

■ ECMWF - Report on the ERS-2 Scatterometer ■

Title: MONITORING STATISTICS OF ERS-2 SCATTEROMETER FOR ESA (Project Ref. 11699/95/NL/CN)

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1 - INTRODUCTION

Cycle 50 had a period from 12 UTC 7 February 2000 until 12 UTC 10 February 2000 without data. This was due to up-linking of new software to control the ERS-2 attitude. This was a planned interruption. The data before and after this up-link does not seem to have changed, based on the monitoring results in this report. For the whole monitoring period the data quality was high. No data was received for 18 UTC 4 February 2000 and 0 UTC 5 February. Lower than usual data volumes were received at ECMWF some cycles: 6-12 UTC 30 January 2000, 18 UTC 10 February 2000, 0 UTC 12 February, 0-6 UTC 15 February 2000 and 6 UTC 27 February 2000. For these cycles the data volume was below 50% of the usual volume. Inspection of the data shows that there were no quality problems with the data received during those reduced volume cycles.

The ECMWF data assimilation system did not change during cycle 50.

2 - ERS-2 STATISTICS FROM 25 JANUARY 1999 TO 28 FEBRUARY 2000

The level of the sigma0 biases with respect to the ECMWF model first guess winds are similar to the results from the previous cycle for descending tracks. For ascending tracks fore and aft beam biases are slightly larger over the whole incidence angle range, compared to the results from cycle 49. All curves have a fairly flat distribution over the whole incidence range.

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The distance to the cone history shows most pronounced the data void period 8-10 February 2000 related to the up-link activities. The sigma0 anomaly from 12 UTC 16 February 2000 until 6 UTC 17 February 2000 was due to the satellite being in Fine Pointing Mode (FPM) that is less accurate than the nominal mode (YSM). In addition, three peaks above normal levels are seen on 12 UTC 30 January 2000, 12 UTC 2 February 2000 and 0 UTC 12 February 2000. The first and the third peaks are due to low data volume for these two cycles and is not linked to instrument problems, the second peak is related to an orbital manoeuvre. For the remaining part of the period the monitoring results are very stable without any sign of instrument problems. The sigma0 level is generally at the same level as is the previous cycle. The speed monitoring time series are very stable, except for the anomalies on 12 UTC 30 January 2000 (low data volume), 12 UTC 2 February (orbital manoeuvre), 0 UTC 12 February 2000 (low data volume) and the FPM period 16-17 February 2000. The directional statistics shows a very uniform result, similar to the previous cycle's. The spike on 6 UTC 31 December 1999 is due to low data volume.

The UWI winds have an average bias of -0.81 m/s, (-1.12 m/s for nodes 1-2 down to -0.66 m/s for nodes 11-19). This is similar to the results from the previous cycle. The standard deviations are similar to the results from the previous cycle: the standard deviation is on the average 1.56 m/s, and very similar for all nodes.

The standard deviation for ECMWF (4D-Var) processed data is similar to the results from the last monitoring cycle, the average value is 1.64 m/s. The bias is better than in cycle 49: the average value is now -0.55 m/s. The (scatterometer - model) direction standard deviations were ranging between 30 and 65 degrees for the UWI data (the average value 50 degrees) and between 15 and 30 degrees (average value 19.5 degrees) for their 4D-Var counterparts. The direction standard deviations are similar to the numbers in the previous report period. As usual, the directional bias is close to zero for both UWI and 4D-Var products. The scatter plot of model 10 m wind speeds versus UWI wind speeds shows bias and standard deviation similar to the results from the previous cycle. The direction scatter plot is in close agreement with the results from the previous cycle, perhaps with a slight degradation.



