Geophysical Research Abstracts
Vol. 18, EGU2016-11526-2, 2016
EGU General Assembly 2016

The Soil-Plant-Atmosphere Continuum of Mangroves: A Simple Ecohydrological model

Saverio Perri (1), Francesco Viola (2), Leonardo Valerio Noto (3), and Annalisa Molini (1)

(1) Institute Center for Water and Environment (iWater), Masdar Institute of Science and Technology, Abu Dhabi, United Arab Emirates (sperri@masdar.ac.ae), (2) Dipartimento di Ingegneria Civile, Ambientale e Architettura, Università di Cagliari, Cagliari, Italy, (3) Dipartimento di Ingegneria Civile, Ambientale, Aerospaziale, dei Materiali, Università di Palermo, Palermo, Italy

Mangroves represent the only forest able to grow at the interface between a terrestrial and a marine habitat. Although globally they have been estimated to account only for 1% of carbon sequestration from forests, as coastal ecosystems they account for about 14% of carbon sequestration by the global ocean.

Despite the continuously increasing number of hydrological and ecological field observations, the ecohydrology of mangroves remains largely understudied. Modeling mangrove response to variations in environmental conditions needs to take into account the effect of waterlogging and salinity on transpiration and CO_2 assimilation. However, similar ecohydrological models for halophytes are not yet documented in the literature.

In this contribution we adapt a Soil-Plant-Atmosphere Continuum (SPAC) model to the mangrove ecosystems. Such SPAC model is based on a macroscopic approach and the transpiration rate is hence obtained by solving the plant and leaf water balance and the leaf energy balance, taking explicitly into account the role of osmotic water potential and salinity in governing plant resistance to water fluxes. Exploiting the well-known coupling of transpiration and CO_2 exchange through the stomatal conductance, we also estimate the CO_2 assimilation rate. The SPAC is hence tested against experimental data obtained from the literature, showing the reliability and effectiveness of this minimalist approach in reproducing observed processes. Results show that the developed SPAC model is able to realistically simulate the main ecohydrological traits of mangroves, indicating the salinity as a crucial limiting factor for mangrove trees transpiration and CO_2 assimilation.