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# Conditions for the formation and atmospheric dispersion of a toxic, heavy gas layer during thermal metamorphism of coal and evaporite deposits by sill intrusion

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There is compelling evidence for massive discharge of volatiles, including toxic species, into the atmosphere at the end of the Permian. It has been argued that most of the gases were produced during thermal metamorphism of coal and evaporite deposits in the East Siberia Tunguska basin following sill intrusion (Retallack and Jahren, 2008; Svensen et al., 2009). The release of the volatiles has been proposed as a major cause of environmental and extinction events at the end of the Permian, with venting of carbon gases and halocarbons to the atmosphere leading to global warming and atmospheric ozone depletion (Svensen et al., 2009)

Here we consider the conditions required for the formation and dispersion of toxic, heavier than air, gas plumes, made up of a mixture of $CO_2$, $CH_4$, $H_2S$ and $SO_2$ and formed during the thermal metamorphism of C- and S- rich sediments. Dispersion models and density considerations within a range of $CO_2/CH_4$ ratios and volatile fluxes and temperatures, for gas discharge by both seepage and from vents, allow the possibility that following sill emplacement much of the vast East Siberia Tunguska basin was - at least intermittently - covered by a heavy, toxic gas layer that was unfavorable for life. Dispersion scenarios for a heavy gas layer beyond the Siberian region during end-Permian times will be presented.

REFERENCES

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