



## **Sill-induced evaporite- and coal-metamorphism in the Tunguska Basin, Siberia, and the implications for end-Permian environmental crisis**

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The emplacement of the Siberian Traps Large igneous province is regarded as the main processes behind the end-Permian environmental crisis. The details of this link are however still under investigation. Among the suggestions are lava degassing of mantle- and crustal-derived gases, explosive lava and phreatomagmatic eruptions, and gas release from contact metamorphism related to the sub-volcanic sill complex. Whereas the lava pile is relatively well studied and investigated, the sub-volcanic sills, dikes, and contact aureoles are poorly studied and documented. We present borehole and field data of sills and contact aureoles from across the Siberian Traps, from Norilsk in the north to Bratsk in the south. The data have been compiled during three field campaigns in 2004, 2006, and 2010. The sill geometries and thicknesses vary considerably from kilometer-scale intrusive complexes to individual thin sills of a few tens of meters. In contrast to several other LIPs, sills are also emplaced within the extrusive pile. Thick sills (up to 900 meters in thickness) occur in high abundance in the upper part of the sedimentary succession, affecting the coal-rich Tunguska Series sediments. Moreover, very thick sills (100-300 meters) are also emplaced within the vast Cambrian salt formations. Petrographic investigations of the metamorphic sediments demonstrate that widespread high temperature devolatilization took place. We show that depending on the specific location within the province and the emplacement depth, the potential for degassing of both greenhouse gases ( $\text{CH}_4$ ,  $\text{CO}_2$ ), aerosols ( $\text{SO}_2$ ), and ozone destructive gases ( $\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{Br}$ ) was substantial and can explain the crisis.