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Magma emplacement at Lemptégy volcano (Chaîne des Puys, France) based on field work, AMS and paleomagnetic data

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Lemptégy volcano is a scoria cone located in the Chaîne des Puys (Auvergne, France) that erupted about 32,000 years ago. A first edifice (Lemptégy 1) formed during a trachy-basalt eruption as a group of satellite vents of the Puy de Gouttes scoria cone. A second trachy-andesitic edifice (Lemptégy 2) formed shortly after, completely covering Lemptégy 1 with a 100 m-high breached cone. Since 1946, Lemptégy volcano has been quarried for scoria and today offers unprecedented three-dimensional exposure of the shallow plumbing system of a small volcano. In order to determine the internal architecture and flow orientation within the plumbing system, structural fieldwork was carried out with special attention to magma flow indicators (e.g. tensions gashes, striation etc) along and across feeder dikes. In addition, drill cores for anisotropy of magnetic susceptibility (AMS) and paleomagnetic data were collected from ten dikes surrounding the central Lemptégy 2. In total, twenty sites were established with one to four sites in each dike. 504 AMS specimens were analyzed of which 479 specimens are used to infer magma flow patterns. Structural data (tension gashes, riedel shears, vesicles), the maximum susceptibility axis (K1), and the imbrications of the magnetic foliation (K1-K2) planes are consistent and indicate both upward and downward sense of flow, as well as towards and away from the central vent. Paleomagnetic data from most dikes yield statistically distinct, at the 95% confidence level, remanence directions and we argue that the discordant directions are related to sub-volcanic deformation during volcanic construction. From those combined data, we draw a model of evolution of a “monogenic” cinder cone. The Lemptégy volcano shares similarities in terms of inferred eruption style and structures with other scoria cones, such as Cerro Negro (Nicaragua), and thus provides an excellent field laboratory to investigate active scoria cones world-wide.