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Can evaporation-based disaggregation techniques of surface soil moisture observations help improve the validation strategies of SMOS data?

Olivier Merlin (1), Christoph Rudiger (2), Philippe Richaume (1), Elsa Jacquette (1), Arnaud Mialon (1), Ahmad Al Bitar (1), Jeffrey Walker (2), and Yann Kerr (1)

(1) CESBIO, Toulouse, France, (2) Monash University, Melbourne, Australia

Disaggregating remote sensing data is a way to solve the extent mismatch between remotely sensed and in situ observations. However, disaggregation is always a compromise between downscaling resolution and accuracy. The higher downscaling resolution, the more disaggregated values are representative of ground observation but the less they are accurate, and vice versa the lower downscaling resolution, the less disaggregated values are representative of ground observation but the more they are accurate relative to low-resolution remotely sensed observation. Consequently, a condition to use disaggregation as a tool for validating remote sensing data using in situ measurements is to assess uncertainties and potential error sources in downscaled observations. In this study, a thermal-based disaggregation technique of surface soil moisture is applied to SMOS (Soil Moisture and Ocean Salinity) data using MODIS (MODerate resolution Imaging Spectroradiometer) data. The 40 km resolution SMOS soil moisture is disaggregated at 1 km resolution over a 600 km by 200 km area in southeastern Australia and the 1 km resolution disaggregrated soil moisture is subsequently compared to the in situ measurements aggregated at 1 km resolution over the sampling areas selected for the two AACES (Australian Airborne Calibration/validation for SMOS) campaigns. Disaggregated soil moisture is evaluated during AACES-1 (austral summer month) and AACES-2 (austral winter 2010). The potential of such a disaggregation technique for validating SMOS data is discussed with respect to fine-scale land surface conditions and regional-scale climate.