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Double-Diffusive Convection in Low-Aspect Ratio Containers S. POL, H.J.S. FERNANDO, Arizona State University, S. WEBB, Sandia National Laboratories — Laboratory experiments and phenomenological modeling were undertaken to investigate the influence of container sidewalls on the evolution of diffusive layering in confined double-diffusive systems. Such flow configurations are common in engineering situations, including underground storage caverns of national strategic petroleum reserves. The laboratory flow configuration consisted of a linearly salt stratified fluid subjected to either heating from below or uniform heating from both the bottom and sidewalls. A number of different containers were used, allowing investigations over a range of governing parameters. The growth of the lowest mixed layer as well as multiple convecting layers aloft separated by diffusive interfaces were monitored using LIF, PIV and traversing temperature/conductivity probe techniques. The aspect ratio for side walls to become important was inferred by the bottom-layer growth measurements, which undergoes a transition of the growth law upon onset of side-wall effects. The combined side and bottom wall heating case was strikingly different from the bottom heating case, wherein layers of approximately equal heights are generated rather rapidly in the former as a result of convective plumes rising along the sidewalls and their arrest by the background stable density gradient. Theoretical arguments were advanced to explain and parameterize experimental observations.

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