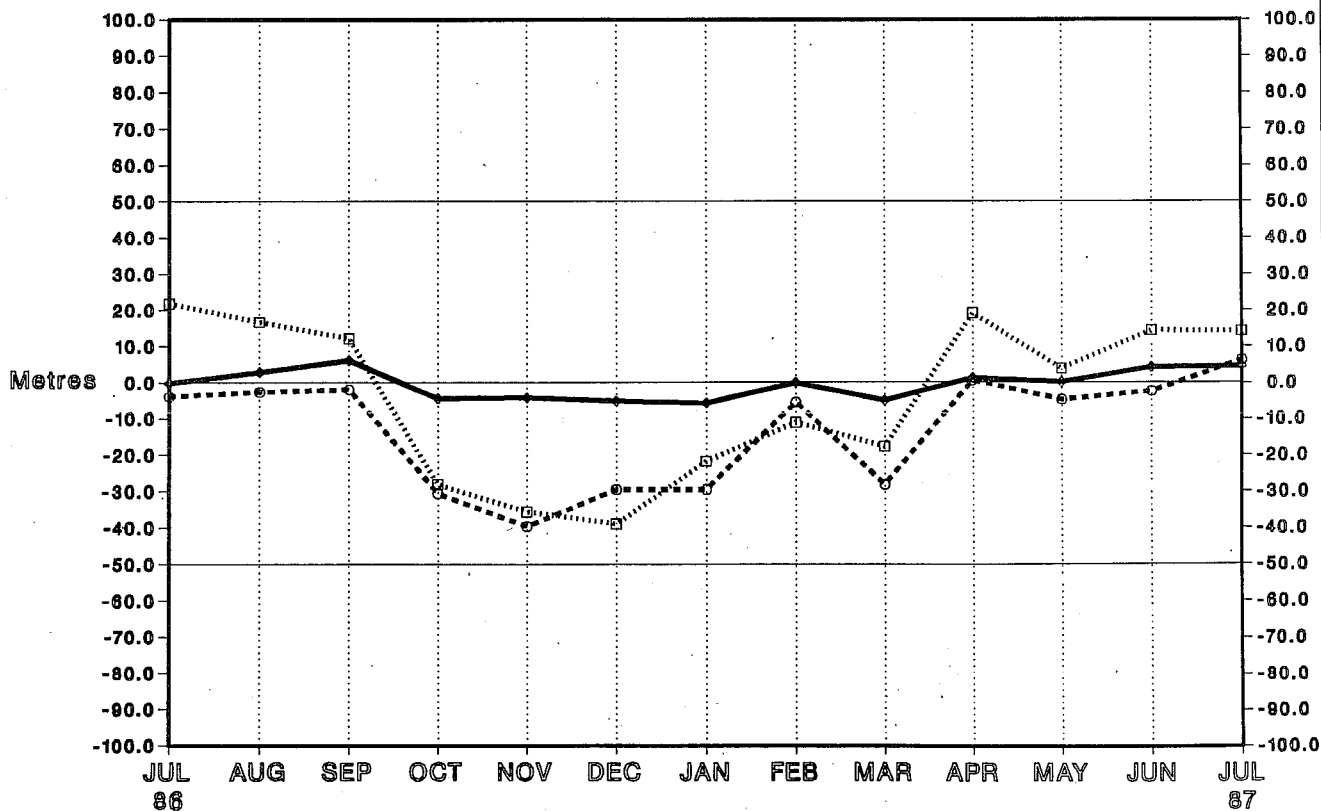
31

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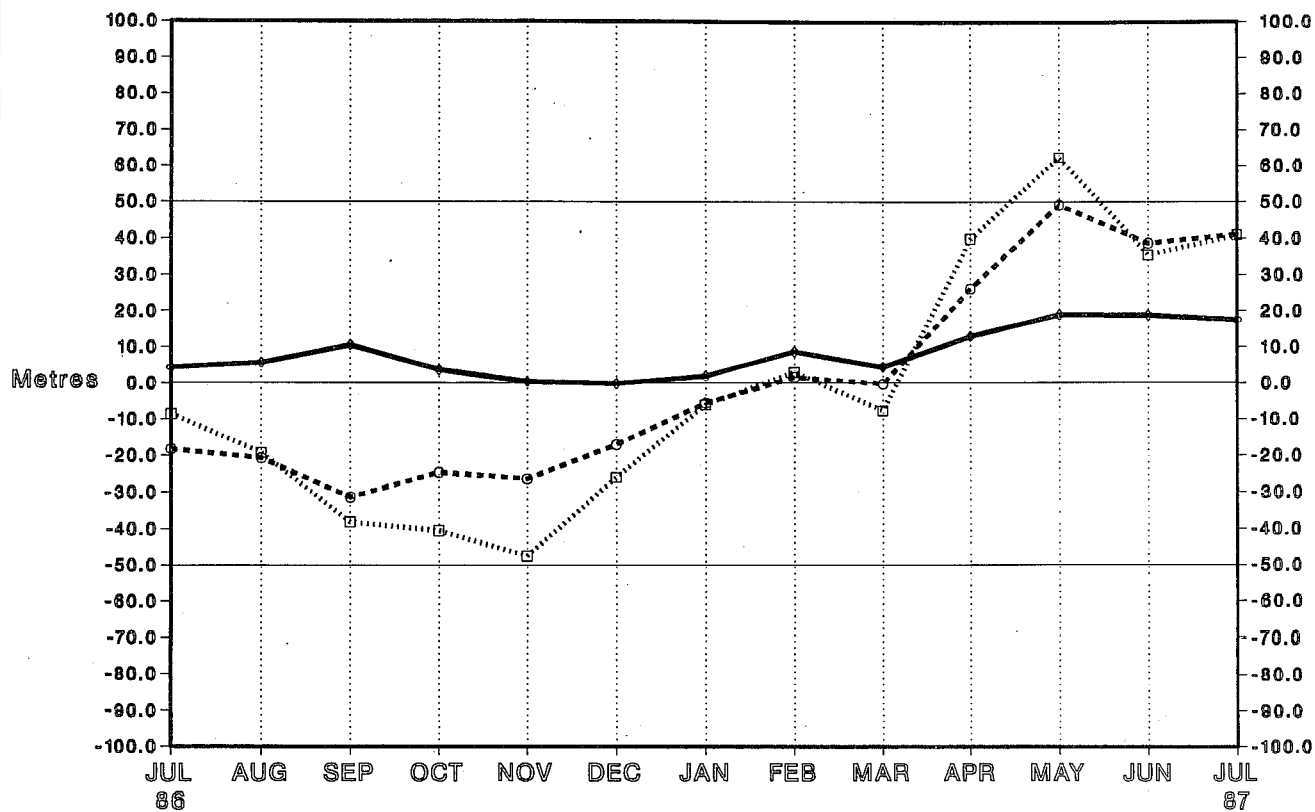
Station 72232 (29N 088W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30 29 29 27 29 26 29 26 29 30 30 30 31



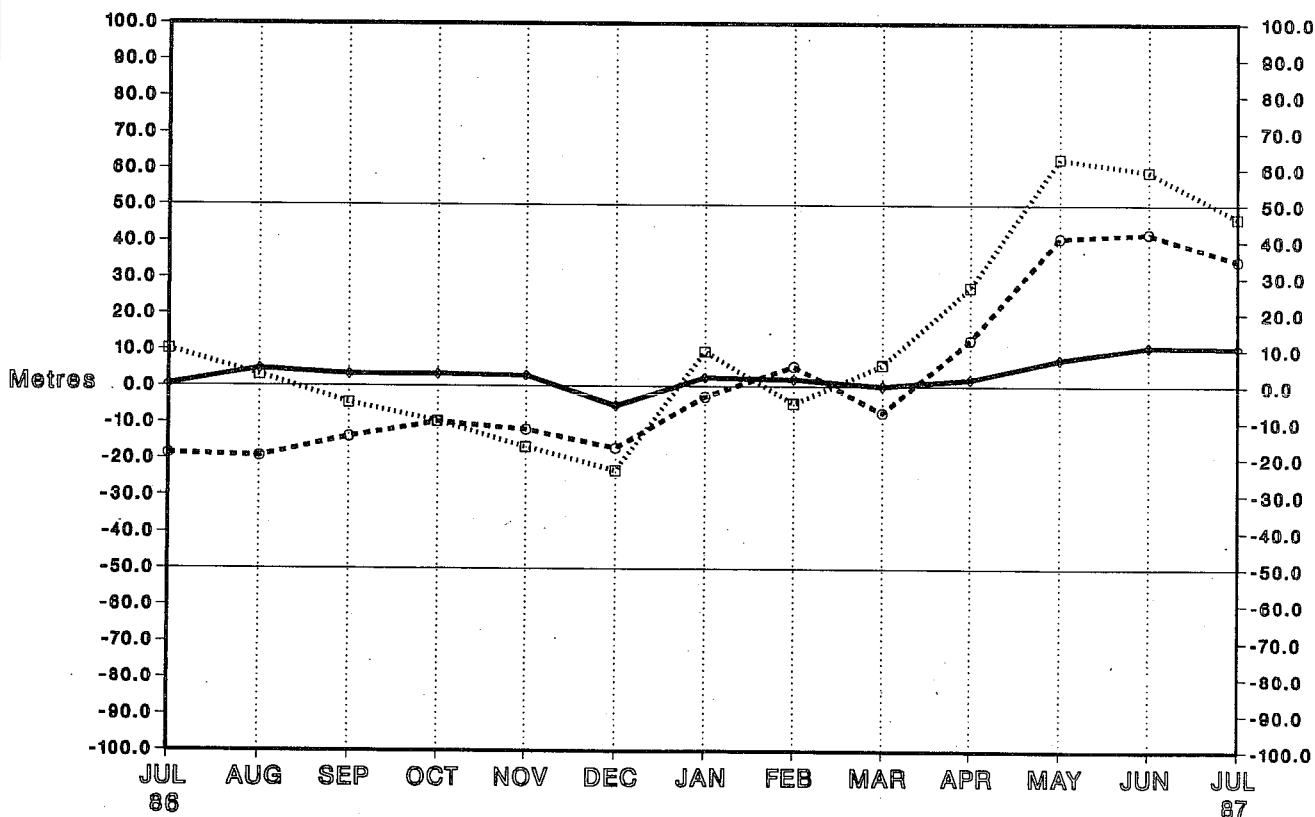
Station 72232 (29N 088W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

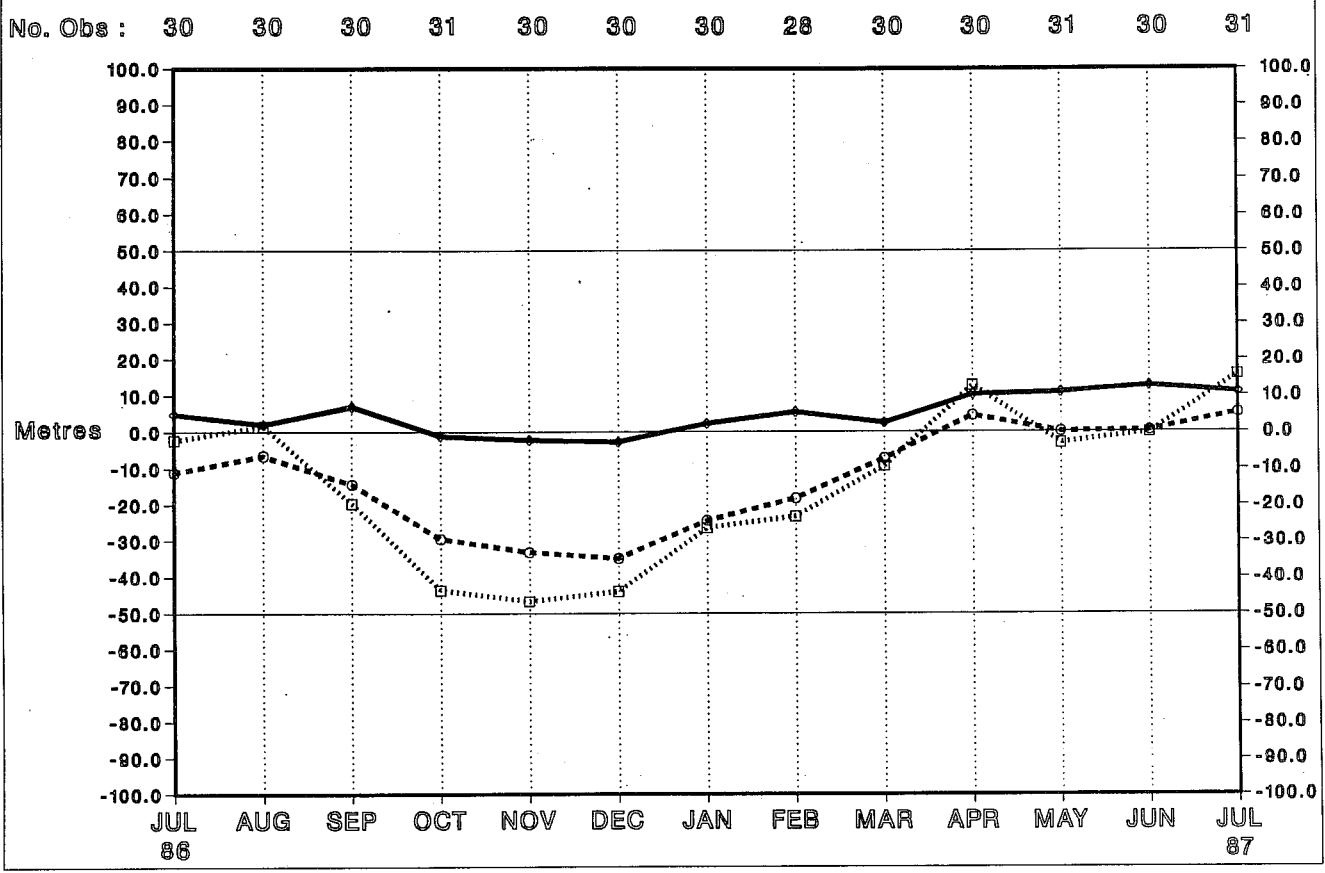
- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 30 29 27 26 29 27 26 26 31 30 31 29 31



