Geophysical Research Abstracts
Vol. 20, EGU2018-2271, 2018
EGU General Assembly 2018

Rainfall estimation from soil moisture observations, SM2RAIN: recent advances and future directions

Luca Brocca, Christian Massari, Luca Ciabatta, Stefania Camici, Angelica Tarpanelli, and Paolo Filippucci
National Research Council, Research Institute for Geo-Hydrological Protection, Perugia, Italy (luca.brocca@irpi.cnr.it)

Five years ago, we published our first paper on SM2RAIN (Brocca et al., 2013), i.e. on using in situ and satellite soil moisture observations for directly estimating rainfall. The method was firstly applied to in situ (and synthetic) observations to check the validity of the method in controlled conditions. Secondly, satellite soil moisture observations from ASCAT (Advanced Scatterometer), SMOS (Soil Moisture and Ocean Salinity), SMAP (Soil Moisture Active and Passive), ESA CCI (European Space Agency Climate Change Initiative), and AMSR2 (Advanced Microwave Scanning Radiometer 2) are used for estimating rainfall on a global scale (over land). The method is found to accurately estimate 1-day and 5-day accumulated rainfall, outperforming state-of-the-art rainfall products in regions in which satellite soil moisture product are accurate, e.g., South Africa, South America, India, Australia, Wester USA, Southern Europe (Brocca et al., 2014). Therefore, we started international projects with Space Agencies for providing long-term and near real-time rainfall products to be used in hydrological and climate applications. Indeed, the rainfall products obtained through SM2RAIN are found to be highly beneficial for improving flood forecasting over 975 basins throughout Europe.
The presentation will provide, firstly, an overview of the results and applications of SM2RAIN algorithm in the last 5 years. Secondly, the more recent advances will be illustrated as the merging of multiple soil moisture products, the integration of SM2RAIN-based and state-of-the-art rainfall products (e.g., from Global Precipitation Measurement, GPM, mission), and the application of SM2RAIN to the recent soil moisture products from Sentinel-1 (to obtain a 1-km rainfall product). Finally, the future directions of this research activity will be illustrated: 1) SM2RAIN parameterization with soil moisture observations only and algorithm refinement, 2) optimization of the integration/merging of multiple rainfall estimates (including SM2RAIN) by considering the error characteristics of the products, 3) full exploitation of the method for improving hydrological (floods, landslides), climate and agricultural (irrigation, insurance) applications.

REFERENCES

Brocca, L., Melone, F., Moramarco, T., Wagner, W. (2013). A new method for rainfall estimation through soil moisture observations. Geophysical Research Letters, 40(5), 853-858, doi:10.1002/grl.50173.
Brocca, L., Ciabatta, L., Massari, C., Moramarco, T., Hahn, S., Hasenauer, S., Kidd, R., Dorigo, W., Wagner, W., Levizzani, V. (2014). Soil as a natural rain gauge: estimating global rainfall from satellite soil moisture data. Journal of Geophysical Research, 119(9), 5128-5141, doi:10.1002/2014JD021489.