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3 - FIGURE CAPTION

- Fig. 1:* Ratio of $\langle \sigma_0^{0.625} \rangle$ over $\langle \text{CMOD4}(\text{First Guess})^{0.625} \rangle$ converted in dB for fore beam (solid line), mid beam (dashed line) and aft beam (dotted line) as a function of incidence angle for descending and ascending tracks. The thin lines indicate the error bars on the estimated mean. (fig 1a: as fig1 but proper first guess values used.)
- Fig. 2:* Mean normalised distance to the cone computed every 6 hours for nodes 1-2, 3-4, 5 to 7, 8 to 10, 11 to 14 and 15 to 19 (solid curve close to 1 when no instrumental problems are present). The dotted curve shows the number of incoming triplets in logarithmic scale (1 corresponds to 60000 triplets) and the dashed one indicates the proportion of triplets rejected by the ESA flag, the SST or the land/sea mask, i.e. affected by technical problems (0: all data kept, 1: no data kept).
- Fig. 3:* Mean (solid line) and standard deviation (dashed line) of the wind speed difference UWI - First Guess for the data retained by the 4D-Var quality control. (fig 3a: as fig3 but proper first guess values used)
- Fig. 4:* Same as Fig. 3, but for the wind direction difference. Statistics are computed only for wind speeds higher than 4 m/s.
- Fig. 5-6:* Same as Fig. 3 and 4 respectively, but for the 4D-Var processed data.
- Fig. 7:* Two-dimensional histogram of First Guess and UWI wind speeds, for the data kept by the 4D-Var quality control. Circles denote the mean values in the y-direction, and squares those in the x-direction.
- Fig. 8:* Same as Fig. 7, but for wind direction. Only wind speeds higher than 4m/s are taken into account.

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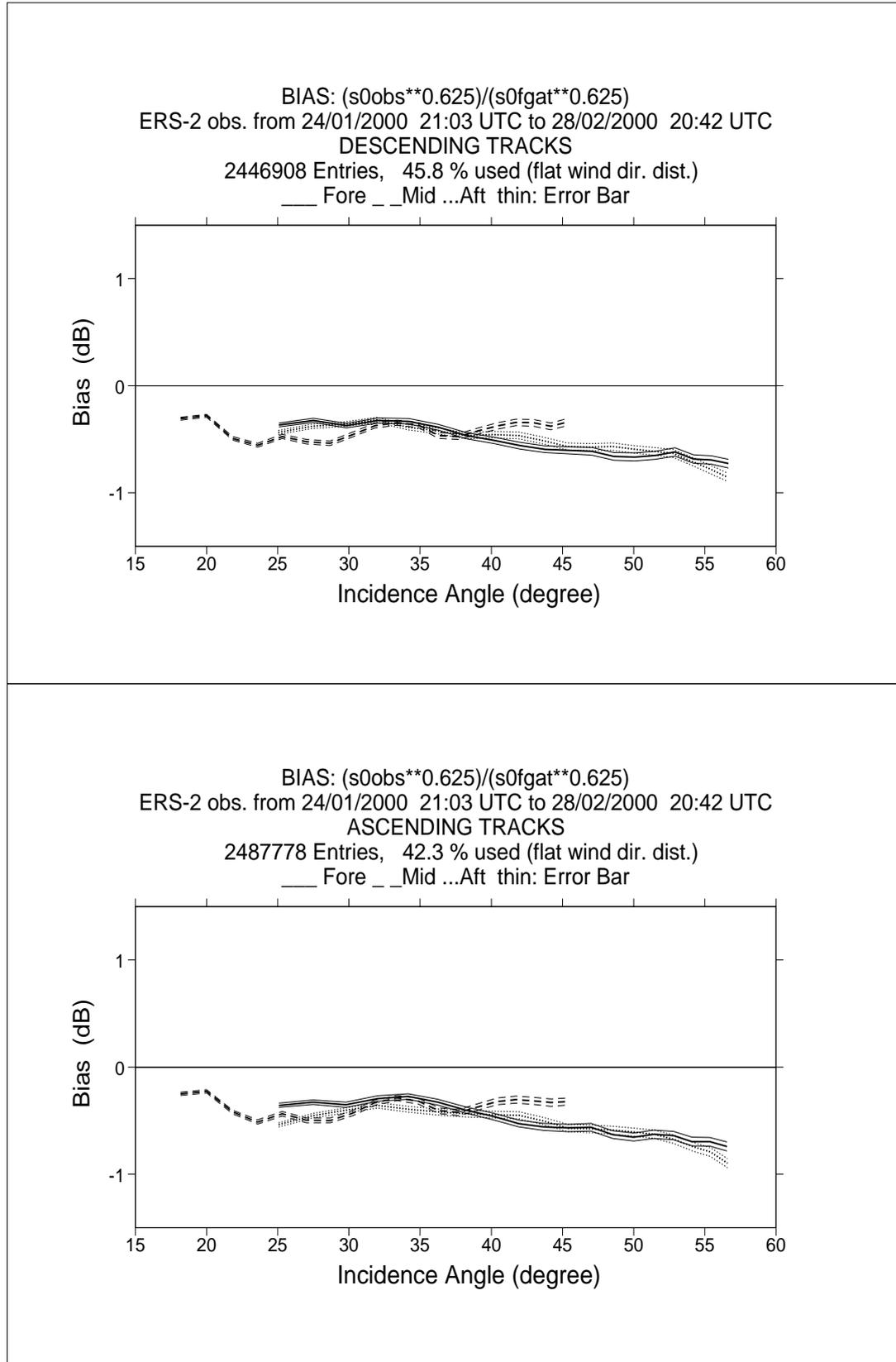


