Geophysical Research Abstracts
Vol. 13, EGU2011-4687, 2011
EGU General Assembly 2011

Characterizing land surface evapotranspiration within hilly watersheds

Rim Zitouna Chebbi (1), Laurent Prévot (2), Frédéric Jacob (3), and Marc Voltz (2)
(1) LR GERE, INRGREF, Ariana, Tunisia (rimzitouna@live.fr), (2) UMR LISAH, INRA, Montpellier, France, (3) UMR LISAH, IRD, Montpellier, France

Determining land surface evapotranspiration within hilly watersheds is paramount for environmental and agricultural issues. Indeed, such topographic structures are widely spread within orographic regions over the world , whereas they allow water harvesting for crop production under water shortage conditions. Eddy covariance (EC) techniques have been widely used to quantify land surface fluxes, with recent advances under mountainous conditions. On the other hand, very little studies addressed hilly watersheds and most of them were restricted to slope magnitude only.

The objective of the current study is using EC measurements to characterize energy fluxes within an agricultural watershed with hilly topography. The experiment is conducted within the Kamech Mediterranean watershed, located in the Cap Bon peninsula, Northeastern Tunisia. EC measurements are collected during several months on two fields located on the two opposite rims of the watershed, where topographical slopes range between 6% and 9%. They are completed with meteorological data acquired at the watershed outlet.

In a first time, it is shown externally driven winds mainly induce regimes of forced convection. Two main wind directions are highlighted, which combination with the watershed topography induces upward and downward flows on the two opposite rims of the watershed. The second step consists of comparing topographic slopes derived from a Digital Elevation Model against airflow inclinations captured by the planar fit correction of EC measurements. It is shown the influence of topographic slope on airflow inclination is driven by upward and downward flows, whereas additional effects from vegetation height are ascribed to changes in roughness length. A third step addresses the magnitude of the planar fit correction on the EC based estimates. It is shown flux magnitudes significantly vary with upward and downward flows, whereas planar fit correction slightly reduces these differences and improves energy balance closure. Overall, the data analysis suggests the limits of EC measurements and planar fit correction are reached for one of the two fields that depicts a rugged topography and a steep slope close to 10%.