Some effects of time filtering on climate circulation indices

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The goal of this study is to evaluate the effects of different temporal averaging timescales on the structure of the wintertime mid-tropospheric teleconnection patterns using the ECMWF 40-year Reanalysis (ERA-40 henceforth) for the period December 1957-March 2002). Teleconnection patterns have been identified by applying a Rotated Empirical Orthogonal (REOF) analysis to 500-hPa geopotential field. The sensitivity to the number of retained unrotated modes have also been examined. Three different datasets have been used to check the impact of data averaging in the computation of climate indices: 10-day low-pass filtered, 30-day low-pass filtered and monthly 500-hPa anomalies. The varimax rotation has produced results that agree with previously identified in NCEP-NCAR re-analyses with a similar percentage of fractional variance. The largest fraction of variance is explained by the North Atlantic Oscillation (NAO), while smaller fractions are explained by other patterns of large scale variability as the Pacific-North American (PNA), the West Pacific pattern (WP) and the Scandinavian pattern (SCA).

As far as the WP and the PNA modes are concerned, all the implied datasets exhibit a great similarity. In this case, it seems that the characterisation of atmospheric variability in the Pacific is not so dependent upon the time filtering applied to the data. A certain degree of sensitivity of the NAO-Artic Oscillation (AO) and SCA patterns to time averaging has been detected. While in some datasets, the NAO-AO pattern is similar to the canonical pattern, when different averaging is applied a shift of the dipole appears. This shift is a funcion of the number of retained unrotated modes. Similar features are found in SCA. Little sensitivity to the number of unrotated modes

has been detected when using monthly mean data. This indicates that the monthly averaging filters out a certain amount of the variability that produces uncertainty in the estimation of climate indices.