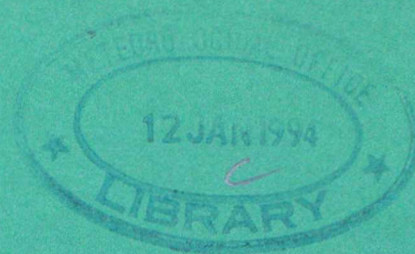


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OP DIVISION

REPORT ON ASDAR MONITORING

JULY - SEPTEMBER 1993

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Headquarters, Bracknell

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July-September 1993.

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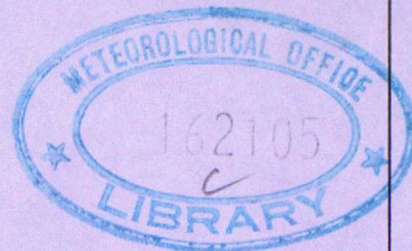
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THE ASDAR CENTRE

REPORT ON ASDAR MONITORING : JULY - SEPTEMBER 1993

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## 1). INTRODUCTION

ASDAR reports received into the Met. Office Synoptic Data Bank (SDB) have been monitored by the ASDAR Centre since the first ASDAR unit began flying on 29/11/90. The aim of the monitoring is to detect and identify any problems with the data or their transmission as soon as possible and to instigate fault correction procedures. These processes are vital to maintaining data quality and credibility.

Monitoring of the observations has covered data availability, receipt delays, reporting frequency and checks on the consistency and quality of the meteorological data. All irregularities have been reported to the ASDAR Technical Centre.

This report summarises the performance of the ASDAR units during the period July - September 1993 and highlights outstanding problems with data availability, transmission and quality, and with fault correction procedures.

## 2). OPERATIONAL UNITS

Eight ASDAR units reported during the period, though one, BA010PUZ, did not report after 22nd July due to a major overhaul of the aircraft and another, LH005VNZ, did not report after 11th August due to an unknown fault.

AMDAR coded reports were also received from a number of KLM aircraft (with 7 character call-signs beginning KL) from the 2nd September. A listing of these reports is contained within the listing of the ASDAR reports produced each day by the ASDAR Monitoring Centre. However they are not included in this report.

The following table shows the carriers, types of aircraft, identifiers and the dates on which observations were first received :-



AIRLINE	AIRCRAFT TYPE	IDENTIFIER	OPERATIONAL DATE
British Airways	747	BA000NEZ <sup>@</sup>	12/6/92
British Airways	DC 10	BA001LLZ	29/11/90
British Airways	DC 10	BA008DJZ	19/12/91
British Airways	DC 10	BA009BMZ	11/2/92
British Airways	747	BA010PUZ	27/6/91
Continental Airlines	747	CO00624Z <sup>§</sup>	17/10/91 <sup>+</sup>
Continental Airlines	DC 10	CO00768Z	20/10/91
KLM	747	KL012UMZ <sup>=</sup>	23/4/92
Lufthansa	747	LH005VNZ	23/6/93

@ Unit identifier reported as BA000NDZ before 4/10/92.

§ Unit identifier changed from CO006PEZ on 19/11/91.

+ Some observations were received from this unit on 3/6/91 but it was not considered to be operational at that time.

Unit was switched off on 2/4/93 and is not expected to produce data with this identifier again.

= Unit identifier reported as PH012UMZ before 11/5/93

### 3). LIST OF OUTSTANDING PROBLEMS

A list is given below of known faults and anomalies present during the latest three month period

i) that were also present in the previous period (long term) and

ii) that became apparent in the latest 3-month period (new)

All have been reported to the ASDAR Technical Centre, who inform the relevant bodies where appropriate. For faults where a specific unit is not mentioned, the fault is present for more than one unit (usually several).

#### i) Long term problems

a) Occasional missing positional information eg latitude.

b) Occasional erroneous data eg impossibly strong wind speeds.

c) Missing reports (occasionally whole flights missing).

d) Spurious observations - reports received while aircraft are on the ground but flight level indicates aircraft is airborne ; usually such reports are from KL012UMZ.



e) Temperature biases - there are positive temperature differences for KL012UMZ relative to numerical forecast model fields of about 1.7 deg C at cruise levels. There are also positive temperature differences of between 1.0-1.6 deg C for BA009BMZ at all levels. Temperature differences taken over all the other units are about +0.4 deg C for all levels, which might be due to a model bias. Fig 1 shows a time series plot of monthly mean differences at the cruise levels for KL012UMZ (=2UMZ), BA009BMZ (=9BMZ) and all other units combined.

f) Varying cruise flight levels - cruise flight levels reported from KL012UMZ fluctuate more frequently than those from other ASDAR aircraft and regularly vary by 100 or 200 feet between observations. Although this feature is anomalous, it does not affect the validity of the ASDAR meteorological data.

g) No reports were received via Tokyo for LH005VNZ. This continued to result in a significant loss of reports for this unit.

#### ii) New problems

a) LH005VNZ - no reports received after 11th August due to an unknown fault. Marconi are investigating.

b) KL012UMZ - in addition to the positive temperature bias reported in 3(e) above at cruise levels, there is an anomalous negative bias of about -0.8 deg C at cruise/ascent levels (see fig 2).

c) BA001LLZ - There were 9 occasions where reports from complete flights were missing during the three month period. Although it is not unusual for one or two flights to be lost over three months, this frequency is high. Generally the flights were lost during periods when no reports were received for a few days.

