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Multiobjective calibration of a simple SVAT model based on the information contained in the diurnal cycle of radiative surface temperature in thermal infrared domain

B. Coudert, C. Ottlé

CETP/IPSL, Vélizy, France (benoit.coudert@cetp.ipsl.fr / Fax : +33 1 39 25 49 22 / Phone : +33 1 39 25 48 15)

The purpose of this paper is to show the interest of Thermal Infrared (TIR) remote sensing data in calibrating a SVAT model. Numerous studies have shown the improvement of calibration and initialization of biospheric, hydrological or atmospheric models brought by remote sensing data from satellite or ground based. Surface temperature is a key variable in closing the water and energy budget at the surface and its assimilation in SVAT modeling is promising. Recent studies have shown that the brightness surface temperature in TIR acquired with high temporal resolution is useful in calibrating such a model (Coudert et al., 2006). The methodology proposed in this study consists in dynamically calibrating the parameters of the SVAT model using information contained in the diurnal cycle of the radiative temperature following the vegetation state and forcing conditions. The study has first been driven at the crop field scale for a homogeneous model functional entity. The Alpilles-ReSeDA database (Baret et al., 2002 ; Olioso et al., 2002) has been used for this work. The two layers and two sources SEtHyS (French acronym for soil moisture monitoring) SVAT model used in this study and developed at CETP/IPSL, calculates the surface energy and water transfers and includes several soil and vegetation parameters and initialization variables (especially soil water content in the surface and root zone) which need to be calibrated. This model is coupled with radiative transfer models in the solar and thermal infrared domains in order to simulate both spectral reflectance and brightness temperature of the canopy. The methodology is based on the principle of multiobjective sensitivity analysis and optimization (Gupta et al., 1999; Bastidas et al., 1999;

Demarty et al., 2004, 2005) taking advantage of the model parameters varying sensitivity to the component features (multiobjective) of the diurnal cycle temperature signal (temporal gradient, amplitude, extrema, phase). It will be shown the contribution and the limits of this continuous monitoring model parameters based on TIR brightness temperature signal characteristics in modelling energetic and hydric budgets at field scale. A comparison with a simple optimization of the complete signal will be presented.