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Geochemistry and alteration of a Siberian crater lake coeval with the end-Permian mass extinction

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Hundreds of phreatomagmatic breccia pipes formed contemporaneously with the Siberian Traps are located in the Tunguska Basin, Siberia. These pipes are believed to be formed by sill intrusions into organic rich sediments, which caused the violent release of gigatonnes of greenhouse gases to the atmosphere with serious implications for the end-Permian environment (Svensen et al., EPSL, 2009). Crater lake deposits overlying the pipes are preserved in some cases and contain a record of the local biology and sedimentation during formation of the Siberian Traps. We are studying the upper 550m of a core drilled through the center of a former crater lake and underlying brecciated pipe in the southern reaches of the Tunguska Basin. The core consists of fine to coarse-grained volcanoclastic sediments cemented by calcite and interspersed with tuff. We report on the bulk geochemistry and the nature of alteration throughout the sequence of crater lake sediments. We propose a model for lake formation, subsequent diagenesis, and the influence of degassing from the underlying breccia pipe. The development of the crater lake is explored in the context of the Siberian Trap flood basalts, phreatomagmatic deposits and the end-Permian environmental crisis.