

The influence of the equatorial *Quasi-Biennial Oscillation (QBO)* on the wave activity in the Northern Hemisphere winter atmosphere

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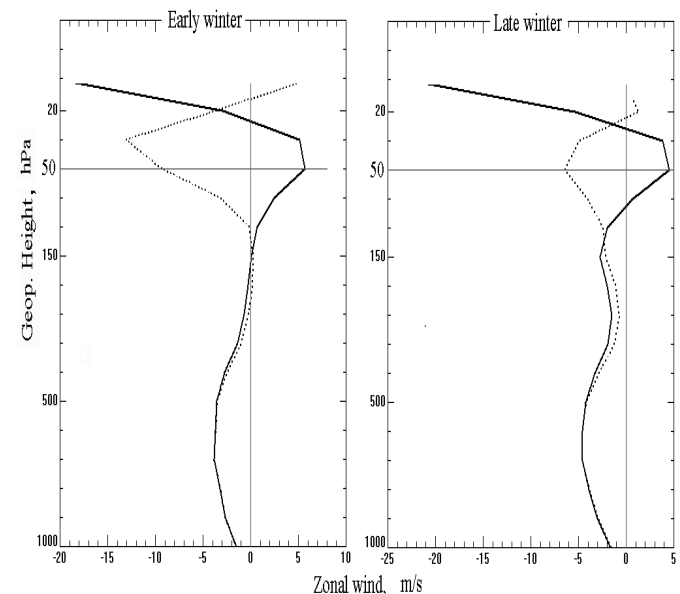
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Hypothesis

It is proposed that the winter Polar vortex strength is modulated by the equatorial stratospheric zonal wind QBO (Holton J.R. et al. 1980). The modulation is provided by the vertically and meridionally propagating planetary waves.

When the equatorial winds are easterly the effective wave guide is narrower and the wave activity at middle and high latitudes tends to be greater. This leads to greater wave-induced drag on the mean flow and reduces westerly winds.

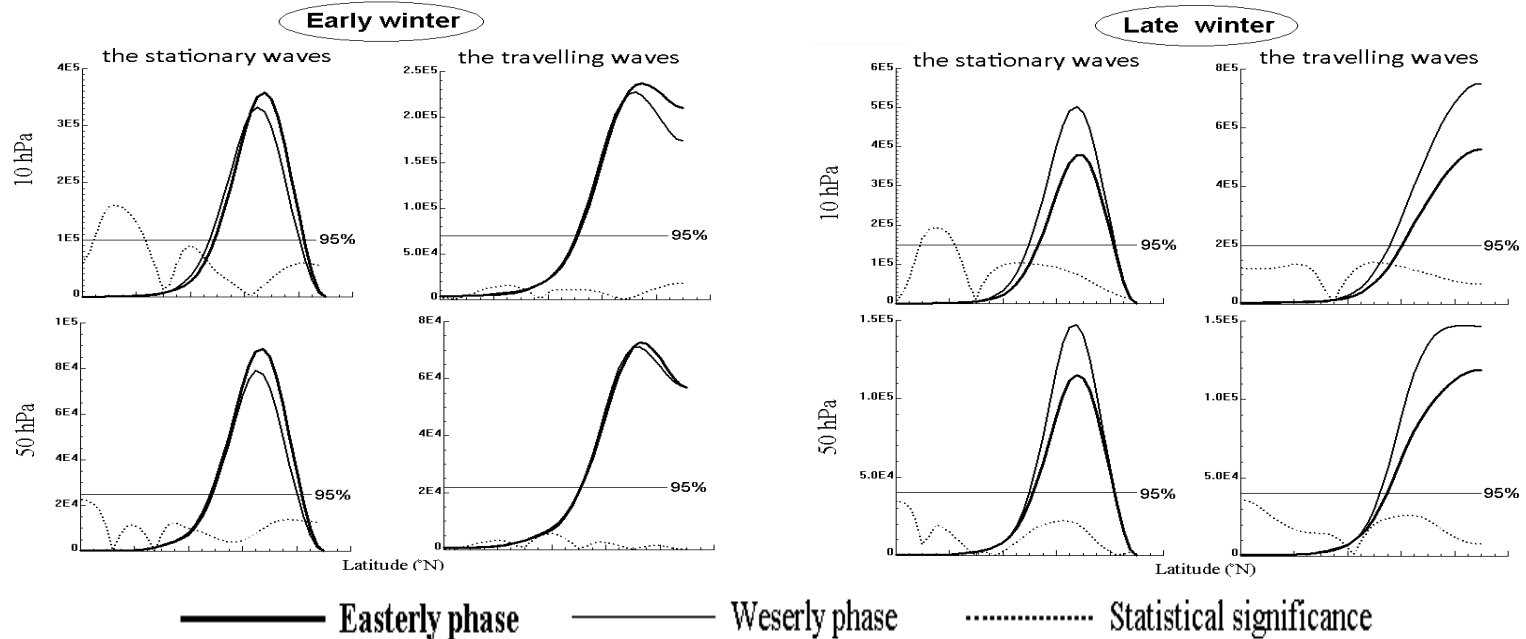


————— Westerly phase
..... Easterly phase

Purpose of this study

- To examine the “wave” hypothesis. For that we compared the planetary wave amplitudes calculated for westerly and easterly phases separately.

