Geophysical Research Abstracts
Vol. 13, EGU2011-6773, 2011
EGU General Assembly 2011

A phreeqC-Elmer coupling algorithm for T-H-M-C modeling applications

alain dimier and elodie jeandel
Germany (alain.dimier@eifer.org)

At the end of the twentieth century, the scientific community warned for greenhouse gas effects on the global climate warming. Today, one of the main studied solutions to that problem is the so called Capture and Carbone Storage, C.C.S., namely the geological storage of "industry-induced" CO_2, mainly in brine aquifers and also in depleted oil reservoirs. Working on that topic, associated to the acquisition of an experimental CO_2-brine-rock reactive percolation test bench, we decided to work on numerical modelling in that field, involving the so called T-H-M-C coupling; the association of modelling and experiments enabling a better understanding and characterization of processes determining how the subsurface will behave as a storage container.

For modelling, we investigate coupling of open source software's to access the aforementioned physics. For such a phenomenology, one way to efficiently implement a multidimensional numerical tool is to couple already available open source tools. That can be done using the operator splitting methodology eventually combined with a sequential iterative approach.

Operator splitting enables to have a modular approach, already available tools becoming part of a new "wrapping" tool, to give access to the broader targeted phenomenology. Object oriented programming has been used to design the tool.

We will briefly present each of the software used in the coupling, namely:

PhreeqC, [1] http://wwwbrr.cr.usgs.gov/projects/GWC_coupled/phreeqc, from the USGS, for geochemistry,

Elmer, [2] http://www.csc.fi/english/pages/elmer, from the CSC finish research center, for flow, ion transport, temperature and mechanics,

Saturne, [3] http://www.code-saturne.org, from EDF, for atmospheric transport

The main part of the presentation will focus on the way the tool is implemented, illustrated with the setup of one simple test case. Various examples issued, partially, from lab experiments will also illustrate its possibilities and potential in terms of phenomenology and computing efficiency.