Energy flux and surface parameters in an urban-agriculture-wetland interfaced area: The case of South Florida

Melesse, A.M [1], F. Miralles [2] and X. Wang [3]
[1]Department of Environmental Studies, Florida International University
[2]Department of Civil and Environmental Engineering, Florida International University
[3]Department of Mathematics, Physics & Engineering, Tarleton State University

Water vapor and energy fluxes (net radiation, latent heat, sensible heat, ground heat fluxes) are components of the surface energy budget playing a very important role in regional climate dynamics and are indicators of land-cover and other landscape changes for a given area. Quantifying these fluxes is very useful in understanding the mass and energy exchanges between the land surface and atmosphere, and determining the biophysical and thermodynamic characteristics of an ecosystem. The water and energy fluxes from land surfaces occur as a response to various forcing factors and are impacted by the land-cover, emissivity, albedo and surface temperature in addition to meteorological factors. These fluxes will be highly transient in dynamic land-cover/use regions where urban areas are encroaching existing agricultural and natural systems, in areas where urban agriculture is being practiced heavily and surface water movement is managed and shared among the three major ecosystems (agriculture, urban and natural).

An analysis framework outlining approaches and some results will be presented from our study. Landsat-based flux and surface parameters is generated for the urban-agriculture-wetland interface of south Florida covering Everglades, Miami metropolitan area and Everglade agricultural area. Latent and sensible heat fluxes, albedo, emissivity and surface temperatures, evaporative and non-evaporative fractions, factional vegetation cover and impervious surface areas were quantified and compared among ecosystems. It was found that the fluxes and surface parameters were highly variable among the three ecosystems and the need for consideration of horizontal advections (latent heat fluxes from wetland to urban and agriculture, sensible heat loads from urban to wetland and agriculture, and latent heat load from agriculture to urban fluxes) need to be well studied and quantified. The resulting energy balance for such settings would require rethinking and modification of the existing energy balance equations.

Corresponding author: Melesse, A.M

Melesse, A.M
Associate Professor
Department of Environmental Studies, Florida International University, 11200 SW 8th St, Miami, FL 33199, USA
Email: melessea@fiu.edu

F. Miralles
Associate Professor
Department of Civil and Environmental Engineering, , Florida International University, 10555 West Flagler Street, Suite EC-3607, Miami FL 33174

Email: miralles@fiu.edu

X. Wang

Assistant professor

Department of Mathematics, Physics & Engineering, Tarleton State University, Box T-0390, Stephenville, TX 76402.

Email: xxqqwang@gmail.com