Data: The daily NCEP/NCAR Reanalysis data from 1960 to 2005 in the grid points $2.5^0 \times 2.5^0$.



Results

In early winter the results are on the whole in agreement with the “wave” hypothesis.

In late winter the results are totally different from expected. The wave activity level is higher during westerly phase of the QBO (when the Polar vortex is strong).

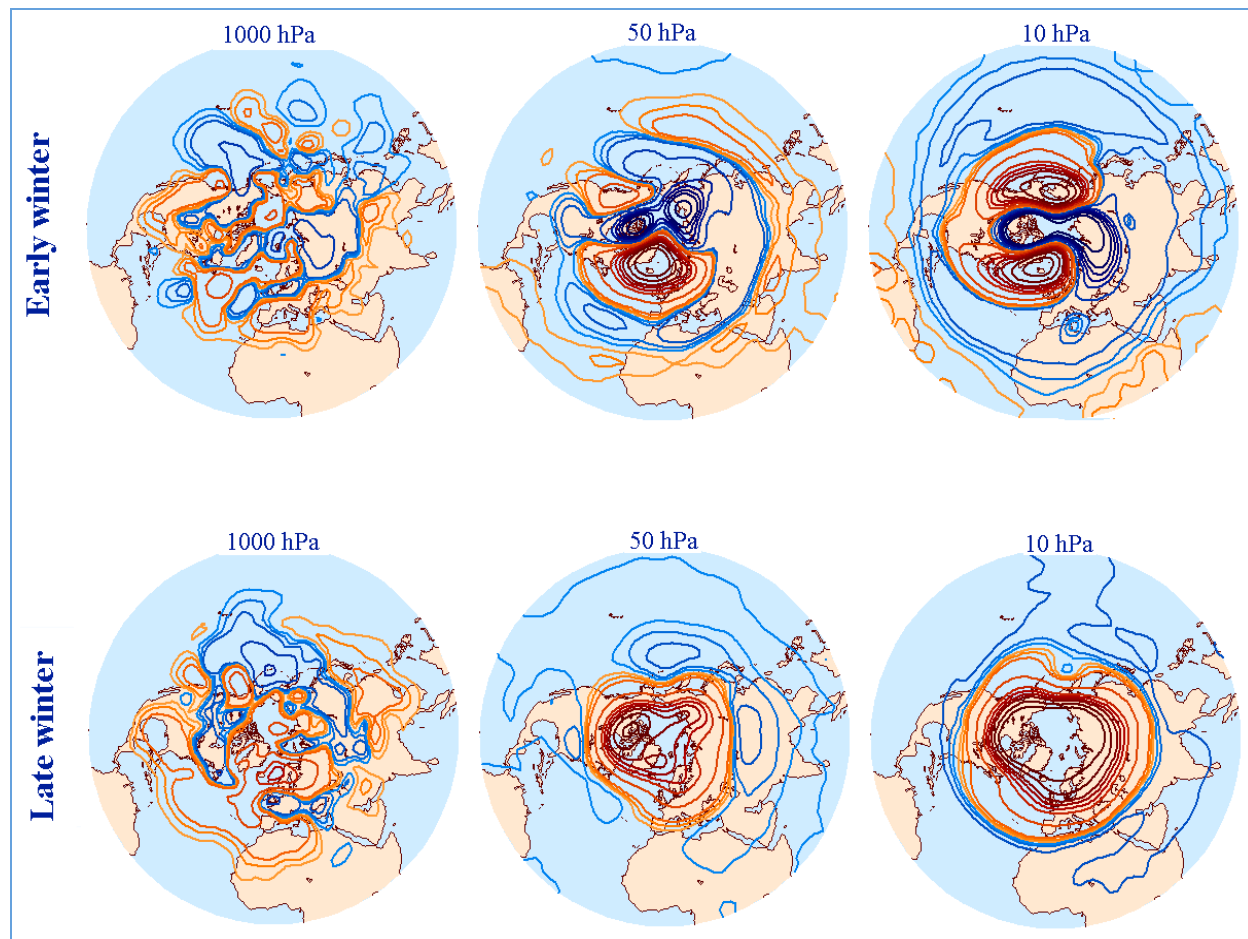
It is interesting also that the sign of the wave activity differences is the same for both 50 hPa and 10 hPa levels in spite of the fact that the equatorial QBO phase on 50 hPa is opposite the phase on the 10 hPa.

Additionally we investigated the spatial structure of the wave activity QBO in the Northern Hemisphere winter atmosphere. For that the differences of wave activity (westerly phase – easterly phase) were accounted.

Results

In early winter in the stratospheric polar region during easterly phase the wave activity is higher. Over Northern Eurasia the wave activity is also higher during easterly phase. Moreover not only in the stratosphere but in the troposphere also.

In late winter in the polar and middle latitudes the wave activity is higher during westerly phase of the QBO.



**Thank You for
attention!**