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THE PROTEROZOIC EVOLUTION OF AFRICA

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INFORMATION CIRCULAR No.343

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THE PROTEROZOIC EVOLUTION OF AFRICA

by

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ABSTRACT

Interpretive palaeogeologic maps portraying 11 time periods stretching from the Archean to the Cambrian suggest that the African continent was formed by the growth of cratonic areas through accretionary events, marginal arc magmatism, rifting, and collisions with island-arc terranes and other cratonic areas. A summary of the main events is presented in the table below:

TIME PERIOD	MAJOR EVENTS
>2500 Archean	▪ Numerous granite-greenstone terrane-forming accretionary events ▪ Incomplete accretionary events ▪ Gneiss complexes ▪ Witwatersrand Basin and Ventersdorp lavas
2500-2200 Ma Early Early Proterozoic	▪ Epicontinental basins on older cratons ▪ Iron formation deposition ▪ First "arc" magmatism in Angola
2200-1900 Ma Middle Early Proterozoic	▪ Birimian accretionary event ▪ Incomplete accretion in the Tuareg-Nigeria Platform ▪ Marginal arc magmatism in Angola and Namibia ▪ Rifting between Congo and South African cratons ▪ Bushveld Complex and other ultramafic -mafic intrusions
1900-1600 Ma Late Early Proterozoic	▪ Arc magmatism and accretion (?) from Angola to South Africa ▪ Southern Tanzania-northern Zambia arc magmatism ▪ Deformation in Magondi and Kheis belts with associated back-arc basin
1600-1400 Ma Early Middle Proterozoic	▪ Marginal basins southwestern South Africa (Kakamas, Areachap, Kaaien) ▪ Initiation of the Kibaran Rift between East African and Congo cratons ▪ Erosion of previously formed cratons
1400-1200 Ma. Middle Middle Proterozoic	▪ Kibaran sedimentation and magmatism; Burundi Ni belt emplacement ▪ Bushmanland sedimentation and mineralization ▪ Sinclair-Koras-Natal back-arc basin ▪ Aleksod sedimentation in Tuareg Shield
1200-1000 Ma Late Middle Proterozoic	▪ Kibaran metamorphism and deformation ▪ Namaqualand collision/convergence; back-arc Koras-Rehoboth magmatism ▪ Accretion in southern Mozambique Belt ▪ Marginal arc magmatism in Malawi and Egypt: start of east coast accretion?
1000-800 Ma Early Late Proterozoic	▪ Initiation of the Damaran Rift ▪ Zambezi Belt collision ▪ Copperbelt sedimentation ▪ Mozambique Belt accretion and/or magmatism ▪ Nubian-Arabian Shield accretion ▪ Epicontinental sheet sandstone deposition, Congo Craton
800-670 Ma Early Sinian Middle Late Proterozoic	▪ Upper Damaran Rift sedimentation ▪ Mozambique Belt metamorphism ▪ Arabian-Nubian Shield accretion ▪ Folding in Copperbelt, Bukoban sedimentation(?) ▪ Collision of island arc terranes of Tuareg-Nigeria Platform with West African Craton; convergence on (present) northwest coast
670-590 Ma. Late Sinian Late Late Proterozoic	▪ Final magmatism in Arabian-Nubian Shield ▪ Amalgamation of northern Africa ▪ Collision of northern Africa with Congo Craton in Cameroon ▪ Damaran deformation
590-505 Ma Cambrian	▪ Penecontemporaneous extensional magmatism and basal Cambrian sedimentation in northern Africa ("Pan-African" Event) ▪ Damaran thrusting and alkalic magmatism

This study suggests that the interpretation of the Proterozoic evolution of Africa could benefit from a re-definition of nomenclature, so that any tectonic or magmatic event is strictly defined with regard to location and time.

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THE PROTEROZOIC EVOLUTION OF AFRICA

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THE PROTEROZOIC EVOLUTION OF AFRICA

INTRODUCTION

In 1984 L. Cahen, N. J. Snelling and others published *The Geochronology and Evolution of Africa*. Their book summarized the geology and geochronological work in all of Africa, and represented a significant advancement of the knowledge of the continent. This was followed in 1999 by A. M. Goodwin's *Precambrian Geology,* which drew heavily upon Cahen and Snellings' work, but also summarized many of the more recent investigations.

Cahen and Snelling's work was also the principal impetus for this paper. Their book contained numerous references to orogenic cycles, thermal events, and magmatic episodes (e.g. Birimian, Euburian, Suggarian, Ubendian, Usagaran, Dodoman, Lufillian, Namaqua, Gordonia, Bushmanland, Khomas, Limpopo, Kheis, Saldania, etc.) that were difficult to reconcile in terms of a modern plate-tectonic framework. Also, extending terms like "Kibaran" and "Pan-African" across the entire continent and for periods of more than 200 million years did not seem to fit with Phanerozoic processes and nomenclature. The writer felt that the best way to look at the continent would be in its entirety, and in time slices that could record, separate, and correlate significant geologic events. This paper attempts to portray the Proterozoic evolution of Africa in graphical form through a series of paleogeographic and paleogeologic maps.

Choice of Time Scale

This compilation of geologic events focuses on Proterozoic time, which spans almost 2 billion years of the earth's history (2500 to 590 Ma). Detailed subdivision of the Proterozoic is only available in certain parts of the world, and then, in may cases, only a small fraction of the Proterozoic has been subdivided. A simple, linear time scale was adopted for this study because subdivisions from other continents did not necessarily apply to Africa, and the writer did not want to introduce bias from other continents into the interpretations.

Time intervals for each map are between 300 to 80 million years. The time intervals were considered a compromise between the abundance of age dates, the resolution of the age dates (many of which are by the Rb-Sr method) and the cartographic representation of distinct geologic events through time. Relatively short intervals were selected so the maps would "capture" events similar to the Jurassic to Recent evolution of the Andes (the "type" Andean arc), which evolved from an extensional arc, with basaltic to bimodal magmatism, to a compressional arc, with calc-alkaline magmatism, in about 200 million years.

The Early, Middle and Late Proterozoic boundaries were taken to coincide with the United States Geological Survey Divisions shown in Harland et al. (1982) of X (Early Proterozoic, 2500-1600 Ma), Y (Middle Proterozoic, 1600-800 Ma.), and Z (Late Proterozoic, 800-590 Ma). Each of these "Eras" was then subdivided into 3 equal parts of 300 Ma for the Early Proterozoic and 200 Ma for the Middle Proterozoic. The Upper Proterozoic was divided into the Early and Late Sinian (Surtian and Vendian, after Harland et al., 1982). The time scale used in this paper is presented in Appendix 1.

Radiometric Age Dates

In order allow the reader to judge the relative value of the radiometric age dates, the dates shown in the paleogeographic maps are colour-coded according to type (Rb-Sr, U-Pb, K-Ar, etc). Although less frequently used these days, Rb-Sr ages are the only ages available for a many regions in Africa. Error limits for some of these ages exceed 100 million years. In most cases, however, even these large error limits were adequate for the purposes of this compilation.

Accretionary Events

Craton-forming events, which result in geologic terranes similar to Archean greenstone belts, have occurred throughout geologic time (e.g. the Lower Proterozoic Birimian of West Africa, the Upper Proterozoic of the Red Sea area, the Ordovician Tasman Orogen of Australia, and the Cretaceous Sierra Nevada of California). Rock sequences, grades of metamorphism, deformational styles, and even ore deposits are similar in all of these areas, suggesting they formed by processes including: (1) an early arc-forming event associated with bimodal and calc-alkaline magmatism; and (2) a later craton-forming event associated with voluminous granitic magmatism. This study suggests that several major accretionary events created large areas of continental crust during the Proterozoic evolution of Africa.

Transitional Crust

Thin, transitional crust, used extensively in these reconstructions, is inferred to underlie:
(1) marginal basins that show some link to adjacent cratonic sequences;
(2) areas that have undergone ductile folding or metamorphism in later time periods; or
(3) areas that have been the sites of later Andean-style magmatism.
These areas of thinner crust may have been formed as thick aprons of sedimentary rocks shed from surrounding cratons or areas that have undergone incomplete accretionary or magmatic events.

Mature Island Arcs

For the purposes of this paper, mature island arcs are those which have evolved over a period of several hundred million years, such as Japan, the Philippines and parts of Indonesia. These "island arcs" are several hunderd kilometers wide and have a basement of Cretaceous or older rocks. This contrasts with the more "typical" island arcs, which have a "basement" consisting of a volcanic edifice and/or oceanic crust (e.g. the Aleutians, the Marianas, etc).

Scale of Study

Because of the large area covered by this study, many generalizations and omissions have been made. The writer expects that, in some cases, the data presented may be wrong or clearly misinterpreted and has made every attempt within his means to include the latest references, but this was not always possible. An invitation is extended to readers to contact the writer drawing attention to any errors or omissions as well as any comments, criticisms, or additions they may care to offer.

References

All of the ages presented on the maps are listed in Appendix 2, which consists of 12 tables grouping the ages by each time period; each table corresponds to a figure for the same time period. Ages are then grouped by country in each table. Data for each age includes the country, age and error limits, age type (method of analysis), rock type and location, coordinates, and a reference. A complete listing of references is given at the end of the text portion of this paper.

ARCHEAN >2500 Ma
(Table 1 and Figure 1)

Accretionary Events

The Archean Eon in Africa was dominated by accretionary events, as outlined in Table 1 and depicted in Figure 1. Only the South African Craton amalgamated early enough to allow for erosion and deposition of successor basins, the Witwatersrand sedimentary basin and the Ventersdorp lavas.

Reconstructions in later time periods suggest that the Congo and South African Cratons may have formed adjacent to one another, and were separated by rifting at about 2000 Ma. East-west trends of greenstone belts in the Kivu and East African cratons suggest that these areas may also have been linked.

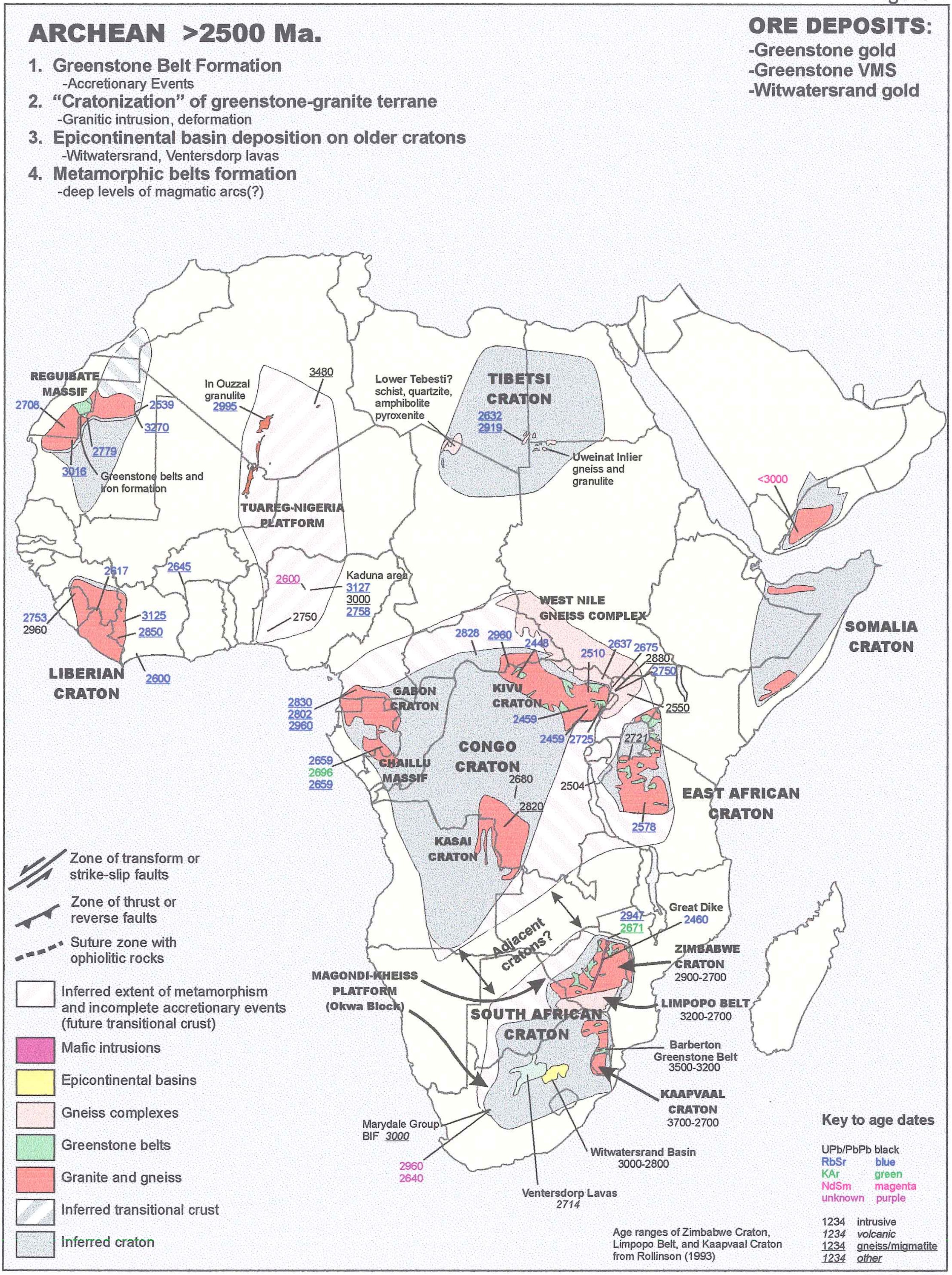
Table 1. Archean (>2500 Ma; see Figure 1)

Area/Craton	Sub-area	Event
SOUTHERN AFRICAN CRATON	Kaapvaal Craton	1. Accretion of Barberton and Murchison greenstone belts and granite-gneiss terrane 3115-3200 Ma 2. Witwatersrand Basin c. 2700 Ma 3. Ventersdorp lavas c. 2643 Ma
	Zimbabwe Craton	1. Accretion of greenstone belts c. 2650-2950 Ma 2. Great Dyke 2460 Ma
	Limpopo Belt	Collision(?) and/or accretion of granite-gneiss terrane
	Magondi Platform	Incomplete accretionary event?
CONGO CRATON	Kivu, Kasai, and Gabon Cratons, Challis Massif	Accretion of granite-greenstone terrane
	West Nile Gneiss Complex	Accretion of granite-gneiss terrane
	Southern Congo Platform	Incomplete accretionary event?
EAST AFRICAN CRATON	East African Craton	Accretion of granite-greenstone terrane in present day Tanzania, Kenya, and Uganda
REGUIBATE MASSIF	Reguibate Massif	Accretion of granite-greenstone terrane
LIBERIAN CRATON	Liberian Craton	Accretion of granite-greenstone terrane
TUAREG-NIGERIA PLATFORM	Tuareg Shield	Incomplete accretionary event? In Ouzzal granulite c. 2995 Ma
	Nigeria Shield	Incomplete accretionary event? Gniess ages c. 2600 Ma
TEBESTI CRATON	Uweinat Inlier	Accretion of granite-gneiss terrane?
	Tibesti area	Lower Tibesti sequence?
SOMALIA CRATON	Archean? outcrops	Accretion of granite-greenstone terrane?. No radiometric data available

Inferred Incomplete Accretionary Events

Incomplete accretionary events may have taken place during Archean time and formed the basement for later depositional and magmatic events. Significant areas include the

Figure 1



S. F. Olson, 2000

Magondi Platform, the area between the Congo and East African cratons, and the Tuareg-Nigeria Platform. These areas may have consisted of dispersed island arc terranes, such as the archipelagos in the present-day southwest Pacific Ocean, and/or they consisted of accretionary terranes that did not undergo the final phase of craton-forming granitic magmatism. Alternatively, some of these areas may have formed during later rifting events.

Gneiss Complexes

The West Nile Gneiss Complex (Laverau, 1975) and the Limpopo Belt (Rollinson, 1993) are broad areas of high-grade rocks that lack the lower-grade greenstone belts typical of other areas of the Archean cratons. These gneiss complexes could represent collisional zones between cratons, the roots of Andean-style arcs, or lower crustal levels of accretionary arcs.

EARLY EARLY PROTEROZOIC 2500-2200 Ma
(Table 2 and Figure 2)

Epicontinental Basins and Iron Formation

Earliest Proterozoic time was a period of quiescence compared to the intense accretionary events of Archean time. Most of the cratons appeared to achieve stability, allowing the deposition of banded iron formation and other epicontinental sequences around their peripheries. The South African Craton received the Transvaal Supergroup, the East African Craton received the Konse Sequence near Iringa and a gondite- and metamorphosed iron formation sequence near Mbeya (writer's correlation), and the

Table 2. Early Early Proterozoic (2500-2200 Ma; see Figure 2)

Area/Craton	Sub-area	Event
SOUTHERN AFRICAN CRATON	Southern African Craton	Deposition of Transvaal Supergroup, including banded iron and manganese formation
CONGO CRATON	SW Congo Platform (Angola)	Marginal (Andean?) magmatic arc along the SW margin of the Congo Craton c. 2200 Ma
EAST AFRICAN CRATON	East African Craton periphery	1. Konse Sequence, Tanzania 2. Metamorphosed iron formation, Mbeya area, Tanzania 3. Buganda-Toro sedimentation and volcanism? Copper-bearing strata in the Kilembe area?
REGUIBATE MASSIF	Reguibate Massif	Beginning of Birimian accretionary event?
LIBERIAN CRATON	Liberian Craton	No known activity
TUAREG-NIGERIA PLATFORM	Eastern Hoggar	Arechchoum and Egere Series; quartzite, shale (schist) and limestone (marble) (Lelubre, 1952),)
	Western Hoggar	Tassenjanet Series (Caby, 1967)*
TEBESTI CRATON	Tebesti Craton	No known activity
SOMALIA CRATON	Somalia Craton	No known activity

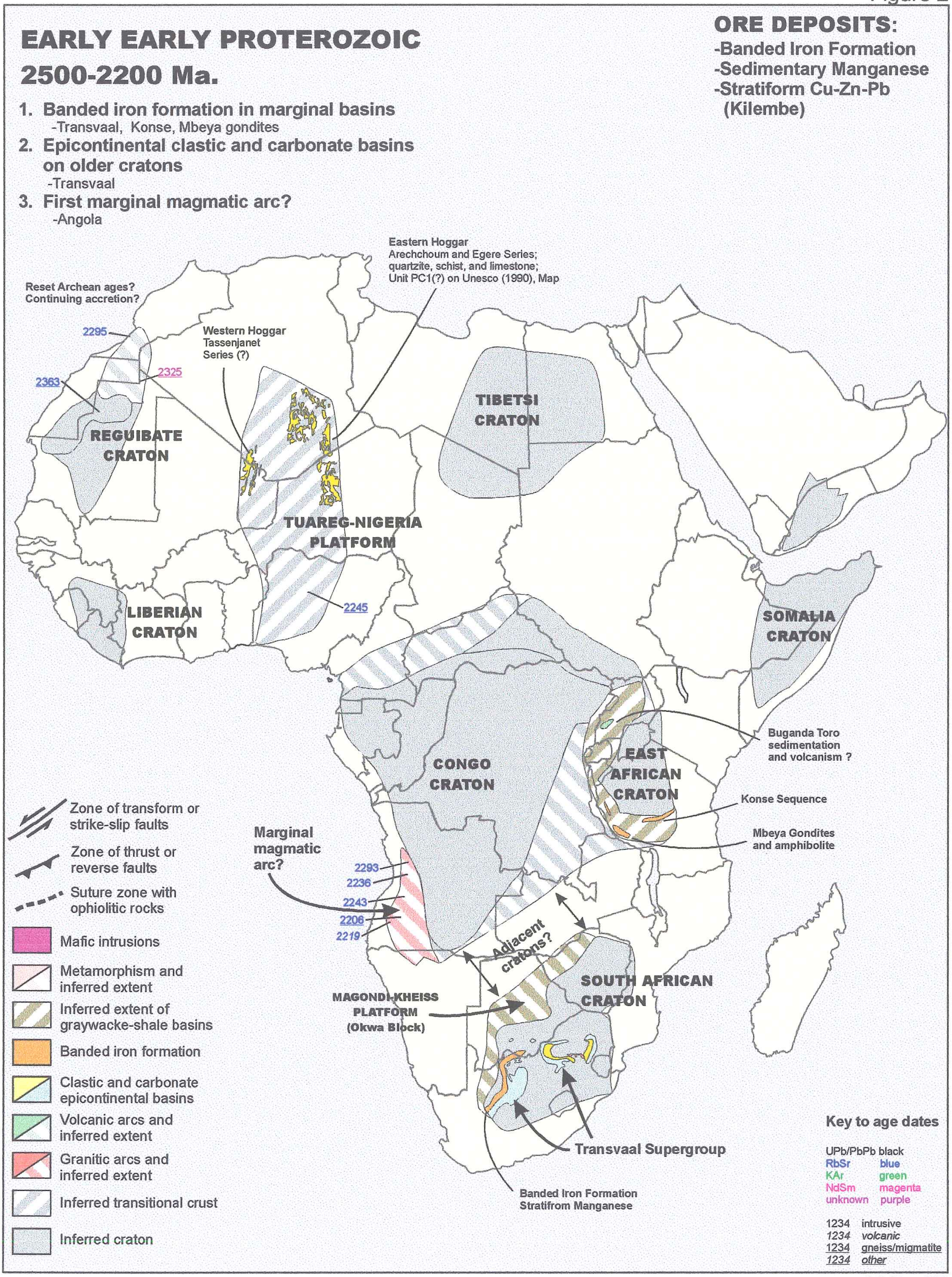
* cited by Cahen et al. (1984)

Tuareg Shield received the Tassenjanet Series in the west and the Arechoum and Egere Series in the east. Buganda-Toro sedimentation and volcanism may also have taken place at this time.

