



## **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**

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Continuous, in situ measurements of water vapor isotopic composition have been conducted in the North Atlantic, Bermuda Islands (32.26°N 64.88°W) between November 2011 and June 2013, using a cavity-ringdown-spectrometer water vapor isotope analyzer and an autonomous self-designed calibration system. Meticulous calibration allows us to reach an accuracy and precision on 10 minute average of  $\delta^{18}\text{O}$ ,  $\delta\text{D}$ , and d-excess of respectively 0.14‰, 0.85‰ and 1.1‰ verified using two parallel instruments with independent calibration. As a result of more than 500 days with 6-hourly data the relationships between deuterium excess, relative humidity (rh), sea surface temperature (SST), wind speed and direction are assessed. From the whole dataset, 84% of d-excess variance is explained by a strong linear relationship with relative humidity. The slope of this relationship ( $-42.6 \pm 0.4$  ‰ per % (rh)) is similar to the theoretical prediction of Merlivat and Jouzel (1979) for SST between 20°C and 30°C. However, in contrast with theory, no effect of wind speed could be detected on the relationship between d-excess and relative humidity. Separating the dataset into winter, spring, summer, and autumn seasons reveals different linear relationships between d-excess and humidity. Changes in wind directions are observed to affect the relationships between d-excess and humidity. The observed seasonal variability in the relationship between d-excess and relative humidity underlines the importance of long-term monitoring to accurately separate signals of local evaporation from signals associated with moisture advection.

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