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Paths from meso to submesoscale processes in the western Mediterranean Sea

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In this work we characterize the mesoscale dynamics in the western Mediterranean (WMed) by analyzing the different contributions to the kinetic energy budgets using a 20 year high-resolution numerical model. The length of the numerical solution allows us to consider statistically stationary state of the ocean, a necessary condition for using the quantification of energy budgets as a tool for analyzing dynamical processes.
To identify and characterize the different submesoscale processes, we isolate the terms in the energy balance equations (the Lorenz Energy Cycle, LEC, equations) responsible for the production (conversion and generation) of the eddy kinetic energy (EKE). Firstly, by comparing the predominance of each conversion term among the others, three different submesoscale instabilities can be identified in a certain region: baroclinic, barotropic and Kelvin-Helmholtz type. Conversely, given the crucial role of the wind forcing in the dynamics of this area, the generation of kinetic energy by surface winds has been also considered. Finally, a regional analysis of the EKE production terms permits the identification of the areas dominated by submesoscale activity. As will be shown in this work those areas are located near the main currents, and submesoscale processes are strongly influenced by sharp bathymetry-flow interaction.