Angolan Arc Magmatism

A linear group of c.2200-2100 Ma ages in present day Angola lie along the western edge of the Congo Craton and may be one of the first modern magmatic "arcs" developed close

Figure 2



S. F. Olson, 2000

to the African continent. Several ages in the northern part of the Moroccan Craton may signal the start of the c.2050 Ma Birimian event.

MIDDLE EARLY PROTEROZOIC 2200-1900 Ma (Table 3, Figure 3)

Magmatic activity increased dramatically in Middle Early Proterozoic time with the Birimian accretionary event, and the extended arc magmatism and rifting in southern Africa.

Birimian Accretionary Event

The Birimian accretionary event was one of the largest accretionary events in the geologic history of Africa, and resulted in the formation of the Birimian Shield and the amalgamation of the West African Craton. This event created a granite-greywacke-greenstone terrane remarkably similar to most Archean granite-greenstone terranes, except that stratiform manganese deposits occupy the corresponding stratigraphic position of the banded iron formations in the Archean belts.

Table 3. Middle Early Proterozoic (2200-1900 Ma; see Figure 3)

Area/Craton	Sub-area	Event
SOUTHERN AFRICAN CRATON	Southern African Craton	1. Bushveld Complex 2. Molopo Farms Complex 3. Kheis Belt depostion
	Western margin	1. Rehoboth terrane island arcs? 2. Haib Volcanics; offshore island arc?
	Northern margin	1. Rifting between South African and Congo Cratons? 2. Magondi Belt volcanism and sedimentation: lavas, shale, and redbeds
CONGO CRATON	Western margin	1. Marginal magmatic arc along the western margin of the Congo Platform 2. Kunene Anorthosite Complex 3. Francevillian Supergroup
	Southern margin	1. Rifting between South African and Congo cratons? 2. Mkushi gneiss protolith deposition
EAST AFRICAN CRATON	East African Craton periphery	Ubendian, Usagaran, and Buganda Toro metamorphism; reset Archean and Early Early Proterozoic ages?
	Zambia, SW Tanzania, and northern Malawi	1. Mkushi gneiss protolith deposition? 2. Early magmatic arc from Mufulira to SW Tanzania?
REGUIBATE MASSIF	Reguibate Massif	Extenstion of Birimian Accretionary Event
LIBERIAN CRATON	Liberian Craton	Amalgamation with West African Craton
WEST AFRICAN CRATON	Birimian Shield	Birimian Accretionary Event: rapid amalgmation of island arc terranes?
TUAREG-NIGERIA PLATFORM	Tuareg Shield	1. Suggarian magmatism in NE Tuareg Shield 2. Linkage with Tibesti Craton
TEBESTI CRATON	Tebesti Craton	Linkage with Tuareg-Nigeria Platform
SOMALIA CRATON	Somalia Craton	No known activity

Tuareg Shield Magmatism

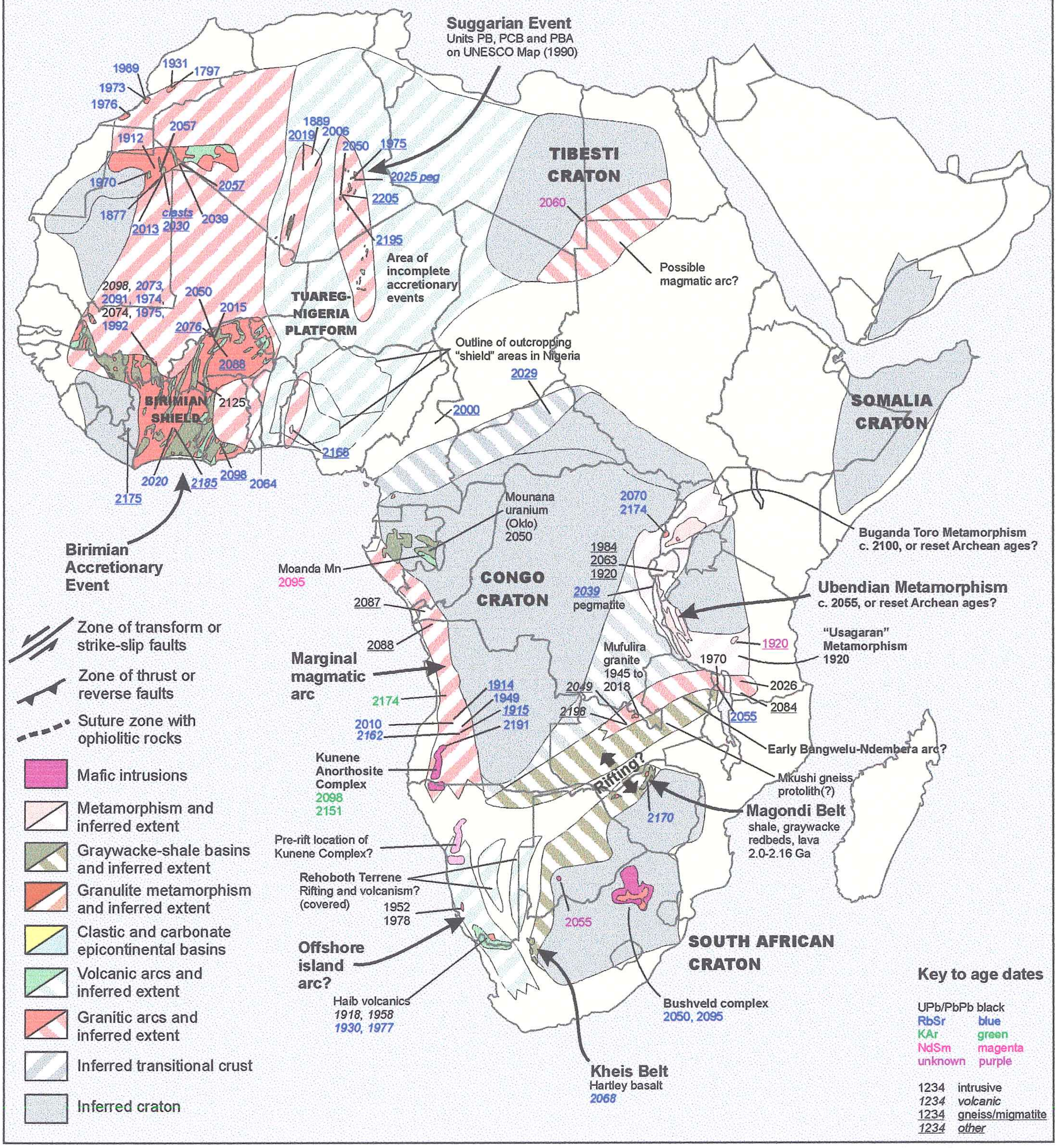
Granite and gneiss ages ranging from c. 1900 to 2200 occur along the NE margin of the Tuareg Shield (Suggarian Event, Allegre and Caby, 1972; cited in Cahen et al., 1984). The Tuareg-Nigera Platfrom was probably still separate from the Birimian Shield; later sedimentary, volcanic, and deformational events took place between these areas. The Tuareg Shield and the Tibesti Craton may have become linked at this time by a series of island arcs, continental fragments, transitional crust and minor collisional events.

Figure 3

MIDDLE EARLY PROTEROZOIC 2200-1900 Ma.

1. Accretion of the Birimian Shield
2. Angola-Namibia-South African arc terranes
3. Rifting of Congo and South African Cratons?
4. Bushveld-Malopa-Kunene mafic intrusions

ORE DEPOSITS:
- Birimian Au & Mn
- Bushveld Pt-Cr-Cu-Ni
- Francevillian Mn & U (Gabon)



S. F. Olson, 1999

Angolan-South African Arc

A major belt of magmatism probably extended from Gabon to southern Angola at this time and may have been the continuation of arc magmatism initiated in Early Early Proterozoic time. Deposition of a major manganese horizon in the Francevillian Supergroup at Moanda, Gabon (Hein and Bolton, 1993) suggests that this event may have been linked to the Birimian event, or that similar processes prevailed in both areas.

It is tempting to correlate the Haib Volcanics (Richtersveld Province) in Namibia and South Africa with the Angolan "arc". Contemporaneity and alignment of these arcs suggests that the South African and Congo cratons were closer during this time interval. Other terranes similar to the Haib volcanics may also have accreted in the covered Rehoboth Terrane at this time.

Magondi-Kheis Belt Sedimentation and Volcanism

Radiometric ages on basalts in the Kheis and Magondi belts suggest that these basins were initiated along the western margin of the South African Craton in an extensional, rift-like setting. Protoliths of the Mkushi gneiss in central Zambia may be the same age. The rifting in the Magondi Belt may represent the first separation of the Congo and South African cratons.

Ultramafic Intrusions

A chain of ultramafic and mafic intrusions extends from the Bushveld Complex in South Africa to the Kunene anorthosite complex in southern Angola. If the present site of the Damaran Rift and the Mkushi gneiss is "closed", the linearity becomes even more striking, and provides at third line of evidence suggesting the Congo and South African cratons were closer during this time interval.

East African Metamorphism

Ages of migmatite and gneiss (1900 to 2100 Ma) in Uganda, Rwanda, and Tanzania, are commonly associated with Buganda-Toro, Ubendian, and Usagaran metamorphism. However, the lack of a well-defined belt of granitoid intrusions suggests typical arc-magmatism was not involved in these areas; another (preferred) interpretation is that these (sparse) ages represent Archean or earliest Proterozoic ages that were re-set by a major magmatic event between 1850 and 1700 Ma. An early phase of this magmatism may be represented by granitoids in Malawi, north central Zambia, and southwest Tanzania.

LATE EARLY PROTEROZOIC 1900-1600 Ma
(Table 4, Figure 4)

Late Early Proterozoic time saw continued magmatism along the western margin of the Congo and South African cratons. Rifting, initiated c. 2000 Ma between the South African and Congo cratons, was reversed during this time period, causing an intense period of magmatism along the southern margin of the East African Craton, and deformation along the northwestern margin of the South African Craton.

Bangwelu-Ndembera Arc

A major area of volcanism and granitoid intrusion took place in southern Tanzania and northern Zambia. Volcanic rocks in the Iringa area, Tanzania (the Ndembera volcanics) and the Mansa area, Zambia, have yielded ages similar to the surrounding granitoids. Metamorphism of the Mkushi gneiss may be related to this arc magmatism. The parallelism of this arc with the northern Magondi Belt suggests these areas formed as part of the same convergent system. It is tempting to correlate this magmatism with the Franzfonten granite in the Kamanjab Inlier of northern Namibia.

The post Buganda-Toro intrusions also appear to occupy a parallel belt in Uganda. The apparent intracratonic position of these intrusions suggests they occupied a rift setting, or that the Uganda area underwent rifting and later convergence as postulated between the South African and Congo cratons.

Island Arcs and the Foreland Thrust - Foreland Basin Pair of Southern Africa

Convergence related to arc magmatism may have caused a foreland thrust belt - foreland basin pair on the South African Craton. The Vioolsdrif intrusions in the Richtersveld Province probably intruded the Haib volcanics in a mature island-arc setting. Collision with other island-arc terranes may have amalgamated the Rehoboth Province and caused folding and thrusting in the Kheis Belt. Uplifted areas in the deformed Kheis and Magondi belts may have shed a broad apron of sedimentary rocks southeastward over the craton.

Waning Birimian and Tebesti Magmatism

Several ages on granitoids along the western margin of the West African Craton, and granite in the Uweinat Inlier, may signal the final stages of Birimian-aged accretion in northern Africa.

Table 4. Late Early Proterozoic (1900-1600 Ma; see Figure 4)

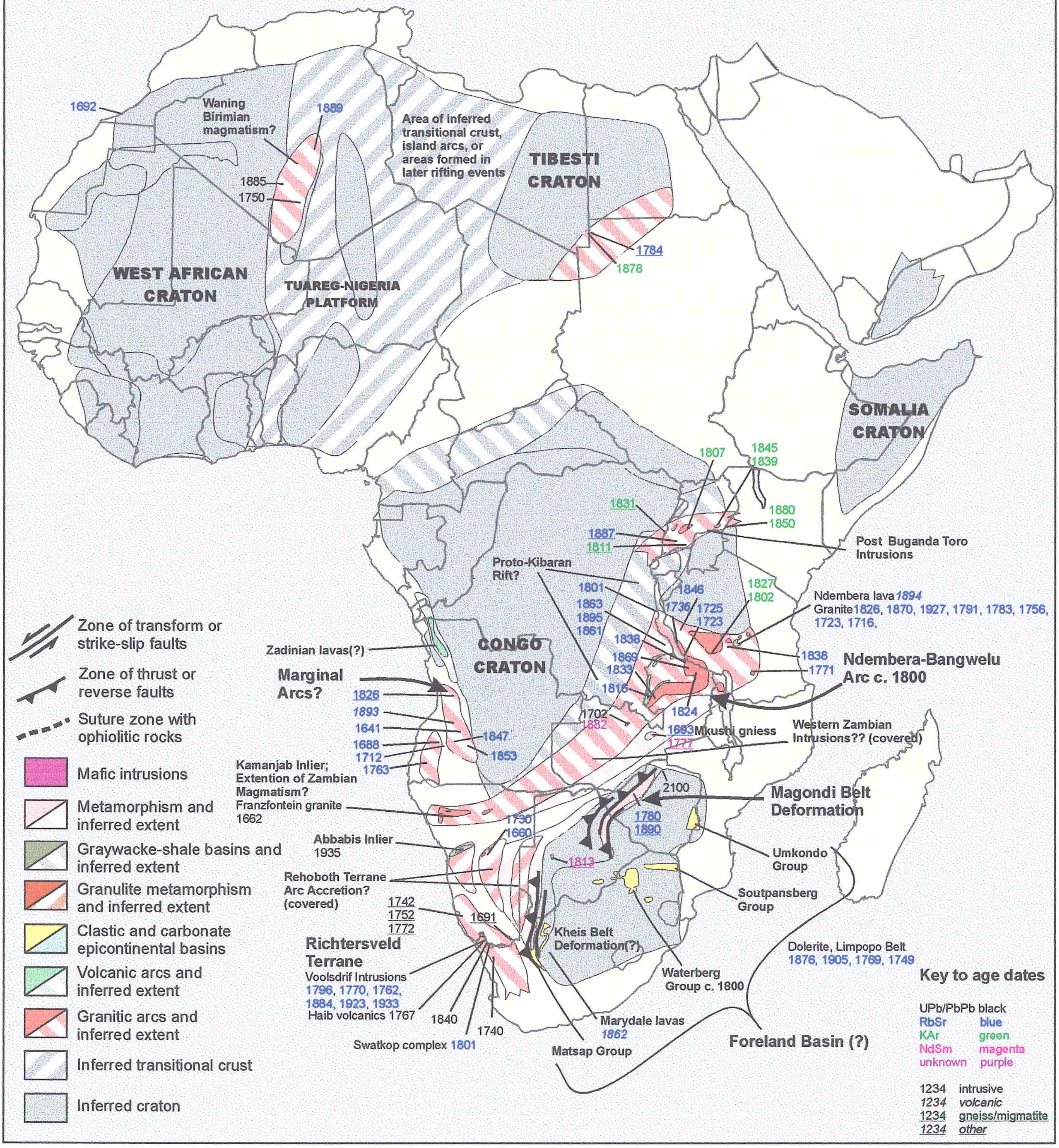
Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	South African Craton	1. Kheiss Belt deformation 2. Magondi Belt deformation 3. Foreland basin (Umkondo Group, Soutpansberg Group, Waterberg Group, Matsap Group)
	Western margin	1. Amalgamation (collision?) of mature island arcs of the Richtersveld and Rehoboth Provinces 2. Voolsdrif intrusions, Richtersveld Province
CONGO CRATON	Western margin	Magmatic arc along western margin (Angola)
	Eastern margin	Proto-Kibaran rift?
EAST AFRICAN CRATON	Northern margin	"Post Buganda-Toro" granitic intrusions
	Southern margin	1. Ndembera-Bangwelu magmatic arc in southern Tanzania and northern Zambia 2. Mkushi gniess metamorphism
WEST AFRICAN CRATON	Birimian Shield	1. Waning Birimian magmatism? 2. Erosion
TUAREG-NIGERIA PLATFORM	Tuareg Shield	Waning Sugarian-Birimian magmatism?
TEBESTI CRATON	Uweinat Inlier	Granitic intrusion
SOMALIA CRATON	Somalia Craton	No known activity

Figure 4

LATE EARLY PROTEROZOIC 1900-1600 Ma.

ORE DEPOSITS:
-Chunya District Au veins, SW Tanzania
-Cu mineralization, Magondi Belt?

1. **Ndembera-Bangwelu magmatism**
   -1800 Ma.magmatic arc
2. **Deformation of the Magondi-Kheis Belt**
   -and foreland basin sedimentation
3. **Angolan-Namibian magmatism**
   -Kamanjab-Rictersvelt-Anglolan granitoids



S. F. Olson, 2000

EARLY MIDDLE PROTEROZOIC 1600-1400 Ma
(Table 5, Figure 5)

The Early Middle Proterozoic was a period of extreme quiescence compared to the previous 600 million years. The single biggest feature is the appearance of the basal sequences of the Kibaran Rift at about 1400 Ma. Both the West African Craton and most of the East African Craton probably remained highlands during this time period and shed sediments into the surrounding areas.

Basal Kibaran Rift Sequences

The earliest sedimentation in the Kibaran Rift is thought to have started c. 1400 Ma ago with quartzite, phyllite and lesser conglomerate, rhyolite and greenstone at the base (Cahen et al., 1984). Over much of the length of the rift, sedimentary rocks attained a thickness of over 10 000m. The "rift" may have been initiated in a back-arc setting with respect to the voluminous Ndembera-Bangwelu magmatism (Figure 4).

South African Terranes

The Kaaien quartzitic terrane (Kheis subprovince) and the rocks of the Korannaland Group (Kakamas metasedimentary terrane and the Areachap volcano-sedimentary terrane?) may also have been deposited at this time. Parts of the Korannaland Group may have been, in part, the basement to - and in part laterally equivalent to - the Bushmanland Group (writer's interpretation of the literature: Joubert, 1986; summary by Cahen et al., 1984; Goodwin, 1991).