### 4). MONITORING RESULTS

#### i). Data Availability

ASDAR reports are received via Darmstadt (EESA), Washington (KWBC) and, more rarely, Tokyo (RJTD), depending on the location of the aircraft. Table 1 shows for each unit the number of reports received in the SDB, the number of days when no reports were received, the average number of reports received per day and an estimate of the number of complete ascents, complete descents and complete flights that were not received.

As reports received are not checked to flight schedules it is likely that the absence of some complete flights will be missed. The number of reports received is adjusted to remove duplicates (identical versions of the same report) but, due to inconsistencies in the reports received via Washington and Darmstadt, the totals are likely to include some duplicates.

All days had at least 4 units reporting. Periods of more than 7 days when a particular unit did not report were :-

Jul 23rd - end of period for BA010PUZ  
Aug 11th - end of period for LH005VNZ  
Sep 16th - 23rd for BA001LLZ



Unit CO00768Z provided the most data. Over the 3 month period as a whole an average of 960 reports per day were received from all units combined, compared with 1111 in the previous three-month period.

#### ii). Data Coverage

Of the 8 aircraft carrying ASDAR units during the period, all those except those flying CO00768Z and LH005VNZ flew predominately between Europe and North America or within these regions. The aircraft carrying CO00768Z flew between North America and Australasia (via the Pacific) and LH005VNZ between Europe and Asia, also covering routes to South America and Africa.

#### iii). Data Timeliness

Table 2 gives the frequencies of report receipt delays. Receipt delay is taken to be "time of receipt in SDB - time of report" and reports where the time is missing are ignored.

Speed of data receipt was good with 76% of reports being received within one hour of observation time and 99 % within two hours, over all reporting units.

#### iv). Frequency of Reporting

The expected frequency of ASDAR reports is one every 7 minutes during level flight and one every 10 hPa or 50 hPa during ascent and descent (with the higher frequency applying to the lower part of the atmosphere). Taking daily samples wherever possible, the average time between reports during level flight, and the average pressure difference (in hPa) between the first 10 reports on ascent and the first 10 reports below 3500 feet (approximately 890 hPa) on descent are shown in Table 3. Maximum and minimum values are also given. The pressure differences are obtained from height differences using the standard atmosphere relationship that 1 hPa is approximately equivalent to 29 feet in the layer 1000-900 hPa.

From Table 3 it can be seen that all the reporting units achieved the "report every 7 minutes" target in level flight. All except CO00768Z achieved the "report every 10 hPa" target in the near-ground phase of ascent. The mean frequency for near-ground descent was slightly poorer than the specified criterion for all units except BA010PUZ. BA000NEZ and BA010PUZ are notable for their high frequencies of reporting in level flight, both with means of about once every 4.5 minutes.



## 5). DATA QUALITY

Figures 3 to 10 show for each individual unit and the complete three month period the results of "O-B" (observation minus background i.e. a 6-hour forecast) and "O-A" (observation minus analysis) comparisons for all levels between 950 and 150 hPa. The UK 19-level global forecast model is the model used for the comparison. Results are given for temperature and for wind (u component, v component, speed, direction and rms vector) separately and show mean and standard deviation of the differences from the model fields at each level. Hand-written headings have been added to fig 3 to clarify the charts.

Although both "O-B" and "O-A" plots are shown, comparison with the background field is more meaningful as in data sparse areas the model analysis will tend to fit to an observation, regardless of its quality, provided it passes the quality control. The temperature anomalies mentioned in section 3 for BA009BMZ and KL012UMZ are apparent. It is also evident that the standard deviation of the wind directions at low levels is large for KL012UMZ and for LH005VNZ. The former may be due to spurious reports from the ground included in the statistics ; the latter are based on very few observations and so may not be representative.

## 6). SUMMARY

i) Overall timeliness and quality of the data from the existing operational units remain high.

ii) Eight units reported during the period. However after 10th August a maximum of 6 units reported on any one day ; the aircraft flying BA010PUZ began a major overhaul on 22nd July and unit LH005VNZ ceased producing reports after 10th August due to an unknown cause which is being investigated.

iii) Temperatures from BA010BMZ and KL012UMZ compared to model background temperatures continued to be somewhat anomalous at cruise levels. The latter's low level temperatures also appear rather low in the latest three month period.

iv) All units maintained the stipulated reporting frequencies for level flight and all but one for near-ground phase of ascent. The frequency for near-ground phase of descent fell slightly short of stipulated frequencies for all but one unit.

v) Spurious reports from the ground continue to be received, particularly from KL012UMZ.



TABLE 1: SUMMARY OF DATA RECEIVED AND MISSING DATA: JULY - SEPTEMBER 1993

UNIT	NO. REPORTS RECEIVED	PERCENTAGE VIA KWBC EESA RJTD	"NO REPORT" DAYS	AVE NO. PER DAY*	<-NO. OF MISSING EVENTS-> ASC DES CF
BA000NEZ	13812	15 85 -	15	179	25 29 1
BA001LLZ	8457	18 82 -	31	139	23 33 9
BA008DJZ	13001	42 58 -	5	149	35 23 -
BA009BMZ	13271	47 53 -	5	153	32 36 -
BA010PUZ	3387	24 76 -	72	169	10 14 -
CO00768Z	17628	71 0 29	2	196	36 55 1
KL012UMZ	14891	39 61 -	2	165	41 62 -
LH005VNZ	3828	22 78 -	53	98	24 39 1
TOTAL	88275				

# NOTES

\* Days with no reports are excluded for averaging purposes.

