

# African-Arabian Craton

By

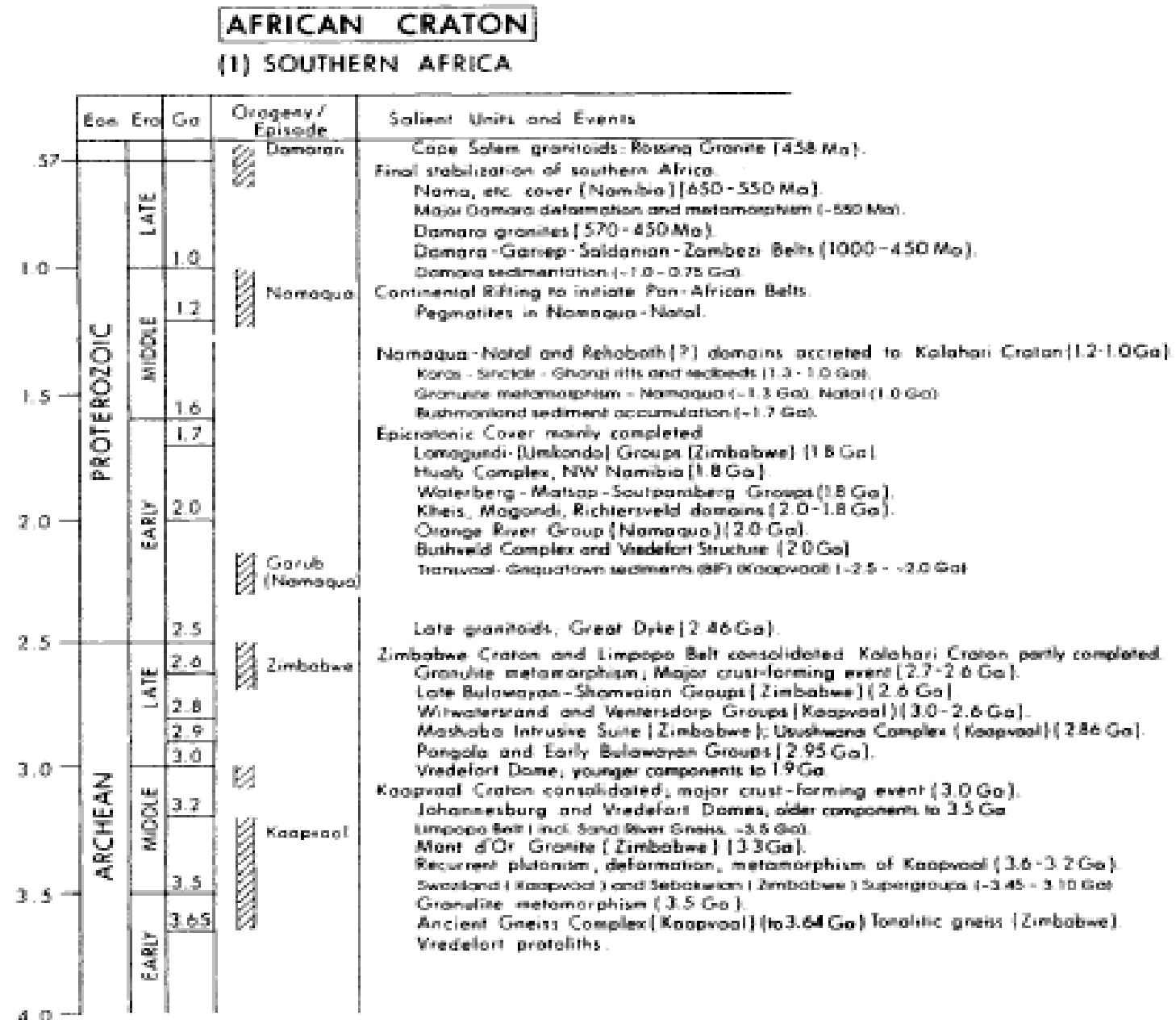
Ritesh Purohit

# Introduction

- Occupies all of the continent with the exception of the restricted Cape, Mauritanide and Atlas fold belts, located respectively at the south, northwest and north margins.
- This unusually large craton is conveniently divided by an orthogonal system of late Precambrian (Pan-African) mobile belts, into five parts: (a) Kalahari (southern); (b) Congo (equatorial); (c) West African (northwestern); (d) East Saharan (north-central) cratons; and (e) Arabian-Nubian (northeastern) Shield.
- The system of Pan-African belts includes from west to east, *the N-trending* (a) Pharusian-Dahomeyan; (b) West Congo-Gariep; and (c) Mozambique and, from south to north, *the ENE-trending* (d) Saldanian; (e) Damara-Katanga- Zambezi; (f) Central African; and (g) an unnamed northern African belt.
- Two large central subsidence basins~Taoudeni and Congo--are located in the West African and Congo cratons respectively.
- The southerly Kalahari Craton is largely obscured in the northwest by the Kalahari desert. The rifted Madagascar and Seychelle Islands are included in the African Craton.

- **Kalahari Craton (Southern Africa):** (1) Kaapvaal Craton, (2) **Zimbabwe Craton**, (Rhodesia) (3) Limpopo Belt, (4) Namaqua-Natal Belt, (5) Rehobothian Domain, (6) Koras-Sinclair troughs, (7) Nama Basin
