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Geoscientific Model Development Discussions
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Interactive comment on "The implementation of the CLaMS Lagrangian transport core into the chemistry climate model EMAC 2.40.1: application on age of air and transport of long-lived trace species" *by* C. M. Hoppe et al.

Anonymous Referee #2

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This article presents the EMAC/CLAMS climate model. The first part of the article, presentation of the model, is well-written. However, the validation part of this version of the model is not adequate. Although they state that, "an extensive comparison will be done in a separate paper", it is necessary to present a discussion regarding the performance of the model compared to measurements, at least, for the processes presented in this article. The discussion is mostly centered around the Polar Regions (although you haven't stated this in the outline of the article given in P 1762, Para 3) and is not enough. Therefore, a revision on these aspects will definitely improve the

quality of this article.

Main suggestions

1. You have stated the importance of simulating the transport barriers and tropical pipe in the introduction (P 1761, Para, 2-3), as a motivation for the implementation of the transport module in the EMAC model. However, you present only the discussion on the polar barriers (Arctic and Antarctic vortices). Since EMAC is a climate model, it is also good to present a discussion on the subtropical barriers. You can use either age of air or any tracer simulations (N2O/CH4) for this and please make a comparison with measurements.

2. As you have already pointed out the significance of the accurate simulation of H2O in the climate models (P 1761, L 6; P1762, L 18-20,), I would also like to see the performance of EMAC/CLAMS on this. Please discuss the representation of the tape-recorder in your model. You could compare that with the MLS measurements.

3. Temperature is one of the important parameters to look at as far as the validation of a model is concerned. In addition, temperature has a seasonal cycle in the high latitudes, and you are presenting the polar vortex as an example of transport process in the model, so it is necessary to discuss the simulated temperature in the model. As shown by the SPARC (2010) report, some models show bias in the polar temperature. Therefore, please present a comparison of the modeled and measured/or reanalyzed (e.g. ERI) temperature.

Minor points

P1760, L15-16, example for what ? Please specify.

P1761, L10: jet and tropopause

P1761, L24: simulating or maintaining (transport barriers)? [also at P1763, L13 and in abstract] (e.g. maintaining a vortex in summer?)

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P1763, L2: "simulations of"

P1769, L5-10: Yes, you can present that in a separate publication. However, you also need to present some comparisons for this study too (e.g. When this article is read, the reader should get a clear idea about the transport/dynamics of the model, if this is the goal of your article.)

P1771, Sect. 3.2: Please present a contour plot of the age of air distribution (latitude versus altitude), prior to the comparison at a particular altitude.

P1772, L2: Hoffmann et al. (2004) is not published yet. So the readers do not know their comparison details. Therefore, please add more information on this.

Interactive comment on Geosci. Model Dev. Discuss., 7, 1759, 2014.

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