



A site-level comparison of lysimeter and eddy-covariance flux measurements of evapotranspiration

Martin Hirschi (1), Dominik Michel (1), Irene Lehner (1,2), and Sonia I. Seneviratne (1)

(1) ETH Zurich, Institute for Atmospheric and Climate Science, Zürich, Switzerland (martin.hirschi@env.ethz.ch), (2) Centre for Environmental and Climate Research (CEC), University of Lund, Lund, Sweden

Accurate measurements of evapotranspiration are required for many meteorological, climatological, ecological and hydrological research applications and developments. Here we examine and compare two widely used methods to measure evapotranspiration at the site level: lysimeter-based measurements (E_L) and eddy-covariance (EC) flux measurements (E_{EC}). The analyses are based on parallel measurements at the research catchment Rietholzbach in northeastern Switzerland and focuses on the period June 2009 to December 2013. The measurements are compared on the yearly, monthly, daily, and hourly time scales, and with respect to an over 35-year lysimeter evapotranspiration time series. Overall, the two measurement techniques agree well, especially on the annual time scale. They also agree well with an independent catchment water-balance estimate of evapotranspiration. The good agreement of these independent methods emphasizes the representativeness of the lysimeter and EC measurements for the entire catchment despite their comparatively small source areas. The study also discusses different possibilities to close the energy balance of the EC flux measurements. From the comparison of E_L and E_{EC} , the closure of the energy balance according to the Bowen ratio is found to be reasonable.