Data README for "Data from Climate Model Ensemble Simulations for the Mesozoic Climate Evolution"

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When using the data please cite:

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The data are supplementary material to:

J. Landwehrs, G. Feulner, S. Petri, B. Sames, and M. Wagreich. Investigating Mesozoic Climate Trends and Sensitivities with a Large Ensemble of Climate Model Simulations. *Paleoceanography and Paleoclimatology*, 2021. doi:10.1029/2020PA004134

Abstract: In "Investigating Mesozoic Climate Trends and Sensitivities with a Large Ensemble of Climate Model Simulations" we study global trends in the climatic evolution through the Mesozoic era (252-66 Ma). The data presented here is the model output on which the results of this manuscript are based. Also included are different different boundary condition model input files and scripts to generate the included figures (using the Python programming language in a Jupyter Notebook). The model output is provided in different netcdf files. The data is generated using the coupled ocean-atmosphere model CLIMBER3alpha (Montoya et al. 2005) which models climate globally on a 3.75° x 3.75° (ocean, lon.x lat.) and 22.5° x 7.5° (atmosphere) grid. This Readme contains a short description of the included files. Please note that data from other research that is shown in the figures in Landwehrs et al. (2021) is not included in this data publication to avoid copyright issues.

Model Input and Output

c3a_model_input_output/ contains one directory for each climate simulation run that has been included in the analyses in the main paper. The name of the directory indicates the boundary condition configuration for the respective simulation. Each directory contains several model input and output files:

- **input files**: kmt.dta and oro.dat files specify the ocean floor depth and land surface orography. The prescribed vegetation pattern is defined in p2_vegetat_obs.dat. rivermask_375X375_hvr.dat defines the runoff routing map. SolarConstant.dat contains the value of the solar constant.
- **output files**: history*.nc contain annual or seasonal mean values of atmosphere (history_p2.nc), ocean (history.nc) and sea-ice (history_isis.nc) model variables over the last 500 years of the simulation. ensmean_snapshots*.nc contain monthly data of the three model components averaged over the last 500 years of the simulation. topog.dta.nc contains the processed bathymetry on the ocean model grid.

Post-Processing: Plotting and Analysis

- **scripts/** contains the Python scripts script_aggregateData.py and script_plotFigures.py. With these, the figures in Landwehrs et al. (2021) can be reproduced from the model output files included in this data package. When all required python packages are installed (including i.a. pyferret, basemap, netCDF4) this should work out of the box. Python v3.7.3 was originally used.
- **plots_allruns/** contains *.pdf documents in which model output data for all runs and timeslices of the ensemble have been compiled. This includes AllRuns_Spinup.pdf (atmosphere and ocean spinup time-series and Gregory plots), AllRuns_Maps.pdf (surface climate maps), AllRuns_OceanCrosssections.pdf (ocean temperatures and meridional overturning), AllTimeslices_MeridionalGradient_SAT.pdf and AllTimeslices_MeridionalGradient_SST.pdf (meridional gradients of zonal mean surface air temperatures and sea surface temperatures).

References

J. Landwehrs, G. Feulner, S. Petri, B. Sames, and M. Wagreich. Investigating Mesozoic Climate Trends and Sensitivities with a Large Ensemble of Climate Model Simulations. *Paleoceanography and Paleoclimatology*, 2021. doi:10.1029/2020PA004134.

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