



Advancing Multi-Angular SMOS Retrievals within Land Parameter Retrieval Model for the Climate Change Initiative Programme

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The European Space Agency (ESA) developed the Climate Change Initiative (CCI) programme to integrate observations from successive active and passive satellite missions and to generate the first multi-decadal global soil moisture data set. The Land Parameter Retrieval Model (LPRM) has been widely used to derive soil moisture from passive microwave observations. Traditionally, LPRM employs a single incidence angle for soil moisture retrieval and has been successfully applied across multiple passive microwave sensors. However, unlike other passive sensors used within the CCI programme, the Soil Moisture and Ocean Salinity (SMOS) mission measures brightness temperatures over a wide range of incidence angles, from 0° to 65°. However, the existing algorithm relies on single incidence angle observations; therefore, there is a need to exploit the multi-angular information provided by SMOS. This study focuses on advancing and adapting the soil moisture retrieval algorithm to incorporate multi-incidence angle observations while maintaining compatibility with other sensors, thereby enabling the production of a consistent long-term climatological soil moisture data record. The LPRM cost function is modified to integrate brightness temperature information acquired at dual polarizations and multiple incidence angles. This enhancement is expected to improve the operational retrieval algorithm and contribute to the generation of a more reliable multi-decadal soil moisture data record.