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The impact of combined assimilation of RA2 altimeter wave height and ASAR wave spectra (ENVISAT) on wave forecast

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More and more satellite observations related to sea state have become are becoming more and more available and this represents a stimulating challenge for wave modelers in order to improve operational wave forecasting. At Météo France, studies about the assimilation of directional wave spectra (ASAR level 2 wave products) have been already started a few years ago and have shown that the use of spectral information improves estimation of wave parameters (wave height, period and direction) in particular for swell case (Aouf et al. 2004). However there are still some problems related to the quality of the data.

The goal of this study is to evaluate the impact of combined assimilation of RA2 altimeter wave height and ASAR wave spectra. The advantage of such assimilation is the correction of both wind sea and swell parts of the wave spectrum. Quality control algorithms for ASAR data depending upon normalized variance images, wind speed (at the free surface) and the ratio of signal to noise, are implemented in a prior procedure before assimilation. The sensitivity of the assimilation with respect to the wavelength cut-off for spectral data is also investigated. The model runs were performed for a period of one complete week of RA2 and ASAR level 2 wave products.

The results show that the scheme works correctly resulting in a significant reduction of the RMS error for the mean wave parameters (significant wave height, mean period

and direction). On the other hand, we find that more than 50 % of the ASAR data were rejected throughout quality control and analysis process. The intercomparison between the assimilation results and independent wave observations such as altimeters (Jason-1) and buoys exhibits good skill for the significant wave height and the mean period. Specific analysis of the results is discussed according to different ocean basin areas (tropical, intermediate and high latitudes regions).