

Plain Language Summary: We investigate the impact of vertical discretization method and vertical resolution on Quasi-Biennial Oscillation (QBO)-like oscillations that can occur in mechanistic general circulation models (dry GCMs). Two models are compared: vertical finite difference (VFD) model and three-dimensional spectral (3DS) model, with all settings identical except for the vertical discretization method. The 3DS model does not generate any QBO-like oscillations. The VFD model generates QBO-like oscillations in the low vertical resolution setting, but not in the high vertical resolution setting. In the models where QBO-like oscillations do not occur, eastward wind regions are formed, which suppress the upward propagation of the eastward moving waves.

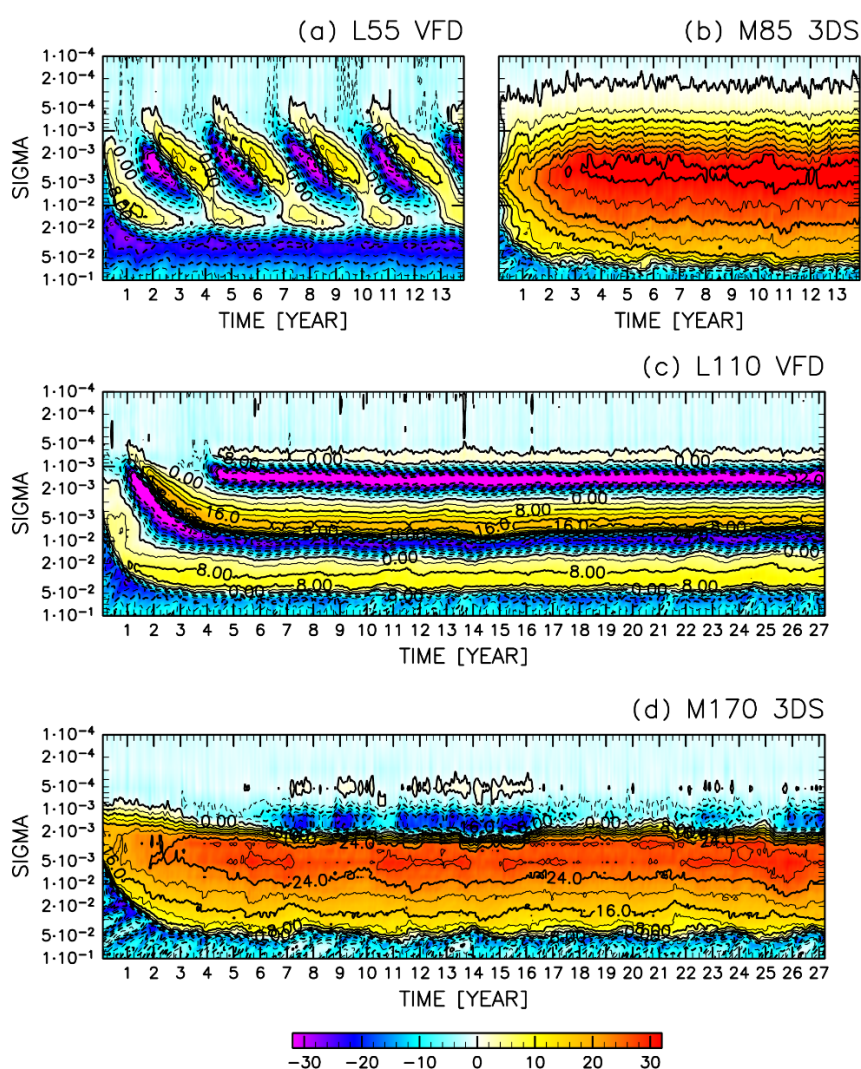


Figure 1. Time-sigma cross section of zonal mean zonal wind averaged in 2°S – 2°N (unit is m s^{-1}). The horizontal axis is the model year (360 days) and the vertical axis is the sigma, i.e., the pressure divided by the surface pressure. The contour interval is 4 m s^{-1} . (a): VFD model with low vertical resolution, (b): 3DS model with low vertical resolution, (c): VFD model with high vertical resolution, and (d): 3DS model with high vertical resolution.

- Analyses of the wave contribution to the vertical momentum flux show that the strength of upward propagating eastward moving waves depends not only on the realized zonal wind structure, but also on the vertical resolution.
- Transformed Eulerian mean analyses for the VFD model show that the acceleration due to the vertical component of the Eliassen-Palm flux varies with the vertical resolution.
- We speculate that the representation of wave-mean-flow interactions is altered by the vertical resolution.