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Ignimbrites of Armenia – Paleomagnetic constraints on flow direction and stratigraphy of pyroclastic activity of Mount Aragats

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The Aragats volcano is one of the largest stratovolcanoes within the Turkish-Armenian-Iranian orogenic plateau. It is located close to the Armenian capital Yerevan, and only ∼30 km from the only nuclear power plant within the country. Additional to numerous lava flows, Mount Aragats is thought to be the source of at least two large pyroclastic eruptions leading to a huge number of ignimbrite outcrops, which are located surrounding Mount Aragats with an evaluated eruption radius of ∼50 km. The age of several ignimbrite outcrops has recently been determined to be ∼0.65 Ma (Meliksetian et al., 2014). The different ignimbrite flows are characterized by huge diversity of colors, degree of welding and textures. Due to that reason some disagreement exist on how these outcrops can be linked and how the eruption process actually happened in terms of different eruption phases and mixing mechanism of magmas during the eruption.
To add constraints to this debate we carried out an intensive paleomagnetic investigation on most of the ignimbrite outcrops (32 sites) in terms of directional and anisotropy measurements. Paleomagnetic directional measurements yield basically two polarities: (1) a well grouped normal polarity is present in the majority of the studied sites including 3 sites which have supposedly originated from a different vent located on Turkish territory in the west; (2) a reversed polarity of the remaining sites with a somewhat increased scatter. Based on secular variation arguments and considering the high quality of the data we suggest that at least all young outcrops represent a single eruption phase in the area at ∼0.65 Ma, which is in agreement with an occurrence during the Brunhes geomagnetic chron. Additional to that, at least one earlier phase of pyroclastic activity took place prior to the Brunhes-Matuyama boundary (0.781 Ma). Anisotropy of magnetic susceptibility (AMS) suggests initial radial flow directions, which shortly after the eruption become topographically controlled.
Such explosive eruptions with VEI≥5 are usually considered among most hazardous volcanic phenomena, therefore detailed multidisciplinary studies of such events occurred in the past are significantly important to estimate recurrence rates of such eruptions, their magnitudes to probabilistically access potential volcanic hazards to populated places and critical infrastructure.

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