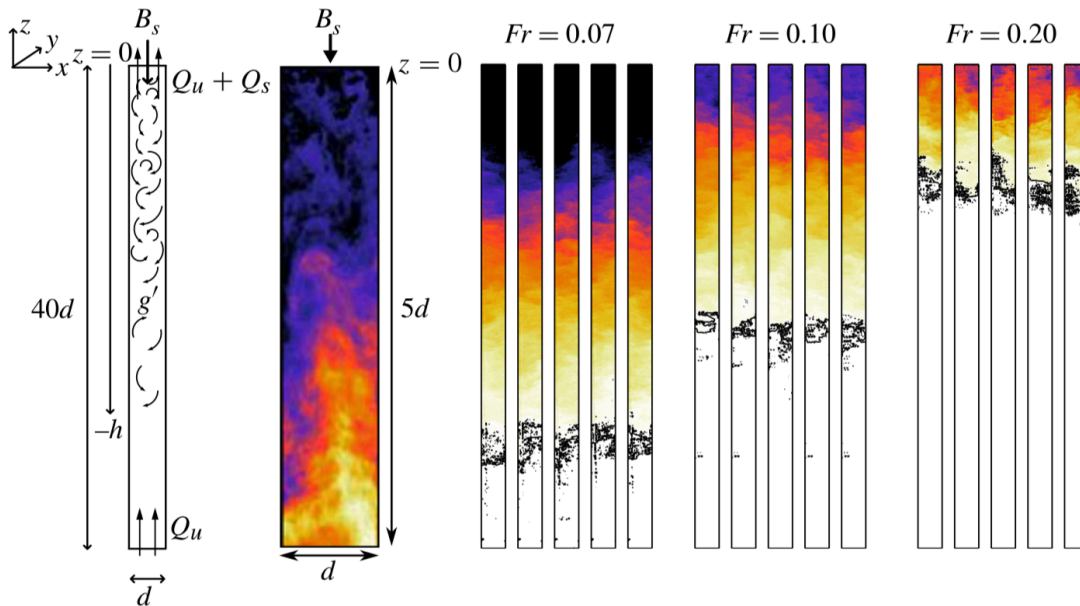


Vertical Exchange Flows in Rotating Fluid

Bruce Sutherland and Colm-cille Caulfield



[van Sommeren et al, 2013]

A vertical exchange flow consists of a tube filled initially with dense (salty) fluid located above a less dense (fresh water) ambient. After a membrane is pierced, the salt water is allowed to descend into the fresh ambient while the fresh water rises into the tube to replace the salt water that exits. The result, for sufficiently large scale flows, is a turbulent exchange of salt and fresh water within the tube.

This proposed project aims to examine the influence of background rotation on the exchange process as it depends upon the size of the tube, the density difference of salt and fresh water, and the rotation rate. Because rotation inhibits vertical motion, mixing should be influenced by rotation, particularly if the tube size is comparable to the characteristic Rossby deformation radius. The resulting dynamics are unclear and may provide insight into understanding the more complex problem of mixing and entrainment in rotating plumes.

Further reading

- Van Sommeren, Caulfield & Woods, “Advection and buoyancy-induced turbulent mixing in a narrow vertical tank”, J. Fluid Mech. (2013)