MAGMA EMPLACEMENT AND NEW GEOCHEMICAL AND PETROGRAPHIC DATA FROM THE OLIGOCENE ZÁKUPY DIATREME, CZECH REPUBLIC

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The Oligocene Zákupy diatreme, Czech Republic, is located at the southern edge of the Lausitz Volcanic Field at the intersection of the NE–SW Eger Rift within the NW–SE dextral Labe fault zone. The diatreme was mined for building stone and the exposed high walls reveal up to 50 m of the lower to upper diatreme facies. These consist of proto-diatreme dikes injected into unconsolidated, lithic-rich, diatreme fill, that during assent changed geometry, forming sills along bedding planes in water saturated, non-welded, lapilli tuffs. The sills are often highly fragmented with angular peperite horizons. Anisotropy of magnetic susceptibility (AMS) data from 32 sites yields primarily oblate magnetic fabrics. K_1-K_2 magnetic foliation planes and K_1 lineation directions from paired dike margins indicate a strong structural control on magma flow into and out of the diatreme as dikes either follow a NE–SW trend or a NW–SE trend. Paleomagnetic data from 19 of 25 independent intrusions yield stable, single component magnetizations that decay linearly to the origin with less than 10% of the characteristic remanent magnetization remaining after treatment in 120 mT applied field or thermal demagnetization up to 550°C. These data show scatter about the expected late Paleogene reverse polarity direction and statistically distinct directions between individual intrusions. We argue that these data reflect either short-term secular variation of the geomagnetic field and thus significant time between emplacement events or subvolcanic deformation of the intrusions following emplacement or a combination of these factors. Twenty-four samples from the late stage intrusions and varying diatreme facies were studied petrographically to distinguish mineral and textural variations among individual intrusions. Petrographic and field observations were supported by bulk-rock and mineral-chemistry analyses. The observed dikes were subdivided into two basic groups: i) early dikes of olivine nephelinite to basanite/limburgite composition, and late dikes of picrobasalt. Geochemical analyses, however, classify all these samples as ultrabasic (14.5–16.5 wt.% MgO) alkali basalts (picrobasalts and basanites) based on TAS diagram. All samples show parallel and almost linear chondrite normalized REE patterns with high degrees of LREE enrichment (La_N/Yb_N = 21.98–26.21). Likewise, all samples show congruent mantle-incompatible trace element variations with negative Rb, Th, Ti, and K anomalies. The results from this multidisciplinary study reveal that the Zákupy Diatreme is a complex, long-lived, volcanic system that displays characteristics that are better described by a polygenetic emplacement model. Furthermore, we argue that magma emplacement into the Zákupy diatreme occurred in a syn-tectonic transtensional stress regime that evolved from several similarly sourced magmatic pulses and molten fuel coolant interactions that did not result in eruption.

The research was supported by NGS GRANT #8887-11 to MP, JL, and BV, NSF grant OISE 1658085, New Mexico Highlands University Faculty Research Fund, CGS 322800 project to VR, AVOZ30460519 research plan to JV.