

# ■ 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 46th cycle no orbital manoeuvres or other problems affected the quality of the ERS-2 data. For the whole monitoring period the data quality was high. No data was received for 0 UTC 23 September 1999, because ESA performed (well in advance warned) ERS-2 Year 2000 certification activities. Lower than usual data volumes were received at ECMWF for a few cycles: 0 UTC 16 September 1999, 0 UTC 1 October 1999 and 12 UTC 6 October 1999. 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 was not changed during cycle 46.

## **2 - ERS-2 STATISTICS FROM 7 SEPTEMBER 1999 TO 11 OCTOBER 1999**

The sigma0 biases with respect to the ECMWF model first guess winds had slightly bigger negative bias for all three beam measurements for descending tracks middle range incidence angles compared to the previous cycle. The mid beam measurements were very similar over the whole incidence angle range for ascending tracks measurements, whereas the negative bias has been reduced for fore and aft beam ascending track measurements. All curves have a nice flat distribution over the whole incidence range, this is especially true for the fore and aft measurements.



Lars Isaksen

European Centre for Medium Range Weather Forecasts

Shinfield Park, Reading, Berkshire RG2 9AX, England

Telephone: U.K. (0118) 9499852, International (+44 118) 9499852

Telex 847908 ECMWF G, Telefax (01189) 869450, e-mail mpi@ecmwf.int

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The distance to the cone history shows the total lack of data on 0 UTC 23 September 1999. It is seen that very little data was available for 0 UTC 1 October 1999. For the whole period the monitoring results are very stable without any sign of problems. The low volume data cycles do not result in any increased distance to the cone. The sigma0 level is generally at the same level as is the previous cycle. On the other hand, most of the low volume cycles show up in the wind speed statistics, especially 0 UTC 16 September 1999, 0 UTC 1 October 1999 and 12 UTC 6 October 1999. The directional performance statistics are visible worse for the last two cycles. This has been proved to be due to the lower than usual data volume and is not linked to poor quality data.

The UWI winds have an average bias of -0.50 m/s, (-0.87 m/s for nodes 1-2 down to -0.32 m/s for nodes 11-19). This is similar to the results from last cycle. The standard deviations is slightly lower than the values seen in the previous cycle: the standard deviation is close to 1.50 m/s for all nodes.

The standard deviation for ECMWF (4D-Var) processed data is better than in the last monitoring cycle, the average value is 1.59 m/s. The bias is similar to the results seen in cycle 45, the average value is still -0.24 m/s.

