Improving the Findability of Digital Objects in Climate Science by adopting the FDO Concept

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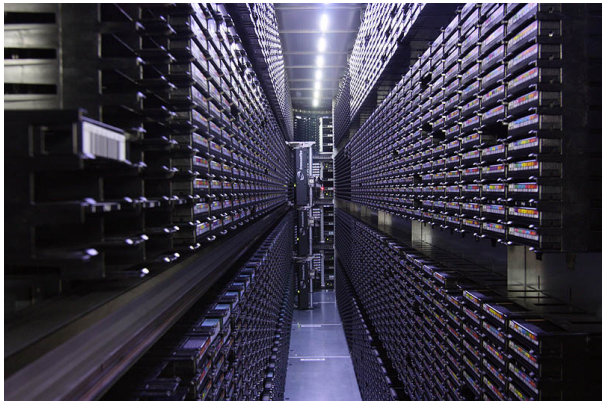
Status Quo

- Large-volume climate model data
- Interdisciplinary data (re)use
- Machine to machine interaction



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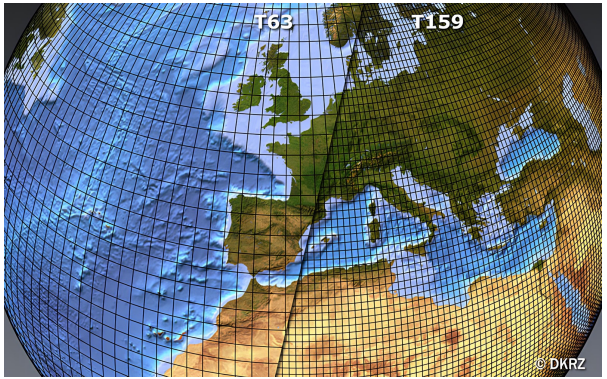

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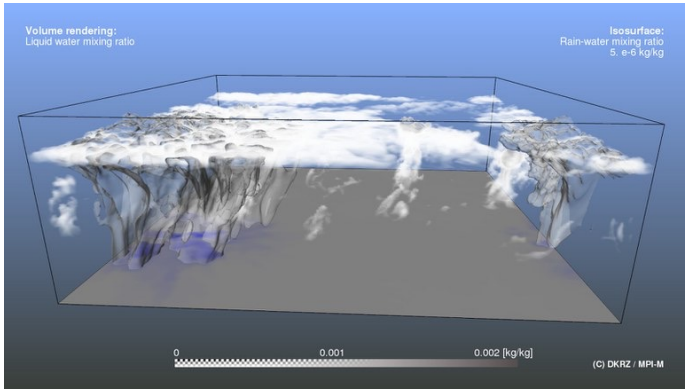
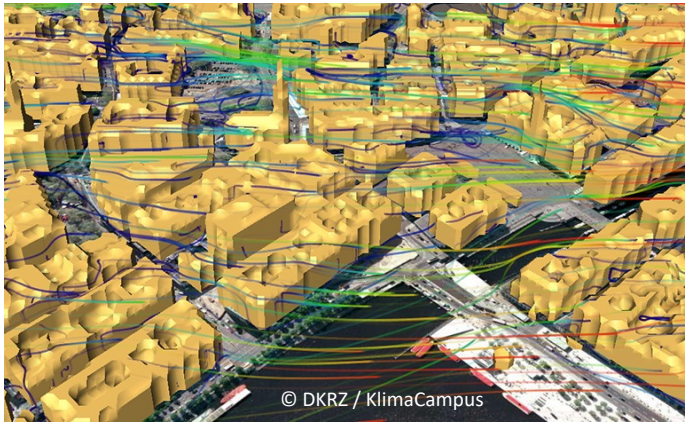
Challenges