FIGURE 1

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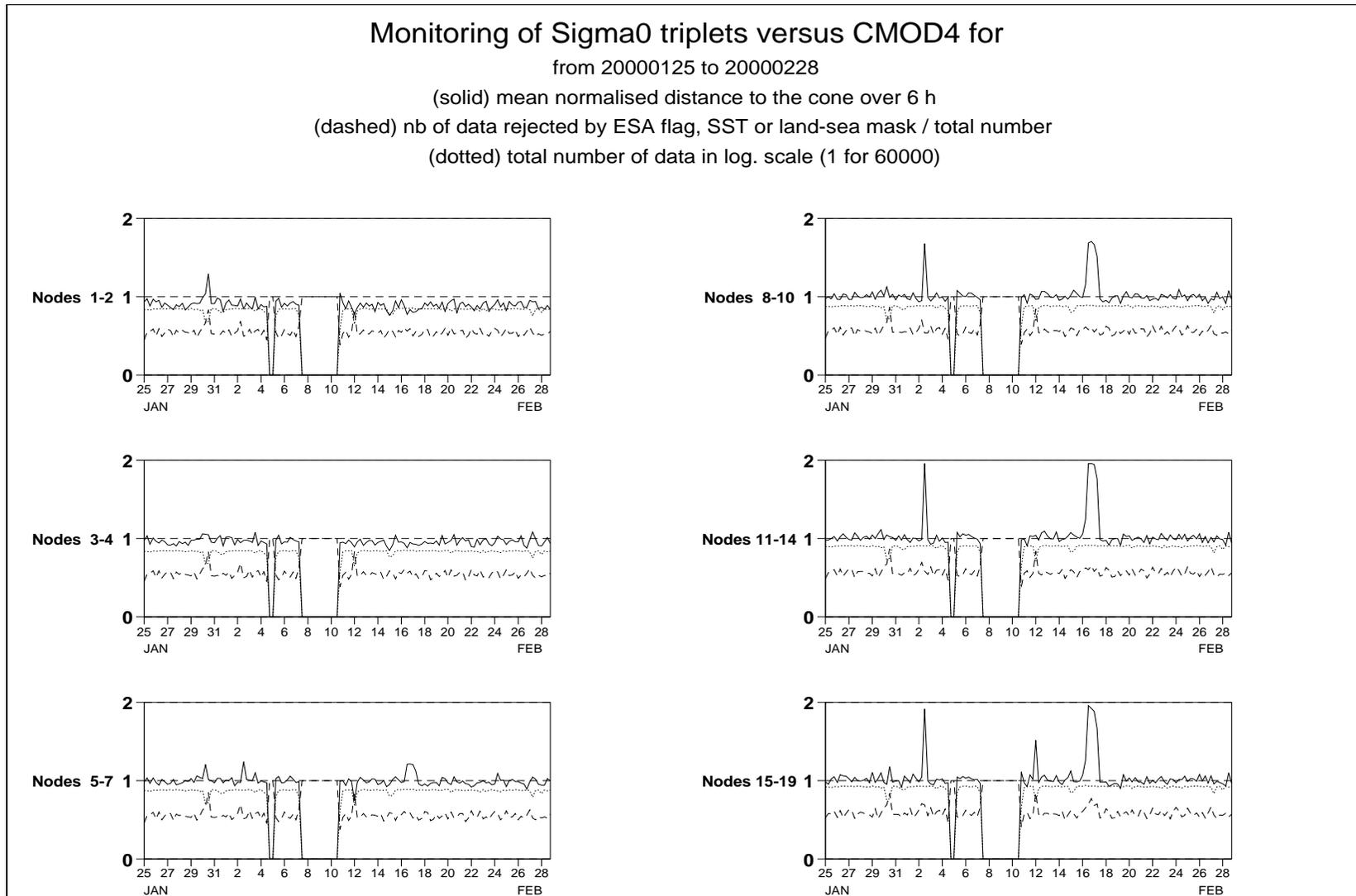