Table 5. Early Middle Proterozoic (1600-1400 Ma; see Figure 5)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Namaqua Province	1. Deposition of Kaaien quartzitic terrane, Kheis Subprovince 2. Korannaland Group, (partial basement to Bushmanland sequence?)
CONGO CRATON	Eastern margin	Basal Kibaran Rift sequence
EAST AFRICAN CRATON	Western margin	Basal Kibaran Rift sequence
WEST AFRICAN CRATON	West African Craton	Erosion?
TUAREG-NIGERIA PLATFORM	Tuareg Shield	Erosion?
TEBESTI CRATON	Tebesti Craton	No known activity
SOMALIA CRATON	Somalia Craton	No known activity

MIDDLE MIDDLE PROTEROZOIC 1400-1200 Ma
(Table 6, Figure 6)

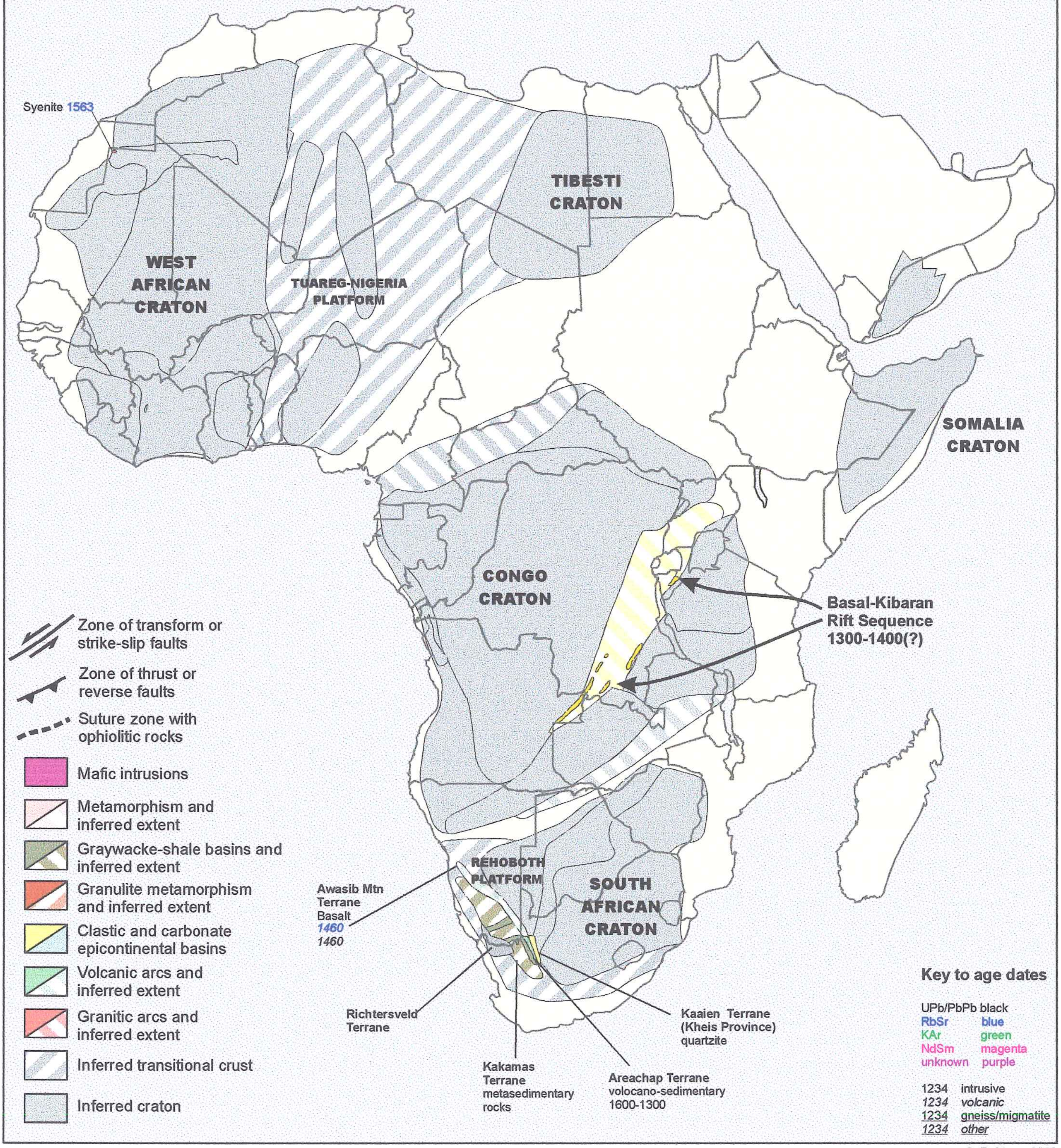
Middle Middle Proterozoic time recorded major magmatism in the Kibaran Rift, rift-related massive sulphide deposits in southern Africa, bimodal volcanism in Namibia, and renewed sedimentation on the Tuareg-Nigeria Platform.

Figure 5

EARLY MIDDLE PROTEROZOIC
1600-1400 Ma.

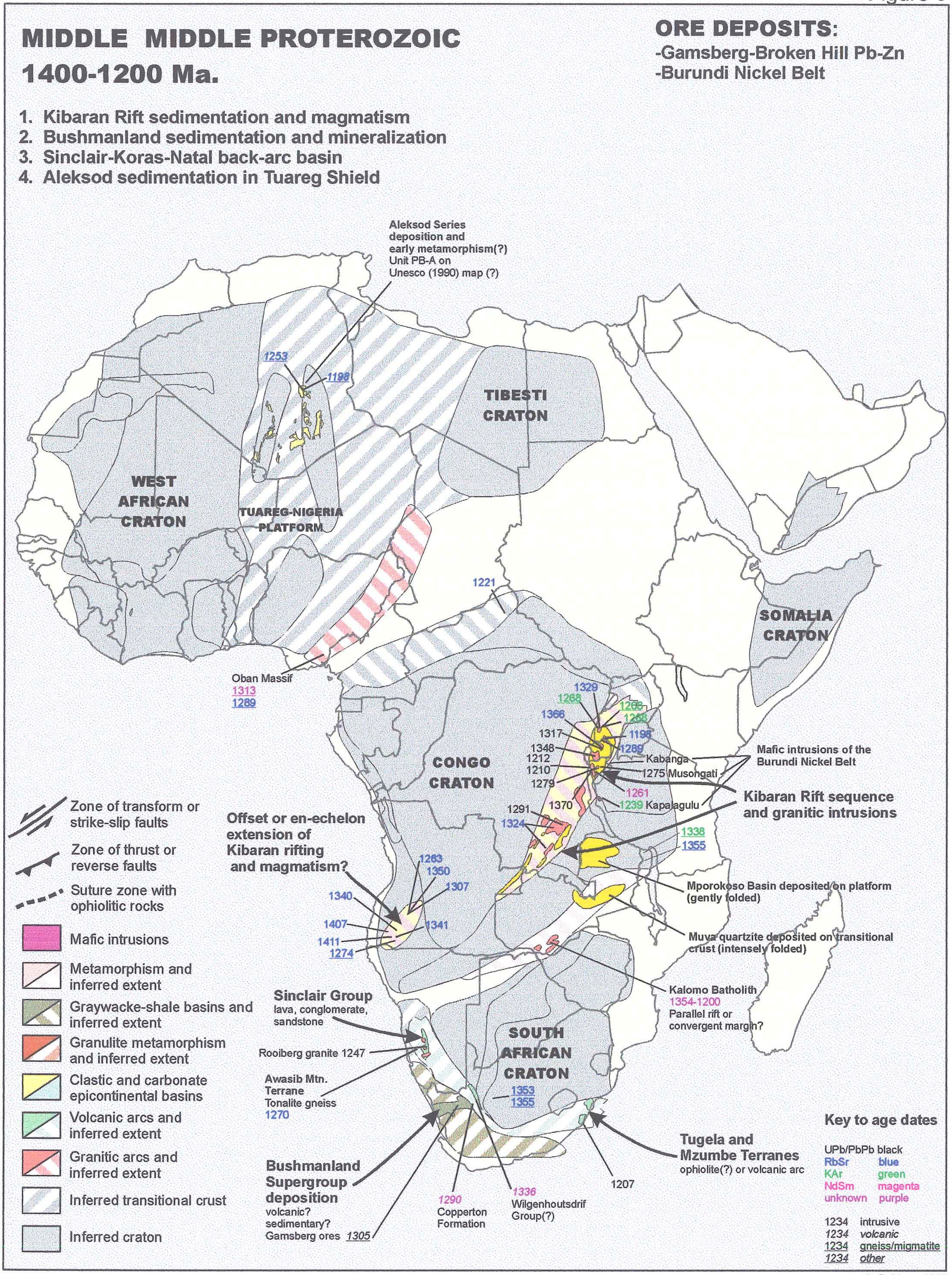
1. **Erosion of arc terranes formed in Late Early Proterozoic time**
   -Bangwelu-Ndembera block, Rehoboth Province
2. **Proto-Kibaran Rift**
   -Basal clastics
3. **Outboard terranes in South Africa**
   -Areachap, Kakamas, Kaaien

ORE DEPOSITS:
-?



S. F. Olson, 2000

Figure 6



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Kibaran Magmatism and Sedimentation

The Kibaran granites intruded the length of the Kibaran Rift, from Shaba in the Congo to Uganda, between 1200 and 1350 Ma ago. Magmatism was accompanied by compressional deformation, which persisted to c. 1180-1100 Ma (summary by Goodwin, 1991). Large ultramafic intrusions, such as Musongati (1275 Ma) and Kapalagulu (1239 Ma), intruded near the end of the granitic magmatism. Granitoid intrusions 1400-1270 Ma in southern Angola may represent a southwestward extension of the Kibaran rift system.

The writer interprets the Muva quartzite, which crops out at the base of the Zambian Copperbelt, and the Mporokoso Basin in northeastern Zambia, to be broadly contemporaneous with the Kibaran sedimentation. The Kalomo Batholith of southern Zambia also intruded at this time, and may represent renewed convergence between the Congo and South African cratons, or alternatively, additional rift-related magmatism between the already-linked cratons.

Bushmanland Sedimentation and Mineralization

Deposition of the Bushmanland Group in the Namaqualand Province of South Africa probably took place over the amalgamated magmatic arcs of the Richtersveld and Rehoboth Provinces. Köppel (1978) reported a 1305 Ma Pb-Pb age on galena from the "syngenetic" orebodies at Broken Hill and Gamsburg.

Broadly contemporaneous with the Bushmanland Group are the volcanic rocks of the Wilgenhoutsdrif Formation (1336 or 1125 Ma), the Koras Group (c.1200 Ma), the Sinclair Group (c.1250 Ma) and the Tubela and Mzumbe terranes (c.1207 Ma.). These rocks may have occupied an extensional back-arc-like setting between the South African Craton and the Namaqualand Province. Rb-Sr ages of 1353 and 1355Ma on granulite in the Marydale area probably represent Archean ages reset by later metamorphism.

Tuareg-Nigeria Platform Sedimentation

Erosion progressed sufficiently in the older arc terranes of the Tuareg Shield to allow the deposition of the Aleksod (Bertrand, 1974; cited in Cahen et al., 1984). Dates from the Oban Massif in the most southeastern part of Nigeria suggest that convergence may have been renewed along the southeastern margin of the platform area.

LATE MIDDLE PROTEROZOIC 1200-1000 Ma
(Table 7, Figure 7)

Late Middle Proterozoic time saw the effects of renewed convergence in eastern and southern Africa. Gneiss belts and associated magmatism in the Namaqualand Province and the southern Mozambique Belt signalled the start of a series of accretionary and collisional events that culminated in latest Proterozoic times.

Namaqualand-Natal Metamorphism and Magmatism

Granitiod intrusions and high-grade metamorphism in Namaqualand and Natal were probably the result of convergence culminating with the collision of mature island arcs (e.g. the Richtersveld Province) with the South African Craton. The contemporaneous low-grade bimodal volcanics in the adjacent Koras Goup, and on-strike in the Rehoboth area in Namibia, may have formed prior to collision as extensional volcanic arcs over a subduction zone. Subduction may have shifted to outboard of the Namaqualand-Natal Belt after the collision, allowing the continuation of granitoid magmatism in the collisional zone.

Table 6. Middle Middle Proterozoic (1400-1200 Ma; see Figure 6)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Bushmanland	1. Deposition of Bushmanland Group with Broken Hill and Gamsberg Pb-Zn deposits 2. Sinclair Group deposition and intrusions 3. Wilgenhoutsdrif Formation; lava, dolomite, clastics
	Eastern margin	Tugela and Mzumbe Terranes
CONGO CRATON	Eastern margin	Kibaran granites and deformation
	Western margin	Extension of Kibaran magmatism?
EAST AFRICAN CRATON	Southern margin	1. Muva quartzite? 2. Mporokoso Basin?
	Western margin	1. Kibaran granites and deformation 2. Burundi Nickel Belt
WEST AFRICAN CRATON	West African Craton	Erosion?
TUAREG-NIGERIA PLATFORM	Tuareg Shield	Aleksod Series deposition and earliest metamorphism?
	Southeast margin	Renewed convergence; formation of rocks in the Oban Massif area
TEBESTI CRATON	Tebesti Craton	No known activity
SOMALIA CRATON	Somalia Craton	No known activity

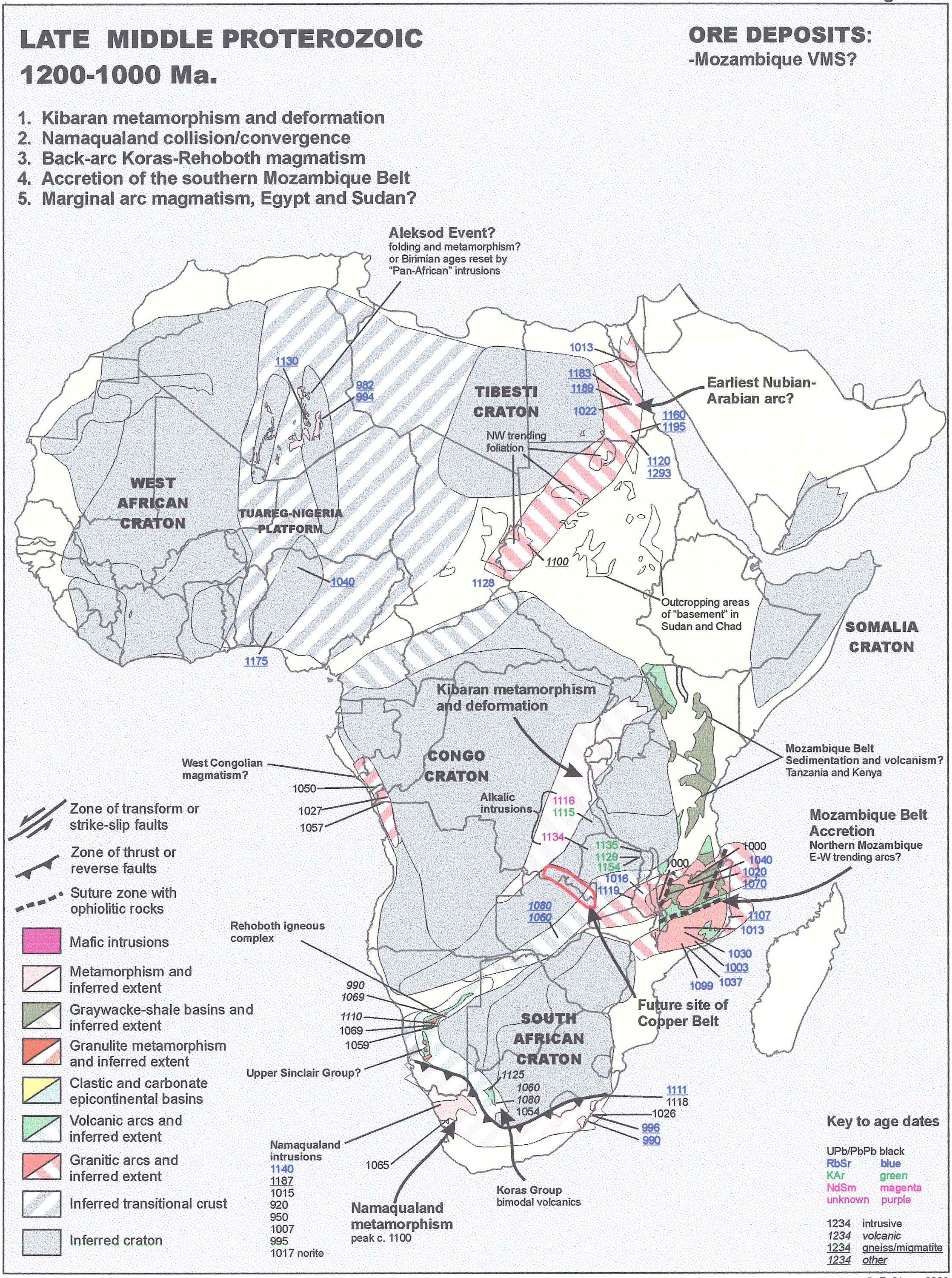
Kibaran Deformation and Metamorphism

Kibaran deformation and metamorphism probably reached its peak at c.1150 Ma (Cahen et al., 1984), closely following the intrusion of the Burundi-Tanzania nickel belt. This compressional deformation may have been caused by convergence between the Congo and East African cratons.

Table 7. Late Middle Proterozoic (1200-1000 Ma; see Figure 7)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Southern margin	Collision with offshore island arc terrenes
	Namaqua Province	1. Granulite and upper amphibolite metamorphism 2. Granitoid and noritoid intrusion
	Kheis Subprovince and Sinclair-Rehoboth areas	1. Koras Group bimodal volcanic rocks: extensional arc? 2. Volcanic and intrusive rocks of the Rehoboth area
	Natal	High -grade metamorphism and intrusion
CONGO CRATON	Eastern margin	1. Deformation of Kibaran Rift; 2. Amalgamation with East African Craton
	Western Margin	Early West Congolian magmatism
EAST AFRICAN CRATON	Western margin	Deformation of Kibaran Rift
	Eastern margin	Sedimentation and volcanism
	Southern margin	Accretion of Mozambique Belt
WEST AFRICAN CRATON	West African Craton	Erosion?
TUAREG-NIGERIA PLATFORM	Tuareg Shield Nigerian Shield	1. Aleksod Event? 2. Phyllite and schist ages, Nigeria?
TEBESTI CRATON	Egypt, Sudan, northern Chad	Arc magmatism along eastern margin?
SOMALIA CRATON	Somalia Craton	No known activity

Figure 7



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Early Mozambique Belt Sedimentation, Volcanism and Magmatism

Gneissic rocks from northern Mozambique yield the oldest dates in the Mozambique Belt of 1000 to 1100 Ma (Carta Geologica de Mozambique, 1987). The E-W trending Lurio Belt, which contains ultramafic assemblages, suggests that accretionary arcs may have been oriented in this direction. Other mafic and ultramafic assemblages are, however, oriented NNE. Eastern Tanzania has no age dates over 1000 Ma and may have been undergoing sedimentation in a back-arc setting at this time. Sequences in Tanzania and Kenya consist of relatively thin horizons of marble, quartzite and graphitic schist separated by thick packages of felsic to amphibolitic gneiss (pers. obs., 1994 -1999).

Magmatism, Western Margin of the Tibesti Craton

Several age dates from the Sinai and eastern Egypt suggest a magmatic arc formed along the eastern margin of the Tebesti Craton. A single Pb-Pb age on galena of 1100±200 Ma and NW-trending foliations (map by Vail, 1978) suggest this magmatism extended towards southern Sudan and Chad.

Aleksod Event

The Aleksod event in the Tuareg Shield is defined on the basis of several Rb-Sr ages on micas from the Aleksod Series sedimentary rocks (Cahen et al., 1984). Metamorphic ages on phyllite and schist also occur in Nigeria during this time period. The writer is of the opinion that these ages probably represent older protolith ages (c. 1400 Ma?) reset by later magmatic events.

