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Abstract View

Intrusion Characteristics in the Antarctic Polar Front

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ABSTRACT

Data obtained on two cruises to the Antarctic Polar Front are used to investigate the nature of thermohaline intrusions in the front. These data, obtained in the Drake Passage and south of New Zealand, include CTD time series made relative to neutrally buoyant vertical-current meters, temperature data from these floats, and small-scale CTD sections. Analysis of these data is divided into a study of temporal persistence and an examination of the spatial structure of the intrusions. The study of intrusion time scales is hampered by the presence of large spatial gradients in the intrusion field. This study suggests that features are persistent for several days but additional measurements appear necessary to resolve the intrusion decay process. The length scales of intrusions are found to vary within the frontal zone. Near the region of maximum lateral gradients in the front, length scales of 5 to 10 km are observed, while elsewhere scales of only 1 km are found. It is suggested that these small, isolated leaves of fluid are old intrusions that have been sheared and advected from their generation site. Several pieces of circumstantial evidence are presented to support the hypothesis that intrusions are driven by salt fingering, and good agreement between the observations and the results of a dynamical model of intrusions driven by salt fingers is noted. Finally, application of a statistical model for intrusive variance predicts that intrusions may effect constant lateral eddy diffusivities in fronts provided the small-scale vertical diffusivity is constant.

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