# MONITORING STATISTICS OF ERS-2 SCATTEROMETER FOR ESA (Project Ref. 12893/98/NL/PR)

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•Date: 9 November 2000

## 1 - INTRODUCTION

During cycle 57 ERS-2 scatterometer data was affected by a few spacecraft anomalies. No data was received at ECMWF between 16:38 UTC 7 October and 16:49 UTC 10 October 2000. Poor quality data was received within the 6-hourly periods centred around 06 UTC and 12 UTC 27 September 2000 and from 18 UTC 24 October 2000 to 12 UTC 25 October 2000. For these periods the distance to the cone was larger than normal for the higher nodes (see figure 2), which is an indication that orbital manoeuvres were performed. The erroneous data in these periods were rejected by the 4D-Var data assimilation system at ECMWF. In total 19 6-hourly periods out of 140 were affected by one of the above mentioned problems. For the remaining part of the monitoring period the data quality was high. The ECMWF assimilation system was not modified during cycle 57.

## 2 - ERS-2 STATISTICS FROM 26 SEPTEMBER TO 30 OCTOBER 2000

Compared to the results from the previous cycle, the bias level of the descending Fore and Aft beam sigma0 biases have been slightly increased for incidence angles between 35 and 47 degrees with respect to the ECMWF model first guess winds. For ascending tracks of the Fore and Aft beam, as well for the Mid beam



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of both ascending and descending tracks the bias levels are very similar compared to measurements from the previous monitoring period. All curves still have a fairly flat distribution over the whole incidence angle range.

The distance to the cone history shows the 11 6-hourly periods without data (00 UTC 8 October to 12 UTC 10 October 2000) as described above. The peaks for the periods in which the data flow ended (18 UTC 7 October 2000) and in which it was resumed (18 UTC 10 October 2000) are caused by poor quality at the initial and final stage of the anomaly. The peaks for the higher nodes for the 6-hourly periods from 06 UTC to 12 UTC 27 September 2000 and from 18 UTC 24 October to 12 UTC 25 October 2000 are a signature for orbital manoeuvres, as discussed above. The UWI and 4D-Var processed wind speed and direction monitoring plots also show peaks for these periods. The mean normalised distance to the cone level is similar to the previous report cycle for all node ranges.

The UWI winds have an average bias of -0.80 m/s, (-1.15 m/s for nodes 1-2 down to -0.66 m/s for nodes 11-19). This is somewhat worse than the previous report cycle (-0.72 m/s). It is most likely caused by a larger number of 6-hourly periods with poor quality data (8 compared to 2 for the previous ERS-2 cycle) which are accompanied by large negative biases. The standard deviations are almost equal to the results from the previous cycle: the standard deviation is on the average 1.55 m/s, and similar for all nodes. The standard deviation for ECMWF (4D-Var) processed data is also similar to the results from the last monitoring cycle, the average value is 1.63 m/s. The bias has degraded (probably for the same reason as for the UWI winds) since the results from the cycle 56 report: the average value is now -0.53 m/s. The (scatterometer - model) direction standard deviations were ranging between 30 and 60 degrees for the UWI data (average value 49.1 degrees) and between 15 and 30 degrees (average value 18.6) for their 4D-Var counterparts. As usual, the directional bias is close to zero for both UWI and 4D-Var products.



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The scatter plot of model 10 m wind speeds versus UWI wind speeds shows a small increase in bias compared to the plot from the previous cycle (-0.73 m/s compared to -0.67 m/s). The direction scatter plot agrees well with the results from the previous cycle, although the bias has increased from 0.5 to 0.9 degrees.

