

Interactive comment on “Uncertainty and detectability of climate surface response to large volcanic eruptions” by Fabian Wunderlich and Daniel M. Mitchell

Anonymous Referee #2

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This paper revisits the important topic of the effects of volcanic variability to surface climate. The article begins by comparing the response to volcanic eruptions in the first and second year after the eruption date in a wide range of reanalyses and observations. The second part involves a detection and attribution method to estimate the response to volcanic eruptions in observed and modelled tropical mean temperature. The results support a stronger response to volcanic eruptions in models than in observations. The analysis seems rigorous and the results well explained.

However the results as presented do not appear sufficiently novel. More needs to be done to place them in the context of previous findings, such as those by Stenchikov et al, Christiansen 2008, Hegel et al 2011, Driscoll et al 2012 (Driscoll et al 2012 is not

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referenced, if this is the paper you are referring to by D12 this should be stated and the paper referenced), many of which have gone further than this study to also compare the response to models. Given that there is already this large body of literature looking at this topic it is essential that the authors highlight any differences and improvements on previous work to make this paper relevant and worthy of publication. For example in the abstract it says that you “conclude that [the NAO] is not as clear cut as current literature suggests”. This should be explored further. The introduction should therefore be greatly expanded to motivate this particular study and original findings highlighted.

In particular I do not see what more the detection and attribution results add to the large body of literature which has already reached similar conclusions with the same models and observations and very similar techniques, papers such as Ribes et al 2013, Jones et al 2013, Gillet et al 2013 all of which seem to show very similar results to those in figure 10. Although these results use natural and not volcanic simulations, given the small response in models to solar forcing, the fact that the results look very similar seems unremarkable. Therefore I think that more should be done to highlight any differences or this section should be removed and previous studies cited instead.

Minor comments:

Lehner et al 2016, have conducted a similar study analysing the effect of ENSO on detection and attribution results. Since a possible ENSO bias is mentioned throughout this article a discussion of the results found in Lehner et al 2016 should be included.

In the methods more details should be added to the meaning of the RCT test, since as it stands it is difficult to interpret the lower panel of figure 10.

Why are the anomalies with respect to 1880-1919 on figure 11?

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