



Effects of the data loss and data homogenization on the long-term properties of the observed temperature data

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We use scaling analysis in the form of a combination of the detrended fluctuation analysis of the second order (DFA2) and the wavelet transform spectral estimation (WTS) to assess how the calculations of long-term properties of time series of historical temperature records are affected by data loss, or by considerable adjustments due to data inhomogeneities. We have analysed instrumental records and publicly available derived regional temperature data of the HadCRUT4 dataset. We have calculated DFA2-WTS scaling exponents for both the adjusted and unadjusted records retrieved from the NCDC Global Historical Climatology Network land stations monthly dataset. In this contribution, we will illustrate results that demonstrate that in both cases of substantial amount of missing data and of considerable homogenization the DFA2 exponents for the adjusted temperature data used in the gridded HadCRUT4 dataset can differ even substantially from that of the raw unadjusted data. We will discuss how the corresponding WTS can help reveal the possible sources of such discrepancies. In order to further illustrate this artificial alteration of the scaling properties we will present and discuss temporal changes in the global pattern of the long-term persistence (LTP) of the HadCRUT4 during the period from 1850 to 2000. Our findings indicate that for a largely predominant part of the HadCRUT4 grid where there is a large percentage of missing values the true LTP is likely higher than the one estimated from the available data.