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Geoscientific
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Discussions

Interactive comment on "A test of numerical instability and stiffness in the parametrizations of the ARPÉGE and ALADIN models" *by* M. Tudor

A. Cioaca (Referee)

alexgc@vt.edu

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This research article describes a practical approach to test the robustness of numerical weather prediction models, in the presence of stiff phenomena. Such an approach can be useful for determining the acceptable range of the simulation time step.

The test proposed by the authors is simple, yet effective. It involves a trial-and-error process of attempting to have each parametrization scheme push the model into instability. Many simulation runs are performed with different values for the contribution of the implicit part and the size of the time step. The resulting level of fibrillations in the solution is monitored to detect the parametrization schemes that cause instability. Each test hypothesis is well motivated by the authors and is relevant from a scientific aspect.

The introduction is clear and consistent, and is backed with citations to previous work and current alternatives. The authors argue that the literature lacks reports about studies similar to theirs and this paper will fill that gap.

Experimental results are provided with both a large-scale complex numerical model and a simple non-linear diffusion equation prototype. This test was able to identify the parametrization schemes responsible for the fibrillations. Moreover, the authors argue that the source of instability comes from the way the model handles the behavior of water in the atmosphere and present some carefully crafted experiments that confirm their allegation.

The narrative of the paper is fluid and follows the norms of the scientific literature. The writing style is appropriate and contains no obvious errors or typos. The motivation behind this type of research is well described and documented. The testing methodology is explicitly stated and seems reproducible. The results of the study are presented in a conclusive way. I recommend this paper for acceptance.

Interactive comment on Geosci. Model Dev. Discuss., 5, 4233, 2012.

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