Validation and optimization of remotely sensed estimation of actual evapotranspiration in cotton ecosystems of Central Asia

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Abstract

Detailed knowledge of land surface fluxes, especially latent and sensible components, is important for monitoring the climate and land surface, and for agriculture applications such as irrigation scheduling and water management. The growing interest in quantifying regional actual ET for water resource and irrigation management led to the development of numerous methods to estimate ET from remote sensing data. The study is primarily concerned with the irrigation farming of cotton ecosystems in Central Asia, in particular with the situation within Khorezm Oblast in Uzbekistan. Regional problems of Khorezm Oblast are e.g. high groundwater levels, soil salinity, and non-sustainable use of land and water. Cotton is the major crop in Khorezm region. About 46% of the agricultural area was covered with cotton in 2009 and 2010, among the other main crops winter wheat (30%) and rice (5%). Due to the low level of precipitation (<100 mm p.a.) irrigation is the only available water source for the crops. The objective of this study was to validate the ET estimation and to improve the performance of the established surface energy balance algorithm for land (SEBAL) approach for estimating the energy balance. Input parameters and estimations of the surface energy fluxes are calibrated and validated with ground measurements of an eddy-covariance (EC) flux station and four agro-meteorological stations. First results show that the MODIS based SEBAL approach leads to good estimations of the seasonal behavior of actual ET in the study area. The implementation of satellite derived surface soil moisture is improving the estimation of the soil heat flux.