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Eruptive dynamics and hazards associated with obsidian bearing ignimbrites of the Geghama Volcanic Highland, Central Armenia: a textural insight

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The Geghama Volcanic highland in central Armenia is an ideal setting to study the young (∼750-25 ka [1]) volcanism that characterises the Lesser Caucasus region. The volcanism in the area is bimodal in composition: the eastern highlands are dominated by numerous monogenetic scoria cones, whilst the west shows more evolved volcanism centered on two obsidian bearing, polygenetic domes (Hatis and Gutanasar) [2]. Activity at Hatis and Gutanasar is thought to have spanned 550ka-200ka [3] and produced a range of products including obsidian flows, ignimbrites and basaltic scoria cones, consistent with long lived and complex magma storage systems. During a similar time period there is evidence for the presence of hominin groups in the surrounding region [3] and it is likely that at least some of the volcanic activity at Hatis and Gutanasar impacted on their distribution [4]. A better understanding of the eruptive behaviour of these volcanoes during this period could therefore shed light on the effect of volcanic activity on the dispersal of man through this period.

Whilst large regional studies have striven to better understand the timing and source of volcanism in Armenia, there have been few detailed studies on single volcanoes. Obsidian is ubiquitous within the volcanic material of both Gutanasar and Hatis as lava flows, dome deposits and within ignimbrites. This study aims to better understand the eruptive history of Gutanasar, with specific focus upon the determination of the petrogenetic history of obsidian lenses observed within the ignimbrite deposits. Identification of these obsidians as the result of welding or in-situ melting will help constrain eruptive volumes and flow thickness, important for the reconstruction of palaeo-volcanic hazards. In order to interpret how this obsidian was deposited, macro textural analysis is combined with micro textural measurements of microlite crystals. Quantitative measurements of microlites in obsidian can provide significant insight into the eruptive dynamics and emplacement history [5]. In particular, microlite number density, volume and alignment represent the summation of degassing, conduit flow and emplacement [6]. As such, there is great significance in the quantification of these parameters for the determination of eruption dynamics. Analysis of these obsidians will establish patterns of textural heterogeneity as a signature for the distinction of volcanic glasses formed by different mechanisms and allow for identification of patterns in microlite number density, volume, alignment and plunge that characterise differing modes of emplacement. Together, these measurements will aid interpretation and improve understanding of this volcanic system, with applicability to the determination of the impact of these volcanic episodes on the distribution of early man in Armenia as well as assessment of the potential for future events.

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