Geophysical Research Abstracts, Vol. 7, 06573, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06573

Global soil moisture monitoring: possible assimilation assimilation of a suite of satellite observations from the visible to the microwave

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The sensitivity of available satellite observations to soil moisture has been examined for climatological applications. Satellite observations from the thermal infrared to the microwave are analyzed: (1) thermal infrared: a statistical analysis of the Ts available estimate (ISCCP) enabled reconstruction of the full diurnal cycle of Ts (Aires et al., JGR, 2004). (2) passive microwave: land surface microwave emissivities have been calculated from the SSM/I observations (Prigent et al., JGR, 1997), by subtracting the atmospheric and cloud contributions. (3) active microwave: the ERS scatterometer observations have been processed for a consistent estimate of the backscattering coefficients over the continents. (4) visible and near-ir: the AVHRR reflectances in the VIS and NIR are used in order to assess the contribution of the vegetation to the other observations.

A sensitivity analysis of this suite of observations to the soil moisture has been performed at regional and global scales. Results confirm the sensitivity of the Ts amplitude, passive microwave emissivities, and radar backscattering to the soil moisture content. However, very strong correlation between vegetation and soil moisture might be responsible for most of this sensitivity. The challenge is to separate as much as possible the soil and vegetation contributions.

Specific algorithms have been developed in order to perform the merging of satellite information and the potential exists now to (1) diagnose and validate surface model, and (2) constrain these surface models using the satellite observations. We will be using the ISBA and ORCHIDEE surface models to explore the potential of the assimilation of a suite of satellite observations in a land surface model.