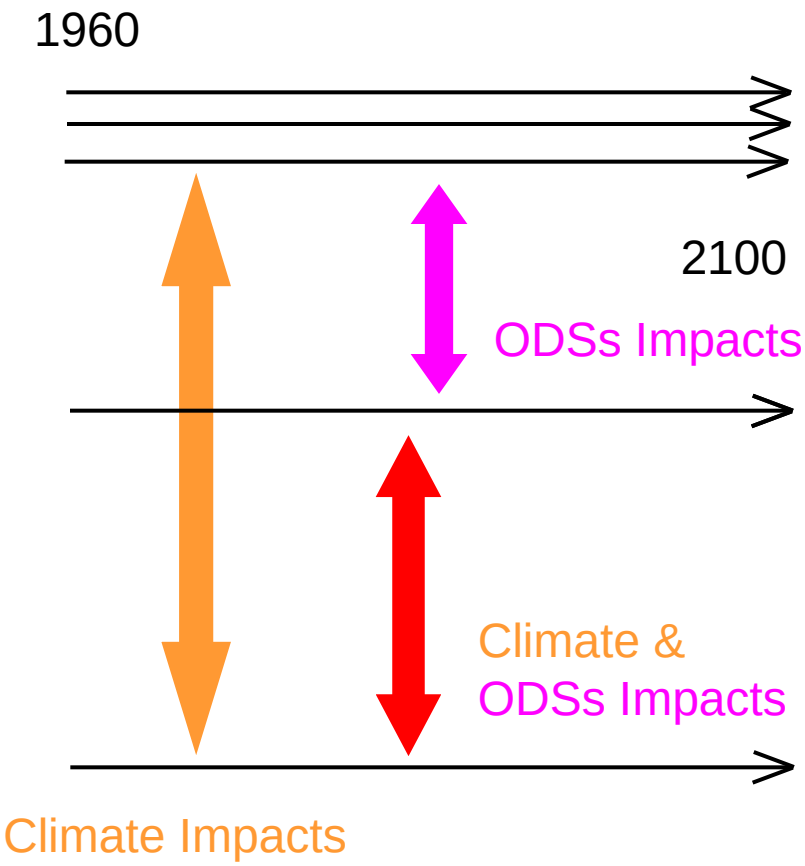
Gravity wave drag effects on the future quasi-biennial oscillation in the tropical stratosphere under greenhouse gas increase up to year 2100: Simulations with a chemistry-climate model

Kiyotaka Shibata and Makoto Deushi
Meteorological Research Institute, Tsukuba, Japan

Outline

- MRI-CCM
- CCMVal-2 simulations
- Overall climate changes
- Changes in QBO
- Summary

