Geophysical Research Abstracts
Vol. 19, EGU2017-696, 2017
EGU General Assembly 2017

Evaluation of an operational real-time irrigation scheduling scheme for drip irrigated citrus fields in Picassent, Spain

Dazhi Li (1,2), Harrie-Jan Hendricks-Franssen (1,2), Xujun Han (1,2), Miguel Angel Jiménez Bello (3), Fernando Martínez Alzamora (3), Harry Vereecken (1,2)

(1) Agrosphere (IBG 3), Forschungszentrum Jülich, Jülich, Germany, (2) Centre for High-Performance Scientific Computing in Terrestrial Systems (HPSC-TerrSys), Geoverbund ABC/J, Jülich, Germany , (3) Institute of Water and Environmental Engineering (IIAMA), Universitat Politècnica de Valencia, Valencia, Spain

Irrigated agriculture accounts worldwide for 40% of food production and 70% of fresh water withdrawals. Irrigation scheduling aims to minimize water use while maintaining the agricultural production. In this study we were concerned with the real-time automatic control of irrigation, which calculates daily water allocation by combining information from soil moisture sensors and a land surface model.
The combination of soil moisture measurements and predictions by the Community Land Model (CLM) using sequential data assimilation (DA) is a promising alternative to improve the estimate of soil and plant water status. The LETKF (Local Ensemble Transform Kalman Filter) was chosen to assimilate soil water content measured by FDR (Frequency Domain Reflectometry) into CLM and improve the initial (soil moisture) conditions for the next model run. In addition, predictions by the GFS (Global Forecast System) atmospheric simulation model were used as atmospheric input data for CLM to predict an ensemble of possible soil moisture evolutions for the next days. The difference between predicted and target soil water content is defined as the water deficit, and the irrigation amount was calculated by the integrated water deficit over the root zone. The corresponding irrigation time to apply the required water was introduced in SCADA (supervisory control and data acquisition system) for each citrus field. In total 6 fields were irrigated according our optimization approach including data assimilation (CLM-DA) and there were also 2 fields following the FAO (Food and Agriculture Organization) water balance method and 4 fields controlled by farmers as reference.
During the real-time irrigation campaign in Valencia from July to October in 2015 and June to October in 2016, the applied irrigation amount, stem water potential and soil moisture content were recorded. The data indicated that 5%∼20% less irrigation water was needed for the CLM-DA scheduled fields than for the other fields following the FAO or farmers' method. Stem water potential data indicated that the CLM-DA fields were not suffering from water stress during most of the irrigation period. Even though the CLM-DA fields received the least irrigation water, the orange production was not suppressed either.
Our results show the water saving potential of the CLM-DA method compared to other traditional irrigation methods.