EARLY LATE PROTEROZOIC 1000-800 Ma
(Table 8, Figure 8)

Early Late Proterozoic time recorded the continuation of the convergence and associated magmatism initiated c.1200 Ma ago. In addition to the convergence-related events, this time period records the stabilization of the West African and Congo cratons with the first major deposition of epicontinental sheet sandstone deposits, and the formation of the largest copper deposits in Africa.

Damaran Rift

The Damaran Rift was initiated at c. 900-1000 Ma (Miller, 1983) with the Nosib Graben Stage, which included the deposition of basal clastic sedimentary rocks, minor volcanic rocks and the intrusion of syenite (Miller and Burger, 1983). Evaporites also formed part of the sequence, as `did carbonates and red-bed-hosted copper mineralization (Miller, 1983). The Damaran Rift may also have extended into the Ghanzi area of Botswana.

Kibaran Tin Granites

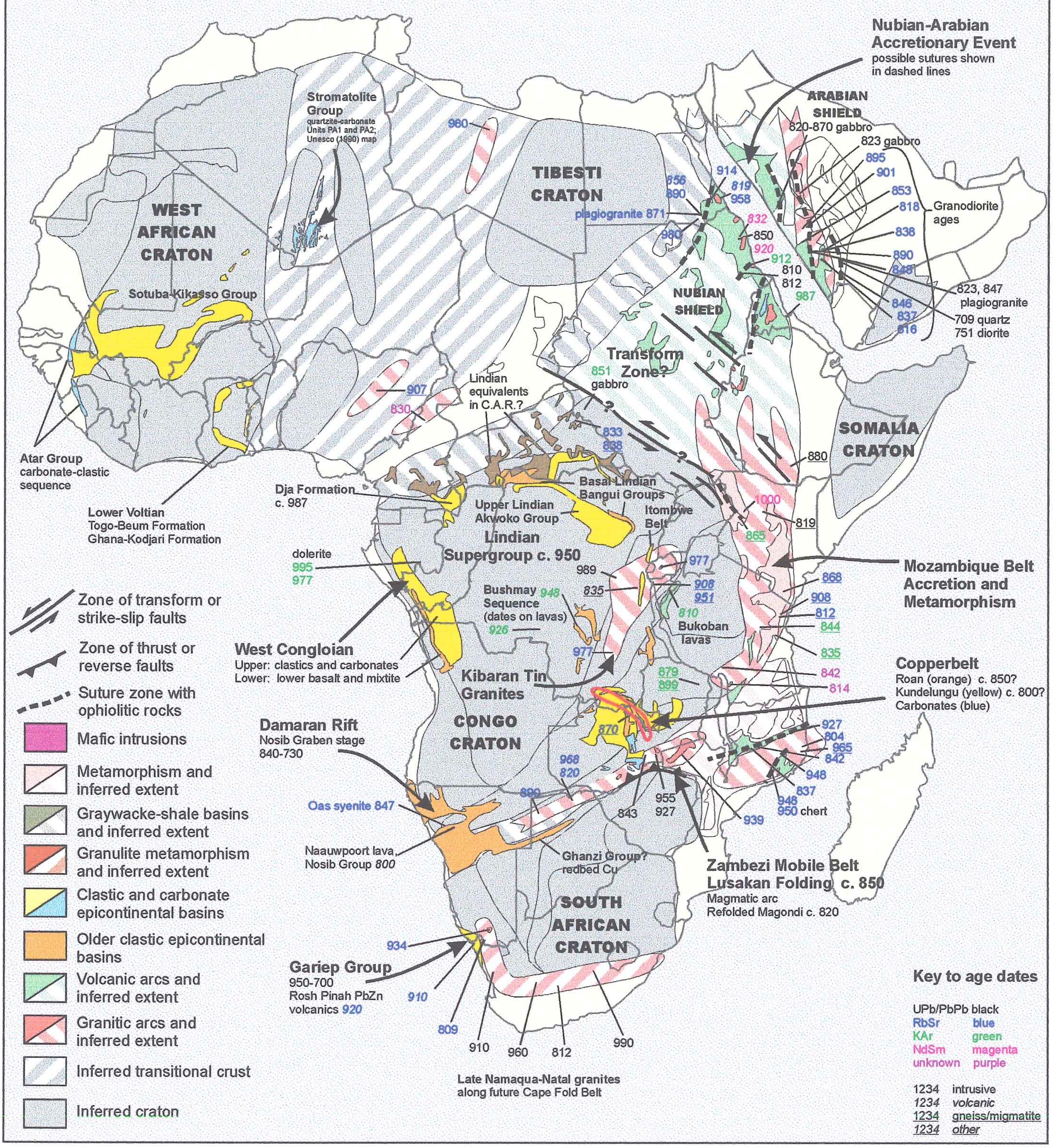
The tin- and gold-bearing hydrothermal systems associated with the Kibaran "Tin Granites" were emplaced c. 950 Ma ago (Cahen et al., 1984) - nearly 300 million years after the last major Kibaran granites were emplaced. This magmatism was probably due to extension along the Kibaran Rift, and was not directly related to the original Kibaran

Figure 8

EARLY LATE PROTEROZOIC
1000-800 Ma.

1. Copperbelt deposition
2. Nubian-Arabian accretion
3. Mozambique Belt accretion and magmatism
4. Circum-Congo basins
5. Basal Damaran Rift
6. Collision of Congo and South African cratons
   -Zambezi Mobile Belt

ORE DEPOSITS:
-Copperbelt Cu & Zn
-Nubian-Arabian greenstone Au-Cu-Zn
-"Kibaran" tin granites



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magmatism. This extension may be related to penecontemporaneous extension in the Damaran Rift.

Copperbelt

The Zambia-Congo Copperbelt is the largest known concentration of copper in Africa, and is broadly contemporaneous with the Damaran Rift in Namibia. In the Congo, it consists of two major sequences: the Roan Group and the Kundelungu Group. Incorporation of clasts of Kibaran Tin-Granite in the basal conglomerate (Madi, 1986; cited in Kampunzu and Cailteux, 1999) suggest that the Roan is no older that c. 950 Ma.

The Roan Group consists of thick talc- and clay-rich breccias (RAT: Roche Argilleuse Talceuse of Francois, 1987) enveloping a thin and highly deformed sequence of carbonate and clastic rocks that hosts the majority of the copper mineralization. The Kundelungu Group consists of a think sequence of conglomerate, greywacke, carbonates and shale, which are deformed into broad open folds. In Zambia the RAT is missing and the copper is hosted by clastic horizons lying close to the basement. Carbonate-hosted Pb-Zn deposits occur in the Kundelungu Group: the Kipushi Mine in the Congo and the Broken Hill Mine in Zambia.

Table 8. Early Late Proterozoic (1000-800 Ma; see Figure 8)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Namaqua-Natal Metamorphic Belt	Late granites
	Damaran Rift	1. Nosib Graben Stage; volcanism and alkaline intrusions 2. Felsic lavas and Ghanzi Group(?)
	Zambezi Mobile Belt	Zambezi-Lusakan folding c. 850
CONGO CRATON	Western margin	West Congolian Supergroup sedimentation
	Northern margin	1. Lindian Supergroup sedimentation 2. Dja Formation, Cameroon and Central African Republic
	Central Congo Craton	1. Bushmay Sequence sedimentation 2. Lindian Supergroup sedimentation 3. Itombwe Group sedimentation 4. Kibaran "Tin Granites"
	Lufillian Arc	Copperbelt deposition 1. Roan Group: carbonate, clastics and breccia 2. Kundelungu Group: conglomerate, greywacke and shale
EAST AFRICAN CRATON	Mozambique Belt	Magmatism and metamorphism?
WEST AFRICAN CRATON	Craton	1. Lower Voltian in Ghana (Affaton et al.,1980)* 2. Sotuba-Kikasso Group in Mali (Bertrand-Sarfati, 1977)* 3. Beum Formation in Togo
	Western margin	1. Atar Group, clastic and carbonate sequence, southern edge of Regiubate Rise (Trompette, 1983)* 2. Rockel River Group, Sierra Leone (Allen, 1969)**
TUAREG-NIGERIA PLATFORM	Tuareg Shield	Stromatolite Group; carbonate-clastic sequence (Black et al., 1979)*
NORTHEAST AFRICA	Arabian-Nubian Shield	Arabian-Nubian accretionary event
SOMALIA CRATON	Somalia Craton	No known activity

*cited by Goodwin (1991); **cited by Cahen et al. (1984)

Within the Copperbelt, the Roan Group appears to have formed in a NW-trending fault-bounded trough, approximately perpendicular to the NE-trending southern margin of the Congo Craton. This is a permissible direction for extensional fractures if the craton was undergoing approximate NW-SE directed compression. The extreme northwest end of the belt, near Kolwezi, may have been bounded by reactivated NNE-trending Kibaran faults.

Arabian-Nubian Accretionary Event

Upper Proterozoic rocks in the Red Sea area bear remarkable similarities to Archean greenstone belts (pers. obs, 1987-1999), and were probably formed by similar accretionary events. Granitoid intrusions and volcanic rocks in Egypt, Sudan, Eritrea and western Saudi Arabia have yielded ages of c. 950-800 Ma. Greenstone belts in west central Ethiopia may be also of this age. Numerous mafic and ultramafic intrusions were used by Berhe (1990) and other workers to infer ophiolite-bearing collisional zones.

Mozambique Belt

Granitoids and gneisses from the Mozambique Belt in Tanzania, Kenya, and central Mozambique have yielded ages of c. 800-950 Ma. These ages are absent from northernmost Mozambique and southern Tanzania. This may reflect shifting magmatic loci and styles, or insufficient data.

Zambezi Belt Deformation

Deformation in the Zambezi Belt and Lusakan folding is thought to have taken place c.850 Ma ago (Cahen et al., 1984). This folding may be related to convergence and magmatism, which stretched from northern Botswana to the Tete Province in Mozambique. Zambezi deformation may also represent a portion of the final collision between the Congo and South African cratons. The Lurio Belt in Mozambique is parallel to, and aligned with, the Zambezi Belt suggesting that these zones may have been connected or evolved contemporaneously.

Relation Between the Mozambique Belt and the Arabian-Nubian Shield

High-grade rocks (c. 880 Ma old) in the Lega Dembi mine area, southern Ethiopia, are normally associated with Arabian-Nubian accretion, but these rocks may just as well represent the northern extension of the Mozambique Belt. Fault-bounded areas of high-grade rocks also occur in west central Ethiopia and as far north as Eritrea (pers. obs. 1997-99). The transition from the high-grade rocks in the Mozambique Belt to the lower-grade rocks in the Arabian-Nubian Shield may have taken place through tectonic interleaving of low- and high-grade rocks.

The trend of the Mozambique Belt changes from N-S in northern Kenya to NW-SE in northeastern Uganda, southwestern Ethiopia and southern Sudan. The rocks of the Arabian-Nubian Shield then trend northerly through central and northern Sudan, western Ethiopia, Eritrea, and Saudi Arabia. Northeast-trending faults and mylonite zones in northeastern Uganda and southwestern Ethiopia may represent a transform zone around the northeast corner of the Congo Craton. This zone may have facilitated the transition from the relatively narrow Mozambique Belt to the broader Arabian-Nubian Shield.

Congo and West African Sedimentation and Convergence

Early Late Proterozoic time saw the first major epicontinental sheet sandstones deposited on the Congo Craton: the West Congolian Group (Alvarez and Maurin, 1991), the Lindian Supergroup (summary by Goodwin, 1991), and the Bushimayi Supergroup (Rumvegeri and Walraven, 1993). The West African Craton and the Tuareg-Nigeria

Platform also started to receive sequences of carbonate and clastic sedimentary rocks as outlined in Table 8. Isolated dates on granitoids in the Tuareg-Nigeria Platform area may indicate renewed convergence between Nigeria and Libya.

LOWER SINIAN (Middle Late Proterozoic) 800-670 Ma (Table 9, Figure 9)

Lower Sinian time recorded major collisional events on the eastern margins of both the Congo and West African cratons. Accretion continued in the Arabian-Nubian Shield, and convergence related sedimentation and volcanism was initiated again in the Tuareg-Nigerian Platform. At this time, the entire African continent was beginning to see the effects of compressional deformation.

Mozambique Collisional Event

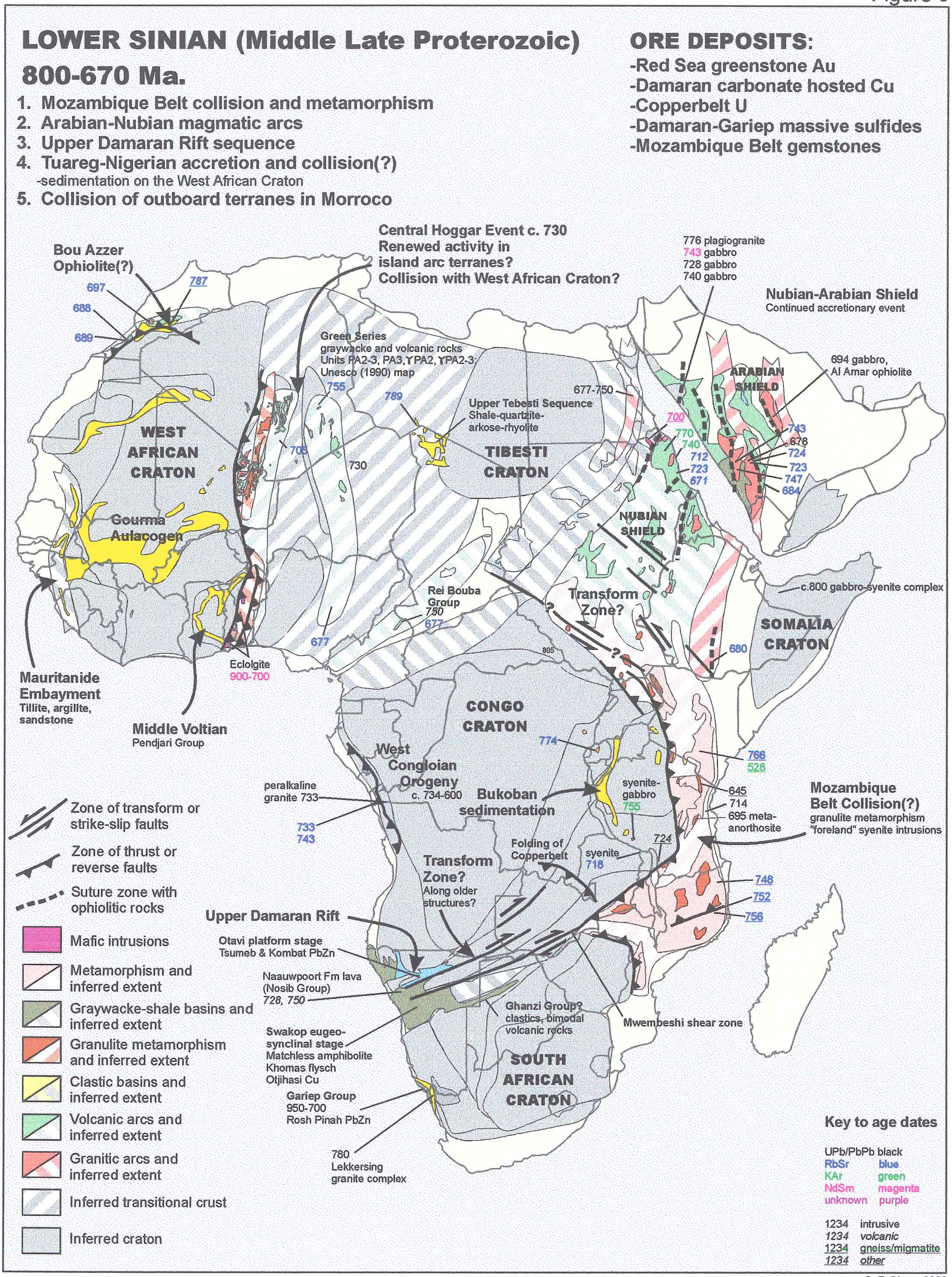
Ages on granulite indicate that peak metamorphism in the Mozambique Belt took place c. 650 - 750 Ma. Windows of granulite-grade rocks stretch from southern Sudan and southern Ethiopia to northern Mozambique (Vail, 1978; Davidson, 1983; Muhongo and Lenior, 1994; Mappa Geologica de Mozambique, 1987). The actual time of "collision" is poorly constrained. Syenite and syenite-gabbro complexes intruded into craton adjacent to the belt, suggesting that parts of the craton were under extension during the "collision". The upper parts of the Bukoban sedimentary sequence may have been deposited at this time in a foreland basin setting.

Table 9. Lower Sinian (Middle Late Proterozoic 800-670 Ma; see Figure 9)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Damaran Rift	Deposition of Matchless schist, Tsumeb carbonate platform, and extrusion of potassic lava
	Western margin	Deposition of Gariep Group
	Zambezi Belt	1. Continued deformation? 2. Movement on Mwenbeshi shear zone, central Zambia
CONGO CRATON	Western margin	West Congolian Orogeny c. 734-600 Ma
	Southern margin	Deformation of Lufillian arc
	Northern margin	Arc sequence in Cameroon: Rei Bouba Group
EAST AFRICAN CRATON	Eastern margin	Collision with Mozambique Belt
	Central and Western Margin	Deposition and deformation of Bukoban-Banguelu foreland basin
WEST AFRICAN	Northern margin	1. Magmatic arc, granite-granodiorite intrusion 2. Bou Azzer Ophiolite obduction
CRATON	Craton center	1. Toun Koutiale Group (Bertrand-Sarfati, 1977)* 2. Middle Voltian Pendjari Group (Affaton et al., 1980)*
	Eastern margin	Ophiolite obduction?
TUAREG-NIGERIA PLATFORM	Tuareg Shield Togo-Benin	1. Green Series: greywacke-volcanic rocks (Caby, 1972)** 2. Collision with West African Craton
	Togo-Benin	1. Ophiolite obduction in Benin-Togo? 2. Collision with West African Craton
	Cameroon	Rei Bouba Group arc magmatism
NORTHEAST AFRICA	Tibesti Craton	Quartzite-arkose-rhyolite sequence c. 789 Ma
	Arabian-Nubian Shield	Continued accretion of granite-greenstone terrane
SOMALIA CRATON	Somalia Craton	No known activity

*cited in Goodwin (1991); ** cited in Cahen et al. (1984)

Figure 9



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Arabian-Nubian Accretion

Accretionary events continued in the Arabian-Nubian Shield, with the loci of magmatism and ophiolitic complexes broadening eastward to include Saudi Arabia and possibly central Ethiopia.

By Lower Sinian time, the Mozambique Belt and the Arabian-Nubian Shield had attained vastly different characteristics, even thought they appear to have started as part of the same convergent margin. Plate reconstructions (De Wit et al., 1988) suggested that the Mozambique Belt was squeezed between the East African Craton and the Madagascar-Indian Cratons, whereas the volcanic belts in the Arabian-Nubian Shield remained in an oceanic environment. A zone of transform faults probably continued to accommodate the different rates of convergence and structural styles between the Mozambique Belt and the Arabian-Nubian Shield. Another transform zone, the Mwenbeshi Shear Zone, may have passed utilized old plate boundaries from central Zambia to the Damaran Rift; several workers have postulated right-lateral transform movement along this structure. The resulting pattern of faults in East Africa is remarkably similar to that in the Indian-Tibet collisional zone (Tapponnier et al., 1982).

West Congolian Orogeny

The first compressive phase of the West Congolian Orogeny took place between 700 and 600 Ma ago (Alvarez and Maurin, 1991), suggesting that the Congo Craton was interacting with other continents on both its east and west margins.

Upper Damaran Rift

The upper part of the Damaran Rift sequences include the rocks of the Swakop "eugeosynclinal" stage and the Otavi carbonate platform (Miller, 1983). Rocks of these sequences host several sulphide deposits, including the Tsumeb and Kombat Pb-Cu-Zn-carbonate-hosted deposits and the Otjihasi massive sulphide Cu deposit.