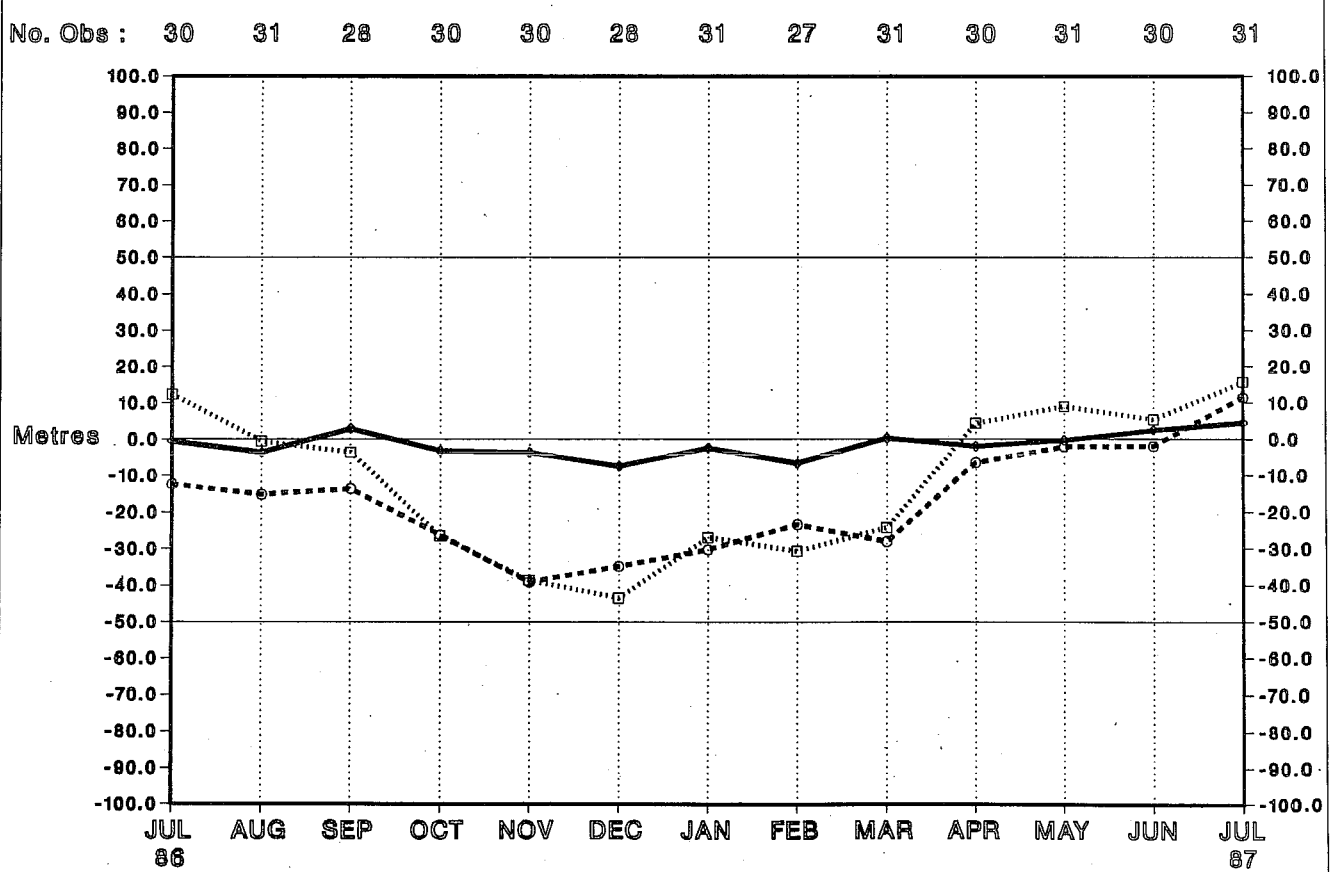
Station 72235 (32N 089W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa



Station 72235 (32N 089W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

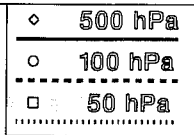
- ◇ 500 hPa
- 100 hPa
- 50 hPa



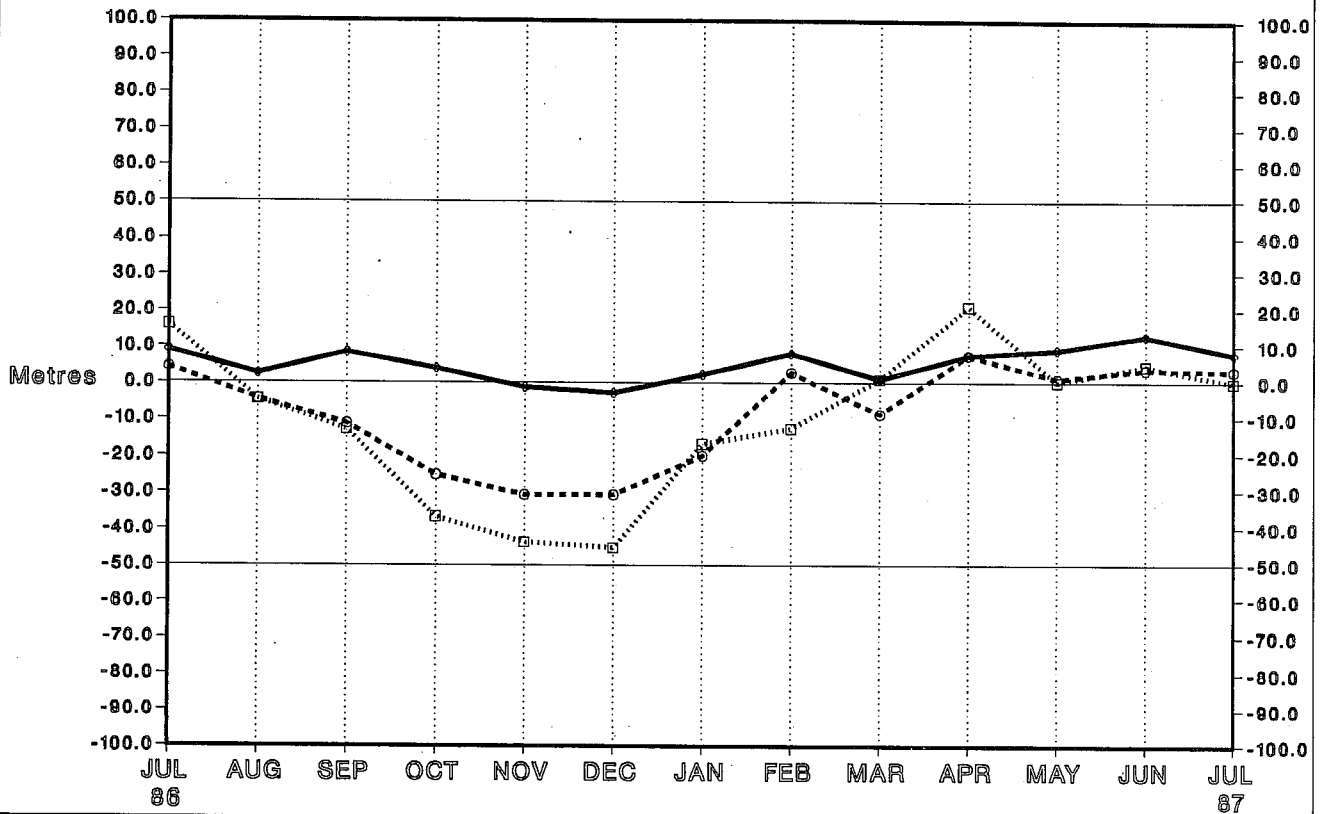
Station 72240 (30N 092W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



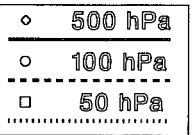
No. Obs : 16 15 29 30 30 30 31 28 31 29 31 29 30



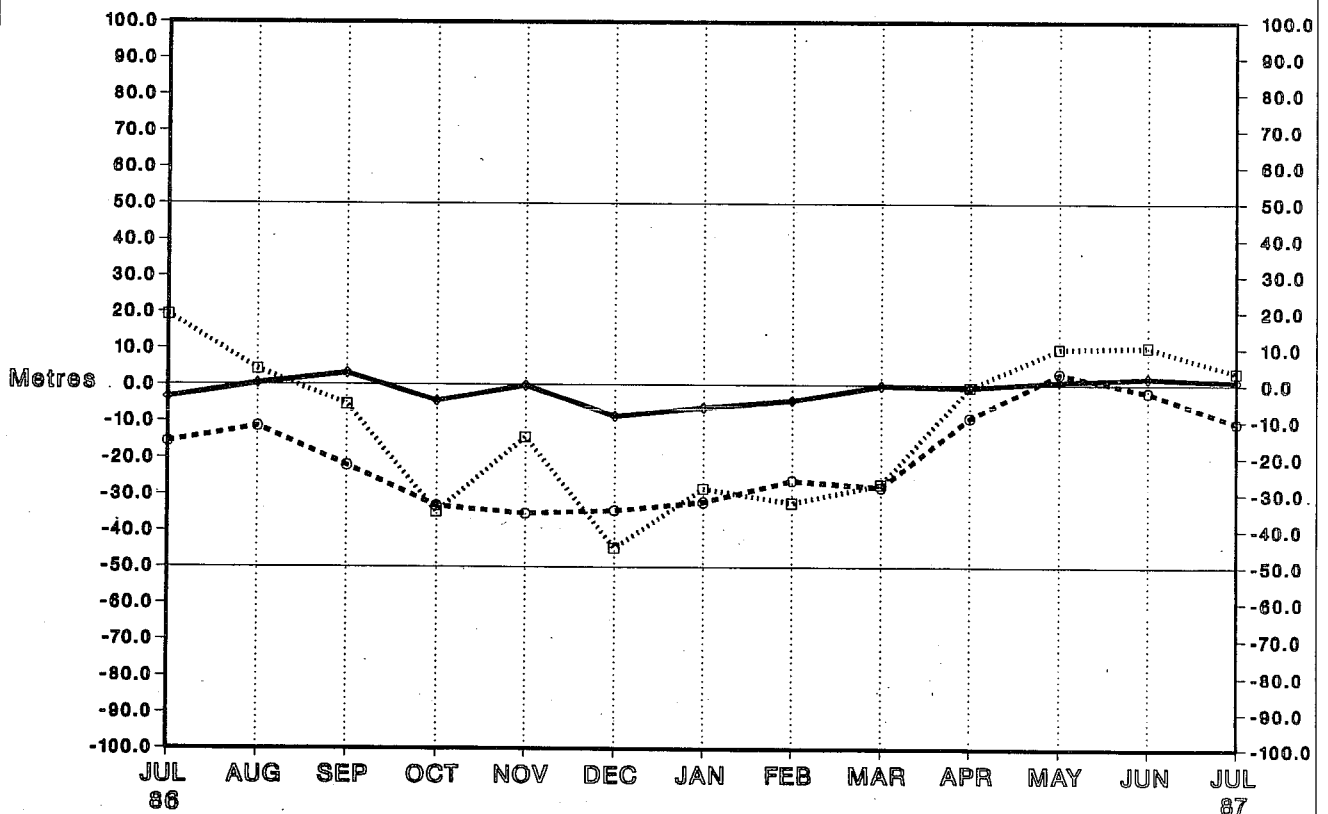
Station 72240 (30N 092W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 18 17 30 29 30 31 31 28 31 30 31 30 31



Station 72247 (32N 094W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 31

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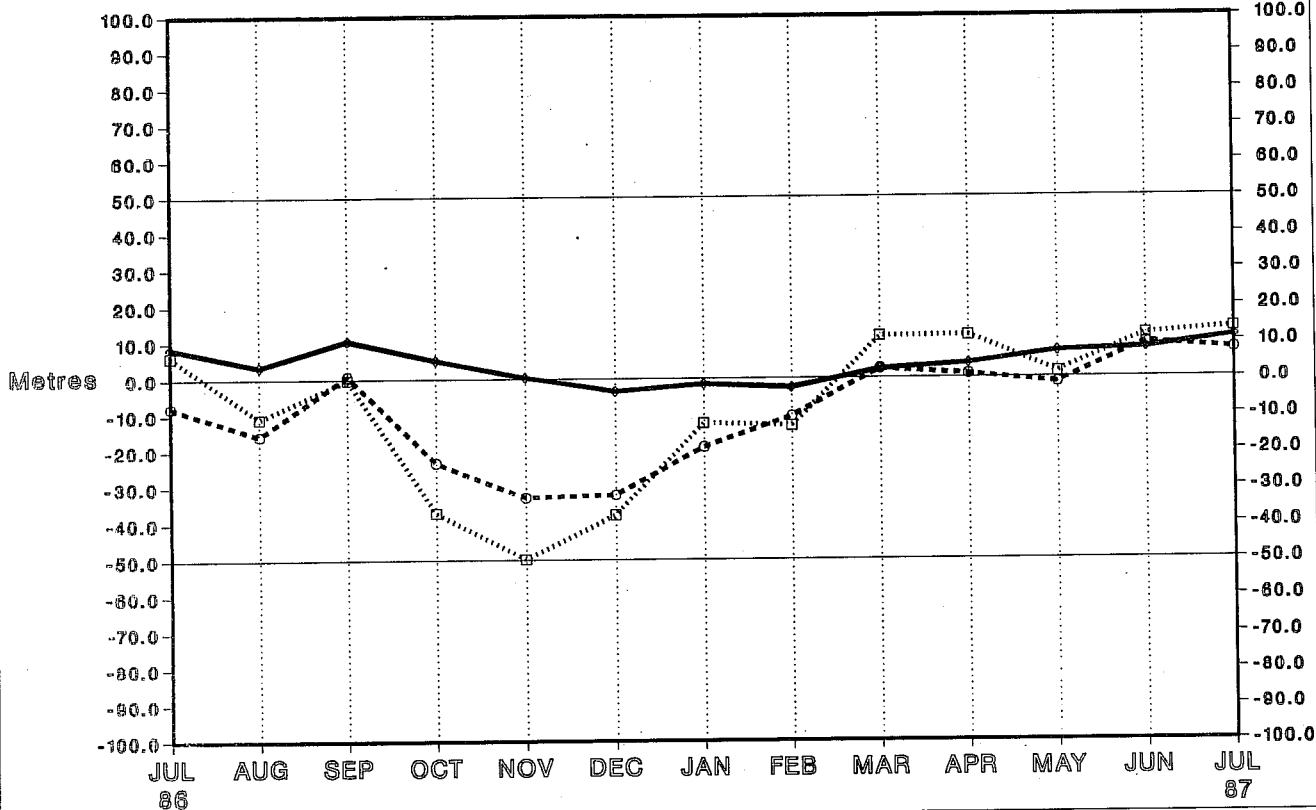
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Station 72247 (32N 094W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs: 30

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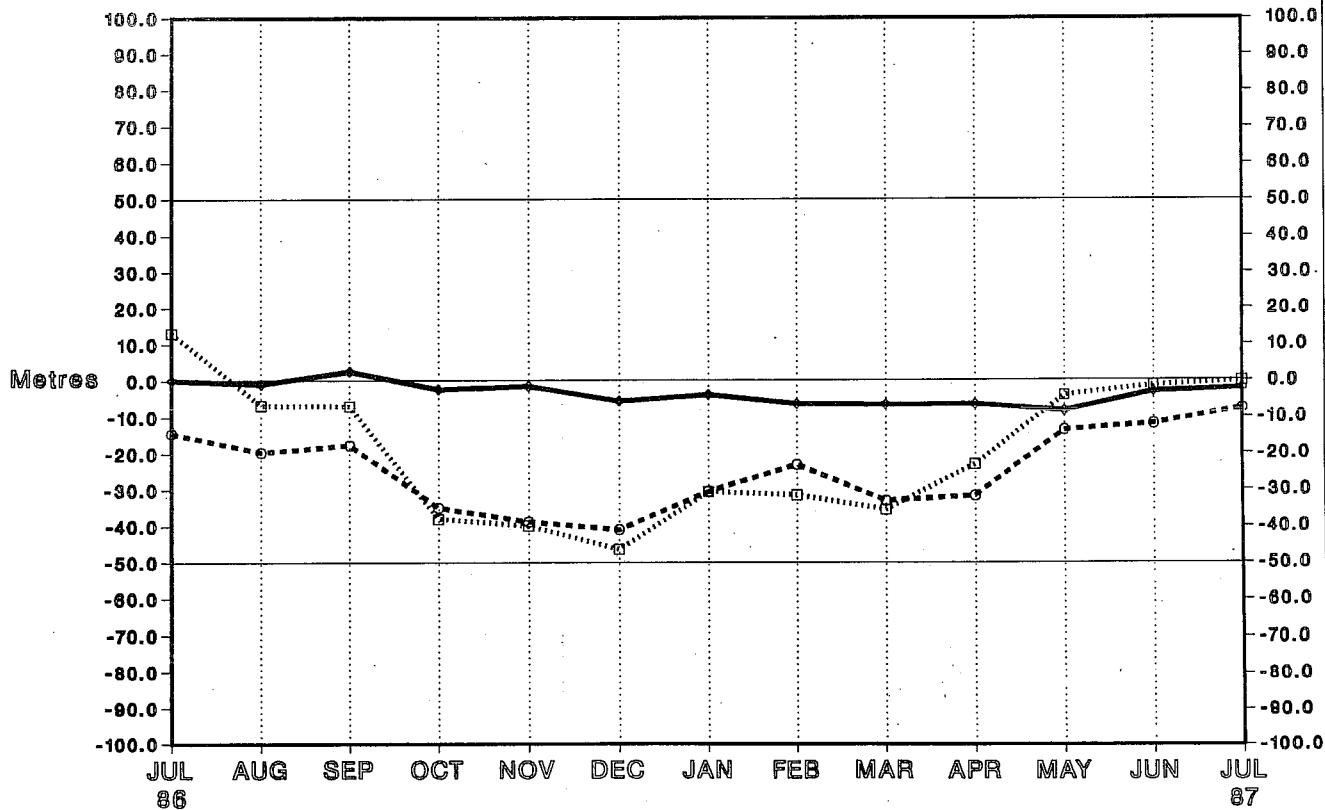
31

