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11-years cycle in reanalyzed datasets: a comparison of spatial frequency patterns detected in NCEP/NCAR and ERA-40 temperature series

P. Pisoft

Charles University in Prague, Faculty of Mathematics and Physics, Department of Meteorology and Environment Protection, Praha 8, Czech Republic (petr.pisoft@mff.cuni.cz)

In the presented study, we describe detailed comparison of frequency analysis of NCEP/NCAR and ERA-40 reanalyzed temperature series. The series were analyzed by the pseudo-2D wavelet transform that provides maps of spatial distribution of specified oscillations together with information about temporal evolution of the detected frequency patterns. The analysis was focused on oscillations with periods of 10+, 11+ and 12+ years (the sign plus implies that the periods are not set by one exact value but they are defined as an interval of periods with a mean values about 10, 11 and 12 years). The temperature fields were studied at 17 geopotential levels from 1000 hPa to 10 hPa.

Role of variability of the incoming solar radiation that is linked with the variability of the sunspot cycle is generally considered to be very important for our climate system. However, specific influence is still being unclear in many ways and it is discussed/analyzed by numerous papers. To assess consequences of the sunspot cycle variations, it is necessary to analyze available datasets first. Most of the related studies utilize reanalyzed datasets to achieve that, but the series reliability in sense of detailed frequency characteristics still needs to be studied. The comparison presented in this analysis is a contribution for such evaluation of the reanalyzed datasets.

Study of 11+ years oscillations shows that the cycle is detected over extensive regions. Those are mostly equatorial areas. Nevertheless, the results differ significantly for some regions that are identified in the NCEP/NCAR and ERA-40 reanalysis. That indicates that a study utilizing a reanalyzed dataset should compare the results with an analysis of another type of reanalysis and the result should not be interpreted without careful discussion.