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Stable isotopes in water vapor and precipitation for a coastal lagoon at mid latitudes

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The stable oxygen and hydrogen isotope composition in precipitation can be used in hydrology to describe the signature of local meteoric water. The isotopic composition of water vapor is usually obtained indirectly from measurements of δD and $\delta^{18}O$ in precipitation, assuming the isotopic equilibrium between rain and water vapor. Only few studies report isotopic data in both phases for the same area, thus providing a complete Local Meteoric Water Line (**LMWL**). The goal of this study is to build a complete LMWL for the lagoon of Venice (northern Italy) with observations of both water vapor and precipitation. The sampling campaign has started in March 2015 and will be carried out until the end of 2016. Water vapor is collected once a week with cold traps at low temperatures ($-77°$C). Precipitation is collected on event and monthly basis with a custom automatic rain sampler and a rain gauge, respectively. Liquid samples are analyzed with a Picarro L1102-i and results are reported vs VSMOW. The main meteorological parameters are continuously recorded in the same area by the campus automatic weather station. Preliminary data show an LMWL close to the Global Meteoric Water Line (**GMWL**) with lower slope and intercept. An evaporation line is clearly recognizable, considering samples that evaporated between the cloud base and the ground. The deviation from the GMWL parameters, especially intercept, can be attributed to evaporated rain or to the humidity conditions of the water vapor source. Water vapor collected during rainfall shows that rain and vapor are near the isotopic equilibrium, just considering air temperature measured at ground level. Temperature is one of the main factor that controls the isotopic composition of the atmospheric water vapor. Nevertheless, the circulation of air masses is a crucial parameter which has to be considered. Water vapor samples collected in different days but with the same meteorological conditions (air temperature and relative humidity) show differences in terms of $\delta^{18}O$ up to $3‰$. Isotopic ratios in rain events and water vapor are in fact dominated by a seasonal component but outliers are clearly linked to air parcel origin. The monthly measurements of δD and $\delta^{18}O$ in precipitation of August 2015, for instance, are lower than in colder months, considering monthly average temperatures. Single rain events show a small sequence of precipitation, that leads to 40% of total precipitation of August, which lowers $\delta-$values considerably. The sampling on event basis during occasional and discontinuous rain also allows to identify the rainout effect, which leads to lightening water during a rainfall. Statistics based on back trajectories (48 hours) show that the major part of air parcels travels across central Europe and derives from sources located in the north Atlantic, whereas, a smaller fraction of the water vapor can be attributed to Mediterranean sources.