

Interactive comment on “Climatic controls on water vapor deuterium excess in the marine boundary layer of the North Atlantic based on 500 days of in situ, continuous measurements” by H. C. Steen-Larsen et al.

Anonymous Referee #1

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Evaluation of Manuscript

General comments:

This paper showed a 500 days continuous water vapor isotope composition data in Bermuda Island. The authors found that d-excess (1) does not depend wind-speed (2) but is affected by wind direction. They also showed an interesting result; the decreasing slope of d-excess vs RH along with data averaging period. Although the data quality seems to be very good, the “Material and method” section is too long. A technical

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keyword (e.g., “calibration method” etc.) should be added into Title because ~70% of this paper described technical method. Overall, the manuscript is well written, and provides new data and interpretations. I recommend accepting the paper after the authors address all points I raise below.

Specific comments:

1.P2377 L.7 and other part “d-excess vs wind-speed relationship” Diffusional 18-O fractionation factor dependency on wind speed was investigated using 17O-excess data (Uemura et al. 2010). The observed diffusional fractionation factors are scattered and do not show clear dependency on wind speed (Fig 2 in their paper). On the contrary recent study showed that d-excess dependency on surface wind speed (Benetti et al., 2014). This discussion paper supports the former. The inconsistency is even confusing because the first author of this discussion paper is a coauthor of Benetti et al. (2014). I guess that the wind dependency differ widely depending on sampling location/height, moisture source and weather conditions etc. The authors should clarify the differences and discuss possible reasons.

References: Ryu Uemura, Eugeni Barkan, Osamu Abe, and Boaz Luz, Triple isotope composition of oxygen in atmospheric water vapor, Geophysical Research Letters, VOL. 37, L04402, doi:10.1029/2009GL041960, 2010

Marion Benetti, Gilles Reverdin, Catherine Pierre, Liliane Merlivat, Camille Ris, Hans Christian Steen-Larsen, Françoise Vimeux, Deuterium excess in marine water vapor: Dependency on relative humidity and surface wind speed during evaporation, Journal of Geophysical Research, Volume 119, Issue 2, 584–593, 2014 DOI:10.1002/2013JD020535

Technical corrections

P2366, L21-22 “. . .which alter the slope of 8 due to temperature dependence of the equilibrium fractionation coefficient. . . .”

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The slope is changed any process that does not follow the D/18O slope of 8 (i.e., not only the temperature). Indeed the crude approximation of logarithm $(1+\delta)$ is an important artifacts (Appendix in Uemura et al., 2012).

References: Uemura, R., V. Masson-Delmotte, J. Jouzel, A. Landais, H. Motoyama, and B. Stenni, Ranges of moisture-source temperature estimated from Antarctic ice cores stable isotope records over glacial–interglacial cycles, *Clim. Past*, 8, 1109-1125, 2012, doi:10.5194/cp-8-1109-2012

P2368, L19 “water vapor isotope system” >water vapor isotope monitoring system

P2370, L13, “..and provides the measurement, which are the focus of this paper”. What does this sentence mean? All the data (fig 10 to 13) are from this top inlet?

P2373, L21-21, “We first injected air with two significantly different water vapor concentrations.. and secondly injected ...with two significantly different water vapor isotopic compositions”. It is difficult to make such water vapors. How did you prepare the different vapor? Please describe in detail.

P2374, L24, “. . .a second Picarro inc. analyzer ” Add product name (2120-i or 2130-i)?

P2375, L3, “. . .The mean he mean deviation for ” > Remove “he mean”.

P2378, L20, “. . .This is supported by a wavelet analysis showing significant. . . ” Where is the figure showing the wavelet analysis?

P2379, L16, “. . .allows for ntegration. ” >integration

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 14, 2363, 2014.