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The Monapo Alkaline-Carbonatite Complex, Mozambique

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The Monapo Structure, also referred as the Monapo Klippe [1,2], located in northeastern Mozambique, is a 35 x 45 km oval shaped feature composed of a suite of ultramafic, mafic and felsic alkaline rocks, which intrude granulite-gneiss basement. It is regarded as an isolated allochthonous Neoproterozoic outlier that formed to the north of the Lúrio tectonic belt, and was then thrust onto the Nampula Block, which is part of a southern structural domain composed of Mesoproterozoic rocks [3]. New field evidence indicates that the intrusive suites within the Monapo Structure are largely alkaline-carbonatite rocks and these rocks fill almost the whole extent of the structure. This would arguably make the Monapo Alkaline-Carbonatite Complex one of the largest of its kind in the world.

Between 2008 and 2012, Vale Mozambique Lda. undertook a comprehensive geological exploration program at the Monapo Complex, including an extensive drilling program. Several lines of evidence indicate that the carbonate-rich rocks are carbonatites rather than marbles formed from metamorphosed carbonate rocks. Evidence includes: i) the presence of angular to rounded granulite and gneiss (minor fenite) xenoliths, some with reaction rims as well as carbonatite fragments; ii) potassic fenitization at the margins of the carbonatites, with some bodies composed exclusively of k-feldspar (orthoclase) but also intergrown k-feldspar and quartz, previously mapped as pegmatites; iii) several of the rocks previously identified as syenites are the product of fenitization and represent the end-product of this process; iv) the presence of carbonatite dikes in the host rocks, with fenitization around margins; v) cyclical layering, with rocks characterized by varying proportions of calcite, phlogopite and apatite; vi) the occurrence of phoscorites, characterized by the presence of apatite and phlogopite and vii) the absence of layering or interbedded schists, quartzites or other rock-types that would indicate a metasedimentary origin for the sequence of rocks. Twenty three individual carbonatites including the Evate carbonatite have now been identified within the Monapo Complex, with varying shapes and sizes, some but not all with fenitized margins. Other igneous rocks that have been identified include syenites, quartz syenites, nepheline syenites, pyroxenites, gabbros and ijolites. In particular, an apatite clinopyroxenite is observed at the northern part of the complex; a common rock type in other carbonatite complexes in the world. Analysis of the structural and geochronological data suggests that the complex was formed by a series of magmatic intrusions emplaced in an active tectonic environment, with subsequent overprinting by deformation and metamorphism [4,5]. This differentiates the Monapo Complex from the majority of other carbonatite complexes, which were emplaced in anorogenic settings.

References:

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