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Water vapour fluxes trends on different time scales and their relationship with weather and soil drivers: a case study from a dehesa site in South Spain

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Water vapour fluxes between the soil surface and the atmosphere constitute one of the most important components of the water cycle in the continental areas. Their regime directly affect the availability of water to plants, water storage in surface bodies, air humidity in the boundary layer, snow persistence... among others, and the list of indirectly affected processes comprises a large number of components. Water potential or wetness gradients are some of the main drivers of water vapour fluxes to the atmosphere; soil humidity is usually monitored as key variable in many hydrological and environmental studies, and its estimated series are used to calibrate and validate the modelling of certain hydrological processes. However, such results may differ when water fluxes are used instead of water state variables, such as humidity.

This work shows the analysis of high resolution water vapour fluxes series from a dehesa area in South Spain where a complete energy and water fluxes/variables monitoring site has been operating for the last four years. The results include pasture and tree vegetated control points. The daily water budget calculation on both types of sites has been performed from weather and energy fluxes measurements, and soil moisture measurements, and the results have been aggregated on a weekly, monthly and seasonal basis. Comparison between observed trends of soil moisture and calculated trends of water vapour fluxes is included to show the differences arising in terms of the regime of the dominant weather variables in this type of ecosystems. The results identify significant thresholds for each weather variable driver and highlight the importance of the wind regime, which is the somehow forgotten variable in future climate impacts on hydrology. Further work is being carried out to assess water cycle potential trends under future climate conditions and their impacts on the vegetation in dehesa ecosystems.