Merging Microwave and Optical Satellite Observations for High Resolution Soil Moisture Data Products

With the loss of the L-band radar, the NASA SMAP satellite lost the capability to directly provide high resolution global soil moisture data products after July 7th, 2015. However, the SMAP L-band radiometer has been successfully and continuously providing high quality coarse resolution observations with the best RFI mitigation since April 2015. These coarse resolution soil moisture observations could be downscaled to finer resolution using finer scale observations of soil moisture sensitive quantities from existing satellite sensors. In the past decade, several algorithms have been introduced to downscale passive microwave soil moisture observations. Most of these methods exploit the soil moisture information from optical sensing of land surface temperature and vegetation dynamics while others use active microwave (radar) observations. In this study, alternative algorithms are intercompared in order to find out the most reliable algorithm that could be implemented for routine or operational product generation. In this paper, coarse scale satellite data are from NASA SMAP radiometer and fine scale satellite data are backscatter from SMAP radar, land surface temperature (LST) and vegetation index from NOAA GOES, and AMSR2 Ka band observations for the warm seasons in 2015 and 2016. Results from those downscaling algorithms were analyzed and compared. They were the NASA SMAP Active-Passive product algorithm, a simple LST regression algorithm, and a data mining algorithm. Four sets of *in situ* soil moisture measurement data were collected and processed from Millbrook, NY, Walnut Gulch, AZ, Tibetan Plateau, China, and Yanco, Australia, respectively. Preliminary results of this inter-comparison study are reported.