Geophysical Research Abstracts
Vol. 16, EGU2014-5300, 2014
EGU General Assembly 2014

Testing the hydrological water balance model criteria using TDR measurements and micrometeorological data

Feliciana Licciardello (1), Giulia Villani (2,3), Luigi Pasotti (4), and Simona Consoli (1)

(1) Dipartimento di Gestione dei Sistemi Agroalimentari e Ambientali, University of Catania, Via S. Sofia, 100, 95123 Catania, Italy, (2) Dipartimento di Scienze e Tecnologie Agro-Alimentari (DISTAL), University of Bologna, V.le G. Fanin 50, 40127, Bologna, Italy, (3) ARPA Emilia-Romagna, Servizio Idro-Meteo-Clima, Viale Silvani 6, 40122, Bologna, Italy, (4) Servizio Informativo Agrometeorologico Siciliano, Regione Sicilia

In arid and semi-arid regions, the availability of water is a major limitation on crop production due to insufficient rainfall to compensate the evaporative losses by crops. Improvements in water management in irrigated areas and adequate irrigation scheduling are essential also to increase the sustainability of irrigated agriculture. In particular, reliable estimates of soil moisture changes in agricultural soils may help the available water management under scarce conditions.
In the last two decades this issue has induced the development of physically based models for simulating the different components of the water balance. These models, often developed in specific environmental or agronomic conditions, needs to be further validated.
The study aims at assessing the performance of the physically based CRITERIA model to simulate the hydrological water balance of agricultural soils. The model, developed by the ARPA-SIMC (Hydro-meteorological service of the Emilia-Romagna region, Italy), includes procedures and conceptual models for the simulation of infiltration, evapotranspiration, runoff, deep drainage, capillary rise, canopy expansion and root deepening. The model consists of (i) an algorithm for coupling the surface flow components (i.e. Richards equation), with simultaneous solution of the conservation equation, (ii) various modules which may it applicable to various topographical and environmental conditions (i.e. Penman-Monteith equation for crop evapotranspiration fluxes among others). In the model, the soil water retention data are described by the van Genuchten equation, with the hydraulic conductivity calculated by the Mualem model. CRITERIA, that includes a database with several crops, was already tested in north Italy and in USA but never in typical Mediterranean semi-arid environments where citrus orchards growth. In order to verify the performance of CRITERIA, data from an experimental citrus orchard located in Eastern Sicily, Italy, were used to test the model. About 2.5 hectares are planted with citrus orchard since 1990. The available 4-year data set (Sept 2009- Dec 2013) includes meteorological measurements (i.e. hourly shortwave radiation, relative humidity, air temperature, wind speed and precipitation), micrometeorological evapotranspiration fluxes from an Eddy Covariance tower, soil physical properties (i.e. bulk density, texture, soil water retention curves, hydraulic conductivity at saturation), three soil water content profiles by TDR measurements, agronomic data on the crop main features, supplied irrigation volumes and irrigation timing. To compute the soil water balance, a grid structure was adopted and the integrated finite difference solution was then solved. TDR measurements were used to calibrate/validate the model by using qualitative and quantitative (both summary and difference measures) approaches.