Dr. Franziska Scholder-Aemisegger, ETHZ, Switzerland

**Multi-platform observations of stable water isotopes in the North Atlantic trades as tracers for the atmospheric circulation at different scales**

Low clouds over the tropical oceans are at the heart of current uncertainties in future climate projections. These boundary layer clouds form due to a subtle interplay between the large-scale atmospheric circulation and small-scale physical processes embedded in the flow. In this presentation, I show how stable water isotopes can be used as measurable tracers of this interplay and thus serve as a tool to link different flow regimes in the North Atlantic trades with low-level cloudiness. To do so, I take advantage of a combination of multi-platform isotope observations with high-resolution numerical model simulations. In the first part of my presentation, I show how the Saharan heat low dynamics in summer moistens the eastern subtropical North Atlantic. Ground- and satellite-based remote sensing observations (FTIR and IASI) over the Canary Islands highlight large synoptic timescale variability of stable water isotope signals. This observed variability in the heavy isotope content of the free troposphere can be linked with different atmospheric transport pathways and water vapour sources using air parcel trajectories and numerical tracers in a regional model simulation. Despite the strong free tropospheric moistening by the Saharan air layer, low-level cloudiness is anomalously low in this flow regime. In the second part of my presentation, I use in-situ measurements of stable water isotopes in the downstream North Atlantic trades from the Barbados Cloud Observatory and from the French research aircraft ATR. With these observations, I illustrate how water isotope signals in the lower troposphere are linked to different mesoscale cloud organisation patterns and their associated cloud-relative overturning circulation.