

## ***Interactive comment on “Assessing the Impact of a Future Volcanic Eruption on Decadal Predictions” by Sebastian Illing et al.***

### **Anonymous Referee #3**

Received and published: 17 March 2018

#### General Comments:

This manuscript describes a set of decadal prediction experiments initialized with different phases of the NAO & PDO where the effects of a volcanic eruption of the magnitude of Mt. Pinatubo are examined. The authors find expected responses in the temperature and precipitation fields in the global average, but find that the different initial states produce regional responses that are different. This is a nice result that has implications for how decadal predictions should be performed when a volcanic eruption happens. The manuscript can be improved in terms of clarity and improvements in figures.

The paper is more or less complete in terms of analysis except for one issue that they could have explored a little more. This pertains to the 2014-Pinatubo experiment where the years 1-4 precipitation response (Figure 9) indicates a pattern that is very similar

to an El Niño response. While this hints at a possible volcano triggered El Niño, they make no mention of it but discuss this possibility in the conclusions purely in other published references. It would be interesting to see if indeed the 2014-Pinatubo runs show that an ENSO event was triggered – while the 2012-Pinatubo doesn't.

Detailed comments:

1. Abstract. Line 12: A little more descriptive wording than just “the MiKlip prediction system” would be useful here.
2. Page 2, Line 1: Suggest changing “more attention is paid to the research field of decadal climate ...” to “more attention is paid to decadal climate ...”
3. Page 2, Line 18: The wording in “impact on atmospheric composition, atmosphere, ocean dynamics” does not make clear what other than composition is altered in the atmosphere.
4. Page 2, Line 24: Not clear what a “positive impact on the North Atlantic Oscillation” means. The following sentence does not state it any better when one reads “. . . the positive NAO response could be better interpreted in terms of a deficit of negative NAO circulations”.
5. Page 3, Line 9: The use of “nowadays” sounds strange. Suggest rewording.
6. Page 3, Lines 9-10: The sentence “. . . how dependent are the results from the start year and respectively the initial climate state?” implies that initial climate state and start year are delinked.
7. Page 4, Line 3: The phrase “Pinatubo forecasts” should be changed or an uninformed reader may take it as a forecast of the eruption itself.
8. Page 4, Line 11: “For decadal forecasting, a stand-by model system for rapid model-based assessment . . .”. Why the use of “stand-by”? Do you mean “operational”?
9. Page 4, Lines 24-25: Suggest changing “. . . of the historical time period (1850 till

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today)” to “. . . since 1850”.

10. Page 4, Line 32: “. . . using a lagged-day method” can be explained better in words or needs a reference.

11. Page 5, Line 1: Why "around"? Shouldn't it be "on"? How many days before and after Dec 31 are the other forecasts?

12. Page 5, Line 11: What does “both variables” refer to?

13. Page 5, Line 12: What is a “a ‘nowadays’ setup”?

14. Page 6, Lines 5, 6: The word “significant” here (at least in the first instance) needs to be changed to “statistically significant at x% level”.

15. Page 6, Line 29: Does the phrase “in less warm air being advected . . .” mean less advection or the air is less warm?

16. Page 7, Line 27: Suggest using “On the other hand” instead of “On the contrary”.

17. Page 8, Line 5: Not sure the difference between what and what stays nearly constant?

18. Page 8, Line 24: Not clear what variable/difference “. . . stays significant for all lead-times.”

19. Page 8, Line 31: Suggest rewording “Similar behavior has been found in CMIP5 model simulations, but it turned out that the precipitation . . .” to “Similar behavior has been found in CMIP5 model simulations, although they underestimate the precipitation . . .”.

20. Page 9, Lines 9-10: “The drying effect is strongest over the tropics, particularly in Southeast Asia, and is even more pronounced in exp-2014. In general, exp-2014 shows a stronger drying response in the tropical region.” I am not sure it is a drying all across the tropics. I see the pattern in exp-2014 as an eastward shift of precipitation

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– a possible signature of El Niño. The interpretation of Fig. 9 presented needs to a relook and the authors can examine whether indeed this is an ENSO event in the model simulations.

21. Page 10, Line 8: The phrase “. . . are in both experiments in a similar state. . .” may be reworded as “are in a similar state in both experiments”.

22. Page 10, Lines 31-32: “Therefore our simulations in this study should be extended with experiments starting with other initial conditions like the recent El Niño year 2015/2016.” In your simulations, the ENSO response like pattern is seen for 2014-Pinatubo runs. The initial conditions for both runs were similar in terms of ENSO state - yet one of them produces what looks like an ENSO-like pattern. It should be relatively easy to check (and at least comment on) whether it triggered an El Niño. Initializing with ENSO conditions is not answering the question whether volcanoes might trigger ENSO events.

23. Page 24, Figure 7 caption: What does “two other” refer to?

Technical Comments:

24. Page 19, Fig 2 caption: The coordinates “North Atlantic (60°W, 0°E, 50°N, 65°N)” is better written as “North Atlantic (60°W-0°E, 50°N-65°N)”. Similarly for other regions.

25. Figures 3,5, 7, 9 all have maps shown with no latitude/longitude markings or labels.

26. Figure 4: Vertical axes in hPa units would be better. Latitude axis can be shown with ticks/labels so effects in polar/tropical regions are better seen.

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