



Long-term observations of energy balance closure of eddy covariance flux data over agricultural crops in two regional climates of Southwest Germany

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The energy balance of eddy covariance measurements (EC) is typically not closed. This is a main challenge for the evaluation of EC measurements. In our study, EC measurements were conducted in two different climatic regions (Kraichgau and Swabian Jura) in Southwest Germany at a total of six sites from 2010 to 2016. From this dataset, the year 2015 was selected for a detailed analysis of the energy balance closure (EBC). To examine potentially uncaptured eddy motions due to loss of low and/or high-frequency, we applied different time averaging intervals, ogive analyses and cospectrum analyses to the data set. The standard Bowen ratio (BR) was compared with the alternative buoyancy flux ratio approach to understand near-surface secondary circulations. Moreover, statistical analyses were conducted for the whole data set to test the effects of year, site and crop on EBC. The annual mean EBC over all seven years and six sites ranged from 57 to 88% and was significantly affected by the site. First results of the spectral analyses indicate that most of missing turbulent energy can be attributed to the sensible heat flux. We show that the contribution of low frequency loss to the energy gap of EC measurements can be appropriately estimated when minor energy storage and flux terms are considered in addition to the correction for high frequency losses.