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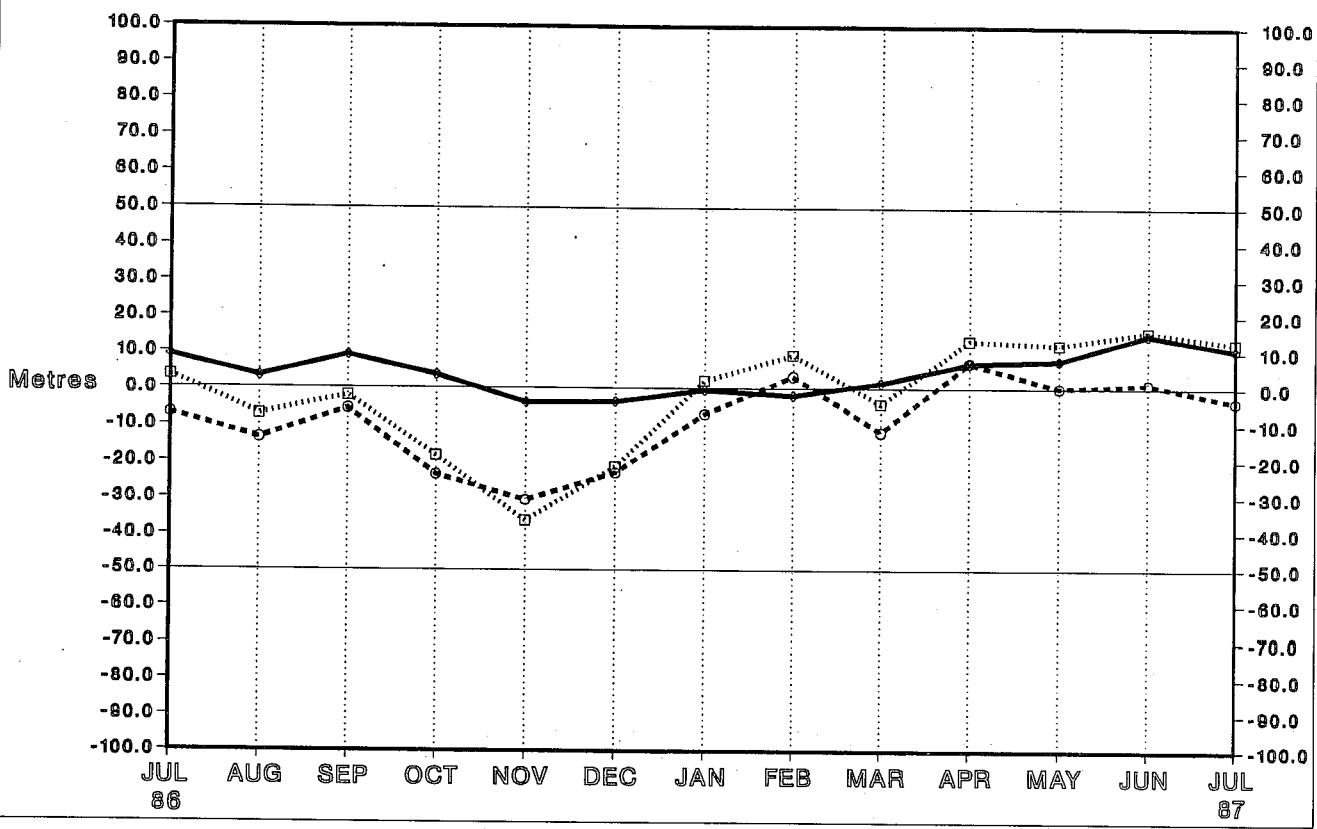
Station 72250 (26N 096W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 30 27 31 30 31 28 27 30 21 31 30 31



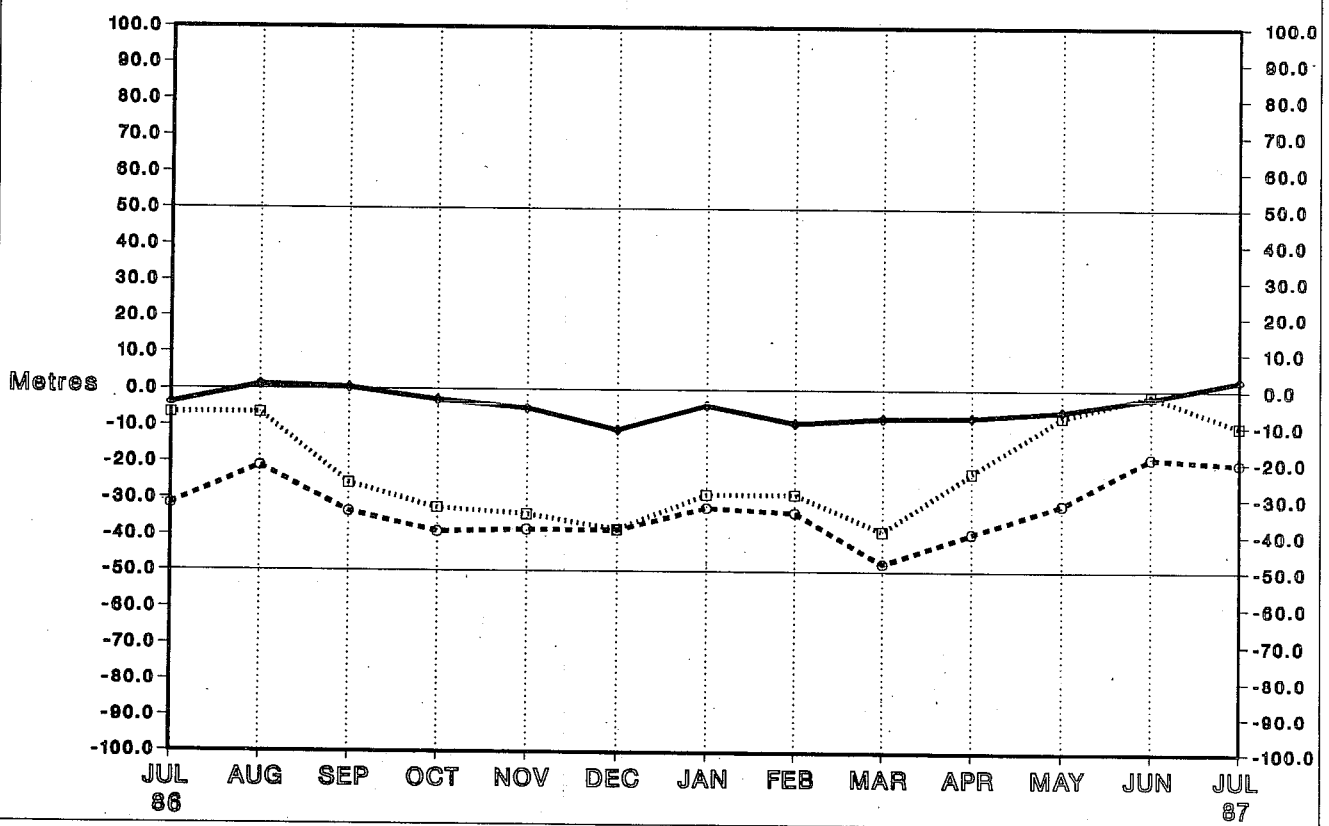
Station 72250 (26N 096W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- 50 hPa

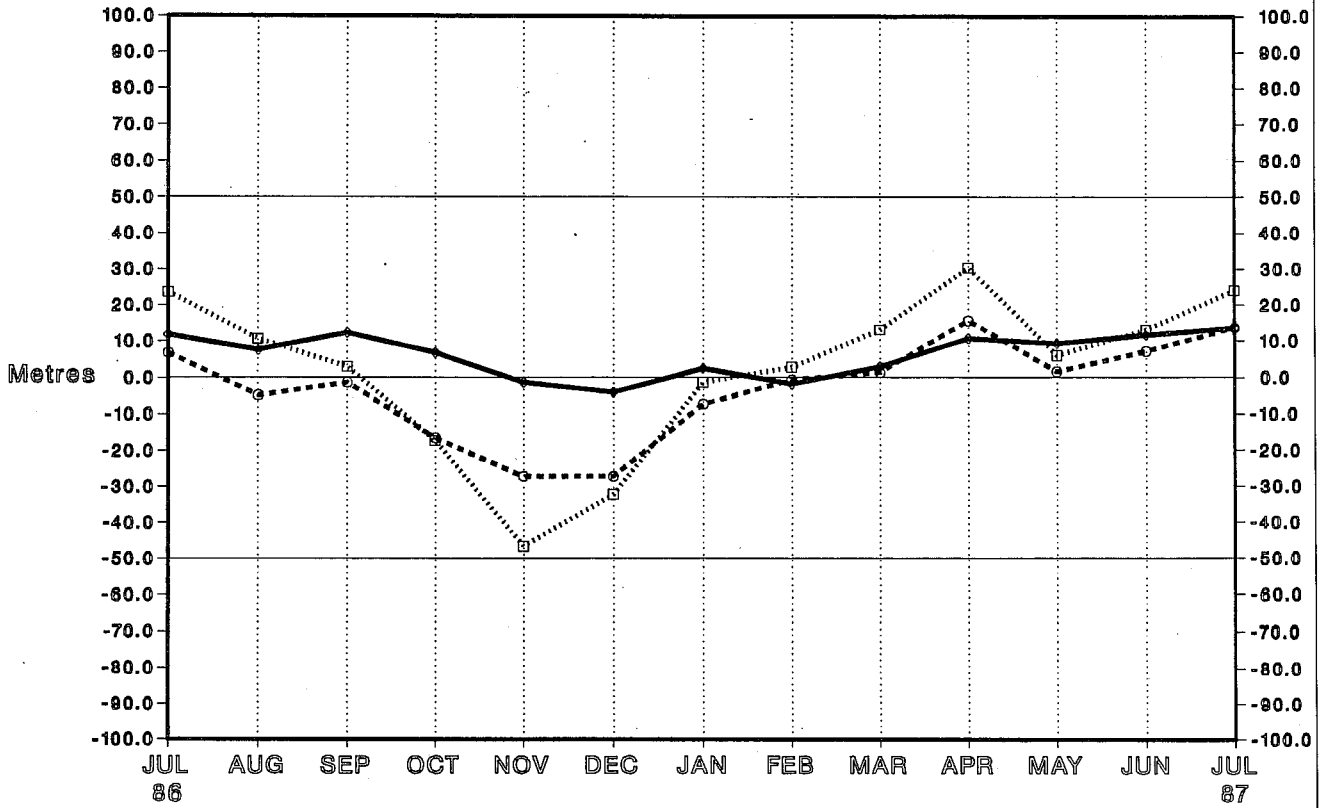
No. Obs : 30 31 26 31 30 31 25 27 31 19 31 30 31



Station 72255 (29N 096W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

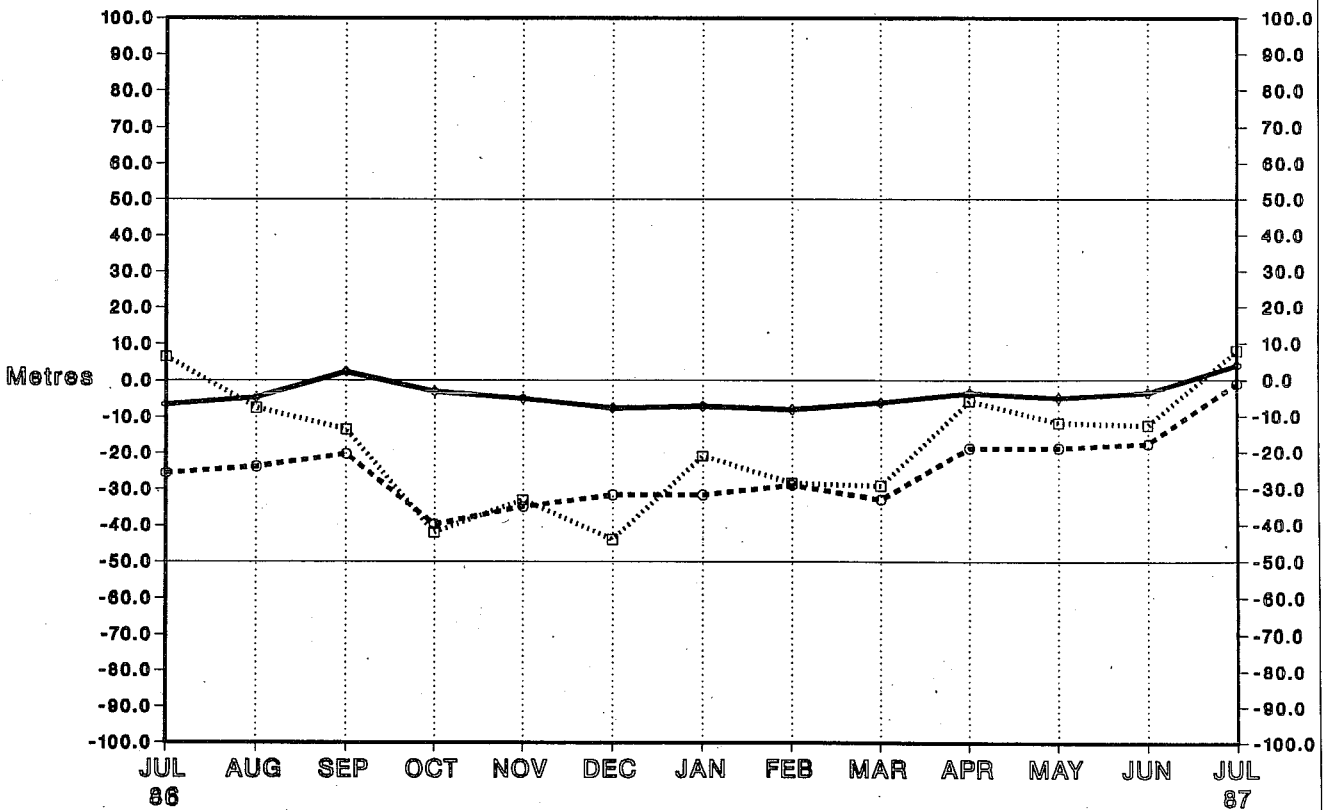
No. Obs : 31 29 30 31 30 30 31 28 31 30 30 30 30