## 3 - FIGURE CAPTION

*Fig. 1:* Ratio of < σ0**0.625 > over < CMOD4(First Guess)**0.625 > 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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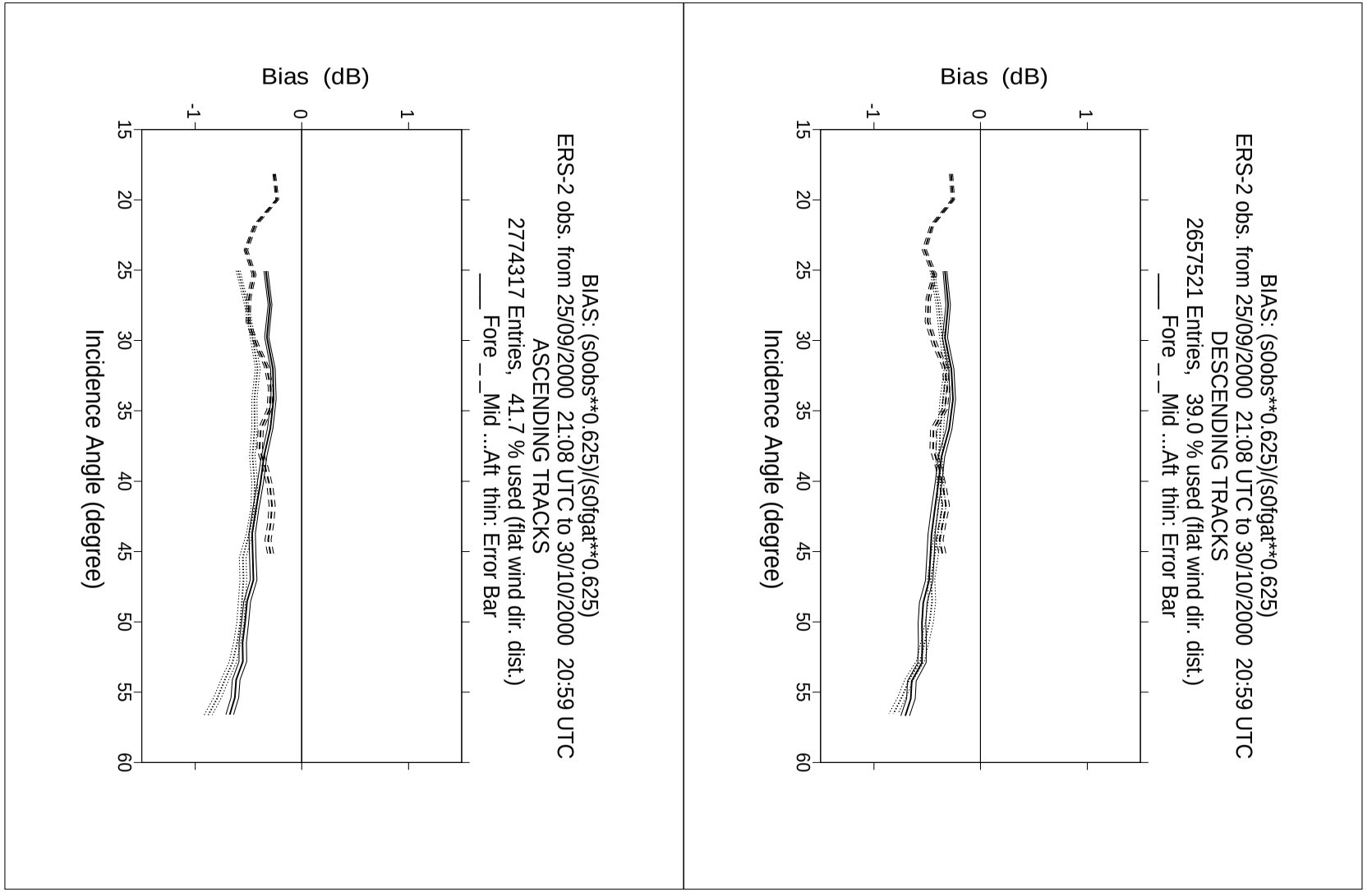


