

PREVIEW

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## Petrological and geochemical characterization of the Golja Ignimbrite (Main Ethiopian Rift)

**Federica Langone**<sup>1</sup>, Zara Franceschini<sup>2</sup>, Riccardo Avanzinelli<sup>2</sup>, Eleonora Braschi<sup>3</sup>, Francesca Forni<sup>1</sup>, and Raffaello Cioni<sup>2</sup>

<sup>1</sup>University, Università degli Studi di Milano, Scienze della Terra "Ardito Desio", Italy (federica.langone@unimi.it, francesca.forni@unimi.it)

<sup>2</sup>University, Università degli Studi di Firenze, Dipartimento di scienze della Terra, Italy (zara.franceschini@unifi.it; riccardo.avanzinelli@unifi.it; raffaello.cioni@unifi.it)

<sup>3</sup>Istituto di Geoscienze e Georisorse, Consiglio Nazionale delle Ricerche, Firenze (eleonora.braschi@igg.cnr.it)

The Plio-Pleistocene volcanism of the Main Ethiopian Rift (Ethiopia) is characterized by a bimodal distribution with abundant mafic and felsic compositions and rare intermediate magmas, a feature commonly known as the Daly Gap. The Quaternary activity is characterized by large explosive eruptions associated with caldera collapses that define a regional paroxysm of silicic and basaltic volcanism. The genesis of the evolved compositions and their relationship with the basalts still represents a matter of debate, with interpretations ranging from pure fractional crystallization to more complex scenarios involving magma mixing and crustal melting. Here, we present the first volcanological, petrological and geochemical characterization of a pyroclastic sequence, located in the Central Main Ethiopian Rift, the Golja Ignimbrite (GI). GI is a crystal-poor (<10% crystals of qtz+K-feld+pl+cpx+aen), low aspect ratio ignimbrite that crops out over ~400 km<sup>2</sup> and has an estimated bulk-tephra volume of ~100 km<sup>3</sup>. The pyroclastic sequence is characterized from bottom to top by: 1) a coarsening upward basal fallout layer; 2) an obsidian vitrophyre with rare, scattered fiammae; 3) a weakly to partially welded, lithic-rich PDC deposit and 4) a thick, unwelded PDC deposit containing different types of juvenile material including white, banded pumices and fiamme, as well as dark scoria. Analyses of matrix glass and melt inclusions from all juvenile types reveal a broad compositional spectrum ranging from basalts (found only in the pl-hosted melt inclusions) to rhyolites. Remarkably, we report the occurrence of intermediate compositions (basaltic trachyandesites to trachydacites) found within the mingled pumices and dark scoria. In-situ <sup>87</sup>Sr/<sup>86</sup>Sr analyses of plagioclase display homogeneous isotopic composition with mantle-like signatures akin to the Afar Plume mantle source while Sr isotopic analyses of bulk matrix glasses from the different compositions show both mantle-like and crustal isotopic signatures akin to the Pan African Upper Crust. Bulk <sup>143</sup>Nd/<sup>144</sup>Nd isotopic compositions of matrix glasses do not show significant variations between compositions. Overall, our data indicate a complex geochemical and isotopic evolution, involving fractional crystallization, magma mixing and assimilation of old crustal material. Our data represent the first geochemical characterization of this large ignimbrite and contribute to a better understanding of silicic magmatism in the Central Main Ethiopian Rift.