Prediction of the quasi-biennial oscillation (QBO) with a multi-model ensemble of QBO-resolving models

Tim STOCKDALE[1], Young-Ha KIM[2], James ANSTEY[3], Adam SCAIFE[4,5]

[1] *European Centre for Medium-Range Weather Forecasts, Reading, UK*

[2] *Ewha Womans University, Seoul, South Korea*

[3] *Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change Canada, Victoria, British Columbia, Canada*

[4] *Met Office Hadley Centre (MOHC), Exeter, UK*

[5] *Department of Mathematics, University of Exeter, Exeter, UK*

The high predictability of the quasi-biennial oscillation (QBO) of tropical stratospheric winds offers potential to improve seasonal and multi-year forecasts of phenomena such as the North Atlantic Oscillation (NAO) and Madden-Julian Oscillation (MJO) that are observed to co-vary with the QBO. Fully realizing this predictability will require models that accurately represent both the QBO and the mechanisms underlying QBO teleconnections. Using a multi-model ensemble of QBO-resolving atmospheric general circulation models coordinated by the SPARC QBO initiative (QBOi) activity, hindcasts for May and November start dates during the 1993-2007 period are assessed for their ability to predict the detailed evolution of the QBO, as well as their representation of QBO teleconnections. Although the models tend to show high prediction skill in the "core" QBO region of 20-50 hPa, above and below this region the skill varies more widely. QBO amplitude is not as well predicted as QBO phase, and a number of models lose amplitude rapidly (within 3-4 months) at the lower levels. How important such structural errors in the QBO are for impacts on tropospheric predictability is not yet clear.

Since all models remain close to the initialized state within the first month, the forcing of the QBO can be compared across models under very similar mean-flow conditions, and is seen to vary substantially among models for both resolved and parameterized processes. This provides a methodology to explore model differences, with the aim of better understanding what is needed to accurately model and predict not only the phase, but also the amplitude and vertical structure of the QBO.

Key words: predictability, teleconnection, QBO, NAO, seasonal forecast