Ambient	Point source	Line source
Homogeneous	Morton, Taylor & Turner (1956) (P) Scorer (1957) (T) Johari (1992) (T)	Rouse, Yih & Humphreys (1952) (P) Richards (1963) (T)
Stratified	Morton, Taylor & Turner (1956) (P) Noh, Fernando & Ching (1992) (P) Ching, Fernando & Noh (1993) (P)	Wright & Wallace (1979) (P)
Rotating homogeneous	Elrick (1979) (T) Helfrich (1994) (T) Ayotte & Fernando (1994) (T) Fernando, Chen & Ayotte (1998) (P)	Fernando & Ching (1993) (P) Lavelle & Smith (1996) (P) Present study
Rotating stratified	Speer & Marshall (1995) (P) Helfrich & Battisti (1991) (P) Helfrich (1994) (T)	Present study

TABLE 1. Summary of studies on the dynamics of turbulent plumes (P) and thermals (T) in the presence of ambient stratification and/or rotation.

in a stratified ambient they are lenticular with characteristic aspect ratio prescribed by N/f. The number of such structures generated by a turbulent plume is prescribed by their size relative to the plume source. Maxworthy & Narimousa (1994) examined the discharge of negatively buoyant fluid from an areal source in a homogeneous rotating fluid, and demonstrated that a series of quasi-two-dimensional anticyclonic vortices (of characteristic radius $7.5B_0^{1/2}/f^{3/2}$, where B_0 is the surface buoyancy flux per unit area) emerge from beneath the source (see also Whitehead, Marshall & Hufford 1996, and Boubnov & van Heijst 1994). Fernando, Chen & Boyer (1991) and Julien *et al.* (1996) have considered the influence of rotation on turbulent thermal convection, and also identified the presence of columnar structures of comparable scale. A discussion of the physical processes accompanying convectively-driven mixing in rotating stratified fluids is given by Maxworthy (1997).

The line plume problem has received considerable recent attention owing to its relevance in modelling thermohaline convection associated with cracks in the polar ice caps, or 'leads'. Motivated by the problem of lead-induced plumes impinging on the pycnocline at the base of the oceanic mixed layer, Noh, Fernando & Ching (1992) and Ching, Fernando & Noh (1993) undertook experimental studies of line plumes impinging on a density interface, and characterized the rate of ascent as well as the intrusion depth of the plume. Fernando & Ching (1993) carried out an experimental study of line plumes in a homogeneous rotating fluid, and Lavelle & Smith (1996) undertook an analogous numerical study. In both studies, the influence of ambient stratification was neglected, and only a limited range of parameter space was examined, so that the striking coherent flow structures reported here were not identified. While the individual effects of stratification and rotation on the dynamics of line plumes have been investigated, the study presented here represents the first investigation of their combined effects. By analogy with the point plume problem, we anticipate that the line plume in a rotating stratified fluid will rise to its level of neutral buoyancy before intruding as a gravity current which eventually goes unstable under the influence of the system rotation. However, we will observe an important distinction between the point and line plume problems: when the source time is less than the instability time of the neutral cloud for the case of a continuous release, a