

***Interactive comment on* “Continuous monitoring of summer surface water vapour isotopic composition above the Greenland Ice Sheet” by H. C. Steen-Larsen et al.**

Anonymous Referee #1

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The paper “Continuous monitoring of summer surface water vapour isotopic composition above the Greenland ice sheet” by Steen-Larsen et al. presents water isotope data from water vapour at the NEEM site on the Greenland ice sheet. It presents in detail how the continuous spectroscopic measurements were set up under these extremely difficult conditions and how the crucial calibration of the instruments was done. There is no doubt that these data are extremely valuable both for the interpretation of the many different icecores from the Greenland icesheet and for the interpretation and prediction of the changing hydrological cycle in the near future. The paper is therefore certainly suitable for ACP and its readership. The paper is well organized and the results are clearly presented. My general impression is that certainly more could have been done

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with these extraordinary data in terms of a quantitative interpretation but obviously the authors intend to save more analysis for future publications. I recommend the paper for publication and I have only some minor questions and remarks. 1) L45-47 “Our data show. . .” Then sentence is too general and unspecific for an abstract. This is rather for an proposal. 2) L 167 “with a large fraction”. What does “large” quantitatively mean? 3) L417-425 Could it be that the discussed differences of d18O/dD slopes between precip. and vapour are just interannual variability? What is the interannual variability deduced from snow pits or ice cores concerning the d18O/dD slopes? 4) L565-569 The authors discuss only the parameterization of “real” physical processes (RH at the surface, boundary layer physics) in order to explain the failure of the LMDZ model in simulating the deuterium excess excursions. However the isotopic physics of the excess itself is highly parameterized. It would be indeed a major breakthrough if any problem in simulated isotope signals could be linked to “real” problems of the model’s hydrological cycle. However, unfortunately all kinetic processes of the water isotopes are parameterized and tuned in order to get reasonable climatological results. This should be added into the discussion and the conclusions on what can be learned from the model/data comparison here should be reformulated to my opinion. 5) L571ff I accept that the discussion of the link between AO and the deuterium excess is at this stage still preliminary. However since you have a model available with long simulations it would be logical to have a look if you can find such relationships there.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 1399, 2013.

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