# THEME 5: THE DEEPER EARTH

## Session 5.2: Large igneous provinces

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Large igneous provinces represent some of the volumetrically most significant magmatic episodes in Earth's history, and they have frequently been invoked as a cause of global climate change. We welcome contributions for this session that demonstrate how geochemistry can further our understanding of these magmatic events, in particular contributions that focus on the following aspects:
(i) environ-mental effects - e.g. volatile emissions during eruption, chemical weathering and impact on ocean chemistry;
(ii) geochronology - e.g. duration of magmatism, possible coincidence between large igneous provinces and stage boundaries;
(iii) melt inclusions - e.g. pre-eruptive volatiles, tracers of melting, mixing, and crustal assimilation;
(iv) mantle sources - e.g. compositional features and origin of mantle sources, novel methods and/or new evidence to assess contributions from the lithosphere; and
(v) ore-forming potential - e.g. PGE content, oxygen fugacity, and accumulation mechanisms for mineral deposits.

**5.2.11**

## Flood basalt volcanism and the marine Os isotope record

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Two recent studies focusing on the Central Atlantic Magmatic Province [1] and the Deccan Traps [2] argue that eruption of continental flood basalts (CFBs) caused significant decreases in the seawater $^{187}Os/^{188}Os$ that are preserved in the marine sediment record. These results indicate that the marine Os isotope record has significant potential for correlating episodes of CFB volcanism with the marine sediment record, and thereby providing an improved framework for assessing the environmental consequences of these events.

New data from DSDP Site 577 confirm a decline in $^{187}Os/^{188}Os$ from 0.55 to 0.4 prior to the Cretaceous Tertiary Boundary (KTB) and support the interpretation that the major phase of Deccan volcanism preceded the KTB event [2]. However, these new data indicate that the $^{187}Os/^{188}Os$ decline began after the C30N/C29R magnetic reversal boundary, and not before as indicated by data from DSDP Site 525 [2]. This discrepancy between Os isotope records from the South Atlantic (Site 525) and Western Pacific (Site 577) has significant implications for correlating Deccan volcanism with a late Maastrichtian warming event.

Preliminary investigation of sediment sequences believed to coincide with eruption of the Siberian Traps (Permo-Triassic) and Ethiopian Traps (Oligocene) were also conducted. Analyses of 5 samples spanning the end-Permian extinction event [3] demonstrate mobility of Re and/or Os, precluding reconstruction of seawater $^{187}Os/^{188}Os$. Analyses of Oligocene samples from ODP Leg 199 do not reveal any evidence of a long-term decrease in the $^{187}Os/^{188}Os$ of seawater. Instead, this time interval contains a brief 10% decline in $^{187}Os/^{188}Os$ between 30.2 and 30 Ma. While the timing of this excursion is in excellent agreement with recent age determinations for the Ethiopian Traps [4], it is unclear why the overall structure of the Oligocene marine Os isotope record differs so dramatically from the late Maastrichtian episode of Deccan volcanism. Additional analyses are required to determine whether this Oligocene excursion is a feature of the global marine Os isotope record.

**References**

[1] Cohen and Coe (2002) *Geol.* **30,** 267.
[2] Ravizza and Peucker-Ehrenbrink (2003) *Science* **302,** 1392.
[3] Jin et al. (2000) *Science* **289**, 432.
[4] Coulie et al. (2003) *EPSL* **206,** 477.