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# Strangled Plumes

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It is well known that the rate of diffusion of salt in sea ice directly affects the structure of the fluid flow beneath. Depending on the diffusivity either heavy ‘puffs’ of fluid can be released intermittently downwards, or a relatively steady plume of heavy fluid can be established. This paper reports experimental and theoretical work aimed at understanding the transition from a puff regime to a plume regime.

Starting with the simple jet and plume models of G.I. Taylor (1958), new models have been developed which show the effect of one descending puff on the formation of the next. These models compare well with laboratory measurements of the velocity field. It is shown that due to the entrainment of ambient fluid into the descending puff a straining field acts to reduce the size of the next puff being formed, in a similar manner to the way a wake is restricted in a straining field (Hunt & Eames 2002)

The transition from puffs to plumes is an important one, as it has a significant potential impact on the density of the descending fluid when it reaches the bottom.

Hunt, J.C.R. & Eames, I. 2002 The disappearance of laminar and turbulent wakes in complex flows. Journal of Fluid Mechanics, vol. 457, 111-132.

Taylor, G.I. 1958 Flow Induced by Jets. Journal of the Aero/Space Sciences, vol. XXV, 464-5.