

■ ECMWF - Report on the ERS-2 Scatterometer ■

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

•By: Lars Isaksen

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1 - INTRODUCTION

During the 41th cycle the ERS scatterometer data was generally of high quality. The data volumes were at the normal high level during most of the report period, except for the cycles 12 and 18 UTC 30 March 1999 where no data was received due to a disk crash at Kiruna ground station. No data was received from 3:30-9 UTC on 23 March 1999 and the data received between 3-3:30 UTC on that day looks a bit suspicious. Low data volumes (below 50% of the normal quantity) were received on 12 and 18 UTC 3 April 1999, the data received was of normal high quality.

As mentioned in the previous report, the ECMWF data assimilation system was changed on 9 March 1999. The number of vertical levels were increased from 31 to 50. The 19 extra levels were added in the stratosphere. The increase in the directional standard deviation mentioned in the previous report is also visible in this report period, this may be because of the assimilation change.

2 - ERS-2 STATISTICS FROM 16 MARCH 1999 TO 19 APRIL 1999

The sigma0 biases with respect to the ECMWF model first guess winds had a slightly larger bias for descending tracks fore antenna measurements over most of the incidence angle range. Descending tracks mid antenna and aft antenna measurements were very similar to the biases from the previous report period. The



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ascending tracks aft antenna measurements have a slightly smaller bias for incidence angles above 50 degrees. The ascending tracks fore antenna measurements have a slightly larger bias for incidence angles below 35 degrees. The scatterometer measurements are still generally overestimated by 0.2 dB to 0.3 dB for incidence angles above 32 degrees, most pronounced for the ascending tracks.

The distance to the cone history shows that the only data missing during the 41th report period was on 30 March 1999. Statistical sampling problems for the low data volume on 6 UTC 23 March 1999 may be responsible for the spikes in the distance to the cone values for nodes 1-2 and nodes 11-19. For the remaining part of the period the monitoring gives results very similar to last report period's.

The UWI winds have an average bias of -0.47 m/s, (-0.82 m/s for nodes 1-2 down to -0.27 m/s for nodes 11-19). This is a slight degradation compared to the results from cycle 40. The standard deviations are slightly worse compared to the previous cycle's values: all nodes standard deviations are close to 1.56 m/s.

The standard deviation for ECMWF (4D-Var) processed data are also slightly worse compared to values from the last monitoring cycle, the average value is 1.66 m/s. The bias is similar to the results seen in cycle 40, the average value is now -0.19 m/s.

The (scatterometer - model) direction standard deviations were ranging between 30 and 65 degrees for the UWI data (average value 48 degrees) and between 15 and 30 degrees (average value 20.1 degrees) for their 4D-Var counterparts. The direction standard deviations are higher than in the previous report period, this might be partly due to the assimilation system change. The directional bias is still close to zero for both UWI and 4D-Var products.

The scatter plot of model 10 m wind speeds versus UWI wind speeds shows a larger standard deviation but similar bias to results from cycle 40. The direction scatter plot is in close agreement with the results from the previous cycle.



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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. 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. 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.

