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Long-term persistence in climate and the detection problem

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We have analyzed six recently reconstructed records and one model record of the temperatures of the northern hemisphere and found that they are governed by long-term persistence. Due to the long-term persistence, the mean temperature variations $\sigma(m, L)$ between L years, obtained from moving averages over m years, are considerably larger than for the uncorrelated records. We compare $\sigma(m, L)$ with the corresponding most recent temperature changes $\Delta T_i(m, L)$ in the instrumental record and determine the first years i_c, above which $R = \Delta T_i(m, L)/\sigma(m, L)$ exceeds a certain threshold. We find that for $m = 30$, $L = 100$, and the threshold 2.5, i_c ranges, for the reconstructed records, between 1976 (Mann99) and 1988 (Jones98), while the model record (ECHO-G) did not yet cross the threshold. In 2004, corresponding to 1990 in the $30\,\mathrm{y}$ moving average, R ranges between 2 (ECHO-G) and 5 (Mann99). Accordingly, the acceptance of the hypothesis that at least part of most recent warming can not be explained only with natural factors, is associated with a very small risk, independently of the data base this assessment is based upon.