## KEY TO "MISSING DATA" TABLE HEADINGS

ASC : Complete ascent  
DES : Complete descent  
CF : Complete flight



TABLE 2.: SUMMARY OF DELAY FREQUENCIES : JULY - SEPTEMBER 1993

UNIT	NUMBER OF REPORTS	PERCENTAGE FREQUENCIES OF DELAY----->							MAXIMUM DELAY	MEAN DELAY
		0-30	31-60	61-120	121-180	181-360	361-720	>720		
		-----MINUTES----->								
BA000NEZ	13812	36.1	46.6	16.1	0.2	0.9	0.1	-	384	43
BA001LLZ	8457	36.3	45.9	16.8	0.4	0.4	0.1	-	498	42
BA008DJZ	13001	28.2	47.8	22.5	0.5	0.8	0.2	0.0*	1340	47
BA009BMZ	13271	26.1	50.0	22.3	0.6	0.9	0.3	-	575	48
BA010PUZ	3387	37.8	48.3	13.6	-	0.3	-	-	209	39
CO00768Z	17628	14.6	46.3	38.1	0.4	0.5	-	-	350	54
KL012UMZ	14891	35.2	48.9	15.2	0.4	0.4	-	0.0*	1430	41
LH005VNZ	3828	30.7	45.3	21.8	1.0	1.0	0.1	-	380	47
-----										
TOTALS	88275	28.8	47.6	22.4	0.4	0.7	0.1	0.0*	1430	46

## NOTE

\* Percentage between 0 and 0.05.



TABLE 3 : SUMMARY OF REPORTING FREQUENCIES : JULY - SEPTEMBER 1993

UNIT	<-----LEVEL FLIGHT----->			<--ASCENT (1st 10 OBS)-->			<DESCENT(10 OBS AFTER 890hPa)>		
	N.O.S.	MEAN <-----MINUTES----->	MIN MAX	N.O.S.	MEAN <-----hPa----->	MIN MAX	N.O.S.	MEAN <-----hPa----->	MIN MAX
BA000NEZ	73	4.6	3.3 5.9	46	10.0	9.6 12.3	42	10.4	8.8 11.9
BA001LLZ	53	6.4	4.7 7.0	33	9.9	9.6 10.0	23	10.4	9.2 11.9
BA008DJZ	44	6.4	5.1 7.0	45	9.9	9.6 10.0	60	10.3	7.7 11.9
BA009BMZ	72	6.4	4.2 7.0	48	9.9	9.6 10.0	47	10.2	8.8 11.9
BA010PUZ	21	4.3	3.3 5.1	14	9.9	9.6 10.0	5	9.9	8.8 10.7
CO00768Z	53	6.5	2.0 7.0	86	10.1	9.6 12.3	80	10.7	8.8 13.0
KL012UMZ	0 *	-	- -	54	10.0	9.6 12.3	35	10.2	7.7 13.0
LH005VNZ	32	5.7	4.1 7.0	15	9.8	9.2 10.0	1	-	- -

KEY TO "REPORTING FREQUENCY" TABLE HEADINGS

N.O.S. : Number of samples.

NOTE

\* KL012UMZ - cruise flight levels fluctuate frequently (see text)

