



DataHub

Research Field Earth & Environment



Building FAIR from the Ground: Unifying Data Stewardship Across Meteorological and Climate Research Institutes

DSgG 2025, Karlsruhe

Dr. Katharina Loewe, Dr. Sabine Barthlott, et al.

Research data manager at the Institute of Meteorology and Climate Research (IMK)

Data management at the Institute of Meteorology and Climate Research (IMK)



- I. Infrastructure development
- II. Active data curation
- III. Training



© rdm.kit.edu

Data managers at the IMKs

- **Diverse background**
 - Scientists
 - IT specialist
 - Software developer



<https://www.atmohub.kit.edu>

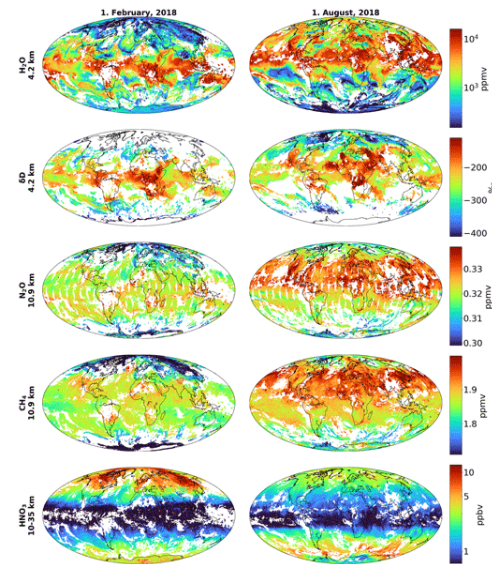
Atmospheric Aerosol Research (AAF)
Atmospheric Trace Gases and Remote Sensing (ASF)
Troposphere Research (TRO)
Atmospheric Environmental Research (IFU)

- **Different experiences**
 - Institutes
 - Contact points
 - Communities

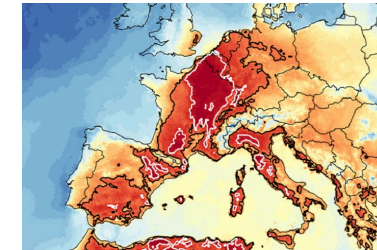
4 Institutes - many diverse data

- **Heterogeneous data** landscape with different data types across scales (in situ – remote sensing – global modeling)
- Requirements:
 - Postprocessing workflows
 - Handling of large datasets
 - Storage and exchange solutions
 - Publication best practices
 - ...
- Cooperation with the KIT infrastructures
 - Scientific computing center (SCC)
 - Library

Atmospheric Aerosol Research (AAF)
Atmospheric Trace Gases and Remote Sensing (ASF)
Troposphere Research (TRO)
Atmospheric Environmental Research (IFU)



© Schneider et al., 2022,
<https://doi.org/10.5194/essd-14-709-2022>



©Tatiana Klimiuk, IMKTRO



© IMKASF,
<https://doi.org/10.48477/COCCON.PF24.KARLSRUHE.SN037.R04>, <https://doi.org/10.14291/tccon.ggg2020.karlsruhe01.R2>

Data management - support for scientists

- Our goals: **FAIR Data** – Improve findability, accessibility, interoperability, and reuse
 - Data Organization & Storage – Secure, structured, and scalable solutions
 - Data Sharing & Publishing – Support repositories, licensing, and open access
 - Training & Support – Workshops, consultations, and best practices
 - Preservation & Security – Ensure long-term data integrity and protection
 - Open Science & Collaboration – Promote transparency and global sharing



© rdm.kit.edu

Data management - support for scientists

- **Daily business**

- On-/Offboarding
- Support data publications
- Active participation in KIT, Helmholtz DataHub and NFDI4Earth communities



- **Training programs**

- Organize or advertise specific workshops (e.g. GitLab, Python, Jupyter)
- PhD induction day
- RDM lecture for Master students
- IMK coffee lectures



Data management - support for scientists

- Tools and best practices

- SMS (<https://helmholtz.software/software/sensor-management-system>)
- Research Data Management Organizer (<https://rdmo.forschungsdaten.info/>)
- System for automated Quality Control (<https://rdm-software.pages.ufz.de/saqc/>)
- Metadata guidelines for environmental data (<https://codebase.helmholtz.cloud/kit-imk-datenmanagement/kit-imk-netcdf-metadata>)
- EDP (<https://earth-data.de/>)



EARTH
DATA

Earth Data Portal

<https://earth-data.de/>

EARTH DATA

HOME ABOUT DATA TOOLS & SERVICES VIEWER LOGIN

Central access to joint interoperable virtual information infrastructure

SPOTLIGHTS [SHOW MORE](#)

Featured Viewers from Earth and Environment

GERMANY FOREST CONDITION

Maps showing the state of the forest in Germany based on remote sensing data. You can get a quick and clear overview for the last years with high-resolution at local stage.

