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Climate Change and Temporal and Spatial Evolution of the Multifractal Universal Parameters in Ebro River Basin

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Multifractal techniques are applied to the study of rainfall daily time series over 14 stations from Ebro river Basin over the second half of XX century. The aim is to determine how climate change affects the evolution of the probability distribution of daily precipitation, through the values of universal multifractal parameters: $C_1,\ \alpha,\ H$ y γ_s for different periods of time. These will offer direct explanations of the shape of the distribution, especially about the extreme events:

C_1 is the mean intermittency codimension. When C_1 increases the precipitation becoming less continuous and more sporadic in time. Therefore there is an increase of extremes.

α, is a mesure of multifratility so an increase of it corresponds to a larger variation of the range of precipitation intensity, and thus also of extremes.

H is the degree of non-conservation of the field, which measures the scale dependency of the average field.

γ_s, the maximal probable singularity that can be observed on a unique sample. It's directly related to the ratio of the range and the mean of field.

From the data collected, we perceive a decline in average rainfall, from 1980. But how is affected the global parameters in this situation?. Results vary according to different rainfall stations.

This work is divided into two parts:

- First the original series was Split into 2 subset of 23 year each (1957-1979 y 1980-2002). For each stations and subset we obtain the classical spectral analysis ($E(f) = f^{-\beta}$), and we estimate β as a function of frequency f. In nearly all station there are two principal peaks: one at 6 months and one year. In resume for lower frequencies, $\beta \approx 0$ is found. The break detected in the periodograms for approximately f≈0:40. It corresponds with a period of 16 days like other studies (Labat et al. 2002, Tessier et al. 1996). They are essentially the "synoptic maximum" found when performing the analysis of the exponential function of the empirical moments scaling. From this result we can apply the method of the double trace. In general, there isn't large differences in the parameter estimates for both periods. However shows a slight increase in both C1 and alpha. Therefore as consequence of it also an increase of γ_s is detected. These results are in agreement with the data simulated by Roger and al. (2008) from the models developed by the IPCC.
  - In the second part of the work we verify as the parameters evolve in the time. We want to check if they move continuously or jumps or changes of trend are established.. To obtain the global parameters, we work with series of 8192 days that are displaced month a month along the whole studied time period. For each station and each segment are noted global parameters and studied the resulting series.

REFERENCES:

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