Reference and sensituvity simulations in MRI for CCMVal-2



REF-B2, 3 members

Observed+Simulated SST, GHGs, ODSs

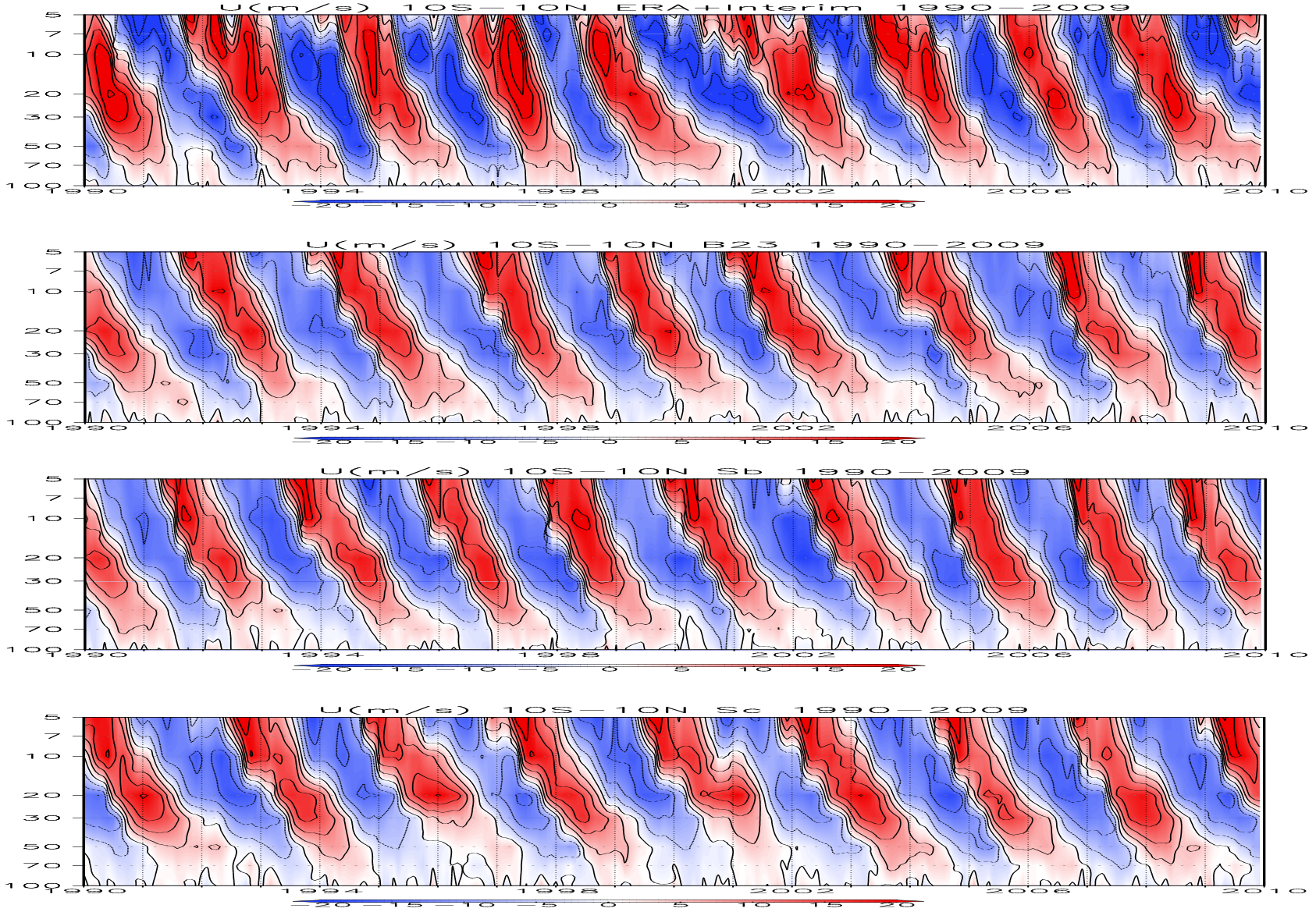
SCN-B2b, 1 member

