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Fig.1 Geology and structure of the Asmara Area.

Structural setting of the Asmara area, Eritrea

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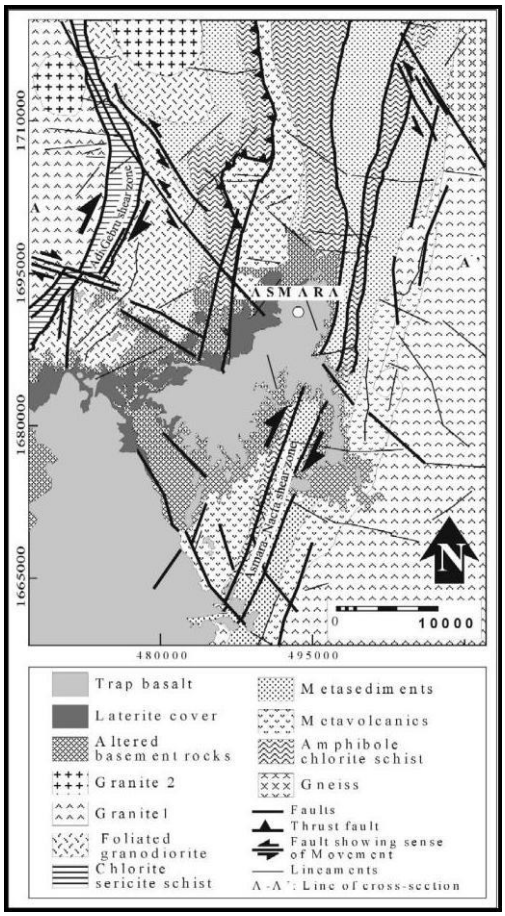
The Pan-African terrain of Eritrea is mainly composed of folded metavolcano-sedimentary (MS) assemblages variably deformed, metamorphosed and intruded by syn- to post-tectonic granites and granodiorites, the largest of which occupies an area of some 7000 km^2 between Asmara and Akordet. These rocks are deformed by a series of N-NNE trending overturned, west and east verging tight synforms and antiforms. Interpretation of enhanced Landsat TM scenes supported by field observation has provided a good basis for outlining the main stratigraphic and structural features of the Asmara area, including some that had not been recorded before.



Four phases of deformation were identified in the area. The first deformation phase (D1), was responsible for the formation of the NE-SW trending, slightly overturned, tight synforms and antiforms. Associated with the F1 folds are well-developed and dominant axial-planar cleavages (S1). These are almost parallel to the bedding in metasedimentary rocks, but local angular relationship can be observed both in outcrop and in thin sections. This folding episode was accompanied with lower grade metamorphism (greenschist facies). Bedding/cleavage relationship suggests amphibole-chlorite schist to occupy the core of the antiforms. Similar observations are known from the work of Beyth (1972)[1] in northern Ethiopia. Most of the MS rocks and foliated granodiorites have been affected by dextral strike-slip shearing during the D2-deformation transposing the pre-existing structures. The shear zones are ductile to brittle-ductile in character. Two dextral strike-slip shear zones, Adi Gebru and Asmara, were formed during the second deformation phase. The Adi Gebru shear zone is located in the western side of the mapped area, between the foliated granodiorite and syn-tectonic granite (Fig.1). It has a maximum width of 3.5 km and extends both northward and southward of the study area. A dextral strike- slip movement is suggested for this shear zone based on Landsat and SRTM imagery, field and mesoscopic studies. The Asmara shear zone, located to the east of city, has a maximum width of 4 km in the south and extends from 4 km to about 6 km to the north of the city. It comprises strongly sheared and folded MS rocks. Alteration of plagioclase to sericite and epidote, and the presence of chlorite, commonly found

within the shear zones, suggests retrograde metamorphism. The intensity of shearing decreases from west to east. The changes in dip direction of the S1/S2 surface west and east of Adi Nefas, in combination with weakly developed crenulation cleavages, indicate a NE/SW trending F3 open synform. D4 is a brittle deformation which results in different types of faults, photolinears and joints. The faults in the study area include strike-slip, normal and reverse faults. The entire fault systems mapped were originally delineated from Landsat TM, ASTER and SRTM datasets of the area and were subsequently validated during fieldwork. Some of the faults are very recent and probably related with the East African rifting and opening of the Red Sea.

References:

[1] Beyth M (1972) The Geology of Central-Western Tigre. Ph.D thesis, Mathematische-Naturwissenschaftliche Fakultät, Rheinische Friedrich-Wilhelms-Universität Bonn, 1972**.**