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Guessing the missing half of a geophysical field with blunt extension of discrete Universal Multifractal cascades

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Universal Multifractals have been widely used to characterize and simulate geophysical fields extremely variable over a wide range of scales such as rainfall. Despite strong limitations, notably its non-stationnarity, discrete cascades are often used to simulate such fields. Recently, blunt cascades have been introduced in 1D and 2D to cope with this issue while remaining in the simple framework of discrete cascades. It basically consists in geometrically interpolating over moving windows the multiplicative increments at each cascade steps.

In this paper, we first suggest an extension of this blunt cascades to space-time processes. Multifractal expected behaviour is theoretically established and numerically confirmed. In a second step, a methodology to address the common issue of guessing the missing half of a field is developed using this framework. It basically consists in reconstructing the increments of the known portion of the field, and then stochastically simulating the ones for the new portion, while ensuring the blunting the increments on the portion joining the two parts of the fields. The approach is tested with time series, maps and in a space-time framework. Initial tests with rainfall data are presented.

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