

## ***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.**

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Dear Marte Stoorvogel,

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.

You listed several concerns that we believe warrant an in-depth response: 1) Suitability of timescales used for analysis of land and ocean domains – While we understand your concerns that the effect of volcanic aerosols have a delayed response in the ocean and

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land domains when compared to the atmosphere, we believe these concerns are irrelevant to the scope of this paper. There is extensive literature that supports the theory that precipitation, surface temperature, the ENSO and the IOD all only show a statistical response to volcanic aerosols within the first five years post eruption (Adams et al., 2003; Cheung & Abram., 2016; Emile-Geay et al., 2008; Gillett et al., 2004; Illes et al., 2013; Joseph and Zeng et al., 2011; Maher et al., 2015; Mann et al., 2005; McGregor et al., 2010; Pausata et al., 2014; Predybaylo et al., 2017; Schneider et al., 2009; Soden et al., 2002; Wahl et al., 2014) . While ocean currents and the deep ocean do take longer to respond, these processes are not examined in this paper. We therefore consider it unnecessary to alter the timescales used in our analysis. 2) Lack of information on experimental design – You raised a valid point here, and we plan to expand the simulations section of the data and methods on revision to include the following information: - The atmospheric model 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). 3) Choice of forcing – Our choice of the combination of 5 volcanically forced ensembles, and 4 non-volcanically forced ensembles was driven by a desire to see a comparison of the effect of volcanic aerosols with non-volcanically influenced scenarios to strengthen any arguments for the effect of aerosols. 4) No explanation of physical mechanisms - We shall conduct further examination of the physical mechanisms, to contribute to our study's agreement with previous work in the results and discussion.

Your other, smaller comments on clarifications and references have been noted and will be changed accordingly.

We thank you for your comments and we hope you agree that our response has ad-

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dressed your concerns.

Regards, Stephanie Blake, on behalf of all authors

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