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Potential and limitation of AMSR-E microwave measurements over Niger for improving water cycle modelling under uncertain rainfall fields

T. Pellarin (1), J.P. Laurent (1), B. Decharme (2), F. Chopin (3), P. de Rosnay (4), A. Boone (5), L. Descroix (1), B. Cappelaere (6)

(1) LTHE, Grenoble, (2) CETP, Paris, (3) LMD, Paris, (4) CESBIO, Toulouse, (5) CNRM/Météo-France, Toulouse, (6) HSM, Montpellier

Rainfall knowledge is probably the most important input required for a correct water cycle modelling in semi-arid regions. In West Africa, the raingauge network is very sparse (except in several regional areas) and large scale rainfall fields are only available using satellite measurements. Obtained rainfall products can be imprecise. The aim of this study is to analyses the potential and limitation of AMSR-E brightness temperatures (TB) to improve water cycle modelling under uncertain rainfall fields. A two-step methodology was built. First, a coupled land-surface (ISBA) and microwave emission (C-MEB) model was calibrated over the Niamey region (Niger) using a dense ground based raingauge network (40 raingauge stations over 160x120 km^2) as well as local soil moisture and runoff measurements. The coupled model fed with ground measurements (precipitation, land-cover and vegetation information, atmospheric forcing, etc) is able to provide similar simulated and observed TB as well as accurate soil moisture and runoff rates. Second, satellite rainfall estimation combining geostationary satellite (Meteosat 8) and low orbiting satellite (TRMM) were used to feed the ISBA/C-MEB coupled model on the same region. Despite the comparable annual cumulative rainfall of the satellite and ground rainfall products, significant differences in the water repartition between surface runoff, evaporation and infiltration rates are obtained. This study analyses the potential and limitation of AMSR-E TB for improving water cycle modelling in West Africa.