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► To cite this version:

Zara Franceschini, Stéphane Scaillet, Raffaello Cioni, Giacomo Corti, Federico Sani, et al.. High intensity ignimbritic activity in the Central sector of the Main Ethiopian Rift. EGU General Assembly 2020, May 2020, Online, France. 10.5194/egusphere-egu2020-676 . hal-03554444

HAL Id: hal-03554444

<https://hal.science/hal-03554444v1>

Submitted on 3 Feb 2022

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High intensity ignimbritic activity in the Central sector of the Main Ethiopian Rift

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The volcano-tectonic evolution of the Main Ethiopian Rift (MER) is punctuated with periods of intense silicic volcanism, characterized by large explosive caldera-forming eruptions and the production of several ignimbrite deposits. These volcanic paroxysms require large volume of evolved silicic magma accumulated in shallow chambers into the continental crust; however, the relations between magmatism and tectonics during rifting, and the influence of the distribution and timing of regional tectonics on the ascent of magma and its stalling in large magmatic reservoirs remain poorly defined.

We present new geochronological data (⁴⁰Ar/³⁹Ar dataset of 29 samples) providing new constraints on the timing, evolution and characteristics of volcanism in the Central sector of the MER, where large ignimbrite deposits and remnants of several calderas testify the recurrence of silicic flare-ups. Specifically, we investigate in detail the eastern margin of the rift, where a voluminous, widespread, crystal-rich ignimbrite (Munesa Crystal Tuff, MCT) has been described. This deposit has been correlated to a thick ignimbrite occurring at the bottom of geothermal wells in the rift, pointing to a giant eruptive event attributed to a huge caldera structure, presumably buried beneath the rift floor. At least other two widespread ignimbrite units are present along the same margin for several tens of kilometres, testifying the high volcanicity of this sector of the MER.

Our survey and analyses suggest that, at least in the eastern margin of the rift, activity was clustered in periods of large magma production and emission, resulting in the recurrence of intense volcanic phases interspersed with periods of rest of volcanism. Ignimbrites and other volcanic deposits occur in the investigated area, spanning an age interval from 3.5 Ma to as recent as 150 ka. The MCT emission, around 3.5 Ma, was followed, after a long quiescence, by an important phase with the emplacement of both mafic (lava flows and scoria cone) and evolved (ignimbrites) products between 1.9-1.6 Ma. After that, volcanism occurred more frequently, possibly with a lower amount of erupted magma and still alternating with quiescent periods, with

volcanism clusters at ~ 1.3 - 1.2 Ma, ~ 0.8 - 0.7 Ma and ~ 0.3 - 0.2 Ma. This clustered volcanic activity will be compared with the episodic rifting of this sector of the Main Ethiopian Rift.