Geophysical Research Abstracts
Vol. 21, EGU2019-10101, 2019
EGU General Assembly 2019

Impact of evapotranspiration on the hydrological response of two small forested catchments

Giulia Zuecco (1), Michele Bottazzi (2), Alessandro Errico (3), and Marialaura Bancheri (4)

(1) Department of Land, Environment, Agriculture and Forestry, University of Padova, Italy (giulia.zuecco@unipd.it), (2) Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy, (3) Department of Agriculture, Food, Environment and Forestry, University of Florence, Italy, (4) Interuniversity Consortium for Hydrology (CINID), Potenza, Italy

Evapotranspiration has a large impact on water budgets, playing a fundamental role in the regulation of water fluxes between soil, vegetation and atmosphere. In forested catchments, the evapotranspiration is dominated by the transpiration component. Despite its important role in the hydrological cycle at the catchment scale, transpiration is often overlooked and not well represented by hydrological models.

In this work, we aim to investigate the role of evapotranspiration on the hydrological response and the water balance of two small forested catchments in Italy: the Ressi catchment (0.02 km^2) located in the pre-Alps, and the Re della Pietra catchment (2.0 km^2) in the Apennines. The two catchments are covered by dense mixed broad-leaf forest, but the Ressi catchment is characterized by wetter conditions than the Re della Pietra catchment due to the larger mean annual precipitation.

Meteorological (rainfall, air temperature, global solar radiation and wind speed), soil moisture and leaf area index data were collected in the two catchments, and these data were used to perform hydrological simulations with the GEOframe-NewAGE system. Then, the predicted streamflow was compared to the measured streamflow data at the two stream gauging stations. The modular structure of the hydrological model allowed for testing different methods to compute hourly evapotranspiration amounts, i.e. classical approaches such as the Penman-Monteith FAO method, the Priestley-Taylor equation and the new Schymanski-Or method, which was modified to include the water stress factor and transpiration resistances. The Schymanski-Or method was also upscaled from the leaf to the catchment scale.

Preliminary simulations performed with the different methods to estimate evapotranspiration were evaluated using the Nash-Sutcliffe and the Kling-Gupta efficiency, showing generally better results using the Schymanski-Or method. Further analyses will be carried out to compare the evapotranspiration fluxes and the hydrological response in the two catchments at different time scales.

Acknowledgements: This study is part of the research project “SILVA - Water fluxes between soil, vegetation and atmosphere: a comparative analysis in two Italian forested catchments”, funded by Premio Florisa Melone 2018 assigned by the Italian Hydrological Society.

Keywords: evapotranspiration, forested catchments, hydrological model, GEOframe-NewAGE.