Geophysical Research Abstracts
Vol. 19, EGU2017-13336, 2017
EGU General Assembly 2017

Global retrieval of soil moisture and vegetation properties using data-driven methods

Nemesio Rodriguez-Fernandez, Philippe Richaume, and Yann Kerr
CESBIO (CNRS, CNES, IRD, Université de Toulouse), Toulouse cedex 9, France (nemesio.rodriguez@cesbio.cnes.fr)

Data-driven methods such as neural networks (NNs) are a powerful tool to retrieve soil moisture from multi-wavelength remote sensing observations at global scale. In this presentation we will review a number of recent results regarding the retrieval of soil moisture with the Soil Moisture and Ocean Salinity (SMOS) satellite, either using SMOS brightness temperatures as input data for the retrieval or using SMOS soil moisture retrievals as reference dataset for the training. The presentation will discuss several possibilities for both the input datasets and the datasets to be used as reference for the supervised learning phase.

Regarding the input datasets, it will be shown that NNs take advantage of the synergy of SMOS data and data from other sensors such as the Advanced Scatterometer (ASCAT, active microwaves) and MODIS (visible and infra red). NNs have also been successfully used to construct long time series of soil moisture from the Advanced Microwave Scanning Radiometer - Earth Observing System (AMSR-E) and SMOS. A NN with input data from ASMR-E observations and SMOS soil moisture as reference for the training was used to construct a dataset sharing a similar climatology and without a significant bias with respect to SMOS soil moisture.

Regarding the reference data to train the data-driven retrievals, we will show different possibilities depending on the application. Using actual in situ measurements is challenging at global scale due to the scarce distribution of sensors. In contrast, in situ measurements have been successfully used to retrieve SM at continental scale in North America, where the density of in situ measurement stations is high. Using global land surface models to train the NN constitute an interesting alternative to implement new remote sensing surface datasets. In addition, these datasets can be used to perform data assimilation into the model used as reference for the training. This approach has recently been tested at the European Centre for Medium-Range Weather Forecasts (ECMWF). Finally, retrievals using radiative transfer models can also be used as a reference SM dataset for the training phase. This approach was used to retrieve soil moisture from ASMR-E, as mentioned above, and also to implement the official European Space Agency (ESA) SMOS soil moisture product in Near-Real-Time.

We will finish with a discussion of the retrieval of vegetation parameters from SMOS observations using data-driven methods.