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

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We thank the reviewer for the in-depth assessment of our paper. The manuscript has been revised accordingly, with most points being taken into account as per the reviewer suggestions. In particular, we emphasized the main results of the paper compared to previous studies. According to the results of Lehner et al., 2016 we included a technique to remove the impact of ENSO to support the robustness of our results. We excluded the fingerprint analysis to get a consistent and clearer picture of our results. We therefore changed the title of the paper to: "Revisiting the observed climate surface response to large volcanic eruptions".

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Discussion paper

Major comments:

- 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.

One major aim of the paper is to measure the uncertainty in the reanalysis products. This kind of direct comparison of the volcanic response between all reanalysis products and the observations has never been done before and will contribute to the S-RIP report. Reanalyses are used to build a complete picture of the atmospheric (and other components) system. Thereby forcing the stratospheric and tropospheric state to be in the direction of that observe during a volcano will filter through to land surfaces being better as well. So we would expect it to be better than models. Part of this paper is to identify the differences in the reanalysis so that researchers who use them know which ones to use, and which to avoid. We also provide a systematic comparison of reanalysis, obs and models looking at both radiative and dynamical response. By revisiting the widely accepted view of the dynamical and radiative response, we conclude that they are not as robust as often stated and show that identifying the effect of volcanic eruptions is still an issue.

- 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.

We excluded the detection and attribution analysis.

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?

We applied a ENSO removal technique to get more robust results. Since we excluded the detection and attribution analysis, the minor comments are negligible.

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