**FIGURE 1**



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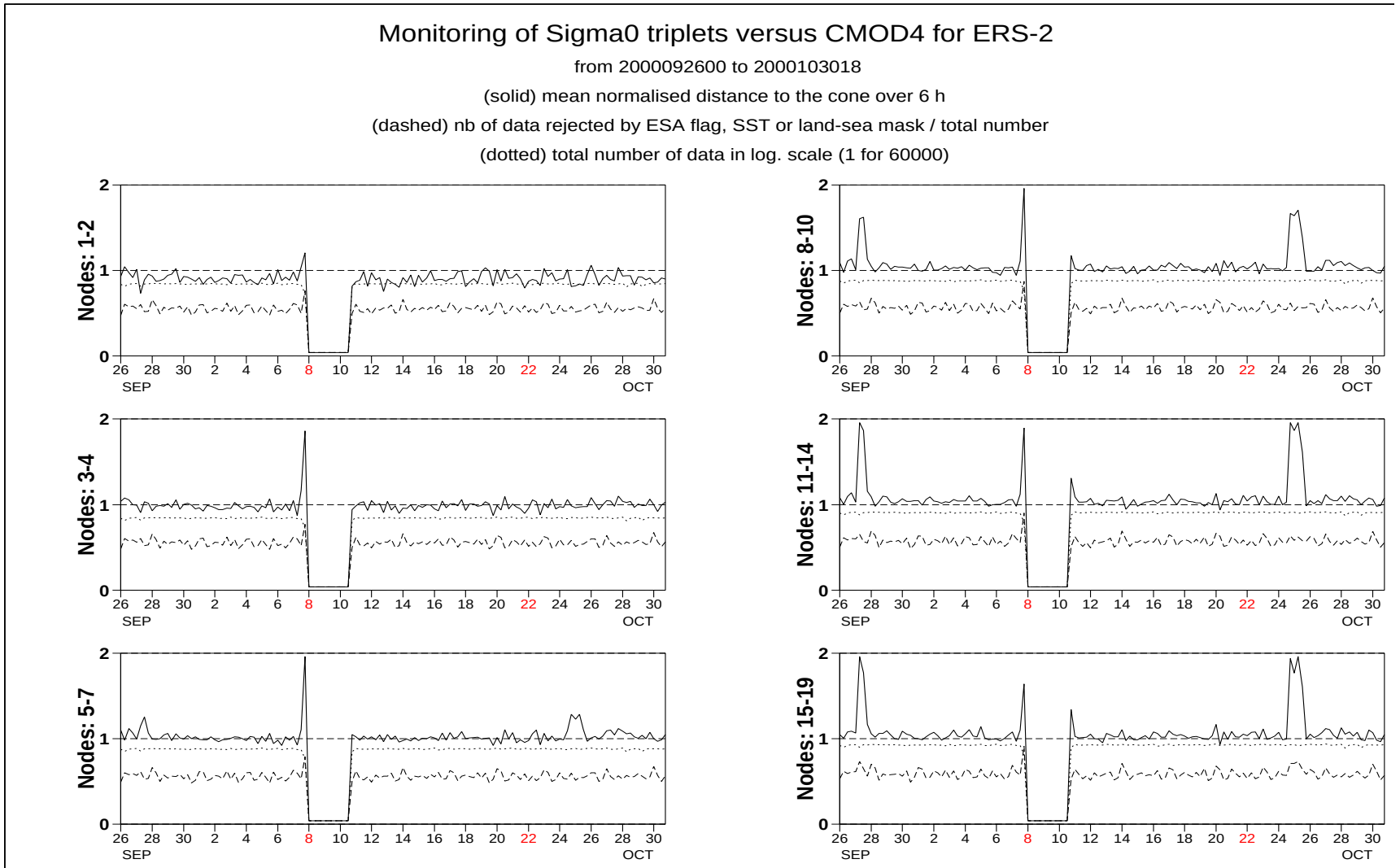