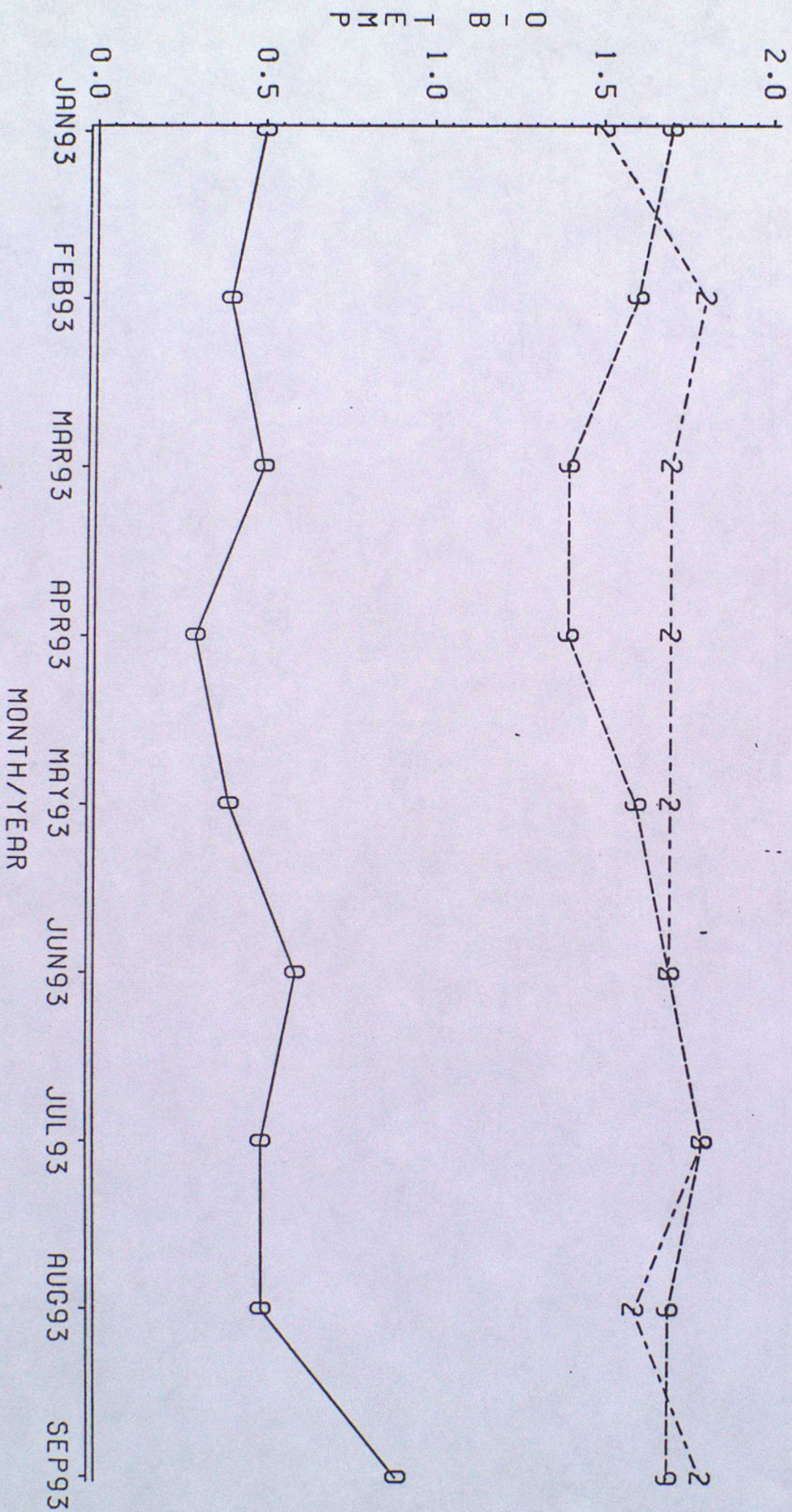


Figure 1

Monthly mean ASDAR O-B temperatures (deg C)

150-350 hPa

Key : 9--9 9BMZ 2--2 2UMZ 0--0 OTHERS





# Figure 2

Monthly mean ASDAR O-B temperatures (deg C)