FIGURE 2

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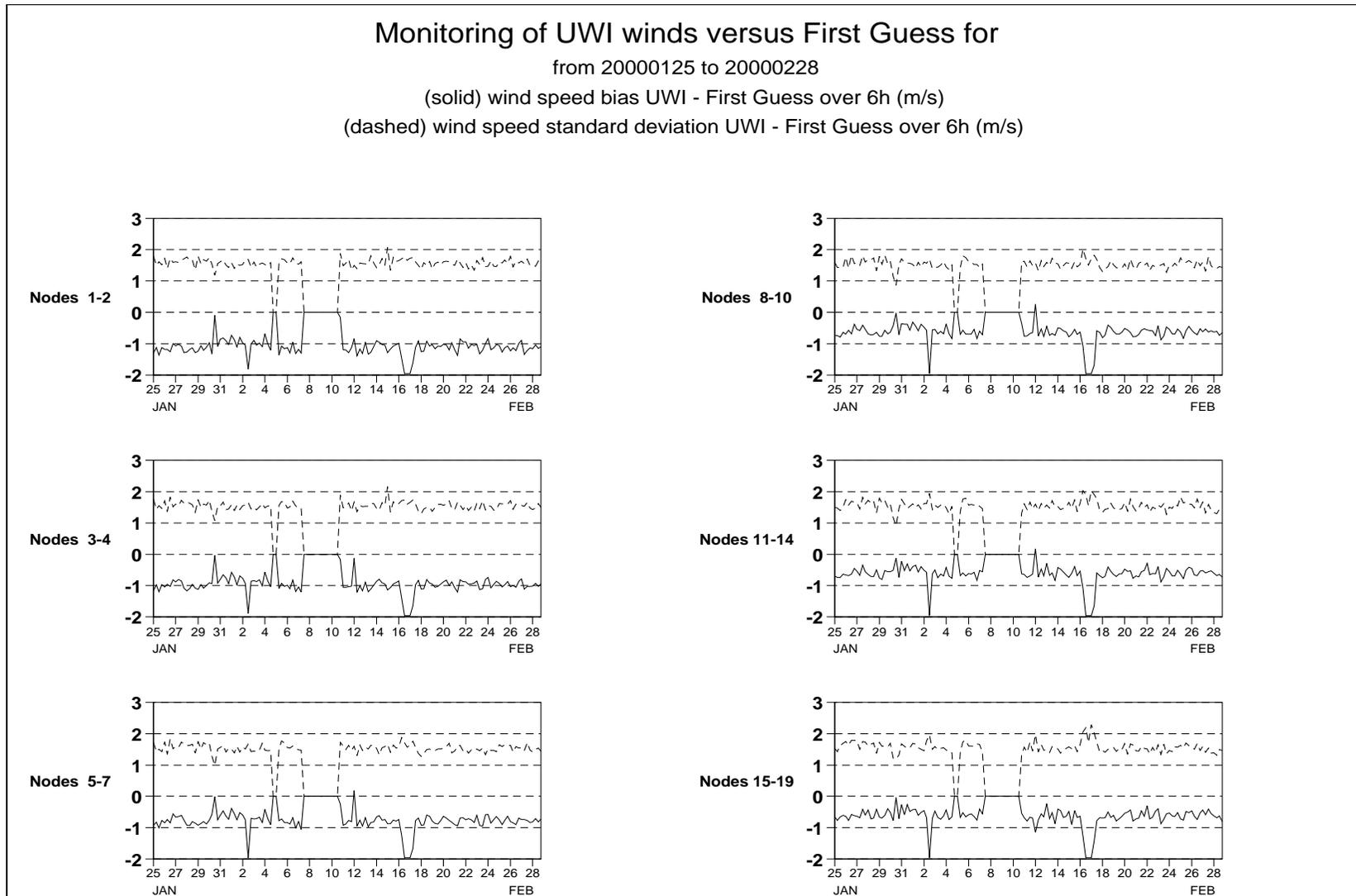


