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Climatic circulation of the Adriatic Sea modulated with tides

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In a model of climatic circulation of the Adriatic Sea (Zavatarelli and Pinardi, 2003) tides were introduced and numerical simulations of circulation with and without tides were explored using the 3D Lagrangian tracking method. The paths of water parcels, which were released at five starting positions (two in the northern Adriatic, two in the southern Adriatic and one in the middle Adriatic) at the beginning of each month, and at a starting depth of 1 m, were explored. Therefore, 120 trajectories have been analyzed. A particle in each of them was followed for a maximum of one climatic year if the particle did not leave the modeling area earlier.

Maximum horizontal speeds reached by 120 particles launched near the surface ranged between 0.7 and 1.0 m/s. The introduction of tides did not manifest statistically in the top 10 % of maximum speeds, while trajectories with tides included were dominant in the lowest 10 % of maximum speeds. The straight-line distance between the starting and ending locations varied between 383.8 km and 669.5 km. The introduction of tides did not significantly change the values of this distance. The length of the trajectories, however, varied between 16.4 km and 3173.7 km, where the lowest 10 % of path lengths were dominated by trajectories without tides. Maximum depths reached by particle trajectories ranged between 2.2m and 998.2 m, while maximum values of absolute vertical velocities were in the interval between 0.001 and 0.27 cm/s. The month in which maximum absolute vertical velocity and maximum depth most frequently occured was climatic March, when convective cooling in the southern Adriatic takes place. Paths of particles follow the western Adriatic current flowing southward along the Italian coastline. They may, however, leave this coastal strip of confined flow if

they are located at its outer edge and may be caught in one of the cyclonic vortices which are typical for the Adriatic Sea and increase the time spent by a water parcel in the Adriatic. This method of Lagrangian tracking of water parcels has been applied in a study of the transport of scyphomedusa *Pelagia noctiluca*.

Zavatarelli M and N. Pinardi 2003. The Adriatic Sea modelling system: a nested approach. Ann. Geophys., 21, 345-364.