Geophysical Research Abstracts
Vol. 20, EGU2018-11010-3, 2018
EGU General Assembly 2018


# What drives evapotranspiration over irrigated cropland? A comparison between flux tower measurements and MODIS remote sensing estimations

Vanessa de Arruda Souza (1), Debora Regina Roberti (2), Tamires Zimmer (2), Anderson Ruhoff (3), Daniela Santini Adamatti (3), Rita de Cassia Marques Alves (2), Marcelo Bortoluzzi Diaz (2), Luis Gustavo Gonçalves de Gonçalves (4), and Osvaldo Luiz Leal de Moraes (2)

(1) Universidade Federal do Rio Grande do Sul, State Center for Research in Remote Sensing, Porto Alegre, Brazil, (2) Universidade Federal de Santa Maria, Departament of Physics, Santa Maria, RS, Brazil, (3) Universidade Federal do Rio Grande do Sul, Institute of Hydraulic Research, Porto Alegre, Brazil (anderson.ruhoff@ufrgs.br), (4) Instituto Nacional de Pesquisas Espaciais, Center for Weather Forecasting and Climate Studies, Sao Jose dos Campos, Brazil

Agriculture accounts for approximately 70% of the world water consumption. Determining the evapotranspiration (ET) over large agricultural areas is a challenging task due to the limited observational data availability in those areas. However, remote sensing techniques have been used to estimate ET over large areas with increasingly high accuracy. Only a small number of studies have been performed assessing the accuracy of MODIS land surface ET product (MOD16) ET algorithm over irrigated cropland areas. In this context, we evaluated MOD16 ET accuracy over two irrigated cropland areas (rice paddy fields) in Southern Brazil, using five years of eddy covariance (EC) measurements. In both sites, rice paddies are cultivated over large river floodplain areas, using a flooding irrigation system. After the rice harvesting, the soil remains with spontaneous vegetation (fallow period), without crop rotation. The main goal of this research is to address the question of what drivers control the ET process over irrigated areas. To this question, we conducted an analysis using EC measurements: (1) assessment of the seasonal ET pattern over irrigated cropland areas and (2) assessment of the main control drivers of ET. We also sought to assess whether global MOD16 algorithm can physically reproduce this pattern and estimate accurately ET over those areas. To answer these questions, our analysis focused on validation of MOD16 ET estimations using EC measurements during irrigated and non-irrigated periods and evaluation of control drivers in MOD16 ET estimations and a comparison between MOD16 ET estimations against observed meteorological variables to address whether MOD16 algorithm can reproduce the physical process of ET. To compare ET observation against estimations, the energy balance closure in EC measurements was forced using the Bowen ratio technique. Although ET based on EC measurements yielded a higher correlation when compared to measured net radiation (Rn) correlation, ET derived from MOD16 algorithm yielded a higher correlation when compared to air temperature (Tair). The MOD16 ET algorithm underestimated the ET when compared to EC measurements, yielding root mean squared errors (RMSE) between 1.35 and 2.37 mm day-1 and coefficients of correlation (R) between 0.43 and 0.82. The major errors and uncertainties occurred during the (rice) growing season. In general, MOD16 global ET estimations presented a low accuracy when compared against experimental measurements over irrigated cropland areas in Southern Brazil, requiring model parameterization adjustments and high accuracy meteorological input data. Overall, the discussion proposed here is an analysis of ET over irrigated cropland and the limitations and uncertainties of those models to represent this process at continental and global scales, suggesting improvements to represent irrigated cropland areas with high soil evaporation.