



Evaluating the significance of weekly cycles in temperature

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It has been shown that some forms of pollution vary on weekly timescales, for example aerosol levels and tropospheric ozone. Thus it is reasonable to question whether meteorological variables such as temperature and precipitation may exhibit weekly cycles as well. We have analyzed temperature data for weekly cycles across the United States and found weekly cycles in some seasons and time periods that satisfy commonly used statistical tests for significance. However, further testing of other cyclic periods that should not have an anthropogenic component (e.g., six-and eight-day cycles) has made clear that apparently significant cycles can arise from natural phenomena. These arise from natural oscillations in the time series imposed by weather systems. The temporal and spatial autocorrelation inherent in the system can cause these signals to appear coherent in time-averages at single locations and over regions. In fact, eastward propagation of the "weekly" cycle is evident at many "weekly" periods. The difficulty of significance testing of weekly cycles will be discussed along with common pitfalls in analyzing weekly cycles. Evidence is presented that cautions against ascribing weekly cycles in temperature across the United States to anthropogenic activity.