Project: **1242**

Project title: **Simulating the atmospheric dust cycle**

Principal investigator: **Kerstin Schepanski**

Report period: **2025-01-01 to 2025-10-31**

The simulations performed were carried out to study the atmospheric dust cycle with particular focus on the representation of atmospheric dust concentrations. Overall, the objectives of the simulations were to improve the dust emission module in HAM2.3 and thus to improve the representation of the atmospheric dust concentrations and its variability. In our study, we used the atmospheric general circulation model ICON coupled to the aerosol model HAM2.3 (Salzmann et al., 2022).

For the reporting period, we requested computational resources for the PhD project on 'dust mineralogy'. In the framework of this project, the PhD student successfully developed and implemented a scheme allowing for explicit description of the mineralogical composition of dust as a function of local soil mineralogy and particle size distribution in the aerosol model HAM. Test runs throughout the implementation phase were performed using ECHAM-HAM; since summer 2025 runs were performed using ICON-HAM at horizontal resolution R2B04. So far, we have performed 1-year test runs and are now preparing 10-year simulations (reference and scenario cases), which will continue into 2026. These simulations will be validated against data on dust mineralogical composition as taken during measurement campaigns. Since there are not so many data sets on dust mineralogical composition available, we are considering a longer simulation time period to allow for model validation at multiple geographical locations and during multiple seasons and years.

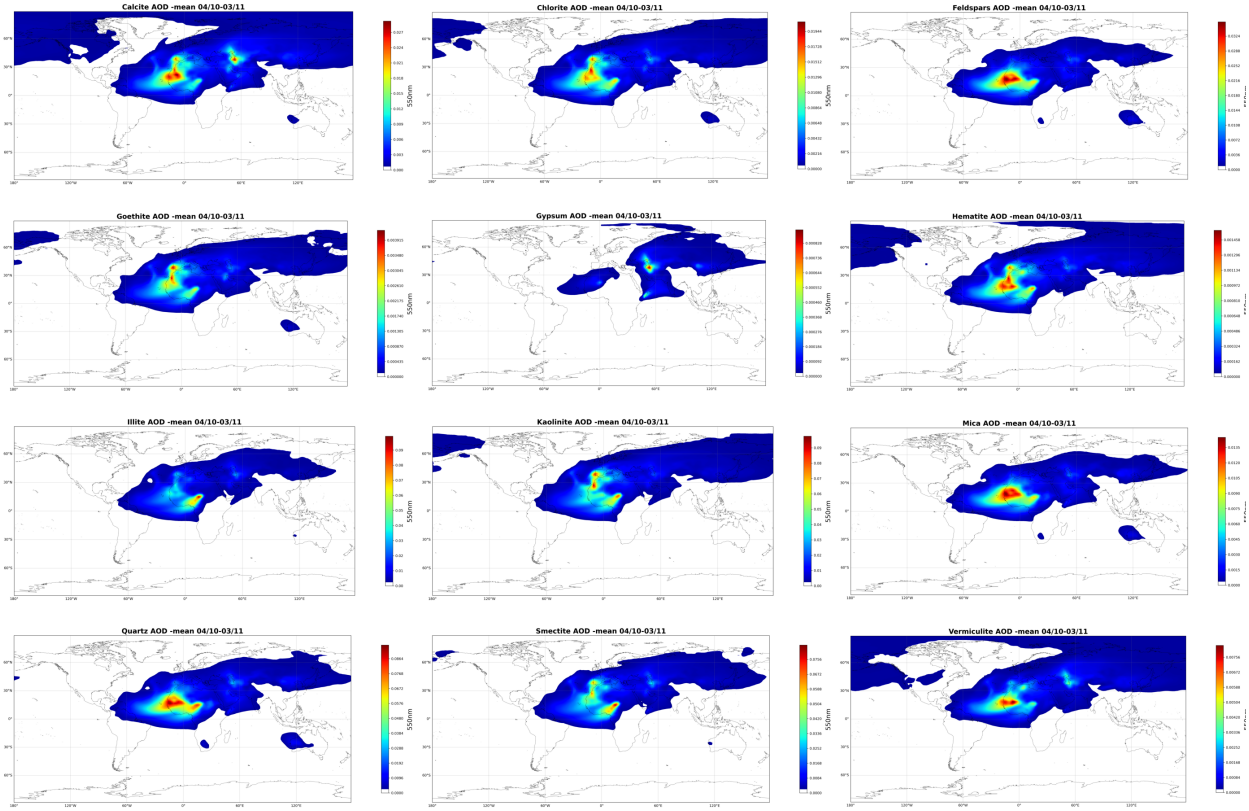

Figure 1: *Mean aerosol optical depth at 550nm (AOD) exemplarily for 1 year (April 2010 – March 2011) testing period. Shown are mean AODs for individual minerals. Please note, the results are preliminary and not validated yet.*

References

Salzmann, M., S. Ferrachat, C. Tully, S. Münch, D. Watson-Parris, D. Neubauer, et al. (2022), The global atmosphere-aerosol model ICON-A-HAM-2.3 - Initial model evaluation and effects of radiation balance tuning on aerosol optical thickness, JAMES, 14, e2021MS002699, https://doi.org/10.1029/2021MS002699.