Surface heterogeneity influence on land-atmosphere energy exchanges.

W.J. Timmermans [1], A. Olioso [2] and J.D. Albertson [3]
[1]International Institute for Geo-information Sciences and Earth Observation, Dept. of Water Resources
[2]INRA Climat, Sol et Environnement, Batiment Climat
[3]Duke University, Department of Civil and Environmental Engineering

Virtually all remote sensing based Soil-Vegetation-Atmosphere Transfer (SVAT) Schemesassume homogeneous, or decoupled atmospheric variables over their modeling domain. This assumption can lead to erroneous flux estimation since landscapes are inherently heterogeneous with variability in land surface state variables inducing spatial variability in the near surface air properties, which in turn affect the fluxes.

A Large Eddy Simulation (LES) model is coupled to a RS based SVAT that accounts for soil and vegetation (dual source) contributions to mass and energy exchanges in order to study the feedback effects between spatially variable land cover and spatial variability in fluxes, through the induction of spatial variability in the lower atmosphere. Previous studies demonstrated that an increase in the correlation between surface and lower boundary layer states with increasing surface state contrast modulated relative increases in the spatial variance in the sensible heat flux. This suggested that the feedback effects act to limit the spatial variability in the flux, implying that ignoring atmospheric feedback from land surface turbulent exchange rates will cause the largest errors at the extremes.

To improve spatially distributed flux estimates a better understanding of the effect of surface heterogeneity on the lower atmospheric boundary layer is needed. In this talk a multi-scale analysis of the land – atmosphere interaction, using a simple wavelet decomposition technique, will be discussed. To examine these effects, two agricultural areas with very different surface heterogeneity scales were studied. A first one concerned the SPARC2004 test site in Barrax, Spain comprising relatively large field sizes of up to 1 km, whereas the second area studied was the ReSeDA site in Les Alpilles, Southern France, with typical field sizes of around 200 meter.

Corresponding author: W.J. Timmermans

W.J. Timmermans
Researcher
International Institute for Geo-information Sciences and Earth Observation, Dept. of Water Resources, Box 6, 7500 AA, Enschede, The Netherlands
Email: Timmermans@itc.nl

A. Olioso
INRA Climat, Sol et Environnement, Batiment Climat,F-84914 Avignon Cedex 9, France
Email: olioso@avignon.inra.fr

J.D. Albertson
Duke University, Department of Civil and Environmental Engineering, Box 90287, Durham, NC 27708, USA

Email: john.albertson@duke.edu