Backward reconstruction of plankton sources in the Gulf of Naples

Daniela Cianelli (1,3,4), Domenico D'Alelio (2), Pierpaolo Falco (1,4), Maurizio Ribera d'Alcalà (2), Enrico Zambianchi (1,4)

(1) Università Parthenope, DIST, Department Science and Technology, Centro Direzionale ISOLA C4, 80143,Napoli, Italy, (3) ISPRA – Istituto Superiore per la Protezione e la Ricerca Ambientale, Via Vitaliano Brancati 60 - 00144 Roma, Italy, (4) CoNISMA, Piazzale Flaminio, 9, 00196, Roma, (2) Stazione Zoologica Anton Dohrn, Villa Comunale, 80121 Naples, Italy

The Gulf of Naples (GoN) is a coastal area of the Southern Tyrrhenian Sea representing a very complex system, influenced by numerous interacting factors depending on the peculiar physical and biogeochemical conditions of this area. Since 2004 a system of HF coastal radars (Sea Sonde CODAR) operates in the GoN providing real time (hourly data) surface current fields with a resolution of 1.0×1.0 Km over almost the entire area of the GoN.

Moreover plankton abundance in the GoN is monitored weekly at the Long-Term Ecological Research station MareChiara (LTER-MC) since 1984. An oscillating population dynamics, with an alternation, especially in summer, between phases reflecting the coastal and offshore influence on the biological community, has been frequently observed at LTER-MC station.

Such an opportunity to integrate biological data and current measurements at high spatio – temporal resolution, makes the GoN a natural laboratory to investigate the role of surface circulation in structuring the marine plankton community.

The results here presented refer to a year-long analysis carried out for 2009, which was characterized by a very accurate estimate of the surface dynamics, with a reduced number of HF radar data gaps. A Lagrangian particle transport model, forced by the HF radar current fields, has been applied to identify probable sources and transport pathways of plankton at LTER-MC station. In particular a backward-trajectory modeling approach has been used to reconstruct a probability distribution function around the LTER-MC station.

The results from the backward trajectory simulations allowed to identify origin of plankton observed at LTER-MC; the surface dynamics analysis accounted for the relationship between the inter-annual alternation in the plankton community and the variability in the wind-driven circulation.