Geology of the Kajiado Region, Kenya

GEOLOGIC HISTORY

PLEISTOCENE:

Plateau/Magadi Trachyte (0.8-1.4 Ma): peralkaline trachyte that is very prominent in the rift valley between Lake Magadi and Suswa. This is one of the several expansive "flood trachytes" that cover the rift floor.

Ol Tepesi Basalts (1.4-1.65 Ma) and Benmoreites (1.42Ma): these two formations were originally correlated with the Singaraini basalts (Fairhead et al. 1972) but were later distinguished by Baker & Mitchell (1976). The benmoreite flow is at least 150m thick and features distinctive tabular and rhombic feldspar phenocrysts in a granular matrix.

Singaraini Basalts (2.31 - 2.33 Ma): these olivine basalts feature bouldery outcrops and occasionally, small visible feldspar phenocrysts. See Baker and Mitchell (1976) for a discussion regarding previous correlations and dating of this formation.

Limuru Trachyte (1.94 - 2.64 Ma): erupted as a series of up to twelve thick, conformable, flows that reach a total exposed thickness of 400m in the eastern rift escarpments. Flows overtopped the escarpment in the region to the north of the mapped area. These trachytes feature characteristically clustered groups of K-feldspar phenocrysts, tend to form bouldery outcrops, and grade upwards into pantellerites (Baker et al. 1988).

Ngong Hills (2.53-2.58 Ma): remnants of an old volcanic cone which had an estimated original diameter of 11km prior to being cut by the rift escarpment. The current summit is 2430 m, and eruptive materials include basanite, tephrite, and some nephelinite. Some lavas are noted by Saggerson (1991) to contain megascopic fragments of gneiss, which are not known from other volcanics in the area.

Olorgesailie (2.2 - 2.7 Ma): the main volcanic cone is located to the west of the mapped area, and is composed predominantly of lavas with some agglomerates. Erupted lavas included trachytes, augites and olivine basalts, with nephelinites found at the summit.

PLIOCENE

Narok Agglomerate: the agglomerates of the mapped region grade into tuffs towards the Nairobi region to the north, and occupy the same horizon as the Kerichiwa Valley Tuffs. Light brown in color with numerous lithic clasts, including blocks of trachyte and phonolite. Ol Doinyo Narok and Arau have been suggested as possible source vent locations, and total thickness may reach over 200m (Matheson, 1966).

MIOCENE
Olorgesailie Lavas: while the main Olorgesailie vent now sits in the rift valley, these earlier lavas are exposed on the rift shoulder. Phonolitic nephelinites (5.80 Ma) in the mapped region are petrographically identical to those at the Olorgesailie summit, and rest on the biotite phonolites which are also attributed to eruptions from Olorgesailie (Matheson, 1966).

Esayeti (5.64-5.85 Ma): this volcanic center is comprised of phonolite, tephrite and trachyte flows, and partially overlies early Ngong eruptives. Maximum elevation is 2085m, but the cone is highly eroded. The given age range was derived from tephrite feldspar (Baker et al., 1971).

Mbagathi Trachyte: these phonolitic trachyte feature feldspar laths in a grey-brown matrix. The formation is comprised of 2-3 flows with a minimum total thickness of 60m, and is overlain by the Narok Agglomerate and Ngong volcanics.

Athi Tuffs: trachytic tuffs that are sometimes welded and were deposited both subaerially and as lake beds. Saggerson (1991) notes that correlation and mapping of this formation has been difficult, and that more detailed field studies would be needed to discern the true extent of these tuffs. These tuff reaches a maximum thickness of around 300m.

