

## ***Interactive comment on “The Model Intercomparison Project on the climatic response to Volcanic forcing (VoIMIP): Experimental design and forcing input data” by Davide Zanchettin et al.***

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### Summary

The authors introduce the experimental design of the new climate model inter-comparison project on the climate response to volcanic forcing. Thereby, they gave an overview of the different forcings suggested to be used by the participants of VoIMIP.

### General Comments

The paper is generally well written and structured. The important steps are described in a sufficient way, so that the participants of VoIMIP can start their contributions. The topic itself is highly relevant as major model uncertainties still exist with respect to the

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climate response to volcanic forcing. Calling for a coordinated approach to tackle these challenges. Therefore, the presented study delivers the necessary background and I recommend to publish this study after minor revision, detailed below.

Christoph Raible

### Minor Comments

Concerning the selected experimental design, I wonder why only a northern latitude volcanic eruption is selected and not also a southern hemispheric one. The reason why I suggest to include such an experiment (forcing like in Fig.4 but for the Southern Hemisphere) is that the climate is different, less land-sea contrast, more zonal flow patterns, etc. which could be of interest to assess. Additionally, it would complement the comparison suggested for the northern latitude simulation.

Another more general point is that only the forcing for the Tambora-like eruption and the northern latitude eruption is shown (Figs. 3 and 4) and not the one for Pinatubo. Maybe this could be included.

L39-40: Please change to: ‘... the applied forcing. It defines ...’

L96: The authors are correct that there are discrepancies between the simulated response of modes of variability to volcanic forcing. Still, reconstructions show at least for the NAO some common response which needs to be mentioned here. A possible relevant publication is:

Ortega, P., F. Lehner, D. Swingedouw, V. Masson-Delmotte, C. C. Raible, M. Casado and P. Yiou 2015: A multi-proxy model-tested NAO reconstruction for the last millennium. *Nature*, 523 71-75.

L112: Maybe the authors could add the following publication as they also show the dependence on the mean state.

Muthers, S., F. Arfeuille, C. C. Raible, and E. Rozanov 2015: The impact of volcanic

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aerosols on stratospheric ozone and the Northern Hemisphere polar vortex: Separating radiative from chemical effects. *Atmos. Chem. Phys.*, 15, 11461-11476.

L119: The Tambora eruption is newly described in a review publication in *Wiley Climate Change* and could be added here:

Raible, C. C., S. Broennimann, R. Auchmann, P. Brohan, T. L. Froelicher, H. F. Graf, P. Jones, J. Luterbacher, S. Muthers, R. Neukom, A. Robock, S. Self, A. Sudrajat, C. Timmreck, and M. Wegmann, 2016: Tambora 1815 as a test case for high impact volcanic eruptions: Earth system effects. *Wiley Interdisciplinary Reviews: Climate Change*, in press.

L180: Maybe add the modes here so the reader knows which modes will be considered.

L219-221: The authors suggest to use an EOF analysis to define the NAO, which is commonly used. Still if a model has deficiencies in simulated the NAO as the leading mode (sometimes EOF1 and EOF2 are exchanged) models can falsely select the wrong mode. Also the pattern can change from one to another model simulation. To avoid this a 'station-based' index definition might be superior. At least the authors need to request that the EOF pattern shows a north-south dipole.

L232: There are multiple ways (and complexities) of a slap ocean model. A very simple parameter is e.g. the mixed layer depth which may vary from model center to model center. I am not sure whether this needs to be defined in more detail to increase the comparability between the different model.

L241: It is not clear why the date should be flexible. I suggest to fix the date to either Nov. 1st 2015 again to avoid problems when comparing the simulations.

L263: Please change 'should' to 'shall'.

L265: Please change 'outstanding' to 'open'.

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L276: Please start with 'The non-mandatory experiment VolcLong-Cluster-Ctrl investigates the climate response ...'

L287: Please change 'should' to 'shall'.

L295: Avoid space for 'Mill'.

L315: Please change 'created' to 'generated'.

L334: Please introduce here the acronym ToA as it is used in the tables.

L338: What is meant with 'mechanistic experiments'?

L363-364: Please change to '... from a given eruption ... and latitude with an idealized spatial ...'

L381-382: Please change to 'Differences occur mainly due to ...'

L415-416: Please change 'diagnostic s should ... and would be useful ...' to 'diagnostics shall ... and will be useful ...'.

L449: This sentence is not well connected to its surrounding.

L463-464: '... records. Additionally, observations-simulations assessments need to include the identification ...' reads better.

L485. ...: Maybe not so important but at which temporal resolution needs the data be provided.

Page 18-24: There are a lot of errors in the publications so please revised them.

Fig. 2 The labels at the 'y-axis' shall be in upper cases.

Fig.3 and Fig. 4: Comparing the magenta dashed line in Fig.3a with the black in Fig.4a I wonder why these are not the same.

Table 1: Second column second row: The largest eruption with respect to which period?

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Table 1: third column third row: 1st -> 1st

Table 3: Column 6, row 3 and 4: Please add numbers in brackets according to the brackets in column 3.

Table 4: ToA needs to be explained and change to ToA and not toa.

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Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-68, 2016.