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Stratification of a closed region containing two buoyancy sources ANDREW THOMPSON, Scripps Institution of Oceanography, PAUL LINDEN, University of California, San Diego — Many closed systems such as lakes, ocean basins, rooms etc. have inputs of buoyancy at different levels. We address the question of how the resulting stratification depends on the location of these sources. For example a lake is heated and cooled at the surface, while for a room cool air may be applied at the ceiling but the heat source may be a person standing on the floor. We present an experimental study of convection in a finite box in which we systematically vary the vertical location of two well-separated, constant buoyancy sources. We specifically consider the case of a dense source and a light source so that there is no net buoyancy flux into the tank. We study the development of the large-time stratification in the tank, which falls between one of two limits. When the location of the dense source is significantly higher than the light source, the fluid is well mixed and the system remains largely unstratified. When the location of the light source is significantly higher than the dense source, a two- layer stratification develops. We find that the circulation pattern is dominated by counter-flowing shear layers (Wong, Griffiths & Hughes, 2001), whose number and strength are strongly influenced by the buoyancy source locations. The shear layers are the primary means of communication between the plumes and thus play a large role in the resulting stratification. We support our findings with a simple numerical model.

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