Geophysical Research Abstracts
Vol. 19, EGU2017-616-1, 2017
EGU General Assembly 2017
© Author(s) 2016. CC Attribution 3.0 License.

Complexity elucidation of rainfall, streamflow and temperature via fractal-multifractal encodings

Mahesh Lal Maskey (1), Carlos E. Puente (1), Bellie Sivakumar (1,2)

(1) University of California, Davis, Hydrological Sciences Graduate Group, Land, Air and Water Resources, Davis, United States (mmaskey@ucdavis.edu), (2) School of Civil and Environmental Engineering, The University of New South Wales, Austrialia

The deterministic geometric approach, the fractal–multifractal (FM) method, produces a host of geometric patterns that very closely resemble various hydrological records that encompass precipitation, streamflow and temperature. In aiming to contribute to climate change issues, this project employs the FM geometric parameters obtained by encoding these three processes in order to elucidate their complexity, using concurrent records available at Merced in the State of California, USA. It is shown that the FM approach results in faithful daily representations of all data sets associated with the three processes over a year, with mean square errors in accumulated sets (mass functions) that do not exceed, in order, a mere 3, 2 and 1.5%. Then, it is revealed how individual geometric parameters for each process evolve and how such FM parameter evolutions may be related to one another, leading to a geometric comparison and a complexity evaluation of the processes. The latter is carried via a geometric classification of parameters using data-mining techniques (k-means clustering) and a non-linear phase space analysis of such parameters.