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Quantification of vapor flux in dune sediments using a precision meteo-lysimeter

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A high precision meteo-lysimeter was installed 2015 in a coastal dune of the Doñana Natural Reserve SW Spain to quantify water and energy fluxes in dune belts, and to estimate its dependence on regional climate trends. The weighing lysimeter contains an undisturbed soil sample of 1 square meter surface, 1.50 m height with a weighing resolution of 10 g. Furthermore, the site is equipped with 2 automatic meteorological stations, 1 Hellmann pluviometer and six calibrated TDR sensors installed outside the lysimeter at 6 different depths until 3 m below surface. Environmental humidity conditions at the lysimeter bottom were maintained by a peristaltic pump controlled by two tensiometers installed inside and outside of the lysimeter and the volume of the drained water was analysed continuously. A total of 11 meteorological and soil water parameters were recorded in 10 and 1 minute-intervalls, respectively. Intrinsic noise in lysimeter data was reduced by smoothing through the AWAT filter (Peters et al. 2014). Precipitation and drained water from the lysimeter was analysed for mayor ions and stable isotopes of water. Additionally relevant physical and retention curve parameters of the sediment were analysed and the individual fluxes were quantified using lysimeter observations. Monitored data were used to set up a 1D model which was calibrated based on monitored groundwater recharge and TDR time series data. The calibrated model reproduces well the monitored data and therefore constitutes a powerfull tool to investigate the impact of climate scenarios on the soil water budget and groundwater recharge in coastal dune areas.