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A mechanistic model of double-diffusive intrusions

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Dynamical structure of double-diffusive interleaving at a density-compensating thermohaline front is investigated. Numerical simulations successfully reproduced a series of sloped intrusive motions (fig. a). It is revealed that the finger convection and its collective vertical buoyancy transport drastically changes the inner structure of the layers as well as the slope of the intrusion layers. To understand the dynamical balance of the motions in layers, a mechanistic model of intrusive layers was devised for an idealised configuration in which a unit layer repeats in vertical direction (fig. b). Transports of heat and salt by small-scale convective motions are parameterised in terms of large-scale quantities. Balances between parameterised transports yielded results qualitatively consistent with that of the numerical simulations.

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