The (scatterometer - model) direction standard deviations were ranging between 30 and 65 degrees for the UWI data (average value 47 degrees) and between 15 and 30 degrees (average value 19.3 degrees) for their 4D-Var counterparts. The direction standard deviations are similar to the ones in the previous report period. As usual, 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 smaller bias and a smaller standard deviation compared to the results from 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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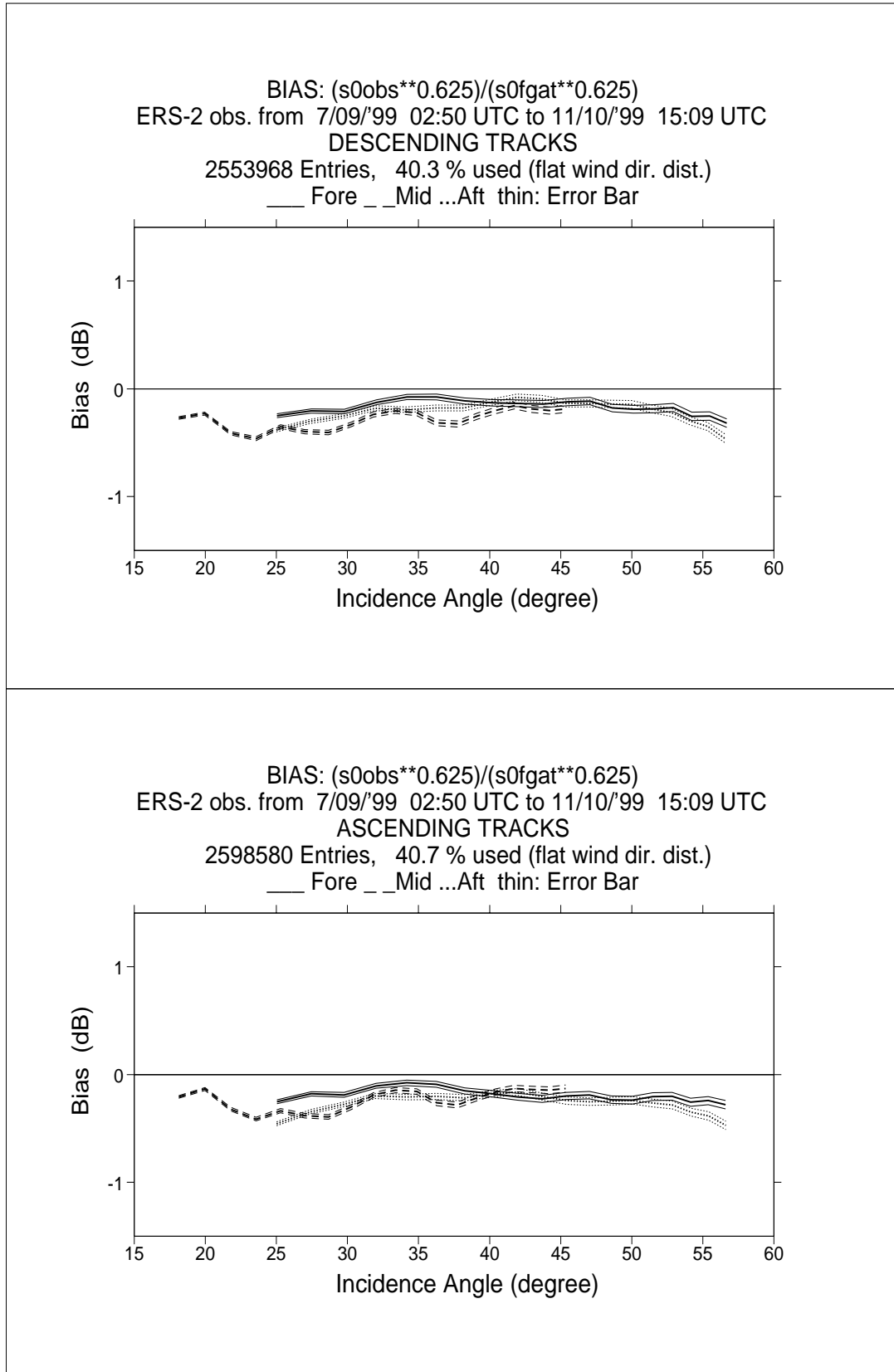
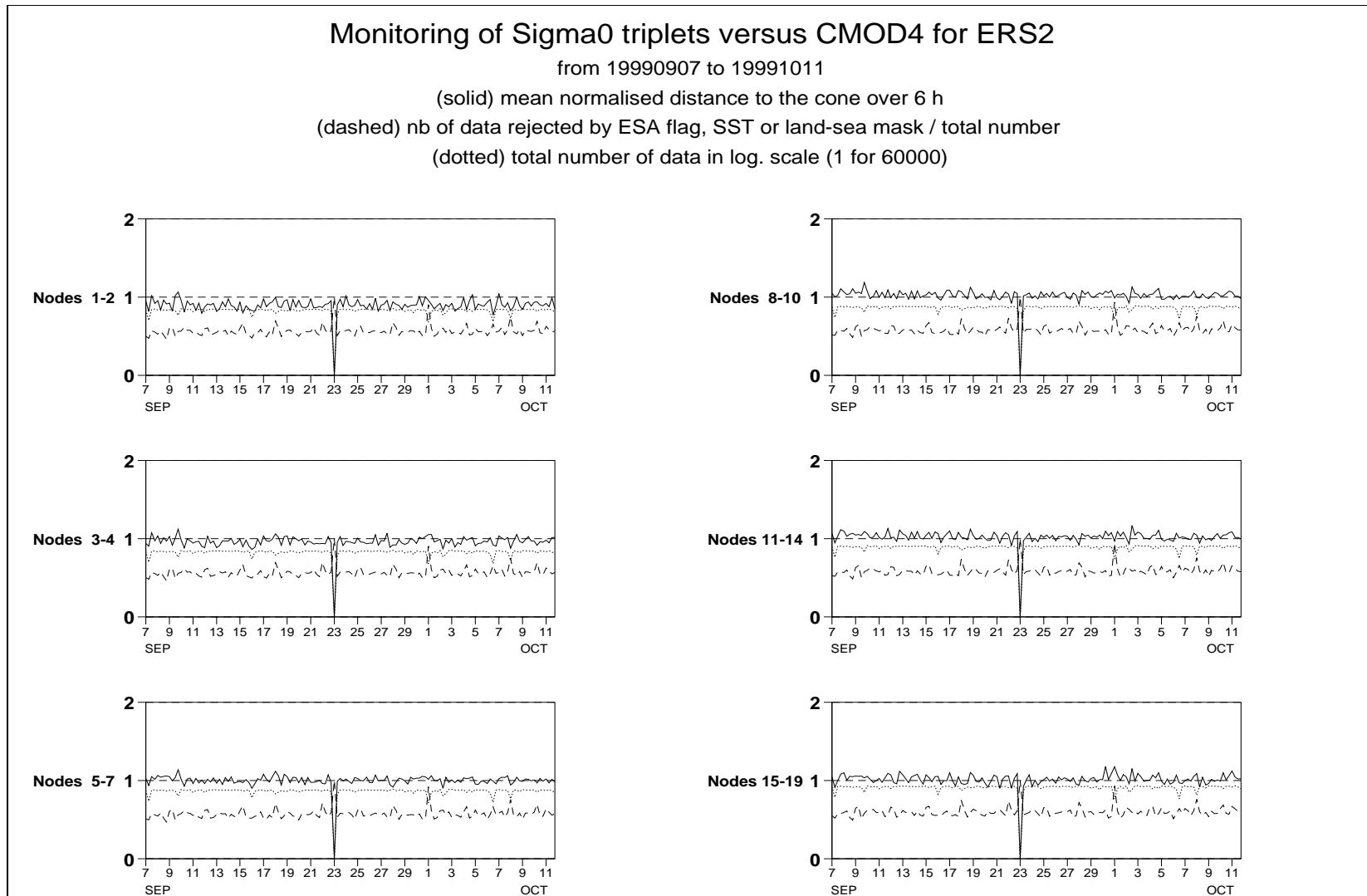


