

Quantification of non-rainfall water for two distinct grassland ecosystems

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Non-rainfall water from dew and hoar frost formation adds in the absence of precipitation water to the soil-plant system. Under arid conditions, non-rainfall events supply a substantial amount of water and are an important ecohydrological component of arid ecosystems, but their role for northern humid ecosystems are largely unknown. Thus, the aim of this work is to quantify the amount and the temporal evolution of dew and hoar frost formation for a low mountain range and alpine grassland ecosystem. In addition there is a general need to estimate the ecological relevance of such non-rainfall water humid grassland ecosystems. Observations from weighable precision lysimeters of two consecutive hydrological years were used to quantify and to better understand the relevance of non-rainfall water for a low mountain range and alpine grassland ecosystems.

Non-rainfall water ranged on a yearly basis between 42.1 mm to 67.7 mm, which corresponds to 4.2 % to 6.0 % of the total annual amount of precipitation. During drier months dew and hoar frost contributed up to 16.1 % of the total monthly precipitation amount. The investigation suggests that dew and hoar frost formation was an ecologically important source of water during droughts as well as cold periods. The seasonal development and the amounts of non-rainfall water could be predicted relatively well with a surface energy balance model (Penman-Monteith), which requires only standard meteorological variables. Our study results reveal that dew and hoar frost formation contribute substantially to the water budgets of a low mountain range and alpine grassland site.