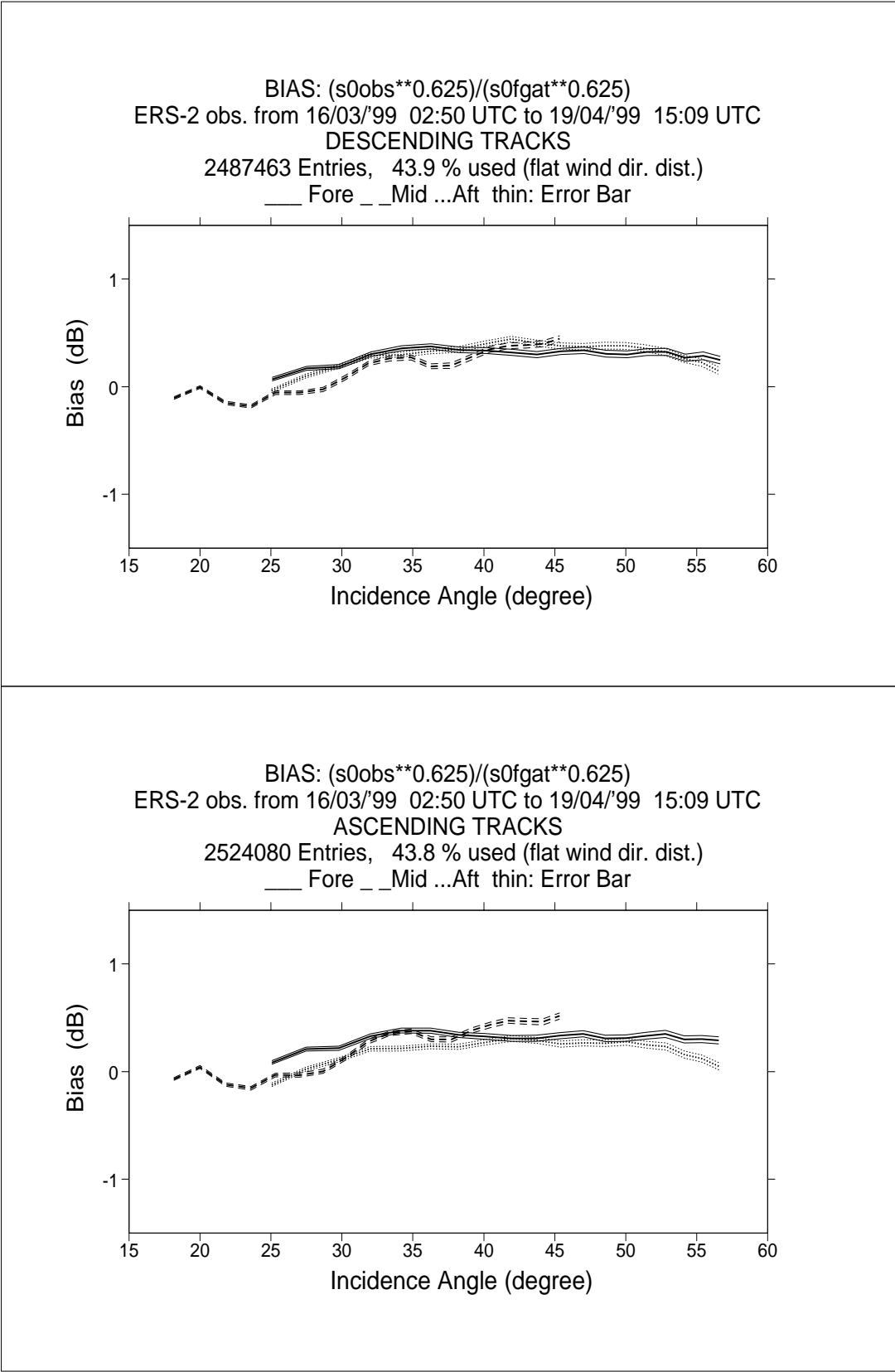


FIGURE 1

