Influences of wind, sea state, and oil type on oil dispersion in the Salish Sea

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Queen Charlotte Sound (11/27/2017)

ATB de-coupling
Oil spill response strategies

RESPONDING TO OIL SPILLS AT SEA

DISPERSION
Chemical dispersion is achieved by applying chemicals designed to remove oil from the water surface by breaking the oil into small droplets.

BURNING
Also referred to as in situ burning, this is the method of setting fire to freshly spilled oil, usually while still floating on the water surface.

BOOMS
Booms are long, floating barriers used to contain or prevent the spread of spilled oil.

SKIMMING
Skimming is achieved with boats equipped with a floating skimmer designed to remove thin layers of oil from the surface, often with the help of booms.

Spill response by wind speed

Figure 1 Summary of Wind Effects on Countermeasures

Environment Canada 2004 report by Merv Fingas
What does oil spill fate look like in the Salish Sea under different sea states?
Modeling Potential Oil Spills
(for preparedness)

SalishSeaCast

NEMO 3.6
• 500 m, structured grid
• 1 – 27 m depth levels

Open boundaries
• Temperature and Salinity
• Tides
• Sea Surface Height

Rivers
• Gauged Fraser River
• Watershed climatology

Atmospheric Forcing
• 2.5 km HRDPS winds
SOILED: Salish Sea Cast (Oiled)
(for preparedness)

Salish Sea Cast, NEMO
- u-, v-, w-velocities
- Salinity
- Temperature
- Sea Surface Height

WaveWatch3®
- Whitecap Coverage
- Significant Wave Height
- Mean Wave Period

HRDPS
- u-, v-wind Velocities

MOHID
Weathering of spilled oil

http://www.medess4ms.eu/marine-pollution
Response efficacy by wind speed

Figure 1 Summary of Wind Effects on Countermeasures

Environment Canada 2004 report by Merv Fingas
Wind-climatology of spill impacts

Western boundary of model domain and main source of open ocean exchange

Strait of Juan de Fuca

HRDPS model climatology

% hours > 10 m/s (2015 – 2018)
Preliminary study sites

- Strait of Georgia
- Turn Point
- Salmon Bank
Variability: Turn Point (TP)

Salinity

Surface Current Speed

Wind Speed

01/2015 01/2016 01/2017 01/2018
Variability: Strait of Georgia (SOG)

- Salinity
- Surface Current Speed
- Wind Speed

Graphs showing variability from 01/2015 to 01/2018.
2 cases: Strait of Georgia (SOG)

(2) Freshet, stronger winds
(1) Non-freshet, weaker winds

Salinity
Surface Current Speed
Wind Speed

01/2015 01/2016 01/2017 01/2018
Non-freshet, weaker winds

PRELIMINARY RESULTS

Alaska North Slope Crude  Diesel

Thickness (microns) summed over 6-days
Fraser River freshet, stronger winds

PRELIMINARY RESULTS

Alaska North Slope Crude

Diesel

Thickness (microns) summed over 6-days
Consider: Oil Spill Impacts are likely to vary in space and time, based on ocean conditions and sea state.
Model of Impacts of Dilbit and Oil Spills in the Salish Sea

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