

Interactive comment on “Stratospheric Variability at a glance – Analysis of the intra decadal timescale and the QBO” by Duy Cai et al.

Anonymous Referee #3

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The purpose of this paper is unclear to me. Comparing two versions of an atmospheric general circulation model (AGCM), one with high vertical resolution and one with coarse vertical resolution (and no other difference between the model versions), it is shown that power at the QBO frequency is absent in the model with coarse vertical resolution. The importance of vertical resolution for simulating the QBO is already a well known result in the QBO literature. It is then shown that the coarse model shows weaker mixed-Rossby-Gravity wave (MRGW) activity than the fine-resolution model and ERA-Interim. This is expected from linear wave theory, and is shown in this paper but it is also well known from the literature (including studies cited here). It is then surmised that inadequate representation of the MRGW is responsible for the lack of a QBO in the coarse model. No calculations of the zonal momentum forcing due to resolved waves are presented, so it is left unclear whether the forcing from MRGW is

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important relative to other wave types. Gravity waves are not discussed at all, except to be given cursory mention in the final paragraph of the conclusions, and it's not stated whether the model uses parameterized non-orographic gravity wave drag although I imagine that since the horizontal resolution is relatively coarse (T42) it probably does.

The quality of writing is generally good, and the figures are clearly presented. The authors cite most of the relevant literature. However, since the results do not appear to add anything new to the literature on the QBO, I must recommend rejection of this paper.

Here are a few other comments by line number:

90-106: The power spectral method is not clearly described. It's not explained why the calculation is done for 10-year segments in continuously shifting windows. At line 105, it's not clear what "independent realizations" means in this context.

153-154: Why is a statistical significance test used (for ERA-Interim, Fig 2)? It's reasonably well established that the QBO exists.

178: How big is a "significant fraction" of the zonal momentum forcing? Why is there no mention of gravity waves?

331: "To conclude, this work shows that in the context of decadal predictions the QBO has an important role." Decadal predictions of what? If the troposphere, this has not been shown.

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