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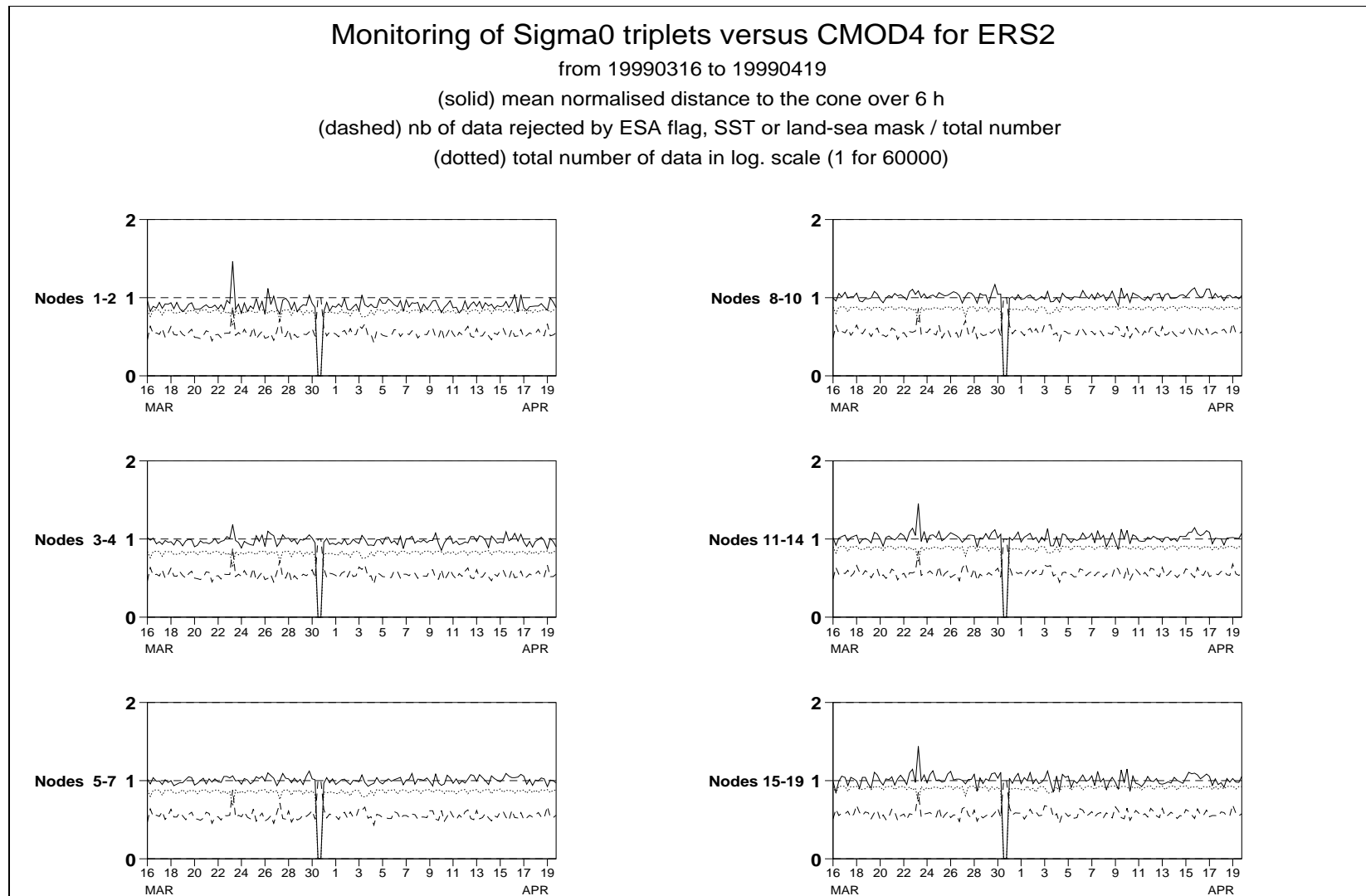


