



## Hidden water fluxes in a Mediterranean ecosystem: new insights into seasonal dynamics from lysimeter data

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Surface water dynamics can impact ecosystem functioning, in particular in seasonally water-limited regions. The potential importance of dew and other non-precipitation water sources have long been recognized in arid biomes, however, their quantification is uncertain as the collection of precise data of these water sources has been difficult with typical measurement techniques.

The recent development of high precision shear-stress cells and validated data processing methods enables to detect water fluxes of 0.01 mm at the resolution of minutes from precision lysimeters. Thus, they outperform classical measurement devices like rain gauges and eddy covariance (EC) measurements regarding their accuracy in inferring dewfall or night-time evapotranspiration.

In this study, we analyze multiple (non-)precipitation water flux components with respect to their relative importance and corresponding inter-annual dynamics based on large high precision lysimeters. This is done in a Mediterranean tree-grass ecosystem.

Specifically, we concurrently analyze several years of lysimeter data with meteorological data and characterize how the different components of the water cycle respond in time to meteorological drivers and vegetation properties. The study is conducted at the experimental site Majadas de Tietar, Extremadura, Spain. Our results show that the fraction of non-precipitation water can account for more than half of the ecosystems water input during the dry months. We further investigate the micro-meteorological dimension of these processes in this ecosystem and changes of the flux components under exceptionally wet and dry years.

This study contributes to recent efforts to better understand the role of non-precipitation water sources in seasonally water-limited ecosystems of high seasonal precipitation dynamics. Furthermore, this investigation underlines the necessity to raise awareness of the limitations of EC and rain gauge devices in precisely quantifying all water fluxes.