Modeled+Simulated SST, GHGs, Fixed ODSs

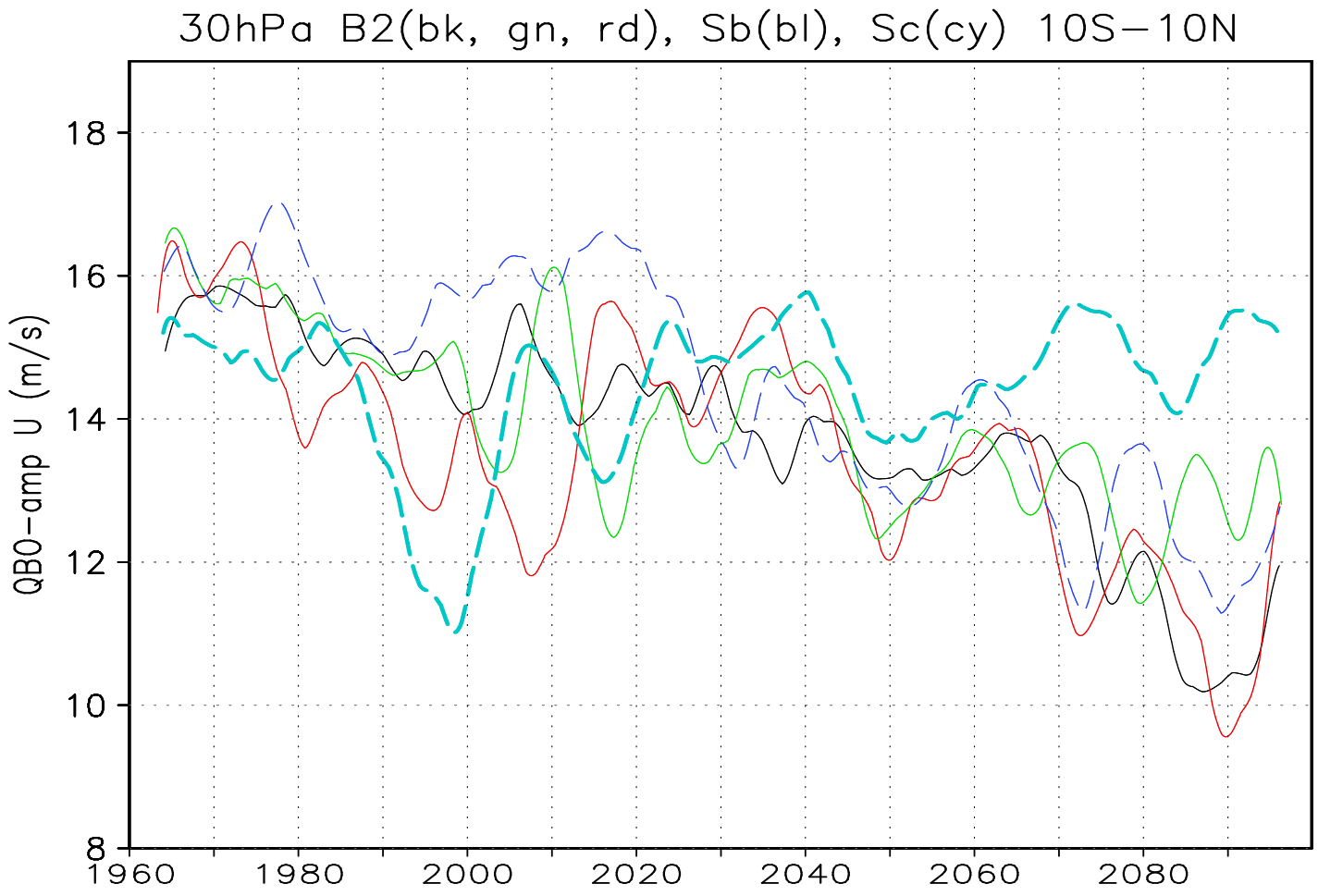
SCN-B2c, 1 member

Fixed SST, Fixed GHGs, ODSs

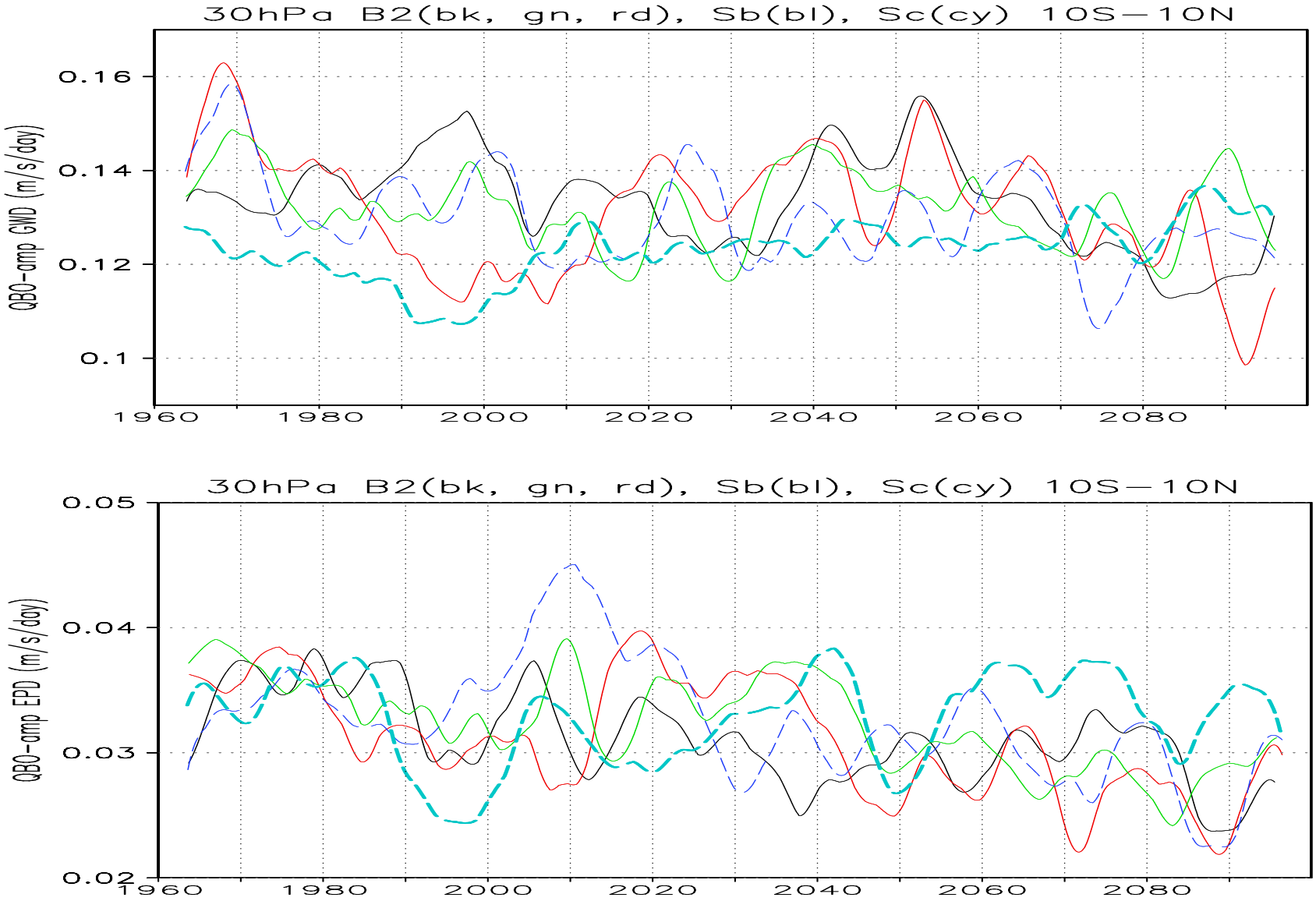
Zonal wind in the tropics



