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Characterization of ocean submesoscale turbulence regimes from satellite observations of Sea Surface Temperatures

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Satellite infrared radiometers have unveiled the existence of distinct turbulence regimes in the upper ocean. These regimes have different contributions on the vertical transport of nutrients, heat, and climatically important gases between the oceanic upper layers and the ocean interior; and contain information about the dynamics in the mixed layer. The main difficulty is to define descriptors able to univocally identify such turbulence regimes and quantify the dynamical characteristics of the upper ocean. In this study, we have investigated the capability of different descriptors to characterize turbulence regimes from the observations of
infrared Sea Surface Temperatures (SST) provided by the AATSR sensor (Envisat). First, data have been divided into granules adapted to the observed cloud coverage with a maximum size of 512 by 512 pixels (i.e. 512 km by 512 km). These granules have been classified into two groups: one characterized by the presence of submesoscale instabilities ($\sim$ 5-10 km) and one characterized by the presence of vortices and filaments. Then, for all the granules of each group we have explored the statistical and geometrical properties of SST using spectral analysis and the curvature of SST fronts completed with the analysis of the multifractal properties of SST images obtained from singularity analysis. Results have shown that the both groups of images were characterized by similar spectral slopes. On the contrary, the characteristics of the singularity spectra of both groups were different indicating different inttermitencies and allowing to identify the distinct dynamical regimes.