

# ■ 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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•Date: 30 May 2000

## **1 - INTRODUCTION**

Cycle 52 was a very stable period without any loss of data from ERS-2. For all the cycles the data volumes were well above 70% of normal data volume. For the whole monitoring period the data quality was high, except for 10-16 UTC 14 April 2000 where the data quality was poor.

The ECMWF data assimilation system was changed during cycle 52. The main features expected to affect the surface winds are use of SSM/I surface winds from two satellites instead of one. SSM/I data is thinned so the volume is similar to the previous one satellite volume. The surface stress calculation in the wave model is modified. The model changes are not expected to change the model wind statistics. This is confirmed by the stable ERS monitoring statistics, seen in this report, for cycle 52.

## **2 - ERS-2 STATISTICS FROM 4 APRIL 2000 TO 8 MAY 2000**

Compared to the results from the previous cycle, the level of the descending track Fore beam sigma0 biases with respect to the ECMWF model first guess winds for incidence angles between 30 and 50 are reduced. For ascending tracks the results are very similar to the results from cycle 51. All curves have a fairly flat distribution over the whole incidence range.



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The distance to the cone history shows the very uniform high data volume during this monitoring cycle. The only performance problem is seen at 12 UTC 14 April 2000. Here there is a clear peak above normal levels for nodes 8-19. This peak is due to poor data quality for that six hour period.

The UWI winds have an average bias of -0.78 m/s, (-1.14 m/s for nodes 1-2 down to -0.60 m/s for nodes 11-19). This is very comparable to the results from the previous cycle. The standard deviations are slightly better than the results from the previous cycle: the standard deviation is on the average 1.52 m/s, and very similar for all nodes.

