Geophysical Research Abstracts
Vol. 16, EGU2014-3980, 2014
EGU General Assembly 2014

A Wiener-Wavelet-Based filter for de-noising satellite soil moisture retrievals

Christian Massari (1), Luca Brocca (1), Luca Ciabatta (1), Tommaso Moramarco (1), Chun-Hsu Su (2), Dongryeol Ryu (2), and Wolfgang Wagner (3)

(1) Research Institute for Geo-Hydrological Protection National Research Council CNR, Perugia, Italy (christian.massari@irpi.cnr.it), (2) (2) Department of Infrastructure Engineering, University of Melbourne, Parkville, Victoria, Australia, (3) (3) Department of Geodesy and Geoinformation, Vienna University of Technology, Vienna, Austria

The reduction of noise in microwave satellite soil moisture (SM) retrievals is of paramount importance for practical applications especially for those associated with the study of climate changes, droughts, floods and other related hydrological processes. So far, Fourier based methods have been used for de-noising satellite SM retrievals by filtering either the observed emissivity time series (Du, 2012) or the retrieved SM observations (Su et al. 2013). This contribution introduces an alternative approach based on a Wiener-Wavelet-Based filtering (WWB) technique, which uses the Entropy-Based Wavelet de-noising method developed by Sang et al. (2009) to design both a causal and a non-causal version of the filter. WWB is used as a post-retrieval processing tool to enhance the quality of observations derived from the i) Advanced Microwave Scanning Radiometer for the Earth observing system (AMSR-E), ii) the Advanced SCATterometer (ASCAT), and iii) the Soil Moisture and Ocean Salinity (SMOS) satellite. The method is tested on three pilot sites located in Spain (Remedhus Network), in Greece (Hydrological Observatory of Athens) and in Australia (Oznet network), respectively. Different quantitative criteria are used to judge the goodness of the de-noising technique. Results show that WWB i) is able to improve both the correlation and the root mean squared differences between satellite retrievals and in situ soil moisture observations, and ii) effectively separates random noise from deterministic components of the retrieved signals. Moreover, the use of WWB de-noised data in place of raw observations within a hydrological application confirms the usefulness of the proposed filtering technique.

Du, J. (2012), A method to improve satellite soil moisture retrievals based on Fourier analysis, Geophys. Res. Lett., 39, L15404, doi:10.1029/ 2012GL052435

Su,C.-H.,D.Ryu, A. W. Western, and W. Wagner (2013), De-noising of passive and active microwave satellite soil moisture time series, Geophys. Res. Lett., 40,3624–3630, doi:10.1002/grl.50695.

Sang Y.-F., D. Wang, J.-C. Wu, Q.-P. Zhu, and L. Wang (2009), Entropy-Based Wavelet De-noising Method for Time Series Analysis, Entropy, 11, pp. 1123–1148, doi:10.3390/e11041123.