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GIS-based statistical multifractal analysis from a DEM

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The geomorphologic area function and width function that characterize the forms of hill slope and river networks are two key parameters employed in the geomorphology-based hydrological model for representing the hydrological processes together with other spatial information. One fundamental issue on the use of the geomorphologic properties is the spatial resolution sensitivity in both the threshold area for river network generation and digital elevation model (DEM) resolution. The threshold area is the minimum drainage area required to initiate the river; the DEM resolution depends on the available elevation data.

In the present study, multifractal analysis was used to investigate the sensitivity of width functions extracted by different threshold areas and the sensitivity of area functions extracted from various resolutions of DEMs.

The site of this work is a broad trip around the Guadarrama Mountains, with an altitude ranging from about 700 m in its southern border near the town of Madrid, to about 1,200 m at its northern end. It forms a gently sloping surface (10ž to 20ž) between the steep slopes of the Sierra and the borders of the sedimentary basin of Madrid.