Atmos. Chem. Phys. Discuss., 12, C27–C28, 2012
www.atmos-chem-phys-discuss.net/12/C27/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Differences between downscaling with spectral and grid nudging using WRF" *by* P. Liu et al.

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Received and published: 26 January 2012

The paper presents an interesting comparison of spectrally and fully nudged regional long-term simulations.

I want to raise four issues, with which the authors should deal with:

a) An additional comparison with "free" simulations would be interesting.

b) What are the synoptic (large scale) situations when the simulations differ strongly on the smaller scales?

c) The concept that a difference between an RCM simulation and observations would necessarily represent an "error" is wrong; RCM simulations are ill-posed problems, and

due to the internal chaotic dynamic, the model may develop different trajectories – a tendency which is strongly reduced when nudging is applied. This phenomenon is long known, and discussed in some detail in Weisse, R., H. Heyen and H. von Storch, 2000: Sensitivity of a regional atmospheric model to a sea state dependent roughness and the need of ensemble calculations. Mon. Wea. Rev. 128: 3631-3642 (see further references in that paper)

d) Unfortunately, the authors have overseen the rich literature on related issues since our von Storch et al. (2000) paper, in particular: Feser, F., B. Rockel, H. von Storch, J. Winterfeldt, and M. Zahn, 2011: Regional climate models add value. Bull. Amer. Meteor. Soc. 92: 1181–1192 with many relevant references, and Feser, F., 2006: Enhanced detectability of added value in limited area model results separated into different spatial scales. Mon. Wea. Rev. 134(8), 2180-2190, in which a similar strategy was employed as in the present manuscript, namely regional analyses as a reference for determining the added value over the driving NCEP re-analyses.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 1191, 2012.