Geophysical Research Abstracts
Vol. 18, EGU2016-6075, 2016
EGU General Assembly 2016

Dynamic of the atmospheric boundary layer from the isotopic composition of surface water vapor at the Maïdo Observatory (La Réunion, Indian Ocean)

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Projections of tropical and subtropical precipitation strongly differ from one climate model to another, both in sign and in amplitude. This is the case for example in some parts of the West Indian Ocean. The causes of those uncertainties are numerous and a better understanding of humid processes in the tropical atmosphere is needed. We propose to address this burning question by using water stables isotopes.

We have been measuring the isotopic composition of surface water vapor at the atmospheric Observatory of Maïdo located at La Reunion Island (21°S, 55°E, 2200m a.s.l) since November 2014. Our results exhibit a strong diurnal cycle all over the year (except during cyclonic activity), with almost constant isotopic values during the day (around -13.5±0.6‰ for oxygen 18 from November 2014 to November 2015) and variable and very depleted isotopic values during the night (down to -35‰ for oxygen 18 over the same period) associated with low humidity levels. We will show in this presentation that the diurnal isotopic variations are associated to a strong air masses mixing. During the day, the isotopic composition of the vapor is typical of marine boundary layer (BL) moisture transported from the close Ocean and lifted up to the Maïdo station. During the night, the depleted values and the low humidity could trace free troposphere moisture, which is consistent with previous studies suggesting that the Maïdo Observatory is above the BL during the night. We will explore the influence of the daily BL development on our observations, using a set of atmospheric vertical profiles done on site in May 2015 during the BIOMAIDO campaign. At last, we will discuss the most isotopic depleted values recorded in our observations during the night as a possible consequence of regional strong subsidences.