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Influence of Richardson number on the ejection of a miscible contaminant from a rectangular cavity by an incoming fully turbulent overflow GEORGE CONSTANTINESCU, University of Iowa, KYOUNGSIK CHANG, KAIST, SEUNG-O PARK, KAIST — The 3D flow past a rectangular shallow cavity is investigated using LES. The flow upstream the cavity is fully turbulent. The unsteady purging mechanism corresponding to ejection of a neutrally buoyant (Richardson number, Ri=0.0) and of a dense miscible contaminant (Ri=0.2) introduced instantaneously inside the cavity is studied. In the non-buoyant case it is shown that along with the engulfment of high concentration fluid by the large scale vortices in the separated shear layer, the coherent structures convected from the near wall region of the channel upstream the cavity can play an important role in accelerating the extraction of contaminant from cavity. In the buoyant case, after the initial stages of the mixing, a sharp density interface is observed whose oscillations are playing a major role in the entrainment process. The main phenomenon is the presence of an internal wave of relatively high amplitude which interacts with a strong recirculation eddy inside the cavity situated near the trailing edge corner. Through this interaction the denser contaminant is extracted from the region beneath the internal wave where it is concentrated. The process is similar even after the density interface starts interacting with the cavity bottom. The period of the internal wave oscillations is found to increase in time. Global diffusion coefficients are estimated for the different mass exchange regimes observed in the simulations.

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