Project: **963**

Project title: **Volcanic Forcings Model Intercomparison Project (VolMIP)**

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Report period: **2019-01-01 to 2019-12-31**

At present (October 2019), the performance of the MPI-ESM1.2-LR simulations for the CMIP6 (Coupled Model Intercomparison Project, Phase 6, Eyring et al., 2016) endorsed project VolMIP (Model Intercomparison Project on the climate response to Volcanic forcing, Zanchettin et al., 2016) has been started. It is expected that this will last until early 2020. In addition, no VolMIP results from other model groups around the world have been submitted to the ESGF archive until now. It is assumed that a first multi-model analysis of VolMIP experiments can be carried out in spring 2020.

In the first half of 2019, VolMIP preparatory work has been continued in project 960. Using the eVolv2k data set (Toohey and Sigl, 2017) and the Easy Volcanic Aerosol v1.0 (EVA, Toohey et al., 2016), we have compiled three forcing time series for the early 19th century: a central estimate, consistent with that used in VolMIP; a high-end estimate, corresponding to the best estimate plus two times the (1σ) sulfur emission uncertainty; a low-end estimate, corresponding to the best estimate minus two times the (1σ) sulfur emission uncertainty. Using these different volcanic forcing data sets we have performed 90 experiments of different length (5 years up to 30 years) in the period from 1800 to 1830. Different scientific aspects of these runs are analyzed, e.g. the atmospheric response in Northern Hemisphere winter, carbon cycle feedback processes and ocean atmospheresea ice coupling mechanisms. As this requires the simultaneous provisioning of 6 hourly data from all 90 ensemble members, we use some of the disk space from project 963 for post-processing.

With this early 19th century ensemble we have tested for example whether different realistic volcanic forcing magnitudes for the 1815 Tambora eruption yield distinguishable ensemble temperature responses (Zanchettin et al., 209) and whether the ‘year without summer’ in 1816 in Europe with anomalously cold conditions and unusual wetness have been caused by the eruption of Mount Tambora in April 1815 (Schurer et al., 2019). Further analysis is ongoing to understand the weak climate signal of the unidentified eruption of 1809 (Timmreck et al., in prep).

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