Geophysical Research Abstracts
Vol. 12, EGU2010-11445, 2010
EGU General Assembly 2010

Underground Coalfires as an Incentive and Challenge to THMC Modeling

Manfred W. Wuttke (1), Christian Fischer (2), Dorel Gusat (3), Uwe Meyer (4), and Martin Schmidt (5)

(1) Leibniz-Institute for Applied Geophysics (LIAG), Hannover, Germany (manfred.wuttke@liag-hannover.de), (2) German Aerospace Center (DLR), Weßling, Germany, (3) Freiberg University of Mining and Technology (TUBAF), Freiberg, Germany, (4) Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany, (5) Federal Institute for Materials Research and Testing (BAM), Berlin, Germany

Spontaneous combustion of coal has become a world wide problem often caused by technical operations in coal mining areas. It affects human activities locally but even more important globally through the contribution to global warming by emitting substantial amounts of greenhouse gases like carbondioxid.

Investigations of underground coalfires so far mainly with the aim of their mitigation have revealed a network of complex interactions between thermal, hydraulic, mechanical and chemical processes in this unique systems. Numerical modeling at the moment is only at the brink of being helpful to support the fire fighting in the field, but has already served as a tool to test the overall understanding of coal fire processes and to estimate their environmental impacts.

This work aims at summarizing the status of THMC modeling of underground coalfires, mainly from the perspective of the Sino-German Coalfire Project, and gives an overview of the open questions and challenges to rise to if one is up to comprehensive and meaningful modeling work. The main topics are:

- The fluid transport through fractured porous media is driven by chemical processes at high temperatures causing high pressure gradients.
- Transport processes occur on different timescales.
- Thermal and mechanical stresses cause fracturing in the porous media on a huge range of scales, thus constantly changing the pathways for oxygen supply and exhaust gas removal.
- To investigate any extinction process one has to consider multi phase transport with phase changes (evaporation and condensation of water, transport of mud and cementation, etc.).
- To interpret surface signatures like temperature anomalies one has to link the underground processes to atmospheric heat transport including radiation.
- Coal fires are highly individual, threedimensional systems in general without any symmetry.

Other problems in geoscience and geoengineering (like nuclear waste deposition, geothermal energy utilization, carbon dioxide sequestration) require a comparably complex approach to modeling. Although the details make it impossible to apply a single code implementation to all systems, their investigations go in similar ways. There is a need for modular code systems with open access for the various communities to maximize the shared synergistic effects.