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Error estimates for ocean surface winds: Applying Desroziers diagnostics to the Cross-Calibrated, Multi-Platform analysis of wind speed

Ross N. Hoffman (1), Joseph V. Ardizzone (2), S. Mark Leidner (1), Deborah K. Smith (3), and Robert M. Atlas (4)

(1) Atmospheric and Environmental Research, Lexington, Massachusetts 02421, USA (ross.n.hoffman@aer.com), (2) NASA GSFC, Greenbelt, Maryland 20771, USA, (3) Remote Sensing Systems, Santa Rosa, California 95401, USA, (4) NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami, Florida 33149, USA

The cross-calibrated, multi-platform (CCMP) ocean surface wind project [Atlas et al., 2011] generates high-quality, high-resolution, vector winds over the world's oceans beginning with the 1987 launch of the SSM/I F08, using Remote Sensing Systems (RSS) microwave satellite wind retrievals, as well as in situ observations from ships and buoys. The variational analysis method [VAM, Hoffman et al., 2003] is at the center of the CCMP project's analysis procedures for combining observations of the wind. The VAM was developed as a smoothing spline and so implicitly defines the background error covariance by means of several constraints with adjustable weights, and does not provide an explicit estimate of the analysis error. Here we report on our research to develop uncertainty estimates for wind speed for the VAM inputs and outputs, i.e. for the background (B), the observations (O) and the analysis (A) wind speed, based on the Desroziers et al. [2005] diagnostics (DD hereafter).

The DD are applied to the CCMP ocean surface wind data sets to estimate wind speed errors of the ECMWF background, the microwave satellite observations and the resulting CCMP analysis. The DD confirm that the ECMWF operational surface wind speed error standard deviations vary with latitude in the range 0.7–1.5 m/s and that the cross-calibrated Remote Sensing Systems (RSS) wind speed retrievals standard deviations are in the range 0.5–0.8 m/s. Further the estimated CCMP analysis wind speed standard deviations are in the range 0.2–0.4 m/s. The results suggests the need to revise the parameterization of the errors due to the FGAT (first guess at the appropriate time) procedure. Errors for wind speeds < 16 m/s are homogeneous, but for the relatively rare, but critical higher wind speed situations, errors are much larger.

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