The standard deviation for ECMWF (4D-Var) processed data is slightly better than the results from the last monitoring cycle, the average value is 1.59 m/s. The bias is like seen in the previous report for cycle 51: the average value is now -0.50 m/s. The (scatterometer - model) direction standard deviations were ranging between 30 and 65 degrees for the UWI data (the average value 49 degrees) and between 15 and 30 degrees (average value 19.1 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 reflects the small changes in bias and standard deviations mentioned above compared to the previous cycle. 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 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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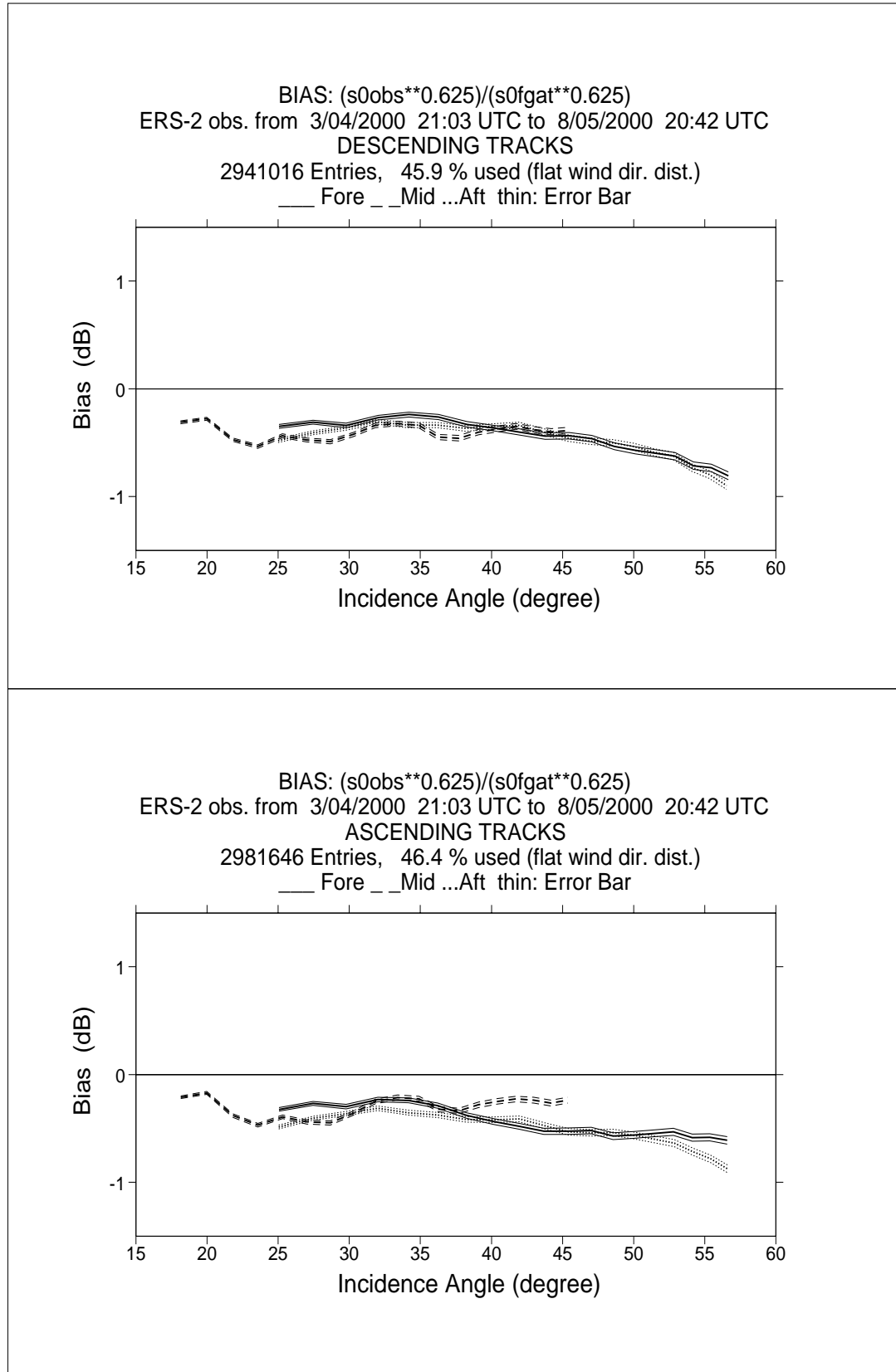
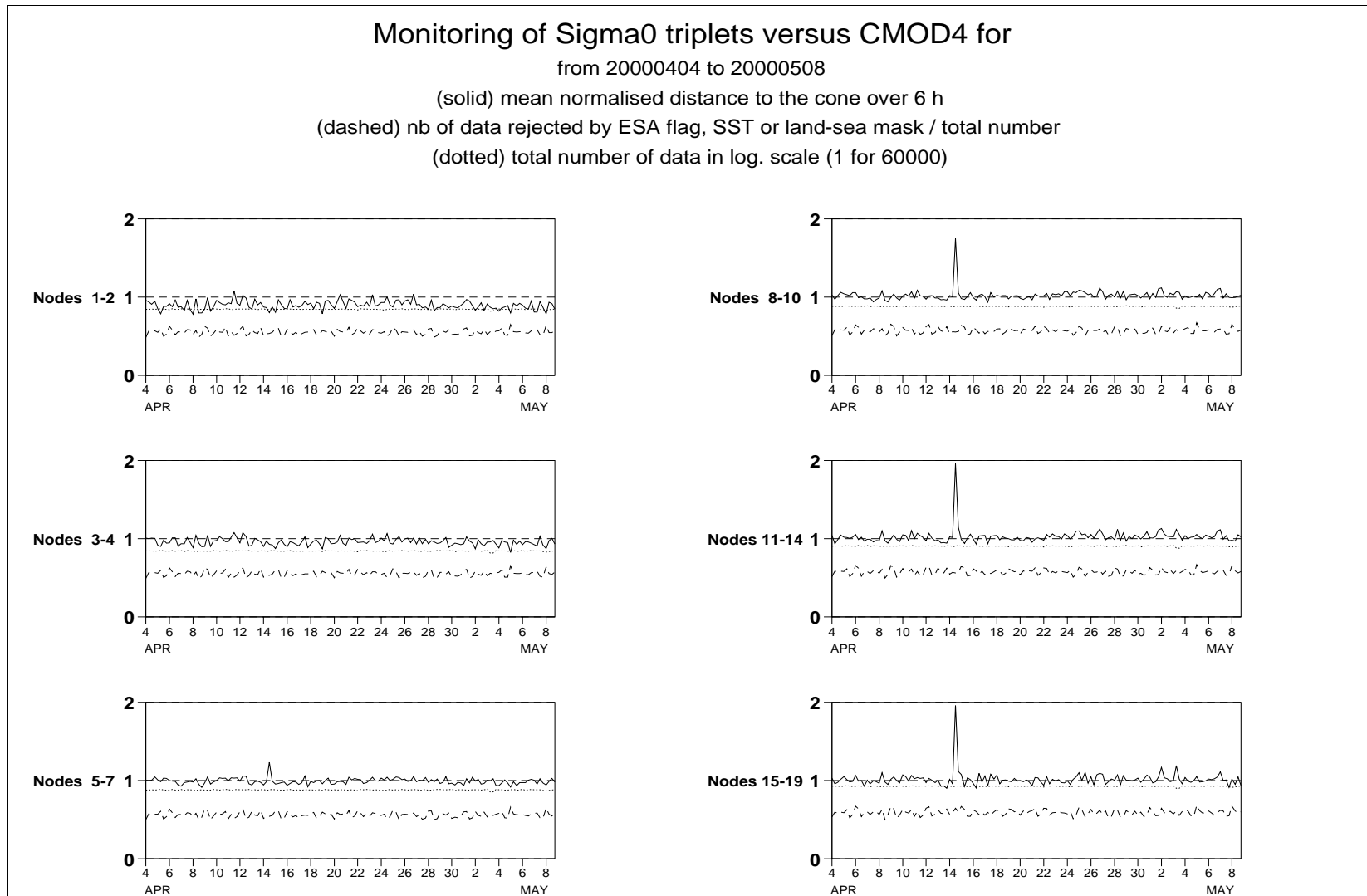