FIGURE 3

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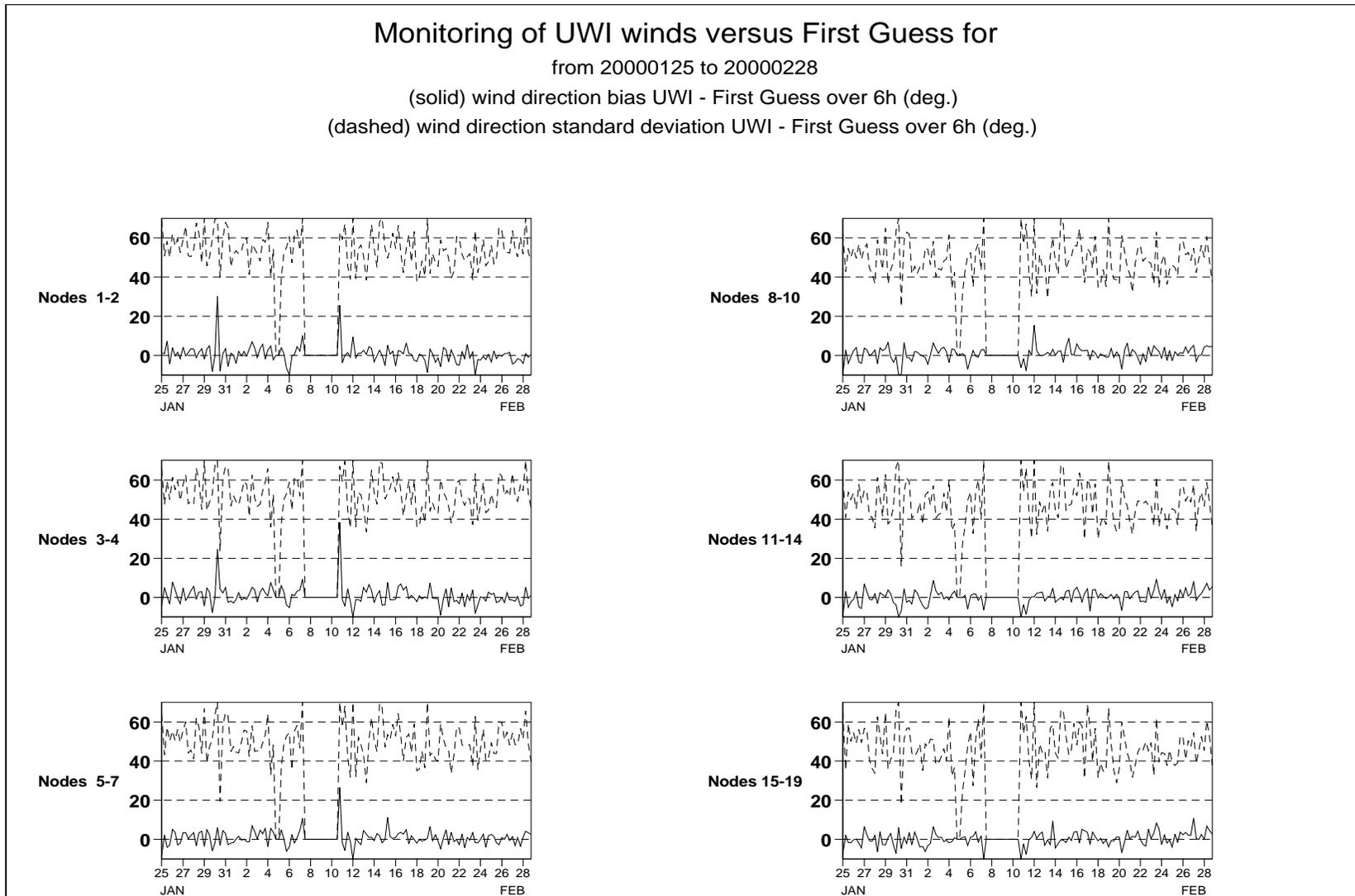


FIGURE 4

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Monitoring of 4D-Var processed winds versus First Guess for

from 20000125 to 20000228

(solid) wind speed bias 4D-Var - First Guess over 6h (m/s)

(dashed) wind speed standard deviation 4D-Var - First Guess over 6h (m/s)