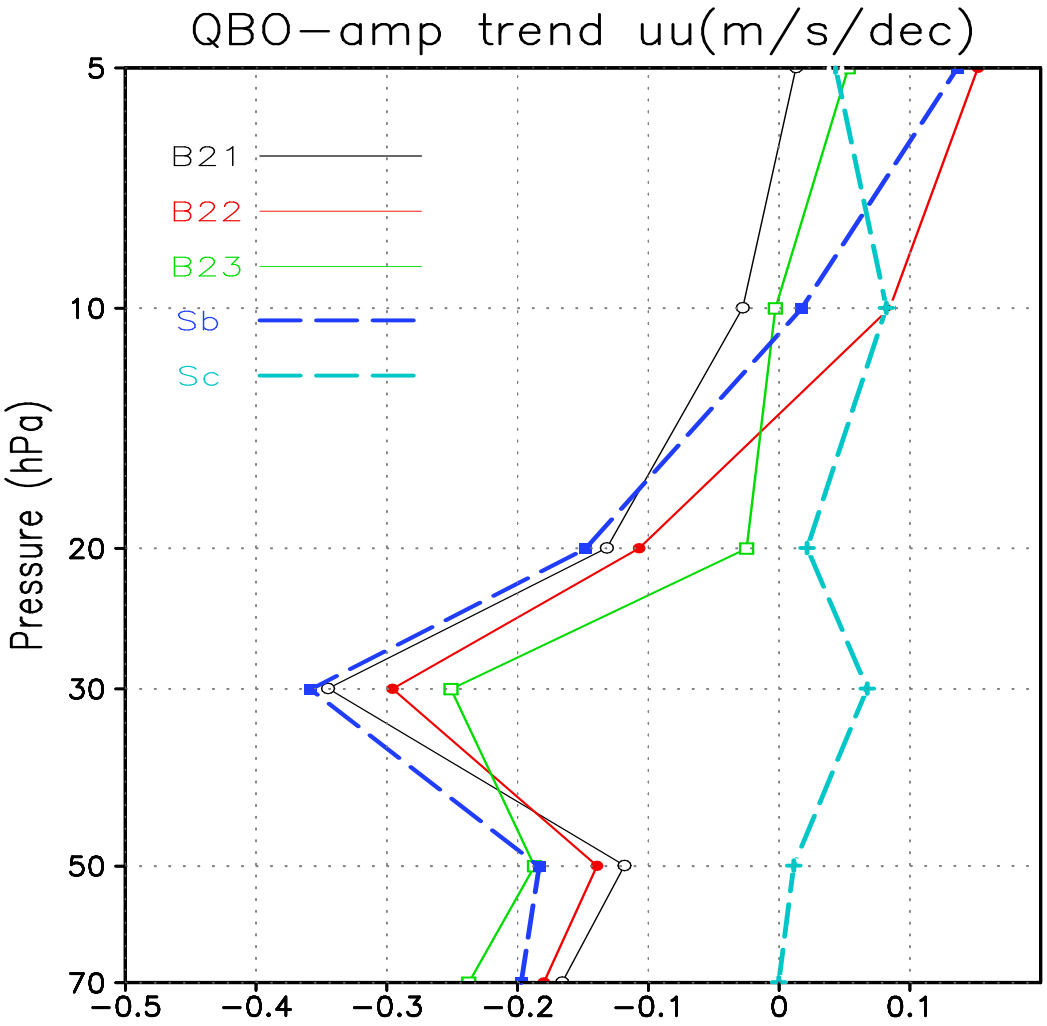
Evolution of QBO amplitude at 30 hPa



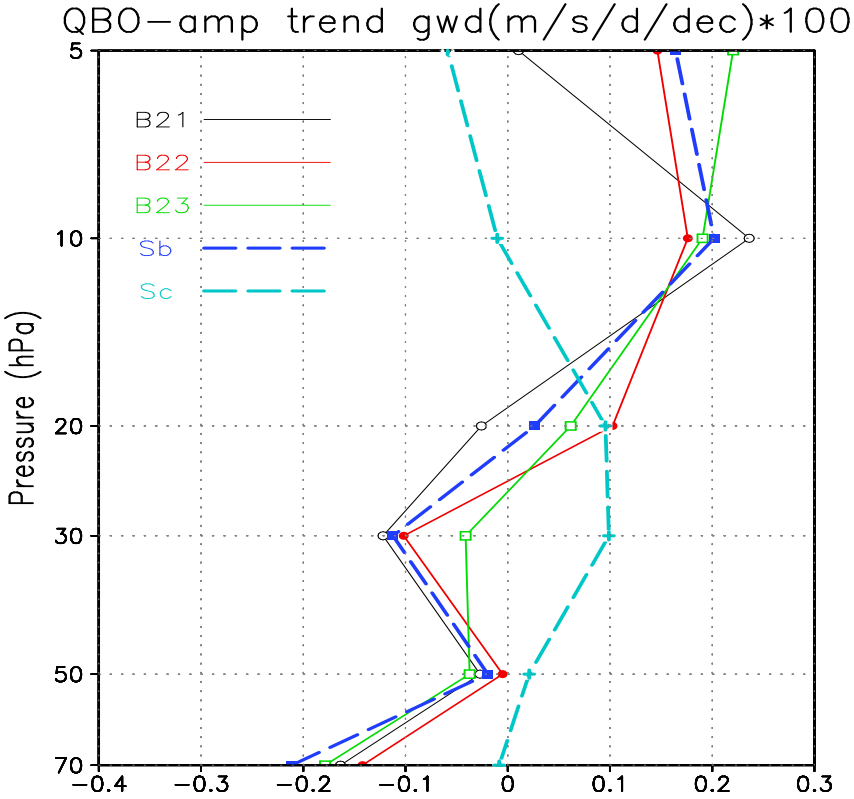
Evolution of GWD & EPD amp at 30 hPa

