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Instability of coupled geostrophic density fronts and its nonlinear evolution

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We revisit the problem of stability of coupled geostrophic fronts. By using the collocation method in the framework of the reduced-gravity rotating shallow water model we benchmark the classical results on zero potential vorticity (PV) fronts and generalize them to non-zero PV fronts. We then study the nonlinear evolution of the most unstable mode with the help of a high-resolution well-balanced finite volume method. The instability develops as follows: after a couple of inertial periods, the coupled fronts are pinched at some location (breaking of the unstable boundary waves) and a series of co-rotating elliptic anticyclonic vortices is formed.