Identifying the dependence structure of a process through pooled timeseries analysis

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Geophysical processes are known to exhibit significant departures from time-independence, ranging from short-range Markovian structure to Hurst-Kolmogorov behavior with large Hurst parameters. However, the identification of the dependence structure of a process is subject to many uncertainties, namely model uncertainty and estimation uncertainty particularly arising from the short length of available timeseries. Here we apply the climacogram (i.e. plot of the variance of the averaged process vs. scale) estimation method which has been shown to be the more robust and less uncertain among various stochastic metrics for the characterization of time-dependence. We further investigate the possibility of eliminating the sampling uncertainty by adequately employing all the available information through a pooled timeseries estimation approach, instead of discarding time-series of short length or of high percentage of missing values as typically performed in such tasks. We compare the merits and demerits of each approach as related to the strength of the dependence structure, the number and sample size of the available timeseries.