Station 72255 (29N 096W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

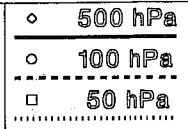
No. Obs : 31 31 29 31 30 31 30 26 31 30 31 29 31



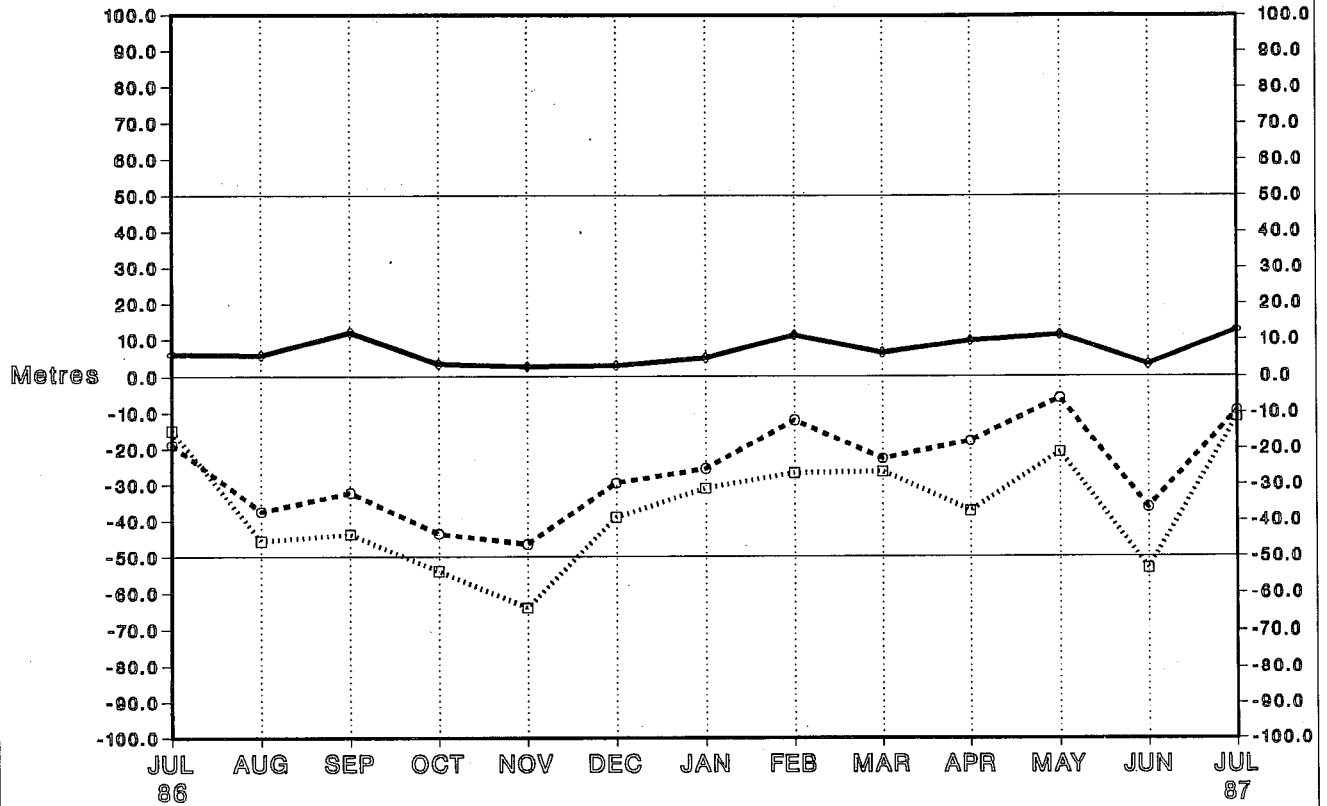
Station 72304 (35N 075W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



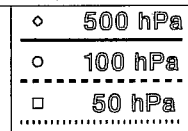
No. Obs : 29 30 30 31 30 30 31 28 31 28 31 30 31



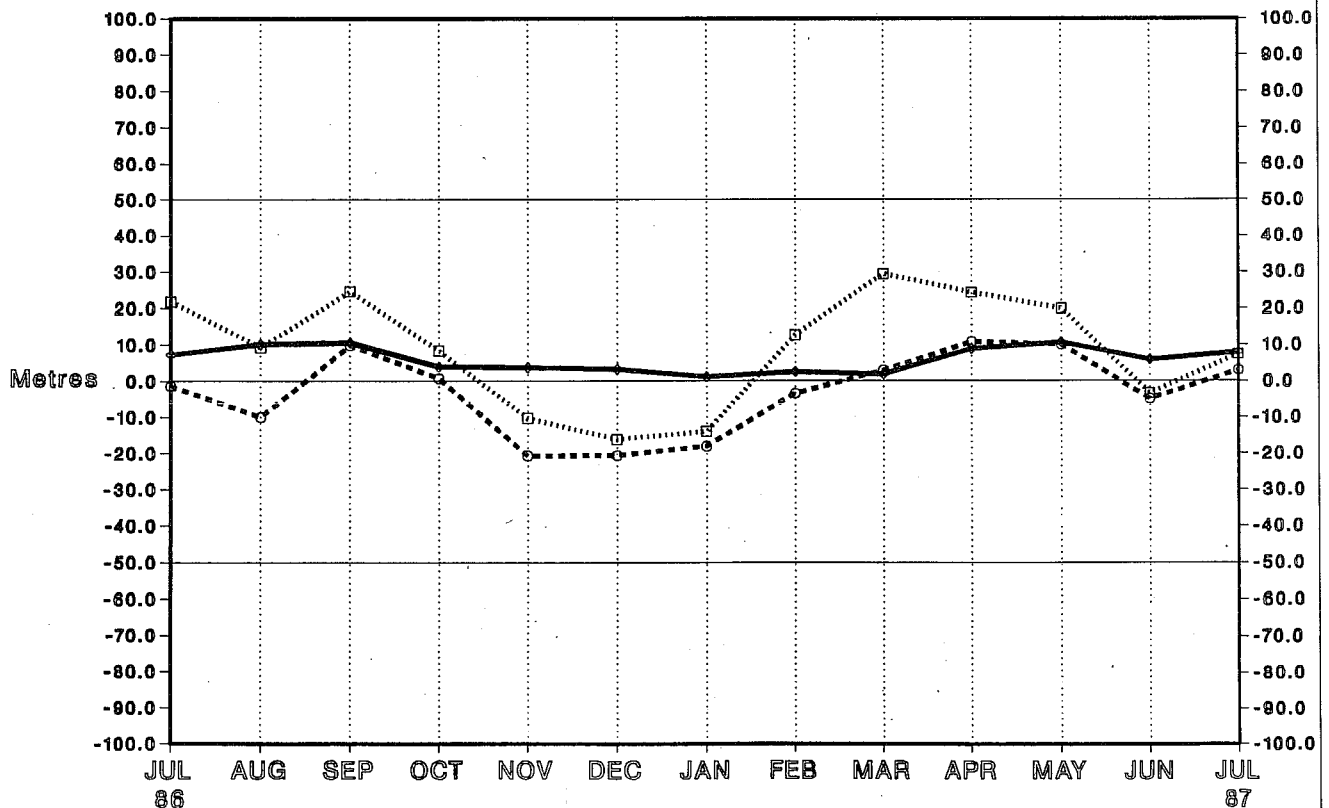
Station 72304 (35N 075W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



No. Obs : 28 28 28 31 30 29 30 28 31 30 31 30 31



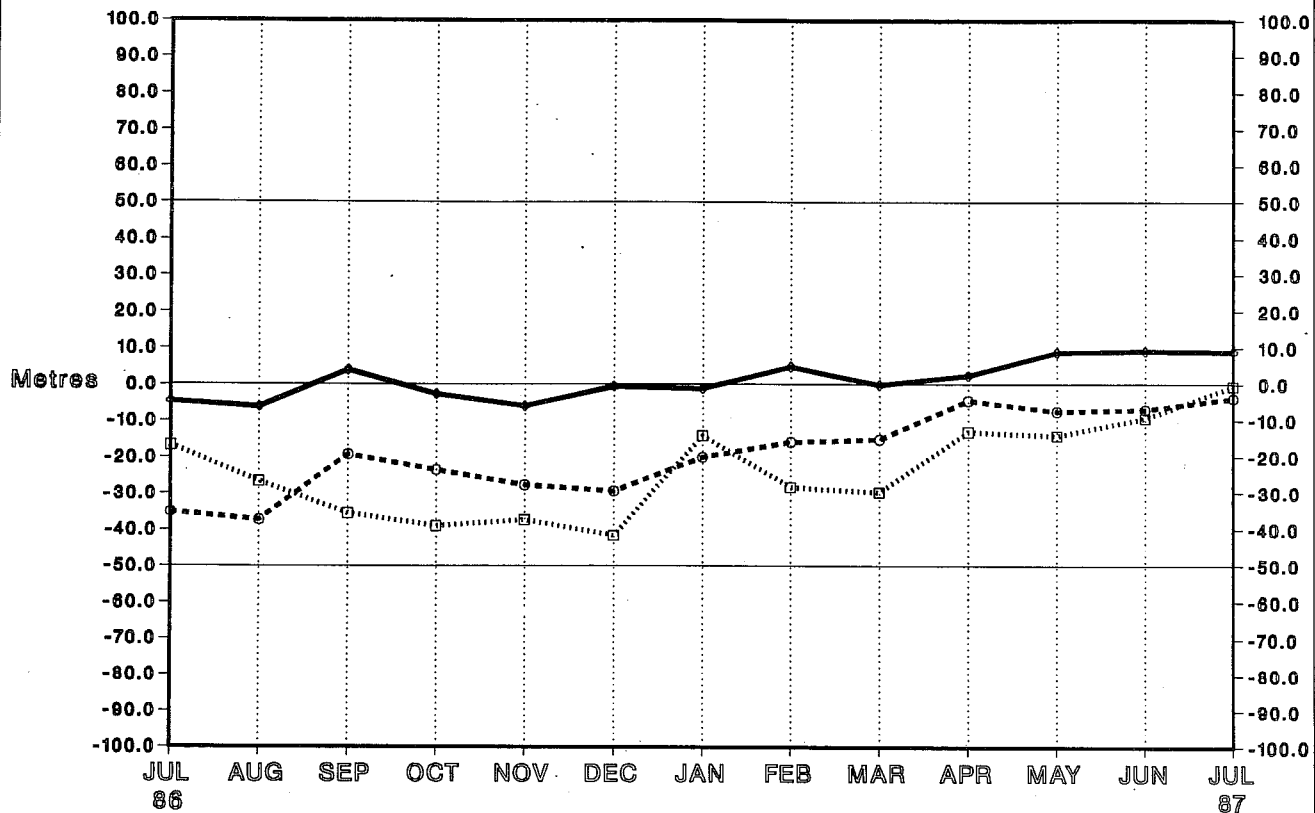
Station 72311 (34N 082W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

No. Obs : 24 26 28 31 30 30 31 27 31 30 30 29 31



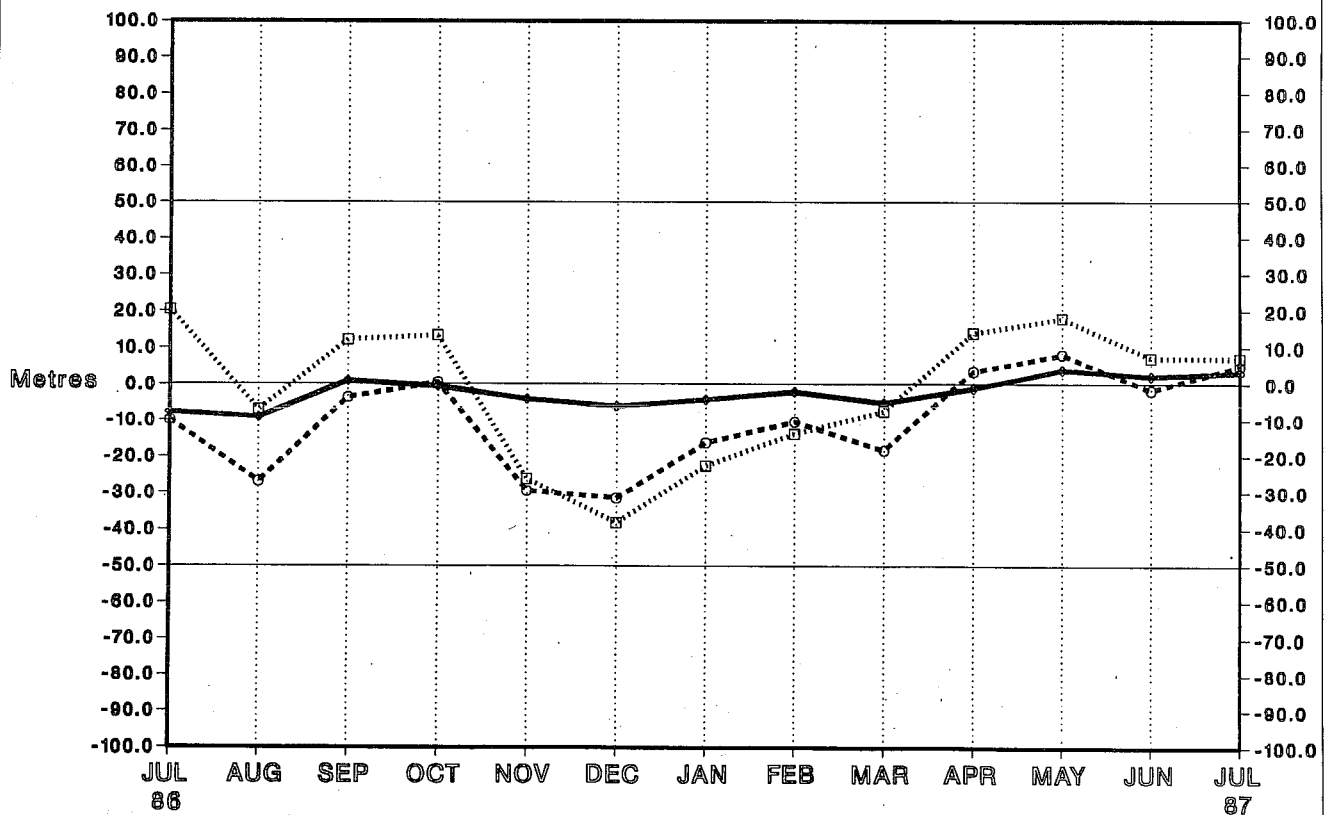
Station 72311 (34N 082W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

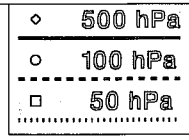
No. Obs : 24 26 28 31 29 30 30 28 31 30 31 30 31



