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Characterizing discrepancies in SST representation between ocean model and remote sensing images by geostatistical means

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Ocean models are important in describing the dynamics of the sea in a given region of the globe. The forecasts of ocean models can best be checked at the surface level, where most information is available, especially thanks to the frequent passage of satellites performing a remote sensing of sea surface temperature (SST) and other parameters. The ground truth of the remote sensing images can itself be checked by comparison with in situ measurements performed from ships or by buoys.

A current challenge in operational oceanography is to produce forecasts not only of the main oceanic currents, but also of eddies of a diameter of several tens of kilometers, which may have a lifetime of several weeks or months. It can happen that the ocean model generates eddies that have no counterpart in the real world or that it fails to generate significant eddies. In sequential data assimilation by the Ensemble Kalman filter (which incorporates kriging for the update step) the state of the model is corrected on the basis of discrepancies between the ocean model forecast and the remote sensing data available at the next time step. An aim of the present study is to understand better the spatial structure of these discrepancies in order to propose either changes in the way the data are assimilated or in the way the numerical model is tuned.

Exploratory graphical tools are a powerful means to unravel main features of a spatial data set. We use conditional graphics with depth and other parameters for delimiting zones, in which separate oceanographic processes take place. Geostatistical mono- and bivariate structural analysis is then an important tool in delimiting the charac-

teristic scales that emerge both from separate and common analysis of model output and remote sensing data. Finally geostatistical filtering techniques, both mono- and bivariate, permit to visualize the displacement in space of features of interest.

The examples discussed in this paper are taken from case studies of an upwelling event in the Gulf of Lion (Mediterrean sea) and of the eddies generated at the confluence of currents in the Skagerrak strait (linking the North Sea and the Kattegat strait).