



Did the strong 1998 ENSO event impact the stratospheric QBO?

Bo Christiansen, Shuting Yang, and Marianne S. Madsen

Danish Meteorological Institute, Center for atmospheric physics and observations, Copenhagen, Denmark (boc@dmi.dk)

Although there in general is no significant correlations between the QBO and the ENSO, observations show that the QBO in the 4-5 years after the strong El Nino event in 1998 was aligned with the ENSO.

In this paper we study the possible connection between the QBO and the ENSO with a new version (v3) of EC-Earth which includes non-orographic gravity waves. We analyze the modelled QBO in ensembles consisting of 10 AMIP-type experiments with climatological SSTs and 10 experiments with observed SSTs. The model experiments cover the period 1982-2013 and validation is done by comparing to reanalysis data.

We show that the modelled QBO is well-behaved with a power-spectrum closely resembling the observed. As expected the coherence is strong and statistically significant in the equatorial troposphere in the ensemble with observed SSTs. Here the coherence is a measure of the alignment of the ensemble members. Regarding the QBO we find in all years a stronger coherence of equatorial zonal winds in the stratosphere in the ensemble with observed SSTs than in the ensemble with climatological SSTs. More notably, in the ensemble with observed SSTs we find a strong and significant alignment between the equatorial stratospheric zonal winds in the period 1998-2002. No such events are found in the ensemble with climatological SSTs. This strongly indicates that the strong El Nino event in 1998 has influenced the QBO and the stratospheric circulation.

We will further study the mechanism by analysing the wave-forcing in observations and model ensembles. We will also include similar ensemble experiments with HadGEM3-A.