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# The METAFOR project: providing community metadata standards for climate models, simulations and CMIP5

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The results of climate models are now of more than purely academic interest: governments and the private sector also have a need to discover the results in order to prepare for and mitigate against the potentially severe impacts of global climate change. Climate modelling is a complex process, which requires accurate and complete metadata (data describing data) in order to identify, assess and use the climate data stored in digital repositories.

The EU funded METAFOR project has developed a Common Information Model (CIM) to describe in a standard way climate data and the models and modelling environments that produce this data. To establish the CIM, METAFOR first considered the metadata models developed by many groups engaged in similar efforts in Europe and worldwide (for example the US Earth System Curator), explored fragmentation and gaps as well as duplication of information present in these metadata models, and reviewed current problems in identifying, accessing or using climate data present in existing repositories. The CIM documents the “simulation context and models”, i.e. the whys and wherefores and issues associated with any particular simulation.

Climate modelling is a complex process with a wide degree of variability between different models and different modelling groups. To accommodate this, the CIM has been designed to be highly generic and flexible. The climate modelling process which is "an activity undertaken using software on computers to produce data" is described as separate UML packages. This fairly generic structure can be paired with more specific "controlled vocabularies" in order to restrict the range of valid CIM instances.

METAFOR has been charged by the Working Group on Coupled Modelling (WGCM) via the Coupled Model Inter-comparison Project (CMIP) panel to define and collect model and experiment metadata for CMIP5. To do this, a web-based questionnaire will collect information and metadata from the CMIP5 modelling groups on the details of the models used, how the simulations were carried out, how the models conformed to the specific CMIP5 experiment requirements. The aim of the questionnaire is to document the climate models in sufficient detail so that the CMIP5 data can be located and compared by a wide and diverse community, including those researchers with an interest in the impacts and adaptations of climate change (e.g. IPCC’s WGII). A new set of “controlled vocabulary” was devised to describe in a standard and structured way the dynamics, physics, numerical schemes and other parameterisations of the several components (ocean, atmosphere, land surface, sea ice, atmospheric chemistry, etc.) of the earth system models used in CMIP5.

The CMIP5 model documentation questionnaire is an ambitious metadata collection tool. It will provide the most comprehensive metadata for a climate model inter-comparison project yet and plans for the community governance of its associated standards and now being organised. The questionnaire’s close ties with the CIM will ensure that the metadata for the CMIP5 model runs will be stored in a standard way, enabling the development of tools to search for and compare CIM documents, and hence different climate models.