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Rainfall extremes and Global Change : a multifractal analysis of a coupled climate scenario

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Due to their extreme variability over a wide range of space-time scales, it is not trivial to objectively quantify the temporal evolution of the extremes of meteorological fields in global change simulations. This is particularly true for rainfall. Therefore, we used multifractal techniques to objectively assess the temporal evolution of its extremes in the SRES A2 scenario simulated with the help of the CNRM ARPEGE -Climate model and with the help of the IPSL model for the period 1860-2100. Indeed, the rainfall variability over scales is then estimated with the help of a few parameters. The most important ones correspond to the mean fractality, which determines the intermittency of the mean rainfall, and the multifractality degree, which measures the diversity of rainfall regimes.

We observed for both models an increase of their intermittency and a decrease of their multifractality. These evolutions result in exponents determining the statistical behaviour of rainfall extremes which roughly balance each other , in particular the critical order of statistical moment divergence is not significantly changed. This already may explain the divergent points of view on the “increase of the rainfall extremes” with global change.

On the other hand, the IPSL model displays a larger intermittency and multifractality than those of ARPEGE. A similar contrast is found between regional time evolutions in Africa and France for ARPEGE runs.