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Petrogenesis and depositional history of felsic pyroclastic rocks from the Melka Wakena archaeological site-complex in South central Ethiopia

Angesom Resom[1], Asfawossen Asrat[2,*], Tegenu Gossa[3], Erella Hovers[3]

[1]Department of Geology, Aksum University, P. O. B 314, Axum, Ethiopia
[2]School of Earth Sciences, Addis Ababa University, P. O. B 1176, Addis Ababa, Ethiopia
[3]Institute of Archaeology, The Hebrew University of Jerusalem, Mt. Scopus, Jerusalem, 91905 Israel

*Corresponding author: Tel.: +251 91 1407553; Fax: +251 11 1239462. E-mail: asfawossen.asrat@aau.edu.et (A. Asrat)

Abstract: The Melka Wakena archaeological site-complex is located at the eastern rift margin of the central sector of the Main Ethiopian Rift (MER), in south central Ethiopia. This wide, gently sloping rift shoulder, locally called the "Gadeb plain" is underlain by a succession of primary pyroclastic deposits and intercalated fluvial sediments as well as reworked volcaniclastic rocks, the top part of which is exposed by the Wabe River in the Melka Wakena area. Recent archaeological survey and excavations at this site revealed important paleoanthropological records. An integrated stratigraphic, petrological, and major and trace element geochemical study has been conducted to constrain the petrogenesis of the primary pyroclastic deposits and the depositional history of the sequence. The results revealed that the Melka Wakena pyroclastic deposits are a suite of mildly alkaline, rhyolitic pantellerites (ash falls, pumiceous ash falls and ignimbrites) and slightly dacitic ash flows. These rocks were deposited by episodic volcanic eruptions during early to middle Pleistocene from large calderas along the Wonji Fault Belt (WFB) in the central sector of the MER and from large silicic volcanic centers at the eastern rift shoulder. The rhyolitic ash falls, pumiceous ash falls and ignimbrites have been generated by fractional crystallization of a differentiating basaltic magma while the petrogenesis of the slightly dacitic ash flows involved some crustal contamination and assimilation during fractionation. Contemporaneous fluvial activities in the geomorphologically active Gadeb plain deposited overbank sedimentary sequences (archaeology bearing conglomerates and sands) along