Carbon-cycle in sedimentary basins intruded by sills - differing responses and implications from depth to the subseafloor

C. Galerne[1], N. Lenhardt[2], O. Rabbel[3], C. Wiggers[1], J. Hasenclever[4], O. Galland[5], A. Götz[6], W. Bach[1], W.-A. Kahl[7], A. Teske[8], D. Lizarralde[9], C. Berndt[10], T.W. Höfig[11,*], and Expedition 385 Scientists

[1]AG Petrology of the Ocean Crust, University of Bremen, Bremen, Germany
[2]Department of Geology, University of Pretoria, Pretoria, South Africa
[3]NJORD, University of Oslo, Olso, Norway
[4]Institute of Geophysics, CEN, Hamburg University, Hamburg, Germany
[5]Physics of Geological Processes, University of Oslo, Oslo, Norway
[6]Georg-August-University Göttingen, Göttingen, Germany
[7]MAPEX Center for Materials and Processes, University of Bremen, Bremen, Germany
[8]Deparment of Marine Sciences, University of North Carolina at Chapel Hill, Chapel Hill, USA
[9]Woods Hole Oceanographic Institution, Woods Hole, USA
[10]GEOMAR | Helmholtz Centre for Ocean Research Kiel, Kiel, Germany
[11]International Ocean Discovery Program, Texas A&M University, College Station, USA
*present affiliation: Project Management Jülich, Jülich Research Centre GmbH, Rostock, Germany

A 20-year-old paradigm postulates that rapid emplacement of large-volume of magmatic sills into basins of organic-rich sediment infill caused some of the greatest mass extinctions in Earth's history. The suggested underlying process is the intrusion of low-permeability sedimentary strata by basaltic magma, which released gases from cracking of organic matter trapped within the host sedimentary rock. The mobilized thermogenic gases were carried upward by epithermal fluids and discharged violently at the basin floor through hydrothermal vents. Here, we report on results of two studies that suggest that sills may act as a trap for some of the thermogenic gas mobilized in the lower part of their contact aureole, a mechanism that may actually lessen the thermogenic gas emission flux. Additionally, new research related to magma-sediment interactions in the subseafloor indicate that very little thermogenic gas is mobilized and emitted from young unconsolidated sediments. We present conclusions on the nature of magma-sediment interactions and the role magmatic intrusions in sedimentary basins may play in carbon-cycling within the subseafloor and the transfer of gases across the ocean floor.