Geophysical Research Abstracts
Vol. 20, EGU2018-2092-1, 2018
EGU General Assembly 2018

An intercomparison of SMAP, SMOS, AMSR2, FY3B and ESA CCI soil moisture products at different spatial scales over two dense network regions

Jiangyuan Zeng (1), Kun-Shan Chen (1), Chenyang Cui (2), and Haiyun Bi (3)

(1) State Key Laboratory of Remote Sensing Science, Jointly Supported by Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences and Beijing Normal University, Beijing 100101, China, (2) School of Earth Sciences and Engineering, Hohai University, Nanjing 210098, China, (3) State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing 100029, China

Understanding the reliability and possible error sources of the satellite soil moisture products is crucial for their utilization in scientific studies and applications, and also gains our knowledge on how they can be further improved. In the study, we examine the performance of eight satellite-based soil moisture products at two typical spatial resolutions, including the Soil Moisture Active Passive (SMAP) passive Level 3 (L3), the Soil Moisture and Ocean Salinity (SMOS) Centre Aval de Traitement des Données SMOS (CATDS) L3, the Japan Aerospace Exploration Agency (JAXA) Advanced Microwave Scanning Radiometer 2 (AMSR2) L3, the Land Parameter Retrieval Model (LPRM) AMSR2 L3, the European Space Agency (ESA) Climate Change Initiative (CCI) L3, and the Chinese Fengyun-3B (FY3B) L2 soil moisture products at a coarse resolution of $\sim$0.25°, and the newly released SMAP enhanced passive L3 and JAXA AMSR2 L3 soil moisture products at a medium resolution of $\sim$0.1°. To achieve these purposes, in-situ measurements from two representative dense networks, i.e. the Little Washita Watershed (LWW) in the United States and the REMEDHUS networks in Spain with different land cover are used to compare and validate the eight soil moisture products. Possible error sources in the satellite soil moisture products are also investigated and discussed in detail in this study.

The results show that the SMAP passive soil moisture outperforms the other products in the LWW network region with an unbiased root mean square (ubRMSE) of 0.027 m3 m-3, whereas the FY3B soil moisture performs the best in the REMEDHUS network region with an ubRMSE of 0.025 m3 m-3. SMOS slightly underestimates soil moisture with a dry bias, but it correlates well with in-situ data with an average correlation value of 0.77. The JAXA product performs much better at 0.25° than at 0.1°, but both of them underestimate soil moisture at most time (bias > –0.05 m3 m-3). The SMAP enhanced passive soil moisture well captures the temporal variation of ground measurements with a correlation coefficient larger than 0.8, and is generally superior to the JAXA product. The LPRM shows much larger amplitude and temporal variation than the ground soil moisture with a wet bias larger than 0.09 m3 m-3. The underestimation of surface temperature contributes to the general dry bias found in the SMAP (–0.018 m3 m-3 for LWW and 0.016 m3 m-3 for REMEDHUS) and SMOS (–0.004 m3 m-3 for LWW and –0.012 m3 m-3 for REMEDHUS) soil moisture. The ESA CCI product shows satisfactory performance with acceptable error metrics (ubRMSE<0.045 m3 m-3), revealing the effectiveness of merging active and passive soil moisture products. The good performance of SMAP and FY3B demonstrates the potential in integrating them into the existing long-term ESA CCI product to form a more reliable and useful product.