On the secondary layers in a stable solute gradient heated from below

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When a fluid column stably stratified by a constant solute gradient is heated uniformly from below by raising its bottom temperature to a prescribed value above the ambient, double diffusive layers are formed successively from the bottom. The layered system thus developed consists of a thick bottom mixed layer and a series of much thinner secondary layers. An experimental stability analysis which considers the criterion for the onset of each secondary layer and its initial thickness is carried out. The stability results collapse on a straight line on the phase plane of thermal and solute Rayleigh numbers. The initial thickness of each secondary layer is a function of the ambient solute gradient and the fluid properties only and is independent of the applied vertical temperature difference.

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