Last glacial maximum and hydrothermal sediment fluxes on the mid-Atlantic ridge

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Pressure fluctuations associated with sea level change across glacial-interglacial cycles may drive variation in both volcanic and hydrothermal activity at mid-ocean ridges [1-4]. Thus, the total hydrothermal input of Fe and other metal species to the deep ocean may not be constant between glacial and interglacial periods. To test the hypothesis that hydrothermal activity is sensitive to sea level change, we constructed records of hydrothermal sediment flux in two gravity cores from Broken Spur (29ºN) and TAG (26ºN) vent fields on the Mid-Atlantic Ridge. We calculated hydrothermal sediment fluxes from major and trace element concentration data using extraterrestrial ^{3}He-derived sediment rain rates.

Elemental fluxes from the Broken Spur core are not indicative of any hydrothermal input and suggest that dust deposition has dominated the Fe budget at this site for the past 70 kyr. Local bathymetry at Broken Spur likely inhibits transport of the Broken Spur plume to the sediments at the core site. In contrast, metal fluxes (e.g. Fe, Cu, V) from the TAG core indicate a marked peak in hydrothermal sediment accumulation starting just before Last Glacial Maximum and ending during the deglaciation. For example, the Fe flux to the sediments is ~4x higher than the background Fe flux during the hydrothermal peak. The LGM variation in hydrothermal sediment accumulation is significantly larger than the variation in dust deposition in the TAG core over the past 50 kyr, as inferred from the flux patterns of Th and terrigenous ^{4}He. The timing of the hydrothermal sediment peak in the TAG core is consistent with the hypothesis that decreased sea level during continental glaciation allows for increased activity at mid-ocean ridges. Our results encourage further investigation into the potential link between glacial cycles and hydrothermal output from mid-ocean ridges.

[1] Huybers and Langmuir (2009) *EPSL* **286**, 479-491. [2] Lund and Asimow (2011) *GGG* 12, Q12009. [3] Lund et al. (2014) *Goldschmidt Abstracts*, 1536. [4] Crowley *et al.* (2015) *Science* **347**, 1237-1240.