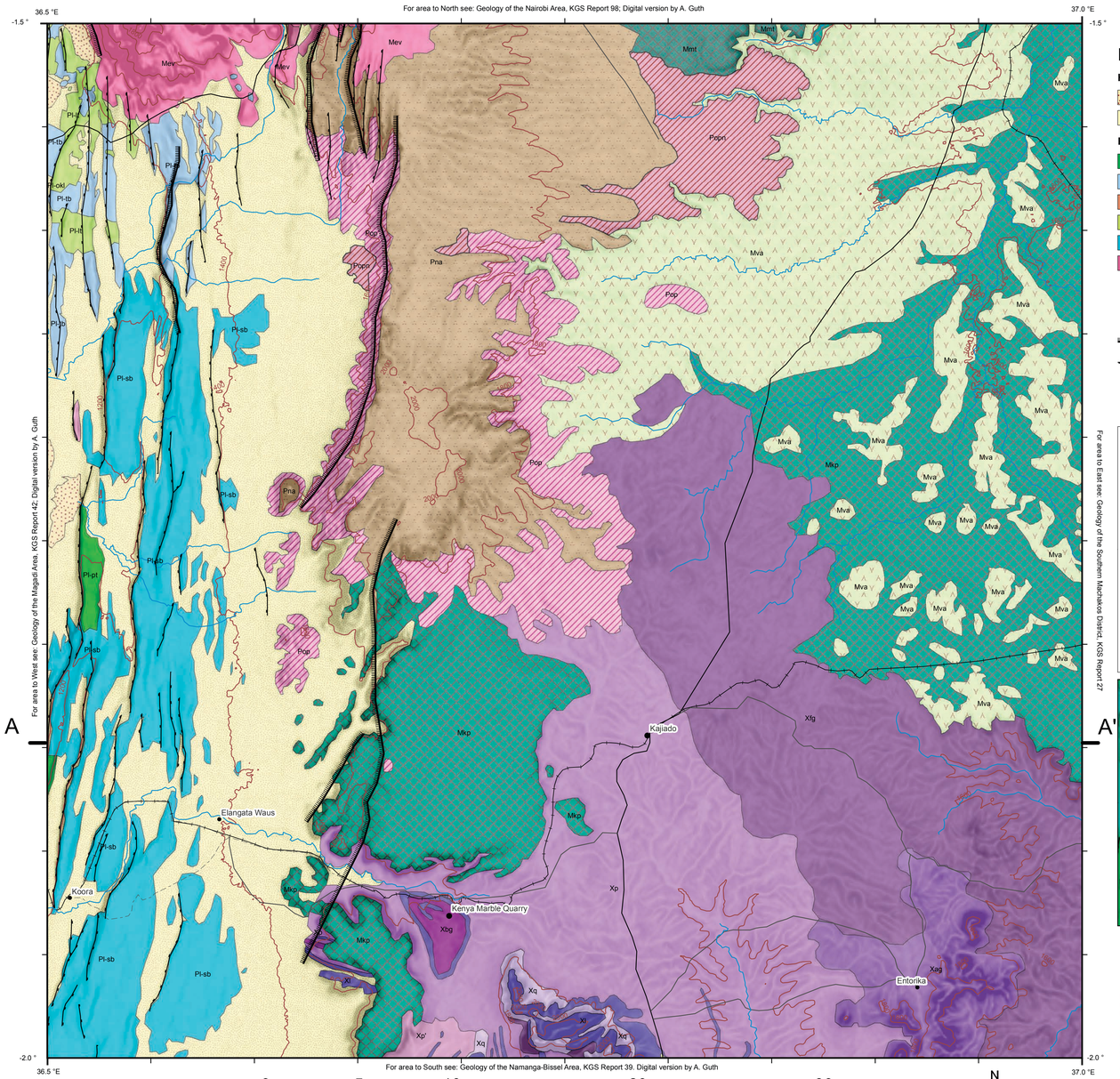
Kapiti Phonolite (12.9-13.4 Ma): large (<76 mm) white feldspar and nepheline phenocrysts make this phonolite quite distinctive. The formation is about 100m thick near the edge of the rift valley, with individual flows being around 30m thick each. The upper surfaces of the flows are sometimes vesicular and glassy. These phonolites were erupted onto the eroded, irregular, surface of the underlaying metamorphic rocks.

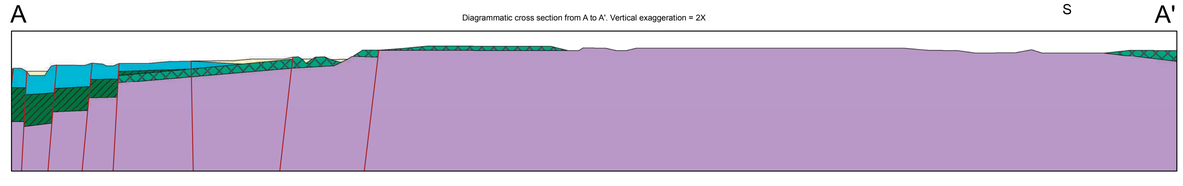
BASEMENT SYSTEM:
Precambrian metamorphic rocks exposed here are part of the The Mozambique Belt, which represents the closure of the Mozambique ocean during the Pan-African Orogeny. The metamorphic rocks present in the region are interpreted as the altered sediments associated with that ancient ocean (Nyamai et al., 2003). Initial deposition may have commenced around 1.4 Ga, with major metamorphic events at 800 Ma and 600 Ma (Warden & Horkel, 1984).

