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Title: Recurrence plots- an information theoretic approach to solar-terrestr physics

Abstract:

There is considerable interest in developing methods for quantifying exploiting the existence of recurrent patterns within space plasma da The existence of such patterns implies some degree of predictability, characterizing this is often difficult: observational data may be sparse have unsuitably low signal-to-noise ratio. In addition, the physical pro that generate the data may not possess time-stationary properties. O method which deals with these problems is recurrence plot analysis. generic technique involves constructing a 2D graph of dots, the coord of which represent the positions in time of repeated sequences within observed time series. Recurrence plots provide a powerful visualisatic timeseries, revealing the extent of non-time-stationarity and patterns glance. They can also provide quantitative measures of the properties underlying system, such as Lyapunov exponents and entropies. Statis methods can then be applied to quantify the predictability of the syst describe the application of these techniques to the AE index, a time s magnetic measurements at high geomagnetic latitude, which reflects enhancements in ionospheric currents caused by magnetospheric acti next apply concepts from Shannon's information theory to questions coupling and causality in the near-Earth plasma environment. At issu effect of the solar wind, as measured by the WIND spacecraft, on the dynamics of the Earth's magnetosphere, as measured by the AE Inde concentrate on the particular problem of synchronising orbital and gr based measurements with respect to an unknown and variable solar- propagation delay time from the spacecraft's position to the Earth. Va methods for estimating this delay time exist, and are compared here the Shannon mutual information to quantify their degree of success. technique also enables us to identify the flow of information from the wind into the magnetospheric system, quantify it, and visualize contri to it using recurrence plots.

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