Collision of the West African Craton and the Tuareg-Nigeria Platform

Nd-Sm ages of c. 900-700 Ma on eclogite in Togo and Benin may indicate the approximate age of obduction of oceanic crust. The granulite facies metamorphism and mylonite zones in Togo-Benin (Sylvain et al., 1986) and in the Eastern Hoggar area (with relic Archean ages?) probably mark the collisional zone between the West African Craton and the Tuareg-Nigeria Platform. This collisional event provided the detritus for the epicontinental sequences on the West African Craton, as summarized in Table 9.

Convergence in Northern Africa

Convergence on the western margin of the West African Craton (in Morocco) was marked by arc magmatism and the obduction of the Bou Azzer ophiolite (Leblanc, 1981; cited in Goodwin, 1991). In the Tuareg Shield, deposition of greywacke and volcanic rocks of the Green Series (Caby, 1972; cited in Cahen et al., 1984) also indicates renewed convergence. In the southeastern-most Tuareg-Nigeria Platform, convergence is marked by the appearance of the volcanic and intrusive rocks of the Rei Bouba Group (Pinna et al., 1993). Deposition of the Upper Tibesti Sequence on the western margin of the Tibesti

Craton at c. 790 Ma also indicates renewed activity of the Tuareg-Nigeria Platform in this area. It is envisaged that the Tuareg-Nigeria Platform was a group of mature island arcs by the end of Lower Sinian time.

UPPER SINIAN (Late Late Proterozoic) 670-590 Ma (Table 10, Figure 10)

Upper Sinian time recorded the final amalgamation of Africa with at least one collision between Cameroon and the Congo. Other collisions may have occurred between Somalia and the Arabian-Nubian Shield and in north central Africa. Additional deformational zones occurred along the western margin of western and southern Africa, and along old craton boundaries within southern Africa. Major magmatism took place in the Arabian and Tuareg Shields.

Final Stages of Arabian-Nubian Accretion

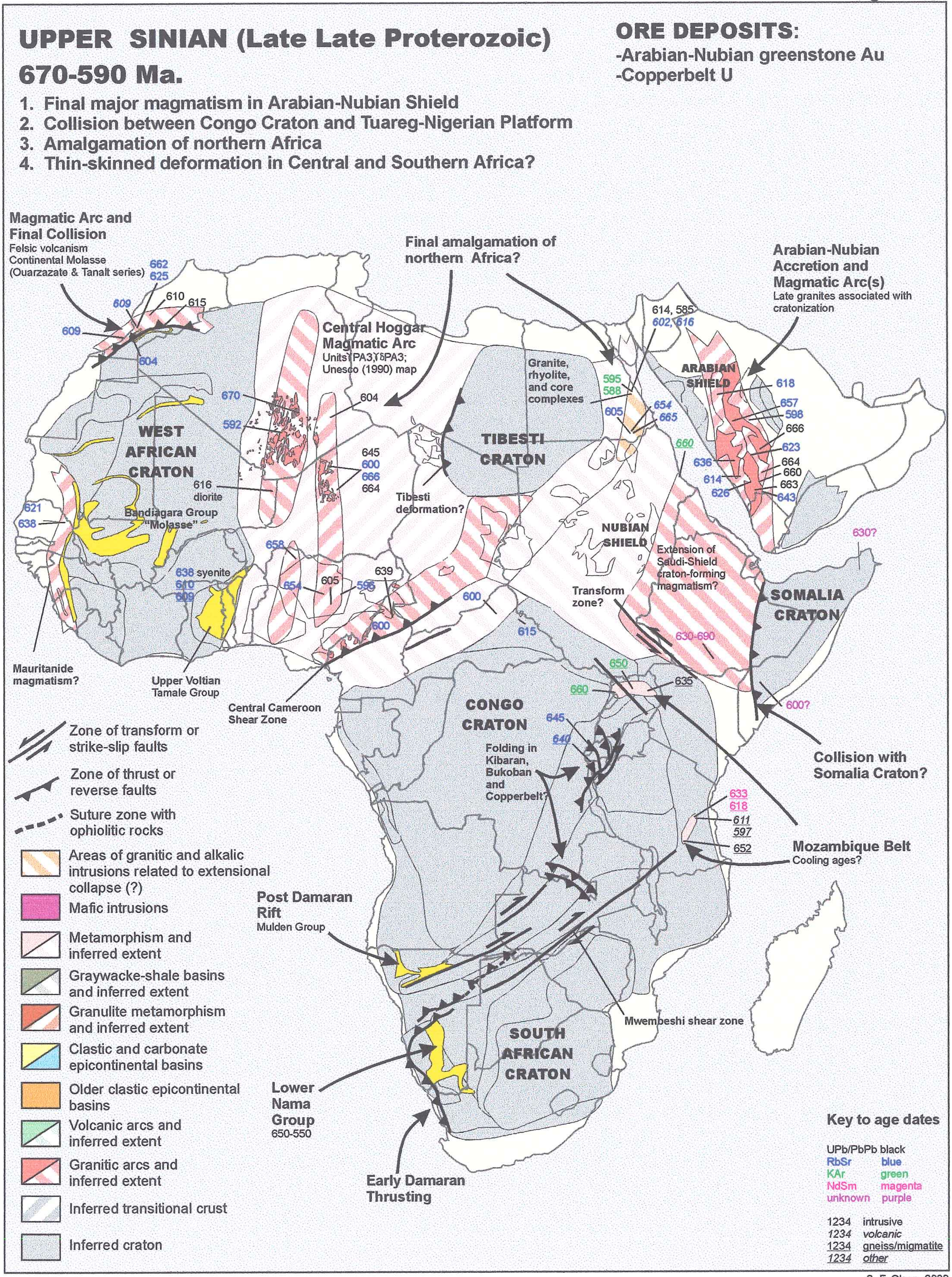
Upper Sinian time marks the final stage of major magmatism and accretion in the Arabian-Nubian Shield with a major zone of granitoid intrusions in Saudi Arabia. The lack of dates on mafic and ophiolitic rocks permits the interpretation that collisional events involving oceanic crust had ceased. It is not clear if this magmatism extended southward into Ethiopia. This zone of magmatism may also mark the final amalgamation with the Somalia Craton and the older basement rocks of the Arabian Peninsula.

In Egypt, Fritz et al. (1996) reported several Ar-Ar dates on shear zones associated with a "core complex". Associated clastic basins and other dates c. 600 Ma on granite and rhyolite suggest these rocks and structures may be related to post-accretion extension. Similar intrusions and associated sedimentary rocks suggest a similar tectonic regime may have spread across most of northern Africa by the end of Ordovician time.

Table 10. Upper Sinian (Late Late Proterozoic 670-590 Ma; see Figure 10)

Area/Craton	Sub-area	Event
SOUTH AFRICAN CRATON	Damaran Rift	1. Post-Darmaran Rift sedimentation: Mulden Group and Lower Nama Group 2. Early thrusting along southern margin of rift
CONGO CRATON	Northern margin	Collision with Tuareg-Nigeria Platform along the Central Cameroon Shear Zone
	Central area	Thin-skinned deformation of Lufillian, Kibaran, and Bukoban rocks close to older craton boundaries
EAST AFRICAN CRATON	Northern and central	Cooling of Mozambique Belt
WEST AFRICAN CRATON	Northern margin	1. Magmatic arc with acid volcanism 2. Continental "molasse" sedimentation
	Craton center	1. Bandiagara Group "molasse" sedimentation 2. Upper Voltian sedimentation
	Western margin	Mauritanide magmatism?
TUAREG-NIGERIA PLATFORM	Tuareg Shield, Niger	1. Arc magmatism 2. Amalgamtion of mature island arc terranes
	Cameroon	1. Magmatism 2. Collision with Congo Craton?
ARABIAN-NUBIAN SHIELD	Saudi Shield, central Ethiopia	Continued arc magmatism in Saudi Shield
	Egypt	Restricted zone of granite-rhyolite magmatism, core complexes and extensional clastic basins
SOMALIA CRATON	Somalia Craton	Collision with Arabian-Nubian shield?

Figure 10



UPPER SINIAN (Late Late Proterozoic)
670-590 Ma.
1. Final major magmatism in Arabian-Nubian Shield
2. Collision between Congo Craton and Tuareg-Nigerian Platform
3. Amalgamation of northern Africa
4. Thin-skinned deformation in Central and Southern Africa?
ORE DEPOSITS:
-Arabian-Nubian greenstone Au
-Copperbelt U
Magmatic Arc and Final Collision
Felsic volcanism
Continental Molasse
(Ouarzazate & Tanalt series)
Final amalgamation of northern Africa?
Arabian-Nubian Accretion and Magmatic Arc(s)
Late granites associated with cratonization
Central Hoggar Magmatic Arc
Unesco (1990) map
Granite, rhyolite, and core complexes
ARABIAN SHIELD
WEST AFRICAN CRATON
TIBESTI CRATON
616 diorite
Bandiagara Group "Molasse"
Tibesti deformation?
NUBIAN SHIELD
Extension of Saudi-Shield craton-forming magmatism?
SOMALIA CRATON
638 syenite
Transform zone?
Mauritanide magmatism?
Upper Voltian Tamale Group
Central Cameroon Shear Zone
CONGO CRATON
Collision with Somalia Craton?
Folding in Kibaran, Bukoban and Copperbelt?
Mozambique Belt
Cooling ages?
Zone of transform or strike-slip faults
Zone of thrust or reverse faults
Suture zone with ophiolitic rocks
Areas of granitic and alkalic intrusions related to extensional collapse (?)
Mafic intrusions
Metamorphism and inferred extent
Graywacke-shale basins and inferred extent
Granulite metamorphism and inferred extent
Clastic and carbonate epicontinental basins
Older clastic epicontinental basins
Volcanic arcs and inferred extent
Granitic arcs and inferred extent
Inferred transitional crust
Inferred craton
Post Damaran Rift
Mulden Group
Mwembeshi shear zone
SOUTH AFRICAN CRATON
Lower Nama Group
650-550
Early Damaran Thrusting
Key to age dates
UPb/PbPb black
RbSr blue
KAr green
NdSm magenta
unknown purple
1234 intrusive
1234 volcanic
1234 gneiss/migmatite
1234 other
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Tuareg-Nigerian Platform Magmatism and Amalgamation

Upper Sinian granitioid intrusions in the Tuareg Shield, the Air Massif in Niger, and in central Nigeria probably represent the continuation of arc volcanism in the Tuareg-Nigeria Platform. This magmatism may represent the final collision and amalgamation of the mature island arcs and final cratonization of the Tuareg-Nigeria Platform.

Cameroon Magmatism and Nigeria-Congo Collision

Upper Sinian granite and gneiss in Cameroon probably represent the continuation of magmatism associated with the Lower Sinian Rei Bouba Goup. The Central Cameroon Shear Zone (Ngako et al., 1991) lies to the south of these arc-related rocks, separates N-S trending foliations in the north from ENE-WSW trending foliations in the south (Ngako et al., 1991), and probably represents the collisional zone with the Congo Craton. The timing of the collision, however, remains poorly constrained.

Damaran Thrusting

Closure of the Damaran Rift and early thrusting along its southern margin (Miller, 1983) was probably the source environment of the sedimentary rocks in the latest Proterozoic Nama and Mulden Groups. Strike-slip movement on this deformation zone may have extended into central Africa along old craton boundaries provoking thin-skinned deformation in the Copperbelt, Kibaran rocks, and the Bukoban sequence.

Moroccan Magmatism and Sedimentation

Granitic intrusion, accompanied by voluminous rhyolitic volcanism, continued along the northern margin of the West African Craton with the Ouarzazate and Tanalt Series (Charlot, 1978; Juery et al., 1975; Benziane, 1974; all cited in Cahen et al., 1984).

CAMBRIAN-ORDOVICIAN (590-438 Ma)
(Table 11, Figure 11)

By the end of Ordovician time, most of the African continent appears to have been amalgamated. Magmatism, however, continued with one of the broadest and most intense zones of granitic-alkalic magmatism in geologic history, viz. the "Pan-African" event.

"Pan-African" Magmatism and Extension

In this paper, the term "Pan-African" is restricted to a broad zone of granitic to alkalic magmatism that stretches from the Birimian Shield to the Red Sea. This area coincides with areas that underwent amalgamation/collision in Upper Sinian time (Figure 10). In Algeria, Chad, Libya, and Benin, the basal Cambrian sandstones were deposited penecontemporaneously and proximally to the intrusions. In Morocco, syenite intrusions were coeval with the basal Cambrian rhyolite and sandstone (Ducrot et al., 1976; Charlot, 1978; cited in Cahen et al., 1984). Tungsten and tin pegmatites in eastern Chad (map of Vail , 1978) may also be associated with this event.

The composition of the magmatism and the proximal, but widespread location of the basal Cambrian clastic rocks permits the interpretation that most of northern Africa was under an extensional tectonic regime in earliest Paleozoic time. The coincidence of this zone of extension with the inferred collisional zones in Late Sinian time suggest these areas retained a higher geothermal gradient after collision, which led to the formation of the granitic magmas at relatively shallow depths.

Table 11. Cambrian (590-505 Ma; see Figure 11)

Area/Craton	Sub-area	Event
CENTRAL AND SOUTHERN AFRICA	Damaran Rift	1. Thrusting along southern margin 2. Granitic and alkaline magmatism 3. Upper Nama Group sedimentation
	Western margin	1. Cape Granite intrusion 2. Alkaline magmatism along transverse structures
	Central area	1. Latest metamorphism in the Lufillian arc 2. Intrusion of Hook Granite 3. Lusaka Granite 4. Late metamorphism in the Zambezi Belt
NORTHERN AFRICA	Northwest margin	Alkalic intrusions into basal Cambrian strata
	Central Sahara and Nubian Shield	"Pan-African" magmatism and sedimentation: Granitic-alkalic magmatism and basal Cambrian sedimentation
	West African Craton	1. Bandiagara Group "Molasse" 2. Mauritanide metamorphism?
	Arabian Shield	1. Waning Arabian-Nubian magmatism and/or extension-related granitic magmatism 2. Basal Cambrian sedimentation

Damaran Deformation and Magmatism

Thrusting continued around the edges of the Damaran Rift until c. 542 Ma (Miller, 1983). Granitic and alkalic magmatism continued along ENE-WSW trending structures into Ordovician time.

CONCLUSIONS

The Proterozoic History of Africa can be Interpreted in Terms of Modern Processes

This study endeavoured to interpret the Proterozoic evolution of African in terms of modern processes such as compressional and extensional arc magmatism. Although some processes, like accretionary events and the development of high-grade metamorphic belts, are still the subject of debate, similar Phanerozoic terranes indicate that these processes have operated throughout geologic time, and are probably happening today.

Critical to this interpretation was the subdivision of the Proterozoic into time periods that could "capture" individual magmatic and tectonic events. Nearly all of the events outlined could be represented in a single time period. Notable exceptions were the accretion of the Arabian-Nubian Shield and the development of parts of the central Sahara, where data is particularly sparse. Only additional mapping and radiometric age dating will refine events in these areas.

Inappropriate Application of Local Names to Continent-wide Events

The application of the names of local events to unrelated events in different parts of the African continent has only served to hamper the understanding of African geology. For example, the Kibaran Rift developed between 1400 and 1200 Ma between the Congo and

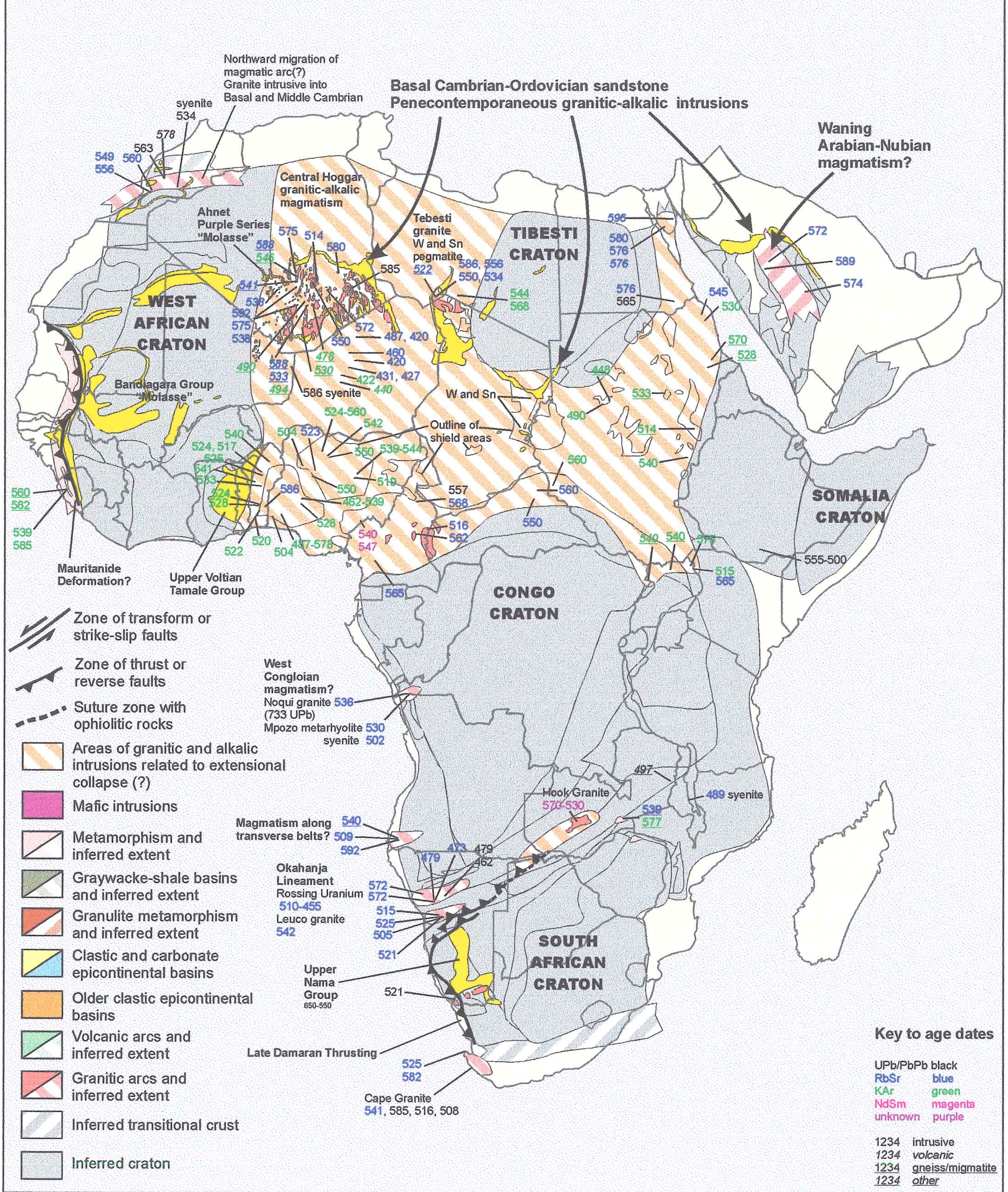
Figure 11

CAMBRIAN-ORDOVICIAN 590-438 Ma.

1. Extensional magmatism: "Pan-African" Event
2. Basal Cambrian sandstones across North Africa
3. Continued Damaran-Zambian magmatism, deformation and metamorphism

ORE DEPOSITS:

-Uranium, Namibia
-W & Sn pegmatite, Tebesti and Chad?



S. F. Olson, 2000

the East African cratons. Using "Kibaran" to label different events (e.g. convergence related magmatism) in other parts of the continent will only lead to confusion. Even labeling the Kibaran "Tin Granites" as "Kibaran" obscures the fact that the tin-bearing granites are almost 300 million years younger that the Kibaran Rift!

