Laplace Transform Integration of a Baroclinic Model

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A time integration scheme based on the Laplace Transform (LT) has- been implemented in a baroclinic primitive equation model. The LT scheme provides an attractive alternative to the popular semi-implicit (SI) scheme.

Analysis shows that the LT scheme is more accurate than SI for both linear and nonlinear terms of the equations. Numerical experiments, with simple wave solutions and with real atmospheric data, confirm the superior performance of the LT scheme.

The algorithmic complexity of the LT scheme is comparable to SI, with just an additional transformation to vertical eigenmodes each time step, and it provides the possibility of improving the accuracy of numerical integrations at comparable computational cost.