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Direct numerical simulation of temporal plumes for entrainment analysis DOMINIK KRUG, JIMMY PHILIP, DANIEL CHUNG, IVAN MARUSIC, University of Melbourne — Temporally evolving jets have already proven to be a valuable tool in studying details of the entrainment process. The present work aims to extend this concept to buoyancy driven flows. In this spirit, we report the direct numerical simulation of pure turbulent plumes evolving in time on a triply periodic computational domain and present details on the choice of key simulation parameters. Further, we use the plume data to investigate entrainment in a buoyancy driven flow. To this end, we determine the entrainment coefficient via two independent approaches. The first approach employs an integral analysis while the second is based on a relation between the bulk entrained flux and the local propagation of the turbulent/non-turbulent interface (TNTI) defined by an isosurface of enstrophy. This allows us to quantify entrainment in terms of quantities related to the propagation of the TNTI relative to the fluid, namely the local entrainment velocity and an amplification factor due to the convoluted shape of the enstrophy isosurface.

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