The Kurase Group has been interpreted as a former shallow shelf environment, while the metamorphosed arkose, greywackes, and basic lavas of the Kasigau group were deposited within a subsiding basin (Warden & Horkel, 1984). Both groups indicate that water depths at the time of deposition deepened towards the east. The uppermost shelf deposits are found east of Nairobi, and the present scapolite-bearing gneisses indicate there had been evaporites in that region (Nyamai et al. 2003).

These sediments have been subjected to several stages of deformation (descriptions in Warden & Horkel, 1984), with all but the most recent sediments reaching upper amphibolite/granulite grade (Nyamai et al. 2003).

Above: Location of presented geologic map (grey-square) in relation to the major rift bounding faults and Lake Turkana





Cross Section Legend

- Alluvial fan
- Lacustrine Sediments
- Magadi Trachyte
- Singaraini Basalt
- Kirikiti Basalt
- Plio-Miocene Volcanics
- Kapiti Phonolite
- Metamorphic

Legend

Holocene
- Alluvial fan
- Lacustrine Sediments

Pleistocene
- Pl-gd Magadi Trachyte
- Pl-tb Tepesi Basalt
- Pl-tv Tepesi Benmoreite
- Pl-lt Limuru Trachyte
- Pl-sb Singaraini Basalt
- Pl-ngv Ngong Hills

Pliocene
- Pna Narok Agglomerate

Olorgesailie Lavas
- Pov Olorgesailie
- Popri Phonolitic nephelinite
- Pop Biotite phonolite

Miocene
- Mev Esayeti
- Mva Athi Tuffs
- Mmt Mbagathi Trachyte
- Mkp Kapiti Phonolite

Metamorphic

Kurase Group
- Xl Crystalline Limestone
- Xp Undiff. Pelitic host
- Xq Quartzite
- Xp' Undiff. Semi-pelitic host

Karigau Group
- Xfg Feldspathic Gneiss
- Xag Augen Gneiss
- Xbg Biotite/Banded Gneiss

faults-large
faults-small
City
Town
Village
rivers
200m-contour
Road-major
Road-minor
Road-track
rail

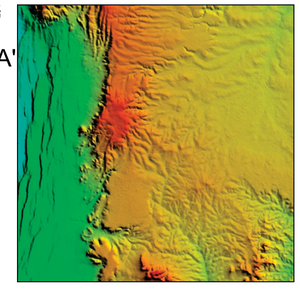
STRUCTURE
The metamorphosed sediments of the basement series exposed in this area were affected by several stages of deformation (see Warden & Horkel, 1984) that produced a general NNW-SSE foliation.

ECONOMIC DEPOSITS
Metamorphosed limestones are mined to produce slaked lime for agricultural and other uses. Diatomite deposits are found on the rift floor at the sites of ancient lakes.

The Kajiado district also has economic pockets of Wollastonite (Nyamai et al. 2003)

WATER RESOURCES
Water is scarce as there are no perennial rivers. Water can be obtained from the river bed of the Kajiado River, but much of the population in this area depends on boreholes. The most accessed horizons are the biotite gneisses, or the contact between the metamorphic rocks and the volcanics. There are also some springs located on the Ol Doinyo Narok Plateau.

GEOTHERMAL PHENOMENA
There is no known geothermal phenomena in this map area.



Colored DEM with hillshade for the mapped region.
Elevation range from 1022 - 2147m (cyan - red).

Reference map showing the source maps and their geographic coverage

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Geological Map of the Southern Kenya Rift

contour interval 200m

Location: Kajiado, Kenya 36.5 E - 37.0 E, 1.5 S - 2.0 S	A. Guth, J. Wood (2013)
Coordinate System: Geographic WGS84	Michigan Technological University

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