

## ***Interactive comment on “The ground-based FTIR network’s potential for investigating the atmospheric water cycle” by M. Schneider et al.***

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Received and published: 28 January 2010

Review of The ground-based FTIR network’s potential for investigating the atmospheric water cycle by M. Schneider et al., ACP MS No.: acp-2009-787 by M. S. Johnson, University of Copenhagen

This is an interesting study presenting tropospheric profiles of H<sub>2</sub>O and dD(H<sub>2</sub>O) for 13 years from Kiruna and Tenerife. The data are compared to the output of an atmospheric general circulation model that incorporates isotopic information. The model must be nudged in order to get a useful fit. In addition, there is the problem of retrieving remote sensing data, which is underdetermined, and here some assumptions must be made. I find it unclear in this paper whether the nudged model is being used to validate the experimental data (including the assumptions), or vice versa, or whether the package

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of experimental data and modeling is being used to draw conclusions, and if so, how can we know that we can trust the model and observations. I am worried about a circular argument. The authors make some interesting new observations concerning the link between tropospheric water vapor transport and the North Atlantic Oscillation. The data, modeling and conclusions appear sound except for my feeling that the first step should be to validate the experimental data - and then to extend it with a model. This is a very interesting piece of work and I believe it should be published when this concern, and those discussed below, is addressed.

26200, 8-9, 'If the model is nudged..the agreement is very satisfactory..which demonstrates the good quality of the FTIR data.' As mentioned above, I am worried about a circular argument in which the model is nudged to agree with meteorological data, and then the fact that it agrees with the remote sensing data is used to say that the FTIR data is OK, ...and because the model agrees with the data, it must be OK too. Possible solutions would be evidence that the model is good, and more of a discussion about 'nudging': why might nudging be different from simply massaging the model to get the desired result? Why should nudging even be necessary if the model is a good one? Also, is there an independent method for validating the FTIR data, for example by comparison with other data sets or satellite data?

26203, I would like to know a little more about nudging: What is the procedure, why is it done, are there references?

Section 3.3 Looking at Figure 1, the FTIR data are highly variable relative to the model data. The deviations seem to be as large as the signal itself. It is hard to judge from Fig 1 the relative roles of offset and variability. Please add an additional panel to the right showing the average and standard deviation of the ground based and IsoGSM simulations. Note that the figure has three panels, but only two of them are described in the figure text - also for Figure 2. Are the axis labels large enough to meet ACPs guidelines? It may help the reader to judge the agreement of the model and data if confidence intervals were added to the figures to account for the differences in vertical

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resolution, horizontal resolution, temporal resolution and sampling frequency.

Proofreading (but not a complete list): 26201, 13, change 'whereby' → 'where' 26201, 16, remove 'By now', this information is already implicit in the verb. 26202, 2, change 'since up to' → 'for' 26202, 7, 'during up to' → 'for' 26203, 5, 'suited' → 'suitable' 26204, 6, remove 'during the last years' this is implicit in the verb. 26202, 21-22, 'among which' → 'including' 26206, 10, → 'degrees of freedom' 26206, 16-17, 'resolves much more vertical details' to 'has better vertical resolution' 26215, 4, 'informs about' → 'shows' 26215, 13-14, → 'the model has problems capturing temporal and spatial inhomogeneities.' 26216, 3, remove 'in' 26218, 20, please don't tell the reader that the results are 'very exciting'. Rather show them the data (which may very well be exciting), and let them make up their minds.

The first paragraph of the conclusion is strong and distills the main findings of the work. I would suggest saving it for the final of the three paragraphs in the conclusion. Right now the final paragraph is apologetic and unsatisfying.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 26199, 2009.

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