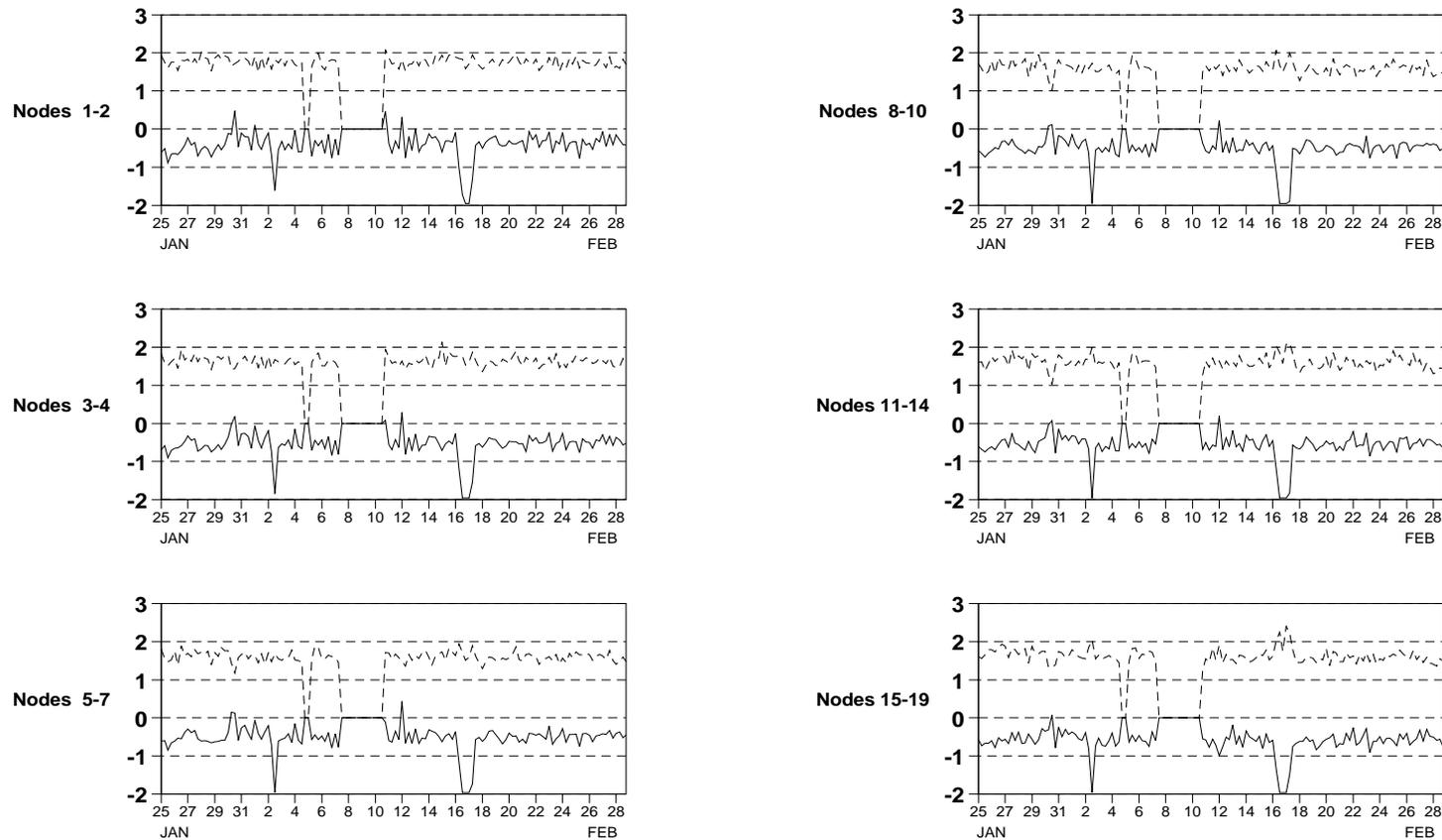


FIGURE 5

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Monitoring of 4D-Var processed winds versus First Guess for

from 20000125 to 20000228

(solid) wind direction bias 4D-Var - First Guess over 6h (deg.)

(dashed) wind direction standard deviation 4D-Var - First Guess over 6h (deg.)

