The relationship between double-diffusive intrusions and staircases in the Arctic Ocean YANA BEBIEVA, MARY-LOUISE TIMMERMANS, Yale Univ — The origin of double-diffusive staircases in the Arctic Ocean is investigated for the particular background setting in which both temperature and salinity increase with depth. Motivated by observations that show the co-existence of thermohaline intrusions and double-diffusive staircases, a linear stability analysis is performed on the governing equations to determine the conditions under which staircases form. It is shown that a double-diffusive staircase can result from interleaving motions if the observed bulk vertical density ratio is below a critical vertical density ratio estimated for particular lateral and vertical background temperature and salinity gradients. Vertical temperature and salinity gradients dominate over horizontal gradients in determining whether staircases form. Examination of Arctic Ocean temperature and salinity measurements indicates that observations are consistent with the theory for reasonable choices of eddy diffusivity and viscosity.

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