Multifractal comparison of two operational radar rainfall products

A. Ichiba [1] [2], A. Gires [1], I. Tchiguirinskaia [1], D. Schertzer [1], Ph. Bompard [2] and S. Lovejoy [3]

[1] U. Paris-Est, Ecole des Ponts ParisTech, LEESU, Marne-la-Vallée, France
[2] Conseil Général du Val-de-Marne, Créteil, France
[3] McGill University, Physics Department, Montreal, PQ, Canada

Distributed rainfall provided by weather radar is widely 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 do not enable to grasp the underlying spatio-temporal structure of the studied rainfall field. In this paper we suggest to implement a novel methodology that relies on Universal Multifractal to compare two operational radar products covering the Paris area. This theoretical 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.

The products are the Météo-France operational radar mosaic and the CALAMAR radar product. Both use the same single polarization radar data provided by the C-band radar of Trappes operated by Météo-France. However both products do not rely on the same QPE algorithms and furthermore not use the same rain gauges in the adjustment phase. 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 a first step we compare each radar product to a network of 27 rain gauges disturbed over a 245 Km^2 area. The rain gauges are operated by the DSEA of the Val de Marne County, the local authority in charge of urban drainage. To achieve this, standard scores at various resolutions (5min, 15min, 30min and 1h) are computed. It appears that Rain gauges are better correlated with Météo France radar product than CALAMAR field.
In a second step both spatial (on 2D maps) and temporal (on 1D time series for each pixel) multifractal analysis are performed and UM parameters computed. Initial results suggest that both fields do not exhibit the same parameters sets in terms of spatial distribution and temporal evolution. A possible explanation could be the significantly higher percentage of zero values for the CALAMAR field.

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