**FIGURE 2**



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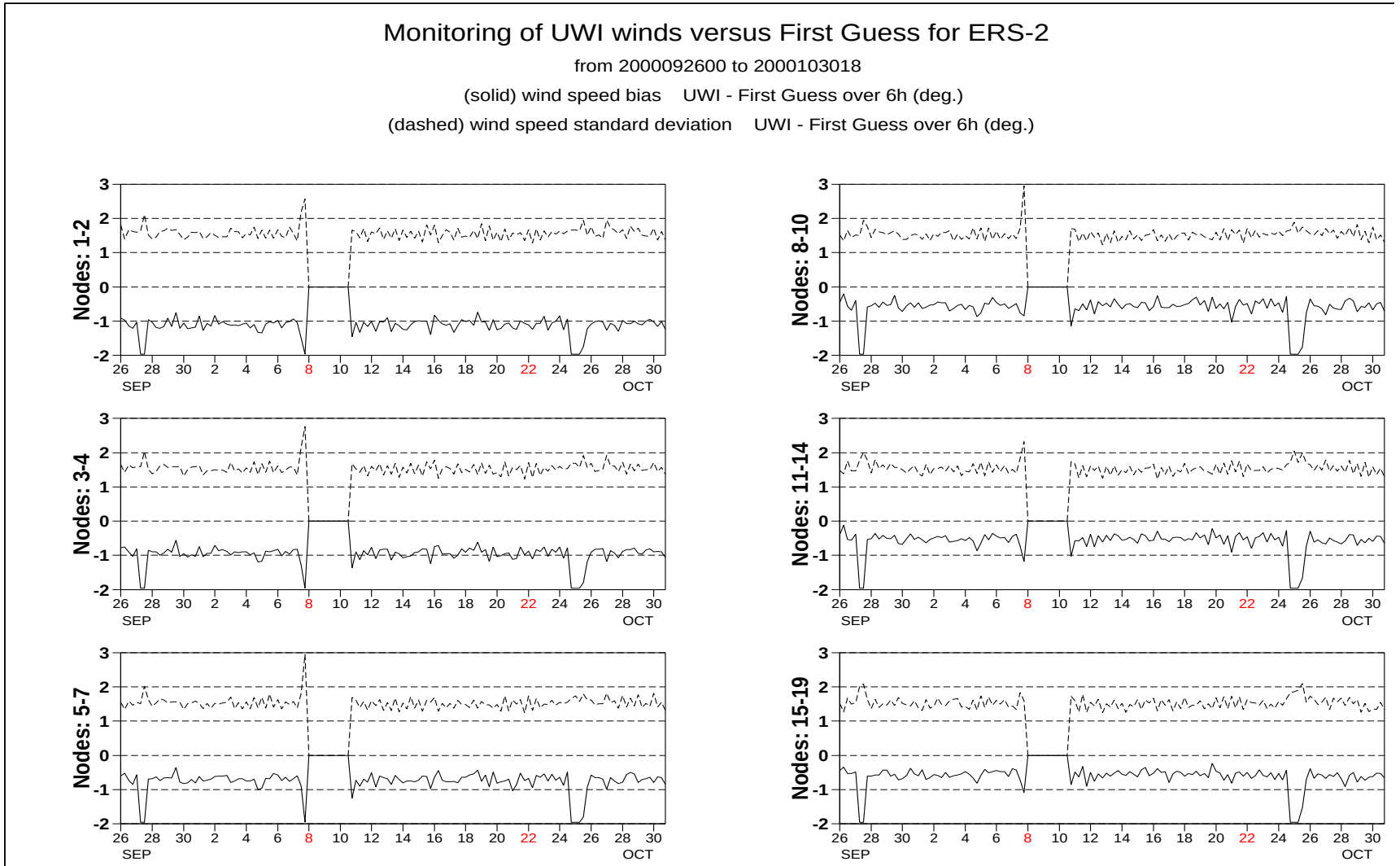


**FIGURE 3**



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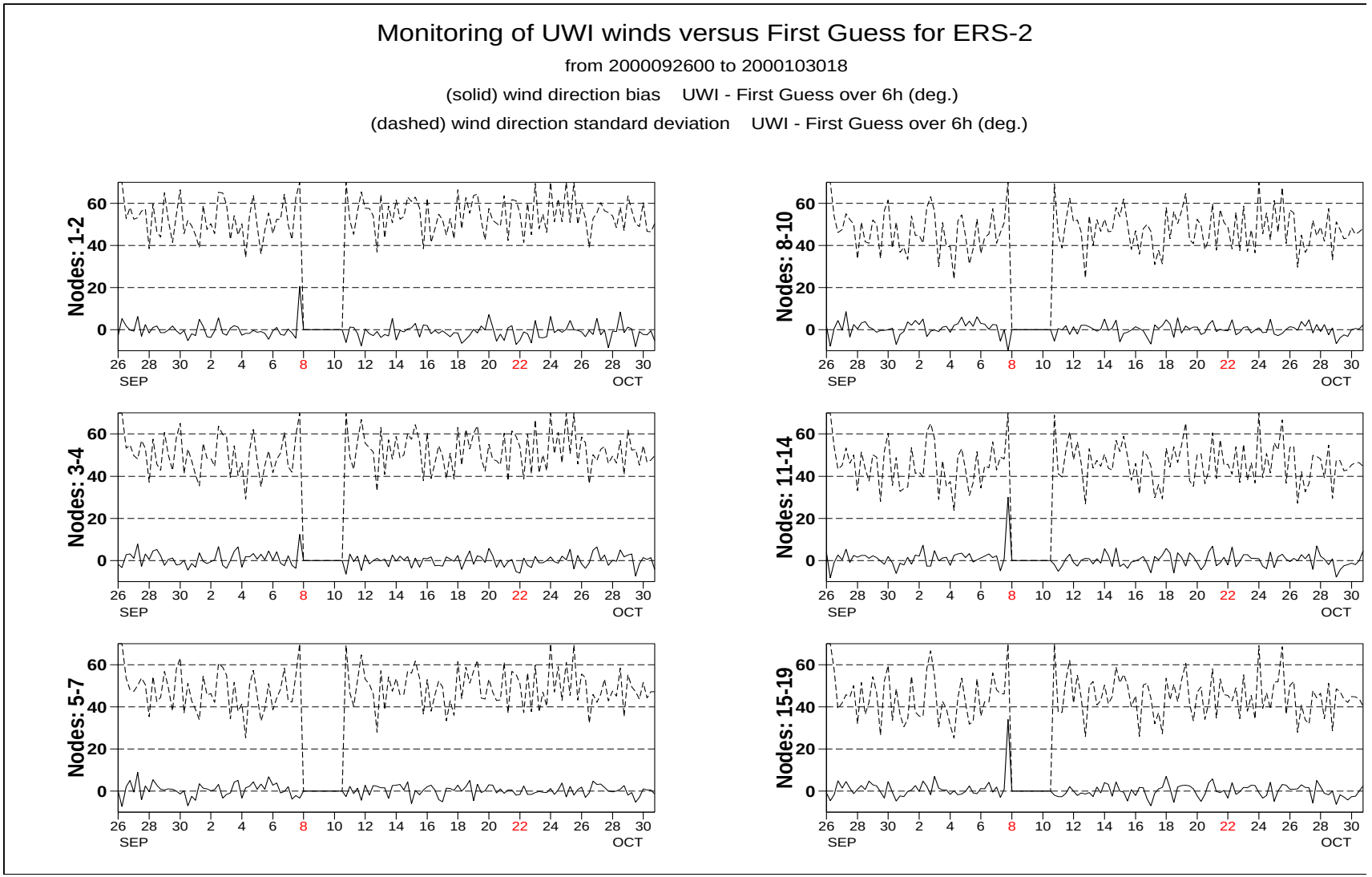


