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Atmospheric Chemistry and Physics Discussions

Interactive comment on "ECHAM5-wiso water vapour isotopologues simulation and its comparison with WS-CRDS measurements and retrievals from GOSAT and ground-based FTIR spectra in the atmosphere of Western Siberia" *by* K. Gribanov et al.

Anonymous Referee #2

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Gribanov et al present results of a brief field campaign ostensibly comparing ground based point source measurements of water vapor isotopologues with co-located FTIR column measurements, several retrievals of deuterium in H2O from GOSAT and modeled isotopologues in vapor from ECHAM5-wiso. Conceptually, the work has merit since the use of O and H stable isotopes in vapor has the potential to teach us much about the hydrologic cycle. Unfortunately, I find the work has several deficiencies that

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will require significant revision prior to publication. Personally, I think the work would benefit from eliminating the FTIR and GOSAT data and concentrating on investigating the nuances of the differences between ground based point source measurements and the ECHAM5-wiso model. Below I itemize my concerns. The continuous record from the ground based Picarro instrument is truly the most useful of the three data sets presented. Given its continuous nature, it is much more useful in comparison to ECHAM5-wiso. The data are rich in information with multiple short and long term excursions in both q and dD, some which compare well to model results and some which do not. Teasing out the details of how the various driving forces lead to such excursions is the reason for making such measurements. How are local versus meso-scale processes affecting the observations? Is there continental recycling occurring? Anything related to cloud micro-physical processes? Other that the brief explanation of a synoptic scale event around the 1st of May, however, the authors do little with this data other than to say that it compares reasonably well to a model with a slight offset. Even the offset could use a more thorough and detailed discussion. The lowest level of ECHAM5-wiso is the lowest 60 m above the ground surface whereas the inlet for the Picarro measurement is 7 meters. Is there reason to suspect that the near surface would be 30 to 40 permil depleted relative to the average of the lowest 60 m? Is there a simple profile model of the surface boundary that might elucidate the relationship between the point measurement and the 60 m average? The FTIR and the GOSAT data are intriguing but of such paucity that they appear to me to be of little use. FTIR results are reported for only 4 separate dates (why are the specific dates not given?). Seven GOSAT retrievals from the month of July 2012 are presented (dates?). The authors do present the tidbit that they observed a 20 permil increase in dD from the FTIR on the morning of July 10 and note that it does correspond to a 10 permil increase in model results. Is there good reason for the discrepancy? Does solar zenith angle come into play? Are there local effects influencing boundary layer vapor that aren't accounted for in ECHAM5-wiso? Why are FTIR data not compared with Picarro data since they are collocated? ECHAM5-wiso most certainly has output for the coordinates of the GOSAT

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observation spots. Why not compare the GOSAT work to the model rather than compare to a Picarro measurement that is arbitrarily adjusted by one day? I truly find this comparison meaningless. The structure of the manuscript is also questionable, starting with measurements, moving to models, and then back to measurements. I think it would flow much better if all measured data were first presented, followed perhaps by comparisons of measured data, and finally comparison to modeling work. Technically, H2O doesn't have isotopes, H and O have isotopes. H2O has isotopologues. I have trouble with the many different new definitions that "in situ" has taken on, not just in this work, but in much recent work in general. Basically, in situ means in place. So you can have an in situ point measurement or an in situ column measurement. Why not just refer to them as that? Or ground versus column? I think it would help avoid confusion.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 2599, 2013.