THE MODELLING SYSTEM FOR SIMULATION OF THE OIL SPILLS IN THE BLACK SEA

I. Brovchenko, A. Kuschan, V. MADERICH, M. Zheleznyak

Institute of Mathematical Machine and System Problems, Glushkov av. 42, Kiev 03187, Ukraine.

The growing concern over the impact of the accidental spill in the new oil transport route from Eastern to Western Black Sea is motivating factor for the development of the decision support tools to evaluate the oil spill response strategies, to provide the environmental impact assessment and to use in the contingency planning and training. The purpose of this paper is to present a development of the real-time integrated modeling system for weather, currents, wind waves coupled with oil slick transport and fate model. The local area weather forecasting model MM5 is used for operational forecasts in the Black Sea region. It was coupled with 3D hydrodynamics and sediment transport model THREETOX, which hydrodynamics part is based on the known POM model, and with the third-generation wave model WAVEWATCH III. This set of models supplies information on currents, waves and sediment concentration to the OILTOX - 3D model of oil slick transport and fate. The oil slick model describes most important processes of oil transport and weathering: advection by wind and currents, spreading, evaporation and dissolution, natural dispersion by breaking waves, emulsification and oil-shore interaction. The oil concentration at surface and entrained oil concentration is calculated by random walk particle method with Gaussian kernel weighting to produce continuous distribution of oil mass. The new physically based numerical approach to compute the spreading of oil slick of arbitrary shape due to gravity and surface tension forces at early stage of spill is presented. The beaching and refloating algorithms were used to describe oil-shore interaction. The database of model includes information about hundred kinds of oil that are transported through the Black Sea and their main physical-chemical properties. The modeling system was designed to operate at LINUX based network of PC.

Simulation of the oil slick propagation in the Black Sea at 5, 10,15 and 20 days after hypothetical accidental release 100 000 tons of crude oil.