Geophysical Research Abstracts, Vol. 8, 06318, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06318
© European Geosciences Union 2006

Gas & Temperature Monitoring of a Natural Coal Fire

S. Schloemer (1), M. Teschner (1), E. Faber (1), U. Meyer (1) and P. Althaus (2)

(1) Federal Institute for Geosciences and Natural Resources (BGR), Germany, (2) Deutsche Montan Technologie GmbH (DMT), Germany (s.schloemer@bgr.de)

Since 2003 the "Sino-German Coal Fire Research Initiative" investigates natural coal fires near Wuda (China) where an area of 280.000 m^2 is affected by subsurface fires. Coal fires cause economic damages due to a reduction of the recoverable coal, land subsidence and affect human health because noxious gases (e.g. SO_2, NO, CO, H_2S) and particulate matter are emitted, the condensation products can pollute water and soil.

Gas composition and temperatures as well as meteorological data have been monitored close to a large fire zone ($\sim$25m) for five months. The temperature in the gas emanating vents showed intense fluctuations (up to $\pm$100˚C within 48h) which could not be related to meteorological conditions. These short-term fluctuations were superimposed by long-term temperature drifts. The general trends are a result of the proceeding fire front and are confirmed by the combustion gas analysis. A significant decrease in the CO/CO_2 ratio together with a temperature increase of 35˚C indicates the approach of the main combustion zone, but the velocity is very slow ($<$ 10m/year). The occurrence of CH_4, CO and CH_4 in the gases is related to various combustion processes (coal pyrolysis, coking and/or coal gasification).

Water-flooding experiments were performed to activate fissures and cracks and in addition the response on temperature and gas composition was measured. Close to the gas measuring site (4.5m^3 water injected) a significant change in the gas composition was observed, which must be attributed to a dilution with the evolving steam (no direct effect on the coal combustion). Another experiment close to the main combustion zone lead to an intense steam production and a temperature drop from 290˚C to 260˚C in a nearby fracture. Temperature continued to decrease almost linearly for several days. We conclude that the water has significantly affected the combustion process and the temperature decline is a result of the subsequently cooling bed rock.