Systematic Geographic Differences between ASCAT, QuikSCAT and ECMWF revisited: Impact of biases and rain contamination.

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The launch of ASCAT on METOP in 2006 brought a second wide-swath scatterometer in space, significantly augmenting the QuikSCAT observations of the near-surface winds over the global oceans, thus allowing for much improved spatial and temporal coverage. This brought to the forefront issues related to the consistency of the wind estimates from the two different instruments. These issues need to be resolved before merging them to produce an extended climate record of near-surface wind and wind stress over the global oceans.

In a recent study, presented at the last Science Team meeting, we compared the retrievals from the two missions in a climatological and geographical sense. We focused on a seven month period (from 10-16-2007 to 05-27-2008) and investigated the temporal and spatial structure of the wind and the wind stress as retrieved by QuikSCAT and ASCAT.

We found that there is a significant geographical variability in the differences between ECMWF and the scatterometer winds. Furthermore, we found that QuikSCAT and ASCAT seem to disagree mostly in the magnitude of the disagreement from ECMWF but not in the sign of this disagreement. A recent study by Portabella and Stoffelen (2009) indicates that additional biases need to be added to the ASCAT winds to obtain the equivalent 10m neutral winds estimated by QuikSCAT. Considering this, we revisited our comparisons applying a number of different biases in the range suggested by Portabella and Stoffelen (2009). Applying the biases lead to decrease in the magnitude of the QuikSCAT/ASCAT differences. However, important geographical differences still remain. We will present and discuss them.

In the previous study we found that QuikSCAT exhibits significantly stronger Westward mean wind component in tropical high-rain areas, hinting at a possible residual rain effect. To evaluate the significance of this effect, we now exclude from the comparison a significant proportion of the data (~10%) that are rather likely to be rain contaminated based on the QuikSCAT rain probability factor. Indeed, excluding these data brings the QuikSCAT and ASCAT wind speeds into even further agreement. However, significant geographical differences still remain in the zonal and meridional wind component estimates from ASCAT and QuikSCAT. The causes for this differences need further investigation.

The comparison of ECMWF to the two scatterometer wind estimates shows another interesting feature – it appears that ASCAT and QuikSCAT wind speeds show the same geographical difference from ECMWF, with higher than the ECMWF speeds in the tropics and lower speeds in the extratropics, suggesting the possibility for SST-related impact. We are now investigating this and other possible causes.

In the previous study we looked also at the dynamical significance of the ASCAT/QuikSCAT differences by investigating how these differences impact the high-frequency and the low-frequency wind stress curl and divergence fields, and the coupling between SST gradients and near-surface wind response. We found that QuikSCAT showed stronger coupling between cross-track SST gradients and the wind stress curl response than ASCAT. We revisit these results, using the new set of bias-corrected data and, also, a new approach to computing the wind stress curl suggested by Chelton et al, (2007) . In this approach we compute the wind stress gradients from orbital instead of gridded (averaged) wind stress components in order to preserve the signals of each meteorological event and to avoid introducing artifacts from computing gradients of averaged quantities over a number of different events. The new results and conclusion will be presented.

References:

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Portabella, M., and A. Stoffelen, 2009: On Scatterometer Ocean Stress. *J. Atmos. Oceanic Technol.*, **26**, 368–382.