Geophysical Research Abstracts, Vol. 9, 03709, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03709

Combined thermal inertia- and triangle-method to estimate surface evapotranspiration using MSG-SEVIRI data – Applied to the Senegal River basin.

S. Stisen, I. Sandholt, A. Nørgaard, R. Fensholt and K.H. Jensen

Department of Geography and Geology, University of Copenhagen, Denmark

ss@geogr.ku.dk / Fax: +45 35 32 25 01 / Phone: +45 35 32 25 13

In a region like West Africa where conventional hydrological data are scarce remote sensing techniques can be a valuable tool for assessment of spatial estimates of evapotranspiration.

Various studies have demonstrated the usefulness of remote sensing in the estimation of surface evaporation. Especially contextual triangle methods based on the surface temperature – vegetation index space (Ts-NDVI) have been applied successfully. Other studies have focused on the thermal inertia as a proxy for energy exchanges at the surface.

The SEVIRI sensor onboard the Meteosat Second Generation (MSG) satellite is equipped with a red and a near-infrared channel as well as two thermal infrared split window channels. The spectral configuration of the SEVIRI, combined with 15 minute acquisition intervals, enables us to merge the thermal inertia methods with the Ts-NDVI triangle methods by expressing Ts as a rise in surface temperature rather than an absolute temperature at a single overpass time. It has previously been shown that the morning rise in surface temperature is closely linked to the total daytime sensible heat.

By combining the two methods and using MSG-SEVIRI data two major improvements are achieved. First, the morning rise in surface temperature (dTs) is a more direct proxy for daily surface evaporation and therefore the thermal information in the

Ts-NDVI method is improved. Second, the mean error in the thermal information is reduced because a temperature gradient is less sensitive to inaccurate information on surface emissivity and atmospheric water vapor content, assuming that these parameters are relatively constant over the time of the morning rise in temperature.

In this study we use the dTs-NDVI space method to parameterize the Priestly-Taylor parameter ϕ. ϕ is scaled between potential evapotranspiration and no evapotranspiration, assuming that both pixels representing wet and fully evaporating conditions and dry non evaporating conditions exists within the satellite image. It is also assumed that the intermediate levels of LE can be interpolated linearly between the two extremes using the information in the dTs-NDVI space.

In this study, maps of total daytime surface evapotranspiration are estimated for the Senegal River basin in West Africa for cloud free days during the 2005 rainy season. The estimates are compared to flux profile estimates for a single site within the basin.