Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08034, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08034
EGU General Assembly 2008

Application of numerical modelling to support underground coalfire fighting in the Wuda coal mining area

M. W. Wuttke, J. Han, M. Halisch, and W. Kessels
Leibniz Institute for Applied Geosciences, Stilleweg 2, D 30655 Hannover
(manfred.wuttke@gga-hannover.de)

Spontaneous self ignition of coal can occur wherever coal is mined, stored or processed. In particular thus generated underground coal fires are nowadays an enormous hazard to the resource itself but also to the global environment. With the increased recognition of the contribution of such fires to the global warming problem by releasing uncontrolled considerable amounts of greenhouse gases the extinction of such fires becomes a crucial task for the future. In the big arid coal mining area of northwest PR China the necessity for protecting the economically valuable coal resources and the environment is now realized, leading to increased fire fighting activities, mostly by removing the burning coal, sealing the surface from oxygen and cooling the fire-zones with water. These activities need a thorough beforehand estimation of the needed resources (e.g. water, filling material), costs and effort to be economically reasonable and sustainable. It is also important now to estimate the current status of release of climate relevant gases and to assess the impact of the taken countermeasures.

Within the Sino-German project "Innovative Technologies for Exploration, Extinction and Monitoring of Coal Fires in North China" a numerical model has been developed to simulate the propagation of underground coal fires in realistic scenarios. This model, based on the FEM code Rockflow (LUH), consists of instationary mass, momentum and energy conservation equations for each component (coal, oxygen, exhaust gas, ash) coupled by source and sink terms describing the exchanges of mass and energy between the components, and incorporates a set of petrophysical data from lab measurements on rock and coal samples from Wuda. It has been used to gain a comprehensive understanding of the processes that control the underground coalfire.

The model is now being incorporated into an onsite modelling tool to enable the mining engineer to estimate the effort necessary for sustainable fire fighting actions. In addition, the model will be used to assess the impact of such actions as Clean Development Mechanism activities within the framework of the Kyoto protocol.

We present new results for realistic scenarios of sealing the fire from oxygen supply by covering the surface with an impermeable layer. Several scenarios with varying coal fire depth, geometry, covering area, permeability and thermal conductivity of the coal, rock and covering material are compared.