Coordination of VolMIP Multi-Model Analysis

Date: 05 September 2017

In the following table: black = planned work/work in progress, blue = work tentatively planned, grey = work completed/published/ditched, red = no information available. If you want to propose an additional VolMIP Multi-Model Analysis, please email the VolMIP Co-Chairs (davidoff@unive.it, claudia.timmreck@mpimet.mpg.de, **myriam.khodri@locean-ipsl.upmc.fr**). If you want to participate to an ongoing analysis, contact the activity leader (highlighted in bold).

	VolMIP Collaborators ***Status of work***	**Title**	**Abstract/Idea**	**VolMIP simulations that are required**	**Timeline**	**Additional Information**
1.	**Lauren Marshall (eelrm@leeds.ac.uk),** Anja Schmidt, Matthew Toohey, Ken S. Carslaw, Graham W. Mann, Michael Sigl, Myriam Khodri, Claudia Timmreck, Davide Zanchettin, William Ball, Slimane Bekki, James S. A. Brooke, Sandip Dhomse, Colin Johnson, Jean-Francois Lamarque, Allegra LeGrande, Michael J. Mills, Ulrike Niemeier, Virginie Poulain, Alan Robock, Eugene Rozanov, Andrea Stenke, Timofei Sukhodolov, Simone Tilmes, Kostas Tsigaridis, Fiona Tummon	Multi-model comparison of the volcanic sulfate deposition from the 1815 Mt. Tambora eruption	The eruption of Mt. Tambora in 1815 was the largest volcanic eruption of the past 500 years. The eruption had significant climatic impacts, leading to the 1816 Year Without a Summer and remains a valuable event from which to understand the climatic effects of large stratospheric volcanic sulfur dioxide injections. The eruption also resulted in one of the strongest and most easily identifiable volcanic signals in polar ice cores, which are widely used to reconstruct the timing and atmospheric sulfate loading of past eruptions. As part of the Model Intercomparison Project on the climatic response to Volcanic forcing (VolMIP), four state-of-the-art global aerosol models simulated this eruption. We analyse both simulated background (no Tambora) and volcanic (with Tambora) sulfate deposition to polar regions and compare to ice core records. Background sulfate deposition is of similar magnitude across all models and compares well to ice core records. However, volcanic sulfate deposition varies in timing, spatial pattern and magnitude between the models. Mean simulated deposited sulfate on Antarctica ranges from 19 to 264 kg km−2, and on Greenland from 31 to 194 kg km−2, as compared to the mean ice core-derived estimates of roughly 40–50 kg km−2, for both Greenland and Antarctica. The ratio of the hemispheric atmospheric sulfate aerosol burden after the eruption to the average ice sheet deposited sulfate varies between models by up to a factor of 15. Sources of this inter-model variability include differences in both the formation and the transport of sulfate aerosol. Our results highlight the uncertainties	VolMIP CCCM Tambora ensemble		submitted to ACP: https://www.atmos-chem-phys-discuss.net/acp-2017-729/

			and difficulties in deriving historic volcanic aerosol radiative forcing of climate, based on measured volcanic sulfate in polar ice cores.			
2.	**Virginie Poulain et al,**	Reconstruction of the Tambora forcing with global aerosol models :Challenges and limitations	As part of the Model Intercomparison Project on the climatic response to volcanic forcing (VolMIP) (Zanchettin et al., 2016), a coordinated multi-model simulation of the 1815 eruption of Mt. Tambora has been carried out using state-of-the-art global aerosol microphysical models. This type of model inter-comparison has already been performed two decades ago with the first global aerosol models, focusing on the 1991 Mount Pinatubo eruption, the largest in the last century. The Tambora eruption is estimated to have injected in the stratosphere 2 to 4 times more sulphur than the Pinatubo eruption. The present study aims to analyze results from the coordinated multi-model simulation of the 1815 eruption of Mt. Tambora and estimate some of the uncertainties in the model calculation of Tambora volcanic forcing. It also explores possible biases in previous simple volcanic forcing reconstruction and discuss the current levels of uncertainties regarding the reconstructed volcanic radiative forcing from global aerosol models.	VolMIP CCCM Tambora ensemble		
3.	Claudia Timmreck et al… …(claudia.timmreck@mpimet.mpg.de)	Understanding the dynamical response after the Mt. Pinatubo eruption Surface cooling vs Atmospheric heating"	To understand the mechanism(s) underlying the dynamical atmospheric response to large volcanic eruptions, in particular in Northern Hemisphere's winters.	volc_pinatubo-full, volc-pinatubo_strat, volc_pinatubo_surf		
4.	**Davide Zanchettin (davidoff@unive.it),**	*inter-hemispheric asymmetries in the simulated response to strong volcanic forcing*	This research work aims to detect and understand inter-hemispheric asymmetries in the simulated response to strong volcanic eruptions, particularly concerning the sea ice response and the implications of volcanically-forced anomalies in meridional energy transports. The study is thought as a follow-up, in a multi-model context, of Zanchettin et al. 2014, available at: https://www.earth-syst-dynam.net/5/223/2014/esd-5-223-2014.pd)	volc-long-eq volc-long-hlN/-hlS volc-cluster-ctrl/-mill		
5.	Myriam Khodri et al... (myriam.khodri@locean-ipsl.upmc.fr)	*"Indo-Pacific Ocean interannual to decadal variability simulated in response to volcanic forcing"*	We will disentangle the physical mechanisms driving the Indo-Pacific Ocean inter annual to decadal variability after large eruptions. Previous works have offered no consensus on the coupled ocean-atmospheric response in the Indo-Pacific region	volc_pinatubo-full, volc-pinatubo_strat, volc_pinatubo_surf volc-long-eq		

			(i.e. ENSO, ect) because the observational record is relatively short and there were inconsistencies between modelling studies. The study is thought as a follow-up, in a multi-model context, of Khodri et al. 2017, available at: https://www.nature.com/articles/s41467-017-00755-6	volc-cluster-ctrl/-mill volc_slab		
6.	Juliette Mignot et al… (Juliette.Mignot@locean-ipsl.upmc.fr)	"*Atlantic ocean overturning response to volcanic forcing: a standardized multi-model approach*"	The large scale Atlantic overturning circulation has strong impacts on the climatic variability at decadal timescales. Yet, partly because of the lack of long-term large scale observations and reconstructions of the oceanic circulation, its response to volcanic forcing is still highly uncertain. Several model studies show a large-scale intensification of the AMOC 5 to 15 years after the volcanic eruptions, which may imply substantial redistribution of the heat received in the ocean. Mechanisms however differ from one study to the other one. Furthermore, some studies have highlighted a sensitivity of the response to the magnitude of the eruption, and possibly to its season. In order to gain understanding on the robust mechanisms driving the response of the AMOC to volcanic eruptions at decadal timescale, we propose a standardize multi-model analysis of the sensitivity simulations performed within VolMIP. Our focus will be to highlight the similarities and differences of the different model responses, and to identify climate relevant robust impacts.	volc-long-eq volc-long-hlN/-hlS volc-cluster-ctrl/-mill		