Geophysical Research Abstracts
Vol. 19, EGU2017-4654, 2017
EGU General Assembly 2017

acme: The Amendable Coal-Fire Modeling Exercise. A C++ Class Library for the Numerical Simulation of Coal-Fires

Manfred W. Wuttke

Leibniz Institute for Applied Geophysics (LIAG), Geothermics and Information-Systems, Hannover, Germany
(manfred.wuttke@liag-hannover.de)

At LIAG, we use numerical models to develop and enhance understanding of coupled transport processes and to predict the dynamics of the system under consideration. Topics include geothermal heat utilization, subrosion processes, and spontaneous underground coal fires. Although the details make it inconvenient if not impossible to apply a single code implementation to all systems, their investigations go along similar paths: They all depend on the solution of coupled transport equations.

We thus saw a need for a modular code system with open access for the various communities to maximize the shared synergistic effects. To this purpose we develop the ***oops!*** (**o**pen **o**bject-oriented **p**arallel **s**olutions) - toolkit, a C++ class library for the numerical solution of mathematical models of coupled thermal, hydraulic and chemical processes. This is used to develop problem-specific libraries like ***acme***(**a**mendable **c**oal-fire **m**odeling **e**xercise), a class library for the numerical simulation of coal-fires and applications like ***kobra*** (**Ko**hle**bra**nd, german for coal-fire), a numerical simulation code for standard coal-fire models.

Basic principle of the ***oops!***-code system is the provision of data types for the description of space and time dependent data fields, description of terms of partial differential equations (pde), their discretisation and solving methods. Coupling of different processes, described by their particular pde is modeled by an automatic timescale-ordered operator-splitting technique.

acme is a derived coal-fire specific application library, depending on ***oops!***. If specific functionalities of general interest are implemented and have been tested they will be assimilated into the main ***oops!***-library. Interfaces to external pre- and post-processing tools are easily implemented. Thus a construction kit which can be arbitrarily amended is formed.

With the ***kobra***-application constructed with ***acme*** we study the processes and propagation of shallow coal seam fires in particular in Xinjiang, China, as well as analyze and interpret results from lab experiments.