Water Watch Validation of energy fluxes at two stations in Bugac and Matra, Hungary

| Location | Bugac and Matra, Hungary |
|------------|--------------------------|
| Contractor | KNMI, WUR |
| Period | 2007 |

Scope of the project

The Surface Energy Balance Algorithm for Land (SEBAL) calculates energy fluxes such as the net radiation (R_n), the sensible heat flux (H), the soil heat flux (G_0) and the latent heat flux (LE) using satellite data and meteorological data. In this project the fluxes measured by SEBAL were compared to the fluxes measured at two flux towers in Hungary.

Study approach

The daily mean fluxes measured at the flux towers Matra and Bugac in Hungary are compared to the SEBAL estimates using the values of the two pixels of 1 by 1 km at the location of the stations. The soil heat flux is assumed to be close to zero over the day. Furthermore a comparison is made between the tower and the SEBAL energy balances closed using (1) the Bowen ratio, and (2) ascribing the missing energy to the latent heat flux. Also the annual evapotranspiration is compared to corrected TRMM rainfall.

Results

SEBAL net radiation is 4.8% higher for Matra and 8.5% for Bugac as compared to the tower measurements, which is a good agreement taking into consideration that the towers are located in a heterogeneous area. The latent heat flux measurements however show a larger difference. The SEBAL evaporation flux is 55% higher than the measurement in Matra, and in Bugac the fluxes are around 31% higher. Errors in the measurements, errors in the SEBAL calculations, or both type of errors may have caused these



Comparison of the energy balance fluxes at Bugac and with SEBAL (daily means of 19 days)

differences. Further analysis of the energy balance showed that closure of the energy balance improves the relation between SEBAL and tower measurements considerably, especially when the missing energy is ascribed to the latent heat flux. 2005 was a very dry year and rainfall surplus is between the 0 and 250 mm in the lower agricultural areas.

Conclusions

Net radiation measurement of SEBAL and of the towers corresponds well, but problems are encountered in closing the energy balance. The Bowen ratio method did not improve the relation between SEBAL and tower measurements, but results improved considerable once the missing energy was ascribed to the latent heat flux.