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Large Early Permian eruptive complexes in northern Saxony, Germany: Volcanic facies analysis and geochemical characterization

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In the course of formation of extensional basins during the Early Permian a widespread volcanic activity led to the deposition of volcanic and volcanosedimentary units in Saxony (Walter 2006, Hoffmann et al. 2013). Situated east of Leipzig, the North Saxonian Volcanic Complex (NSVC) hosts two large caldera complexes, the Rochlitz and Wurzen Volcanic Systems, with diameters of 90 and
52 km, respectively. Volume estimates (> 1000 km^3) qualify these as supereruptions according to Mason et al. (2004). In addition to the large caldera systems, the NSVC hosts several small pyroclastic flow deposits ranging from crystal-poor (e.g. Cannewitz and vitrophyric Ebersbach ignimbrites) to crystal-rich units (Wermsdorf and Dornreichenbach ignimbrites). Additionally rhyolitic lava and subvolcanic units are present. The Chemnitz basin (Schneider et al. 2012), located to the south of the NSVC, harbours caldera-outflow facies deposits of the Rochlitz eruption (Fischer 1991), i.e. the partially vitrophyric Planitz ignimbrite.
The Rochlitz and Wurzen caldera-fill ignimbrites exhibit relatively high crystal contents with maxima up to 52 and 58 vol.-%, for corresponding 66 and 68 wt.-% SiO_2. This is comparable with the 'monotonous intermediates' (Hildreth 1981) in the Cenozoic western USA investigated by Huber et al. (2012). In contrast, the Planitz ignimbrite in the Chemnitz basin reveals predominantly crystal-poor pyroclastics (<10 vol.-%) with higher SiO_2-contents (from 67 to 79 wt.-%). For the comparative study of the NSVC and the Planitz ignimbrite, we use detailed investigation of the volcanosedimentary facies, whole rock geochemical data (> 70 analyses), and mineral geochemistry to reconstruct the eruption history and magma genesis of this large Late Paleozoic magmatic complex in Central Europe. Volcanic textures and geochemical trends indicate magma mingling and mixing to have been important during the formation of the Wurzen caldera system. Geothermometric and -barometric calculations based on composition of pyroxene and feldspar suggest deeply seated crustal magma chambers for the NSVC and the Planitz ignimbrite.

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