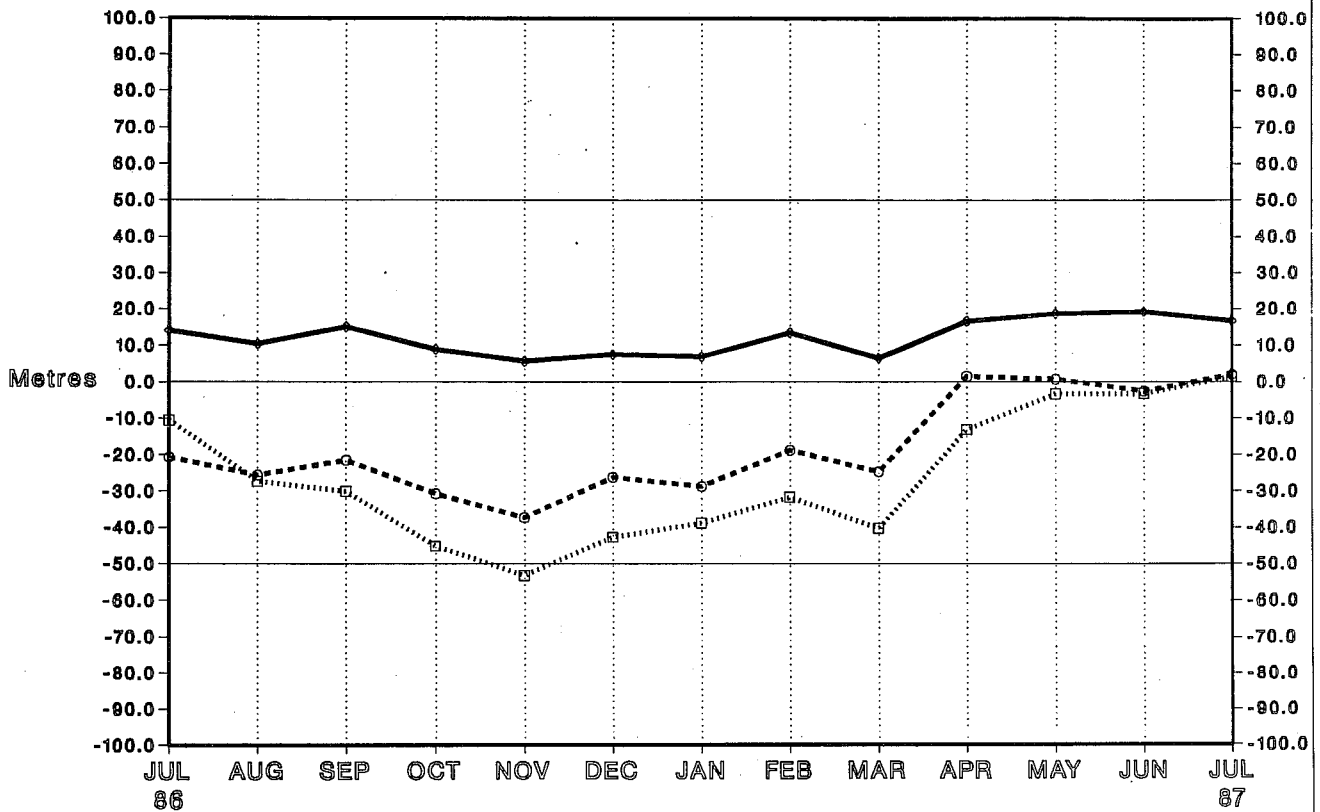
Station 72317 (36N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



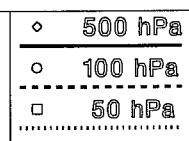
No. Obs : 31 30 27 31 29 29 30 27 31 29 31 30 31



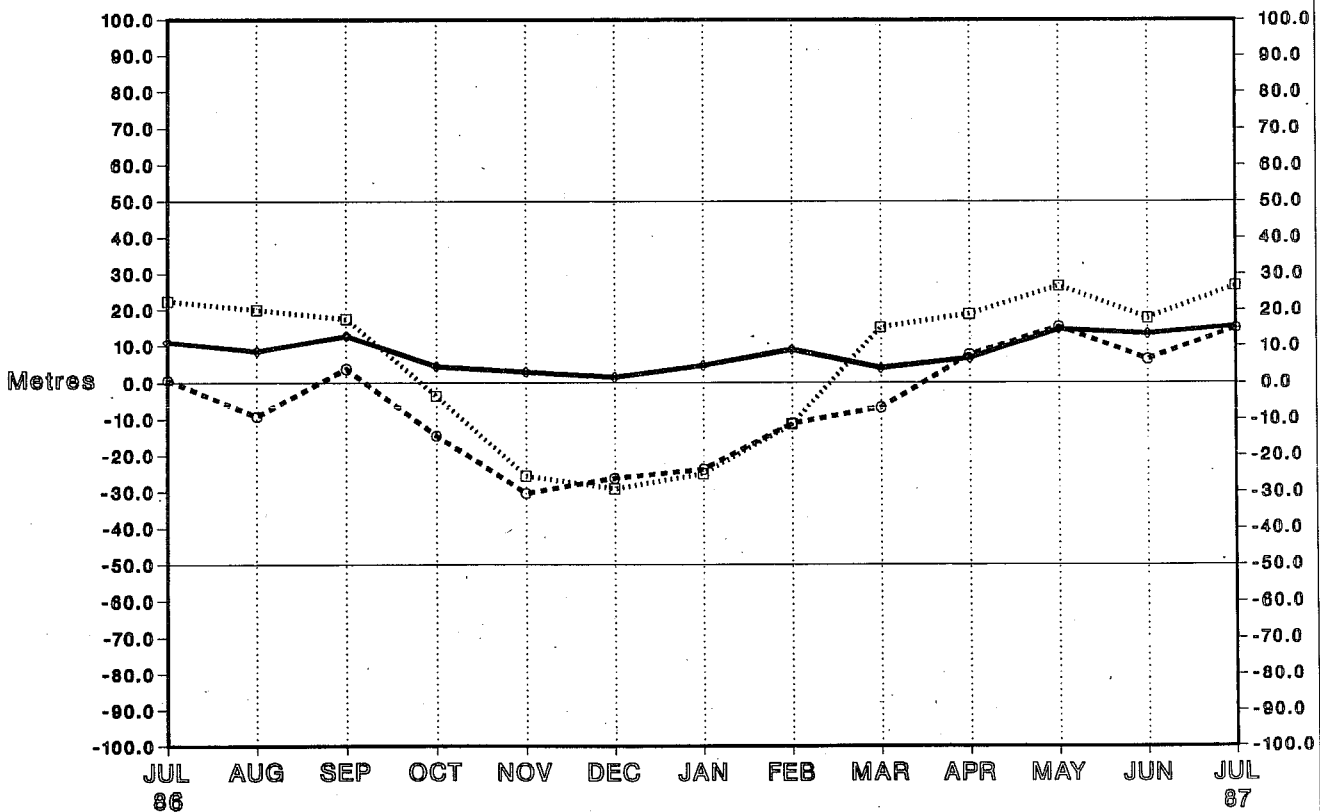
Station 72317 (36N 079W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



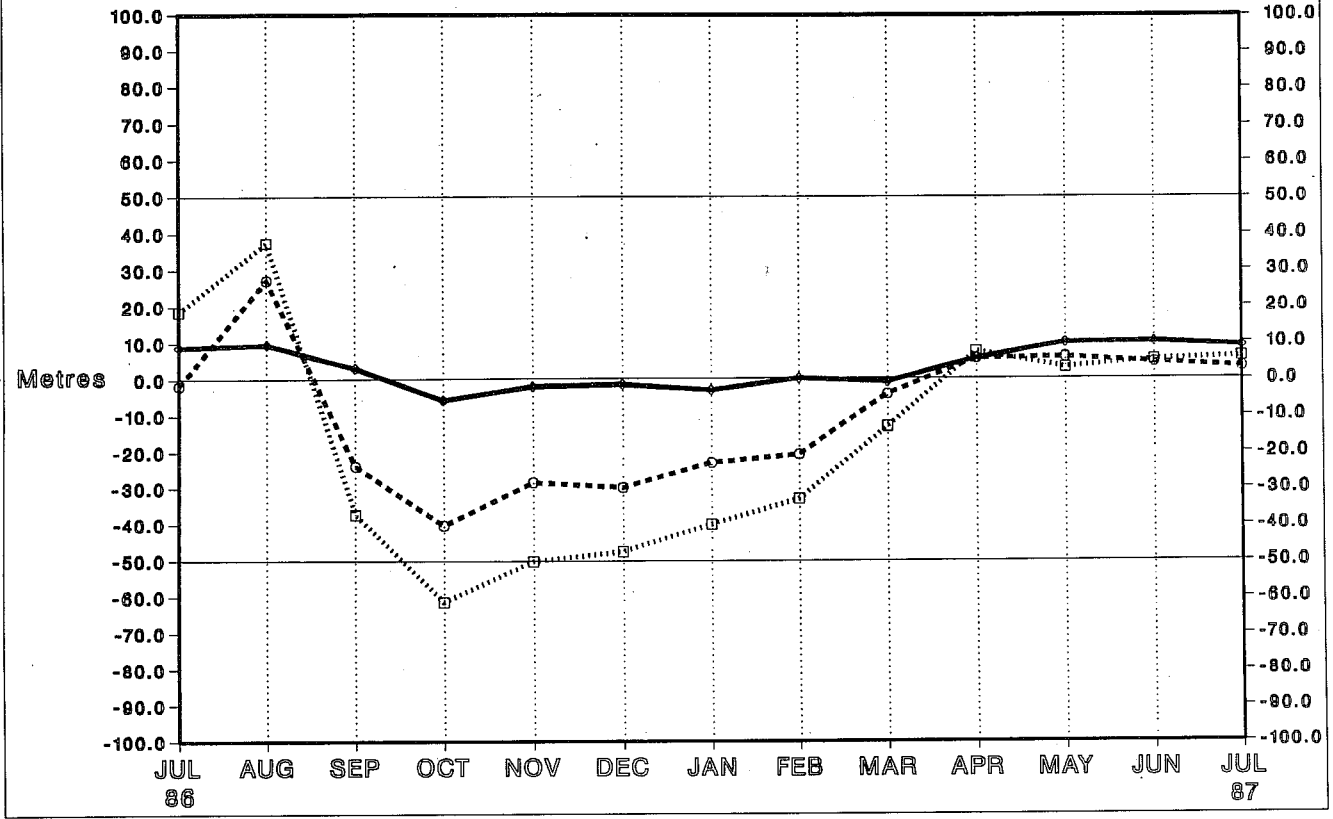
No. Obs : 30 29 24 31 30 31 31 27 31 30 31 30 31



Station 72327 (36N 086W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

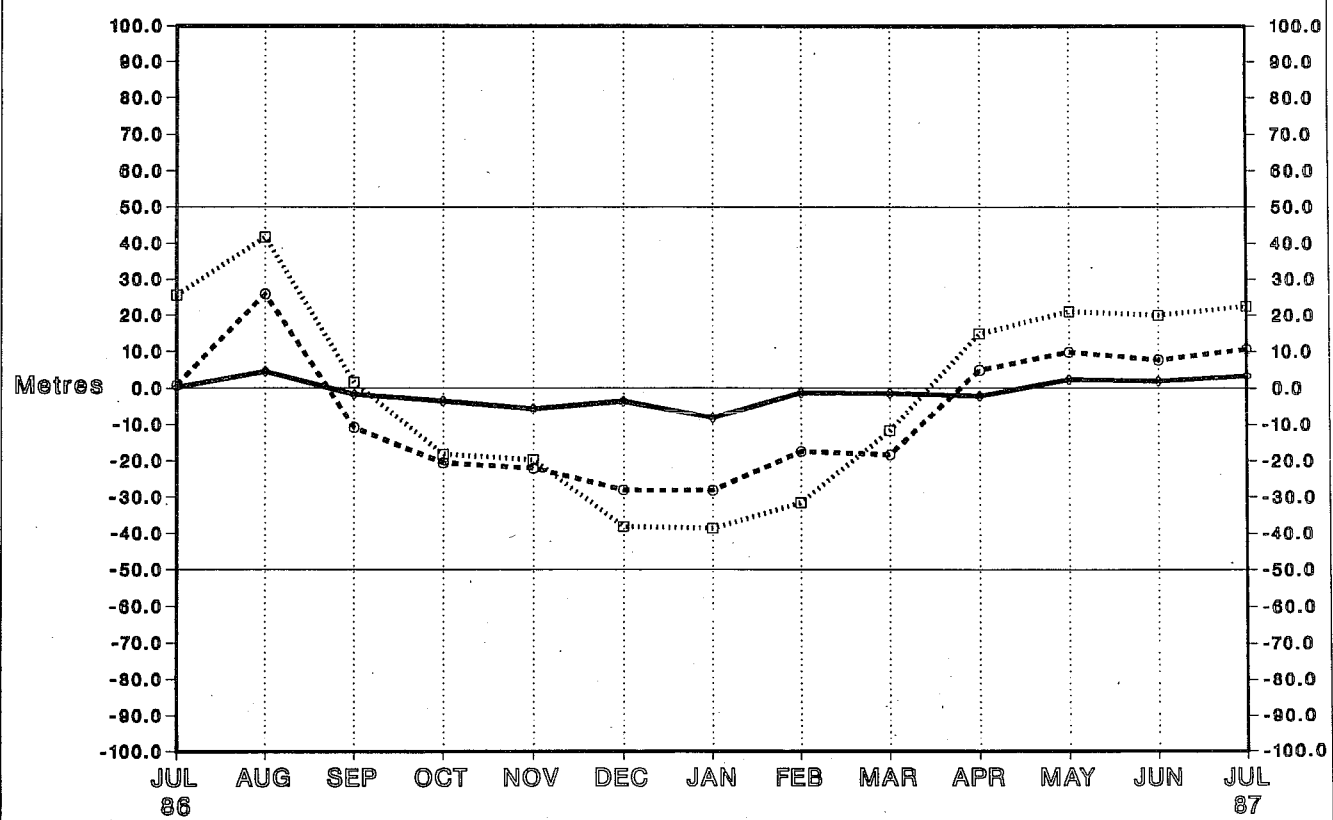
No. Obs : 28 30 30 31 30 29 31 28 31 29 31 30 30



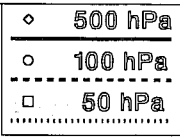
Station 72327 (36N 086W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◊ 500 hPa
- 100 hPa
- ◻ 50 hPa