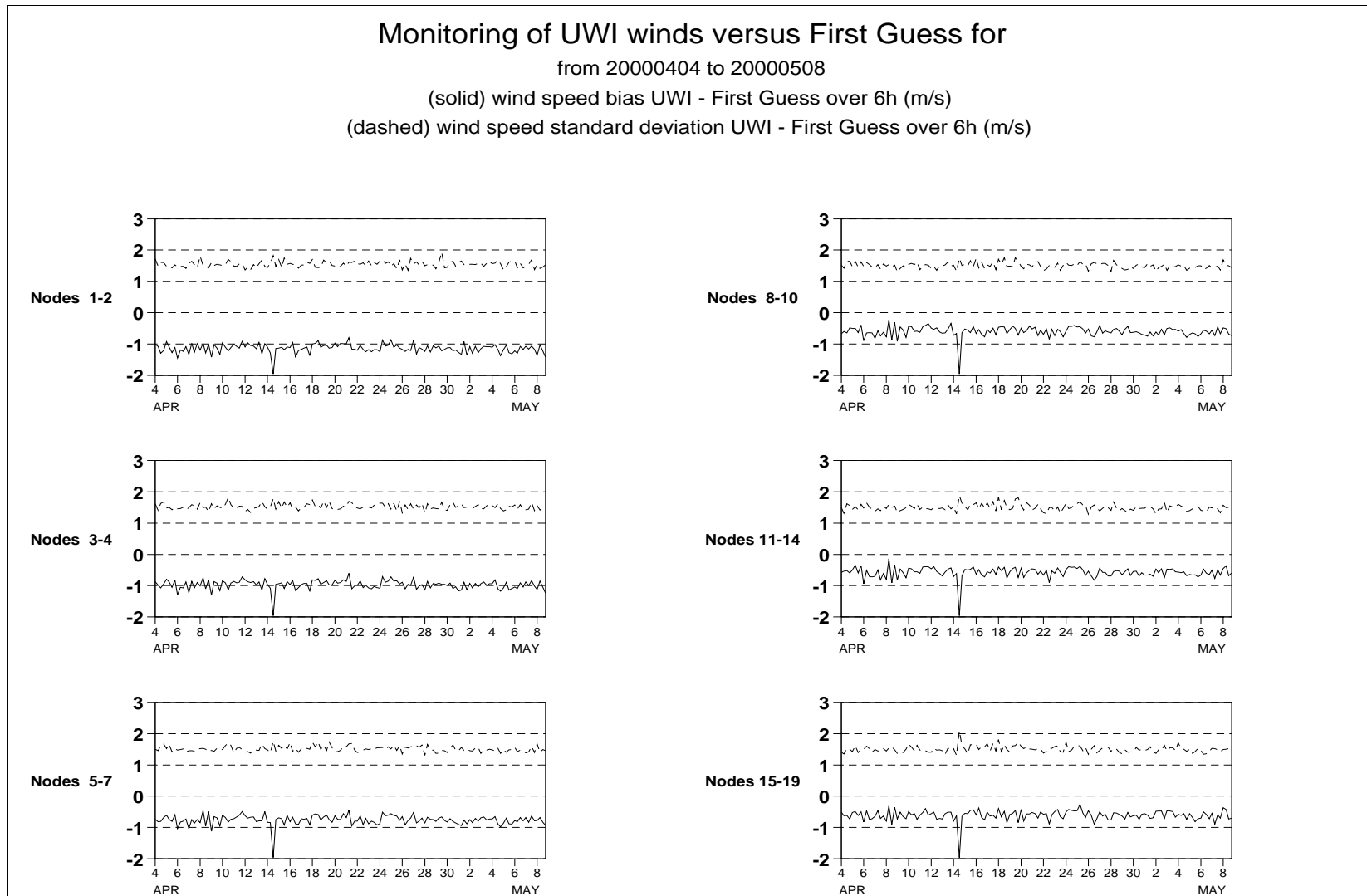
FIGURE 1

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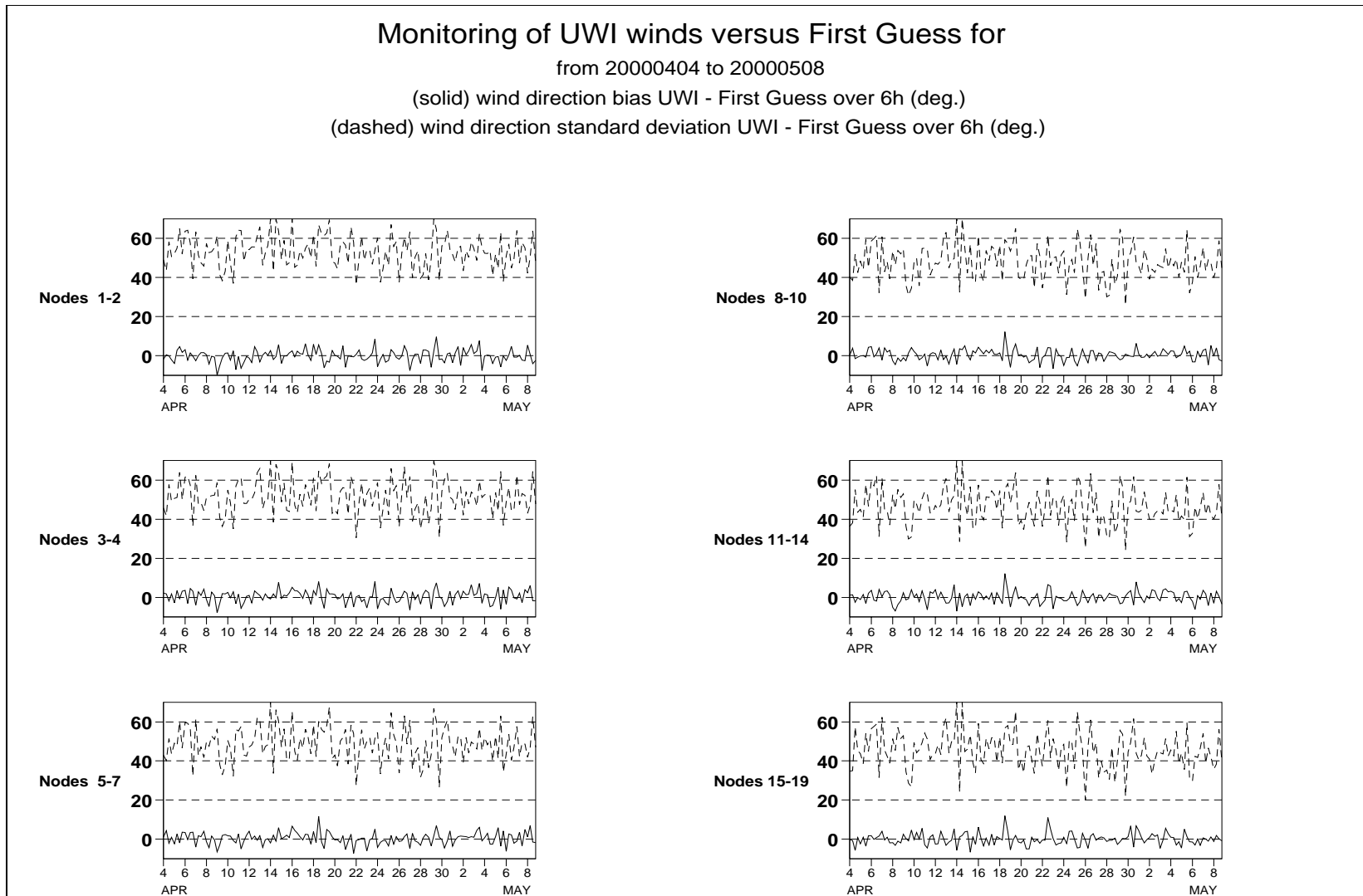
**FIGURE 2**

