Can scatterometer winds improve the quality and resolution of the current NWP-based ocean forcing?

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ABSTRACT

High resolution satellite derived sea surface wind data, such as those from scatterometers, are increasingly required for operational monitoring and forecasting of the ocean. However, the time and space coverage of these datasets is unsuitable for, among others, high-resolution ocean model forcing.

Recent attempts of combining scatterometer data and numerical weather prediction (NWP) outputs, i.e., blended ocean forcing products, allows for an increased temporal resolution (e.g., daily) but generally only resolves NWP spatial scales of ~200 km. Therefore, information on the wind-current interaction, the diurnal wind cycle and the wind variability in moist convection areas is lost in such products. Moreover, known systematic NWP model (parameterization) errors are in fact propagated at times and locations where no scatterometer winds are available. The alternative, direct forcing from NWP results in even more extensive physical drawbacks. We propose to maintain the increased temporal coverage in a gridded wind and stress product (ERA*), but also to maintain the most beneficial physical qualities of the scatterometer winds, i.e., 25-km spatial resolution, wind-current interaction, variability due to moist convection, etc., and, at the same time correct the large-scale NWP parameterization and dynamical errors. Additionally, we correct these winds for the effects of atmospheric stability and mass density, using stress equivalent 10 m winds, U10S.

In fact, collocations of scatterometer and global NWP winds show these physical differences, where the local mean and variability of these differences are rather constant in time and thus could be added to the ERA-interim time record in order to better represent physical interaction processes and avoid NWP model errors. Correction of the wind vector biases and wind vector variability is expected to affect ocean forcing. Information on the scatterometer wind sampling error is provided by these collocations.

The new ERA* gridded ocean forcing product is validated against continuous 10-min buoy wind datasets (RAMA,TRITON/TAO, PIRATA and NDBC) and against scatterometer data, namely the Ku-band OceanSat-2 (OSCAT) 25 km product. Preliminary results for the year 2012 will be presented at the time of the conference. Future work will focus on assessing the impact of the ERA* product in both global and regional ocean models.