Geophysical Research Abstracts,
Vol. 11, EGU2009-13077, 2009
EGU General Assembly 2009

Using the Synergy Between GERB/SEVIRI and Micrometeorological Data to Study the Relationship Between Surface Net Radiation and Soil Heat Flux at Local and Regional Scales

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The surface energy exchange between the land surface and the atmosphere can be described by the energy balance equation R_n - H - LE – G = 0, where R_n represents net radiation, H the sensible heat flux, LE, the latent heat flux and G the soil heat flux. In this work the relationship between R_n and G is studied over vineyard crops, a relative sparse vegetation cover crop where, according to the literature, it is expected that G consumes a significant proportion of R_n. In order to study this relationship at local and regional scales, micrometeorological observations and METEOSAT Second Generation (MSG) satellite data have been used. MSG through the GERB (Geostationary Earth Radiation Budget) and the SEVIRI (Spinning Enhanced Visible and Infrared Imager) sensors can provide estimates of net radiation and required land surface temperature (LST) information with a frequency of 15 min intervals. The necessary micrometeorological parameters, to compare with satellite data, were collected during the full vine growing season of 2007 (May to September) in a field experiment carried out at the Valencia Anchor Station (VAS) site area. The VAS is a robust reference meteorological station which is successfully used preferentially for validation of low spatial resolution satellite data and products. It is located on the natural region of the Utiel-Requena Plateau, at about 80 km west from the city of Valencia, Spain, and represents a reasonable homogeneous area of about 50 km x 50 km dedicated primarily to growing vines. The methodology utilized to study the relationship between R_n and G at local and regional scales, was that proposed by Santanello and Friedel (2002), where surface temperature can be obtained from SEVIRI that provides estimates of LST with unprecedented frequency of 15 min intervals with a spatial resolution of 3.1 km, thus totally covering its diurnal course. The preliminary results show that: 1- the correlation between the ground measurements and SEVIRI LST is significantly good, presenting a Pearson correlation coefficient r of 0.96, with a squared correlation coefficient R^2 of 0.93 and root mean square error, RMSE of 3.51 ºC, and standard deviation, std, of 3.52. This makes apparent the good representativity of the VAS temperature measurements at SEVIRI scale and 2- the comparison between simulated GERB R_n at the surface and the measured one over the VAS field campaigns, at the spatial resolution of 1 km, and over a vineyard mobile micrometeorological station, shows good agreement for both periods and stations, winter of 2004 at the VAS, and summer of 2006 over vineyards, presenting RMSEs of 17 Wm^{-2} and 42 Wm^{-2}, respectively, as well as high Pearson correlations and low standard deviations indicating that the methodology applied is able to reproduce net radiation at surface level.

Besides this and from this preliminary study, we may conclude that it is possible to anticipate the significance of using the synergy between GERB/SEVIRI and ground measurements in order to derive R_n, and consequently G over local and regional areas. Further studies will include the calculation of R_n, and therefore G at GERB pixel spatial resolution.