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Comparing two radar rainfall products with the help of Multifractal Analysis

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Distributed rainfall radar data are commonly used in hydrology and increasingly used in urban hydrology. However radar validation and comparison still commonly relies on standard scores such as Nash-Sutcliffe coefficient, Correlation and Quadratic Error, which enable to grasp neither the underlying spatio-temporal structure of the studied rainfall field nor meaningful statistics, i.e. of order larger than two. We implement an innovative methodology that relies on Universal Multifractal (UM) to compare two operational radar products covering the Paris region. The UM framework has been extensively used to characterize and simulate geophysical fields extremely variable over a wide range of scales such as rainfall with the help of only three parameters, which are furthermore physically meaningful.
Both Météo-France operational radar mosaic and the CALAMAR radar product use the same single polarization C-band radar data. However their QPE algorithms are different, as well as the calibration with rain gauges. Cartesian fields of final resolution 1 km in space and 5 min in time are used in this study. Three rainfall events that occurred in 2010 and 2011 are used, in order to quantify the quality of the adjustment process we add to this comparison a non-adjusted CALAMAR radar product.
As a first step, we compare these radar products to the Val de Marne County network of 27 rain gauges distributed over a 245 Km2 area. Standard scores at various resolutions (5min, 15min, 30min and 1h) are computed. The Météo France radar product is better correlated with these rain gauges data than both CALAMAR products at 5min scale, but we observe the opposite when we increase the time scale. We also observe that the CALAMAR adjustment process improves the correlation with rain gauges.
In a second step, both spatial (2D maps) and temporal (1D time series for each pixel) multifractal analyses are performed and the UM parameters computed. Preliminary results suggest that both products do not yield the same parameters in terms of spatial distribution and temporal evolution. CALAMAR product seems to significantly under-estimates rainfall singularities and yields a higher percentage of zero values. This may results from the fact CALAMAR replaces the ground clutters by zero values.

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