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Long Range (60 days) Stochastic Plume Simulations in Confined Seas

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Major issues in characterizing and predicting the extent of the affected/sensitive regions in real-time during oil spills or other dispersive events in the ocean are a poor knowledge of the actual source functions and the fact that coastal dynamics may not be predictable in a deterministic sense. This work presents a methodology that allows assessing the ocean regions and times that can be likely affected by spill accidents or by water contamination over an extended outlook period, while taking into account the uncertainty in ocean model velocities. The approach uses an ensemble of extended range forecasts (60 days) of high resolution runs of the Navy Coastal Ocean Model (NCOM) configured over the regions of interest. The ensemble runs are assumed to represent the uncertainty in larger scale dispersion and each run is assumed as a reference state used to run a sub-ensemble of Lagrangian Gaussian stochastic models, that take into account the smaller scale dispersion. The ensemble information is integrated as stochastic plumes by defining probability distribution functions for tracer distributions relative to each point on the model grid. Results are displayed using a Risk Assessment Code (RAC) analysis by associating a number from 1 to 5 to each grid point, determined by the likelihood of having tracers within the vicinity of each grid node. The threshold ranges can characterize the expected total dispersion from the ensemble runs and be tuned to represent levels of concentration relative to the source. Results will discuss implementation of this approach in the Gulf of Mexico and central Mediterranean Sea.