Characterization and simulation of space-time rainfall variability using multifractal theory

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It is well know that rainfall fields display fluctuations in space and time that increase as the scale of observation decreases. Multifractal theory represents a solid base to characterize scale-invariance properties observed in rainfall fields as well as to develop downscaling models able to reproduce observed statistics. The availability of such downscaling tools makes possible the forecasting of floods in small basins using hydrological models that accept rainfall predictions of numerical weather prediction models as input, even if meteorological models does not resolve the small scales required by hydrological modelling.

In this talk multifractal theory will be reviewed highlighting the more relevant aspects for rainfall downscaling (e.g., the concept of scale-invariance in rainfall fields displaying space-time self-similarity or self-affinity, the role of orography). The main results of the scale-invariance analysis of rainfall retrieved by remote sensors will be discussed. Finally the application of multifractal models for rainfall downscaling will be presented and some new ideas for ensemble verification will be argued.