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Hydrology and Earth System Sciences Discussions

Interactive comment on "Behavior analysis of convective and stratiform rain using Markovian approach over Mediterranean region from meteorological radar data" *by* M. Lazri et al.

Anonymous Referee #1

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GENERAL COMMENTS

The paper by Lazri et al. (2012) investigates the statistical properties of a time series of radar reflectivity maps collected by a weather radar located in northern Algeria. The observational data consists of 17660 radar images recorded in six months (from October 2001 to March 2002); the time and space resolution of the dataset are 15 min and 1x1 km, respectively. The Authors analyze two study areas of equal size (15x15 km) within the radar field of view (512x512 km), aiming to "provide a better description of precipitation chronological behavior over the sea and the ground" in the Mediterranean region

(pag. 6229). Hence, they obtain two time series representing the weighted mean of radar reflectivity data over the two study areas (see paper equation (2)). The main assumption is that each observed time series forms a stationary first-order Markov chain that undergoes transitions between three possible states (no raining, stratiform precipitation and convective precipitation). The observed values are classified into three states by means of a (somewhat arbitrary) thresholding procedure. The paper ends by showing a comparison between "the stationary probabilities, which are calculated by using the Markovian model, and the actual probabilities" (abstract). Unfortunately, it is my opinion that the Authors did not manage to produce a quality research paper from an interesting topic. In other words, I regret to say that I do not see a clear contribution of the paper under review to scientific community. Indeed, the model presented is well known and the observed values are scarce for the paper purpose. The next section is intended to provide further details about my viewpoint.

SPECIFIC COMMENTS

1. Sample size

I believe that the length of the observed time series (six months) used in this study is too short to make reliable inferences about the chronological behaviour of the rainfall process. This is especially so if the Authors draw conclusions about possible drought trends due to the global climate change, as stated in the paper Section 5 (pag. 6237): "The drought trend (...) has been confirmed by this study. This drought is mainly due to global climate change which increased the annual average temperatures. The climate becomes increasingly dry in many countries, including Algeria". I think the Authors cannot infer any climatic trend from such a small dataset (see also Koutsoyiannis, 2010). Furthermore, the paper analyzes only two small study areas (one located in the hinterland and the other one located off the coast of northern Algeria), but again the conclusions drawn seem to be too general, i.e. results are generalized to the whole Mediterranian region. For example: "The present study attempts to explain the behavior of precipitation in the Mediterranean" and "The dynamic difference of rainfall

between ground and sea has been demonstrated in this study" (pag. 6236). In summary, I strongly suggest the authors to enlarge their dataset, because small sample sizes make it difficult to define the degree to which the datasets reflect the salient features of the process by which they are generated, while larger sample sizes can lead to increased accuracy when estimating unknown parameters.

2. Validation using additional observations

The reason for fitting a statistical model to data is to make conclusions about some essential characteristics of the population from which the data were drawn. Such conclusions can be sensitive to the accuracy of the fitted model, so it is necessary to check that the model fits well. The main issue concerns the ability of the model to describe variations in the wider population, and this is usually achievable when there are additional sources of data against which the model can be judged. By contrast, the Authors seem to judge the accuracy of their model in terms of its agreement with the data that were actually used to estimate it. This limits the value of their results.

TECHNICAL CORRECTIONS

1) The English should be revised. Some sentences in this manuscript are not clearly understandable due to the poor syntax and orthographic errors.

2) I found several missing references, which I list below: - Charles et al., 1999 (pag. 6227, line 23); - Liana and Elena, 2004; Srikanthan et al., 2009 (pag. 6228, line 2); - Smith and Schreiber, 1973; Gates and Tong, 1976; Jimoh and Webster, 1996 (pag. 6228, line 4-7); - Hardenberg et al., 2003; Steiner et al., 1995; Ferraris and Rebora, 2006 (pag. 6230, line 19-21).

3) Lines 17 and 18 of the page 6232 should not be separated.

4) Concerning the paper equation (1), it is worth noting that Z-R relationships derived from drop size distribution measurements have been reported by a large number of authors. The best known is the relationship Z=200Rˆ1.6, which is commonly used as

a "default" relationship in some countries (Raghavan, 2003).

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