On Simulating the Impacts of Open Water Bodies on the SMAP Passive Soil Moisture Data Product

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The Soil Moisture Active and Passive (SMAP) mission is a NASA earth science mission aiming at improving our understanding of the dynamics of the cycles of energy, water, and carbon at global scales. The mission features two complementary sensors on the same low-Earth orbiting platform: an L-band synthetic aperture radar (SAR) operating at 1.26 GHz and an L-band radiometer operating at 1.41 GHz. Together these instruments will provide global mapping of soil moisture and freeze/thaw states in 2-3 days, with a tentative launch date in 2014.

The work reported in this study focuses primarily on the development of the SMAP radiometer-only soil moisture data product. For passive soil moisture retrieval at satellite footprint scales, one way to improve retrieval accuracy is to correct for the microwave emission from open water bodies prior to retrieval. The accuracy of this correction will depend on not only the locations of these water bodies, but also the geolocation accuracy of the instrument. As perfect knowledge is never attainable in practice, it is important to assess the impacts of these uncertainties on the SMAP radiometer observations and hence the passive soil moisture retrieval accuracy.

In this presentation, we present the results of our preliminary assessment on the impacts of these uncertainties. Our study consists of two parts: (1) a sensitivity analysis on the SMAP radiometer observations due to uncertainties in water-body classification, and (2) realistic global simulations that take into account of additional uncertainties (e.g., geolocation and ancillary data) and SMAP-specific instrument characteristics (e.g., orbit sampling and antenna pattern). The results will provide valuable prelaunch guidance to the SMAP team in identifying different error sources and their relative impacts on the passive soil moisture data product.