



Soil Moisture from Altimetry - SMALT

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Soil surface moisture is a key scientific parameter; however, it is extremely difficult to measure remotely, particularly in arid and semi-arid terrain. This paper outlines the development of a novel methodology to generate soil moisture estimates in these regions from multi-mission satellite radar altimetry. Key to this approach is the development of detailed DRY Earth Models (DREAMS), which encapsulate the detailed and intricate surface brightness variations over the Earth's land surface, resulting from changes in surface roughness and composition. These models are created by cross-calibrating and reconciling multi-mission altimeter sigma0 measurements from ERS-1, ERS-2, EnviSat and Jason-2. This approach is made possible because altimeters are nadir-pointing, and most of the available radar altimeter datasets are from instruments operating in Ku band.

These DREAMS are complicated to build and require multiple stages of processing and manual intervention. However, this approach obviates the requirement for detailed ground truth to populate theoretical models, facilitating derivation of surface soil moisture estimates over arid regions, where detailed survey data are generally not available. This paper presents results using the DREAMS over desert surfaces, and showcases the model outcomes over the Arabian and Tenere deserts. A global assessment is presented of areas where DREAMS are currently being generated, and an outline of the required processing to obtain soil surface moisture estimates is given. Results for altimeter derived soil moisture validation with ground truth are presented together with comparisons with other remotely sensed soil estimates. Soil moisture product from ERS-2 radar altimetry in arid regions is presented, and the temporal and spatial resolutions of these data are reported. The results generated by this ESA encouraged initiative will be made freely available to the global scientific community. First products are planned for release within the next few months. Further information can be found at <http://tethys.eaprs.cse.dmu.ac.uk/SMALT>.