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## **CASI-ATM observed and simulated ecohydrological relevant water and energy fluxes**

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### **ABSTRACT**

Monitoring of water and energy fluxes is a requirement for assessment of climate and anthropogenic effects on natural and agricultural ecosystems (Kustas and Norman, 1996). These fluxes consist of the transfer of water (liquid and vapour) and energy (net radiation, latent, sensible and ground heat) between the soil, vegetation and atmosphere compartments. In order to describe these transfers, on local, regional or global scale, and the changes taking place in these compartments it is necessary to have models which assimilate spatial measurements of these fluxes. Physically based distributed hydrological models are appropriate tools and are constantly improving the understanding of this cycling of water through soils, vegetation and atmosphere. However, too often these models do not yet use the opportunities given by remotely observed conditions. Also for the relatively new emerging field of ecohydrology estimation of spatially distributed water and energy levels is essential for predicting occurrence of vegetation species under site specific conditions. Since evapotranspiration is a major flux and ecohydrological highly relevant, it deserves to receive the necessary attention. For the estimation of remotely sensed evapotranspiration, the most popular approach is to use surface temperature and vegetation indices at small scale and low resolution satellite imagery to estimate regional fluxes. Developments in thermal airborne (ATM) combined with CASI imagery allow deriving hydrological observations at an ecological appropriate resolution of 1-10 m.

In this research we therefore propose to estimate on basis of thermal ATM imagery evapotranspiration and other elements of the water and energy balance on a scale, which allows discriminating local wetness and vegetation heterogeneity in relation to differences in soil and vegetation condition. The evapotranspiration in the study area is simulated with the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen et al., 1998). The daily total evapotranspiration is calculated for the 1.3 km<sup>2</sup> Doode Bemde riparian wetland (Belgium), but special attention is given to a grassland area for which detailed soil moisture measured conditions have been obtained. The measured and interpolated soil moisture patterns are correlated with the CASI imagery showing promising spectral proxies for wetness mapping of grasslands. The estimated evapotranspiration values reveal significant spatial variation on short distances as a consequence of hydrological and vegetation conditions. The research results show the feasibility of the derivation of high resolution water and energy fluxes, which contributes to the increase of our understanding of the ecohydrological functioning of this kind of wet grasslands. The study area proves to contain an ecological highly relevant high spatial variability of the water and energy fluxes.