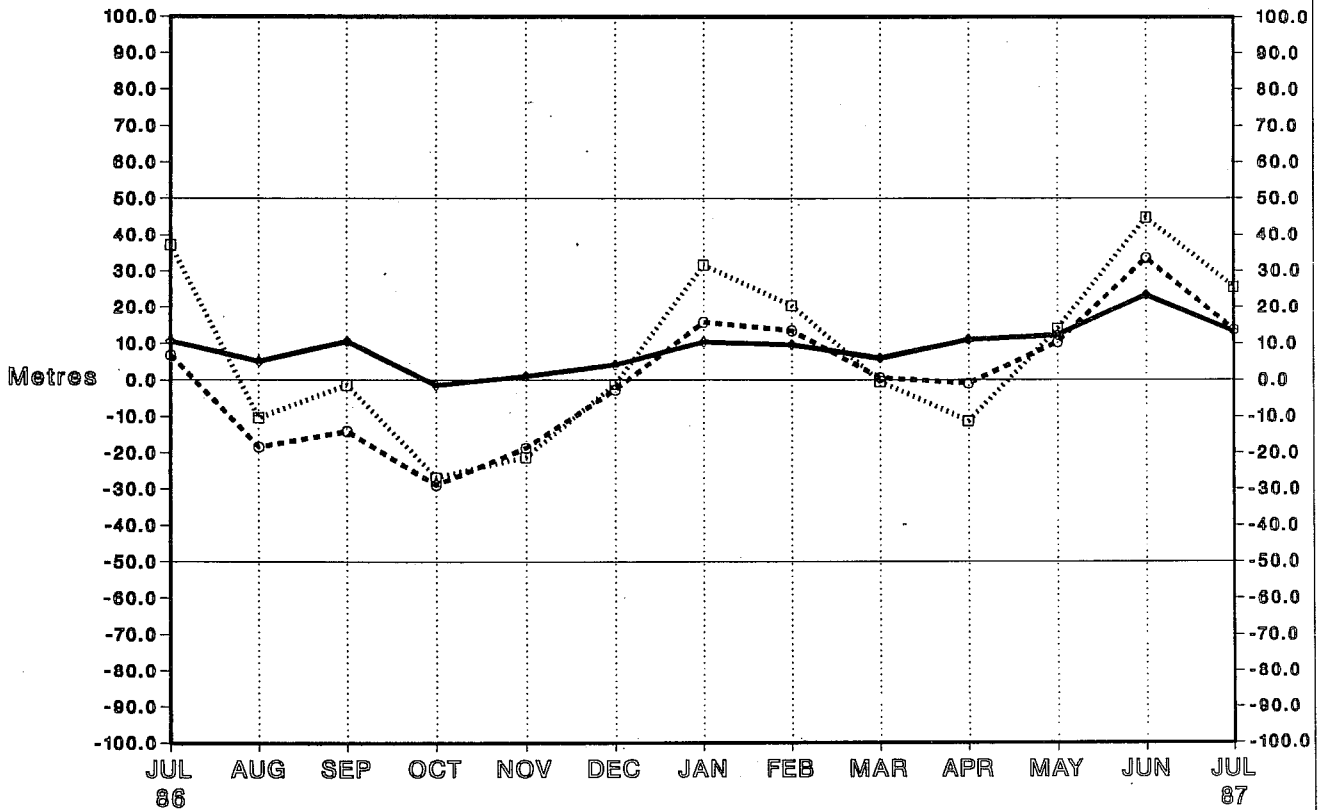
No. Obs : 31 30 28 31 30 31 31 28 31 30 31 30 31



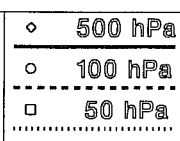
Station 72402 (38N 074W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



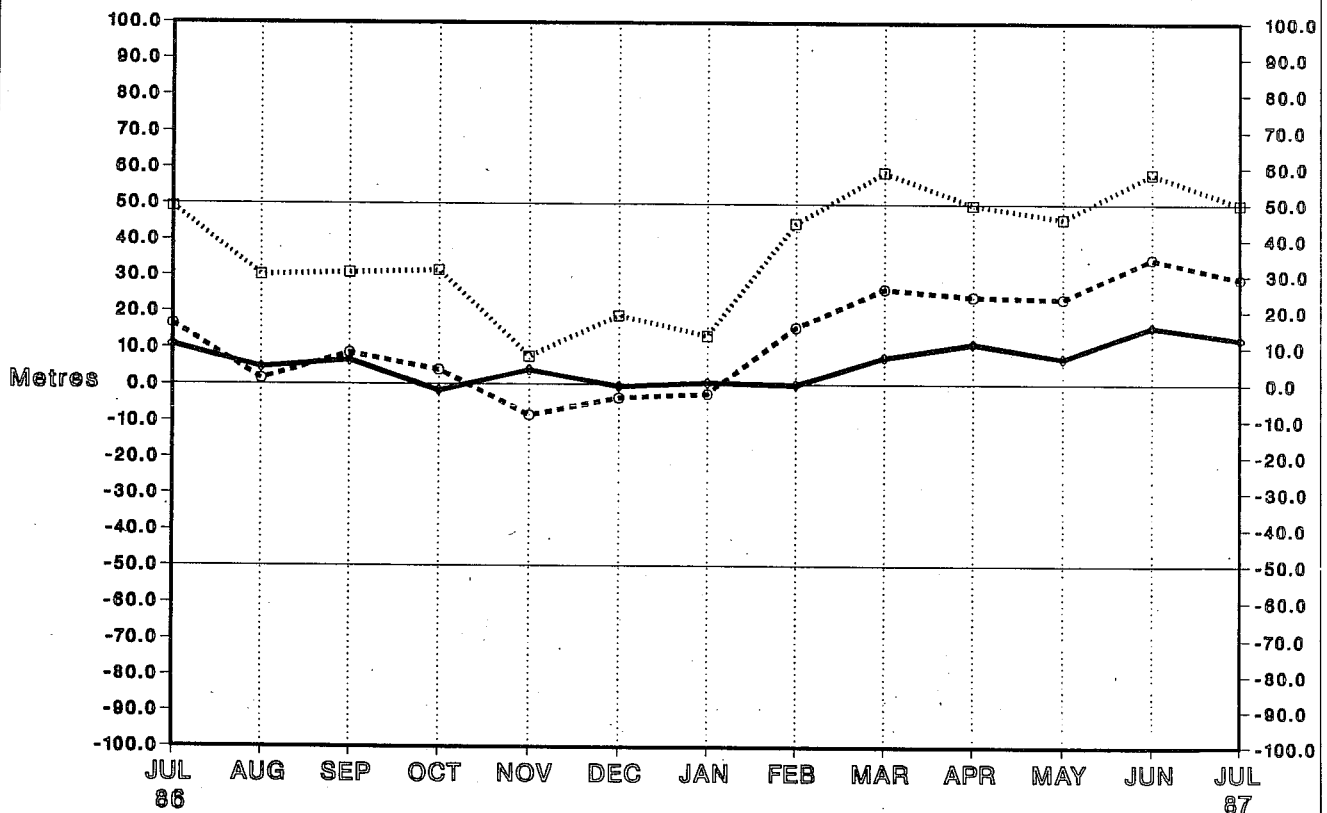
No. Obs : 31 30 28 31 29 28 30 28 31 30 31 30 31



Station 72402 (38N 074W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS



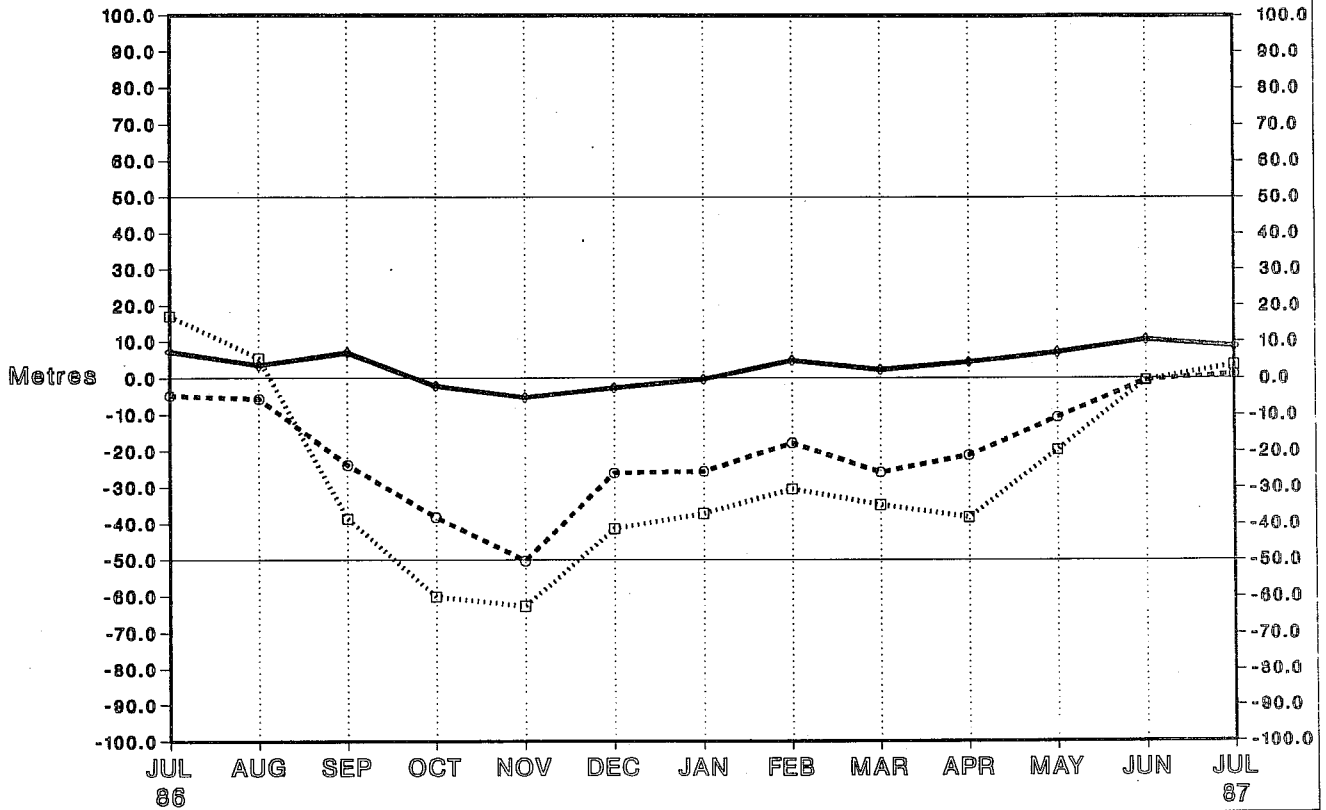
No. Obs : 31 30 28 29 30 30 30 28 30 28 30 30 31



Station 72403 (39N 076W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

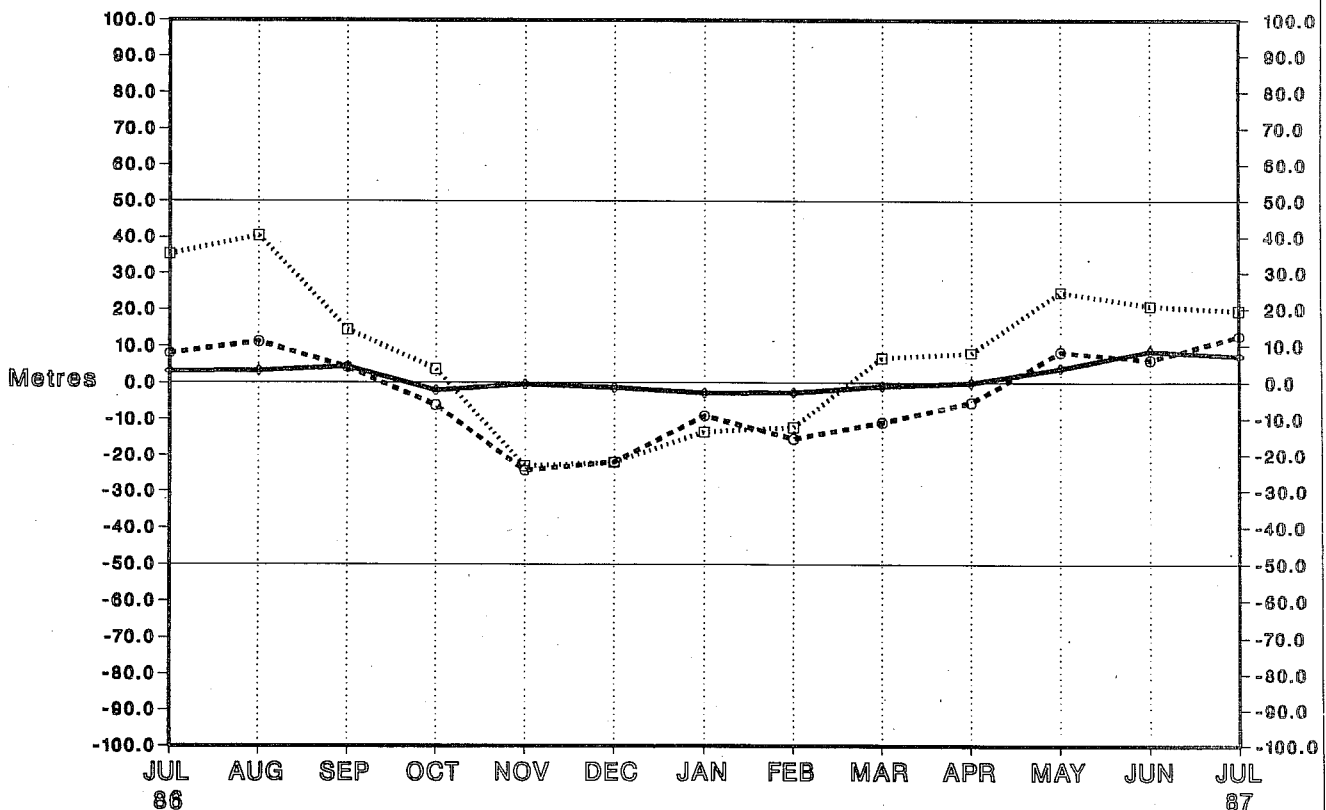
No. Obs : 31 30 30 30 29 28 29 26 29 29 30 30 28



Station 72403 (39N 076W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

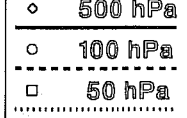
No. Obs : 31 30 24 31 27 31 30 26 29 29 29 30 29



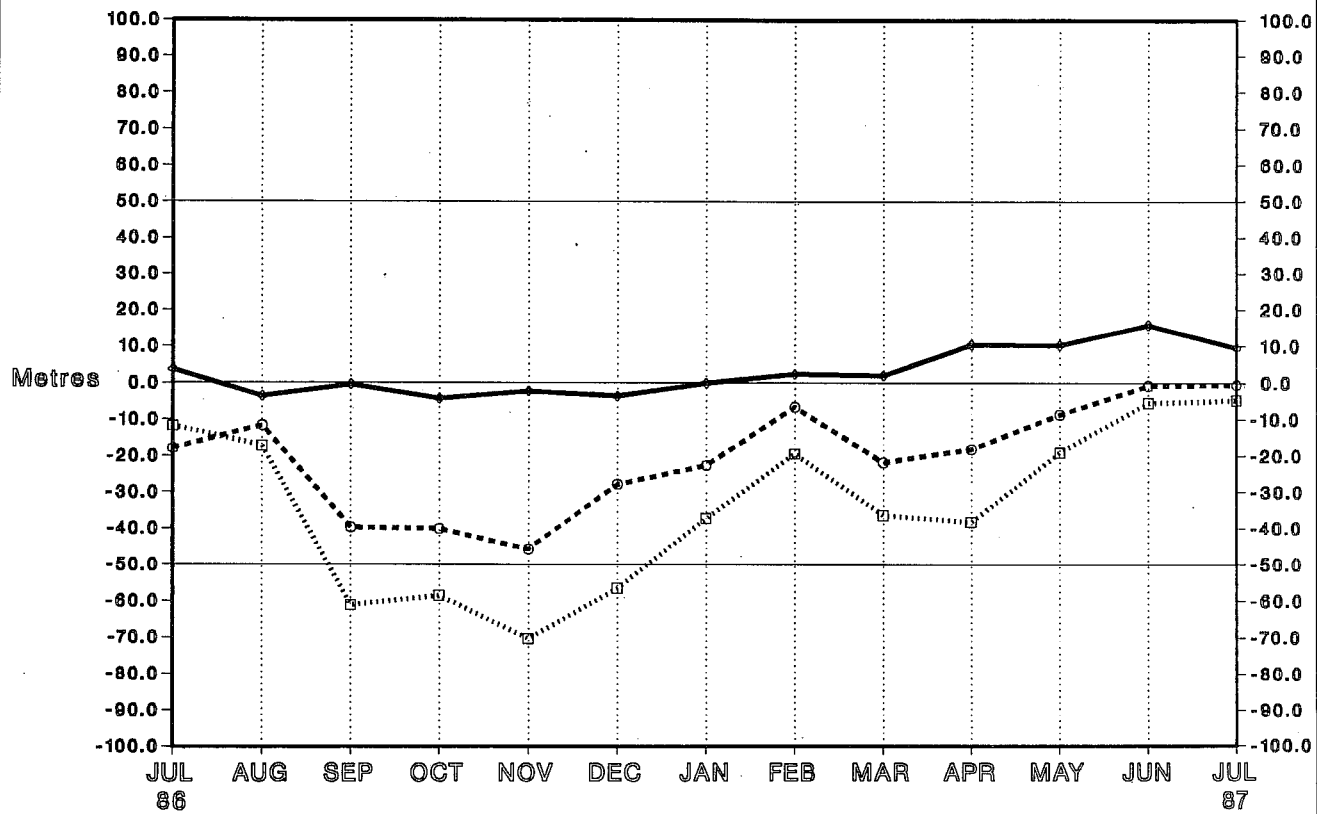
Station 72518 (43N 073W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