400-950 hPa

Key : 9--9 9BMZ 2--2 2UMZ 0--0 OTHERS

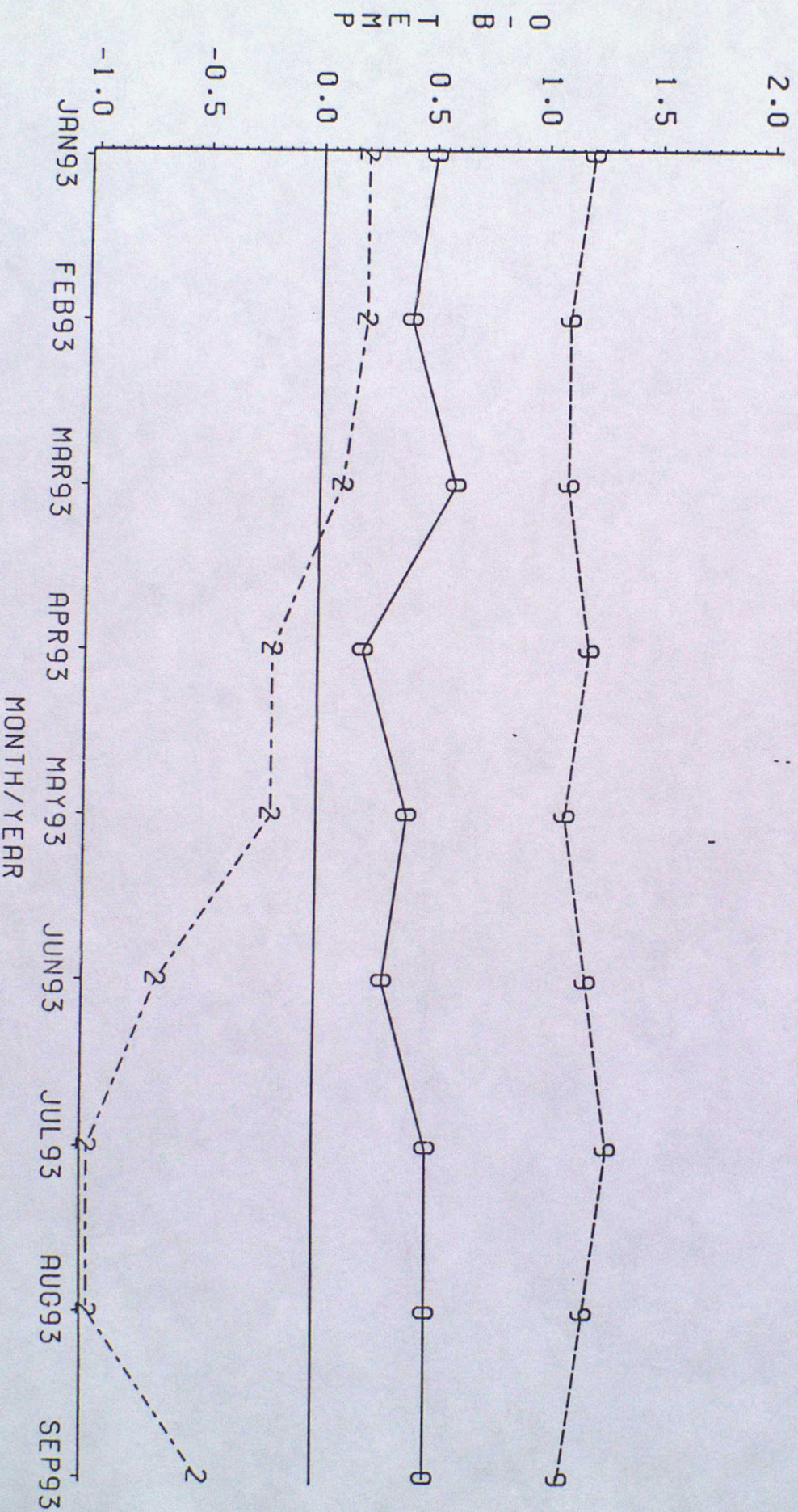




FIGURE 3 : BA000NEZ - MODEL COMPARISON RESULTS (950-150 hPa)

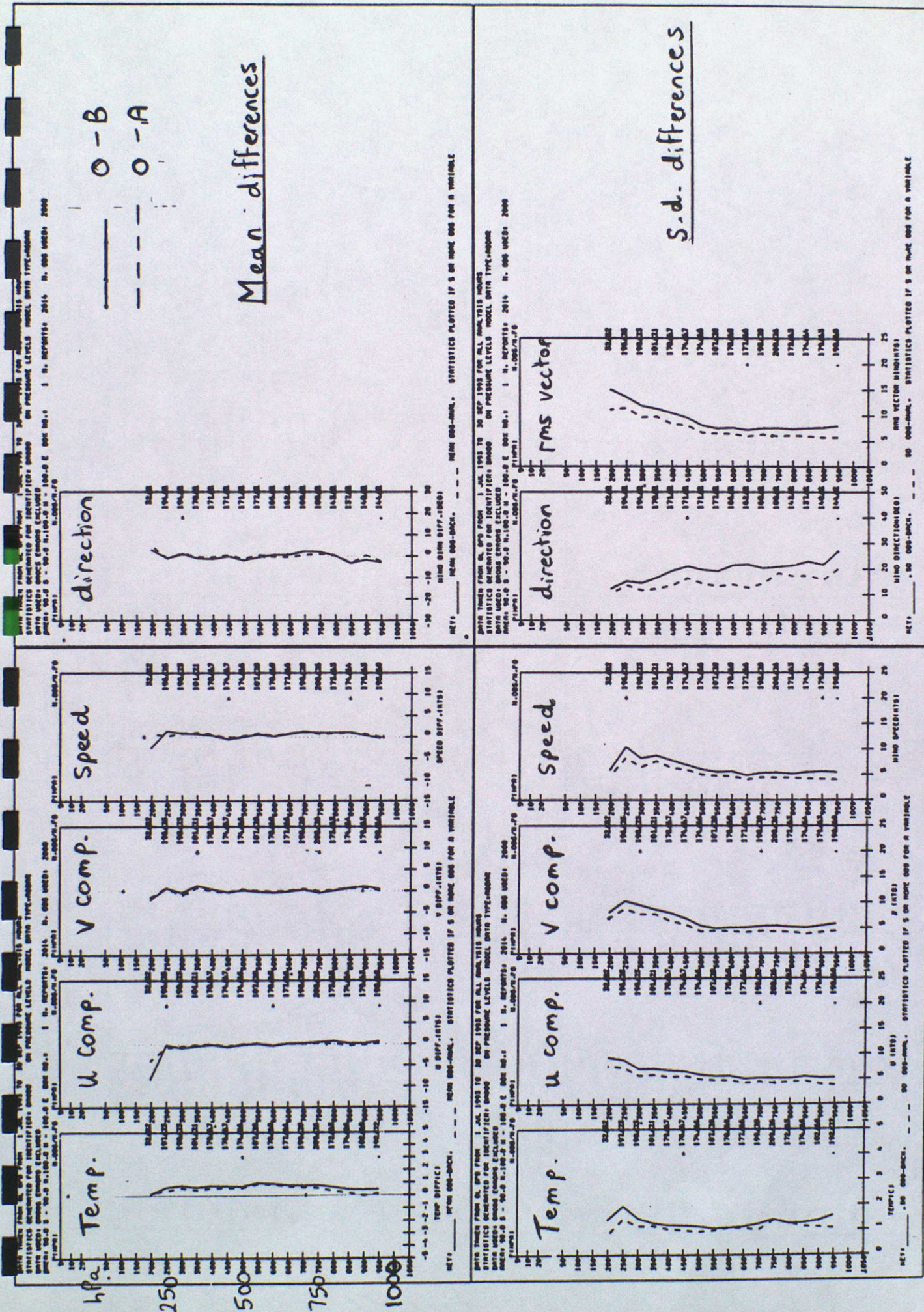








FIGURE 5 : BA008DJZ - MODEL COMPARISON RESULTS (950-150 hPa)

