

Interactive comment on “Assessing the impact of large volcanic eruptions of the Last Millennium on Australian rainfall regimes” by Stephanie Blake et al.

Stephanie Blake et al.

stephanieblake79@gmail.com

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Dear Reviewer,

Thank you for taking the time to read and comment on our paper. Your review was very helpful and we plan to make several important revisions in light of your recommendations.

There were three main issues in the paper that you identified: 1) Lack of information on experimental design – In our revision, we plan to expand the simulations section of the data and methods to include the following information: - The atmospheric model

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is coupled with the dynamical Russel Ocean Model (Schmidt et al., 2014) - The atmospheric model was run with the NonINTeractive (NINT) atmospheric composition treatment (Schmidt et al., 2014) - The AOD was specified as per Crowley and Unterman (2012) or Gao et al. (2008)'s aerosol optical depth data with Reff specified as per Sato et al. (1993) – specifically this study used a 4 layer (15- 20km, 20-25km, 25-30km and 30-35km) vertical and 24 layer (8 degrees) latitude, longitudinally independent AOD with Reff specified as per Sato et al. (1993). 2) Lack of model evaluation – The GISS E2-R model has undergone evaluation in previous studies in reference to global precipitation and surface temperature (Dee et al., 2010; Flato et al., 2013; Schmidt et al., 2014), Australian precipitation and surface temperature (CSIRO and Bureau of Meteorology, 2015) and the ENSO and IOD (Flato et al., 2013; Schmidt et al., 2014). We plan to include an additional literature review of these results in the simulations section as a justification of GISS's ability to simulate key climate aspects examined in this paper. 3) Lack of physical mechanisms – We will conduct further examination of the physical mechanisms, to contribute to our study's agreement with previous work in the results and discussion.

Your specific remarks were also appreciated and most of these changes will be made. One exception to this, is your comment on table 1:

'It says strongest eruptions in the last millennium but I am pretty sure that Tambora was stronger than Huaynaputina. In fact, even the unknown 1809 eruption is bigger. Please adjust your table description.' - We plan to keep our table description as it is. Tambora is included in the table, and listed as the 3rd largest eruption, while Huaynaputina is listed as the 6th. The 1809 eruption was not larger than Huaynaputina, with a total global stratospheric sulfate loading (Tg) of 53.74, compared to Huaynaputina's 56.59. We presume that instead you are referring to the 1783 eruption, with a Tg of 92.96. We specify in the table title that we are looking at the largest 'tropical' eruptions, which are defined in the paper as eruptions that significantly impacted both hemispheres, as recorded by Gao et al., (2012), of which the 1783 eruption was not, with the entire

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92.96 Tg limited to the northern hemisphere.

Once again, we thank you for your comments, and hope that you agree that our response has addressed your concerns.

Regards, Stephanie Blake, on behalf of the authors

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