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Emergent magmatism of the Siberian Traps in a wet forest environment

Sverre Planke (1), Alexander G. Polozov (2), John M. Millett (3), Dougal A. Jerram (4), and Henrik H. Svensen (1)

(1) CEED, University of Oslo, Norway (planke@vbpr.no), (2) IGEM RAS, Moscow, Russia, (3) VBPR, Oslo, Norway, (4) DougalEarth, Solihull, UK

The end-Permian Siberian Traps large igneous province is associated with the major extinction event at the Paleozoic-Mesozoic boundary. The extinction was likely triggered by massive eruption of carbon gasses released from metamorphic aureoles around sill complexes in the Tunguska Basin. However, additional environmental changes were likely caused by the eruption of voluminous lava flows, by e.g. magma degassing, forest fires, and extensive tuff formation during magma-water interaction. We have been conducting detailed field work in the Norilsk area in northern Siberia to study the environment during the initial lava eruption in the Siberian Traps. Five near-vertical tree trunks have been mapped and samples in the lowermost lava flow in the Ore Brook outcrop. The tree trunks contain petrified wood of end-Permian age in the Ivakin Formation, documenting that the Siberian Traps caused deforestation. Pillow lavas are found at the same level in the lava flow as the tree trunks, showing that the lava was erupted in a wet environment. However, no pillows are present in the uppermost part of the lava flow and pahoehoe ropy structures are found at the top of the flow suggesting that the uppermost part of the flow was emplaced in a subaerial environment. We propose a model where the eruption of the lowermost lava flows caused damming of local rivers, forming lakes and partly drowning the forest. These shallow lakes were subsequently in-filled by lava at a later stage during the same eruption. Pillow lava was formed when the lava entered the lake, whereas later inflation of the lava flow lead to subaerial emplacement of the uppermost part of the flow unit. The presence of shallow water prevented the burning of the lower part of the tree trunks. This study documents that the Siberian Traps was locally erupted in a wet forest environment and that it caused forest destruction.