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Effects of the 7-8-year cycle in daily mean air temperature as a cross-scale information transfer

Nikola Jajcay (1,2), Jaroslav Hlinka (1), and Milan Paluš (1)

(1) Department of Nonlinear Dynamics and Complex Systems, Institute of Computer Science, Academy of Sciences of the Czech Republic, Prague, Czech Republic, (2) Department of Meteorology and Environment Protection, Charles University in Prague, Prague, Czech Republic

Using a novel nonlinear time-series analysis method, an information transfer from larger to smaller scales of the air temperature variability has been observed in daily mean surface air temperature (SAT) data from European stations as the influence of the phase of slow oscillatory phenomena with periods around 6-11 years on amplitudes of the variability characterized by smaller temporal scales from a few months to 4-5 years [1]. The strongest effect is exerted by an oscillatory mode with the period close to 8 years and its influence can be seen in 1-2 °C differences of the conditional SAT means taken conditionally on the phase of the 8-year cycle. The size of this effect, however, changes in space and time. The changes in time are studied using sliding window technique, showing that the effect evolves in time, and during the last decades the effect is stronger and significant. Sliding window technique was used along with seasonal division of the data, and it has been found that the cycle is most pronounced in the winter season. Different types
of surrogate data are applied in order to establish statistical significance and distinguish the effect of the 7-8-yr cycle from climate variability on shorter time scales.

[1] M. Palus, Phys. Rev. Lett. 112 078702 (2014)

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