



Vertical mixing and horizontal drift of oil spills: simulations with the open source oil spill model OpenOil

Johannes Röhrs (1), Knut-Frode Dagestad (1), Helene Asbjørnsen (2), Tor Nordam (3,4), Jørgen Skancke (3), Cathleen E. Jones (5), and Camilla Brekke (6)

(1) Norwegian Meteorological Institute, Division for Ocean and Ice, Norway (johannes.rohrs@met.no), (2) University of Bergen, Geophysical Institute, Norway, (3) Sintef Ocean, Trondheim, Norway, (4) Norwegian University of Science and Technology, Trondheim, Norway, (5) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109, USA, (6) UiT The Arctic University of Norway, Tromsø, Norway

The new integrated oil spill transport and fate model “OpenOil” will be presented here, including simulations that highlight vertical and horizontal transport mechanisms for marine oil spills. Recently published parameterizations for the wave-entrainment of oil, the evolution of oil droplet size spectra, and turbulent mixing were implemented to resolve the 3D-development of a spill on the ocean surface and in the water column. Its performance is evaluated by comparing model simulations with airborne observations of an oil slick. The results show that an accurate description of a chain of physical processes, in particular vertical mixing and oil weathering, is needed to represent horizontal spreading. Further simulations show how vertical processes control the horizontal transport in the long term. Exchange of oil between the surface slick and the water column is a crucial component for the horizontal transport of oil because the vertical processes control differences in the drift of various types of oil and in various weather conditions. Dependent on weather conditions, submerged oil often reappears at the surface within a few days after the initial oil spill.

OpenOil is based on the open source trajectory framework OpenDrift and can be applied for a wide range of trajectory simulations in any region, provided that ocean circulation and weather data are available in standard formats. We will give a brief introduction on how to get started with trajectory simulations using OpenDrift.