This paper studies the coupling between the troposphere, stratosphere, and mesosphere by gravity waves during a sudden stratospheric warming (SSW). By using an analytical reflection coefficient R to characterise the spectrum of waves that is transmitted/reflected at the tropopause and stratopause during SSW events, the study offers a novel perspective on the role of gravity waves in atmospheric coupling and the observed effect of a cooling mesosphere during an SSW. Given the knowledge gaps in this area and the need for better representation of gravity wave effects in models, I believe this paper adds value and recommend it for publication provided that the following comments are addressed.

- Whilst the data in the figures supports the conclusion drawn regarding the changes in R during this idealised SSW, I am confused by the key facts used to illustrate the takeaway points. Firstly, please could you provide a reason for the R<0.4 threshold used to delineate transmitted/reflected waves in figures 2 – 5, it seems like an arbitrary choice. Please then could you provide a reason for the Ω = 0.2 and Ω = 0.1 thresholds in Figs 2/4/5 and Fig 3, respectively? $\Omega < 0.2$ and Ω < 0.1 mark most likely transmitted waves given R = 0.4, however the Ω thresholds don't appear to reflect what the figure tells you. For example, in Fig. 2, almost all Ω have R < 0.4 for V_h < 0.5, the text in line 149 however implies that only $\Omega < 0.2$ have R < 0.4 for V_h < 0.9. The same critique applies to Fig 3 and L 155, Fig 4 and L 170, Fig 5 and L 177. These numbers are used in the discussion in the paper, so are a significant aspect which needs addressing before the paper is published.

- The assumptions used in deriving the reflection coefficient, and the set-up of the two scenarios: no-SSW, and SSW, are highly idealised. I.e., The atmosphere from the tropopause to the mesosphere is not isothermal and is highly variable compared to the two idealised scenarios given. Please could you address the sensitivity of your results to deviations from the assumptions and idealisations, and the validity of using this form of the reflection coefficient to the real atmosphere? Perhaps you could support its validity by calculating R from data of observed or modelled SSW events, which should hopefully show that R increases at the tropopause, decreases at the stratopause, and in such a way that suggest similar changes in gravity wave fluxes to those reported in this paper.

- It is not clear how equations 5 come from equations 1 – 3, this appears to be a novel step in deriving the acoustic gravity wave dispersion relation, so would be insightful to have the steps elaborated on with their physical meaning. The reader is pointed to more detail in Jovanovic (2016), however no extra details to what is shown in this paper are given.

- Please ensure that all symbols are correctly defined. E.g., no variables in equations (1 – 3) are defined except the constants.

- For brevity, it would probably be more appropriate to refer to the troposphere-stratosphere boundary as the tropopause and the stratosphere-mesosphere boundary as the stratopause. All terms appear in the paper, so I suggest picking a single convention for consistency in the paper.

- Please could the labels on the figures be made in a larger font, at least to match the font size in the paper.

- Please could you also review the spelling and grammar, as many instances of grammatical errors were spotted in the paper.

References

Jovanovic, G., 2016. Gravito-Acoustic Wave Reflection. Romanian Reports in Physics 68, 459–472.