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**FIGURE 3**

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**FIGURE 4**

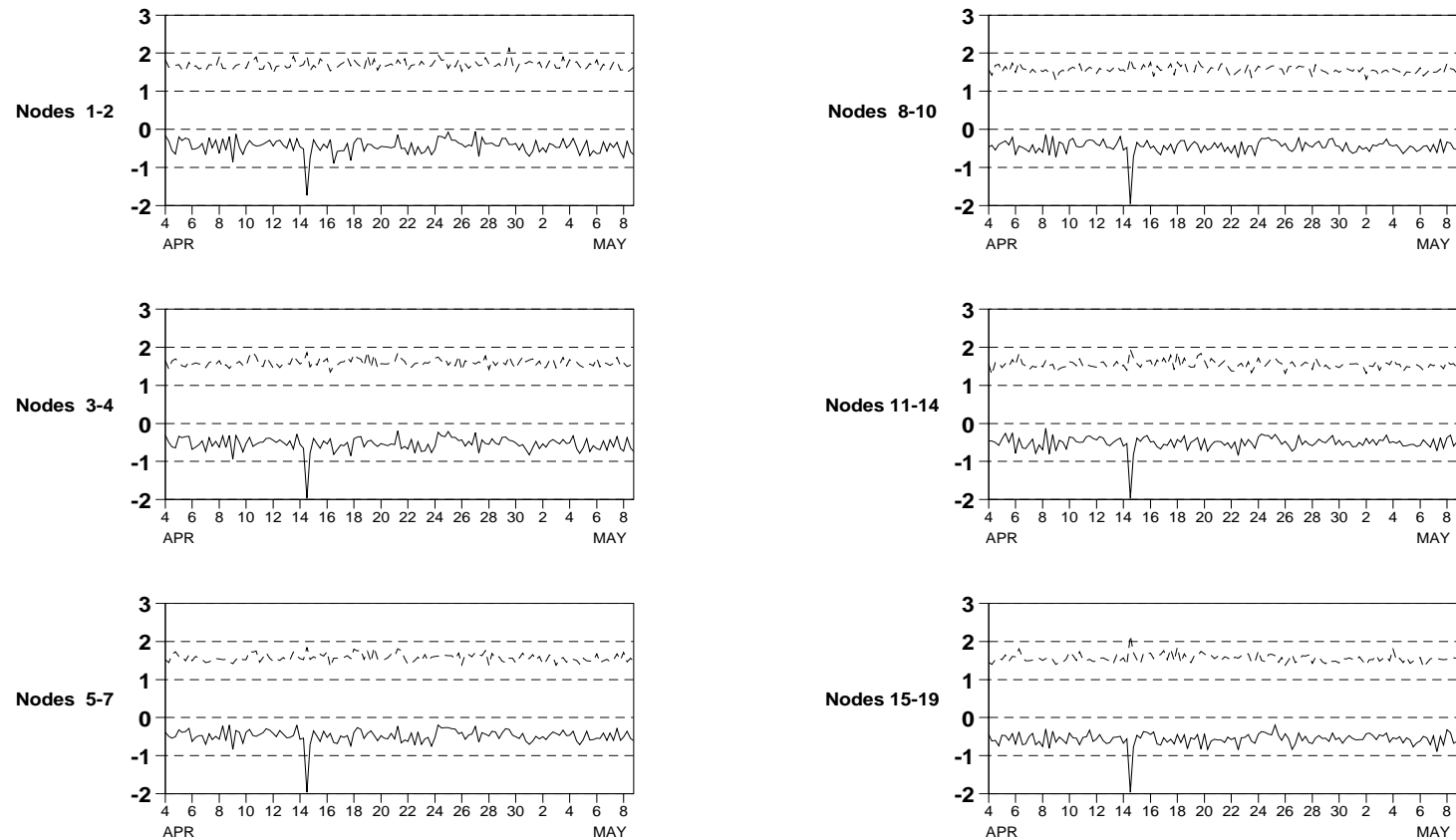
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## Monitoring of 4D-Var processed winds versus First Guess for

