



Satellite-based root-zone soil moisture estimates in West Africa: Evaluation of various satellite products using model outputs and ground observations

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From an operational point of view, most applications of satellite soil moisture products are interested in the root-zone soil moisture rather than the near surface (0-5 cm) soil moisture observed by microwave remote sensing. Thus, many studies were devoted to deduce the root-zone soil moisture from the near surface soil moisture by assimilating microwave measurements into different land surface models. In 1999, a simple semi-empirical method was proposed by Wagner et al. (1999) to produce root-zone soil moisture estimates based on a near-surface soil moisture time-series and a single parameter that describes the drying out velocity of the soil moisture.

In this study, the Wagner methodology was implemented over the sahelian region in West Africa and tested with various satellite-based soil moisture measurements (AMSR-E, METOP-ASCAT, TMI, ERS). Ground-based soil moisture measurements obtained over three sites in Mali, Niger and Benin during the AMMA campaign were used to assess the quality of estimates of near-surface and root-zone soil moisture at the local scale. At the regional scale, root-zone soil moisture estimates were compared to outputs of eleven land surface models from 2005 to 2007 (the ALMIP experiment, Boone et al. 2009). The results show that a satellite-based root-zone soil moisture estimate is possible with an accuracy of about 3 % vol. (RMSE) over the Sahelian band (Niger and Mali) and about 5 % vol. over the Sudanian zone (Benin).