FIGURE 2

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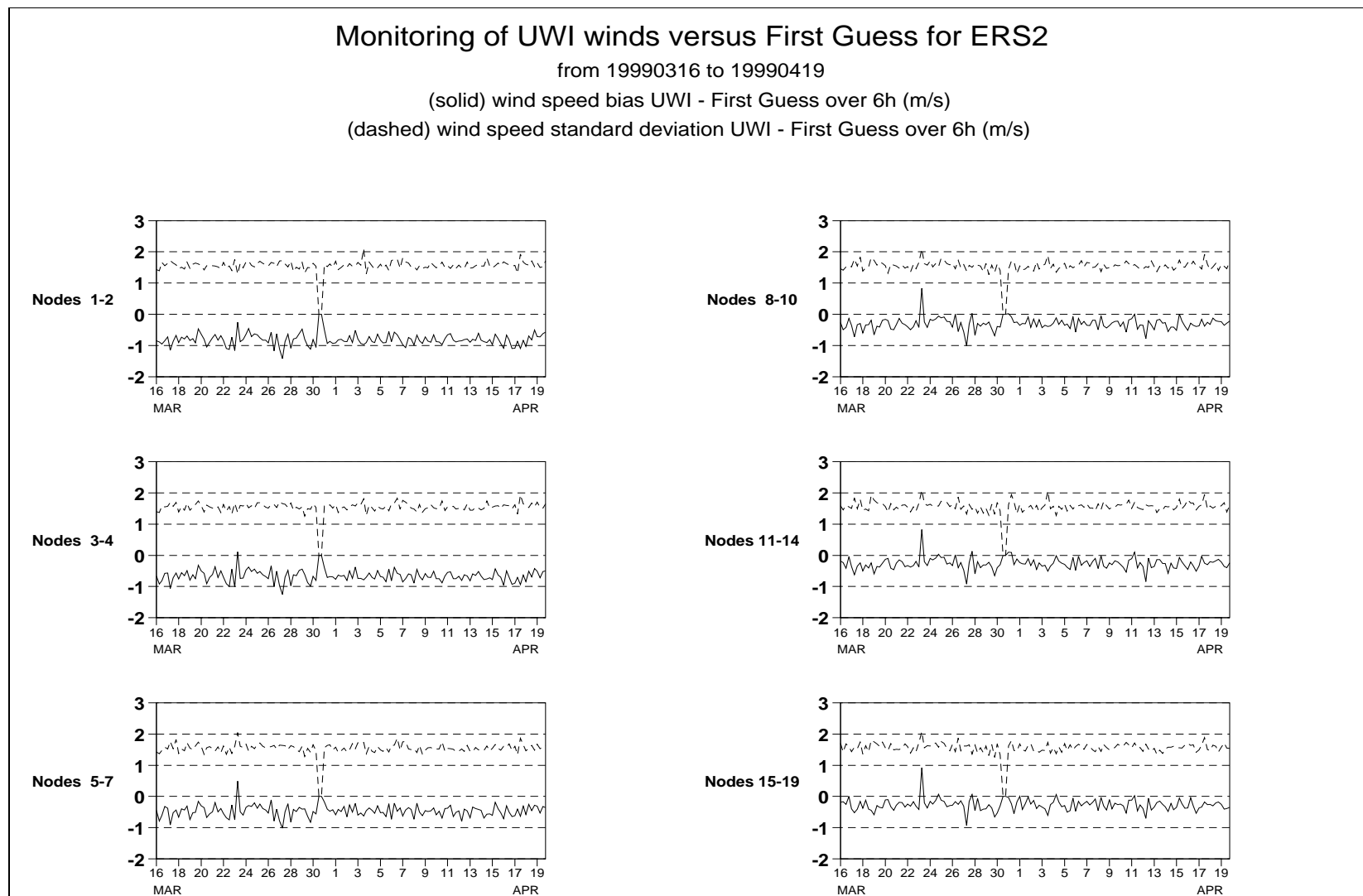


