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An airborne observatory for land surface temperature and evapotranspiration

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Thermal infrared (TIR) remote sensing can provide useful measurements of surface temperatures and surface energy fluxes which are of prime interest for many applications. However, in landscape ecological studies the use of TIR remote sensing data has been limited mainly by the availability of high spatial resolution TIR remote sensing data and a limited understanding of these data and associated difficulties in processing them into useful information.

In this paper we introduce the Luxembourg Airborne Observatory System (LAOS) that has been developed to facilitate at the landscape scale (100-1000 km2) flexible TIR image acquisition and accurate retrieval of land surface temperature (LST) and parameterisation independent estimation of evapotranspiration (ET). LAOS consists of an thermal hyperspectral camera (Telops Hyper-Cam LW) and an airborne observation platform operated from a third party aircraft (twin-engine Cessna T303). The data pre-processing scheme includes generation of radiance images from the raw FT-data and orthophoto mosaic generation. The science data flow comprises LST retrieval through dedicated temperature-emissivity separation scheme (see Rock et al. this session, Rock et al. 2016) and ET estimation through the STIC1.2 model (Surface Temperature Initiated Closure, Mallick et al. 2014, 2015, 2016).

Until know, LAOS has been tested over grassland, agriculture and forest ecosystems in Luxembourg, Belgium, Italy and Poland. Examples of TIR-image based LST and ET retrieval results in comparison to collected ground data are discussed for two sites.