from 20000404 to 20000508

(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**



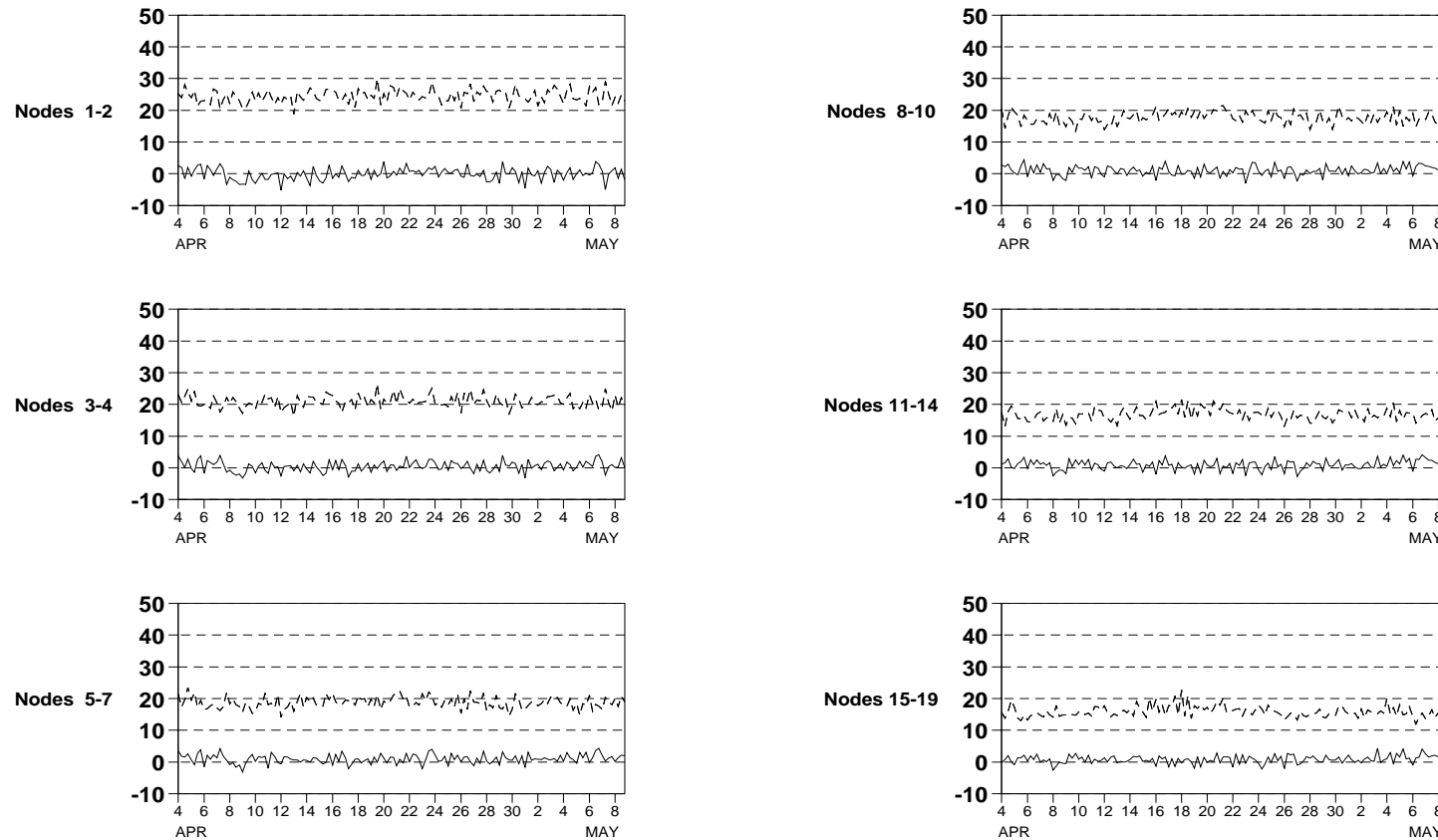
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## Monitoring of 4D-Var processed winds versus First Guess for

