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Towards an improved ASCAT wind product under rain conditions

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Heavy rain affects Advanced Scatterometer (ASCAT) wind retrievals detrimentally, but also in conditions of low or moderate winds, rain splash effects on the ocean cause roughening and artificially enhanced winds. Both topics are addressed here.
The quality of ASCAT derived winds is known to degrade with increasing inversion residual or Maximum Likelihood Estimator (MLE) value. Therefore, an MLE-based Quality control (QC) screens poor-quality winds in the current ASCAT Wind Data Processor (AWDP) [1]. However, this operational QC is little effective in filtering poor-quality winds retrieved under heavy rain conditions [2]. Thus an image processing method, known as singularity analysis, is proposed to complement the current ASCAT QC. The development of this combined QC procedure, based on a comprehensive analysis of the MLE and the singularity exponent (SE), is performed using the European Centre for Medium-range Weather Forecasts (ECMWF) model winds, the Tropical Rainfall Measuring Mission's (TRMM) Microwave Imager (TMI) rain data, and tropical moored buoy wind and precipitation data as reference. The results show that both the Vector Root-Mean-Square (VRMS) difference between ASCAT and the reference winds (ECMWF/buoy) and the mean TMI rain rate increase with decreasing singularity exponent values and increasing MLE values. Thus the poorest-quality ASCAT winds are dominated by heavy rain contamination although wind quality degradation is also found for large sub-cell wind variability conditions. In summary, the combined singularity exponent and MLE approach is found to be very effective in filtering poor quality ASCAT winds.
We further improve ASCAT wind retrievals under light and moderate rain conditions, in which the surface perturbation caused by rain splashing is known to dominate the total rain-induced backscatter for C-band radar scatterometers [3]. In order to correct the rain-induced ocean backscatter and therefore to improve wind retrieval quality for low winds in particular, a simplified and combined rain-splashing and wind-induced backscatter model is characterized using ASCAT data collocated with high resolution rain measurements from the Next Generation Weather Radar data (NEXRAD) and TRMM's Precipitation Radar (PR) data. Preliminary assessment of the simplified model in terms of ASCAT-derived wind quality will be shown at the conference.

[1] Portabella, M., Stoffelen, Verhoef, A. and Verspeek, J.:A new method for improving scatterometer wind quality control, IEEE Trans. Geosci. Remote. Sens. Lett., 9(4), 579-583, 2012.
[2] Portabella, M., Stoffelen, A., Lin, W., Turiel, A., Verhoef, A., Verspeek, J. and Ballabrera, J.: Rain effects on ASCAT wind retrieval: Towards an improved quality control, IEEE Trans. Geosci. Remote Sens., 50(7), 2495-2506, 2012.
[3] Nie, C. and Long, D.G.: A C-Band Wind/Rain Backscatter Model, IEEE Trans. Geosci. Remote Sens., 45(3), 621-631, 2007.