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Vortex interactions and mixing in large Atwood number two-dimensional turbulence LAURENT JOLY, Universite de Toulouse, ISAE, JEAN NOEL REINAUD, University of St Andrews, JEROME FONTANE, Universite de Toulouse, ISAE — We perform direct numerical simulations of the relaxation of variable-density two-dimensional turbulence. An initial collection of vortices is evolved in time together with an initially bimodal density field corresponding to an Atwood number $A = 2/3$. The initial vortex collection counts a thousand Gaussian vortices and spans a radius decade. The vortex Reynolds number of the smaller ones $\Gamma/\nu = 300$ and we consider a unit Schmidt number. The misaligned density-gradient and fluid acceleration trigger baroclinic sources and sinks of vorticity on density fronts. The adaptive spatial resolution increase up to 6144^2 at peak enstrophy production time. We analyze the bias on both the evolution of the vortex population (number and radii) and the mixing progress, against a passive scalar reference simulation started from the same initial fields. Vortex carrying high-density fluid are mass-depleted or break-up into filamentary debris rapidly removed by mass diffusion. Meanwhile, intense vortices merge and trap almost unmixed low-density fluid. The resulting density field is negatively skewed and the mass exchange between vortices and the interlacing medium is shown to be the result of vortex interactions of different types among which asymmetric binary interactions are playing a central role in the mass-segregation by vorticity.

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