Geophysical Research Abstracts, Vol. 8, 08811, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08811

QBO modulation of the high latitude circulation in ERA40 and MAECHAM5 simulations

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The MTM-SVD (Multi Taper Method-Singular Value Decomposition) method is used to analyse the seasonal variation of the QBO modulation of the stratospheric polar vortex in both hemispheres. The QBO spatial pattern in the zonal wind and the patterns of the signal generated in the vertical and meridional wind, temperature, Eliassen Palm (EP) flux and momentum advection are reconstructed for each season and for two different datasets: data from the high vertical resolution configuration of the atmospheric general circulation model MAECHAM5 (M5) and from the ERA40 reanalysis. The datasets cover a 21-year period (1979 -1999) and extend from 100hPa to 0.1hPa for ERA40 and from 100hPa to 0.01hPa for M5.

For both datasets, the QBO modulation of the northern hemisphere polar vortex occurs, mainly, during the winter, when planetary waves are able to propagate vertically and disturb the vortex. For both, ERA40 and M5, the easterly (westerly) QBO phase is associated with EP flux convergence (divergence) at high stratospheric levels. EP flux convergence, related to planetary waves breaking, appears associated to the deceleration of the vortex and also to the generation of a northward and downward circulation that warms the polar stratosphere below the convergence level. Less intense anomalies in the northern high latitude circulation are also detected during the spring.

QBO modulation of the southern hemisphere polar vortex appears to be more intense during the southern spring for ERA40 and M5, being November the month with highest anomalies in the ERA40 reanalysis. Detected anomalies are less intense and reach their maximum at lower levels than in the northern winter case. Also, important differences are found between the signal reconstructed with ERA40 and M5 datasets.