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Stratified Euler flows in a channel and conservation laws GIOVANNI ORTENZI, Università degli studi di Milano Bicocca, ROBERTO CAMASSA, SHENGQIAN CHEN, University of North Carolina, Chapel Hill, GREGORIO FALQUI, MARCO PEDRONI, Università degli studi di Milano Bicocca —
We analyze the consequences of density stratification for the motion of an incompressible two dimensional Euler fluid confined to move under gravity between rigid lids and otherwise free to move along horizontal directions. The conserved quantity related to the horizontal translation invariance (impulse) does not coincide with the horizontal momentum, which is not conserved for generic initial conditions. The classical form of the impulse is given by Benjamin (1986) and it is affected by the boundary limiting values of physical fields such as density or density weighted vorticity. Therefore, the intersection between isopycnals and boundaries could affect the conservation laws of the system even if symmetries are not broken. While the failure to conserve quantities is naturally implied by geometrical changes of the fluid-domain boundary, regardless of fluid stratification, in this case the fluid domain maintains invariance under symmetry and the relevant cause of the failure is the connection properties of pycnoclines. Some results on this topological (non)conservation are exposed in the examples of impulse and total circulation.

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