

Interactive comment on “Assimilation of stratospheric and mesospheric temperatures from MLS and SABER into a global NWP model” by K. W. Hoppel et al.

Anonymous Referee #2

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General Remarks:

The paper describes the newly developed middle atmosphere circulation model NOGAPS-ALPHA and first simulations with it. The topic is very appropriate to the journal of Atmospheric Chemistry and Physics. The paper contains interesting and novel features, in particular the use of data assimilation methods using satellite data of the middle atmosphere region. I commend the authors for this ambitious project to fully resolve the major dynamic and thermal structure of the northern stratospheric warming event during Jan/Feb 2006.

I respond to this paper in the final stage of the discussion period because of two rea-

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sons.

First, I already reviewed the paper "High-Altitude Data Assimilation System Experiments for the Northern Summer Mesosphere Season of 2007 " by Stephen D. Eckermann , Karl W. Hoppel, Lawrence Coy, John P. McCormack, David E. Siskind, Kim Nielsen, Andrew Kochenash, Michael H. Stevens Christoph R. Englert, and Mark Hervig, Special Issue:Summer Mesopause-LPMR, submitted for publication in J. Atmos. Sol. Terr. Phys., 2008. As written in the author's reply to the SABER comment by Artem Feovilov, this paper is still in review, interested readers can check its status and download the latest version at: <http://uapwww.nrl.navy.mil/dynamics/html/nogaps/publications.html>.

This paper (Eckermann et al., 2008) discusses in a similar way (assimilation of SABER/MLS temperature data) the northern summer season 2007 with respect to mesospheric conditions, the thermal state of the summer mesopause region, supersaturation conditions which allow the formation of PMC, etc. The part of the model description, e.g. numerical core description, radiation module (non-LTE), data assimilation numerical formula, improved SABER data version V 1.07, etc., contains much further information. Therefore I recommend to any reader to take these two papers as one package with simply two applications, the SSW at 2006 and the summer 2007, respectively. However, it is very important to mention that the scientific goals of these two papers differ in a large way, so that the separation into two different papers is absolutely justified.

Second, I reread all comments and author responses of this paper, and from my point of view I have no further major comments.

In summary, I strongly recommend the final publication of this paper, perhaps including some minor comments in addition.

Minor comments:

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- 1) page 8460, in footnote 2 a typing error: Hervig not Gervig
- 2) page 8463, section 3.1: It would help the reader who is not so familiar with data assimilation expressions if you define the different meanings of O-F (= innovations = obs - forecast = $y - H(x_b)$) and A - F (analysis - obs := ?) at one place. At least, the latter one I could not identify.
- 3) Page 8466, section 3.4, discussion of Fig. 2: I did not fully understand what happens at locations where no MLS/SABER data are available. You have more longitudinal grid points than satellite orbits, how large is the horizontal radius of influence in terms of number of grid points in east-west and north-south direction, respectively. May be I missed it, but I did not find this.
- 4) Page 8472, section 4.3, 3rd paragraph: In the SH summer, both the standard deviation ... Here you could mention that the SABER data of version 1.07 provide much warmer and higher mesopause temperatures (Eckermann et al., 2008). I believe the use of these data should really improve your mean forecast error in the SH 0.1 -0.01 mbar range (Fig. 9 upper panel, right) because your forward model tends to compute warmer summer mesopause temperatures as seen by SABER 1.07, see also discussion with A. Feofilov.
- 5) Fig. 2 legend: Could you add in brackets the definition of correction := $(x_a - x_b)$?
- 6) Fig. 3b legend: Define red (MLS ?) and black (SABER ?).
- 7) Fig 4 legend: SABER data are bias corrected or not? Also, you say you calculate temperatures diagnostically via the geopotential? Shouldn't it be vice versus? As I know you have virtual potential temperatures, from these you calculate temperatures?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 8455, 2008.

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