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Evolution of Double-Diffusive Convection in Low-Aspect Ratio Containers SUHAS POL, Los Alamos National Labs, HARINDRA FERNANDO, University of Notre Dame, STEPHEN WEBB, Sandia National Labs — 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. The growth of the mixed layers separated by diffusive interfaces was monitored using PIV and traversing temperature/conductivity probe techniques. The importance of aspect ratio effects was inferred from the bottom-layer growth measurements, which undergoes a transition upon onset of side-wall effects (aspect ratio ~ 1). A second transition was noticed at an aspect ratio ~ 2 when elongated eddies break down in to smaller sizes. 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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