- **Congo Craton (Central Africa):** (1) Kasai-Angolan Craton, (2) Chaillu Craton, (3) Gabon Craton, (4) Bouca Craton, (5) Bomu-Kibalian Craton, (6) Tanzania Craton, (7) Zambian Craton (Bangweulu Block), (8) Madagascar Craton, (9) Ubendian-Ruzizian Belt, (10) Ruwenzori (Buganda-Toro) Belt, (11) Kibalian Belt, (12) Irumide Belt, (13) Lurio Belt
- **West African Craton (Northwestern Africa):** (1) West African Craton including Reguibat and Man shields, Taoudeni and Volta basins, Gourma Aulacogen, and Rockelides, Marampa and Kasila belts, (2) Tuareg Shield, (3) Benin Nigeria Shield
- **East Saharan Craton (north-central Africa)**
- **Northeastern Africa:** (1) Tibesti, Uweinat and Tchad inliers, (2) Arabain-Nubian Shield
- **Mobile belts:** (1) Damara-Katanga-Zambezi, (2) Central African (Cameroon-West Nile), (3) Mozambique, (4) West Congo, (5) Trans- Saharan (Pharusian-Dahomeyan), (6) Kaoko, (7) Gariepian, (8) Saldanian

The classification illustrated is that of the IUGS Sub-commission on Stratigraphy (Tankard et al 1982, Plumb and James 1986). Some of the boundaries are highly diachronous. An alternative revised South African time scale is provided by Johnson et al (1989). The validity of the tectonic cycle concept is appraised by Cooper (1990).



**Fig. 1-31(i).** Summary chrono-stratigraphic development of Precambrian crust of the African Craton—southern Africa. Salient crustal units and events are arranged in relation to internal orogenies and resulting tectonic cycles.

