**Geoscientific**
**Model Development**
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Discussions

# Interactive comment on "DYNAMICO, an icosahedral hydrostatic dynamical core designed for consistency and versatility" *by* T. Dubos et al.

### Anonymous Referee #2

This is a well written and researched paper describing the development of the DYNAMICO dynamical core, with an emphasis on its hydrostatic option. The design makes use of several recent numerical advances, including much of the authors' work developing a very general Hamiltonian framework for atmospheric dynamics. It builds on the approach first used in global atmospheric modeling in ICON-IAP.

The paper has a several good demonstrations of the usefulness of the Hamiltonian formulation for dycore design, such as explained in Section 4.3, generalizing and simplifying previous work for the hexagonal C-grid. Several standardized test case results are presented to evaluate DYNAMICO. The initial DYNAMICO implementation is not optimal with respect to accuracy and the test case results are as expected and similar to what would be obtained by many other modern methods on non-lat/lon grids. Hence

the main advantage of this work is the abstract formulation which supports multiple equation sets and choice of conserved quantities and guides many of the choices that must be made when developing a dynamical core.

Minor comments:

page 1760 line 24: Is SCVT defined anywhere? On a SCVT grid, do the $C_i$ and $G_i$ coincide?

page 1767: Since the authors discuss efficiency of RK methods, but end up using a RK4 method with the usual efficiency, I'll note that there are low storage 3rd order accurate RK methods which have more stages, but are more efficient in terms of CFL per stage.

page 1771: The authors mention hyperviscosity for control of grid scale noise, but dont mention its more common usage of controlling the physical energy or enstrophy cascade. What is DYNAMICO would use for that very important component? Although later I see this was addressed somewhat in the conclusions.

page 1774 line 10. Typo in reference - missing year?

Interactive comment on Geosci. Model Dev. Discuss., 8, 1749, 2015.