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Methodological approach of kinematic properties of meso-scale convective system from dense raingauge network: first results and conclusion from the Upper Ouémé hydro meteorological Observatory (Benin)

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There is evidence that meso-scale convective systems – MSCS alias "squall lines" – constitute the main type of rainfall events over most of West Africa (Afouda et al., 2002) especially in the Sahelian zone and to a certain extent in the Soudanian zone. The specific kinematic properties of these systems may be analysed with a dense recording raingauges network (DRRN) suitable for their identification and quantification, as has been illustrated previously on the Sahelian Niamey square degree area (Lebel and Amani, 1999).

The DRRN observatory, the rainfall regime and the rainfall data:

Such an *ad hoc* DRRN has been set up on the upper Ouémé basin Hydro meteorological Observatory (UOBHO) in Benin since 1999. The UOBHO is located in the Sudanian climatic zone of West Africa between 9˚ and 10˚N in Benin. This observatory is made of 30 recording raingauges evenly distributed over a surface of 15000 km^2, for which rainfall data are available over the period 1999-2003.

The rainfall season starts mid-March and finishes at the end of October, with average cumulate rainfall of 1200 mm. Most of the rainfall occurs during major events that encompass 85 % of the total seasonal rainfall. The number of major events ranges from 90 to 120 depending of the rainfall season. Over the considered period 1999-2003, this means that approximately 500 major rainfall events have been monitored. This is considered to be sufficient at this stage for methodological evaluation, despite the fact that we probably have not encountered all the meteorological conditions that may occur in only 5 rainfall seasons.

Evaluation of ground tracking methods from DRRN:

The straightforward application of previously defined methods for MSCS ground tracking suitable for Sahelian rainfall hava shown some limitations for this Soudanian DRRN. This is partly due to the more complex rainfall regime including non-MSCS events. Therefore, other methods of MSCS ground tracking have to be developed to alleviate these limitations.

The methods that are going to be used are the following:

- A vector based method based on time-distance interstational vectors (TDIV method),
- A statistically based method on research of the optimal unidirectional cinematic for the rainfall ebent (network optimal hyetogram Method, NOH),

The results of the various methods will help to defined which is the most appropriate to distinguish MSCS from other types of rainfall and to compute the kinematic of MSCS.

Scientific outcomes and conclusions:

The methodological objective of this paper is to evaluate the efficiency of various methods for identification of MSCS from DRRN ground tracking. The direct expected scientific outcome is to be able to differentiate rainfall events observed during the rain season into several types according to their cinematic behaviour (direction and speed). It finally may constitute one element of diagnosis to understand more precisely the complex rainfall regime of the Soudanian climate driven by the West African Monsoon.

References:

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