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

Reply Anonymous Referee #2:
We want to thank Anonymous Referee #2 for the comments. And we appreciate your suggestions. Indeed, the finding of a vertical threshold for the vertical resolution of GCMs are well known. However, to our opinion our manuscript presents different aspects and novel approach to arrive to this well known conclusion. May we briefly summarize these aspects and explain our approach.

We started with the analysis of the intra decadal power spectrum and could show the domination of the QBO in the spectrum. To our knowledge this is the first time that the relevance of the QBO has been addressed by power spectral analysis for the intra decadal time scale. The decadal time scale is our motivation, and therefore the title and introduction could mislead the reader. So in a revised version we would make this more clear.

The missing QBO signal in the lower resolution model for the intra decadal power spectrum is expected due to the fact that the vertical model resolution is coarser than 2 km. Also the followed analyses using the method of Wheeler and Kiladis (1999) of symmetric and antisymmetric power spectrum is not novel. However, we now can point out that a low vertical resolution of the model lacks of representing the antisymmetric wave spectra, in particular the power of the MRG waves were under represented. From ERAI data we derived the statistically relevant waves in the antisymmetric wave spectrum. Following linear wave theory these relevant waves are characterized by a certain range of equivalent depth. This certain range of equivalent depth we use as input for our calculation for the vertical wavelengths of MRG waves. With this calculation we can show that the wave spectrum of MRG waves derived from ERAI, needs at least to resolve waves with a vertical wave length of 2 km. For alls numerical models in general, this means that the vertical model discretization need to be less than 1 km in order to resolve the relevant wave spectrum of MRGW. These aspects of MRG waves, the approach which lead to this finding is new and so far not documented.

The discussion need to be expanded. In particular regarding subgrid scale parametrization and also possible weaknesses of ERAI data with respect o satellite data as shown in the references mentioned by reviewer 2#. This would be done in a revised version.

For a revised version we need to pin point these new aspects more clearly as it is said by reviewer #2.