# AFRICAN CRATON

## (2) CENTRAL - NORTHERN AFRICA

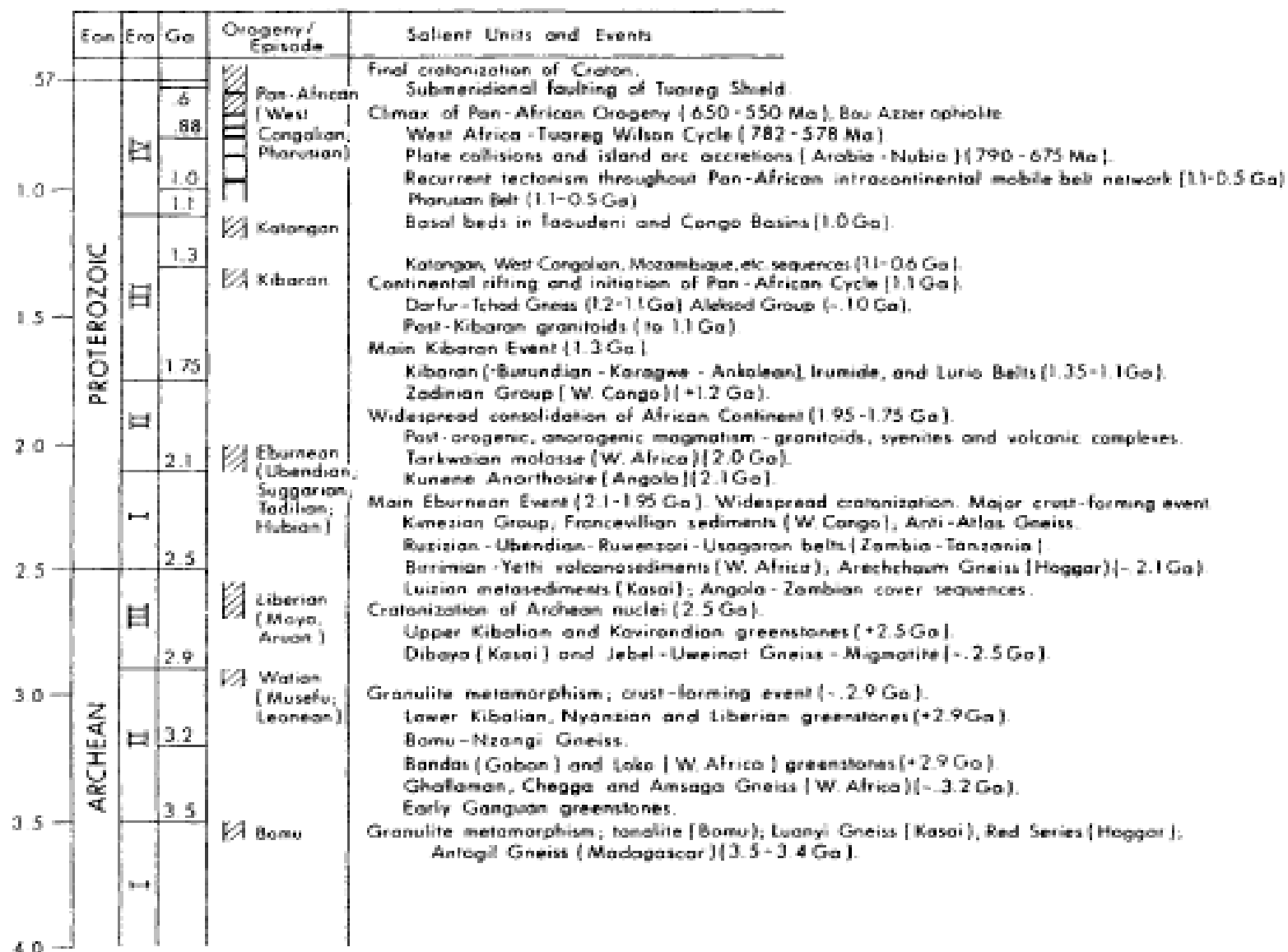


Fig. 1-31(II). Summary chrono-stratigraphic development of Precambrian crust of the African Craton—central-northern Africa. Salient crustal units and events are arranged in relation to internal orogenies and resulting tectonic cycles.