from 20000404 to 20000508

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

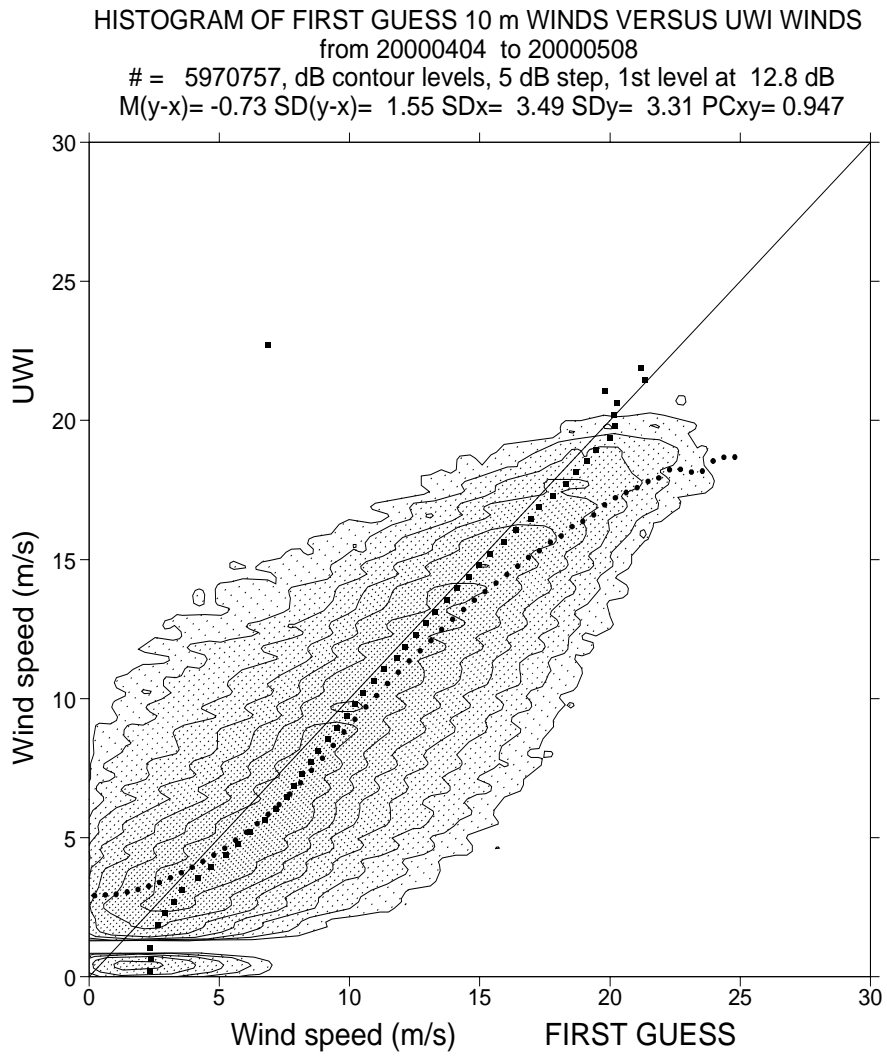
(dashed) wind direction standard deviation 4D-Var - First Guess over 6h (deg.)