FIGURE 3

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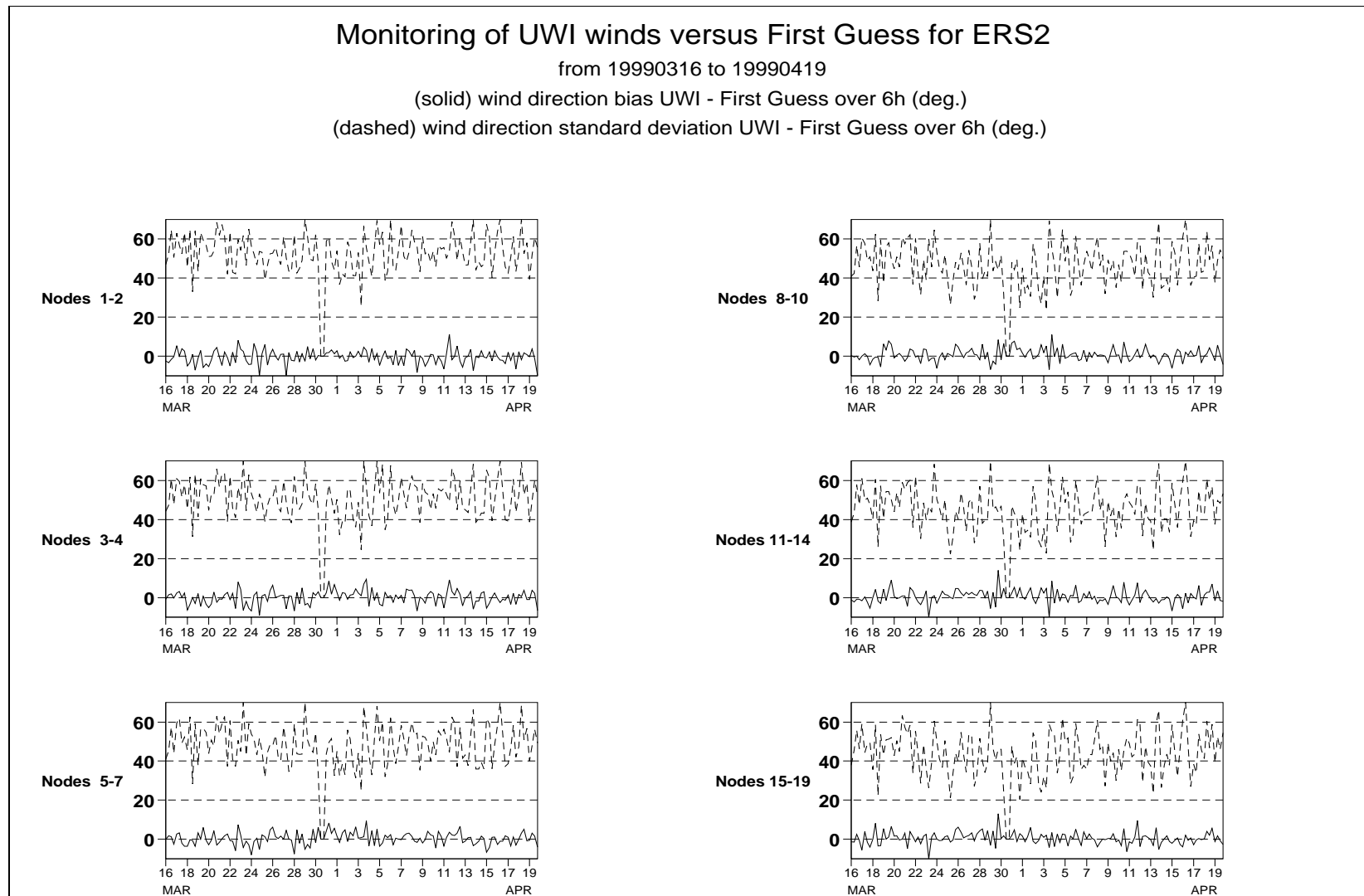


FIGURE 4

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Monitoring of 4D-Var processed winds versus First Guess for ERS2

from 19990316 to 19990419

(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)

