

New approach for studies of time series of satellite observations of rainstorm: II.

The mutual information dimension

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Abstract

Based on the concepts of information and fractal theory, a new quantity called the mutual information dimension $D_{MI}(\tau)$ is proposed in this paper. Its properties and application in the choice of the best time delay for phase space reconstruction in nonlinear time series of GMS-5 satellite observations are analyzed and compared with the mutual information, first. The results show that the new quantity, $D_{MI}(\tau)$, can be used for the choice of the best time delay. Moreover, further analysis and discussions show that this quantity not only describes how complex the information in the signal is, like the fractal dimension, but also can serve as a new measure of dependence of nonlinear time series, which indicate that it has advantage over the mutual information. Furthermore, like the mutual information, the algorithm of the mutual information dimension is also analytical and efficient in calculations, and thus, it is easy to perform in practice.