# Use of QuikSCAT wind observations in the assimilation and forecasting system of DWD

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Space-bourne scatterometer data provide accurate near surface wind observations (both wind speed and direction) over the global oceans with high temporal and spatial resolution under most weather conditions. With an intensification of usage of satellite data at the German Weather Service (DWD), the implementation of wind observations from Seawinds scatterometer onboard the QuikSCAT satellite is being worked on. QuikSCAT has a swath of 1.800 km, although only the inner 1400 km is iluminated by both beams and approximately 90% of the earth surface is covered by the instrument in one day.

Current assimilation tests use the wind vector retrievals provided by JPL. Prior to assimilation experiments an extensive monitoring was carried out to determine quality criteria and any needed bias correction. The wind vector retrievals at a resolution of 25 km are thinned to a resolution of 50 km, roughly in match with the operational model resolution of 40 km. Duplicate and incomplete records are filtered out of the observation handling process and sea ice and land contaminated wind data are excluded. As, unfortunately, the Ku-band scatterometer is very sensitive to rain contamination, a careful elimination of poor quality rain contaminated data is necessary. For this purpose, the performance of the rain flagging algorithm developed at KMNI (Portabella and Stoffelen, 2002) in the framework of OSI-SAF has been compared with the JPL rain flag (Huddleston and Styles, 2000) provided within the data. Data monitoring results show, that the KNMI rain flag is mostly able to flag poor quality scatterometer data, whereas the JPL rain flag additionaly eliminates many winds in rainy areas which seem of acceptable quality. This is especially obvious in regions of extreme weather conditions, like e.g. tropical cyclones. Additionally, a bias correction of wind speed is applied before assimilating the data, since data monitoring indicates dependencies of biases both on wind speed and rain probability. The benificial impact of rain-flagging, elimination of land/sea contamination and bias correction on the data quality is depicted in Figure 1. By using the extensive quality control mechanisms described above, the correlation between QuikSCAT wind speeds and collocated model first guess wind speeds increases from 0.65 to 0.82.

The assimilation of QuikSCAT data, tested in the currently operational OI analysis scheme, have a positive impact on the analyses performance, especially in cases of tropical cyclones, where the position and strength of the investigated cyclones are improved. Unfortunately, a lot of winds around the center of the cyclones are rain-contaminated and therefore cannot be used, which reduces the impact of QuikSCAT wind data considerably. Also, the first guess wind check occassionally rejects correct wind data in severe weather systems, where wind speed and direction varies considerably over short distances. Here, an adapted formulation is neccassary in the future and further advantages will be offered within the 3DVAR analysis system currently under development. The overall impact of the QuikSCAT wind observations on the forecast quality of the global forecasting system of DWD is positive on the Southern Hemisphere for up to 72 hours (Figure 2), slighly negative later on in the forecast and slightly negative on the Northern Hemisphere.

## References

Hudleston, J.N., and Stile, B.W., 2000: A Multi-dimensional Histogram Technique for flagging rain contamination on QuikSCAT. Proc. of IEEE International Geoscience and Remote Sensing Symposium, Vol. 3, pp. 1232-1254

Portabella, M., and Stoffelen, A., 2002: Quality Control and wind retrieval for SeaWinds. Final reportof the EUMETSAT QuikSCAT fellowship, KNMI, de Built, the Netherlands.

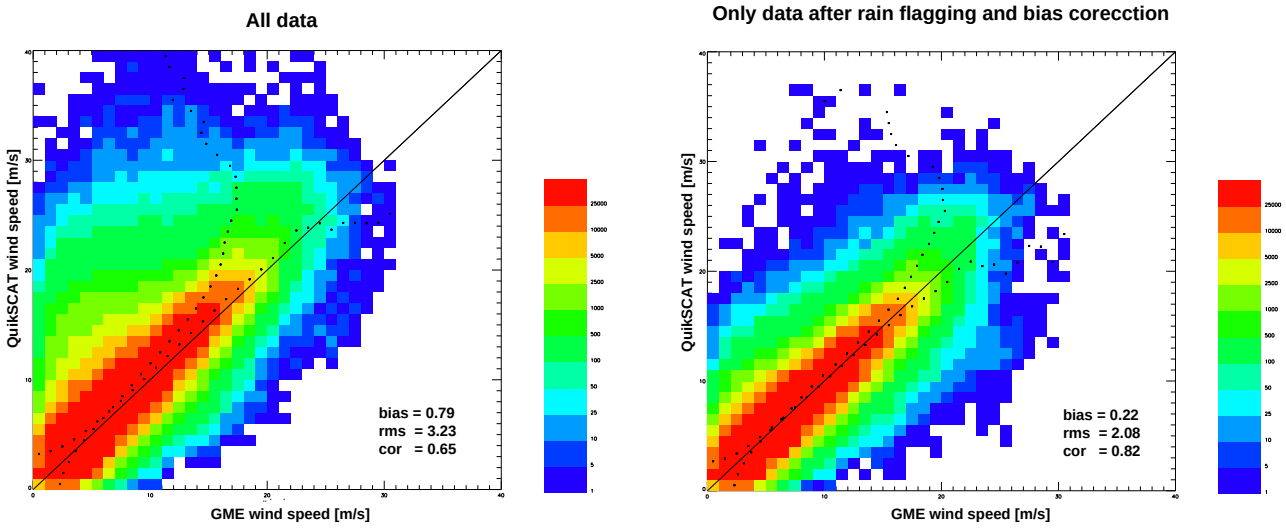


Figure 1: Scatter plots between QuikSCAT wind speeds and collocated GME first guess wind speeds for all data (left panel) and for bias corrected wind speed data that were not rejected due to rain contamination (right panel).

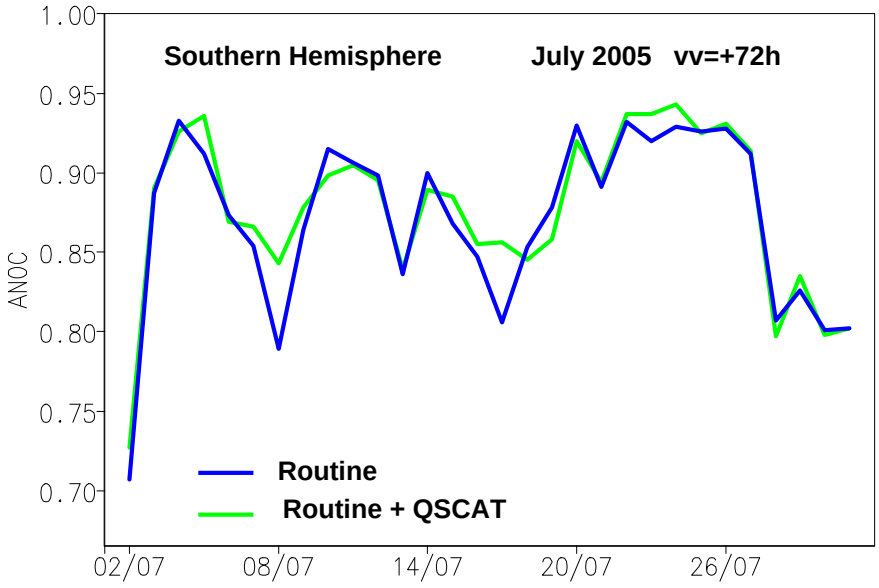


Figure 2: Time series of anomaly correlation coefficients of the sea surface pressure for the Southern Hemisphere at forecast time of 72h for control (red) and experiment (green) forecasts, using QuikSCAT wind observations, from July 02 to July 30, 2005 00 UTC.