

## ***Interactive comment on “Development of the GEOS-5 atmospheric general circulation model: evolution from MERRA to MERRA2” by A. Molod et al.***

### **Anonymous Referee #1**

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The paper is clearly written and provides a record of the improvements and differences between MERRA and MERRA2. The major model changes in moving from MERRA to MERRA2 are given and their impact illustrated. This paper will act as a reference for anyone using MERRA2. The paper is let down by the incorrect labeling of a number of figures towards the end of the paper making it difficult to tell which resolution is being shown.

#### Specific comments

Section 3.2 would benefit from a bit more discussion of how the new source of non-orographic drag in the tropics was arrived as no reference is provided. How does it

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relate to other models schemes of tropical non-orographic drag? e.g. Manzini et al, 1997: Impact of the Doppler spread parameterization on the simulation of the middle atmosphere circulation using the MA/ECHAM4 general circulation model. J. Geophys. Res. or Scaife et al 2002: Impact of a spectral Gravity wave parameterization on the stratosphere in the Met Office Unified Model. J Atmos Sci.

Section 4 This section might benefit from mentioning that lack of convergence in moist processes with increasing resolution is a common problem in atmospheric models. e.g. older studies Williamson 2008: Convergence of aqua-planet simulations with increasing resolution in the community atmospheric model, Version 3. Tellus. Pope & Stratton 2002: The processes governing horizontal resolution sensitivity in a climate model. Clim Dyn. Although the figures are slightly confusing it is still possible to understand the points being made in this section.

#### Technical corrections

p7584 line 15 refers to Fig 9. Panels (a) and (b) look identical and don't show the difference referred in the text. I assume one of the panels is wrong.

p7588 line 1 says that Panels 16(a) to (c) show resolutions 1., 0.5 and 0.25 but the figure says 2, 1 and 0.5, which is correct? (Figure 17 has the same resolutions as Fig 16.)

p7588 line 19 references Tokioka (1988) but this does not appear in the references at the end.

Figure 7 - If colour key correct, then caption wrong as 1 degree is purple, 2 degree is blue.

Figure 12 - what is the grey shading on panels (c) & (f)?

Figure 18 - key has 2.5 degrees but figure caption has 2 degrees, which is correct?

Figure 19 - Panels (b) and (c) both claim to be 0.5 degrees but look different. The units

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claim they are kg/m<sup>2</sup>/s but the colour bar has values of  $\sim 100$  should it be g/m<sup>2</sup>/s?  
Figure 20 - Again panels (b) and (c) both claim to be 0.5 degrees but are different.

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Interactive comment on Geosci. Model Dev. Discuss., 7, 7575, 2014.