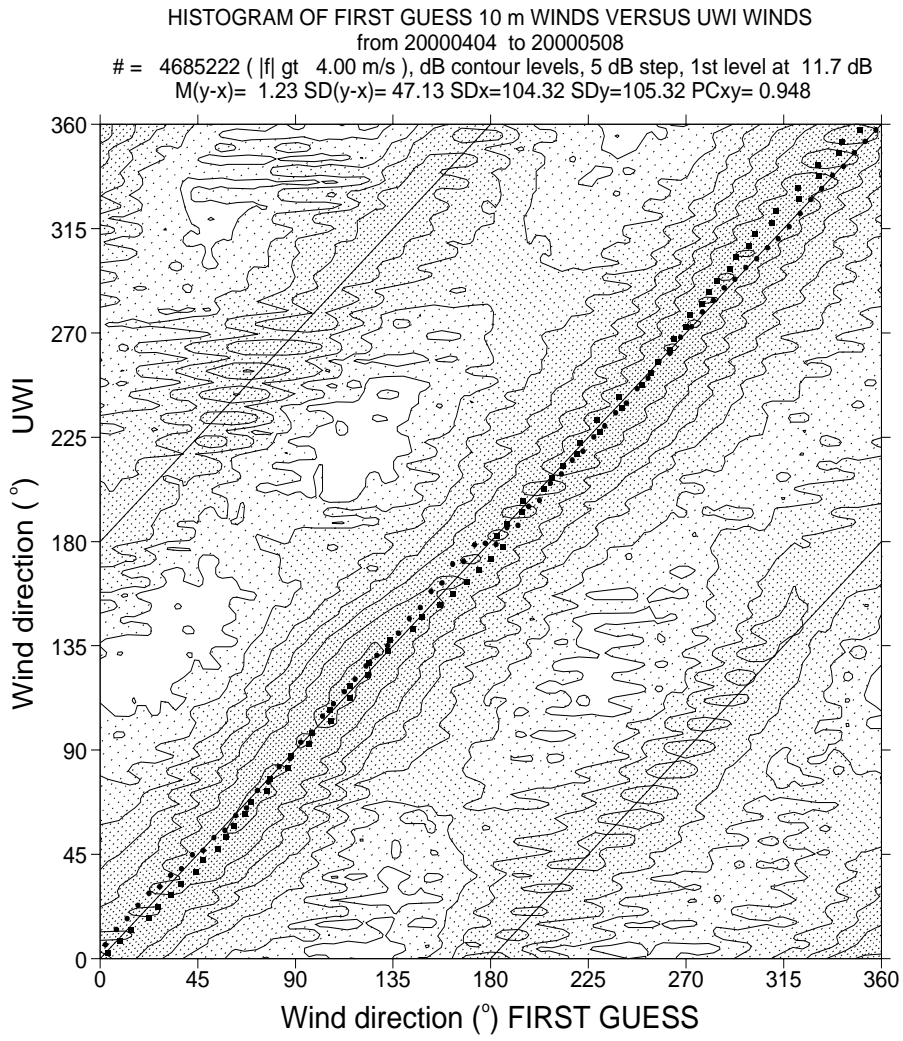
**FIGURE 6**



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■ **FIGURE 7**



■ **FIGURE 8**