

# ***Interactive comment on “The Climatology of Brewer-Dobson Circulation and the Contribution of Gravity Waves” by Kaoru Sato and Soichiro Hirano***

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We greatly appreciate Referee #3’s critical reading and valuable comments. We are afraid that Referee #3, like the other two reviewers, may misunderstand the methodology of our analysis. This misunderstanding simply comes from the insufficient description of our ACPD manuscript. We really apologize about it. We will seriously improve the methodology part of the manuscript. We would very much appreciate it if Referee #3 kindly reads our quick response to the other two reviewers (#AC1, the same as #AC2) in which we tried to clarify our methodology.

The reason why we used  $\bar{X}$  was described in #AC1 (and #AC2). We know that

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$X_{\text{bar}}$  in (1) of our manuscript includes several sources other than GWs for the reanalysis data. However, we have obtained very similar structure in the stream function corresponding to  $X_{\text{bar}}$  in all the reanalysis data. Thus, we think that the stream function corresponding to  $X_{\text{bar}}$  comes from real dynamics in the atmosphere. In addition, as discussed in Section 5, many of the characteristics found in the stream function corresponding to  $X_{\text{bar}}$  are consistent with the characteristics of gravity waves known from previous studies using high-resolution observations and gravity-wave permitting GCM simulations. We will revise our manuscript and clarify the working hypothesis and its limitation of our analysis, if we have the opportunity.

We are also sorry that the description of gravity wave parameterization in our manuscript was not correct. ERA-Interim and JRA-55 use orographic gravity wave parameterization only, while MERRA and MERRA-2 use both orographic and non-orographic gravity wave parameterizations [(Table 3 of Fujiwara et al. (ACP, 2017, doi:10.5194/acp-17-1417-2017)]. This point was also indicated by Dr. Abalos (Referee #2) and we plan to correct that description.

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