**Event-based modeling of stable isotopes in near-surface water vapor**

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Knowledge of the isotopic composition of near-surface water vapor is crucial for understanding the variability of stable isotopes in the atmospheric water cycle. However, the isotope composition is influenced by many different processes on various scales, including surface evaporation, large-scale advection, and microphysical interactions of the vapor with precipitation. Moreover, non-equilibrium fractionation plays an important role in its determination.

Here, two different methods are presented for event-based isotope modeling in near-surface vapor. The first, Lagrangian-based method focuses on evaporation from the ocean and can be applied for comparing results of the Craig-Gordon model with atmospheric observations. In this way, constraints on uncertain model parameters like the non-equilibrium fractionation factor can be obtained. The second method is based on a mesoscale numerical weather prediction model. By implementing isotope fractionation in this model, all processes mentioned above can be simulated in a comprehensive way. First results from model simulations in the Mediterranean region will be presented. In future research, the model will be used for determining the relative importance of the different processes and for learning more about their specific isotope signature with the help of sensitivity studies and through direct comparison with isotope measurements.