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Integrating the ASCAT Observations into a Climate Data Record of Ocean Vector Winds

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Ocean surface vector winds have been continuously observed from space since 1991, starting with the ERS scatterometer, followed later by a series of other scatterometers. These measurements have been proved extremely useful for improving the skill of numerical weather forecasts. With a timeseries extending now to more than 20 years, these measurements can provide great insight into the climate variability of surface wind patterns. Integrating all the measurements from different sensors into a continuous and accurate timeseries suitable for climate analysis is however a challenging task. An essential requirement for this purpose is the consistency among wind retrievals from different sensors at all wind speed ranges.

Here we present our methodology for creating a Climate Data Record of ocean vector winds. We first started with reprocessing the QuikSCAT wind measurements for the whole mission (1999-2009) by using a new Geophysical Model Function (GMF) specifically redeveloped for improving retrievals at high wind speeds. The new GMF Ku-2011 (Ricciardulli and Wentz, 2011) was developed using wind retrievals from the WindSat radiometer as calibration for the scatterometer backscatter ratio. WindSat wind speeds are believed to be accurate for winds up to at least 35 m/s (Meissner and Wentz, 2009).

In order to continue the timeseries after the end of the QuikSCAT mission, we focused on developing a new GMF for the European scatterometer ASCAT, which started in 2007 and is planned to continue for several years. The motivation behind redeveloping the GMF, rather than using the operational one, is based on the necessity of a consistent methodology to reduce biases when combining QuikSCAT with ASCAT in a Climate Data Record. The new ASCAT GMF was developed calibrating the backscatter ratio to the wind speeds from the SSM/I and WindSat radiometers. A preliminary version of the RSS ASCAT winds has been recently produced. Here we will discuss the validation of these retrievals versus in situ observations and winds from other satellite missions. Particular emphasis will be on the comparison with the QuikSCAT retrievals during the overlapping period (2007-2009), in terms of overall consistency at all wind speed ranges and careful analysis of any regional bias. One important feature to keep in mind is the temporal gap in the local observing time of the two scatterometers (about 3-4 hours). This temporal gap can give raise to regional biases and diurnal aliasing in the merged timeseries if the diurnal cycle of ocean winds is not properly accounted for. An additional check for consistency and any potential temporal drift in the QuikSCAT and ASCAT timeseries is done by comparing them with the wind speed timeseries from the SSM/I and SSMIS radiometers.

Once we ascertain the feasibility of merging QuikSCAT and ASCAT measurements with the required climate-quality accuracy, the Climate Data Record can be extended back in time to 1991 by using the same methodology for the European scatterometers ERS-1 and 2. This intercalibrated data set would then provide two decades of global ocean vector winds, suitable for climate research.