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Annales Geophysicae Discussions

# *Interactive comment on* "Effect of latitudinally displaced gravity wave forcing in the lower stratosphere on the polar vortex stability" *by* Nadja Samtleben et al.

**Anonymous Referee #2**

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General Comment: The authors present idealistic simulations with the mechanistic MUAM model testing the impact of stratospheric GW hotspot regions on the SPW generation and vertical propagation. Thus, they conducted several model runs modifying the gravity wave hotspot in the Asian sector (above Japan) location and investigate how it affected the polar vortex and the lower and mid-latitude dynamics. The results of this sensitivity study are discussed presenting various figures and diagnostics. The study is relevant to the community as this case study provides a potential connection how gravity waves excited in the stratospheric above a certain region can lead to asymmetries in the polar vortex and, hence, maybe important in understanding sudden stratospheric warmings. The manuscript is worth to be published in Annales Geophysicae after some



minor changes/improvements.

Comments: The authors should include a table summarizing the different experiments. The reviewer found it a bit confusing that the Gaussian GW hotspot is shown in Figure 2 and the comparison between the 'used' simulations and the Gaussian is later presented in Figure 8. It is suggested to present this type of sensitivity in the experimental description section and later just refer to the 'main' model experiments.

Please clarify whether the altitudes shown in the Figures correspond to the pressure grid or whether the altitudes are computed from the geopotential and converted into a geometric altitude. This simplifies some comparisons to observations results.

Another comment of the reviewer concerns the implementation of the GW drag for the different latitudes. As the drag scales also with the atmospheric air mass that is affected by the drag, it might be mentioned that at higher latitudes essentially less drag is exerted to the atmosphere as the GW drag volume scales with latitude. Or with other words the atmospheric mass that is affected by the drag decreases with latitude. This might need some more discussion or should at least be mentioned in the interpretation of the results.

Some Figures (3,4,6 and 7) need an improvement of the quality.

Page 3: line 18: . . .vertical resolution 2842 km should be 2842 m

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