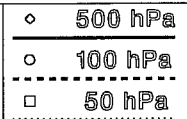
No. Obs : 28 1 11 27 30 30 31 28 30 28 31 30 31



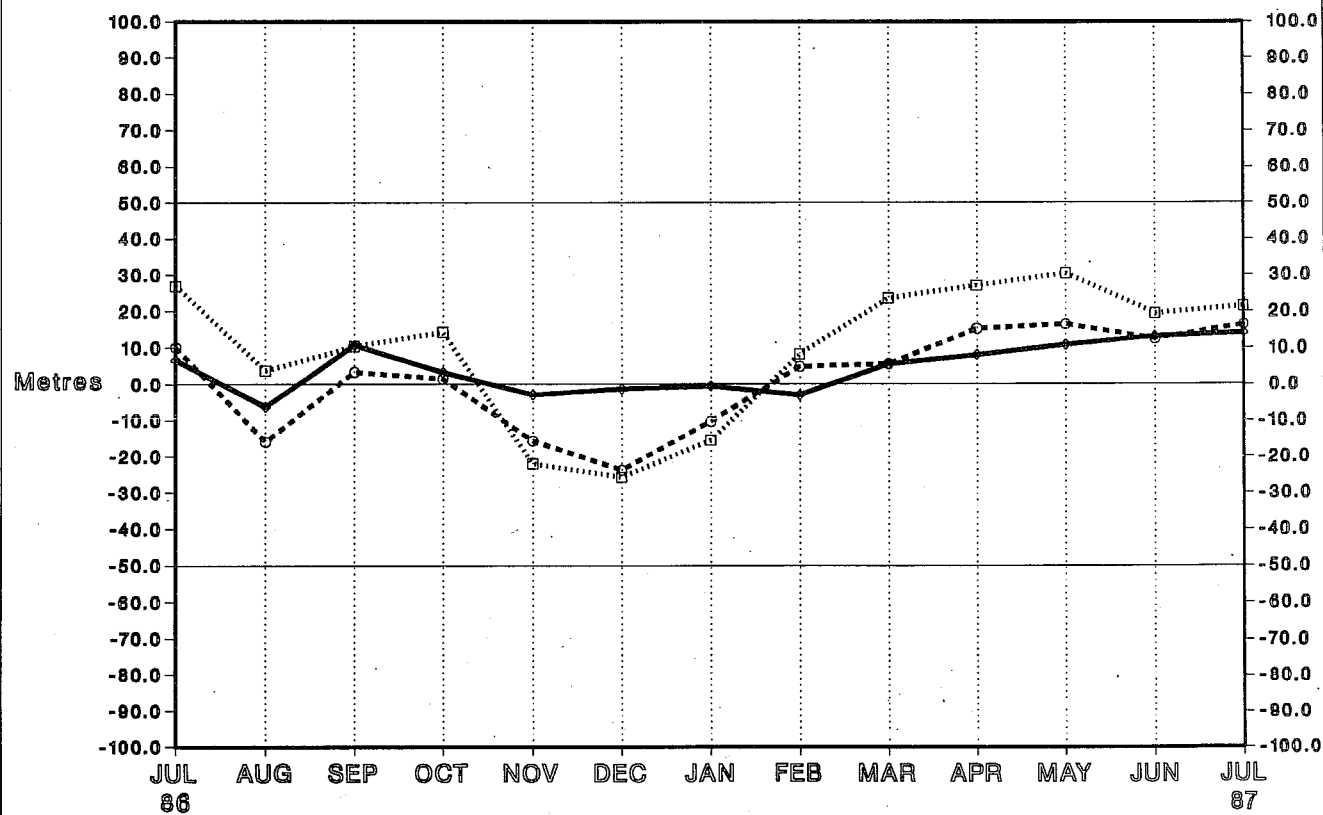
Station 72518 (43N 073W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



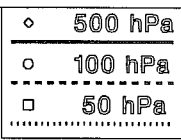
No. Obs : 29 1 14 29 30 31 31 27 31 28 31 30 31



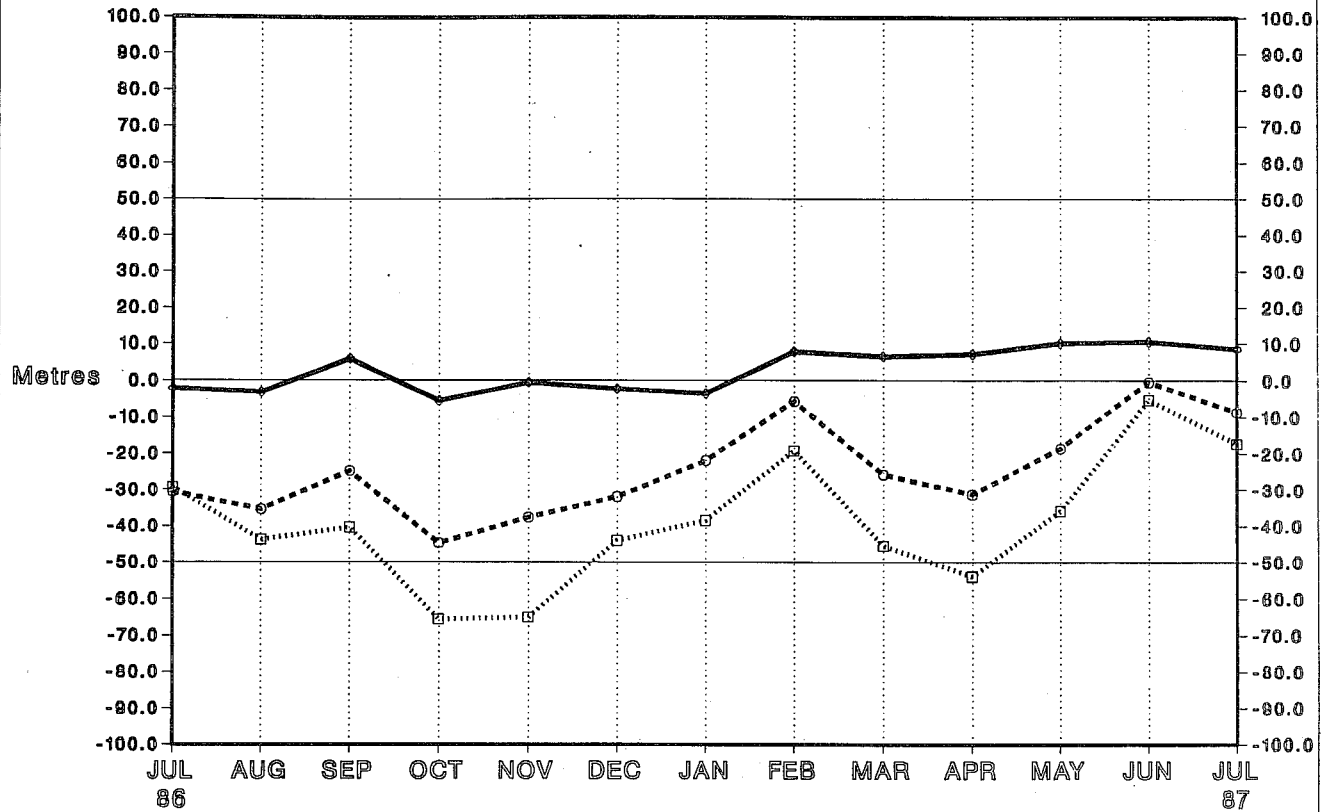
Station 72606 (44N 069W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



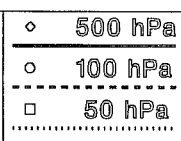
No. Obs : 31 31 30 30 30 30 31 28 31 28 31 30 30



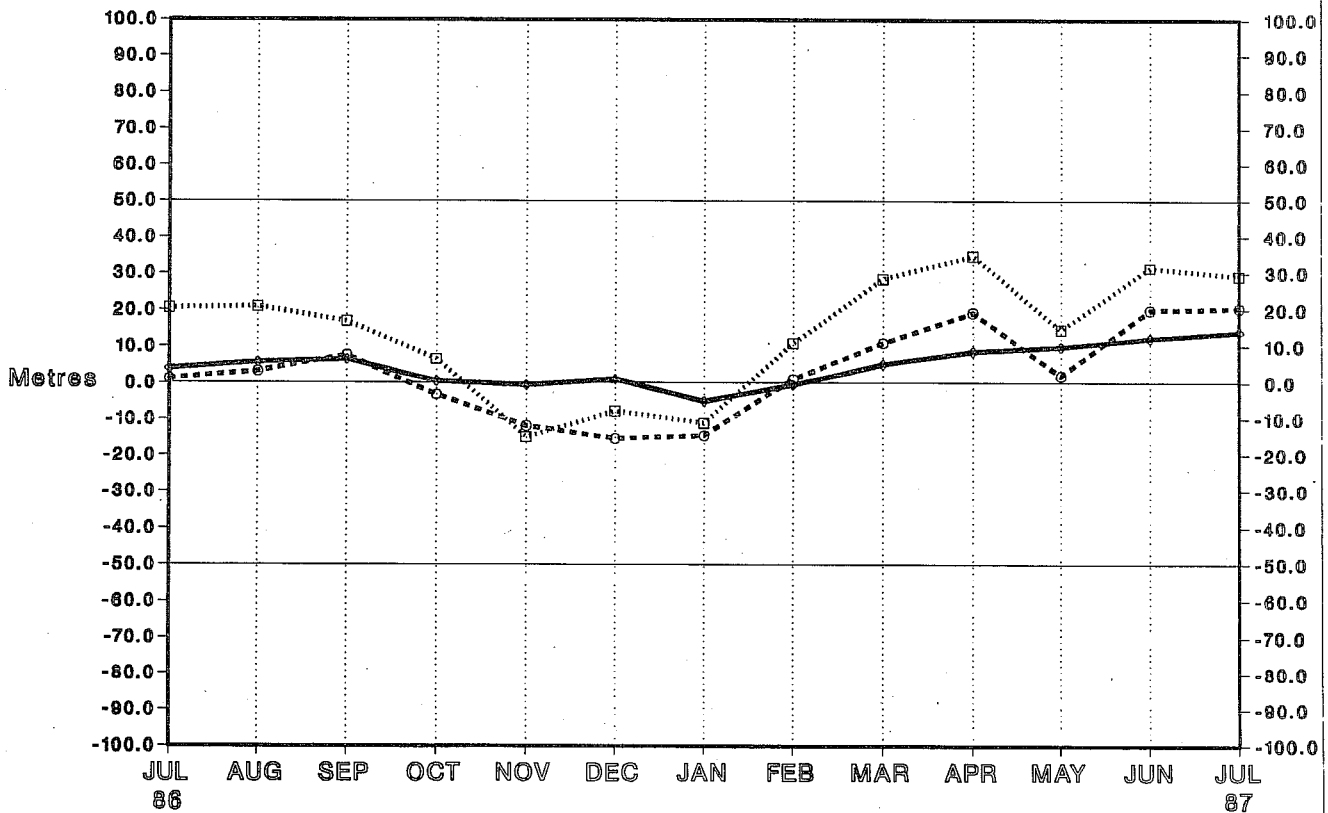
Station 72606 (44N 069W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



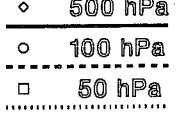
No. Obs : 31 29 29 29 30 30 30 28 30 29 29 30 31



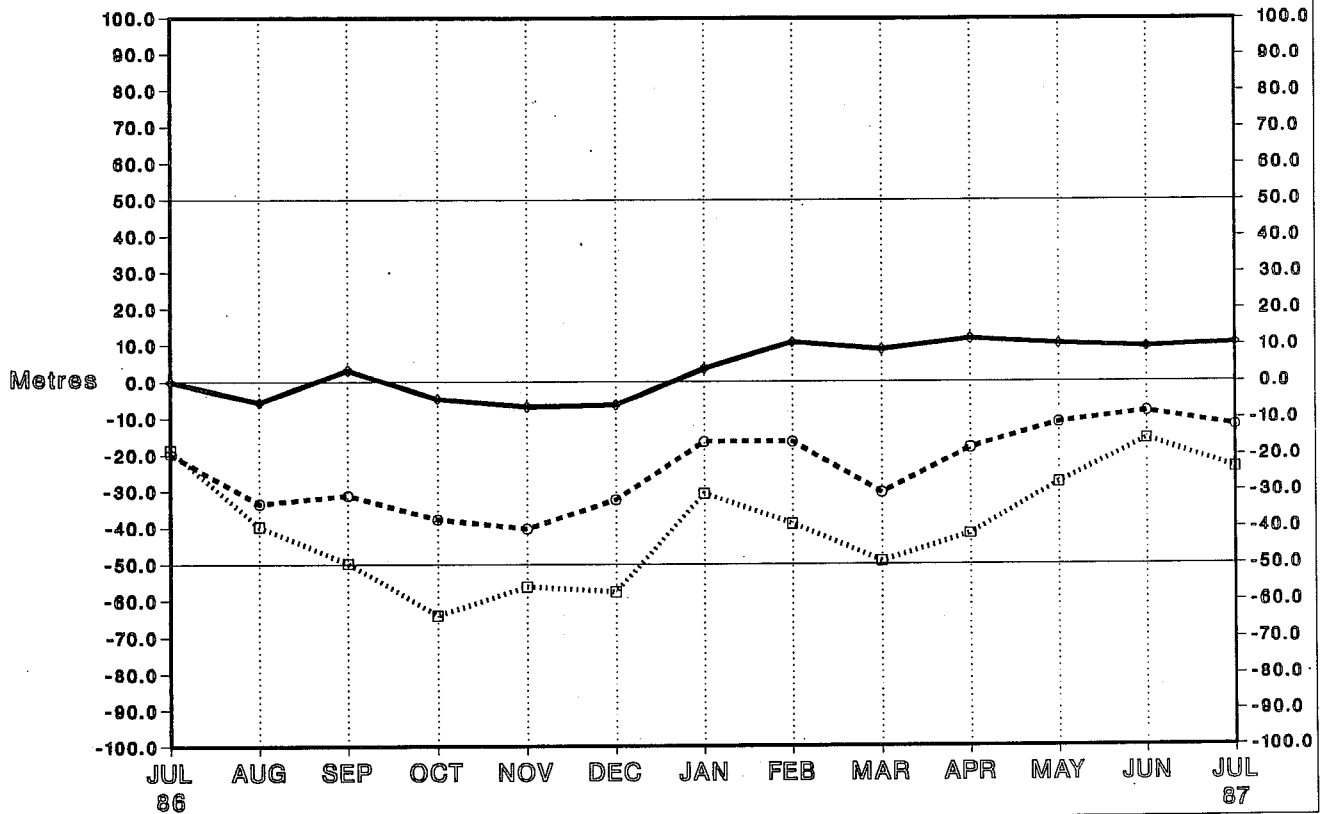
Station 72712 (47N 067W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 00Z BIAS



