Monte Carlo evaluation of oil spill fate in the Salish Sea using AIS ship track data, oil transfer data, and a suite of numerical models.

Rachael Mueller[1, 2,3], Susan Allen[3], Stephanie Chang[3], Haibo Niu[4], Douglas Latornell[3], Shihan Li[4], Ryah Bagshaw, Ashutosh Bhudia[3], Vicky Do[3], Krista Forysinski[3], Ben Moore-Maley[3], Cameron Power[3]

[1]Genwest Systems, Inc
[2]National Oceanic and Atmospheric Administration
[3]University of British Columbia
[4]Dalhousie University

Abstract

Capturing regional risks of oil spills is difficult because it is impossible to predict when and where an accident will result in spilled oil; yet, evaluating vulnerabilities to a significant oil spill before a spill has happened helps support effective planning. In this talk, we present results from a Monte Carlo oil spill risk assessment of a semi-enclosed, estuarine environment that is home to endangered species, multiple nations, two major shipping ports, five oil refineries and eight marine terminals. The Salish Sea supports around 8,300 deep draft vessel transits, ~45 billion liters of oil transported as cargo each year, and distinct oceanographic regions with different driving forces of surface and vertical transport. In this talk, we share an overview of our method for generating spill statistics using a novel approach that combines Automatic Identification System (AIS) ship traffic data, state regulated oil transfer data, and a suite of numerical models to statistically represent the risk of spilled Alaska North Slope Crude, Bunker-C, and Marine Diesel under a variety of environmental conditions. Our results are based on 10,000 MOHID oil spill model simulations with currents, winds, and waves between January 1, 2015 and December 31, 2018. Each of the 10,000 oil spill scenarios was run individually and includes weathering from biodegradation, dissolution, dispersion, emulsification, evaporation, and spreading. Our pioneering approach captures statistical variability in seasonality, traffic, spill locations, and oil types within this semi-enclosed shipping corridor. We show that heterogeneity of 3D circulation in an estuarine environment, combined with marine traffic “footprints”, creates regionally-variable signatures of the timing, likelihood and type of potential oiling within the Salish Sea.