The "Pan-African" Event

Probably the most misused term in African geology is "Pan-African". It has been applied to nearly every event from 1000 Ma to Silurian times. The writer proposes that its use be restricted to: ***Upper Sinian to Cambrian granitic to alkalic magmatism related to post-collisional extension in the area between the Birimian Shield and the Red Sea.*** Although this definition is still broad, it would exclude events that are clearly convergence related, such as the Arabian-Nubian accretion, the arc-related magmatism in Cameroon, and most other events south of the equator.

Contrasting Styles in the Mozambique Belt and the Arabian-Nubian Shield

Many papers have tried to show the relation between the Mozambique Belt and the Arabian-Nubian Shield, and the writer admits that he set out to do the same. However, this study suggests that magmatism and accretion in the Arabian-Nubian Shield continued during and after the granulite metamorphism and "collision" in the Mozambique Belt. Although they were probably part of the same convergent margin, and certain structures can even be traced from one province to the other, their final evolution was significantly different in space and time.

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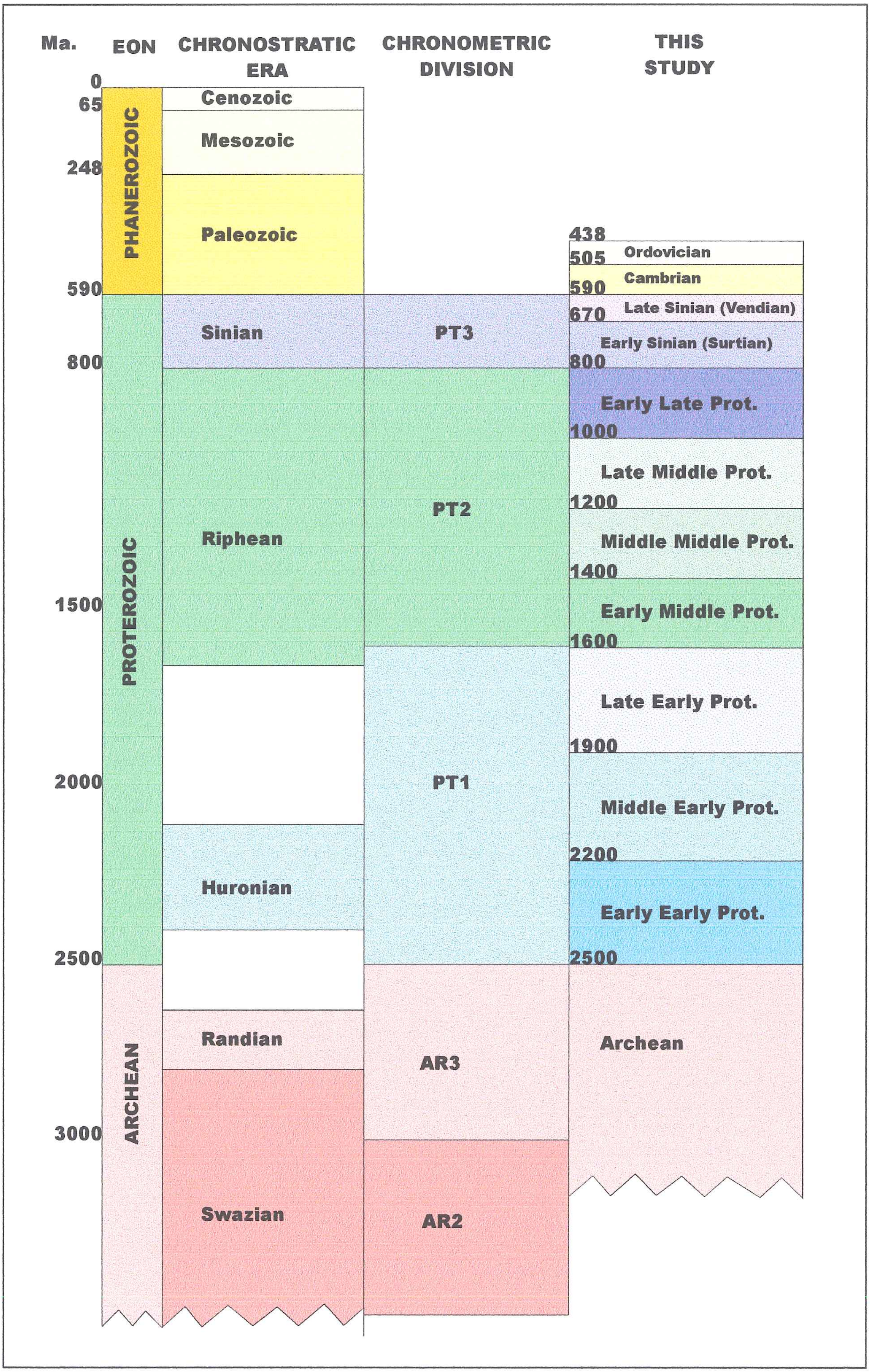
Appendix 1. Time scales used in this study.



APPENDIX 2

REFERENCES TO DATES IN FIGURES

This appendix gives the country, age and error limits, the type of age date, the coordinates, and the reference for each of the ages shown on Figures 1 through 11. This appendix consists of 11 tables corresponding to age ranges of each of the figures. In each table, the ages are listed aphabetically by country. Error limits of the age dates are not shown on the figures, but are included in the table below. A brief description of the material analysed, and the rock type and place name are given if available in the Rock Type column. Latitudes and longitudes, where available, are given in dd.mmss format (degree degree. minute minute second second). The mathematical "approximate" sign (~) is shown where the sample site coordinates are approximate or estimated from maps. The presence or absence of significant figures in the coordinates indicates the approximate accuracy of estimated coordinates. The complete reference for each age date is given in the References section of the main body of this paper.

Archean >2500 Ma (Figure 1)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	2995 ±55	Rb-Sr	Granulite	22.50N	2.40E	Ferrara and Gavelle (1966), cited in Cahen et al. (1984)
Algeria	3480 ±90	Pb-Pb	Gneiss	~22.00N	~7.00E	Latouche and Vidal in written communication with Cahen et al., (1978), cited in Cahen et al. (1984); Latouche (1978), cited in Cahen et al. (1984)
Burkina Faso	2645 ±135	Rb-Sr	Amphibolite	9.29N	2.48E	Bessoles (1977), cited in Cahen et al. (1984)
Burundi	2504	U-Pb	Zircon from cataclastized granite gneiss of Nyanza Lac	4.20S	29.35E	Demaiffe and Theunissen (1979), cited in Cahen et al. (1984)
Cameroon	2830 ±135	Rb-Sr	Charnokite	2.55N	11.08E	Delhal and Ledent,(1975), cited in Cahen et al. (1984)
Cameroon	2802 ±93	Rb-Sr	Charnokite	2.55N	11.08E	Lasserre and Soba (1976), cited in Cahen et al. (1984)
Cameroon	2960 ±70	Rb-Sr	Gneiss	2.55N	11.08E	Lasserre and Soba (1976), cited in Cahen et al. (1984)
Central African Republic	2828 ±70	Rb-Sr	Grelindji granodiorite in the Bandas belt north of Bambari	5.40N	20.36E	Laverau, Ledent, and Poidevin, (1980), cited in Cahen et al. (1984)
Congo	2637 ±87	Rb-Sr	Monzonite	3.50N	30.12E	Lavreau (1980), in Cahen et. al. (1984)
Congo	2725 ±77	Rb-Sr	Tonalite	1.43N	30.15E	Lavreau (1980), in Cahen et. al. (1984)
Congo	2510 ±64	Rb-Sr	Granitoid intrusives at Moto	~2.50N	~29.20E	Lavreau (1980), in Cahen et. al. (1984)
Congo	2459 ±26	Rb-Sr	Granite & orthogneiss	~1.24N	~29.02E	Lavreau (1980), in Cahen et. al. (1984)
Congo	2448 ±28	Rb-Sr	Granite & granite gneiss	~3.48N	~23.41E	Lavreau (1980), in Cahen et. al. (1984)
Congo	2960 ±68	Rb-Sr	Bomu mafic gneiss	~4.45N	~23.00E	Laverau and Ledent (1976) and Laverau (1980), in Cahen et al. (1984)
Congo, Kasai Craton	2820	U-Pb	Granulite	~7.50S	~22.40E	Cahen et.al. (1984), interpreted from data of Delhal et al. (1976)
Congo, Kasai Craton	2680 ±5	U-Pb	Migmatite and granite	~6.30S	~23.20E	Delhal et.al. (1975), cited in Cahen et al. (1984)
Cote d'Ivoire	2850 ±70	Rb-Sr	Migmatite	~6.30N	~8.00W	Papon et al. (1968), cited in Cahen et al. (1984)
Cote d'Ivoire	2600	Rb-Sr	Migmatite and gneiss	5.47N	6.37E	Papon (1973), cited in Cahen et al. (1984)
Cote d'Ivoire	2600	Rb-Sr	Gneiss	4.5240N	6.1320E	Papon (1973), cited in Cahen et al. (1984)
Cote d'Ivoire	3135 ±152	Rb-Sr	Migmatite and gneiss, western Cote d'Ivoire	~7.20N	~7.30W	Data from Papon et al. (1968), reinterpreted by Cahen et al. (1984)
Gabon	2659 ±30	Rb-Sr	Granite and gneiss	1.23S	13.10E	Bonhomme and Weber (1969), cited in Cahen et al. (1984)
Gabon	2696 ±62	K-Ar	Biotite from granite and gneiss	~1.23S	~13.10E	Bonhomme et al. (1978), cited in Cahen et al. (1984)
Gabon	2659	Rb-Sr	Gneiss, pegmatite	1.23S	13.10E	Bonhomme and Webber (1969),

	±30	7 pt	granite	and 1.37S	13.36E	cited in Cahen et al. (1884)
Gabon	2696 ±62	K-Ar	Gneiss			Bonhomme, Leclerc, and Weber (1978), cited in Cahen et al. (1884)
Liberia	2617 ±70	Rb-Sr	Granitoids and granitic metamorphites around Kalahun	8.20N	10W	Hurley et al. (1971); Hedge et al. (1975), cited in Cahen et al. (1884)
Libya	2656 ±71	Rb-Sr	granulite	~22.00N	25.00E	Klerkx and Deutsch (1977), cited in Cahen et al. (1984)
Libya	2919	Rb-Sr	Charnokite	~22.00N	25.00E	Cahen et al. (1984)
Mauritania	3016 ±133	Rb-Sr	Granulite	21.08N	13.10W	Vachette and Bronner (1973), cited in Cahen et al. (1984)
Mauritania	2779 ±83	Rb-Sr	Granulite	22.52N	12.19W	Vachette and Bronner (1973), cited in Cahen et al. (1984)
Mauritania	3270 ±347	Rb-Sr	Gneiss	23.27N-23.29N	8.33W-8.35W	Vachette, quoted by Bessoles (1977) , cited in Cahen et al. (1984)
Mauritania	2539 ±54	Rb-Sr	Granite	23.27N-23.29N	8.33W-8.35W	Vachette, unpublished, cited in Cahen et al. (1984)
Mauritania	2708	Rb-Sr	Granulite gneiss	~22N	~14W	
Nigeria	3000	U-Pb	Gneiss, Kaduna area	~10.30N	~7.30E	Dada (1989) and Bruguier et al. (1991), cited in Dada et al. 1993.
Nigeria	3127 ±20	Rb-Sr	Gneiss, Kaduna area	~10.30N	~7.30E	Dada (1989) and Bruguier et al. (1991), cited in Dada et al. 1993.
Nigeria	2758 ±163	Rb-Sr	Gneiss, Kaduna area	~10.30N	~7.30E	Dada (1989) and Bruguier et al. (1991), cited in Dada et al. 1993.
Nigeria	>275 0	U-Pb	Lead from aplite intruding banded gneiss-quartzite complex	~7.30N	~4.00E	Oversby (1975)
Nigeria	c. 2600		Migmatite and gneiss	~10.30N	~7.00E	Ogezi (1977)
Tanzania	2721 +198 -230	Pb-Pb	BIF, Geita Mine			Walraven, F., Pape, J., and Borg, G., (1994)
Tanzania	2578 ±72	Rb-Sr	Dodoma gneiss			Wendt et al. (1972), cited in Walraven et al. (1984)
Sierra Leone	2960 ±30	Pb-Pb	Granitoid from Fadugu	9.07N	11.55W	Beckinsale et al. (1980), cited in Cahen et al. (1984)
Sierra Leone	2753 ±30	Rb-Sr	Granitoid from Fadugu	9.07N	11.55W	Beckinsale et al. (1980), cited in Cahen et al. (1984)
South Africa	3115 ±50 to 3200 ±40	U-Pb	various	~26S	~31E	Oosthyuyzen and Burger (1973), cited in Cahen et. al. (1984)
South Africa	2643 ±80	U-Pb	Ventersdorp acid lava			Van Niekerk and Burger (1978) , cited in Cahen et al. (1984)
South Africa	3000	Pb-Pb	Banded iron formation from Marydale Group	~29.25S	~22.00E	Cornell and Barton (1979), cited in Joubert (1986)
South Africa	2960	?	Draghoender Granite	~29.25S	~22.00E	Burger and Coertze (1973), cited in Joubert (1986)
South Africa	2640		Skalkseput Granite	~29.25S	~22.00E	Nicolaysen and Burger (1965), cited in Joubert (1986)
Uganda	2675 ± 60	Rb-Sr	Gneiss, granite	~3.00N	~31.00E	Cahen et al, 1984; modified data of Leggo (1974)
Uganda	2550 ±10	U-Pb	Zircon from gneiss at Gulu	2.35N	32.20E	Leggo (1974), cited in Vail (1978)
Uganda	2750 ±75	Rb-Sr	Whole rock granulite at Okollo	2.40N	31.10E	Leggo (1974), cited in Vail (1978)
Uganda	2880	U-Pb	Zircon from granulite at Okollo	2.40N	31.10E	Leggo (1974), cited in Vail (1978)
Zimbabwe	2460 ±16	Rb-Sr	Great Dyke			Hamilton (1977), cited in Cahen et al. (1984)
Zimbabwe	2947 ±129	Rb-Sr	Granulite gneiss	16.35S	31.07E	Vail and Snelling (1971), cited in Cahen et al. (1984)
Zimbabwe	2671 ±50	K-Ar	Biotite in granulite at Waterfall	16.35S	31.07E	Vail and Snelling (1971), cited in Cahen et al. (1984)
Yemen	<300 0 (sic)	TDM Nd	Aden group in Yemen	~24N	~44E	Stoeser et al. (1991), cited in Abdelsalam and Stern (1996)

Early Early Proterozoic 2500-2200 Ma (Figure 2)

Country	Age	Type	Rock Type	Lat	Long	Reference
Angola	2293 ±43	Rb-Sr	Granite	10.37S	15.20E	Cahen et. al. (1984)
Angola	2236 ±48	Rb-Sr	Granite	11.25S	15.07E	Silva and Kawashita (1978) cited in Cahen et al. (1984)
Angola	2243 ±94	Rb-Sr	Granite from Sera de Ganda	13.08S	14.50E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et. al. (1984)
Angola	2206 ±197	Rb-Sr	Migmatite	14.51S	14.30E	Torquato et al., 1979, cited in Cahen et. al. (1984)
Angola	2219 ±90	Rb-Sr	Spilite and Keratophyre	15.10S	13.42E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Mauritania	2325 ±80		Migmatite granite	26.0920 N	8.2515W	Lasserre et.al. (1970), cited in Cahen et. al. (1984)
Mauritania	2363 ±101	Rb-Sr	migmatite	23.30N	11.20W	Vachette, quoted by Bessoles (1977) , cited in Cahen et al. (1984)
Morocco	2295 ±46	Rb-Sr	Aiouzad granite, Ifni Inlier	~29.30N	~10E	Benziane (1974), Yazidi (1976), and Charlot (1978), cited in Cahen et al. (1984)
Nigeria	2245 ±35	Rb-Sr	Migmatite from Kaduna	~10.20N	~7.15E	Hurley et al. (1966), cited in Cahen et al. (1984)

Middle Early Proterozoic 2200-1900 Ma (Figure 3)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	2019 ±36	Rb-Sr	Leptynites	25.44N	3.25W	Sabate et al. (1977), cited in Cahen et al. (1984)
Algeria	2006 ±82	Rb-Sr	Granite	25.52N	4.17W	Lasserre et al. (1970) recalculated by Cahen et.al. (1984)
Algeria	2050 ±25	Rb-Sr	Talat Mellet granitic augen gneiss of the Arechchoum series	~23.45N	~6.20E	Bertrand and Lasserre (1976), cited in Cahen et al. (1984)
Algeria	2205 ±92	Rb-Sr	Banded tonalitic gneiss of Oued Ouadenki	~23.47N	~6.30E	Bertrand and Lasserre (1976), cited in Cahen et al. (1984)
Algeria	1975 ±20	Rb-Sr	Leptynitic gneiss	~25.00N	~7.10E	Bertrand and Lasserre (1976), cited in Cahen et al. (1984)
Algeria	2025 ±57	Rb-Sr	Hypersthene pegmatite	~25.00N	~7.10E	Latouche and Vidal (1974), cited in Cahen et al. (1984)
Algeria	2195 ±150	Rb-Sr	Leptynite	~23.40N	~6.35E	Latouche and Vidal (1974), cited in Cahen et al. (1984)
Angola	2098 ±51	K-Ar	Kunene Anorthosite Complex			Silva, Torquato, and Kawashita (1973), cited in Cahen et al. (1984)
Angola	2151 ±43	K-Ar	Anorthosite			Silva, Torquato, and Kawashita (1973), cited in Cahen et al. (1984)
Angola	2174	K-Ar	Granodiorite	11.03S	14.42E	Silva and Kawashita (1978) cited in Cahen et al. (1984)
Angola	2010 ±117	Rb-Sr	Granite	13.11S	15.08E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	2162 ±99	Rb-Sr	Tuffaceous schist, Chipindo Group	13.51S	15.47E	Torquato and Tomas Oliveira (1977), cited in Cahen et al. (1984)
Angola	2191 ±60	Rb-Sr	Granite	14.51S	14.30E	Torquato et al., 1979, cited in Cahen et al. (1984)
Angola	1915 ±58	Rb-Sr	Black schist, Chipindo Group	13.51S	15.47E	Torquato and Tomas Oliveira (1977), cited in Cahen et al. (1984)
Angola	1949 ±30	Rb-Sr	Govi granite	13.24S	15.55E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et. al. (1984)
Angola	1914 ±28	Rb-Sr	Migmatite from Eleva-Cumaa	12.55S	15.06E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	2088	U-Pb	Zircon from migmatite(?)	~6.00S	~13.45E	Delhal and Ledent (1976), cited in Cahen et al. (1984)
Benin	2064 ±90	Rb-Sr	Orthogneiss from the Lamat-Karra and Natitingou regions, Togo-Benin			Vachette (1979), cited in Cahen et al. (1984)
Botswana	2055	U-Pb	Ultramafic Molopo Farms Complex	~24S	~23E	Kampunzo, pers. comm. (1999)
Burkana Faso	2076 ±40	Rb-Sr	Metapelite	~13.30N	~2.30W	Vachette et al. (1975), cited in Cahen et al. (1984)
Burkana Faso	2088 ±70	RbSr	Migmatite	~13.30N	~2.30W	Vachette et al. (1975), cited in Cahen et al. (1984)