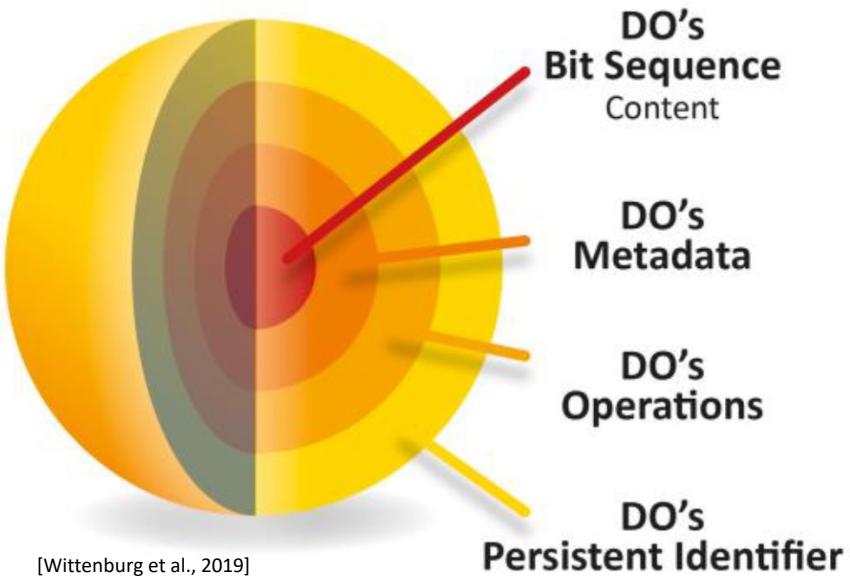
- Hard to find the right data
- Increasing workflow complexity
- Increasing data amounts





What are FAIR Digital Objects?

- Digital Objects (DOs) optimized for M2M actionability
- Includes data, metadata, documents, software
- *Concept of specifications* driven by international & interdisciplinary working groups



[Wittenburg et al., 2019]

FAIR DIGITAL OBJECTS FORUM

https://fairdo.org/

Imagine FDO as DO with a “Passport”

Standardized format

Machine and human readable

Provenance information

Access rights

Author attribution

Location

Verifiable

Unique persistent identifier

Metadata about content

License

FDO-readiness of CMIP6 Data*

Systematic review from researcher perspective:

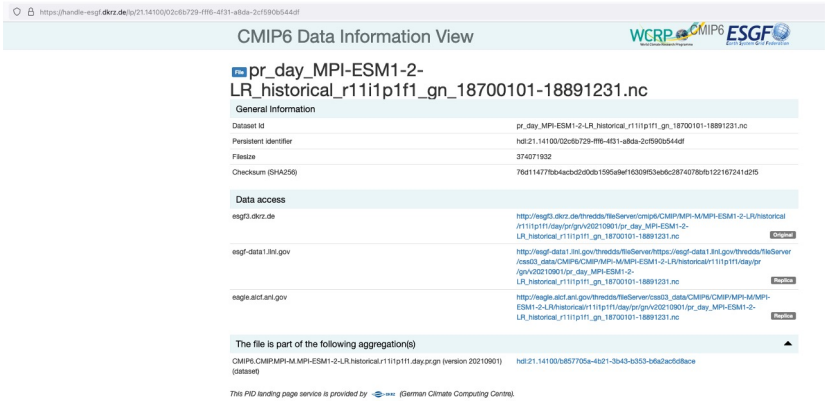
- M2M actionable?
- Encourage Cross-disciplinary research?

[Kulüke et al., 2023]

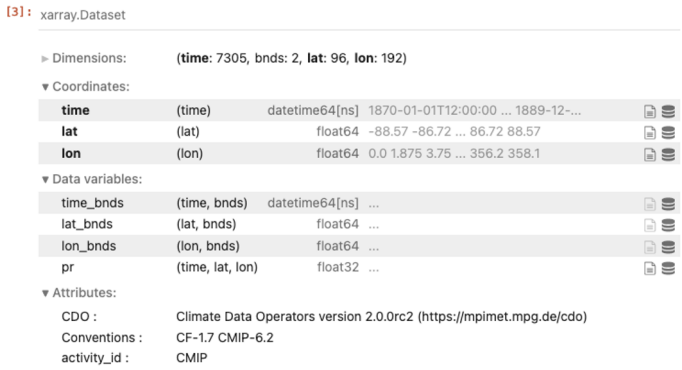
* 6th Phase of the Coupled Model Intercomparison Project
[Eyring et al., 2016; Petrie et al., 2021]

