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Assessing predictability of observed and modelled global climate data

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We quantify the long-term predictability of mean daily temperature data by means of the Rényi entropy of second order, K_2. The inverse of K_2 has units of time and can be interpreted as the mean prediction horizon/time of the system. The method of recurrence plots is used to calculate K_2 and applied to the CRU data set (interpolated measured monthly mean temperature in the years 1901-2003 with 0.5° resolution) as well as to results from a coupled ocean-atmosphere global circulation model on a coarser resolution of 3.75°. A low-pass filtering of the model data is necessary in order to compare the results with the observed data. Furthermore, the results obtained by means of K_2 are compared with the linear variance analysis and calculation of the correlation dimension D_2. The analysis provides a spatial resolved measure of predictability of the global climate.