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Pairing in stratified fluid, one step to turbulence PANTXIKA OTHEGUY, JEAN-MARC CHOMAZ, LadHyX, YOSHIFUMI KIMURA, Nagoya University, NCAR, PAUL BILLANT, LadHyX — In order to understand the difference between strongly stratified turbulence and two-dimensional turbulence, we investigate the effect of stratification on the merging of two vertical vortices by a direct numerical simulation. The merging is accelerated compared to a two-dimensional merging and is fully three-dimensional because of a zigzag instability. It does not occur simultaneously along the vertical. In the linear stage, the zigzag instability translates the vortices closer together and farther apart alternatively every half a wavelength on the vertical. In the layer where the vortices initially moved closer the vortices merge rapidly. In the layer where the vortices initially moved apart, the nonlinear development of the instability brings them back together resulting also in an accelerated pairing. In this nonlinear stage, the flow is seen to nearly recorrelate in each layer, high vertical shear being expulsed in between these layers. This surprising observation suggests that stratified flow should be organized into layers vertically coherent on the buoyancy lengthscale separated by thin viscous layers.

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