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A numerical study of the mesoscale variability in the Adriatic Sea

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The Adriatic Sea mesoscales and their inter-annual variability are investigated by means of a high resolution numerical ocean model with approximately 2 km resolution. The ocean model used is based on the Princeton Ocean Model (POM, Blumberg and Mellor 1987) which has been modified in the advection scheme and the vertical velocity surface boundary condition. The simulations resolve the mesoscale variability and the adopted advection scheme has very low horizontal dissipation. The simulation spans 6 years starting from January 1999 till December 2004. The lateral boundary conditions are obtained from a coarser resolution operational model of the entire Mediterranean Sea. The surface forcing is interactively computed using European Centre for Medium Range Weather Forecast (ECMWF) operational atmospheric fields and climatological precipitation, while river runoff is obtained combining daily Po river (the main Adriatic river) data together with climatological estimates for all the other rivers. The model results have been validated by an extended comparison with in situ and remote sensing observations. The simulated variability exhibits evident similarities with the actual mesoscale variability, in terms of location, nature and temporal evolution of the features. The major results concern the spatial and temporal variability of Eddy and Mean Kinetic Energy (EKE and MKE) and the baroclinic energy conversion term contained in the buoyancy work time rate. We show for the first time evidence of baroclinic instability at the level of major sub-basin scale structures such as the Western Adriatic Coastal Current. Furthermore, the seasonal and interannual variability of mean and eddy kinetic energy is correlated to surface forcing and Po runoff input.