Burkina Faso	2125 ±40	U-Pb	Granite from Diakore, Kotedougou, and Koumbia	10.1824 N 11.1215 N 11.1224 N	4.5236W 4.0806W 3.3912W	Derived from Ledent et al. (1969) by Cahen et al. (1984)
Burkina Faso	2015 ±73	Rb-Sr	Granitic Zogore massif	~13.30N	~2.30W	Vachette et al. (1975), cited in Cahen et al. (1984)
Burkina Faso	2050 ±56	Rb-Sr	Granitic Bedi massif	~13.30N	~2.30W	Vachette et al. (1975), cited in Cahen et al. (1984)
Cameroon	c. 2000		Orthogneiss, Faro-Jibaz Group	~8N	~14E	Lasserre (1966), Toteu (1987), Toteu et al. (1986), and Panaye et al. (1989) cited in Pinna et al. (1993)
Central African Republic	2029 ±70	Rb-Sr	Microcline from amphibole gneiss, Quijoux massif	8.40N	22.14E	Cahen and Snelling (1966), after Roubalt et al. (1965), cited in Cahen et al. (1984)
Central African Republic	1960 ±70	Rb-Sr	Microcline from gneiss at Quijoux Massif	8.50N	22.20E	Cahen and Snelling (1966), cited in Vail (1978)
Congo	2087	U-Pb	Zircon from migmatite	5.05S	13.04E	Delhal and Ledent (1976), cited in Cahen et al. (1984)
Congo	2039 ±180	Rb-Sr	Microcline from pegmatite	3.21S	29.11E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Cote d'Ivoire	2020 ±60	Rb-Sr	Metamorphosed acid lavas from the Tounodi Unit	~1.30N	~5.00W	Vachette and Yace (1969), cited in Cahen et al. (1984)
Cote d'Ivoire	2185 ±125	Rb-Sr	Mica schist from the Kounoukou Unit	~1.30N	~5.00W	Vachette and Papon (1973) cited in Cahen et al. (1984)
Cote d'Ivoire	2175	Rb-Sr	Ortholeptonite from the Toulepleu-Ity Unit	~1.30N	~8.30W	Vachette and Papon (1973) cited in Cahen et al. (1984)
Gabon	2095	Sm-Nd?	Moanda Mn deposit			Bonhomme et al. (1982) and Bros et al. (1992), cited in Hein and Bolton (1993)
Gabon	2050 ±30	U-Pb	Uranium mineralization			Gancarz (1978), cited in Cahen et al. (1984)
Ghana	2098 ±85	Rb-Sr	Gneiss(?) around Bosumtwri Crater	~7.30N	~1.30W	Kolbe et al. (1967), cited in Cahen et al. (1984)
Libya	2060	?	gneiss	~22N	~24.30E	Klerkxz (1971), cited in Vail (1978)
Malawi	2055 ±83	Rb-Sr	Nyika gneiss	~10.20S	~33.35E	Dodson et al. (1975), cited in Cahen et al. (1984)
Malawi	1970 ±30	U-Pb	Nyika granite	~10.20S	~33.35E	Dodson et al. (1975a), cited in Lenoir (1993c)
Mauritania	2057 ±65	Rb-Sr	Yetti granite	25.37N	6.20W	Lasserre et al. (1970), cited in Cahen et. al. (1984)
Mauritania	2039 ±49	Rb-Sr	Granite	25.37N	6.20W	Vachette et al. (1973) cited in Cahen et. al. (1984)
Mauritania	2013 ±75	Rb-Sr	Metamorphites	24.25-24.26N	7.29-7.32W	Vachette et al. (1973) cited in Cahen et al. (1984)
Mauritania	2030 ±49	Rb-Sr	Clasts in arkose	24.48N	7.37W	Vachette et al. (1973) cited in Cahen et al. (1984)
Mauritania	2057 ±66	Rb-Sr	Silt & sills	24.41-24.45N	8.34-8.35W	Vachette et al. (1973) cited in Cahen et al. (1984)
Mauritania	1970	Rb-Sr	Granite	24.38-25.32N	8.13-10.12W	Vachette et al. (1973) cited in Cahen et al. (1984)
Mauritania	1912 ±47	Rb-Sr	Alkaline granite	25N	8.12W	Vachette et al. (1973) cited in Cahen et al. (1984)
Mauritania	1877 ±35	Rb-Sr	Rapakivi granite	24.08-24.31N	7.17-7.59W	Vachette et al. (1973) cited in Cahen et al. (1984)
Morocco	1976 ±14	Rb-Sr	Ain Tamousift and Oussa granite	~28.30N	~10.30W	Charlot (1976, 1978), cited in Cahen et al. (1984)
Morocco	1973 ±24	Rb-Sr	Tazerouait granite	~29.40N	~9.20W	Hassenforder (1978), cited in Cahen et al. (1984)
Morocco	1989 ±28	Rb-Sr	Tahala granite	~29.40N	~9.20W	Charlot (1976, 1978), cited in Cahen et al. (1984)
Morocco	1931 ±48	Rb-Sr	Azuermerzi granite	~30.30N	~7.30W	Charlot (1976, 1978), cited in Cahen et al. (1984)
Morocco	1797 ±18	Rb-Sr	Azuermerzi granite	~30.30N	~7.30W	Charlot (1976, 1978), cited in Cahen et al. (1984)
Namibia	1952 to 1978	U-Pb	Kunguib granite	26.23S	15.27E	Berger (1978), cited in Cahen et al. (1984)
Nigeria	2168 ±125	Rb-Sr	Ibadan granite gneiss	~7.30N	~3.58E	Grant (1970), cited in Cahen et al. (1984)

Rwanda	2063	U-Pb	Migmatite from Butare and Nyakizu	2.24S 2.49S	29.4730E 29.4330E	Gerards and Ledent (1976), cited in Cahen et al. (1984)
Rwanda	1920	U-Pb	Migmatite from Butare area	2.20S	29.4730E	Ledent (1979), cited in Cahen et al. (1984)
Rwanda	1984	U-Pb	Gneiss from Zaire-Nile watershed			Ledent (1979), cited in Cahen et al. (1984)
South Africa	1918 ±49	U-Pb	Haib volcanics	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1958 ±28	U-Pb	Haib volcanics	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1930 ±54	Rb-Sr	Nous Fm Haib volcanics	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1977 ±51	Rb-Sr	Tsams Fm lavas	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	2068 ±70	?	Hartley basalt, Kheiss belt			Barton and Burger (1983), cited in Goodwin (1991)
South Africa	2095 ±24	Rb-Sr	Bushveld upper ferrogabbro			Hamilton (1977), cited in Goodwin (1991)
South Africa	2050 ±30	Rb--Sr	Nebo (red) granite, Bushveld Complex			Coertze et al. (1978), cited in Goodwin (1991)
South Africa	2055	?	Molopo Farms Complex ultramafic			Kampunzo, pers. comm. (1999)
Tanzania	2026 ±8	U-Pb	Mbarali two mica granite, SE Tanzania	~9S	~34.25E	Lenoir et al. (1993)
Tanzania	2084 ±86 814-120	U-Pb	Zircon from Ukunju gneiss	10.10S	34.36E	Theunissen et al. (1992)
Tanzania	1920	?	"Usagaran" gneiss, Iringa area			Wendt et al. (1972) and Gabert and Wendt (1974) cited in Goodwin (1991)
Uganda	2070	Rb-Sr	Whole rock isochron on Mesaba granite			Old and Rex (1971) cited in Cahen et al. (1984)
Uganda	2174	Rb-Sr	Isochron on biotite from granite			Bell and Delong, in Old and Rex (1971), cited in Cahen et al. 1984)
Zambia	1945 to 2018	Pb-Pb	Mufulira granite	12.34S	28.19E	Cahen, Delhal, and Ledent (1970a)
Zambia	2049 ±103	Pb-Pb	Lufubu schist	13.08S	27.25E	Cahen, Delhal, and Ledent (1970a)
Zambia	2198 ±108	Pb-Pb	Pre-Katangan pegmatite	13.08S	27.25E	Cahen, Delhal, and Ledent (1970a)
Zimbabwe	2170	Rb-Sr	Deweras lavas, Magondi Belt			Horndorf, cited in Treloar (1988), cited in Goodwin (1991)
Zimbabwe	2100	Pb-Pb	Galena from Copper Queen Mine			Kramers, cited in Treloar (1988), cited in Goodwin (1991)

Late Early Proterozoic 1900-1600 Ma (Figure 4)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	1855 ±80	Pb-Pb on zircon	Ouallen granite, intrusive into Tassenjanet basement	~24.10N	~1.50E	Lay, Ledent, and Grogler (1965), cited in Cahen et al. (1984)
Algeria	1750	U-Pb	Tiderldjaouine complex micorgranite	~22.55N	~3.05E	Lancelot (1974), cited in Cahen et al. (1984)
Algeria	1889 ±87	Rb-Sr	Granite	26.4820 N	3.5640W	Lasserre et al. (1970) relcaluated by Cahen et al. (1984)
Angola	1853 ±74	Rb-Sr	Granite	14.45S	16.03E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1847 ±62	Rb-Sr	Granite porphyry	14.24S	15.04E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1893 ±76	Rb-Sr	Rhyolite	13.05S	15.08E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1826 ±48	Rb-Sr	Migmatite	11.06S	15.05E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1763 ±21	Rb-Sr	Granite	16.00S	13.00E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1641 ±43	Rb--Sr	Granite	13.51S	15.47E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1688 ±54	Rb-Sr	Alkalic granite	14.29S	14.10E	Torquato (1974b) cited in Cahen et al. (1984)

Angola	1712 ±64	Rb-Sr	Granite porphyry	14.49S	14.34E	Torquato et al. (1979) cited in Cahen et al. (1984)
Botswana	1813 ±234	?	Extension of Kheis belt; gneiss and schist	~22.30S	~22E	?
Congo	1801 ±180	Rb-Sr	Muscovite from Mogandjo granite, near Kalemie	~5.50S	~29.13E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Congo	1863 ±53	Rb-Sr WR	Kirungu Complex, Marungu Plateau	~7.30S	~30E	Kabengele et al. (1990), cited in Lenoir (1993c)
Congo	1895 ±43	Rb-Sr WR	Lumono Complex, Marungu Plateau	~7.30S	~30E	Kabengele et al. (1990), cited in Lenoir (1993c)
Congo	1861 ±28	Rb-Sr WR	Pepa-Lubumba Complex, Marungu Plateau	~7.30S	~30E	Kabengele et al. (1990), cited in Lenoir (1993c)
Libya	1878 ±32	K-Ar	Biotite from granodiorite gneiss	21.05N	24.57E	Huntings Ltd (1974), cited in Cahen et al. (1984)
Libya	1784 ±63	Rb-Sr	Migmatite biotite gneiss from Wadi Wahech	~21.00N	~25.00E	Klerkx and Deutch (1977), cited in Cahen et al. (1984)
Morocco	1692 ±32	Rb-Sr	Oued Chaiba granite	~28.20N	~11.00W	Charlot (1976, 1978), cited in Cahen et al. (1984)
Namibia	1691	U-Pb	Gneiss	28.37S	19.15E	Toogood (1976), cited in Cahen et. al. (1984)
Namibia	1742 1752 1772	U-Pb	Augen gneiss	26.5730 S	15.3330E	Berger (1978) cited in Cahen et al. (1984)
Namibia	1662 ±30	U-Pb	Franzfontein granite	~20S	~15E	Burger et al (1976), cited in Cahen et al. (1984)
Namibia	1935 ±150	U-Pb	Abbabis granite	~22.05S	~15.40E	Jacob, Kroner, and Burger (1978), cited in Cahen et al. (1984)
Namibia	1730	Rb-Sr	Nuab granodiorite			Malling (1978), cited in Cahen et al. (1984)
Namibia	1660	Rb-Sr	Swartfontein granite			Malling (1978), cited in Cahen et al. (1984)
South Africa	1862 ±76	Rb-Sr	Marydale lava	~29.30S	~22.15E	Cornell (1977), cited in Cahen et al. (1984)
South Africa	1796 ±30	Rb-Sr	Leucogranite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1770 ±30	Rb-Sr	Leucogranite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1762 ±55	Rb-Sr	Adamellite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1884 ±82	Rb-Sr	Granodiorite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1923 ±32	Rb-Sr	Tonalite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1933 ±37	Rb-Sr	Diorite	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1801 ±23	Rb-Sr	Swatkop Complex	28.55S	17.45E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1740 ±20	U-Pb	Steinkopf granite(?)	29.04S	17.50E	Welke et al (1979), cited in Cahen et al. (1984)
South Africa	1840 ±30	U-Pb	Granite	28.45S	17.44E	Welke et al (1979), cited in Cahen et al. (1984)
South Africa	1767 ±18	U-Pb	Haib volcanics	~28.30S	~17.30E	Reid (1977), cited in Cahen et al. (1984)
South Africa	1876 ±34	Rb-Sr	Dolerite, Limpopo Belt	~22.25S	~30.05E	Barton (1975), cited in Cahen et al. (1984)
South Africa	1905 ±123	Rb-Sr	Dolerite, Limpopo Belt	~23.20S	~29.55E	Barton (1975), cited in Cahen et al. (1984)
South Africa	1769 ±17	Rb-Sr	Dolerite, Limpopo Belt	~22.40S	~30.00E	Barton (1975), cited in Cahen et al. (1984)
South Africa	1749 ±52	Rb-Sr	Dolerite, Limpopo Belt	~22.40S	~30.00E	Barton (1975), cited in Cahen et al. (1984)
South Africa	1813 ±234	Rb-Sr	Granite, Limpopo Belt	~22.45S	~21.51E	Key and Rundel (1980), cited in Cahen et al. (1984)
Tanzania	1802 ±70	K-Ar	Muscovite from greisen	8.1230S	33.1330E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	1827 ±70	K-Ar	Muscovite from greisen	8.0135S	33.3734E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	1838 ±43	Rb-Sr	Kate granite, 15 km SW of Kawimbi			H. Schandelmeir, (in personal communication with Cahen et al. 1978), cited in Cahen et. al. (1984)

Tanzania	1894 ±33	Rb-Sr	Ndembera volcanics, Sao Hill Quarter Degree Sheet			Wendt et al. (1972), cited in Cahen et al. (1984)
Tanzania	1870 ±393	Rb-Sr	Porphyroid biotite- and hornblende-biotite granite, intrusive into Ndembera volcanics, Sao Hill Quarter Degree Sheet			Wendt et al. (1972), cited in Cahen et al. (1984)
Tanzania	1826 ±45	Rb-Sr	Biotite-muscovite and porphyroid bioitite granite, Sao Hill Quarter Degree Sheet			Wendt et al. (1972), cited in Cahen et al. (1984)
Tanzania	1771 ±45	Rb-Sr	Lukumburu-Wino granite	9.30S	36E	Priem et al. (1979), cited in Cahen et al. (1984)
Tanzania	1927 ±177	Rb-Sr WR	"Northern" anatectic granites	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1791 ±40	Rb-Sr WR	Ndembera intrusives	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1783 ±58	Rb-Sr WR	Dodoman intrusives	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1756 ±45	Rb-Sr WR	"Southern" anatectic granites	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1723 ±80	Rb-Sr WR	"Older" intrusives	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1716 ±60	Rb-Sr WR	"Younger" intrusives	~8.30S	~35E	Gabert and Wendt (1974), cited in Lenoir (1993)
Tanzania	1736 ±82	Rb-Sr WR	Kipili volcanics	~7.30S	~30.45E	Lenoir et al. (1993c)
Tanzania	1725 ±48	Rb-Sr WR	Kate granite north	~8.30S	~31.30E	Lenoir et al. (1993c)
Tanzania	1723 ±41	Rb-Sr WR	Kate granite south	~8.30S	~31.30E	Lenoir et al. (1993c)
Tanzania	1846 ±37	Rb-Sr WR	Mpanda granite	~6.30S	~31E	Nanyaro, (1989), cited in Lenoir et al. (1993c)
Uganda	1807 ±60	K-Ar	Biotite from Mubende granite at Majunwa	0.37N	31.22E	Cahen and Snelling (1996), cited in Cahen et -al. (1984)
Uganda	1845 ±35	K-Ar	Iganga granite, Whole rock (metamorphic age)	0.40N	33.20E	Harper et al. (1972), cited in Cahen et al. (1984)
Uganda	1839 ±35	K-Ar	Iganga granite, Whole rock (metamorphic age)	0.40N	33.20E	Harper et al. (1972), cited in Cahen et al. (1984)
Uganda	1880 ±75	K-Ar	Biotite from the Masaba granite on Kenya Uganda border (metamorphic age)	~1N	~34E	Cahen and Snelling (1996), cited in Cahen et al. (1984)
Uganda	1850 ±60	K-Ar	Biotite from the Biteba granite on Kenya Uganda border (metamorphic age)	~1N	~34E	Cahen and Snelling (1996), cited in Cahen et al. (1984)
Uganda	1887 ±245	Rb-Sr	Granite gneiss from Masha area	0.40S	30.43E	Vernon Chamberlain and Snelling (1972), cited in Cahen et al. (1984)
Uganda	1811 ±60	K-Ar	Muscovite from schist	0.30S	31.30E	Cahen and Snelling (1996), cited in Cahen et al. (1984)
Uganda	1831 ±60	K-Ar	Biotite from schist At Stuhlmann Pass	0.25N	29.55E	Cahen and Snelling (1996), cited in Cahen et al. (1984)
Zambia	1702	Pb-Pb	Roan Antelope granite	13.08S	27.25E	Cahen et al., (1970b), cited in Cahen et al. (1984)
Zambia	1693 ±50	Rb-Sr	Aplite in Mkushi gniess at Mtunga Mine	13.58S	29.08E	Cahen and Snelling (1996), cited in Cahen et al. (1984)
Zambia	1869 ±20	Rb-Sr	Mambwe granodiorite near Chozi river	9.13S	31.40E	Schandelmeir, in personal communication with Cahen et al. (1984)
Zambia	1824 ±75	Rb-Sr	Granodiorite from Kayambi	9.20S	32.20E	Schandelmeir, in personal communication with Cahen et al. (1984)
Zambia	1838 ±43	Rb-Sr	Kate porphyritic granite, 15 km SW of Kawimbi	8.50S	31.30E	Schandelmeir, in personal communication with Cahen et al. (1984)
Zambia	1816 ±11	Rb-Sr	Luapula acid volcanics from near Mansa			Brewer et al. (1979
Zambia	1833 ±9	Rb-Sr	Luongo granite from near Mansa			Cahen et al. (1984), cited in Cahen et al. (1984)
Zambia	1777 ±89	?	Mkushi gneiss, south of Copperbelt			Ng'Ambi et al. (1986), cited in Lenoir (1993)
Zambia	1882	?	Luina granite (Copperbelt granite dome)			Ngoyi et al. (1991), cited in Lenoir (1993)

Zimbabwe	1780 ±280	Rb-Sr	Piriwiri granulite			Treloar and Kramers (1989), cited in Goodwin (1991)
Zimbabwe	1890 ±260	Rb-Sr	Piriwiri enderbites			Treloar and Kramers (1989), cited in Goodwin (1991)

Early Middle Proterozoic 1600-1400 Ma (Figure 5)

Country	Age	Type	Rock Type	Lat	Long	Reference
Mauritania	1563 ±28	Rb-Sr	Syenite	25.47N	11.28W	Vachette, unpublished, cited in Cahen et al. (1984)
Namibia	1460	Rb-Sr Pb-Pb	Basalt from Awasib Mountain terrane	~25.20S	~15.50E	Hoal et al., cited in Hoal (1993)