[VIEWER](#) [WEBSITE](#)

DEUTSCHE ALLIANZ MEERESFORSCHUNG

German marine research has a unique research infrastructure, including research vessels and research stations, aircraft, observatories and underwater vehicles.

[DATA](#) [WEBSITE](#)

DROUGHT MONITOR

The drought monitor was developed at the Helmholtz Center for Environmental Research (UFZ), which provides daily comprehensive information on the state of soil moisture in Germany.... [read more](#)

[APP](#) [VIEWER](#)

FEATURED DATA COLLECTIONS [SHOW MORE](#)

Explore thematically grouped information

MOSES
Modular Observation Solutions for Earth Systems

MODULAR OBSERVATION SOLUTIONS FOR EARTH SYSTEMS

MOSES comprises highly flexible and mobile observation modules which are designed to investigate the interactions of short-term events and long-term trends across Earth compartments.

[DATA](#) [WEBSITE](#)

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

Global change has triggered a number of environmental changes, such as alterations in climate, land productivity, water resources, atmospheric chemistry, and ecological systems.

[DATA](#) [WEBSITE](#)


MOSAIC - MULTIDISCIPLINARY DRIFTING OBSERVATORY

The largest-scale Arctic research expedition of all time. German research icebreaker Polarstern spend a year drifting through the Arctic Ocean, trapped in the ice.

[DATA](#) [VIEWER](#) [WEBSITE](#)

Data management challenges

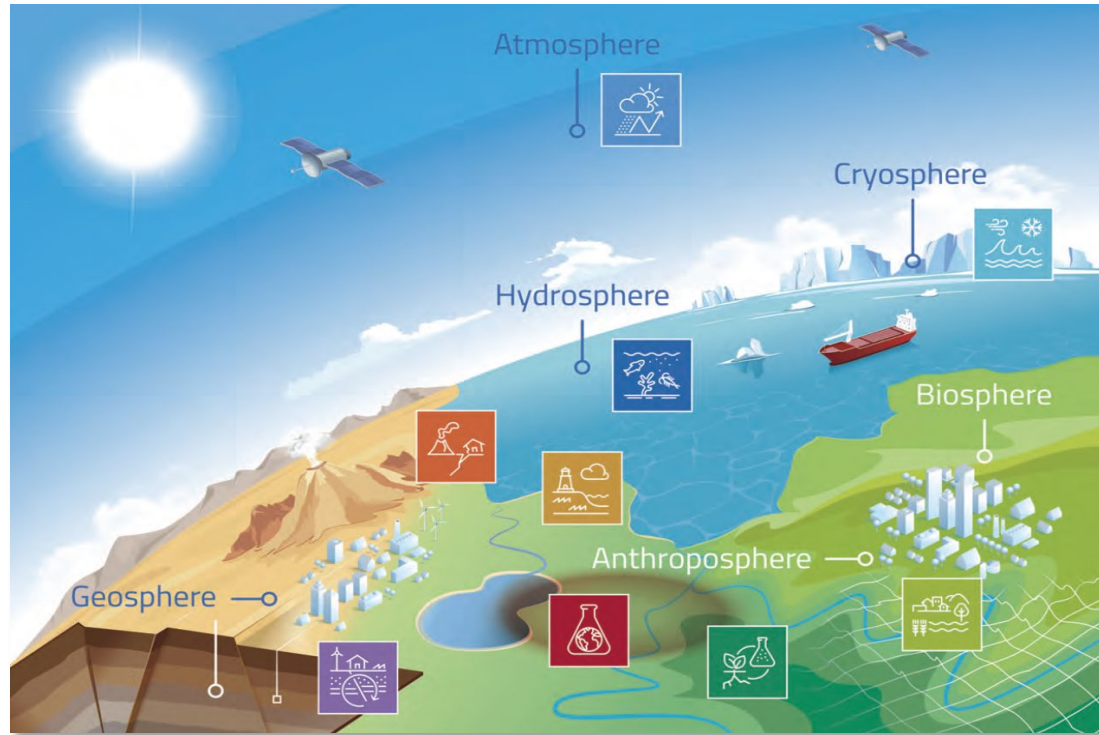
- **Heterogeneous data** landscape with different types of data across scales
- Handling of **large datasets**
- **Metadata harmonization**
- **AI** readiness
- Adjust and **improve** inefficient **workflows**
- Bring **all scientists on board** (lack of time, convincement,...)



