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Numerical simulation of the coastal dispersion associated with river discharges in the Mediterranean Sea

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The spatio-temporal evolution of the dispersion of riverine waters in coastal areas on a regional scale was numerically simulated using a marine circulation model and a Lagrangian particle dispersion model. The oceanographic model, developed from the Princeton Ocean Model, was nested in the Mediterranean Forecasting System (Oddo et al., 2009) domain in order to have the boundary conditions (temperature, salinity and currents) in almost every part of the Mediterranean Sea. On a regional scale, it was able to simulate the effects due to the presence of a river considering the outflow as a subgrid process behaving like a buoyant jet flow (Oey, 1996). The model was forced at the surface by high resolution winds and by MODIS SST fields. The currents generated by the oceanographic model were passed to a Lagrangian particles model (Garcıa Lafuente et al., 2007), which was used to simulate the dispersion of a mass of particles proportional to the known daily discharge of the river. Episodes of discharges could be hindcasted in this way for a period up to 30-50 days. The density of the pollutants were modified by changing the deposition velocity of the particles. The resulting changes in time of the fields of salinity at the surface (calculated by the oceanographic model) and the Lagrangian particles concentration fields were then compared with the evolution of the river plume as described by the available images of MODIS K490 diffuse light attenuation coefficient (Bignami, 2007). Two long winter episodes of major discharge of the Tiber River in the central Tyrrhenian Sea were hindcasted and the results compared with the maps of K490.