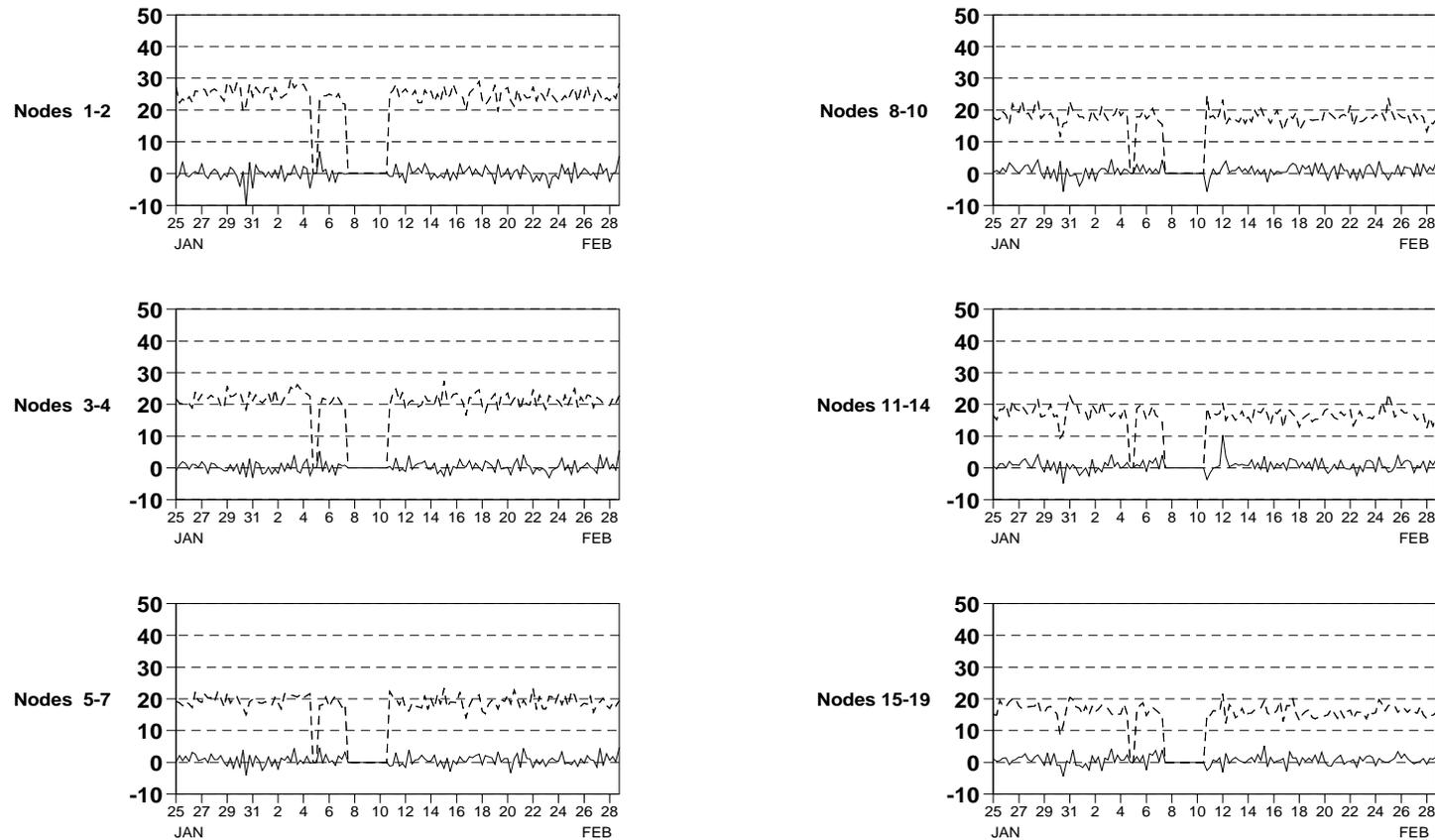
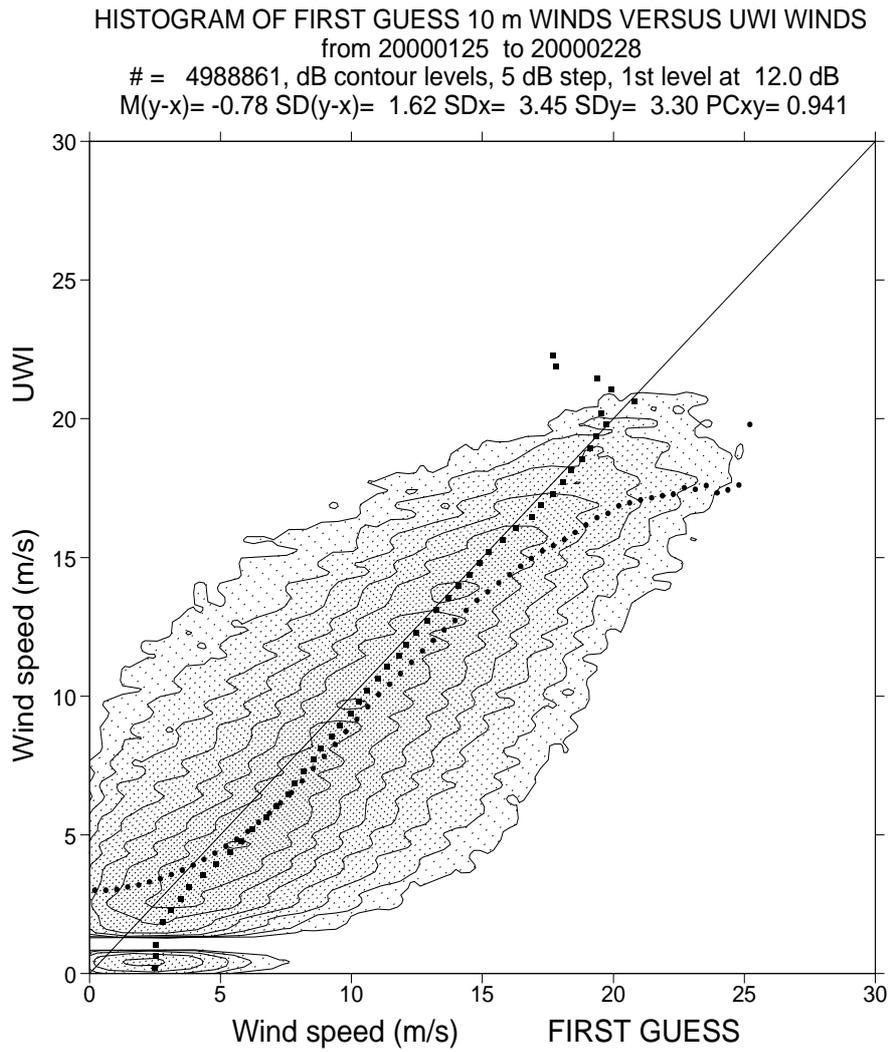


