EMS Annual Meeting Abstracts
Vol. 21, EMS2024-551, 2024, updated on 21 Jul 2024
https://doi.org/10.5194/ems2024-551
EMS Annual Meeting 2024

Monofractal technique to assess extreme precipitation concentration: A reference study of Barcelona (Spain)

David Santuy[1], Robert Monjo[2], and Darío Negro[2]
[1]Universidad Complutense de Madrid, Facultad de Ciencias Físicas, Madrid, Spain (dsantuy@ucm.es)
[2]Climate Research Foundation - Fundación para la Investigación del Clima (Ficlima), Madrid, Spain

The current climate change scenario raises the need to study the variability of extreme precipitation patterns of Mediterranean climates, where hydrological risk assessment plays a key role in building resilience. This is why the study of future precipitation characteristics, including concentration at different time scales, emerges as a priority. We present a sophistication of the *n*-index approach, useful to estimate the monofractal dimension of precipitation, allowing the seasonal characterisation of its regularity at supra-daily scale and of its concentration at a sub-daily scale. The higher the n-index, the more irregular the precipitation, that is, most of the amount is accumulated in shorter duration and more dispersed events. In contrast, if the index is close to zero, precipitation is associated with a more regular regime. By applying the FIClima statistical downscaling to ten Earth System Model outputs for three observatories located in the city of Barcelona (Spain), local climate projections of the *n*-index have been obtained for the period 2015-2100 under different climate change scenarios (SSP1.26, SSP2.45, SSP3.70, SSP5.85). These projections show a clear upward trend of the index, increasing with the radiative forcing implied by the scenario, and marked by interannual and multidecadal variability. Given this situation of future increase in the irregularity of precipitation for the city of Barcelona, the seasonal distribution of these increases has been studied, characterising trends for each month according to the different scenarios. Increases in rainfall concentration are expected between June and October, associated with intensified and more abrupt convection. To support the spatial coherence of our results, a climatological analysis of the daily *n*-index has been carried out using a high-resolution data grid (0.2°) for the period [1971-2015] covering the Northeast Spain, observing consistent trends during this period and the spatial distribution of the index. The techniques presented in this study are useful to replicate in other Mediterranean regions in order to improve decision-making in society, where water resource management becomes even more important given the projected decrease in precipitation over the Mediterranean.