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Effects of 7-8yr cycle in European air temperatures via linear and nonlinear approaches

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The climate oscillation with the period of approximately 7-8 years has been detected in number of meteorological records, especially in Europe and north Atlantic. Although its amplitude is generally quite low (around 0.5 C in temperature) and also variable in space and time, a recent study of its cross-scale effect on higher frequency temperature variability showed that its influence on interannual variability can reach up to 1.5 C in annual means, and even 4 C in DJF means [1]. In this study, we systematically compare linear and nonlinear approaches for estimation of the cycle's response in temperature variability. In particular, we will focus on how the amplitude of the 7-8year cycle is related to its cross-scale effect and how this entanglement is varying in seasons and over years, utilizing temporal window approach. This study contributes to the ongoing discussion about the importance of nonlinear phenomena in atmospheric dynamics and their better understanding due to proper analytical methods.

[1] Jajcay, N., Hlinka, J., Kravtsov, S., Tsonis, A. A. & Paluš, M.: Time scales of the European surface air temperature variability: The role of the 7 – 8year cycle. Geophys. Res. Lett., 43, 1–8 (2016).