**FIGURE 4**



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Monitoring of 4d-Var processed winds versus First Guess for ERS-2

from 2000092600 to 2000103018

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

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

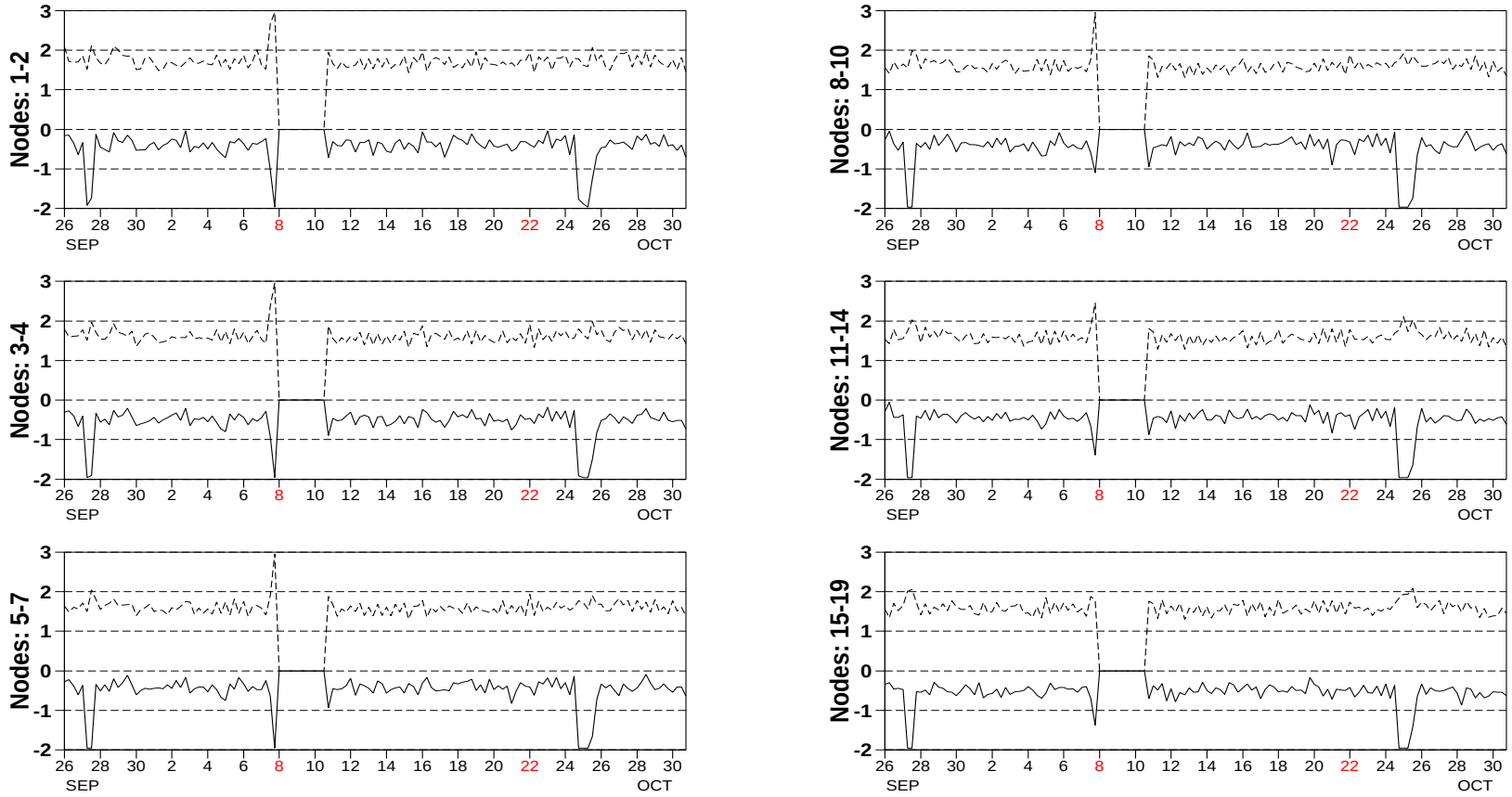


**FIGURE 5**



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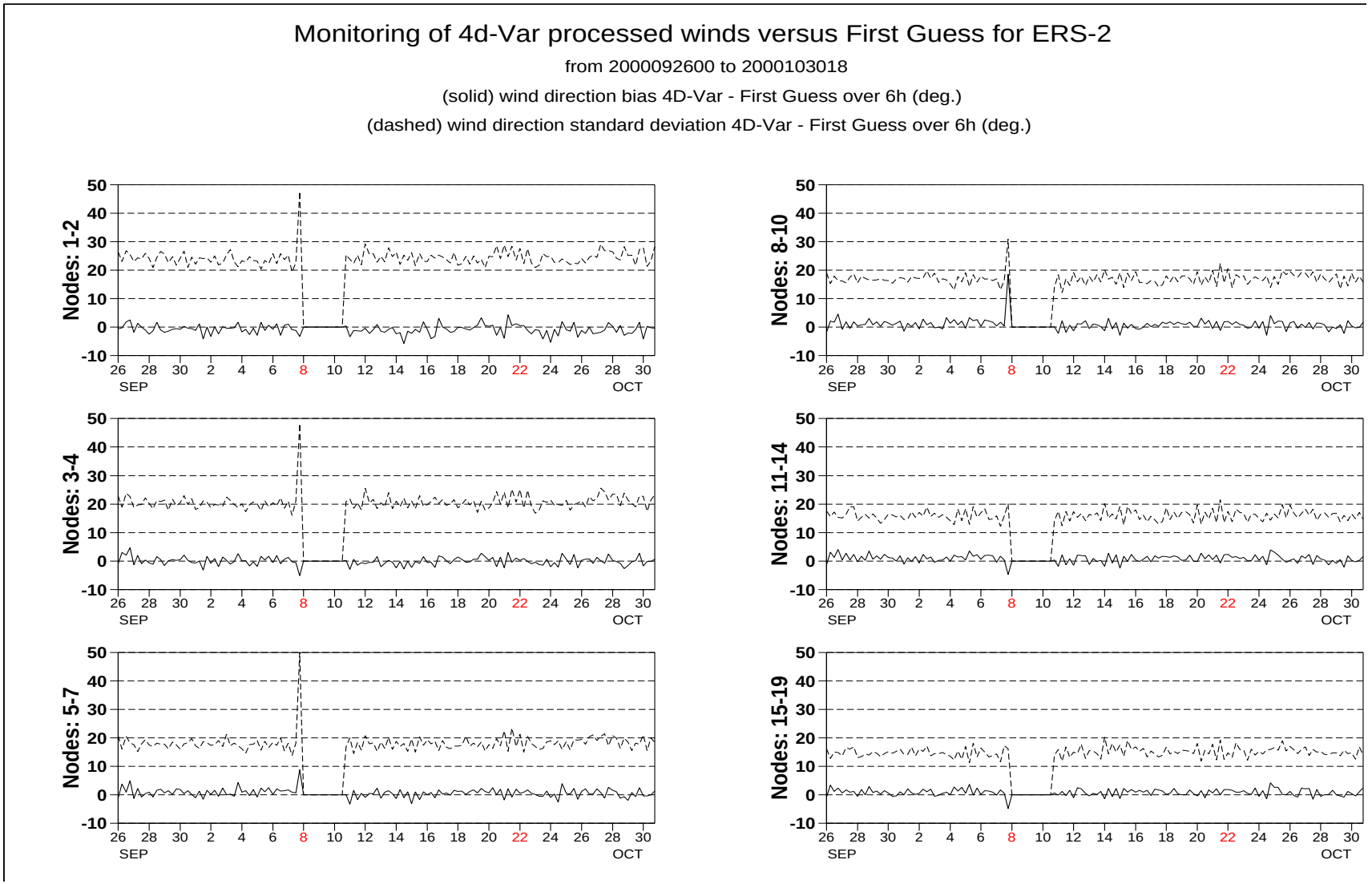


