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Imprints of approximately 8 year oscillation in climatic time series

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Due to activity and complex interaction of various climate-determining agents, a wide range of variability patterns can be found in the meteorological records. Some of these can be attributed to external factors such as changes in solar or volcanic activity; others are linked to internally induced climate variations. Among the perhaps less prominent, yet still potentially influential variability modes is the approximately 8 year oscillation. In the past, its presence has been reported in various (particularly European) climate records, typically related to temperature or pressure data. Here, the presence of the approximately 8y cycle has been investigated in climate signals originating from a range of observational, reanalyzed and simulated datasets. Through statistical techniques based primarily on wavelet transform and regression analysis, magnitude and statistical significance of the approximately 8y oscillation were evaluated, as well as its temporal stability and geographical patterns. In addition to confirming a statistically significant presence of the approximately 8y periodicity in the mean temperature series over a large part of Europe, its existence has also been demonstrated for minimum and maximum temperature series, while only limited traces were found in precipitation data. The analysis of long European temperature records has revealed a distinct multidecadal variation of the magnitude of the approximately 8y oscillation, although the specific mechanism responsible for this behavior still remains unclear. A link of the approximately 8y component in the index of the North Atlantic Oscillation to near-ground temperatures has been detected for much of Europe as well as some areas in the North Atlantic region. Finally, the presence of the approximately 8y cycle in the general circulation model outputs has been investigated: while some indications of the 8y oscillations were found in the simulated data, they seem generally weaker than in their observational counterparts.