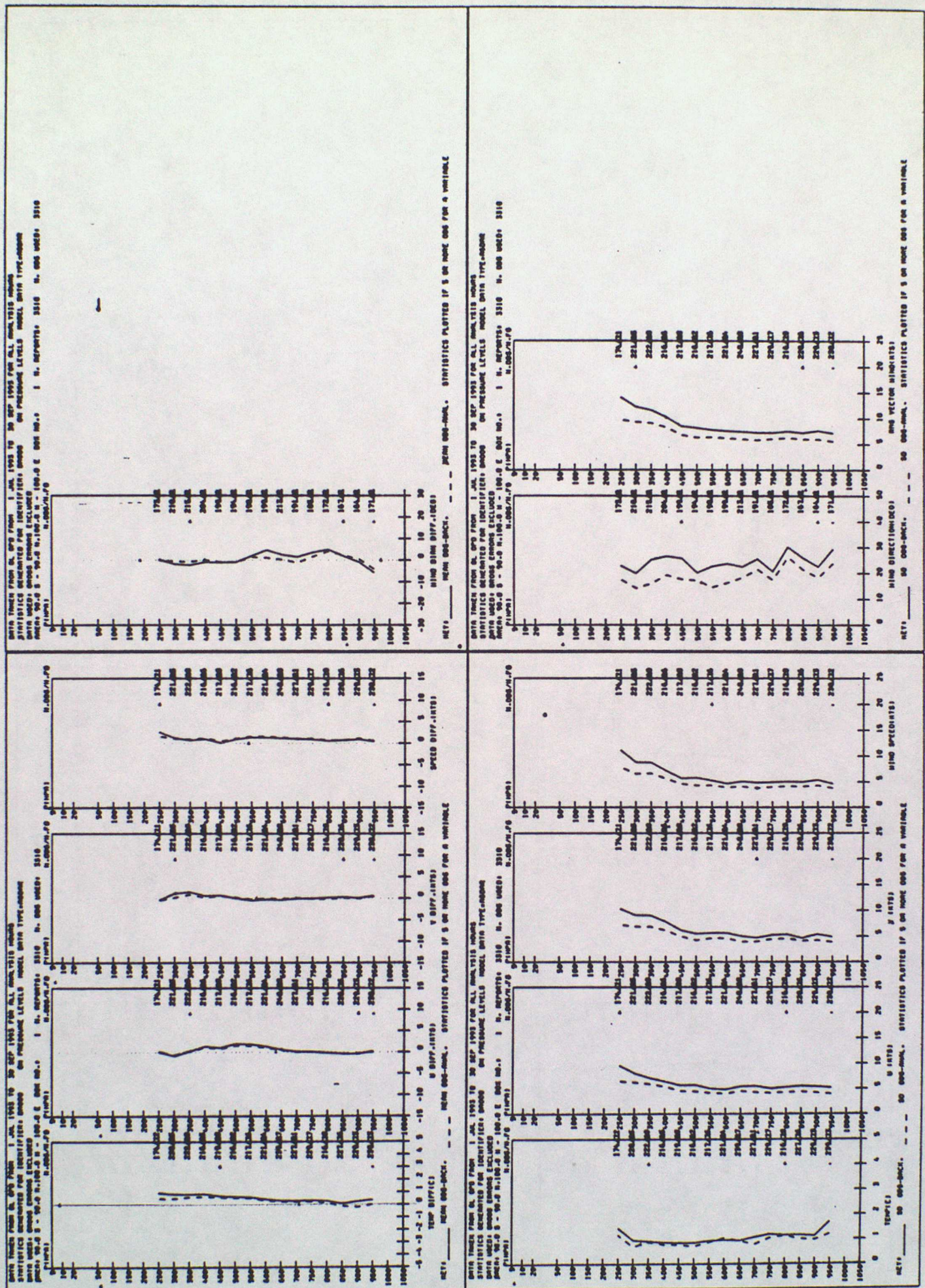




FIGURE 6 : BA009BMZ - MODEL COMPARISON RESULTS (950-150 hPa)

