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A common memory in the climatic series: the alternative divergent trends

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In the processes of detecting geometry in the climatic signal an important uncertainty derives from the limited length of the chronological series in respect to the statistical infinity which must be represented. No historical or proxy time series can be stated as being stationary or not for sure by the mathematicians. A visible trend at secular scale could be in fact part of a quasi –cycle representative for a longer period. Quite often the direction of a trend for certain time intervals was invalidated as new climatic recordings were made. In a similar way, in very long climatic series of proxy data displaying significant trends and quasi –cycles, which appear when analyzing a shorter interval, are masked by noise thus remaining undetected. In this paper we propose a simple method which may allow for the detection of the structural characteristics of a series independent of any subjectivism caused by the length of a time series. The new algorithm decomposes the series in a new fashion not seen yet in the specialized literature. It refers to a succession of sequentially divergent tendencies, following the normal flow direction of time and which alternate in respect to the global mean of the series. They have different lengths, no common points as they are separated by sudden successive positive and negative jumps. This geometry is similar to the fir tree needles or to the feathers arrangement of a bird. Therefore, instead of a global polynomial trend, instead of cycles or of quasi-cycles or instead of parameters indicative of some sort of autocorrelation, the smoothing of a series in the form of divergent and alternating sequential trends turns out to be more adequate as far as the statistically explained variance is concerned. We discovered this characteristic both in the instrumental and proxy series and also in the case of air temperature and atmospheric precipitations. Below we pass in review several series which display a different stochastic structure but which display the same geometry of alternating trends: the Guiot series (1991) – ARMA (2, 0); the Esper et al. series (2002) – ARIMA (2, 1, 1); the Szeicz and Mac

Donald series (1995) – ARIMA (0, 1, 1); the Kirchhefer series (2001) – ARIMA (3, 1, 3). Even Ladurie's series (1983) which rather reflects a random walk ARMA (7, 7) displays the same characteristics. Many other series can be presented in support of the assertion presented in the hereby paper. The interannual temperature instrumental time series analyzed for Central Europe which display more or less evident ARIMA structures can be smoothed in the same manner based on the same model of alternating divergent trends. It is remarkable that the white noise series like the interannual precipitation series for Romanian, Algerian and French stations can be modeled in the form of alternating divergent trends, divided by climatic jumps. The evident conclusion is that, irrespective of the scale (decadal, secular or millennial) the climatic series, either stationary of non-stationary under the periods have a common memory: a succession of alternating divergent trend separated by climatic jumps. This characteristic must be explored for a better understanding of the variability and change mechanism so that we can gain in terms of climatic predictability.