Oil Spill Modeling: Physical Fates and Behavior

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The objectives of this exercise are

1. to carry out a literature review, including collection of relevant data where appropriate and available;
2. to clarify what is needed and what is available to develop improved model algorithms;
3. to specify a 5-year study and development plan.

The physical fates and behavior group will review recent research into the processes that affect eventual distribution, effects, and recoverability of spilled oil:

- spreading,
- evaporation,
- dispersion,
- dissolution,
- emulsification,
- sedimentation,
- photo-oxidation,
- bio-degradation,
- shoreline and bottom interactions.

Of special interest are recent studies of the time-dependent changes in physical-chemical parameters of spilled oil including

- density,
- viscosity,
- rheology,
- water content,
- emulsion stability,
- droplet size distribution,
- surface tension,
- adhesion characteristics, and
- Chemical composition.

The review will include environmental factors only in so far as they affect the oil weathering and fate. These factors could include wave breaking, subsequent droplet formation, Langmuir processes, re-suspension, ice interaction, interactions with suspended particulate matter in the water column, interactions with seafloor sediments, and beaching.

The review will identify those areas where significant improvement has occurred in understanding the science and those areas in need of further research, and suggest methods for integrating new algorithms into next-generation models.

<u>Areas of overlap of missions between subgroups</u>

Transport

1. Drift characteristics will change as the oil weathers and/or goes sub-surface.
2. Transport processes strongly affect oil spreading, and therefore evaporation, dispersion and emulsification, and hence eventual biological effects.

Biology
Physical and chemical transport and behavior of the oil determine in part the potential for interactions with the natural resources.

Response
1) The effectiveness of alternate response technologies, either for control of location (e.g. dispersing from surface to water column, or protective booming of stream mouths), or removal of spilled oil will depend on time-varying oil properties, as well as environmental conditions.
2) All response options (other than the no-response option) will affect the fate of the oil.