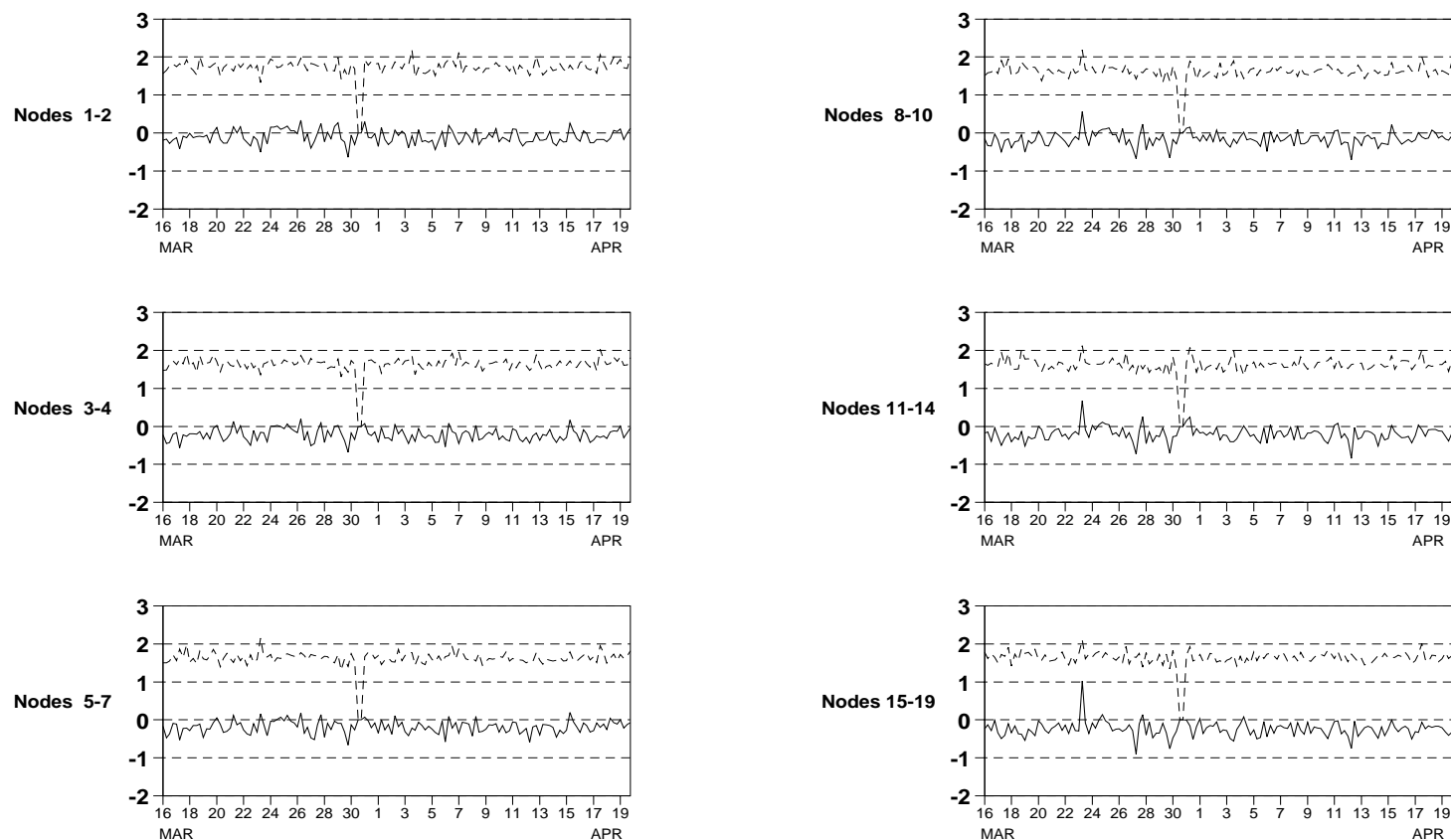


FIGURE 5

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Monitoring of 4D-Var processed winds versus First Guess for ERS2

