

Degassing and emptying of the Laacher See magma chamber seen in a Greenland ice core

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The Plinian eruption of Laacher See Volcano (LSV; Germany) occurred at the end of the last glacial warm period (Allerød, 12,900 BP) and spread ~20 km³ of phonolitic tephra over central Europe. The Laacher See magma chamber was compositionally zoned. Detailed analyses (e.g., [1]) have revealed that the earliest eruptions were that of highly evolved, volatile-rich, phenocryst-poor phonolite and the latest eruptions were that of mafic phonolite. The LSV event produced a minimum of 1.9 Tg S, 6.6 Tg Cl, and 403 Tg H₂O [2]. In the GRIP ice core, while a tephra layer is absent, the LSV event is evident as a sharp spike in electrical conductivity (ECM), which corresponds to an increase in the deposition of sulfuric acid (e.g., [3]). Here we investigated whether the GRIP Os isotope chemistry provides a high resolution record of the different stages of the LSV event.

Typical Os concentration of polar ice-melts is ~1 fg/g (= 10⁻¹⁵ g/g). We process 25-50 g of water and have a procedural blank of 2.7 fg. The [Os] and ¹⁸⁷Os/¹⁸⁸Os ratio of the ECM peak is 1.01 ± 0.06 fg/g and 0.32 ± 0.02, respectively. In comparison, we find two Os peaks that occur 5 years and 11 years prior to the ECM peak. The [Os] and ¹⁸⁷Os/¹⁸⁸Os ratio of ECM-5 peak are ~160 fg/g and 0.38 ± 0.02, respectively. This peak is associated with a Mo spike. The [Os] and ¹⁸⁷Os/¹⁸⁸Os ratio of ECM-11 peak are ~1300 fg/g and 0.29 ± 0.02, respectively. This peak is associated with pronounced spikes in Sn and Zn. While the ECM peak reflects the main stage of Laacher See eruption, the ECM-5 and ECM-11 peaks show the early degassing of the volatiles

[1] Schmincke, H.-U. et al. (1999), *Quat. Int.*, 61, 61-72. [2]

Harms, E. and Schmincke, H.-U. (2000) *CMP*, 138, 84-98.

[3] Taylor, K.C. et al. (1997) *JGR*, 26511-26517.