

Dear Dr. Gunter Stober,

thank you very much for giving us the opportunity to submit a revised draft of the manuscript “Estimating the impact of the 1991 Pinatubo eruption on mesospheric temperature by analyzing HALOE (UARS) temperature data” to *Annales Geophysicae*. We appreciate the time and effort that you and the reviewers dedicated to providing feedback on our manuscript and are grateful for the insightful comments on our paper that resulted in its improvement. We have highlighted the changes within the manuscript.

Answers to the review from Dr. Ellis Remsberg

You have conducted an extensive set of analyses that include an episodic term to simulate the possible effects of the Pinatubo eruption on temperature trends in the upper mesosphere. Below I have several comments and/or suggestions that would improve your manuscript.

We would like to thank the reviewer for taking the time to assess our manuscript and agree that his comments resulted in its improvement. We will address all of the reviewer’s comments in the following paragraphs.

Lines 42 to 46—It is not quite true that “Remsberg (2009) did not consider...”. I suggest merely saying “did not include,,,”. In my earlier review I pointed to my most recent model for fitting the HALOE temperature time series (Remsberg et al., 2018), and I achieved good fits by including a solar flux proxy term and, more importantly, a term related to the ENSO forcing (MEI). You may find that a model that includes an MEI term will yield different results.

We thank the reviewer for clarifying this point and changed the manuscript as he suggested.

Line 119—Your use of the episodic term would be more convincing if you first showed the fit and residual at 35-45°N and 86 km using your model without the episodic term. Perhaps, you could at least put it in the supplement. Then, after the reader is aware of your result without the episodic term, you could then show your Figures 1 and 2 for comparison.

We agree with the reviewer and added two graphs to the supplementary material (now indicated as Figure S1) showing the fit and the residuals without a volcanic term. The following sentence is added to line 110-113: “We fit the temperature data and compare two approaches that each include a term for a potential volcanic perturbation (for the results of the fit without any volcanic contribution, please see Figure S1 in the supplementary material and compare them with Figure 1 and Figure 2).”

Line 125—Is A_{11} the amplitude?

A_{11} is one of the regression coefficients in fit $F_1(t)$ and is part of the term that describes the volcanic perturbation. As the perturbation function described by this term is not normalized to one, we do not report the value of A_{11} as the amplitude of the perturbation signal. Rather the maximum or minimum value of the function that is described by this term is used as the amplitude. We added a short phrase to the sentence in line 131 for a better understanding: “In contrast to the regression coefficient A_{11} , ...”

Line 275—Author is James Russell III.

We thank the author for drawing our attention to this typo and fixed it.

Finally, we thank the reviewer again for taking the time to revise our manuscript and for providing insightful comments.