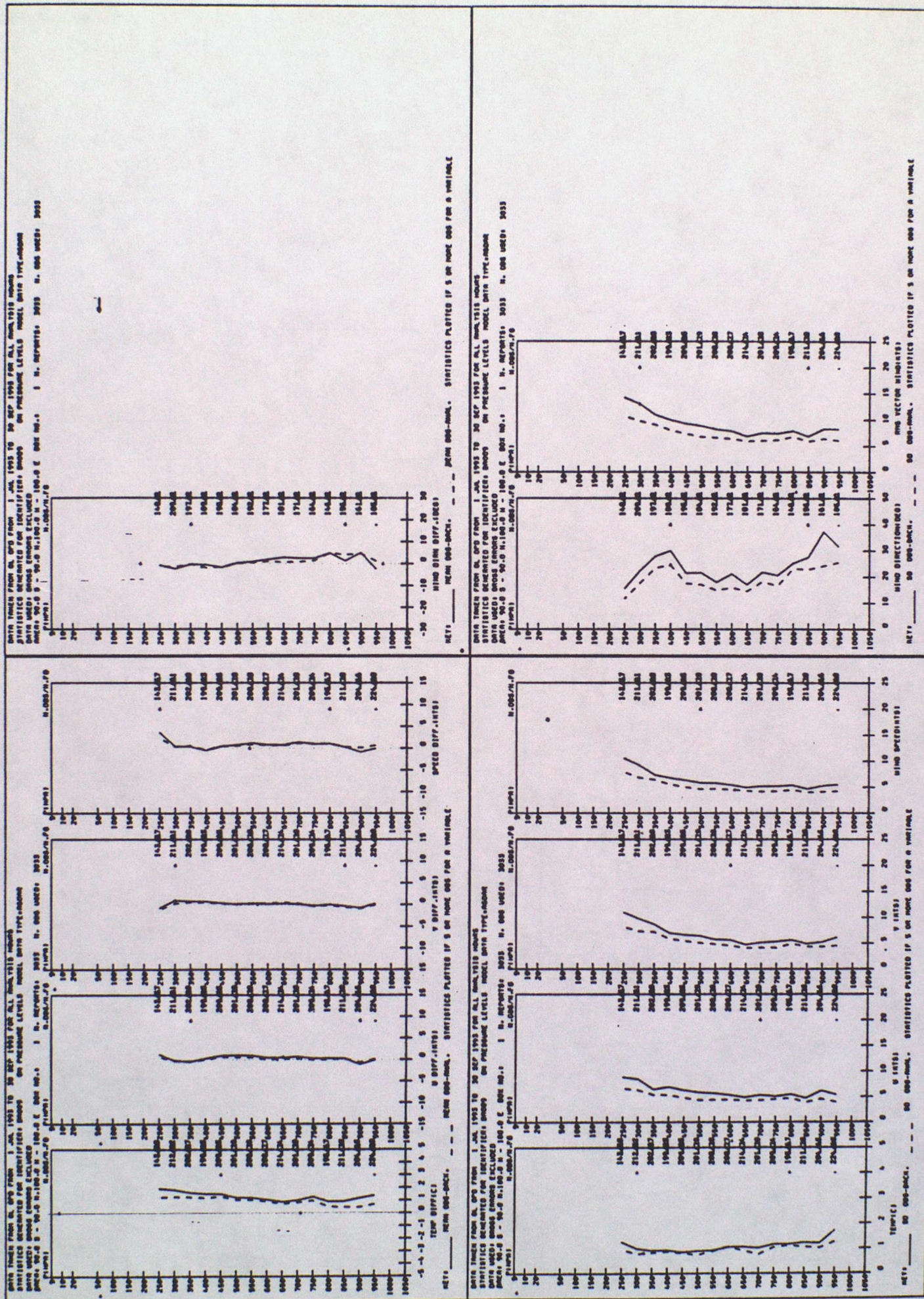




FIGURE 7 : BA010PUZ - MODEL COMPARISON RESULTS (950-150 hPa)