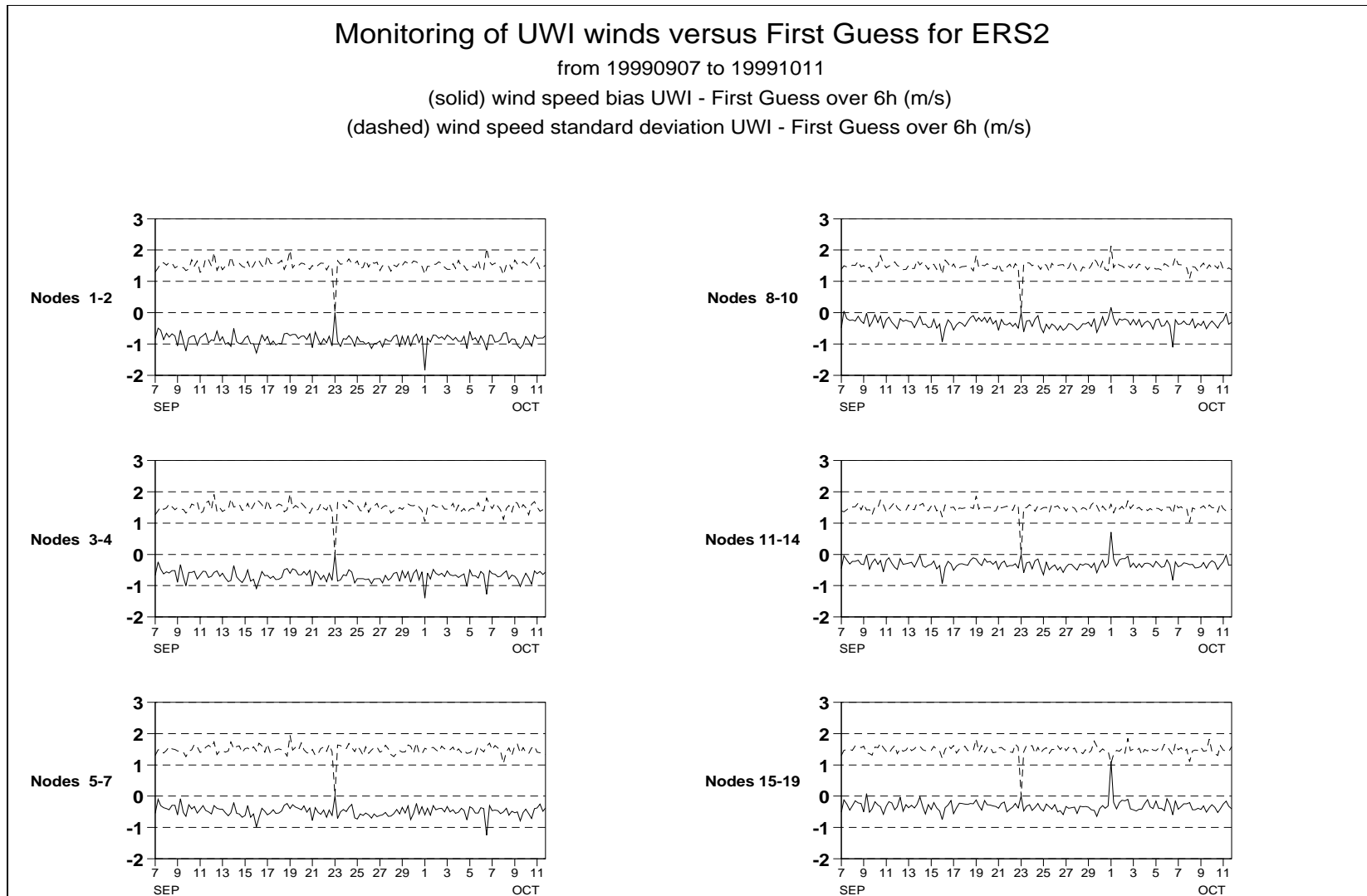
FIGURE 1

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