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Data stewardship for PalMod - A FAIR-based strategy for data handling in large climate modeling projects

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German climate research initiative Paleo Modeling or PalMod¹ (currently in phase III) is presented here as an exclusive example where the project end-product is unique, scientific paleo-climate data. PalMod data products include simulated climate data from three state-of-the-art coupled climate models of varying complexity and spatial resolutions. Integrating this simulated or modeled climate of the past 130,000 years, with a comprehensive compilation of paleo-proxy reconstruction data facilitate model-model and model-proxy intercomparison/evaluation leading to a more credible climate projections for the future. Being a large multidisciplinary project, a dedicated RDM (Research Data Management) approach is applied within the cross-cutting working group for PalMod. The DMP (Data Management Plan), as a living document, is used for documenting the data-workflow framework that defines the details of paleo-climate data life-cycle. The workflow containing the organisation, storage, preservation, sharing and long-term curation of the data is defined and tested. In order to make the modeling data inter-comparable across the PalMod models and easily analyzable by the global paleo-climate community, model data standardization (CMORization) workflows are defined for individual PalMod models and their sub-models. The CMORization workflows contain setup, definition, and quality assurance testing of CMIP6² based standardization processes adapted to PalMod model simulation output requirements with a final aim of data publication via ESGF³. PalMod data publication via ESGF makes the paleo-climate data an asset which is (re-)usable beyond the project life-time. Along with ESGF publication, the standardized data is long term archived for the use of paleo-climate research community.

The presented RDM infrastructure enables common research data management according to the FAIR⁴ data principles across all the working groups of PalMod. Common workflows defined for the exchange of data and information along the process chain(s) are an important asset which could be applicable to other large scale climate modeling projects. Applying data management planning within PalMod made sure that all the data related workflows were defined, continuously updated if needed and made available to the project stakeholders. End products of PalMod which consist of unique long term scientific paleo-climate data (model as well as paleo-proxy data) are made available for re-use via the paleo-climate research community as well as other research disciplines (e.g., land-use, socio-economic studies etc.). The PalMod data stewardship ensures a FAIR based data dissemination for the climate model datasets as well as the various data standardization workflows developed within the project RDM.

1. www.palmod.de
2. Coupled Model Intercomparison Project phase 6 (<https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6>).
3. Earth System Grid Federation (<https://esgf.llnl.gov>).
4. Findable, Accessible, Interoperable, Reusable.

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