

Post-doctoral fellowship at IRD – HydroSciences Montpellier (France)

« *Water and energy budget estimation in the semiarid Sahel* »

Lab. : IRD, UMR HydroSciences Montpellier (HSM), France (<http://www.hydrosciences.org>)

Duration : 12 mois

IRD's HydroSciences Montpellier laboratory (~ 60 researchers and ~ 30 postdocs and PhD students) works on the study of climate and anthropogenic impacts on tropical and mediterranean hydrosystems.

The appointee will work in the labs's AMMA team, in cooperation with researchers from LTHE and LSCE labs (France).

Job description

Context

The proposed work is part of the AMMA research programme (African Monsoon Multidisciplinary Analyses). This large international programme is conducted by several French and foreign institutions, and aims at better understanding the mechanisms of the West African monsoon and evaluating its impacts on regional natural resources. The « Land surfaces » workgroup of AMMA gathers several labs, including HSM, and focuses on the quantification of water and energy budgets at seasonal / regional scales. This objective requires the development of spatially-distributed models adapted to Sahelian ecosystems. One such model was recently developed at LSCE on the Niger supersite area of AMMA. Calibration was performed on the first available data produced by the experimental setup¹, and validated against optical and micro-wave remote sensing data². Moreover, a stochastic event rainfield generator was developed by LTHE, with conditioning to available point data, allowing to simulate the space-time structures characteristic of the region³. Associating this generator to a hydrological model showed that large negative biases were produced when interpolating rainfall by conventional spatial distribution methods.

Objectives

The objective is to improve water and energy budget estimations, based on the

¹ Ramier et al. (2009). *Towards an understanding of coupled physical and biological processes in the cultivated Sahel – 1. Energy and water*. <http://dx.doi.org/10.1016/j.jhydrol.2008.12.002> .

² Saux-Picart et al. (2009). *Water and energy budgets simulation over the AMMA-Niger super-site spatially constrained with remote sensing data*. <http://dx.doi.org/10.1016/j.jhydrol.2008.12.023> .

³ Vischel et al. (2009). *Conditional simulation schemes of rain fields and their application to rainfall runoff modeling studies in the Sahel*. <http://dx.doi.org/10.1016/j.jhydrol.2009.02.028> .

available methods and tools for the AMMA-Niger study area. Three main research components can be distinguished :

- 1) Calibration / validation of existing modelling tools based on AMMA-Niger data. So far, only a fraction of data available now was used for the initial calibration. This calibration can be significantly improved, taking into account in particular the methodological recommendations that emerged from the recent thesis on this subject. Stochastic sensitivity analysis and optimization methods will be used to that end.
- 2) Spatial extension of the model to the supersite area (50x40km) : model forcing with rainfields produced by the stochastic generator, production of ensemble simulations, and analysis of statistical properties obtained for the different components of the water and energy budgets ; comparison with forcing by deterministic rainfields (kriging, Thiessen) ;
- 3) Model extension to the meso-scale domain (100x100km). This work component is part of the intercomparaison of several land surface models used among the « Land surface » workgroup. It will participate to the development of the forcing database for the Niger site, in the framework of this intercomparaison project.

Profile of candidate

Relevant science fields : hydrology/ hydrometeorology/ bioclimatology/ remote sensing

A PhD thesis in the field of biosphere or hydrology modeling is required. Experience in the use of remote sensing data, and a good background in maths (signal processing, statistics) and/or programming (Fortran, Matlab, Unix) will be appreciated.

Application

Job start : **1st Avril 2009** ; duration : 12 months, net monthly salary : ~1750 €

Please send ASAP detailed curriculum and names/addresses of two scientific referees to :

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