New directional wave observations from CFOSAT: impact on ocean/wave coupling in the Southern Ocean

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The Southern ocean is a complex ocean region with uncertainties related to surface wind forcing and fluxes exchanges at the air/sea interface. The improvement of wind wave generation in this ocean region is crucial for climate studies. With CFOSAT satellite mission, the SWIM instrument provides directional wave spectra for wavelengths from 70 to 500 m, which shed light on the role of correcting the wave direction and peak wave number of dominant wave trains in the wind-waves growth phase. This consequently induced a better energy transfer between waves and a significant bias reduction of wave height in the Southern Ocean (Aouf et al. 2020). The objective of this work is to extend the analysis of the impact of the assimilation of wave number components from SWIM wave partitions on the ocean/wave coupling. To this end, coupled simulations of the wave model MFWAM and the ocean model NEMO are performed during the southern winter period of 2019 (May-July). We have examined the MFWAM/NEMO coupling with and without the assimilation of the SWIM mean wave number components. Several coupling processes related to Stokes drift, momentum flux stress and wave breaking inducing turbulence in the ocean mixing layer have been analyzed. We also compared the coupled runs with a control run without wave forcing in order to evaluate the impact of the assimilation. The results of coupled simulations have been validated with satellite Sea Surface Temperature and available surface currents data over the southern ocean. We also investigated the impact of the assimilation during severe storms with unlimited fetch conditions.

Further discussions and conclusions will be commented in the final paper.

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