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Discrete baroclinic and symmetric instabilities on the B and C grids

Tuesday 28 January 2020 14:00 (30 minutes)

Baroclinic instability drives mesoscale eddy formation. We perform a von Neumann analysis of several B and C grid discretizations in the Eady problem to examine the impact of horizontal spatial discretization on the resulting growth rates. Growth rates of symmetric instability are typically too small and converge upwards, and at fixed resolution the C grid is more accurate. Baroclinic instability on the B grid has a growth rate that is too low at eddy-permitting resolution, and converges upwards towards the true value as the grid is refined. On the C grid there is a spurious baroclinic instability at small scales. At large Richardson numbers this spurious instability is peaked near the grid scale, and does not disappear as the grid is refined. We are unable to completely eliminate this spurious instability, but recommend a combination of fourth-order tracer advection and biharmonic viscosity to effectively damp it out.

Do you need an official invitation letter?

No

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