Much convincing is needed. Tipps and good experiences are very welcome!

Research Field Earth & Environment

Interoperable digital ecosystem for Earth System Science



©

https://www.helmholtz.de/fileadmin/user_upload/04_mediathek/epaper-POF_IV_Changing_Earth_Pro/epaper/ausgabe.pdf

- **Holistic approach** to Earth System Sciences
- Bringing together all natural sciences and data sciences
- Producing a **large amount of heterogenous data** from **multiple sources**



Helmholtz DataHub

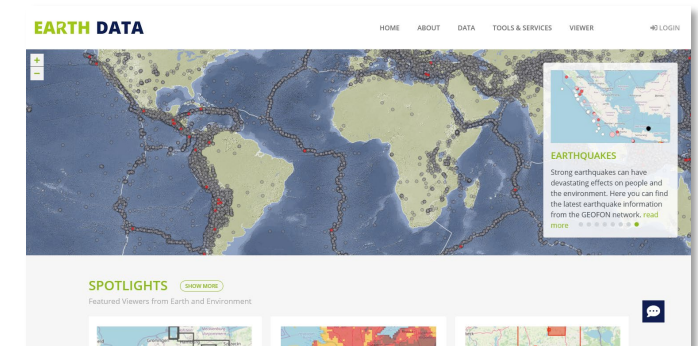
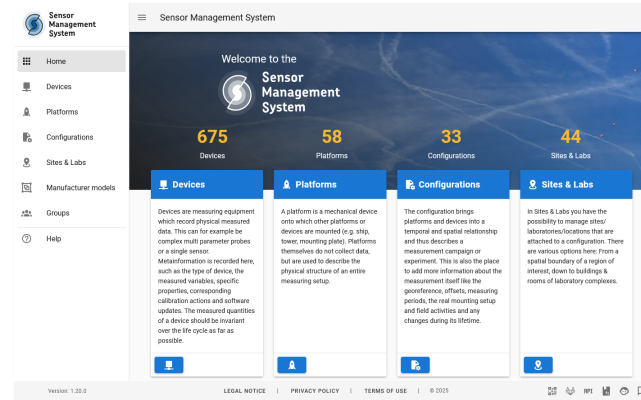
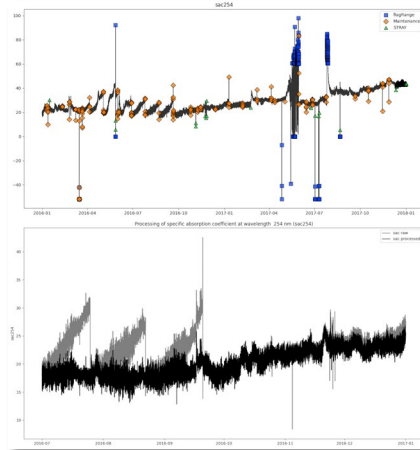
some Facts & Highlights

- 7 Helmholtz centers = **whole Research Field E&E**
- Community of **>100 active contributors**
- **Thematic taskforces** across disciplines (e.g. metadata & PIDs, portal & viewer)
- **Collaborative software, tool & service development** across centers, e.g.



