

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

Anonymous Referee #1

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The paper investigates the impact of major volcanic eruptions on the surface temperature and pressure. Both the impact in the tropics (mainly radiative cooling) and in the extra-tropics (mainly dynamical winter warming) are considered. The paper compares the impact in 10 different reanalysis datasets and observations from HadCRUT and HadSLP. The main difference between this paper and previous work seems to be the many different reanalyses used here. The volcanic impact is at the edge of significance and in the tropics the authors use a fingerprint method to identify a signal. It is an important topic but I wonder a little how many novel results the paper contains.

Major comments:

The main new contribution seems to be the inclusion of the many reanalyses. However,

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I doubt how much additional information the reanalyses provide when we already have the observations of both surface temperature and pressure. If the models do not get the impact of the eruptions right then why should the reanalysis products which are based on models be better than the observations?

The Introduction is very brief. I think the authors need to discuss the difference between the tropical radiative response and the extra-tropical dynamical response already here. There should also be a more detailed discussion of previous work in these two separate areas.

Minor comments:

page 4, l24: Is Adams et al. 2006 the right reference? I briefly browsed the article and couldn't find anything about volcanic eruptions. Perhaps it should be Adams et al. 2003. This paper is cited in Christiansen 2008 which discuss the subject in some detail.

Fig. 5: I think this figure is hard to understand. It is said in the caption that the blue lines are for the winter after Pinatubo and El Chichon, but there seems to be more than two blue lines in the plot. I also wonder what the histogram tells us. Should it indicate the significance? But it is not for the same source as the other data so how can they be compared?

Fig. 8: The same here. Also, now it is said that the orange curves show the NAO signal. Should it be the TAS?

page 7, l23: It would be interesting to see results when more weaker eruptions are included.

page 8: It should be mentioned in the beginning of section 3.2 that this deals with the annual mean response.

page 9, l25. If the solar signal does not add anything why not begin the discussion with the two-signal ROF?

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page 10, lines 3-12: The discussion of the sampling of El-Nino events is unclear.

page 11: l14: Is there a cooling signal in Europe in summer?

Section 2.4: The description of the fingerprint method is very brief and impossible to understand without reading the references. In this way this analysis is different from the rest of the paper. Perhaps the fingerprint analysis could be deleted?

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