Submitted Abstract

ID IMC22-FSAbstr- 511

First Author First Name Last Name	 Amol (1,2) Patil
Submitting Author First Name Last Name	 Joel Arnault
Correspondence	joel.arnault@kit.edu
Co-Authors >> E-Mails will be not listed	Arnault, Joël (1); Fersch, Benjamin (1); Hendricks Franssen, Harrie-Jan (3); Kunstmann, Harald (1,2)
Organisations	1: KIT/IMK-IFU, Germany 2: Augsburg University, Germany 3: Forschungszentrum Jülich, Germany
Country	Germany
Region	Western Europe
Title	Utility Of Cosmic-Ray Neutron Counts For Enhanced Soil Moisture Characterisation In Noah-Mp Land Surface Model.
Keywords	Soil Moisture, Cosmic Ray Neutron Sensing, Land Surface Modeling
Type	List Of Focus Session
Focus Session ID	72

Abstract

The non-invasive Cosmic-Ray Neutron Sensing (CRNS) method can be used to determine average soil moisture over a few tens of hectares. Combining the CRNS method with land surface models utilizing data assimilation techniques further provides the ability to predict soil moisture over kilometers. In this work, the Ensemble Adjustment Kalman Filter (EAKF) was used to assimilate the CRNS neutron counts in order to update the spatial soil moisture, soil infiltration, and evapotranspiration parameters of the Noah-MP land surface model. The study was conducted in the Rott and Ammer catchments in southern Germany, which contain the TERENO Pre-Alpine observatory and a dense network of cosmic ray neutron sensors. To assess the significance of parameter estimation, assimilation was performed for both soil moisture only and soil moisture plus parameter estimation scenarios. For both assimilation scenarios, the results show a strong improvements in field scale soil moisture characterization. The RMSE of simulated soil moisture was reduced by up to 66 % at field scale and up to 23 % at catchment scale. Furthermore, with 0.025 cm3/cm3 reduction in spatial bias, the spatial patterns in the field scale soil moisture showed improvements. These findings support the use of the CRNS technique to improve the spatial and temporal patterns of soil moisture at catchment scale by means of data assimilation.