Development of SMAP Project Cal/Val Activities

Andreas Colliander[1], Tom Jackson[2], John Kimball[3], Simon Yueh[1], Eni Njoku[1]

[1] Jet propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA
[2] Hydrology and Remote Sensing Laboratory, Agricultural Research Service,
U.S. Department of Agriculture, Beltsville, MD, USA
[3] Flathead Lake Biological Station, Division of Biological Sciences,
The University of Montana, Polson, MT, USA

The objective of the NASA's Soil Moisture Active and Passive (SMAP) mission is to map global land surface soil moisture and freeze/thaw state in order to contribute to: understanding of processes that link the terrestrial water, energy and carbon cycles; enhancing weather and climate forecast skill; and quantifying the net carbon flux in boreal landscapes. To fulfill its objective SMAP will carry on board a conically scanning L-band radar and radiometer. The radar is capable of achieving 1-3 km spatial resolution using synthetic processing, while the radiometer has a spatial resolution of 40 km. A soil moisture product is provided at 10 km resolution that combines both radar and radiometer measurements, utilizing the strengths of both instruments.

The objective of the SMAP Cal/Val program is to calibrate and validate the Level 1 through Level 4 science algorithms and products of the mission. The Cal/Val program encompasses those activities of the project and the community that contribute to the calibration and validation of the science algorithms and products, in both pre- and post-launch phases. The plan for carrying out the Cal/Val program is based largely on the algorithm and product specifications contained in the Algorithm Theoretical Basis Documents (ATBDs), which are developed by members of the SMAP Science Definition Team (SDT) and the SMAP Algorithm Development Team. The SMAP Cal/Val Plan document is intended to be in place by the end of Phase B of the mission.

During the pre-launch period a number of activities fall within the scope of calibration and validation. These involve on-ground instrument calibration; algorithm development, evaluation and selection (including algorithm testbed simulations and field campaigns focusing on the less well developed aspects of the algorithms); and establishing the infrastructure and methodologies for post-launch validation. In the post-launch period the calibration and validation activities will address directly the measurement requirements (primarily accuracy and resolution) of the L1 through L4 science data products. Each data product has quantifiable performance specifications to be met over the mission lifetime. In both pre- and post-launch phases, field campaigns involving in situ, truck, tower and airborne data acquisitions play an important role, as well as the use of data from in-situ networks, and land surface hydrology and ecosystem models.