



## Case study Climate Change : How Earth System Science benefits from FAIRCORE4EOSC components

**Anna-Lena Flügel**, Beate Krüss, Heinrich Widmann, Hannes Thiemann, Stephan Kindermann, and Fanny Adloff

Deutsches Klimarechenzentrum (DKRZ), Hamburg, Germany

Climate Change is one of the most pressing global challenges in which researchers from around the world and from various disciplines are working together. Due to the demands regarding the use of openly accessible data in their own as well as other research domains, providing services embedded in European and international infrastructures has always been crucial for climate model researchers. Therefore the Horizon Europe project FAIRCORE4EOSC established the case study “Climate Change” to demonstrate how researchers, the Earth System Science (ESS) community and wider user communities can benefit from the components developed in FAIRCORE4EOSC.

Within FAIRCORE4EOSC, the German Climate Computing Center (DKRZ) examines the possibility of integrating EOSC (European Open Science Cloud) and IS-ENES (Infrastructure for the European Network for Earth System Modelling) services within the Climate Change case study to address some of the data challenges of the ESS community. For example, a huge data space exists in ENES which cannot be found in EOSC, neither on fine-granular nor coarse-granular level. For some ENES data collections, DataCite DOIs are assigned, but these usually refer to thousands of data objects that need to be grouped into different levels of aggregation for which no PIDs are currently available. Additionally, data still miss context formed by producers, experiments, projects, devices, etc crucial for interdisciplinary re-use as well as metadata crosswalks.

To address these challenges, the Climate Change case study investigates the benefits of four FAIRCORE4EOSC components: RAiD (Research Activity Identifier Service), PIDGraph, DTR (Data Type Registry) and MSCR (Metadata Schema and Crosswalk Registry). The goal is to improve discoverability and reusability of data collections at all levels of granularity, and to link data to experiments and projects.

In this case study, selected ENES data collections will receive identifiers using Kernel Information Types developed in FAIRCORE4EOSC as well as the DTR contents. The assignment of RAiDs to projects/experiments provides domain agnostic users with an aggregated view of the entities (data, software, people involved, etc.) from data generation by the Earth System modellers up to publication of final assessment reports by IPCC authors. These metadata will be supplied to Open Science Graphs and represented within the PIDGraph that visualises the context and interlinking for a specific research project based on DOIs and RAiDs. In addition to the identifiers, the scientific

metadata are also made available. Improving information that enables meaningful crosswalks is important and supported by the features of the DTR and MSCR. The DTR offers the possibility to register and assign a PID to a data type (e.g. measurement unit, info type, schema) and ensures a machine actionable standardisation of PID metadata for data objects. The Climate Change case study will use DTRs for persistent Climate Forecast convention (CF) variable definitions. The MSCR can then be used to create machine actionable unit conversions or variable mappings based on DTR data types. This focus on improving the prerequisites for machine-aided analytics including semantic aspects is of high priority due to the commonly large data volumes and the high interdisciplinary requirements in climate science.