Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

The growth and breakdown of a vortex-pair in a stably stratified fluid. ADVAITH S, Doctoral student, AASHAY TINAIKAR, Graduate student, MANU K V, Assistant Professor, SAPTARSHI BASU, Associate Professor — Vortex interaction with density stratification is ubiquitous in nature and applied to various engineering applications. Present study have characterized the spatial and temporal dynamics of the interaction between a vortex and a density stratified interface. The present work is prompted by our research on single tank Thermal Energy Storage (TES) system used in concentrated solar power (CSP) plants where hot and cold fluids are separated by means of density stratification. Rigorous qualitative (High speed Shadowgraph) and quantitative (high speed PIV) studies enable us to have great understanding about vortex formation, propagation, interaction dynamics with density stratified interface, resulted plume characteristics and so on. We have categorized this interaction phenomena in to three different cases based on its nature as non-penetrative, partial penetrative and extensively penetrative. Along with that we have proposed a regime map consisting non-dimensional parameters like Reynolds, Richardson and Atwood numbers which predicts the occurrence above mentioned cases.

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Date submitted: 31 Jul 2017 Electronic form version 1.4