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Assessment of water budgets computed from NWP models and observational datasets during AMMA-EOP

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The moisture budget over West Africa during the AMMA Extended Observing Period (EOP) is examined using Numerical Weather Prediction (NWP) models. NWP models provide their own complete description of the water cycle but with limitations (especially in precipitation and evapo-transpiration terms). As many additional observations have been assimilated by NWP models during the EOP, we may be optimistic that these model analyses are improved, at least for the atmospheric part.

The present study focuses on the inter-comparison of large- scale water budgets obtained from ECMWF operational analyses and simulations, as well as NCEP reanalysis 1 and 2, for years 2005 to 2007. We investigate water budget closure in distinct boxes over continental West Africa. Significant differences are found between the three NWP datasets. Then an assessment of NWP model water budget terms (precipitable water vapour PWV, water vapour fluxes WVF, precipitation P, and evapotranspiration ETP) is realised by comparing them with observational datasets (independent PWV estimates from GPS, upper air data from radiosondes, P estimates from satellites; and ETP estimates from land-surface modelling). This assessment points out current limitations in the NWP models, especially in their simulation of P and ETP, it also highlights significant spreading in their estimations of mass and moisture fluxes, especially in the low levels.

Hybrid water budgets are also computed, combining NWP estimates for moisture fluxes and observational datasets for P and ETP. Moisture flux convergence provides

also an indirect estimate of ETP-P. The interpretation of these budget terms helps investigating the significance of water recycling and atmospheric advection of water, and the role and efficiency of surface and atmosphere processes as well as their modes of interaction, at scales ranging from seasonal to synoptic.