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**On the Interaction of Buoyant Plumes With Ocean Mixed-Layer Fronts<sup>1</sup>**

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The ocean's surface mixed layer is notoriously complex due to high spatial and temporal gradients of density and velocity fields. The understanding and modeling of such flows have a wide range of applications. For instance, anomalous currents and density perturbations in the acoustic and optical environment can affect a variety of naval operations. These flows can also influence strongly the dispersion of surface and sub-surface pollutants. Large eddy simulations of an idealized mixed-layer problem are conducted using the spectral element model Nek5000. Sampling strategies of these fields are investigated using passive tracers and Lagrangian particles. These idealized fields are then used in order to explore the behavior of a buoyant plume through the water column, namely its surface and sub-surface dispersion, which is motivated by the Deepwater Horizon oil spill.

<sup>1</sup>In collaboration with Paul Fischer, Argonne National Laboratory.