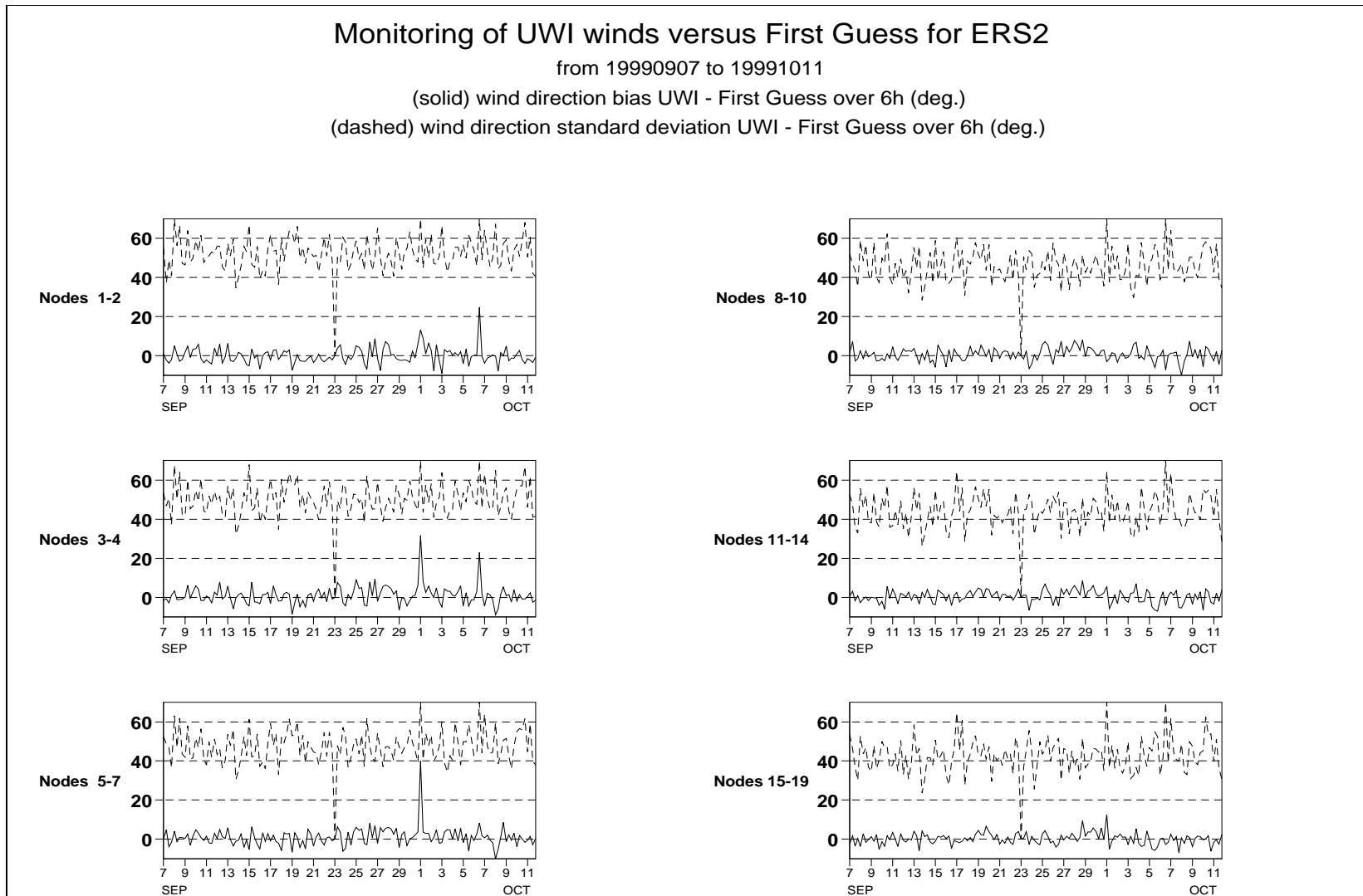
**FIGURE 2**