from 19990316 to 19990419

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

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

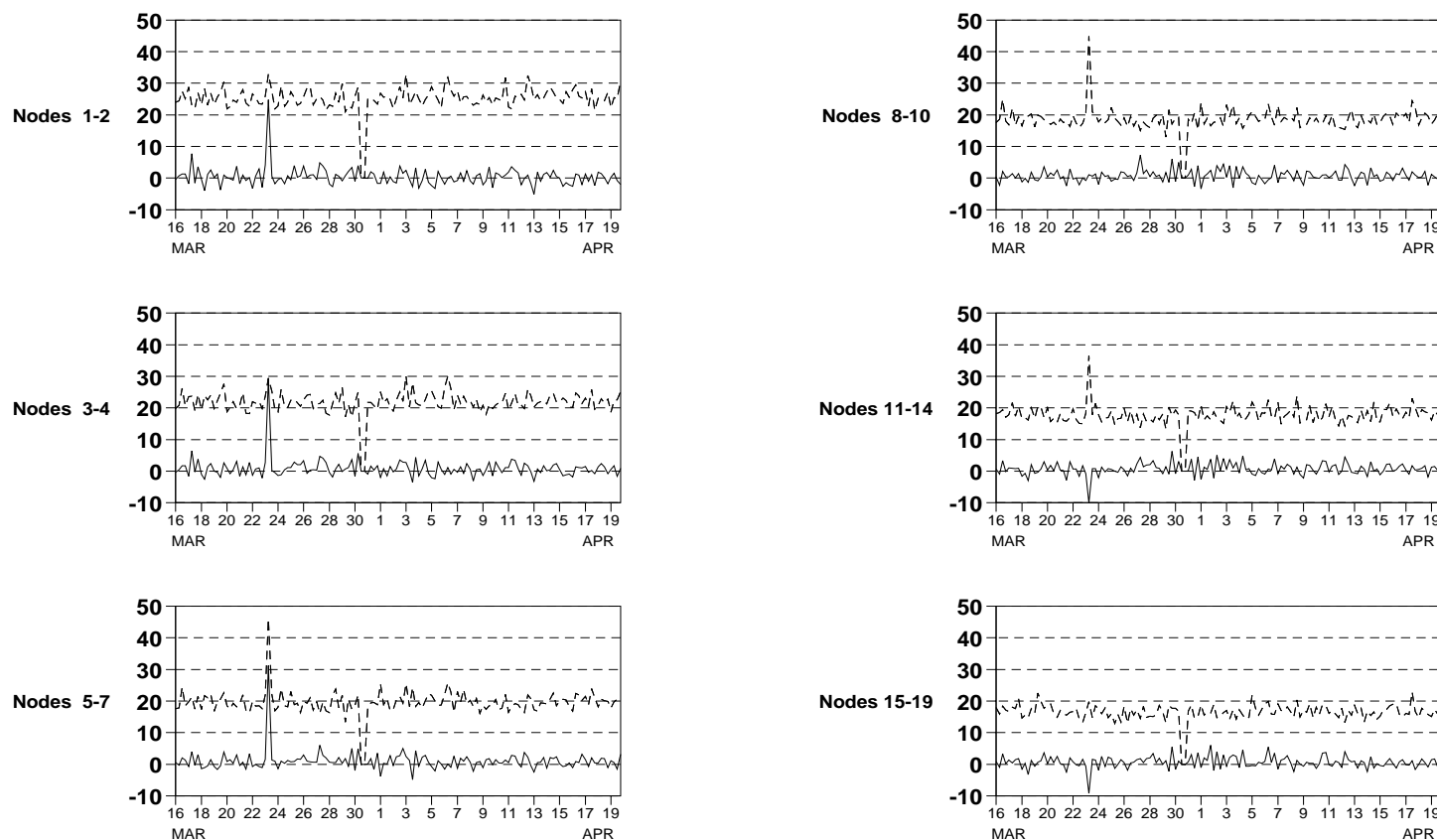
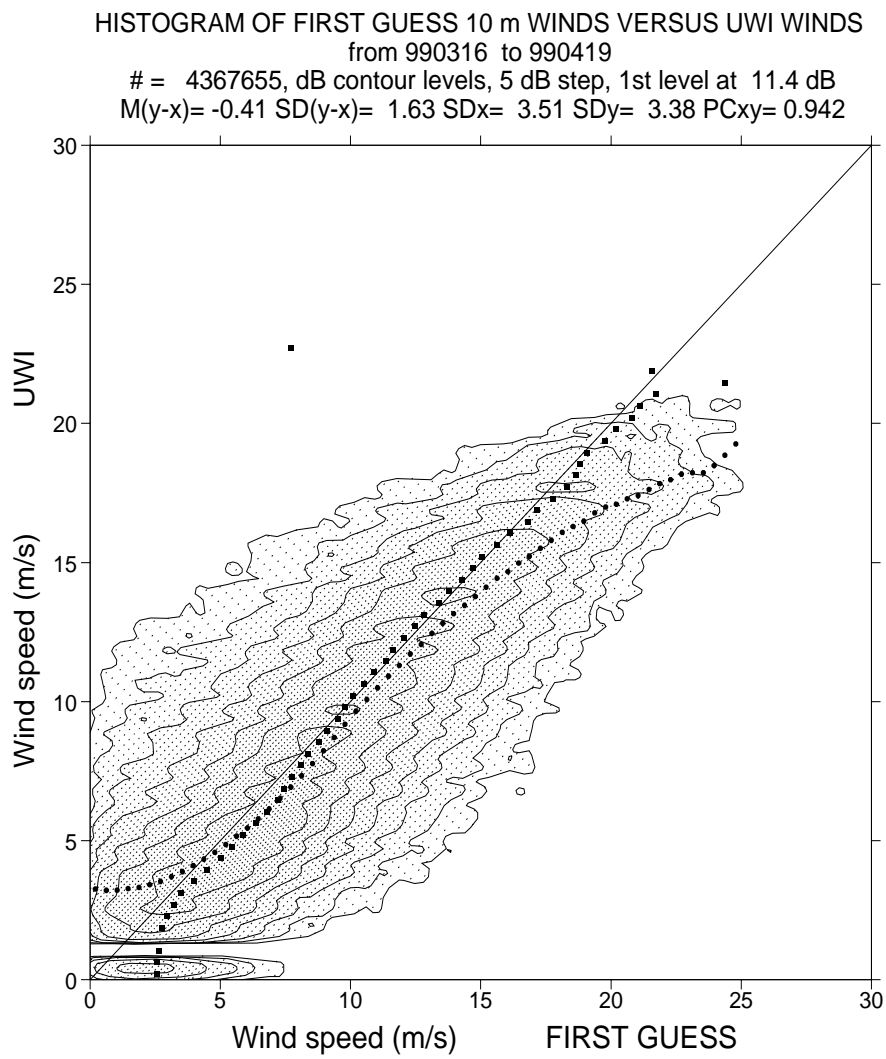


