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Assessment of the Influence of Fractures on the Dynamics of Coal Seam Fires by Numerical Experiments

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Uncontrolled burning coal seam fires still constitute major problems for the coal industry by destroying the resource, a serious hazard for the local people by severe environmental pollution, and a tremendous threat to the global environment by the emission of greenhouse gases and aerosols. In particular when the seams are lying shallow the alteration of the immediate surrounding of the coal seam fire feeds back on the dynamics of the fire. Thermal stress induced fracturing produces direct connections of the fire zone with the atmosphere. This influences the supply with oxygen, the venting of the exhaust gases, and the dissipation of heat. The first two processes are expected to enhance the fire propagation whereas the latter effect should slow it down. With our dedicated coal seam fire code ACME ("Amendable Coal-fire Modeling Exercise") we study these coupled effects of fractures in simulations of typical coal seam fire scenarios based on data from Xinjiang, China. Fractures are predefined as 1D/2D objects in a 2D/3D model geometry and are opened depending on the passage of the heat wave produced by the coal seam fire.