# Geological Setting

- In keeping with its great size, the African Craton includes diverse Precambrian units ranging from comparatively small Archean cratons, through now-restricted early to mid Proterozoic mobile belts and cover, to a plethora of late Proterozoic to early Paleozoic, polycyclic (Pan-African) mobile belts with their large accompanying interior basins.
- The roughly orthogonal (N-S) and E-W) Pan-African belt system conveniently divides the composite craton into five component cratons: southern (Kalahari), central (Congo), northwestern (West African), north-central (East Saharan) and northeastern (Arabian- Nubian Shield).
- The main E-trending Pan-African belts are from south to north (1) Saldanian; (2) Damara-Katangan-Zambezi; and (3) Central African.
- The main N-trending Pan-African belts are, from west to east, (1) Rokelides (- Mauritanides); (2) Pharusian-Dahomeyan; (3) West Congo-Kaoko-Gariep; and (4) Mozambique.

# Kalahari Craton

- Kalahari Craton (southern Africa) The crudely hexagonal Kalahari Craton, about 2000 km across, comprises three main parts:
- (1) in the east, the Archean Kaapvaal and **Zimbabwe cratons**, with intervening polycyclic Limpopo Belt, and partly obscuring Archean to early Proterozoic epicratonic cover;
- (2) in the west and south, the early Proterozoic Magondi and Kheis belts, the flanking, mid-Proterozoic (to -1.0 Ga) Namaqua-Natal Belt with the broadly coeval Koras-Sinclair-Ghanzi (Chobe) rift system; and
- (3) at the western margin, the small Eocambrian Nama Basin.

# Kaapvaal Craton

- The *rectangular Kaapvaal Craton*, about 800 x 600 km, comprises an early- to mid-Archean (3.6-3.0 Ga) granitoid-greenstone basement with unconformably overlying late Archean to early Proterozoic (3.0-1.7 Ga) epicratonic basin cover.
- The Archean basement includes the Ancient Gneiss Complex and associates with ages to 3.64 Ga, and adjoining mafic-ultramafic-rich greenstones, notably the Barberton belt, with established ages to 3.44 Ga.
- The craton was partly stabilized by 3.0 Ga whereupon epicratonic cover accumulated, heralded by Pongola and basal Witwatersrand strata. Intermittent granitoid intrusions to 2.5 Ga completed Kaapvaal cratonization.



# Zimbabwe Craton

- To the north, the ***Zimbabwe Craton***, about 700 x 300 km, is formed of a similar granitoid greenstone 'basement complex' with widespread platform cover.
- The gneiss-migmatite basement contains sparse earlier Archean (3.4 Ga) (Sebakwian) and more common later Archean (2.7 Ga) (Bulawayan-Shamvaian) greenstone belts.
- Widespread late Archean (~2.6Ga) granitoid intrusions stabilized the craton.
- A unique feature of this craton is the presence of the 2.5 Ga Great Dyke, a major NNE-trending linear graben-controlled mafic-ultramafic layered igneous complex.

# Limpopo Craton

- The *Limpopo Belt*, a 150 km-wide intercratonic polycyclic complex.
- It comprises medium to high grade gneisses with metasedimentary associates and layered mafic-ultramafic intrusions, including anorthosites.
- The growth history of the belt extends from -3.5 Ga (Sand River Gneiss) to at least 2.5 Ga, the time of Great Dyke intrusion.

# Proterozoic Belt and Basin

- The early Proterozoic *Kheis, Magondi and Umkondo* belts, flanking the Kalahari craton on the west and northeast, constitute thin-skinned, foldand- thrust belts, involving 2.0 Ga metasedimentary- amphibolite assemblages with large-scale craton-directed vergence.
- The mid-Proterozoic *Namaqua-Natal Belt* bordering the Kaapvaal Craton on the south and west, comprises polycyclically deformed, granulite-bearing gneiss-migmatite, representing reworked basement-cover assemblages with components dated to at least 2.0 Ga.
- Widespread metamorphic retrogression 1.3-1.0 Ga accompanied progressive late granitoid intrusions.

