Project: **1051**

Project title: **Contribution to AerChemMIP with ECHAM-HAMMOZ simulations**

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Report period: **2019-07-01 to 2020-06-30**

Text: maximum of two pages incuding figures.

The aim of the project 1051 is the preparation of the contribution of the ECHAM-HAMMOZ community to the next assessment report of the Intergovernmental Panel on Climate Change (IPCC/AR6) with a focus on atmospheric aerosol processes. The CMIP6 Diagnostic, Evaluation and Characterization of Klima (DECK) experiments and the CMIP6 historical simulations are carried out with interactive aerosol and aerosol-cloud interactions for liquid, mixed-phase and ice clouds as a basis for the Aerosol Chemistry Model Intercomparison Project (AerChemMIP). Also the AerChemMIP simulations are done to quantify the climate and air quality impacts of aerosols. Models with detailed representation of microphysics of liquid, mixed-phase and pure ice clouds and their interactions with aerosols like ECHAM-HAMMOZ help to understand how anthropogenic emissions contributed to global radiative forcing during the historical period, uncertainties in forcing estimates, model performance and differences between models.

During the previous project phase from 07/2019 to 04/2020 the bulk of the CMIP6 and AerChemMIP experiments have been run and the post-processing of the output has started and first output has been uploaded to the CMIP6 data archive at the Earth System Grid Federation (ESGF). The generated model dataset is published as CMIP6.AerChemMIP.HAMMOZ-Consortium.MPI-ESM-1-2-HAM under https://doi.org/10.22033/ESGF/CMIP6.1621 *(Neubauer et al., 2019).* The simulation data provides a basis for climate research designed to answer fundamental science questions, and the results will undoubtedly be relied on by authors of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC-AR6). First publications have used the data of these experiments (e.g. *Allen et al., Atmos. Chem. Phys. Discuss., 2020*), Figure 1.

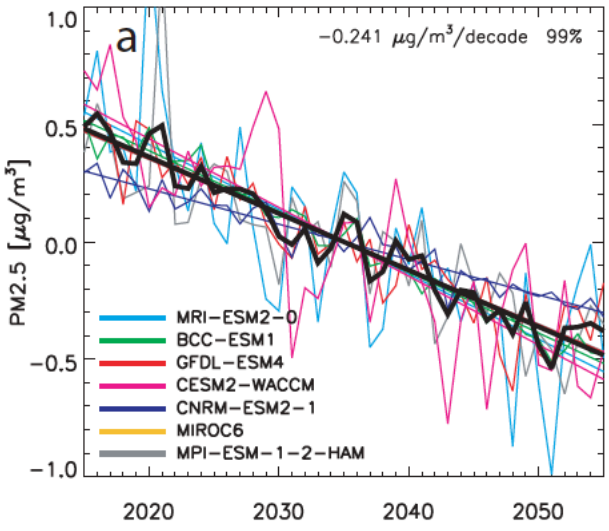

Figure 1: Time series of global annual mean PM2.5 as difference between a strong and low minigation scenario (Figure 4 in Allen et al, ACPD in review). Results from MPI-ESM using ECHAM-HAM a spart of this project are shown as grey line.

Due to a lack of manpower and problems with post-processing scripts that could only be fixed in

01/2020 and 04/2020, we were unable to post-process the output of several experiments. The post-processing required considerably more storage and took longer than anticipated. Due to this delay in post-processing the amount of data stored, we exceeded the granted ~220 TB of storage for several weeks. This had an impact on the productions runs since no more new data can be produced as long as the output of the previous experiments use up the granted disk space. For the 04/2020 to 06/2020 it is planned to post-process and upload the output of previous production runs. The computing resources have been used up completely in 2019 already, but it is still hoped that some of the remaining production runs can be started or continued during this time period.

Allen, R. J., Turnock, S., Nabat, P., Neubauer, D., Lohmann, U., Olivie, D., Oshima, N., Michou, M., Wu, T., Zhang, J., Takemura, T., Schulz, M., Tsigaridis, K., Bauer, S. E., Emmons, L., Horowitz, L., Naik, V., van Noije, T., Bergman, T., Lamarque, J.-F., Zanis, P., Tegen, I., Westervelt, D. M., Le Sager, P., Good, P., Shim, S., O'Connor, F., Akritidis, D., Georgoulias, A. K., Deushi, M., Sentman, L. T., Fujimori, S., and Collins, W. J.: Climate and air quality impacts due to mitigation of non-methane near-term climate forcers, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-1209, in review, 2020.

Neubauer, David; Ferrachat, Sylvaine; Siegenthaler-Le Drian, Colombe; Stoll, Jens; Folini, Doris Sylvia; Tegen, Ina; Wieners, Karl-Hermann; Mauritsen, Thorsten; Stemmler, Irene; Barthel, Stefan; Bey, Isabelle; Daskalakis, Nikos; Heinold, Bernd; Kokkola, Harri; Partridge, Daniel; Rast, Sebastian; Schmidt, Hauke; Schutgens, Nick; Stanelle, Tanja; Stier, Philip; Watson-Parris, Duncan; Lohmann, Ulrike ***(2019)****. HAMMOZ-Consortium MPI-ESM1.2-HAM model output prepared for CMIP6 AerChemMIP. Version YYYYMMDD. Earth System Grid Federation.* *https://doi.org/10.22033/ESGF/CMIP6.1621*