Assimilation of sea ice concentration in the Global 1/4° Mercator Ocean analysis and forecasting system: first results.

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Since several years Mercator-Ocean is developing a hierarchy of ocean analysis and forecasting systems designed to simulate the global ocean circulation (from 2° to 1/12°). These systems are based on the NEMO ocean/sea ice coupled model and the multivariate data assimilation system SAM2 (Système d'Assimilation Mercator V2) derived from the SEEK filter. Actually, the ocean component alone is monitored by the assimilation using in situ Temperature and Salinity vertical profiles, Sea Surface Temperature in addition to altimetry. Previous studies (found in literature or in others operational systems) have already shown the substantial improvement made in the Polar Regions representation when sea ice analysis is explicitly implemented. Regarding also the key rule played by sea ice in the recent and rapid climatic changes observed in the oceanic Polar Regions, Mercator-Ocean, in the framework of the GMES/MyOcean project, extends the assimilation control to the sea ice quantities. This work has been done in collaboration with IFREMER / CERSAT which has developed methods to estimate sea ice concentration and sea ice drifts data from passive microwave radiometers. As a first step, we have started to assimilate the sea ice concentration quantity alone. Our study presents first the original method based on the SAM2 tools and a description of the data used by the assimilation scheme. Hindcasts experiments have been performed and comparison studies made with experiments with and without sea ice assimilation illustrates the impact of assimilating observation of sea ice concentration on the upper oceanic layers. In particular, the results obtained over the Antarctica show how the oceanic model responds to the surface conditions changes imposed by the assimilation.