



“2D” wavelet transform of NCEP/NCAR reanalysis datasets: first steps in discovering worldwide frequency patterns

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Wavelet transform is a powerful mathematical tool that is being used in climate research for years. However, in case of time variability analyses, this technique has been applied only on particular time series and has provided geographically specific results.

In this study, to achieve general information about the worldwide time-frequency pattern, 1D wavelet transform has been used to analyse all NCEP/NCAR data grids for 1951-2000. The transform has been computed for individual series. Then some specific regions of frequency spectra have been chosen to create other time series (time series of specified frequency zone for definite geographic points, e.g. time series characterizing 8-years periodicity for the 22.5N 97.5W grid point). Those have been put together in one big cube defined by time, longitudes and latitudes. Particular geographical grids with marked regions of some interesting frequency behaviour have been then created as time slices of this cube of numbers. NCEP/NCAR reanalyses datasets contain huge amount of information that require long logistic and computation time. For this reason, only results of temperature fields of 850 hPa geopotential height transform are presented for now.

The results illustrate varied time-frequency characteristics across the whole world. They point up geographical regions of different (or similar) distinct periodicities that occurred during different years. The results are presented as 2D/3D graphs and movies that demonstrate both the time and the geographical regions of noticeable frequency patterns.