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**FIGURE 3**

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**FIGURE 4**

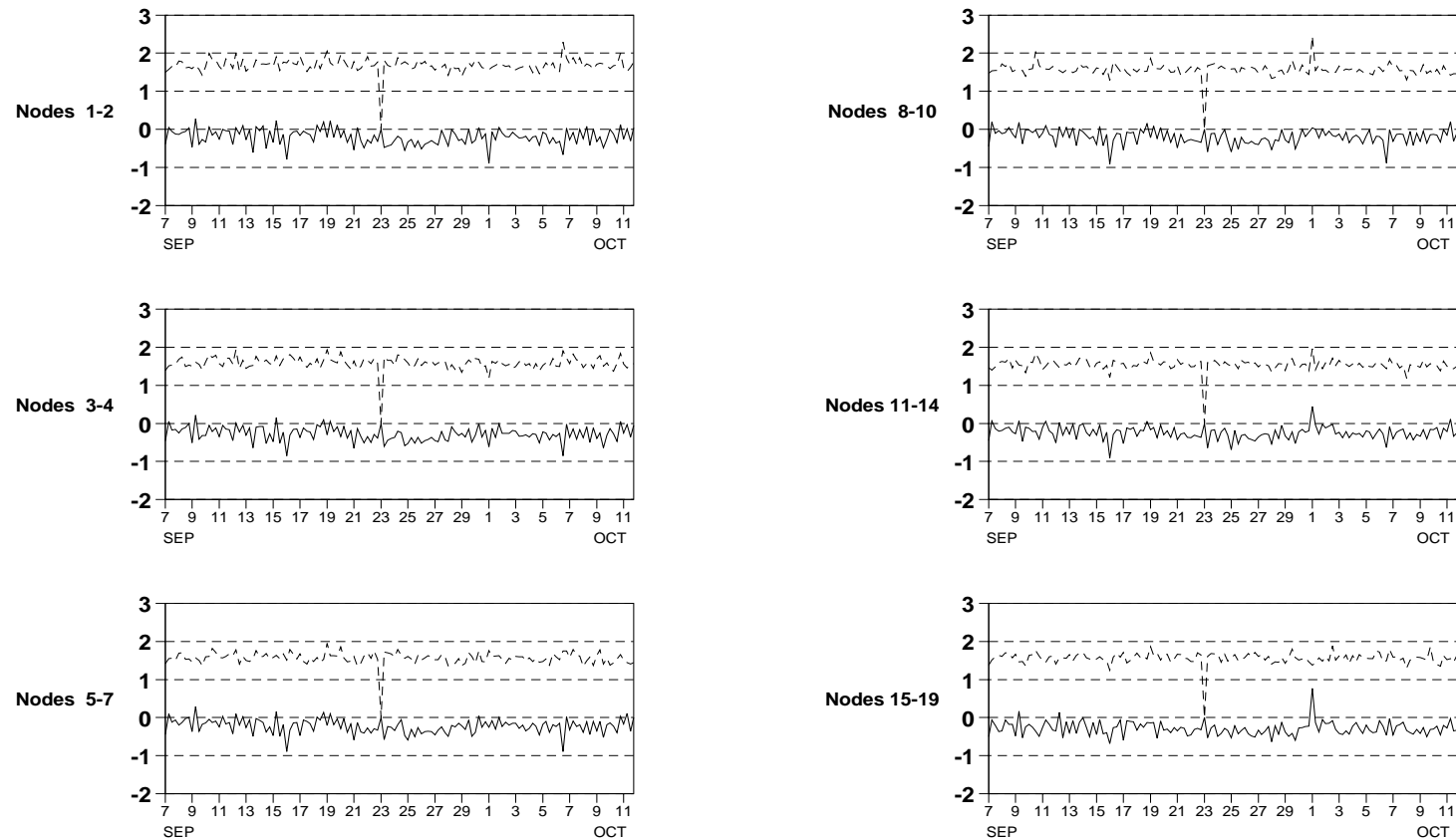
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## Monitoring of 4D-Var processed winds versus First Guess for ERS2

