Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

A New Model for Instantaneous Coal and Gas Outbursts KANGPING CHEN, Arizona State University — An instantaneous coal and gas outburst is a sudden and violent simultaneous ejection of large amounts of coal and gas from the working coalface during underground mining. Existing theories are incapable of explaining many precursors of an outburst, which include the occurrence of distinct audible noises originating close to the mine opening and a decrease in the temperature in the solid of the coalface and the nearby atmosphere. Nor can they explain the increased proneness to outbursting with increased rate-of-advance of the coalface. They are incapable of predicting a failure of explosive and catastrophic nature which characterizes an instantaneous outburst. A new model combining fracture mechanics, gas dynamics and rock mechanics is presented to elucidate the physical mechanisms leading to instantaneous coal and gas outbursts. This model suggests a domino effect that causes a catastrophic failure of the coal and an instantaneous outburst; it identifies a critical condition for the onset of an outburst, and it successfully predicts all of the observed phenomena preceding outbursts. The model also predicts a fracture aperture size effect which is confirmed by observations.

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Date submitted: 09 Aug 2012 Electronic form version 1.4