Findable

- **Obstacle 1:** no mapping between meaningful names and model variable names
- **Obstacle 2:** PID profile does not contain variable info



PID profile of CMIP dataset



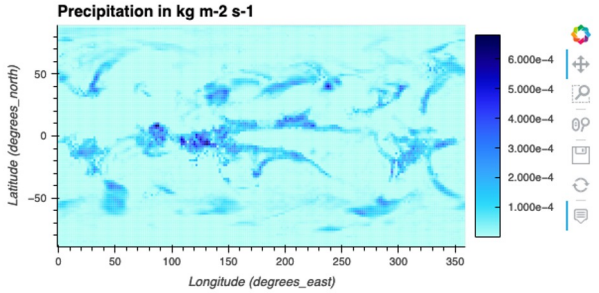
NetCDF header of same dataset

Accessible & Interoperable

hdl:21.14100/0163da97-35d1-387c-a51b-0d12fc4d3b24

jupyter

notebook



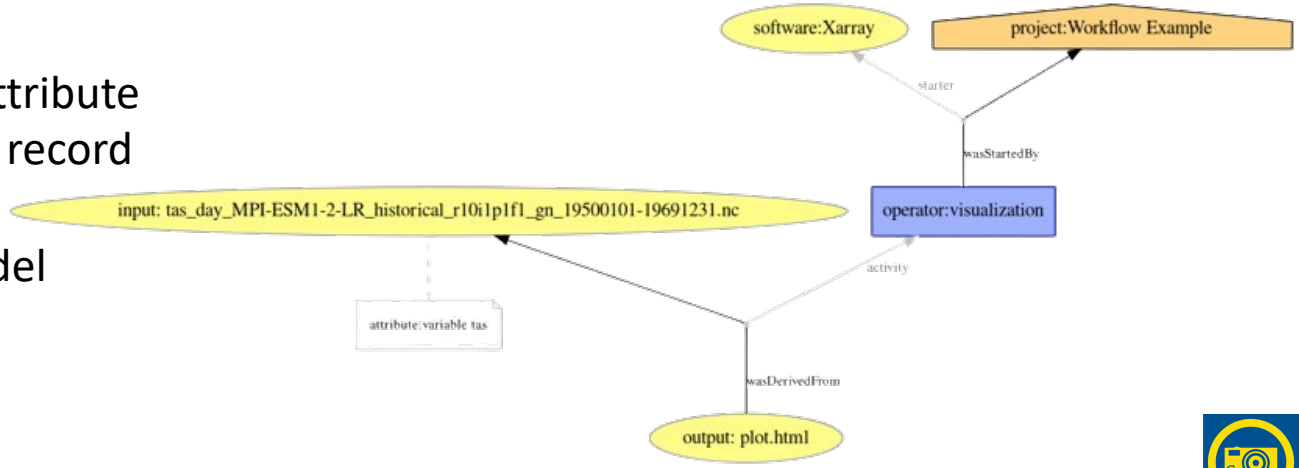
CMIP6 DOs are machine accessible
and to a large extend interoperable

Reusable

CMIP6 DOs have *history* attribute
with sporadic provenance record

→ Adopt PROV data model

[Belhajjame et al., 2013]



How can FDO Concept help?

- Enrich data PID profiles
- Data catalogs as FDOs
- Break down jargon barriers

INTAKE

[faircore4eosc.eu]

Use Case: Apply FDO Concept to ESM Data

- 1 PB high-res ESM data derived from nextGEMS project[1]
- Stored on HEALPix grid[2] → allows hierarchical output and horizontal chunking

Publish Intake / STAC catalog at WDCC[3] with persistent identifier

[1] https://nextgems-h2020.eu/
[2] https://healpix.sourceforge.io/
[3] https://www.wdc-climate.de/

Thank You!

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