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Evaluation of the water cycle as simulated by land surface models. Case study on the Upper Oueme basin (Benin)

Christophe PEUGEOT [1], Thomas DARRAS [1], Aaron BOONE [2], Jean-Martial COHARD [3], Sylvie GALLE [3], Adrien GUYOT [4], Marielle GOSSET [5], Guillaume QUANTIN [3], Luc SEGUIS [1], Julien VIARRE [5], Théo VISCHEL [3] and the ALMIP group

1 IRD/HSM, Montpellier, France
2 CNRS/CNRM, Toulouse, France
3 IRD, UJF/LTHE, Grenoble, France
4 NCGRT/U. Queensland, Australia
5 IRD/GET,Toulouse, France

Land surface models (LSMs) are widely used in environmental and climate sciences to simulate matter (water, carbon) and energy exchanges between the continental surface, the soil and sub-soil, the vegetation cover and the atmopshere. The AMMA project, and the associated observation campaigns provided unique data-sets to run land surface models, and to evaluate their results over the West African region, where such high added-value informations have been lacking. This talk focuses on the evaluation of the water cycle as simulated by several LSMs involved in the ALMIP project (AMMA Land surface Model Intercomparison Project). Model runs from ALMIP-phases 1 (regional scale) and 2 (local and meso-scales), using several variants of forcing fields, were used. The key components of the water budget (runoff, drainage, evapotranspiration, soil water storage) as simulated by the models were compared to ground based observations on the meso-scale upper Oueme watershed, (10 000 km2, Benin). Previous studies performed in the AMMA framework led to a comprehensive understanding of the fundamental hydrologic processes responsible for the water exchanges and transfers in this region. Notably, the key role of sub-surface water transfer in river discharge, and probable deep tree water uptake were put forward. All these mechanisms were not necessarily represented in the LSM we used. The way the LSM results should be interpreted with respect to the observed processes will be first discussed. Then model runoff and drainage averaged over the basin will be compared to observed river discharge and groundwater levels at daily to annual time scales. Daily simulations of soil moisture and evapotranspiration will be evaluated locally using the observations available on three local-scale sites representative of the dominant land cover type encountered over the basin. From these comparisons, we will attempt a first discrimination of the respective role of the forcing fields, the specifications used in the model for soil and surface properties, and the model physical parametrisations.

Keywords: Land surface models, Evaluation, Water cycle

Email: christophe.peugeot@ird.fr

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F. Guichard

AMMA International Project Office
Université Pierre et Marie Curie
LOCEAN/IPSL
Boite 100 - 4 Place Jussieu
75252 Paris cedex 05 - France

Web: http://www.amma-international.org
Email: amma.office@amma-int.org