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Oil spill risk assessment for a Single Buoy Mooring terminal in the Port of Taranto (Southern Italy)

Svitlana Liubartseva¹, Ivan Federico², Giovanni Coppini², and Rita Lecci²

¹CMCC Foundation – Euro-Mediterranean Center on Climate Change, Ocean Predictions and Applications, Bologna, Italy (svitlana.liubartseva@cmcc.it)

²CMCC Foundation – Euro-Mediterranean Center on Climate Change, Ocean Predictions and Applications, Lecce, Italy

Being situated in a semi-enclosed Mediterranean lagoon, the Port of Taranto represents a transport, industrial and commercial hub, where the port infrastructure, a notorious steel plant, oil refinery and naval shipyards coexist with highly-dense urban zone, recreation facilities, mussel farms, and vulnerable environmental sites. A Single Buoy Mooring in the center of the Mar Grande used by tankers and subsea pipeline that takes oil directly from tanker to refinery are assumed to stay at risk of accidental oil spills, despite significant progress in technology and prevention.

The oil spill model MEDSLIK-II (<http://medslik-ii.org>) coupled to the high resolution Southern Adriatic Northern Ionian coastal Forecasting System (SANIFS <http://sanifs.cmcc.it> Federico et al., 2017) is used to model hypothetical oil spill scenarios in stochastic mode. 15,000+ hypothetical individual spills are generated from randomly selected start locations: 50% from a buoy and 50% along the subsea pipeline 2018–2020. Individual spill scenario is based on a real crude oil spill caused by a catastrophic pipeline failure happened in Genoa in April 2016 (Vairo et al., 2017). The model outputs are processed statistically to represent quantitatively: (1) timing of the oil drift; (2) hazard maps in probability terms at the sea surface and on the coastline; (3) oil mass balance; (4) local-zone contamination assessment.

The simulations reveal that around 48% of the spilled oil will evaporate during the first 8 hours after the accident. Being transported by highly variable currents and waves, the rest is additionally exposed to multiply reflections from sea walls and concrete wharfs that dominate in the study area. As a result, the oil will be dispersed almost isotropically in the Mar Grande, indicating a rather moderate or small level of concentrations over the minimum threshold values (French McCay, 2016).

We have concluded that at a probability of 50%, the first oil beaching event will happen within 14 hours after the accident. The most contaminated areas are predicted on and around the nearest Port berths, on the coastlines of the urban area and on the tips of the breakwaters that frame the Mar Grande openings. The remote areas of the West Port and Mar Piccolo are expected to be the least contaminated ones.

Results are applicable to contingency planning, ecological risk assessment, cost-benefit analysis,

and education.

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