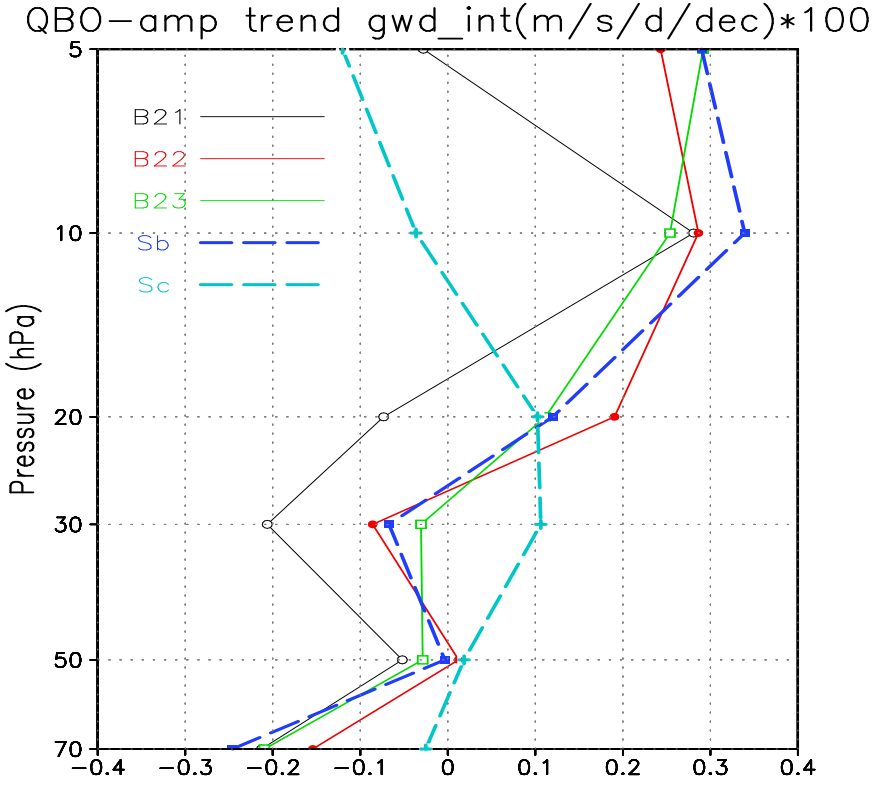


QBO-amp trend: U-wind

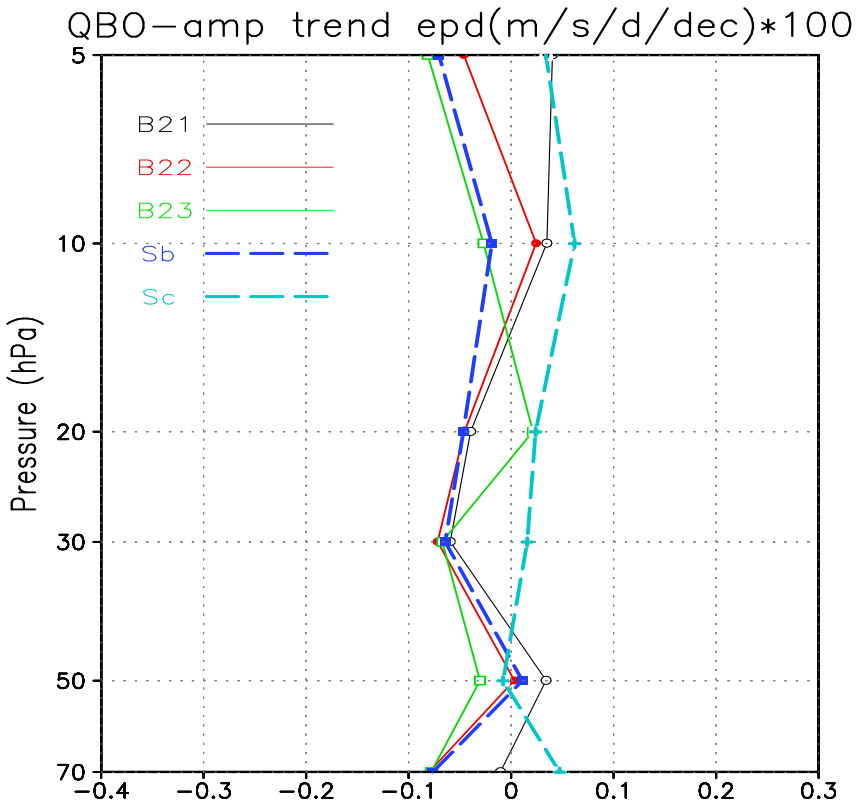


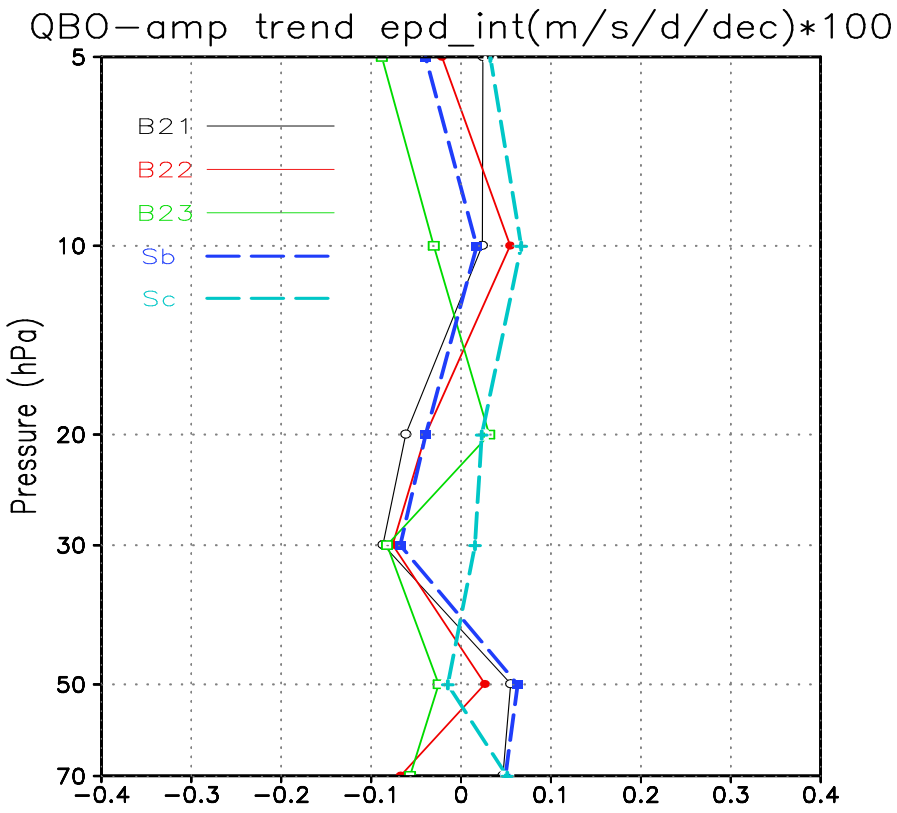
QBO-amp trend: GWD



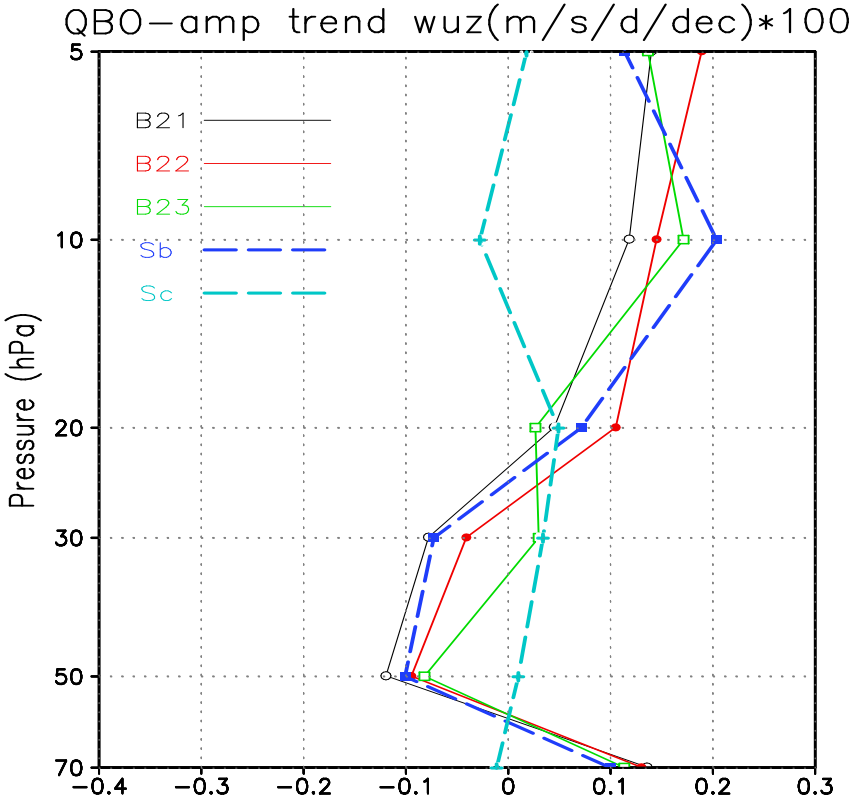


