The Representation Of The Qbo And Its Effects In Modern Climate Models

Scott OSPREY[1#+], James ANSTEY[2], Neal BUTCHART[3], Kevin HAMILTON[4]
[1] National Centre for Atmospherice Science, University of Oxford, United Kingdom, [2] Environment Canada, Canada, [3]Met Office Hadley Centre, United Kingdom, [4] University of Hawaii, United States
[#]Corresponding author: Scott.Osprey@physics.ox.ac.uk [+]Presenter

The Quasi-biennial Oscillation (QBO) - the dominant mode of variability in the tropical stratosphere - has been studied extensively for over 60 years. It has well-known wintertime teleconnections to high latitudes, includes redistribution of important trace gases from the tropics, influences the Polar Night Jet and is important for skillful seasonal forecasts. The chief characteristic of the QBO is its metronome-like behavior: exhibiting alternating eastward and westward winds, every 28 or so months. Current understanding is underpinned by a paradigm of small and large scale waves roiling up from tropospheric convection, and wave interactions with the stratospheric winds. Outstanding questions relating to the QBO have been limited to details of wave-type, their ascent from the lower atmosphere and eventual breakdown - or so we thought.

The NH winter of 2015/2016 saw a disruption to the QBO and with it our preconceived notions of its behaviour. The disruption cannot be explained by the upward motion of waves, but instead by Rossby wave incursions from higher latitudes. None of the major seasonal forecasting centres predicted the event, although a recovery is suggested. Presently, the conditions supporting the disruption are not completely understood. However, evidence is emerging of an increase frequency of similar disruptions in the future.

A major modelling effort is underway to better understand the QBO. The Quasi-biennial Oscillation initiative (QBOi) involves all the major relevant modelling centres. We will discuss results from a model intercomparison examining the effects of interannual variability and climate change on the QBO and the ability of models to capture the recent past. QBOi will not showcase contemporary GCMs abilities to model the QBO, but also identify their capability for reproducing disruptions similar to those seen in 2016.