# GENERAL GEOLOGIC DIVISIONS OF AFRICAN CRATON

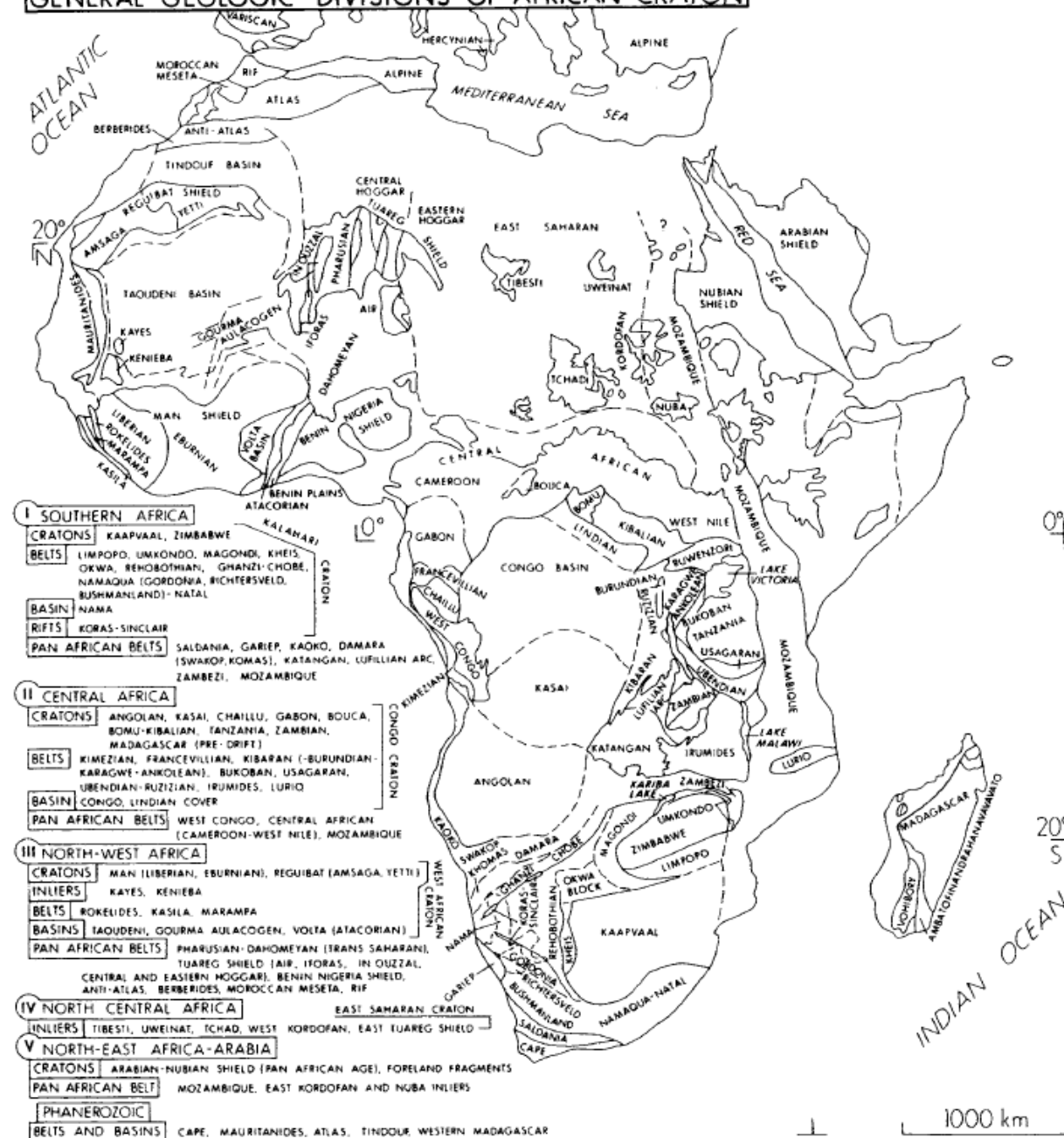


Fig. 1-5f(1)a. Main geologic outline of the African Craton showing general geologic divisions of Pre-cambrian crust (adapted from Saggerson 1978, Fig. 1).