from 19990907 to 19991011

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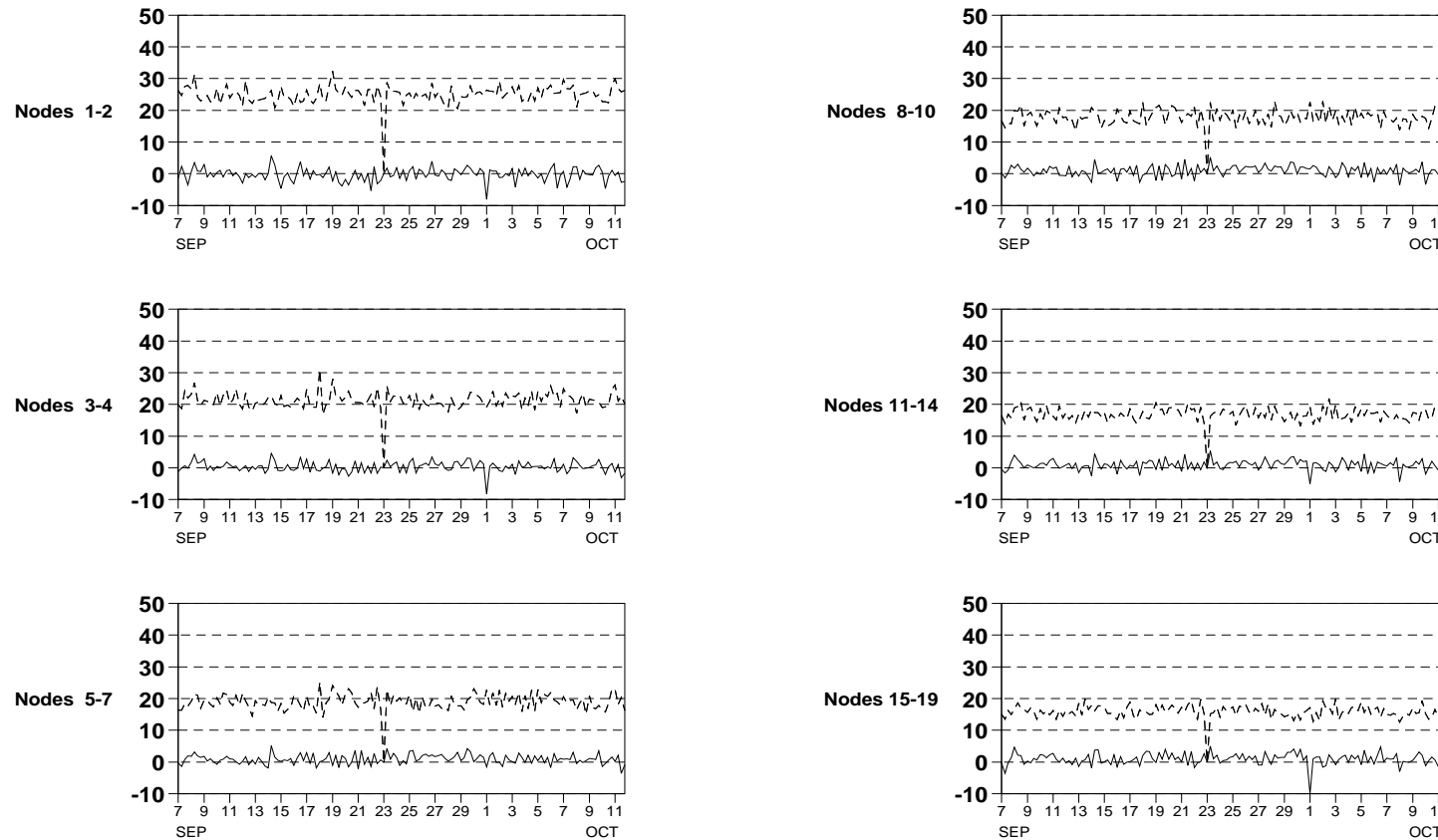
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(solid) wind direction bias 4D-Var - First Guess over 6h (deg.)

