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Regimes of the northern hemisphere mid-latitudes in the NCEP and ERA40 reanalyses

P.M. Ruti (1), V. Lucarini (2), A. dell'Aquila (1) and S. Calmanti (1)

(1) Progetto Speciale Clima Globale, Ente Nazionale per le Nuove Tecnologie, l'Energia e l'Ambiente, Roma, Italy, (2) Dipartimento di Matematica ed Informatica, Università di Camerino, Camerino (MC), Italy. (paolo.ruti@casaccia.enea.it / Fax: +39 06 30484264 / Phone: +39 06 30484886)

We compare 45 years of the re-analyses of NCEP-NCAR and ECMWF in terms of their representation of the mid-latitude winter atmospheric variability for the overlapping time frame 1957-2002. We adopt the approach of computing spectral indexes, which are theoretically based on the assumption of the existence of multiple regimes. These indexes identify the low and high frequency variability component of the winter Northern Hemisphere. We consider the two re-analyses as independent realization. The results of the analysis confirm the bimodal nature of the planetary waves amplitude in the Northern Hemisphere winter. Discrepancies are found between the two re-analysis in the inter-annual variability of the low frequency and high frequency indexes. Common to both re-analyses, it has also been observed a difference in the first 15 years and the rest of the records. This implies that in the first period both the datasets have a different representation of the baroclinic available energy conversion processes and interaction with planetary waves, which affects the bimodal probability density function. These results are also discussed in the context of the time-varying density of the assimilated data. This study is also a preliminary test for some of the methodologies and diagnostics tools which will be employed in the broader context of a sub-diagnostic project presented to the Program for Climate Model Diagnosis and Inter-comparison (PCMDI), sponsored by the Intergovernmental Panel on Climate Change Assessment Report 4 (IPCC-AR4).