

## ***Interactive comment on “Influence of the sudden stratosphere warming on quasi-2 day waves” by S.-Y. Gu et al.***

### **Anonymous Referee #1**

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#### GENERAL COMMENTS

The paper is an interesting contribution on the appearance of QTDW. TIME-GCM simulations are used to separate the impact of forcing of planetary waves at the surface. Although the simulated SSW is only minor, the data base is evaluated to show an overall decrease of westward PW3 due to reduced instabilities and an increase of westward PW2 due to nonlinear interactions. I suggest an extended discussion of these results with respect to observations and recommend: minor revision.

#### SPECIFIC COMMENTS

1) Mesospheric instabilities: The simulations bring up a SSW and are sufficient to discuss certain pathways leading to QTDWs. However, the warming is minor and possibly not sufficiently strong to explain observations of major warmings. One of the obvious

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effects is the missing of instabilities in the stratospheric easterlies during these times. Its potential to generate planetary waves is lined out in Liu et al. (2004), Limpasuvan et al. (2012), Zülicke & Becker (2014) and Sato & Nomoto (2015), for example.

2) Equatorial instabilities: It should at least be mentioned, that the intensifying equatorial stratopause easterlies may also lead to instabilities and subsequent forcing of QTDW (Limpasuvan et al., 2000).

3) Observations: For the conclusion of the paper I would like the authors to add a discussion observations in the context of W2 and W3 relation to SSWs. Beside of the relatively weak SSW modelled here, it could also be that a SPW2 forcing (a split-vortex SSW) may directly lead to stronger QTDW.

#### TECHNICAL CORRECTIONS

With respect to common use of wordings, I suggest the following: a) use "sudden stratospheric warming" instead of "sudden stratosphere warming" b) use "nonlinear advection" instead of "nonlinear advective"

In the following, all numbering refers to the discussion paper "acp-2015-982.pdf"

line 49: "TIME-GCM" should be defined.

line 86: "TIMED/SABER" should be defined.

line 96: stratospheriC - see a) above.

line 115: If defined before as suggested, "TIMED" need not be defined here again.

line 197: Here it seems to me that "eastward" and "westward" were confused.

line 261: I suggest to start the sentence not with "And" but "Further, " for example.

line 271: If you want to indicate vectors with an over-arrow as you do later, I suggest to do this here, too. Also, because you later introduce another flux, I would add here the index "EP".

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line 288: "expansive" → "extended"

line 294: "by" → "at"

line 273: The sentence "In the northern... region" confused me. I see in your plots that the mesospheric winter easterlies (!) reversed, resulting in weak (!) instabilities in this region. Please, reconsider the text.

line 409: You write of "strong" SPW1 energy, while I see in fig. 13a in 0 - 30 °N at 60 - 80 km only moderate SPW1 fluxes in comparison to the stronger fluxes at about 60 °N. Please, clarify.

line 411: "advective" → "advection", as done in the figure captions - see b) above.

line 415: Add an arrow over the "V" after the "nabla".

line 422: could be deleted because not used.

line 423: Delete arrow because it is a vector component only.

line 426 - 434: In order to save place for additional discussion, I suggest to delete the text "By adopting... waves." This is for my taste only technical information which does not need to be explained.

line 445: You write the amplitude may be "too large" - please, explain why? What did you take for reference?

line 446: Please, add the corresponding kilometers, which is the unit of the vertical axes.

line 450: Although this peak in Fig. 13c is not one-to-one at the same position as the one in Fig. 11d, I follow your argument.

line 466: This is right, and this is what I mean with my specific comment 1). Only the present simulations do not show this instability because the SSW is too weak. Please, mention this because it is important when discussing observations.

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## REFERENCES

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