On the way to synoptic interpretation of geoscientific data in joint CCS project CO2-MoPa[1]

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ABSTRACT

Within the research framework "*Geotechnologien*" of the German ministry *BMBF* and the scientific research organization *DFG*, the joint project "*Modelling and Parameterisation of CO_2 Storage in Deep Saliniferous Formations for Dimension and Risk Analyses" (CO_2-MoPa)* aims at the development and application of an improved model and database system, comprising the hydraulic, geometrical, geochemical, and geomechanical aspects of virtual subterrestrial CO_2 sequestration, and permitting dimensioning and risk analyses of CO_2 storage in deep saline formations. In this context, the task of the subproject *CO_2-MoPa M3*: "Parameter identification for modelling – validation and Visualization" is the spatial and temporal integration of geological, geophysical and geochemical data and their meta-information in a synoptic model within the framework of computer aided simulations of CO2 sequestration.

The heterogeneity of the data to be handled, and the structure of the joint project consisting of ten co-operating work groups situated in different institutions at different locations requires a distributed organization of the information structure that is modular and flexible. Moreover, its use by the different collaborators should not impose much additional work. In particular, different representations of data should not hinder the passage of information. On the other hand, the management of certain data, in particular spatial 3D models, requires sophisticated special operations.

In order to enhance the navigation between the individual data resources, a meta-information data basis provides information both on technical issues like software and formats, and on scientific content.

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The proposed paper briefly addresses some of the challenges of handling heterogeneous distributed geoscientific data, gives an overview on the architecture of the infomation system under development, and presents the meta-information database and the spatial *3D/4D DBMS DB4GeO (Bär 2007, Breunig et al 2009)* for the management of spatial models of the subsurface that provide a geometric basis for further numerical modeling.

The system is based on well-known Web-technology, using the http protocol in *REST (Fielding 2000)* style, the *XML DBMS eXist (exist 2010)* for the management of meta-information on resources, with query language *XQuery* and *XSLT* stylesheet transformation between different data formats. For the representation of the relationships between information resources in a graph structure generated from the resource descriptions, *RDF* or *OWL* will be used. Interfaces to relational databases like *MySQL* and also to *MS Access* permit to include classical *SQL* queries. The object-oriented spatio-temporal DBMS *DB4GeO* written in *JAVA* uses Apache software for web server functions, and is based on the open source *OODBMS DB4O (Db4o 2009)*. Spatial 3D functions and operations can be invoked via the http protocol, and complex queries encoded in *JAVA* can be installed on the server side as extensions. Visualization is supported by a "Geo-Wall" installation and software *GOCAD (Gocad Research Group 2010*), *ParaView (Paraview 2010)*, *IGMAS+(Schmidt et al. 2007)* permitting scientists from different subprojects to observe and discuss large size spatial models, if required in stereo view.

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