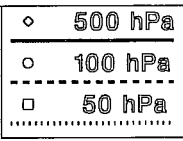
No. Obs : 30 31 30 31 30 30 30 28 31 29 31 30 31



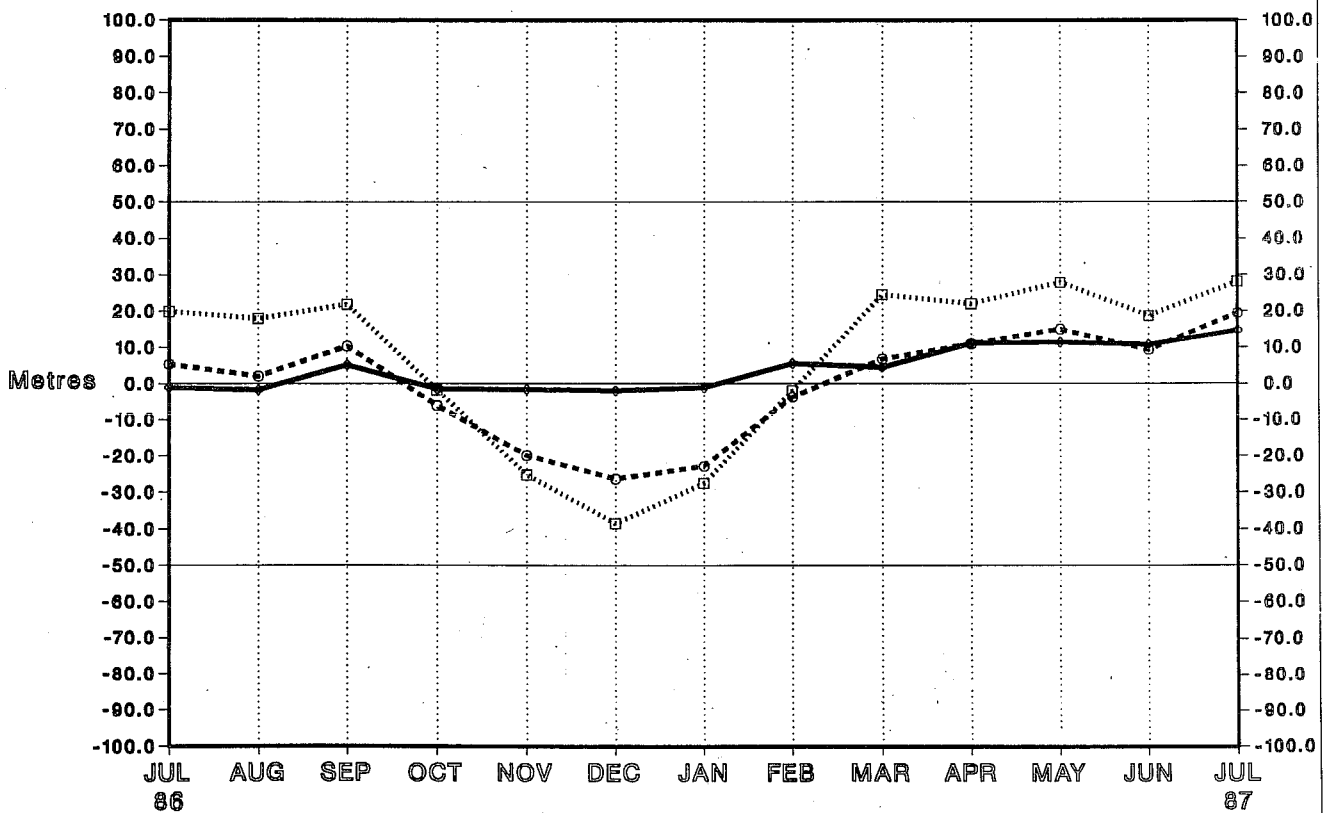
Station 72712 (47N 067W)

Radiosonde Height Monitoring Statistics

OBS - FG Differences - 12Z BIAS



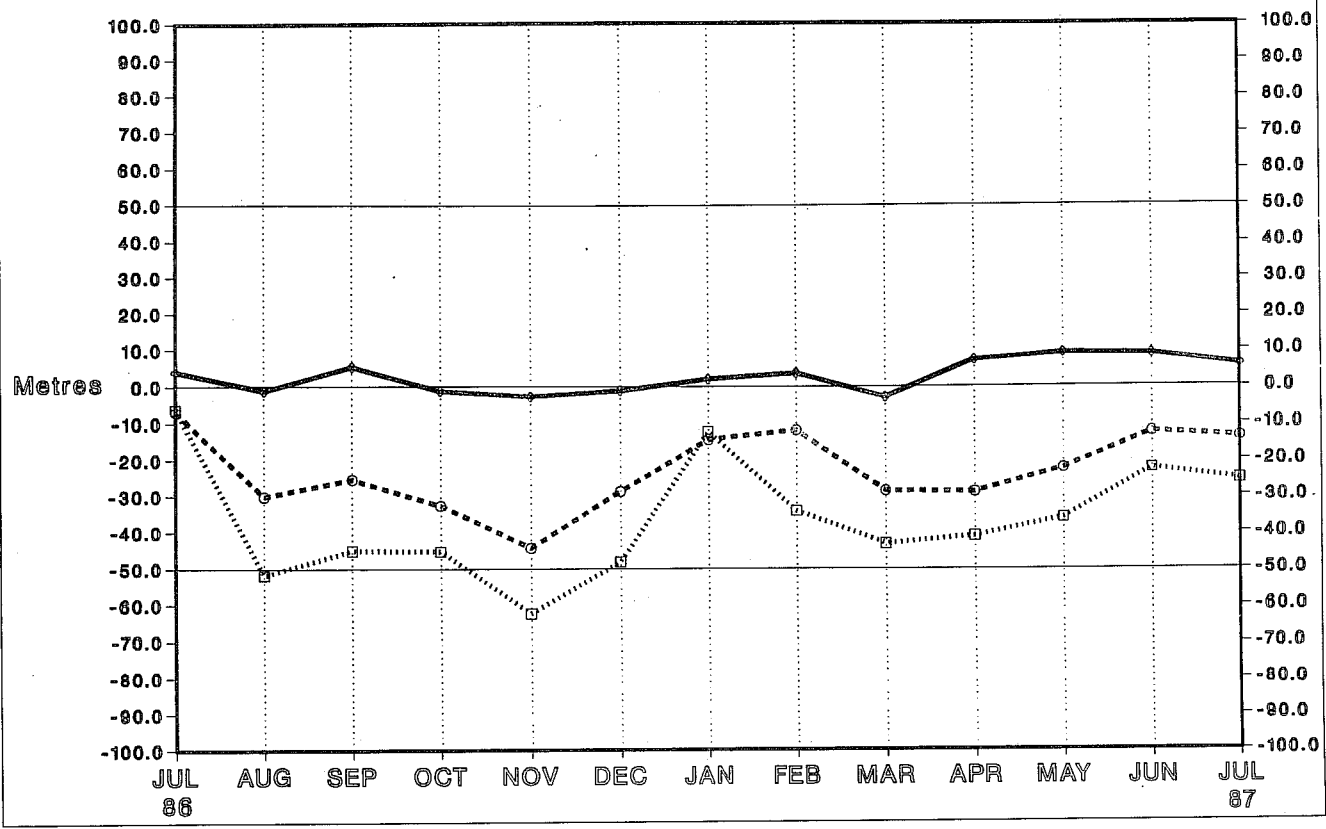
No. Obs : 30 31 30 31 30 29 31 28 30 30 31 30 31



Station 74494 (42N 069W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

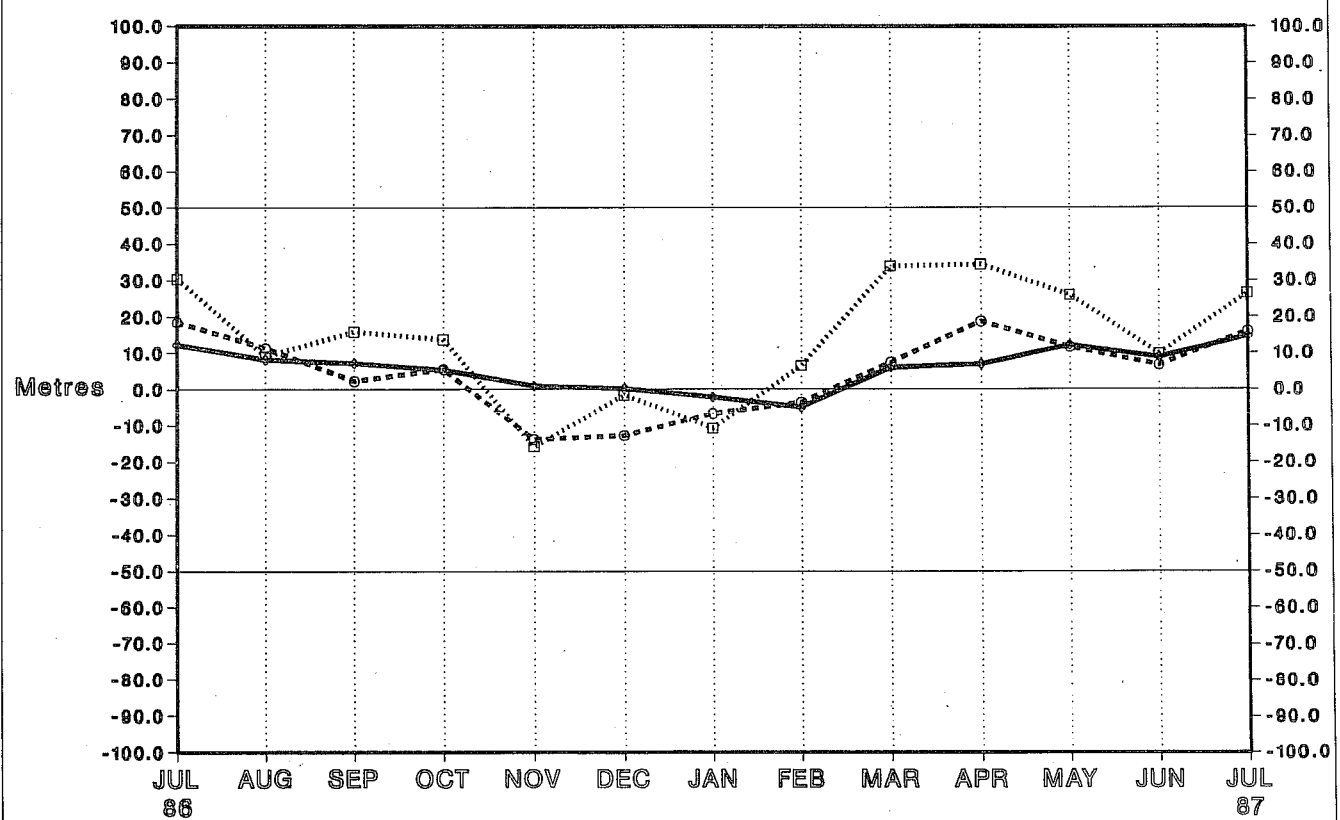
No. Obs : 31 30 30 29 30 31 31 27 30 29 31 29 30



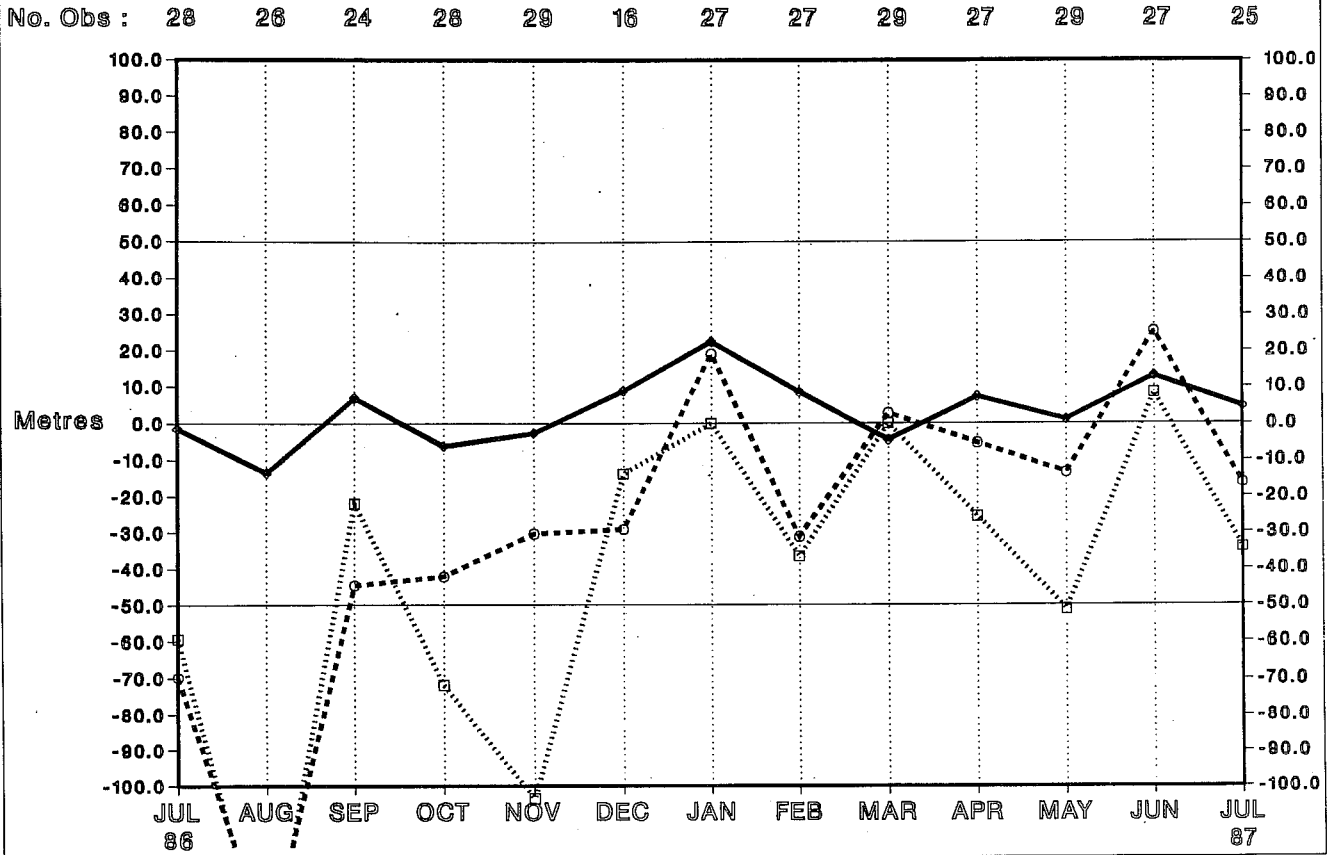
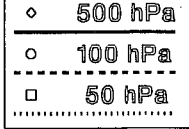
Station 74494 (42N 069W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

- ◇ 500 hPa
- 100 hPa
- 50 hPa

No. Obs : 31 29 30 30 27 30 30 27 30 29 31 30 29



Station 78016 (32N 064W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 00Z BIAS



Station 78016 (32N 064W)
 Radiosonde Height Monitoring Statistics
 OBS - FG Differences - 12Z BIAS

