Assessment of the Impact of ERS-1 Scatterometer Wind in Simulating TOPEX/POSEIDON Sea Level observation

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It has been demonstrated that current-generation global ocean general circulation models (OGCM) are able to simulate large-scale sea level variations fairly well. In this study, a GFDL/MOM-based OGCM was used to investigate its sensitivity to different wind forcing. Simulations of global sea level using wind forcing from the ERS-1 Scatterometer and the NMC operational analysis were compared to the observations made by the TOPEX/POSEIDON (T/P) radar altimeter for a two-year period. The OGCM has a horizontal resolution of 2 degrees in longitude and 1 degree in latitude, and 22 vertical levels. It was spun-up for 10 years using climatological air-sea fluxes before forced by the real-time wind of NMC and ERS-1. A 10-day running mean filter was applied to both simulations for comparison to the T/P data which was sampled at 10-day intervals.

The global RMS difference, between the OGCM simulation and the T/P observation is 4.5 cm with the NMC wind, and 4.2 cm with the ERS-1 wind. Over many parts of the global oceans, the RMS difference is significantly reduced by using the ERS-1 wind instead of the NMC wind, especially in the tropics and the Southern Ocean where the wind forcing plays a dominant role. The RMS difference is reduced from 5 cm to 2~3 cm in the eastern equatorial Pacific as well as in the equatorial Atlantic, The RMS difference is reduced from 2.6 cm to 1.9 cm in the Indian Ocean, and from 2.0 cm 101.7 cm in the western Pacific. In the Southern Ocean, about 1-2 cm RMS reduction is seen in regions where intraseasonal oscillations are strong, in particular the southeast Indian Ocean and the southeast Pacific ocean. The result of the study has demonstrated (1) the synergistic use of two spaceborne sensors in advancing the study of wind-driven ocean dynamics, and (2.) the sensitivity of the OGCM to the quality of wind forcing.