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Comparison of SMAP and SMOS Measurements to PALS Airborne Acquisitions in 2015 and 2016

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NASA's (National Aeronautics and Space Administration) Soil Moisture Active Passive (SMAP) mission was launched in January 2015. The objective of the mission is global mapping of soil moisture and freeze/thaw state using L-band radiometer measurements. Well characterized sites with calibrated in situ soil moisture measurements are used to determine the quality of the soil moisture data products; these sites are designated as core validation sites (CVS). To support the CVS based validation airborne field experiments are used to provide high-fidelity validation data and to improve the SMAP retrieval algorithms.
The SMAP project and NASA coordinated airborne field experiments at three CVS locations in 2015 and 2016. SMAP Validation Experiment 2015 (SMAPVEX15) was conducted around the Walnut Gulch CVS in Arizona in August, 2015. SMAPVEX16 was conducted at the South Fork CVS in Iowa and Carman CVS in Manitoba, Canada from May to August 2016. The main objective of SMAPVEX15 was to understand the effects and contribution of heterogeneity on the soil moisture retrievals, whereas the main objective of SMAPVEX16 was to understand the anomalous retrieval behavior observed over the South Fork and Carman CVS.
Each campaign featured the airborne PALS (Passive Active L-band Sensor) instrument. PALS mapped the SMAPVEX15 experiment area 7 times and the SMAPVEX16 domains were each mapped 12 times. This makes altogether 30 coincidental measurements with SMAP. ESA's SMOS mission is another satellite making L-band brightness temperature measurements. The PALS flights coincided with 26 SMOS overpasses during these experiments. The area covered by PALS, at about 1 km resolution, was three adjacent SMAP pixels in SMAPVEX15 and one SMAP pixel over both of the domains in SMAPVEX16 (about 36 km). The spatial resolution of SMOS is similar to SMAP. Each field experiment was accompanied with intensive ground sampling regime consisting of manual sampling and augmentation of the CVS soil moisture measurements with temporary networks of soil moisture sensors.
The data set of these three instruments with the intensive ground measurements offers a unique opportunity to gain insight into the characteristics and performance of the instruments and soil moisture retrieval algorithms. In this presentation the brightness temperature and soil moisture trends between PALS, SMAP and SMOS will be compared to each other and to in situ soil moisture observations carried out during the experiments.

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