

# **Towards a forced-dissipative shallow water test case with physics-dynamics coupling.**

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Most, if not all, published test cases for the spherical shallow water equations are short duration initial value problems. Arguably, there is a need for a long-term forced-dissipative test case: a shallow water analogue of the Held-Suarez 3D test case. This would allow different aspects of the dynamical core accuracy to be assessed, such as long-term stability, conservation properties, energy spectra, and the handling of small scales and cascades.

The limitations of a dynamical core are often not seen until 3D dynamics is coupled to physical parameterizations, with small-scale feedbacks forcing short space and time scales and even on-off behaviour in space and time. It would be valuable to have a shallow water test case that displays some typical physics-dynamics coupling behaviour in order to begin to address any issues at an earlier stage in the dynamical core development.

I will present progress in formulating a pair of forced-dissipative test cases for the shallow water equations. The first represents ‘dry’ dynamics and simulates a statistically steady climate in which barotropic instability maintains turbulent ‘weather’ systems in mid-latitudes. The second also includes a simple subgrid model intended to mimic the small-scale physics-dynamics feedbacks of a typical convection parameterization. Sample results from a selection of shallow water models will be presented, and some of the philosophical as well as technical challenges of formulating a suitable test case will be discussed.