Geophysical Research Abstracts
Vol. 19, EGU2017-7424-1, 2017
EGU General Assembly 2017

LIP volcanism and paleo-environmental crises – impact of magma emplacement sequence on thermogenic degassing rates from the Karoo sedimentary basin

Christophe Galerne (1) and Jörg Hasenclever (2)

(1) GEOMAR - Helmholtz Centre for Ocean Research Kiel, Kiel, Germany (cgalerne@geomar.de), (2) MARUM - Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany (jhasenclever@marum.de)

Volcanism in organic-rich sedimentary basins leading to thermogenic greenhouse gas generation has been documented as a strong forcing factor of past mass extinctions. However, quantitative studies fail to provide degassing rate estimates that would allow a direct comparison with anthropogenic warming. We are investigating different sill-emplacement sequences of a Large Igneous Province (LIP) plumbing system to identify their potential variable impact in terms of thermogenic degassing rates and cumulative amount of gas released at the basin top. We use a 2D finite element model that solves for hydrothermal fluid flow and thermal evolution around several cooling intrusions. Igneous sills are represented by horizontally dominated thermal anomalies that are sequentially placed within the sedimentary basin. We test different end-member scenarios of emplacement like bottom-to-top, top-to-bottom, and arbitrary emplacement order. Degassing pulses monitored during the simulations are recorded and compared for various end-member scenarios. The LIP emplaced in the Karoo Basin (South Africa, 183 Ma) is considered as a case study. We use basin lithostratigraphic properties (e.g. Total Organic Carbon content, sill to sediment proportion and structural data) to discuss results of our end-member models. This research potentially holds the key to demonstrate whether or not anthropogenic warming is in a comparable range to a documented paleo-environmental crisis and mass extinction triggered by degassing related volcanism.