FIGURE 6



■ **FIGURE 7**

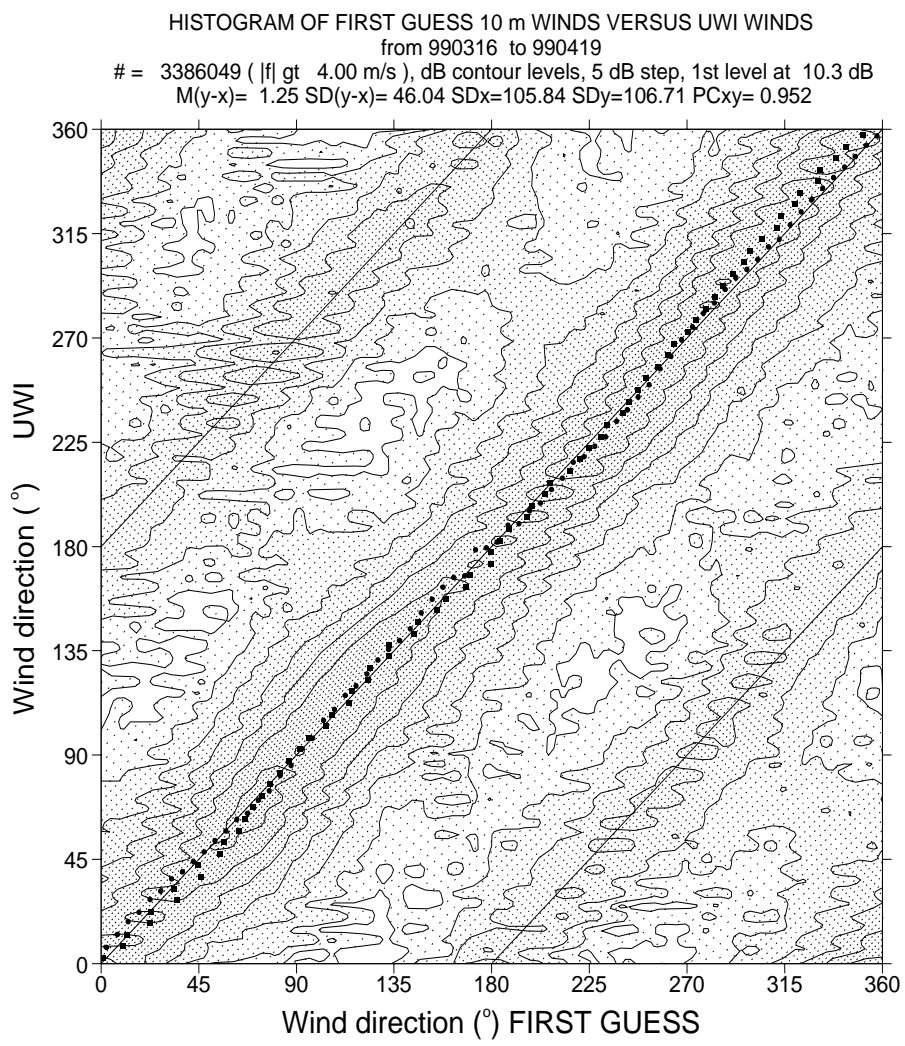


FIGURE 8