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

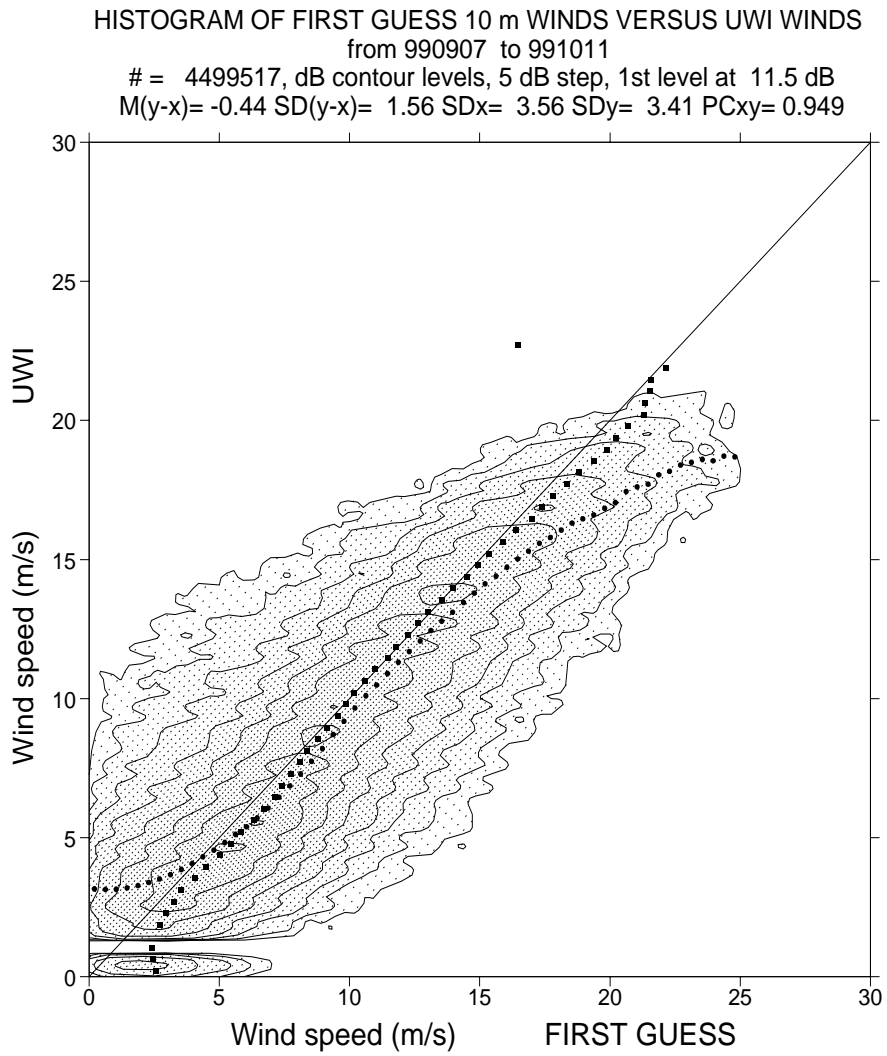


**FIGURE 6**

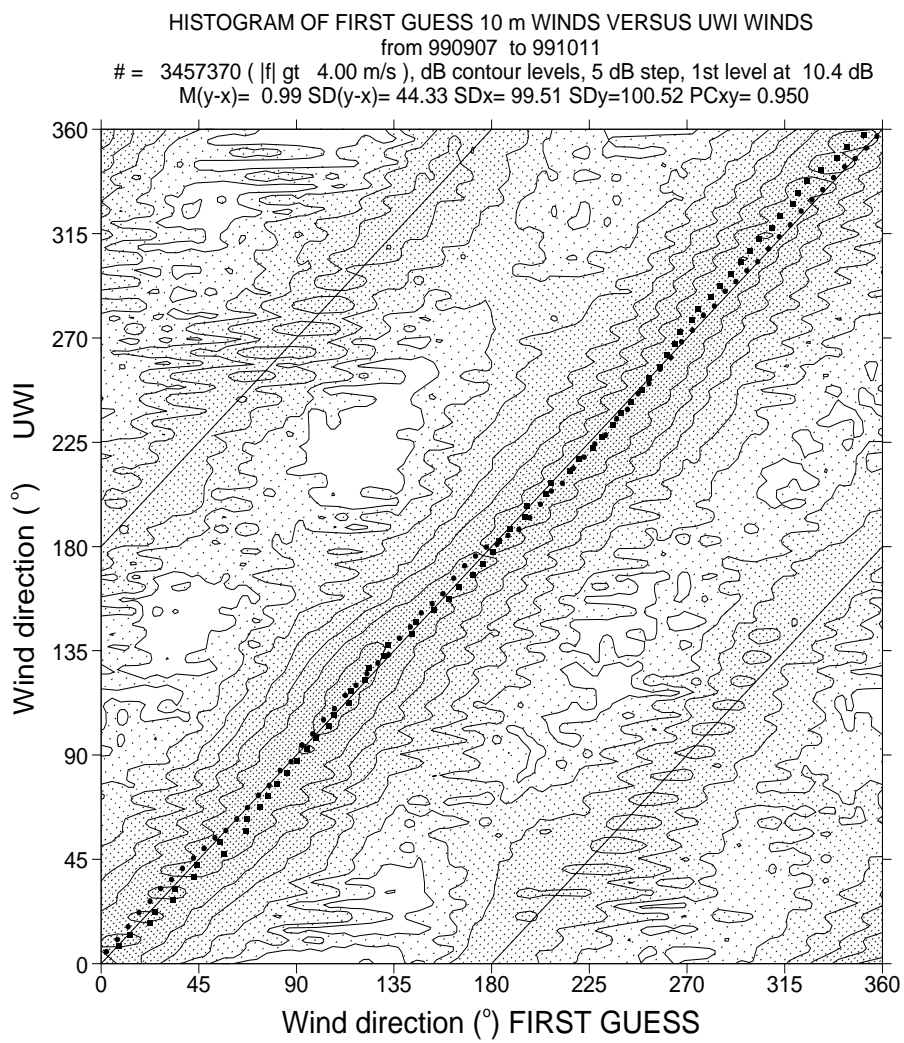


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■ **FIGURE 7**



■ **FIGURE 8**

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