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Mining air temperature records employing the fractal-multifractal method

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The fractal–multifractal (FM), a deterministic geometric approach, which has been found faithful in describing, simulating and downscaling rainfall and streamflow records gathered daily over a year, is employed to harness the geometry of smoother daily air temperature records gathered over a year. This study centers on encoding and downscaling 115 years of such sets gathered near Sacramento and employing at most 7 geometric parameters. Results show that both faithful encodings and downscales of air temperature via the FM method are possible, with accumulated errors that are less than merely 1% on the average, for both applications. Given the success on mining information, successive geometric parameters in time were used to issue temperature predictions, one-year ahead, via: (a) statistical time series models, (b) neural networks, and (c) conventional Markov matrices, based on geometrical information from the past. As found in previous studies for streamflow, this study also reveals that that the FM approach may sometimes produce reasonable forecasts that not only capture the accumulated temperature sets but also preserve statistical attributes as well as the overall “texture” of the records.