Geophysical Research Abstracts,
Vol. 11, EGU2009-11741, 2009
EGU General Assembly 2009

Investigation of the West African Monsoon water cycle from Numerical Weather Prediction models and elaborate products.

R. Meynadier (1), O. Bock (1,2), F. Guichard (3), A. Boone (3), and J.L. Redelsperger (3)

(1) C.N.R.S, Service d'Aeronomie/LATMOS, Paris, France (remi.meynadier@aero.jussieu.fr), (2) IGN, LAREG, Marne-la-Vallee, France, (3) CNRS & Météo-France, CNRM-GAME, Toulouse, France

This study investigates the atmospheric water cycle over West Africa at seasonal and intra-seasonal timescales during AMMA Extended Observing Period (2005 to 2007). It aims at characterizing the scales of variability and inter-relations of atmospheric water budget terms and the underlying processes. The regional-scale moisture budget is examined using Numerical Weather Prediction (NWP) models and elaborate products. The latter are: TRMM 3B42v6 satellite precipitation estimates and evapo-transpiration estimates produced by land surface models (ALMIP project). These products allow for a comprehensive description of the water budget. NWP models provide also their own complete description of the water cycle but with limitations due to deficiencies in model physics and inconsistencies introduced by the assimilation process. The study is mainly conducted on the basis of the ECMWF IFS operational analysis and forecasts, but NCEP/NCAR and NCEP/DOE reanalyses are used also for comparison purposes and estimating the uncertainty in NWP models. Precipitation (P) and evapo-transpiration (E) simulated by the NWP models are assessed using the elaborate products. Significant deficiencies in the NWP model forecasts are seen which are linked with parameterizations and impact of assimilation. They are namely a too southerly ITCZ, i.e. an underestimation of P in the Sahel, along with a surprisingly too strong E in the same region indicating poor coupling between these too parameters in the models. A hybrid budget analysis is thus proposed in which the elaborate products are combined with PW tendency from the models. This allows assessing the moisture flux divergence (MFD) calculated from NWP model analyses in an indirect way. Large uncertainties in MFD are observed between the NWP models, with significant biases and errors compared to the hybrid MFD, revealing namely differences in the representation of the shallow meridional circulation linking the heat-low and ITCZ regions over West Africa. Precipitable water estimates from GPS observations and upper air data from radiosondes are used further assessing this point.