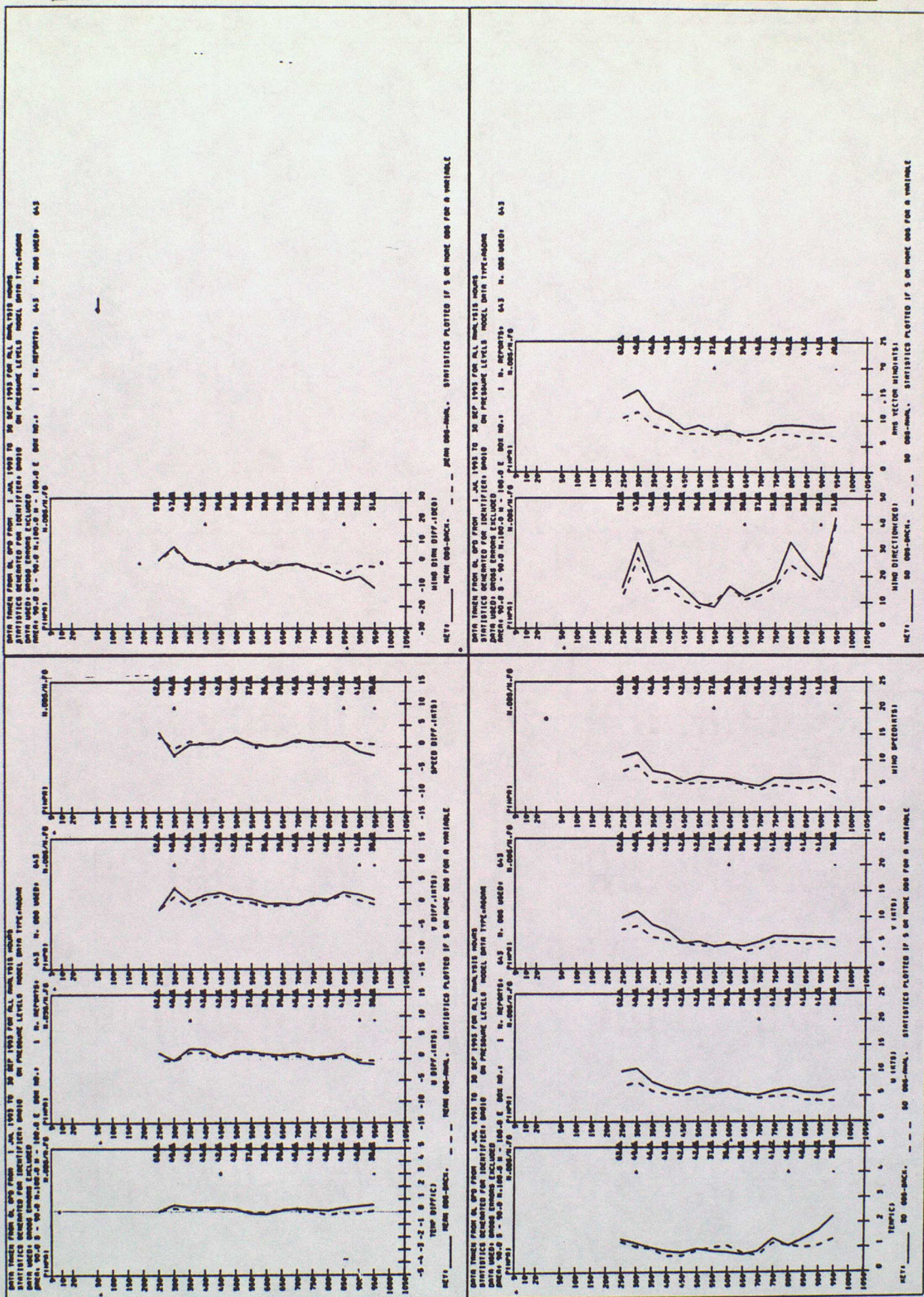




FIGURE 8 : CO00768Z - MODEL COMPARISON RESULTS (950-150 hPa)

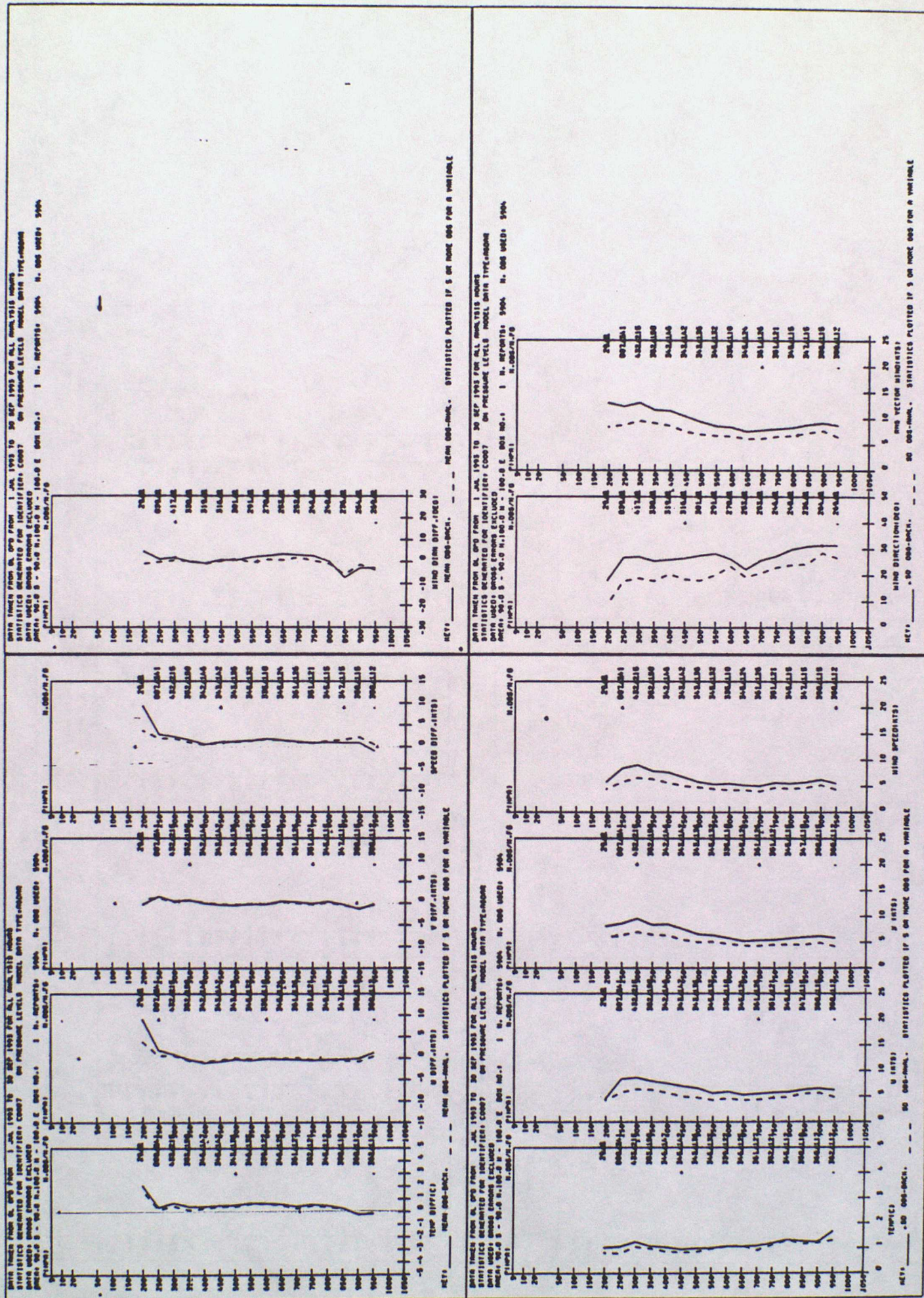




FIGURE 9 : KL012UMZ - MODEL COMPARISON RESULTS (950-150 hPa)