© Helmholtz E&E DataHub

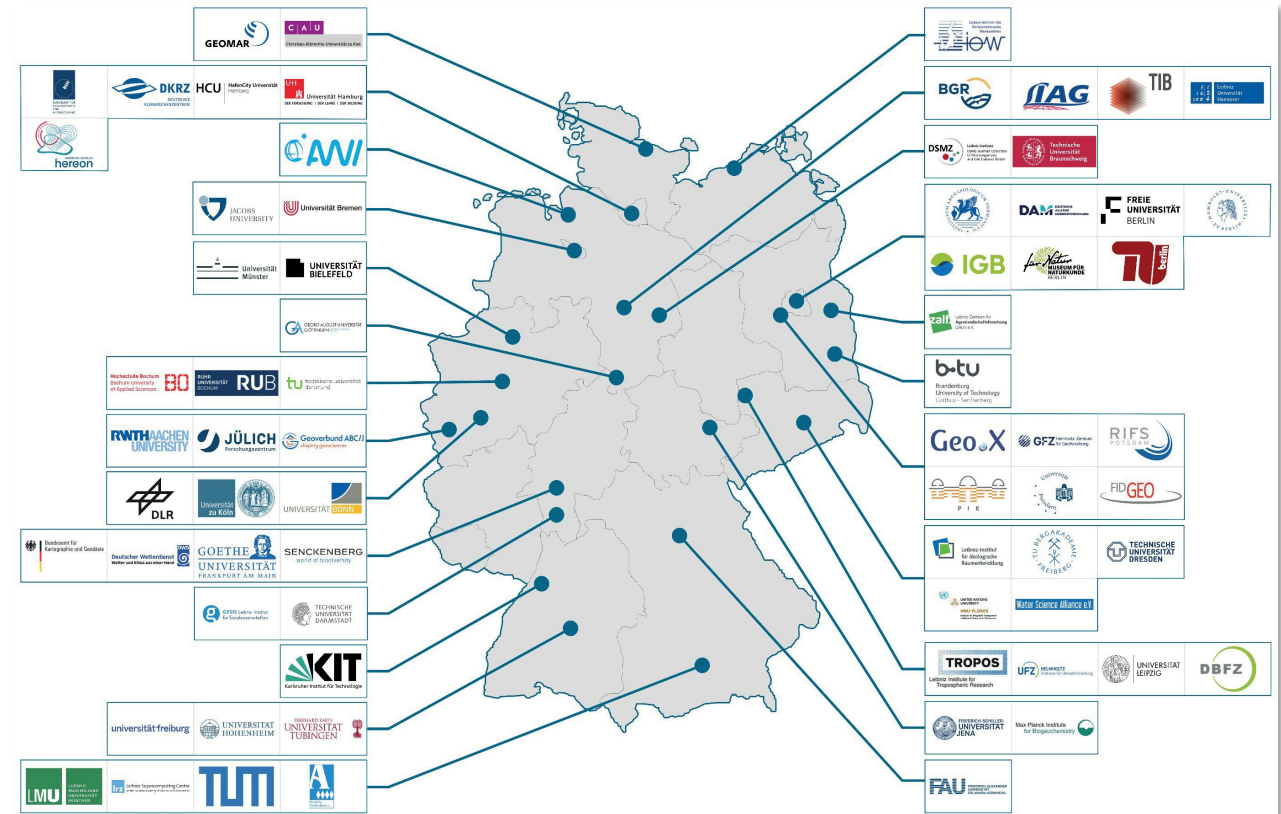
Metadata guidelines



NFDI4Earth – in a nutshell

NFDI4Earth...

- .. is a community-driven process with **66 partner institutions** from different Earth System Sciences (ESS) disciplines **all over Germany**.
- .. provides researchers with **FAIR, sustainable and open access** to all relevant Earth System data.
- .. promotes **innovative research data management (RDM)** and data science solutions.
- ... develops a **joint architecture of services** in close contact with the entire ESS community and its users.



© NFDI4Earth

Data management at IMK - our way

- **FAIR** is a gradual **process** that requires coordinated **infrastructure**, **training**, and **cultural** shifts across diverse institutions.
- **Diversity is a strength**
 - Different institutes and disciplines bring different needs, but unifying them creates robust, reusable data ecosystems.
 - Diverse backgrounds of team members contribute to effective teamwork.
- **Collaboration is the key to sustainability**
 - By aligning with Helmholtz DataHub, NFDI4Earth, and KIT facilities, IMK contributes to a larger interoperable digital ecosystem.



**“building from the ground”
together**



Thank You

*You can have data without information,
but you cannot have information without data*

Daniel Keys Moran (Sci-Fi Author & Programmer)