The Siberian Traps magma emplacement dynamics links to environmental changes across the Permian-Triassic boundary in Svalbard

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The **Permian–Triassic extinction event** formed the boundary between the Permian and Triassic geologic periods, as well as between the Paleozoic and Mesozoic eras, approximately 252 million years ago.

It is the Earth's most severe known extinction event, with up to 96% of all marine species and 70% of terrestrial vertebrate species becoming extinct.

**Wikipedia; Svensen et al. (2009)**

**Siberian Traps LIP**
- Sediment degassing
- Magma degassing
- Tuffs
Siberian Traps

**Age:** ca. 252 Ma – duration of <1 Ma

**Size:** Max. 4 mill. km² with lava. Up to 6 km thick

**Sills:** Abundant subvolcanic intrusions. Up to 250 meter thick

**Sediments:** Pre-cambrian to Permian age carbonates, evaporites, clastic sediments, and coal

**Pipes:** Phreatomagmatic origin, heating of evaporites by magma

Figures from Svensen et al. (2009) and Burgess and Bowring (2015)
Putorana Plateau, Siberia: Layered Basalt Flows
Pillow lava near base

Ropy (pahoehoe) top
Drill Site Operations | Svalbard

Drilling and extraction by Arctic Drilling (Store Norske)
- Two ca 100 meter deep boreholes (90 meter continuous cores); **DD-1** (Primary) and **DD-2** (Back-up and QC)

Photography and sedimentological field logs by field crew

Fjellknaus drill rig and associated crew provided by Arctic Drilling, Store Norske Spitsbergen Kulkompani
Permian-Triassic Depositional Development

DD-1 borehole in Svalbard

- Bioturbation returns
- Restricted marine conditions
- Ash-layers

Major change in living conditions

“Extinction event”

Life expands

Zuchuat et al. (in press) "A new high-resolution stratigraphic and palaeoenvironmental record spanning the End-Permian Mass Extinction and its aftermath in central Spitsbergen, Svalbard (PALAEO_109732)"

Glaucnitic sand shoals
Upper shoreface? (Blomeier et al., 2013)
Summary

- **Successful drilling** of two cores across the P-T boundary in Svalbard

- **Mass extinction** associated with major changes in depositional system
  - *Organic-rich mud above P-T boundary*
  - *Potential carbonate and clastic Permian reservoirs below*

- Environmental changes likely triggered by the **Siberian Traps Large Igneous Province**