Dry spells analysis: Multi-scale detection, attribution of impacts and sources of uncertainty using an integrative approach

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Introduction

The analyses of rainfall in the last one and half decade have revealed the persistence of « dry days episodes » (dry spells, DS) in the seasonal distribution of rainfall events (Salack et al. 2011a). This poster reports results of studies which objectives were to (i) improve our understanding of DS space-time distribution, (ii) detect DS implications in rainfall patterns (Salack et al. 2011b), (iii) estimate DS impacts on local millet production and associated uncertainties using crop and climate models (Salack et al. 2011c). DS analysis is essential for drought monitoring and food crisis alleviation in the Sahel and Sudan zones of West Africa.

Data and Methods

Data consists of 87-rainguage daily data and 8 Regional climate models (RCM) ensemble simulations (fig. 1). The raingauge network is divided into catchments of different dimensions (fig. 2). Following a multiple scale extraction algorithm (equation 1), the raingauge data is assessed to detect the intraseasonal starting dates (STDDATE), duration (D), seasonal frequency of occurrence (F) and interannual oscillations of dry spells (DS) at station, 1°x1°, 2°x2° and rainfall regions. Both observed and 8-RCM ensemble simulation rainfall are used to force crop models in order to identify and estimate the potential impacts of DS on millet production.

The integration of 8-RCM ensemble rainfall to a crop model (SARRAH) shows how much the biases in the distribution of DS is propagated into impact assessments studies on potential millet yield at local scale.

Results and Discussions

1. Multiple scales characteristics of dry spells

2. Attribution of impacts and sources of uncertainty in forecasting seasonal extreme DS oscillations

** Extreme dry spells (extDS) are associated to rainfall deficits (table1). They explain the maximum loss of millet yield in the Sahel and Sahel-Sudan regions of West Africa (Sivakumar 1992).

** Original 8-RCM ensemble forecasts are unable to describe very well the seasonal frequency-duration (fig. 6a) and starting dates of extDS (fig. 6b, c) in those regions, due to high level of noise (i.e < 1 mm/day) in RCMs’ simulations. When the noise is filtered out from the original outputs during post-treatments (RCM-fil), better results are found.

** The lack of good representation of DS in RCM ensemble forecasts explains very well the lack of good validation of DS in RCM ensemble forecasts.

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Discussion 2

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References