Predictability of the Vegetation Cycles over Sahel from AVHRR-NDVI data : distribution of the Horizon of Prediction estimated from

a non-linear analysis

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The NOAA-AVHRR Normalized Difference Vegetation Index (NDVI) data set used here is the last updated and NOAA-16 calibrated data set. Data are extracted over Sahel window [lat: 12.5N – 17.5N; long: 17.5W – 17.5E] and spatially aggregated in windows of $[8\text{km}]^2$ (no aggregation), $[128\text{km}]^2$ and $[1024\text{km}]^2$ respectively, providing sets of time series with 828 samples each.

For each of these scales, characteristic non-linear invariants of the vegetation annual cycles are estimated from the temporal series, say the correlation dimension, the Kolmogorov entropy and the additive noise level. This information is then used to design a prediction algorithm based on the following steps: (1) a NDVI time series aggregated at a given spatial scale is split in two parts: one part to be used for the prediction; the other part is kept for estimating the accuracy of the prediction; (2) Aggregated NDVI time series are embedded in a N_d dimensional space; (3) A non parametric method based on radial basis functions is used to extrapolate the time evolution of the NDVI in the embedding space; (4) The local and average (in the embedding space) predictive performance of this algorithm is evaluated by comparing the predicted NDVI data with the really observed data (2^{nd} part of the time series).

Given an admissible prediction accuracy of the NDVI, we estimate the low order moments of the statistical distribution of horizon of prediction (time lag over which a "good" prediction can be performed) and a descritpion of its saisonalities as a function of the spatial aggregation scale.