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# Barotropic and baroclinic energy conversions associated with planetary wave forcing of the northern stratospheric polar vortex

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An analysis of the energy conversion of barotropic and baroclinic planetary waves for extended winter in the extratropical Northern Hemisphere is presented. The analysis is based on a three-dimensional normal mode expansion of the global circulation of the atmosphere (Castanheira et al. 2002; Liberato et al. 2007). This method allows separating the atmospheric circulation into planetary (Rossby) and inertio-gravity waves as well as characterising each type of wave by the respective zonal, meridional and vertical structures. The 3-D normal mode scheme further allows evaluating the contribution of each type of wave for the global total (i.e., kinetic + available potential) atmospheric energy.
A brief overview of the normal mode energetics of the global atmospheric circulation is given, focusing on the energy conversions between barotropic and baroclinic components of different vertical and horizontal scales. The methodology is applied to the global NCEP/NCAR (National Centers for Environmental Prediction / National Center for Atmospheric Research) reanalysis data set, using extended winter (November to March) daily means of the horizontal wind components (u, v) and of the geopotential height, at the 17 standard pressure levels, with the spatial horizontal resolution available (2.5º regular grid) and spanning the period 1957-2008.
Obtained results are then used to relate the variability of the stratospheric polar vortex to the variability of the energy of the forcing planetary waves. Barotropic and baroclinic energy conversions associated with planetary wave forcing of the northern winter polar vortex are finally analysed, during rapid stratospheric vortex decelerations and accelerations.

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