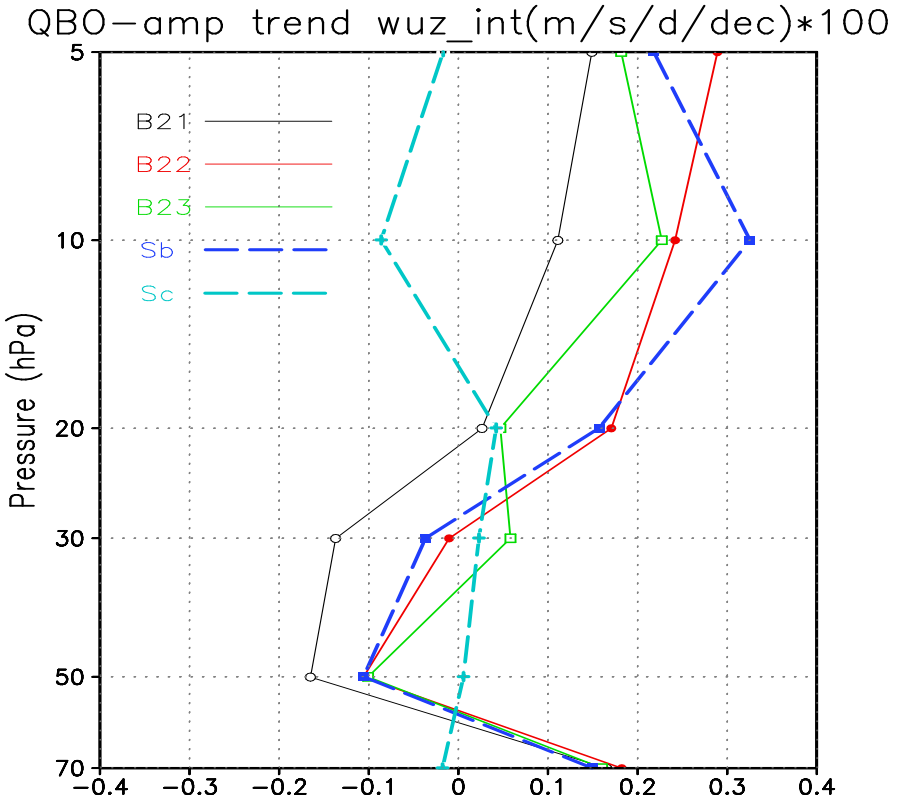
QBO-amp trend: EPD





QBO-amp trend: vertical advection





Summary

- Transient simulations were made from 1960 to 2100 using the CCMVal scenarios: REF-B2, SCN-B2b (fixed halogens), SCN-B2c (fixed climate).
- In the changing climate runs (REF-B2 & SCN-B2b) the QBO amplitude was decreased, while it was almost constant in the fixed climate run .
- QBO major frocings, parameterized gravity waves , resolved waves, and vertical advection were all related with the QBO amplitude decrease.
- Causality ?