



## Three-dimensional Lagrangian microplastic transport simulations in the Gulf of Naples (Southern Tyrrhenian Sea)

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The high-resolution Campania Regional Ocean Model (CROM), coupled with an online Lagrangian particle tracking algorithm (TRACE), is used to investigate the horizontal and vertical behaviour of different (in terms of size and density) plastic polymer types during February and August 2016 in the Gulf of Naples, a coastal marine area of the southern Tyrrhenian Sea, heavily affected by anthropic stress due to the presence of numerous tourist attractions, high population density, and intense maritime commercial activity. The choice of a winter (February 2016) and a summer month (August 2016) in our simulations aims to understand how seasonality, and thus the different hydrological features of the marine environment, affect the 3D transport of plastic particles since variation of the seawater density also plays a critical role in the particle settling dynamics. The transport of passive particles is evaluated based on the three-dimensional Eulerian velocity fields provided by the ocean model. The virtual particles are released in several hot spot areas in the Gulf of Naples where most of the marine debris is supposed to come from: the Sarno River mouth, the harbour of Naples, and the coastal area of Bagnoli. A sensitivity analysis on the vertical sinking for negatively buoyant particles is carried out. The sinking behaviour is determined by the settling velocity, which depends on the physical properties of the individual litter item as well as on the hydrodynamical features of the marine environment. Different numerical experiments are carried out to evaluate the effect of marine dynamics on three-dimensional transport.