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Earth System Dynamics
Discussions

Interactive comment on "Interannual variability of the gravity wave drag – vertical coupling and possible climate links" *by* Petr Sacha et al.

Anonymous Referee #2

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In this research, the authors discuss the dependence of orographic gravity wave drag (OGWD) inter-annual variability on the tropospheric climate modes through the 30 year simulation using Canadian Middle Atmospheric Model (CMAM), and assess the potential relationship between OGWD and large-scale climate modes such as North Atlantic Oscillation (NAO), the Quasi-Biennal Oscillation (QBO), and the El Nino Southern Oscillation (ENSO) using multiple linear regression. It was argued that the orographic gravity wave and gravity waves in general can be a quick mediator of tropospheric variability into the stratosphere. The topic is very interesting, however, the following comments should be addressed before publication in ESD.

Major comments:

1. The author solely relies on the orographic gravity wave drag parametrization scheme

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of the CMAM model to examine the inter-annual variability of the orographic gravity wave drag. However, the tuning procedure as mentioned in the research may potentially overestimate the role of orographic gravity wave as compared to non-orographic source such as convections. How does the choice of tuning parameters in the orographic gravity wave drag scheme affect the conclusions in this research?

2. The QBO in this simulation is potentially affected by nudging. How is QBO represented in the simulation as compared to the observation? And how sensitive is the relationship between orographic gravity wave drag and QBO to nudging?

Minor comments:

1. The wind vectors in figure 1, 4 and 5 are too thin to see, it help vision if the wind vectors are drawn thicker.

2. In figure 2, it would be more concise if the standard deviation of the wind vector amplitude (norm of the wind vector) due to orographic gravity drag rather than both zonal and meridional components are shown. This is also the case for Figure 3.

3. In Figure 8, 9 and 10, the author mentioned the fractions are explained by "both component", does this mean the combined norm variance of the 850-hPa wind vector?

4. Acronyms such as PW, SSW, IGW needs clarification.

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