**FIGURE 6**



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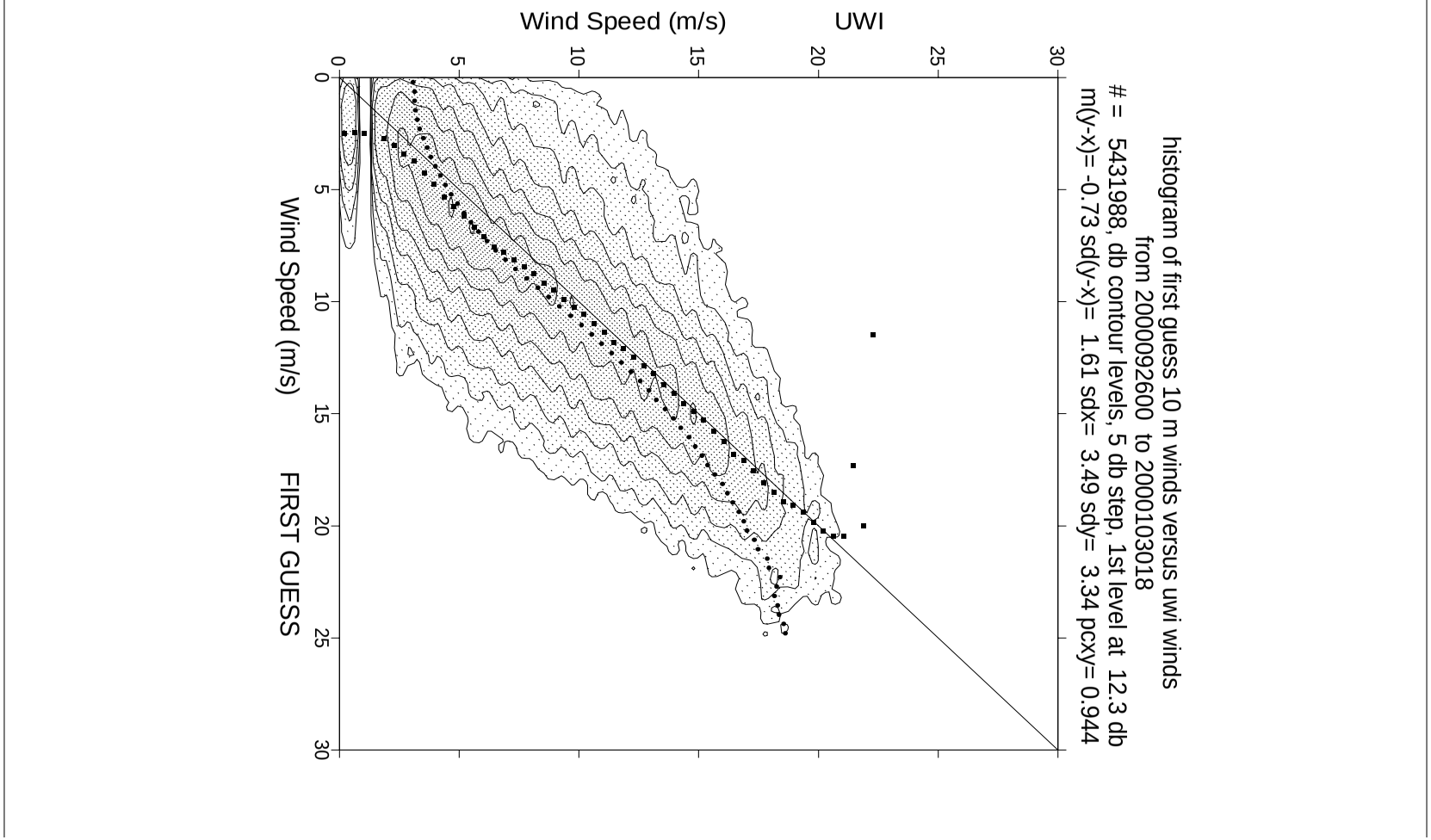


