

Final Preport for Project **1123**

Project title: **AtMoDat**

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Report period: **May 6, 2019 - Dec. 31, 2022**

This is to report on the activities and use of DKRZ resources during the AtMoDat project. The AtMoDat project (www.atmodat.de) was a BMBF-funded project involving four project partners: DKRZ, the German National Library of Science and Technology (TIB) and the universities of Leipzig (Ulei) and Hamburg (UHH). Formally, the project started in June 2019 and ended in May 2022, but the project work ran until December 2022.

The aim of the AtMoDat project was to improve the overall reusability and reuse of atmospheric model data. FAIR data publication standards are well established and used in large, internationally coordinated model intercomparison projects (e.g. for climate models in CMIP). However, these standards cannot be directly applied to many sub-disciplines of atmospheric modeling, such as urban climate or cloud-resolving modeling. Within the AtMoDat project, a new metadata standard for netCDF files was developed that specifically addresses the requirements of the data standards of the sub-disciplines of atmospheric modeling: the ATMODAT standard (Ganske et al. 2021). In addition, a new branding was introduced to highlight carefully curated data publications: the EArth SYstem DATA Branding (EASYDAB). EASYDAB was specifically developed as a quality seal for FAIR and open geoscience data. Data repositories can brand data publications that meet the requirements of the EASYDAB guideline with the protected EASYDAB logo.

Within the AtModat project, the feasibility of implementing the ATMODAT standard and EASYDAB branding was tested on two data publications, one containing the results of a cloud-resolving model (Muelmenstaedt, 2022) and the other a statistical analysis of weather types over the North Sea (Loewe, 2022). In both cases, the data were standardised according to the ATMODAT standard and subsequently published in the World Data Center Climate (WDCC) under the branding EASYDAB.

In cooperation with DKRZ and Ulei, a Python tool was developed to support data producers in checking their data for compliance with the ATMODAT standard. The atmodat data checker is available at https://github.com/AtMoDat/atmodat_data_checker. It is installed centrally on Levante and is used by the DKRZ data curators for general quality control of the data before it is published via the WDCC.

During the reporting period, the AtMoDat team actively promoted the project results through conference presentations, user workshops and publications.

Use of resources

Of the granted 24 TB of Levante storage space, the AtMoDat project has actually only used a maximum of 10 TB. Of the 25 granted Levante CPU node hours, the project has only used 2 node hours.

Two reasons explain the lower resource requirements: Originally, it was planned to process the extensive output of the obstacle-resolving model MITRAS. However, the completion of the output was delayed, so a small weather-dependent dataset was processed instead. In addition, a much shorter time series of cloud-resolving model data was processed and published than originally planned.

Project Output

EASYDAB data publication

Loewe, Peter (2022). Lamb weather types (reduced set) and gale days over the North Sea since 1948 based on NCEP/NCAR Reanalysis 1 daily mean sea level pressure fields. World Data Center for Climate (WDCC) at DKRZ.

<https://doi.org/10.26050/WDCC/LambWTyRSetAndGaleDaysOverTheNo>

Mülmenstädt, Johannes (2022). ECHAM6-HAM2 model experiments to characterize the effect of parameterized autoconversion/warm rain on cloud lifetime. World Data Center for Climate (WDCC) at DKRZ. https://doi.org/10.26050/WDCC/Aerocom_ECHAM6-HAM2_rain

The ATMODAT standard

Ganske, Anette, Kraft, Angelina, Kaiser, Amandine, Heydebreck, Daniel, Lammert, Andrea, Hoeck, Heinke, Thiemann, Hannes, Voss, Vivien, Grawe, David, Leitzl, Bernd, Schlünzen, K. Heinke, Kretzschmar, Jan, and Quaas, Johannes: ATMODAT Standard (v3.0), https://doi.org/10.35095/WDCC/ATMODAT_STANDARD_EN_V3_0, 2021

The EASYDAB guideline

Ganske, Anette; Burger, Felix; Thiemann, Hannes; Lammert, Andrea: EASYDAB Guideline (v1.2). World Data Center for Climate (WDCC) at DKRZ. https://doi.org/10.35095/WDCC/EASYDAB_Guideline_v1.2, 2022.

atmodat data checker

Jan Kretzschmar, atmodatcode, am-kaiser, & wachsyron. (2022). AtMoDat/atmodat_data_checker: Version 1.3.1 (v1.3.1). Zenodo. <https://doi.org/10.5281/zenodo.6701508>

Peer-reviewed publications

Ganske, A., Heydebreck, D., Höck, H., Kraft, A., Quaas, J., and Kaiser, A.: A short guide to increase FAIRness of atmospheric model data, Meteorologische Zeitschrift, 29, 483–491, <https://doi.org/10.1127/metz/2020/1042>, 2020.

Ganske, A., Voss, V., Kaiser, A., Heil, A., and Lammert, A.: Die Veröffentlichung von Standardisierten Daten aus der Stadtklimaforschung, <https://doi.org/10.11588/HEIBOOKS.979.C13723>, 2022.

Conference contributions

Heil, A., Ganske, A., Lammert, A., Heydebreck, D., and Thiemann, H.: The ATMODAT Standard enhances FAIRness of Atmospheric Model data, EMS Annual Meeting 2021, online, 6–10 Sep 2021, EMS2021-298, <https://doi.org/10.5194/ems2021-298>, 2021.

Voss, V., Grawe, D., and Schlünzen, K. H.: How to develop and apply a model data standard on microscale model data., EMS Annual Meeting 2021, online, 6–10 Sep 2021, EMS2021-420, <https://doi.org/10.5194/ems2021-420>, 2021.

Lammert, A., Ganske, A., Kaiser, A., and Kraft, A.: A Standard for the FAIR publication of Atmospheric Model Data developed by the AtMoDat Project, pico, <https://doi.org/10.5194/egusphere-egu21-8144>, 2021.

Ganske, A., Kaiser, A., Kraft, A., Heydebreck, D., Lammert, A., and Thiemann, H.: EASYDAB (Earth System Data Branding) for FAIR and Open Data, pico, <https://doi.org/10.5194/egusphere-egu21-2139>, 2021.

Heydebreck, D., Kaiser, A., Ganske, A., Kraft, A., Schlunzen, H., and Voss, V.: The ATMODAT Standard enhances FAIRness of Atmospheric Model data, Atmospheric Sciences, <https://doi.org/10.1002/essoar.10504946.1>, 2020.

Kaiser, A., Heydebreck, D., Ganske, A., and Kraft, A.: Making the Maturity of Data and Metadata Visible with Datacite DOIs, Atmospheric Sciences, <https://doi.org/10.1002/essoar.10504947.1>, 2020.

Voss, V., Schlünzen, K. H., Grawe, D., Heydebreck, D., and Ganske, A.: First results of a model user survey on a micro-scale model data standard, Atmospheric Sciences, <https://doi.org/10.1002/essoar.10505067.1>, 2020.

Ganske, A., Kaiser, A., and Kraft, A.: Warum und wie Sie Klimamodelldaten veröffentlichen sollten, <https://doi.org/10.5194/dkt-12-7>, 2020.

Voss, V., Schlünzen, K.H. and Grawe, D.: Entwicklung eines Datenstandards für mikroskalige Modellergebnisse, <https://doi.org/10.5194/dkt-12-31>, 2020.

Karsten, P., Neumann, D., and Thiemann, H.: Towards increasing the reusability of atmospheric model data: adapting metadata standards and introducing quality criteria. <https://doi.org/10.5281/zenodo.3667635>, 2020.