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Energy balance closure considerations from measurements above agricultural crops and bare field

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Conservation of energy allows to formulate a budget equation for the energy flux densities at the surface. Energy balance closure requires that the sum of sensible and latent flux densities equals the available energy which includes all other energy sinks and sources, mainly net radiation, soil heat flux density and the rate of change of heat storage between the soil surface and the measurement height. However, many micrometeorological experiments applying the eddy covariance technique have shown that closure of the surface energy balance can not be achieved. Several methodological and instrumental hypotheses have been suggested to account for the lack of energy balance closure.

This contribution considers the results from measurements of the Institute of Meteorology, Climatology and Remote Sensing of the University of Basel carried out in the framework of two international experiments over flat, agriculturally used terrain. The first (EBEX-2000) took place in July and August 2000 above an irrigated cotton field in the San Joaquin Valley (U.S.). The second was a study from June 2004 to October 2006 above a rain-fed field with maize-fallow rotation in the Southern Upper Rhine Valley (Germany). At both sites energy balance was not in equilibrium and the non-closure shows a similar and pronounced daily pattern albeit the meteorological conditions, the growth stage or if the measurements were made over bare field. This behaviour and possible reasons for non-closure, including the accuracy of the measurements, different source areas of the terms of the energy balance, neglected ad-

ditional energy sinks and sources or the inappropriate averaging period, are discussed.