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

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The end-Permian Siberian Traps large igneous province (LIP) is temporally associated with the major extinction event at the Paleozoic-Mesozoic boundary. The extinction was likely triggered by massive eruption of carbon and halocarbon gases released from metamorphic aureoles around sill complexes in the Tunguska Basin. Additional environmental pollution was likely associated with magma degassing, forest fires, and extensive tuff formation during magma-water interaction. We have conducted detailed field work in the Norilsk area since 2006 to study the environment during the initial lava eruptions in the Siberian Traps. The field work included mapping, photogrammetric drone surveying, sampling, and subsequent inorganic geochemical and petrographic analyzes. The sediment-lava transition is particularly well exposed in the Norilsk area. In the Kajerkan quarry, shallow basaltic igneous intrusions were emplacement into the coal-rich upper part of the Tunguska Group of Late Carboniferous and Permian age. In the Ore Brook and Red Rocks localities, more than ten sub-vertical tree trunks have been mapped and sampled in the lowermost lava flow. The tree trunks are petrified wood of end-Permian age. Pillow basalts are found at the same levels, showing that the lava flow was emplaced in a wet environment. Ropy pahoehoe structures are found at the top of this flow, which suggests that the uppermost part of the lava flow was emplaced in a subaerial environment. Further south, in the Bratsk area, extensive sill intrusions and magnetite-rich hydrothermal vent complexes are abundant, documenting extensive eruptions of metamorphic gases and tuffs to the atmosphere. We have been drilling two 100-m long stratigraphic boreholes across the Permian-Triassic boundary in Svalbard, arctic Norway, to study the effect of the Siberian Traps magmatism on the sedimentary basin development some 2000-km away from the main eruption sites. The near complete core recovery, complemented by material collected in a river section ca. 1 km north-east of the drill site, allowed high-resolution analyses of the Permian-Triassic boundary interval. The cores have been

logged and analyzed in detail, including organic and inorganic geochemistry, isotope geochemistry, petrography, and biostratigraphy. The Permian-Triassic boundary (PTB) is identified in the cores and lies within the *Reduviasporonites chalastus* Assemblage Zone, 2.50 m above the lithological change from bioturbated to dark grey, laminated mudstones. This corresponds to the local position of the Late-Permian Mass Extinction event (LPME) and its associated sharp negative  $\delta^{13}\text{C}_{\text{org}}$  excursion. High-resolution environmental proxies indicate a dramatic change in provenance across the PTB, and a transition towards a more arid climate in the earliest Triassic. This transition was contemporaneous with prolonged bottom-water dysoxic or anoxic conditions, following a Late Permian increase in volcanic activity, probably linked to the emplacement of the Siberian Traps LIP. Zircons have been separated from numerous basaltic ash layers in this sequence, and a few have been successfully dated with the U-Pb TIMS method and overlap in age with the Siberian Traps magmatism. This study shows that the Siberian Traps LIP had a major impact of both the basin development and life in the arctic Barents Sea region.