**FIGURE 7**



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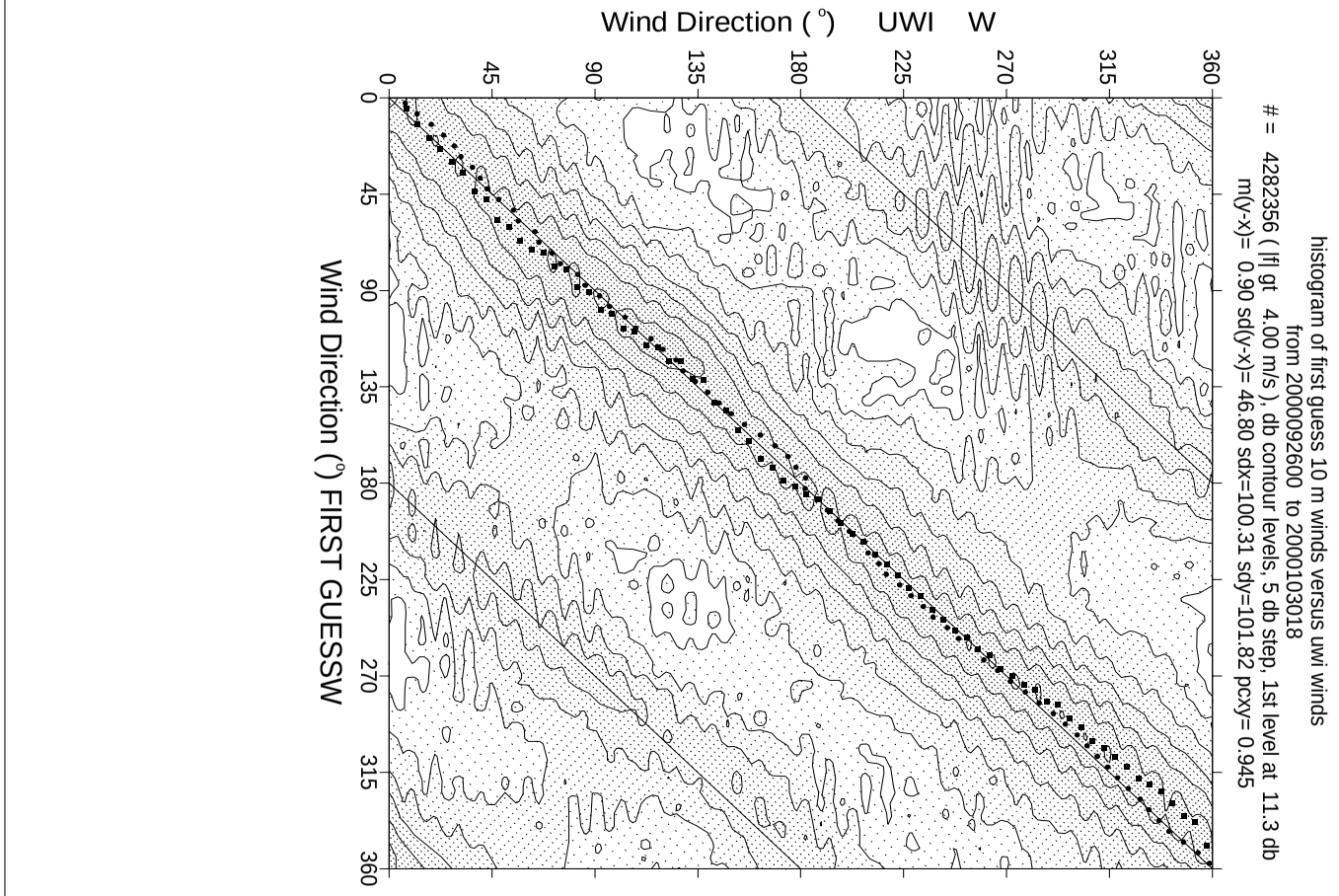


**FIGURE 8**



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