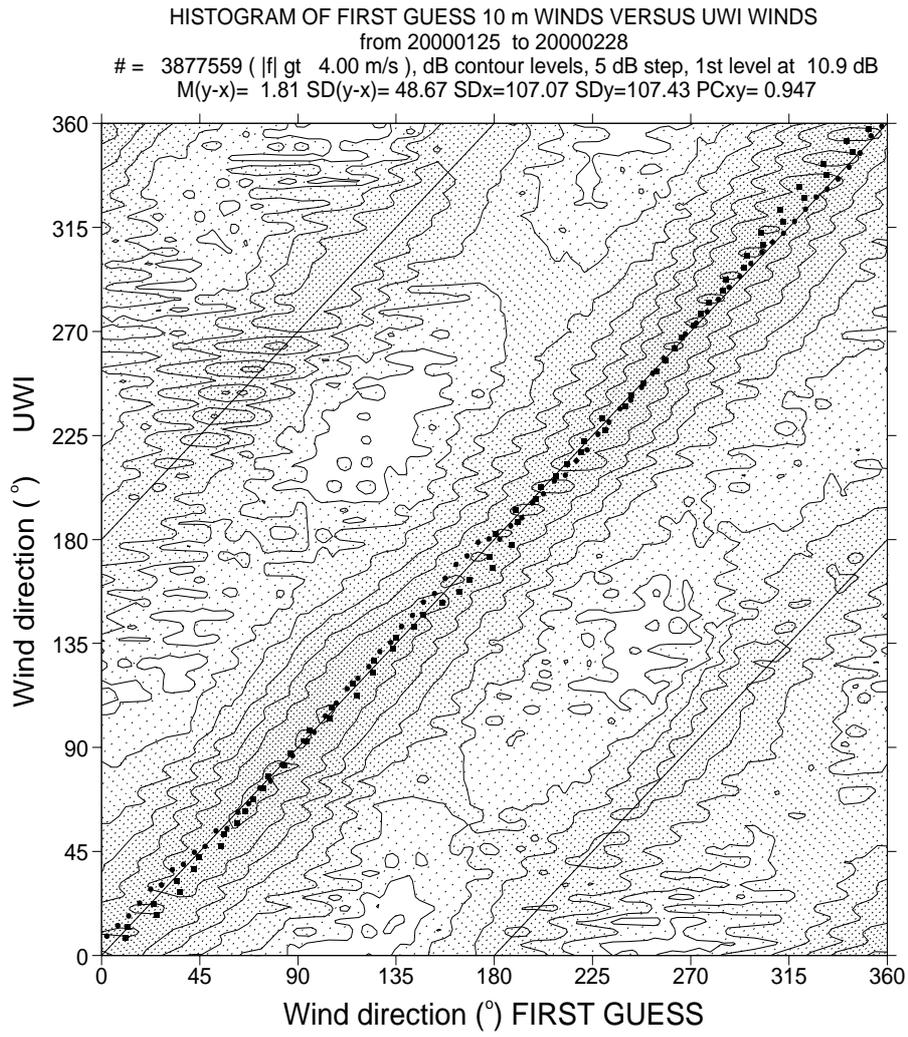
FIGURE 6



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■ **FIGURE 7**



■ **FIGURE 8**