Midde Middle Proterozoic 1400-1200 Ma (Figure 6)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	1253 ±110	Rb-Sr	Muscovite from Egere series quartzite of Tifinamine	26.00N	5.55E	Boissonnas et al. (1964), cited in Cahen et al. (1984)
Algeria	1198 ±114	Rb-Sr	Egere series quartzite of Tifinamine	26.00N	5.55E	Boissonnas et al. (1964), cited in Cahen et al. (1984)
Angola	1350 ±65	Rb-Sr	Micro-granite	14.46S	15.04E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1307 ±46	Rb-Sr	Alkalic granite?	14.46S	15.04E	Torquato et al. 1979, cited in Cahen et al. (1984)
Angola	1263 ±33	Rb-Sr	Alkalic granite?	14.46S	15.04E	Torquato et al. 1979, cited in Cahen et al. (1984)
Angola	1340 ±27	Rb-Sr	Acid porphyry	16.05S	14.07E	Torquato and Salgueiro (1977), cited in Cahen et al. (1984)
Angola	1341 ±202	Rb-Sr	Granite	16.25S	14.07E	Torquato and Salgueiro (1977), cited in Cahen et al. (1984)
Angola	1411 ±24	Rb-Sr	Granite	16.30S	13.56E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1407 ±26	Rb-Sr	Granite	16.14S	13.36E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Angola	1274 ±24	Rb-Sr	Ultra-mylonite	16.59S	13.15E	Carvalho, Fernandez, and Vialette (1979), cited in Cahen et al. (1984)
Burundi	1370	U-Pb	Granite at Nyamurungu	3.35S	29.05E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Burundi	1261	?	Mugere granite	~3.30S	~29.30E	Klerkx et al. (1984, 1987), cited in Tack and Nkurikiye (1993)
Burundi	1275	U-Pb	Zircon from Musongati ultramafic body	~3S	~30E	Tack et al. (1993)
Burundi	1279	U-Pb	Zircon from Atyre granite, central Burundi	~3S	~30E	Tack et al. (1993)
Burundi	1272 ±41	?	Kigarama/Akanyaru granite			Klerkx et al. (1984), cited in Brinckmann et al. (1994)
Burundi	1212 ±2	U-Pb	Zircon from granite at Cibitoke/ Kamburantwa	~3S	~29E	Brinckmann et al. (1994)
Burundi	1210 ±3	U-Pb	Zircon from aplite at Cibitoke/ Kamburantwa	~3S	~29E	Brinckmann et al. (1994)
Central African Republic	1221 ±73	Rb-Sr	Djalle granite	8.54N	22.49E	Cahen and Snelling (1966), after Roubalt et al. (1965), cited in Cahen et al. (1984)
Congo	1324 ±71	Rb-Sr	Adamellite from Mwanza and Mount Bia	7.55S 9.35S	26.37E 26.00E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Congo	1291	U-Pb	Granitoid from Bukena	7.40S	27.20E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Egypt	1120 ±62	Rb-Sr WR	Hornblende schist	22.40N	33.28E	El Shazly et al. (1973), cited in Cahen et al. (1984)
Egypt	1293	Rb-Sr WR	Hornblende schist from Wadi Haimur	22.40	33.28	El Shazly et al (1973), cited in Vail (1978)

Malawi	1355 ±28	Rb-Sr	Phyllonitized Ubendian Nyika granite	10.35S	33.46E	Cahen and Snelling (?) (1966), cited in Cahen et al. (1984)
Malawi	1338 ±60	K-Ar	Hornblende from amphibolite of Misuku gneiss	9.55S	33.25E	Fitches (1968), cited in Cahen et al. (1984)
Namibia	1247	Pb-Pb	Zircon from Rooiberg granite	25.10S	16.40E	Watters (1974), cited in Cahen et al. (1984)
Namibia	1270	Rb-Sr	Aunis tonalite gneiss, Awasib Mountain terrane	~25.20S	~15.50E	Hoal et al. (1989), cited in Hoal (1993)
Nigeria	1313 37	?	Amphibolite from Oban massif	~5.35N	~8.47E	Ekwueme and Cann-Vachette (1989), cited by Ekwuene and Caen-Vachette (1992)
Nigeria	1289 ±153	Rb-Sr	Charnockite from Oban massif	~5.35N	~8.47E	Ekwuene and Caen-Vachette (1992)
Rwanda	1348	U-Pb	Adamellite from Gitarama	2.16S	29.47E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Rwanda	1317	U-Pb	Granite from Gatsibo	1.35S	30.13E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Rwanda	1366 ±32	Rb-Sr	Gatsibo and Gitarama granitoids	1.35S	30.13E	From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
South Africa	1353 ±33	Rb-Sr	Granulite	~29.30S	~22.15E	Cornell (1975), cited in Cahen et al. (1984)
South Africa	1355 ±20	Rb-Sr	Granulite	~29.30S	~22.15E	Cornell (1975), cited in Cahen et al. (1984)
South Africa	1305 ±100	Pb-Pb	Gamsberg ores			Köppel (1978), cited in Cahen et al. (1984)
South Africa	1290	?	Copperton Formation, Namaqualand Complex	~29.55S	~20.20E	South African Committee for Stratigraphy (SACS) (1980), cited in Joubert (1986)
South Africa	1336	?	Wilgengoutsdrif Group volcanic rocks(?)			South African Committee for Stratigraphy (SACS) (1980), cited in Joubert (1986)
South Africa	1207 ±10	U-Pb?	Mzumbe gneiss, Natal	~29.45 S	~31.40E	Thomas and Eglinton (1990), cited in Thomas (1993)
Tanzania	1239 ±50	K-Ar	Phlogopite from Kapalagulu layered intrusive complex, Western Tanzania			Cahen and Snelling (1966), cited in Cahen et al. (1984)
Uganda	1329 ±55	Rb-Sr	Granitoid from Ntungamo, Uganda			From one of various references (Cahen et al. 1967, Ledent, 1979, Cahen and Theunissen, 1980, and unpublished results) cited in Cahen et al. (1984)
Uganda	1289 ±31	Rb-Sr	Arena granites from Rwentobo, Kmawezi, and Ntungamo	~1.00S	~30.30E	Vernon-Chamberlain and Snelling (1972) cited in Cahen et al. (1984)
Uganda	1268 ±45	K-Ar	Muscovite from schsit	~0.00	~30.00	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Uganda	1268 ±45	K-Ar	Hornblende from amphibolite	~0.00	~30.00	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Uganda	1268 ±45	K-Ar	Biotite from Kilembe schist	~0.00	~30.00	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Uganda	1198 ±47	Rb-Sr	Chitwe granite	0.56S	30.26E	Vernon-Chamberlain and Snelling (1972) cited in Cahen et al. (1984)
Zambia	1345-1200	?	Kalomo Batholith	~17S	~26.30E	Hanson et al. (1988), cited in Unrug (1992)

Late Middle Proterozoic 1200-1000 Ma (Figure 7)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	1130 ±30	Rb-Sr	Aluminous kyanite-garnet gneiss	~23.40N	~6.15E	Bertramd amd Lasserre (1976), cited in Cahen et al. (1984)
Central African Republic	1128 ±310	Rb-Sr	N'Daya granite, Djalle	9.07N	22.45E	Cahen and Snelling (1966), after Roubalt et al. (1965), cited in Cahen et al. (1984)

Congo	1050	U-Pb	Zircon from granite at Mfoubou	~4.30S	~12.30E	Djama (1988), cited in Vicat et al. (1992)
Congo	1027	U-Pb	Mativa granite and Kianga microgranite	5.2230S 5.32S	13.3730E 13.40E	Cahen et al. (1978b), cited in Cahen et al. (1984)
Congo	1057	U-Pb	Zircon and sphene from the Mao leucocratic potassic granite	5.52S	13.12E	Cahen et al. (1978b), cited in Cahen et al. (1984)
Congo	1116 ±30		Mount Kalolo hornblende syenite	7.20S	29.30E	
Congo	1115 ±27	K-Ar	Mount Kalolo syenite			Cahen et al. (1975)
Congo	1169 ±15	K-Ar	syenodiorite	~7.10S	~21.40E	Snelling (unpublished) cited in Cahen et al. (1984)
Congo	1100 ±15	K-Ar	syenodiorite	~7.10S	~21.40E	Snelling (unpublished) cited in Cahen et al. (1984)
Congo	1145 ±15	K-Ar	syenodiorite	~7.10S	~21.40E	Snelling (unpublished) cited in Cahen et al. (1984)
Egypt	1183 ±41	Rb-Sr	Metasedimentary rocks from the El Shalul area	25.25N	33.40E	Unpublished studes by El Manharawy (1977), cited in Cahen et al. (1984)
Egypt	1189 ±41	Rb-Sr	Metasedimentary rocks from the El Bakriya area	25.15N	33.40E	Unpublished studes by El Manharawy (1977), cited in Cahen et al. (1984)
Egypt	1122 ±31	Rb-Sr	Granodiorite	~25.20N	~33.40E	Unpublished studes by El Manharawy (1977), cited in Cahen et al. (1984)
Egypt	1160 ±144	Rb-Sr WR	Mica schist from Abu Swayel Mine	22.47N	33.38E	El Shazly et al. (1973), cited in Cahen et al. (1984)
Egypt	1013 ±35	Rb-Sr	Feiran dioritic gneiss, Sinai peninsula			
Egypt	1195	Rb-Sr WR	Biotite schist from Abu Swayel Mine	22.47N	33.38E	El Shazly et al. (1973), cited in Vail (1978)
Malawi	1119 ±71	Rb-Sr	Hypersthene granite of the Sakhuta Hill, MchingiRige and Kachebere Hill pluton	~13.30S	~33.00E	Brewer et al. (1979a)
Malawi	1016 ±33	Rb-Sr	Mcezi granite, Dwanga area	~13.00S	~33.45E	Darbyshire, in personal communication with Cahen et al. (1984) in 1979
Mozambique	1020	?	Leptonite/Leucocharnockite	~13.05S	~35.15E	Carta Geologica de Mozambique (1987)
Mozambique	1070 ±40	Rb-Sr	Enderbitic gneiss	~13.05S	~35.15E	Carta Geologica de Mozambique (1987)
Mozambique	1000 540± 3	U-Pb	Syenite / monzonite	~13.25S	~34.55E	Carta Geologica de Mozambique (1987)
Mozambique	1040	Rb-Sr	Migmatitic tonalite	~12.15S	~37.20E	Carta Geologica de Mozambique (1987)
Mozambique	1013 ±75	Rb-Sr	Granite, late- to syn-kinematic	~15.35S	~36.55E	Carta Geologica de Mozambique (1987)
Mozambique	1030 ±124	Rb-Sr	Granite?	~16.00S	~37.00E	Carta Geologica de Mozambique (1987)
Mozambique	1003 ±14	Rb-Sr	Mica schist and gneiss, Nipode Subgroup	~16.35S	~37.45E	Carta Geologica de Mozambique (1987)
Mozambique	1099 ±4	Rb-Sr	Granite, migmatitic	~16.55S	~36.50E	Carta Geologica de Mozambique (1987)
Mozambique	1037 ±30	Rb-Sr	Gniess and migmatite, Mocuba Group	~17.05S	~37.10E	Carta Geologica de Mozambique (1987)
Mozambique	1107 ±60	Rb-Sr	Gneiss, Mecuburi Group	~14.10S	~40.25E	Carta Geologica de Mozambique (1987)
Namibia	1059 ±30	U-Pb	Gamsberg granite (Rehoboth)	~23.15S	~16.20E	Hugo and Schalk (1975), cited in Cahen et al. (1984)
Namibia	1069 ±30	U-Pb	Aben-druhe Granite (Rehoboth)	~23.15S (?)	~17.25E (?)	Hugo and Schalk (1975), cited in Cahen et al. (1984)
Namibia	1110 ±90	Pb-Pb	Rhyolite porphyry (Rehoboth area)	~23.15S (?)	~17.00E (?)	Van Niekerk and Burger (1969), cited in Cahen et al. (1984)
Namibia	990	Pb-Pb	Zircon from Grauwater Formation			Cahen et al. (1984)
Namibia	1069 ±70	Pb-Pb	Volcanic rocks beneath Doornpoort (Grauwater) Formation			Cahen et al. (1984)
Nigeria	1175 ±140	Rb-Sr	Ife granite gneiss	7.2800N	4.3225E	Grant et al. (1972a), cited in Cahen et al. (1984)

Nigeria	1040 ±25	Rb-Sr	Greenschist facies phyllite	12.22N	6.19E	Ogezi (1977), cited in Cahen et al. (1984)
South Africa	c. 1200	?	Koras Group volcanic rocks	~28.30S	~21.40E	South African Committee for Stratigraphy (SACS) (1980), cited in Joubert (1986)
South Africa	1060 ±30	U-Pb	Koras quartz porphyry	~29.40S	~22.20E	Burger (1967) cited in Cahen et al. (1984)
South Africa	1180 ±74	U-Pb	Koras quartz porphyry	~29.40S	~22.20E	Botha, Grobler, and Berger (1979), cited in Cahen et al. (1984)
South Africa	1054	U-Pb	Granite	~29.40S	~22.20E	Geringer and Botha (1976), cited in Cahen et al. (1984)
South Africa	1125 ±20	Rb-Sr	Wilgenhoutdrif volcanics	~28.30S	~21.40E	Cornell (1975), cited in Cahen et al. (1984)
South Africa	1140 ±20	Rb-Sr	Rietberg grantie	~29.40S	~17.40E	Clifford et al.(1975), cited in Cahen et al. (1984)
South Africa	1187 ±22	Rb-Sr	Ratelpoort granulite	~29.40S	~17.40E	Clifford et al. (1975), cited in Cahen et al. (1984)
South Africa	1015 ±65	U-Pb	Rietberg & Concordia granite	~29.40S	~17.40E	Clifford et al.(1975), cited in Cahen et al. (1984)
South Africa	1007 ±20	U-Pb	Rietberg & Concordia granite	~29.40S	~17.40E	Clifford et al. (1975), cited in Cahen et al. (1984)
South Africa	1200-1100	?	Keimoes Batholith, Areachap/Kakamas terranes			Geringer et al. (1988), cited in Thomas et al. (1994?)
South Africa	1017 ±110	U-Pb	Noritoid suite	~29.40S	~17.40E	Stumpfl et al. (1976), cited in Cahen et al. (1984)
South Africa	1118 ±35	U-Pb 207/206	Migmatite	28.46S	31.23E	Nicolaysen and Burger (1965), recalculated by Cahen et al. (1984)
South Africa	1111	Rb-Sr	Migmatite	28.46S	31.23E	Nicolaysen and Burger (1965), recalculated by Cahen et al. (1984)
South Africa	1026 ±4	U-Pb	Zircon from late granite in Margate terrane	~30.30S	~31.30E	Thomas et al. (1993), cited in Thomas (1993)
South Africa	1065 ±2	U-Pb	Bloukop granite	31.0152 S	18.1251E	
Sudan	1100 ±200	Pb-Pb	Quartz vein, galena	14.12N	24.37E	Coomer and Vail (1974), cited in Cahen et al. (1984)
Uganda	1198 ±47	Rb-Sr	Chitwe granite	0.56S	30.26E	Vernon-Chamberlain and Snelling (1972), cited in Cahen et al. (1984)
Zambia	1134 ±8		Lusenga hornblende syenite	9.27S	29.10E	Brewer et al. (1975), cited in Cahen et al. (1984)
Zambia	1045 ±30	K-Ar	Muscovite from pegmatites around Kalomo batholith	~17S	~26.30E	Snelling et al. (1972), cited in Unrug (1992)
Zambia	1050 ±40	K-Ar	Muscovite from pegmatites around Kalomo batholith	~17S	~26.30E	Snelling et al. (1972), cited in Unrug (1992)
Zambia	1080 ±31	Rb-Sr	Muscovite in Pegmatite	16.49S	27.02E	Cahen and Snelling (1966), cited in Cahen et al.(1984)
Zambia	1060 ±40	K-Ar	Muscovite in pegmatite	16.49S	27.02E	Snelling et al. (1972), cited in Cahen et al. (1984)
Zambia	1154 ±61	K-Ar	Arfvedsonite from lamprophyre intruding Mafingi Group	10.02S	33.16E	Fitches (1968), cited in Cahen et al. (1984)
Zambia	1129 ±30	K-Ar	Biotite from Nthonga granite	10.06S	33.12E	Fitches (1968), cited in Cahen et al. (1984)
Zambia	1135 ±40	K-Ar	Metadolerite dyke intruding Chambo Gneiss	9.52S	33.32E	Ray (1974), cited in Cahen et al. (1984)

Early Late Proterozoic 1000-800 Ma (Figure 8)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	982 ±36	Rb-Sr	Muscovite from Toukmatine (?) series	~23.45N	~7.30E	Guerange and Lasserre (1971), cited in Cahen et al. (1984)
Algeria	994 ±95	Rb-Sr	Muscovite from Pharusian mica schist	~23.45N	~7.30E	Picciotto, Ledent, and Lay (1965), cited in Cahen et al. (1984)
Botswana	968 ±16	Rb-Sr	Feldspar porphyry, Gotha Hills	18.27S	24.00E	Rundel (1979), cited in Cahen et al. (1984)
Botswana	820 ±20	Rb-Sr	Kgwebe porphyry, Gotha Hills	18.27S	24.00E	Rundel (1979), cited in Cahen et al. (1984)
Botswana	890 ±7	Rb-Sr	Adamellite, Xangwa Valley	19.33S	21.11E	Rundel (1979), cited in Cahen et al. (1984)

Burundi	815 ±14	K-Ar	Amygdaloidal lava at base of Mosso Group, Burundi (= Uhe group, Tanzania)			Cahen and Snelling (1974)
Burundi	908 ±21	Rb-Sr	Ruhembe quartz-muscovite--tourmaline gold system	~3N	~29E	Brinckmann (1988)
Burundi	951 ±18	Rb-Sr	Muscovite and tourmaline from Mulehe tin system, NW Burundi	~3N	~29E	Recalculated by Brinckmann et al. (1994), from Brinckmann (1988)
Central African Republic	833 ±52	Rb-Sr	Ouandja granite	8.30N	23.53E	Cahen and Snelling (1966), after Roubalt et al. (1965), cited in Cahen et al. (1984)
Central African Republic	838 ±40	Rb-Sr	Gneiss from Kotto	8.30N	23.53E	Cahen and Snelling (1966), after Roubalt et al. (1965), cited in Cahen et al. (1984)
Cameroon	c. 830	?	Gneiss complex, Poli area	~8.30N	~13.30E	Toteu (1987), cited in Pinna et al. (1993)
Congo	948 ±20	K-Ar	Basalt	~6S	~24E	Cahen et al. (1975) cited in Cahen et al. (1984)
Congo	926 ±30	K-Ar	Kasadi-Sadi pillow lava	~7.10S	~21.40E	Snelling (unpublished) cited in Cahen et al. (1984)
Congo	976 ±10					Cahen et al. (1979b), cited in Cahen et al. (1984)
Congo	977	Rb-Sr	Granite of the Mwanza massif	7.55S	26.32E	Cahen and Ledent (1979), cited in Cahen et al. (1984)
Congo	989 ±28	Rb-Sr	Granite near Kalima, Kivu	2.30S	26.40E	Cahen and Ledent (1979), cited in Cahen et al. (1984)
Congo	835	U	Uranium in Kobokobo pegmatite, Kivu	3.06S	28.07E	Monteyne-Poulaert et al. (1963), cited in Cahen et al. (1984)
Egypt	819 ±150	Rb-Sr	Metavolcanic rocks from Wadi Nagib, Abu Swayel Mine	~24.00N	~35.30E	El Shazly et al. (1973), cited in Cahen et al. (1984)
Egypt	958 ±32	Rb-Sr	Quartz-diorite from Um Krush	~24.00N	~35.30E	No reference, cited in Cahen et al. (1984)
Egypt	914 ±31	Rb-Sr	Quartz-diorite at Shaitian Granite, Egypt			El Manharawy (1977), cited in Cahen et al. (1984)
Egypt	871	Rb-Sr	Plagioclase granite	22.49N	33.44E	El Shazly et al. (1973), cited in Cahen et al. (1984)
Egypt	856	Rb-Sr WR	Greenstone from Wadi Nagib	22.48N	33.43E	El Shazly et al. (1973), cited in Vail (1978)
Egypt	890	Rb-Sr WR	Granite from Wadi Nagib	22.49N	33.44E	El Shazly et al. (1973), cited in Vail (1978)
Egypt	980	Rb-Sr WR	Diorite from Um Kush	22.39N	33.43E	El Shazly et al. (1973), cited in Vail (1978)
Ethiopia	~880	U-Pb	Zircon evaporation on gneiss in Adola-Moyale area; granite protolith	~5N	~39E	Teklay et al. (1993), cited in Adelsalam and Stern (1996)
Eritrea	987	K-Ar	Granite near Masawa	15.30N	39.33E	Frazier (1970), cited in Cahen et al. (1984)
Gabon	995 ±15 977 ±14	K-Ar	Dolerite	~1.30S	~3.00E	Bonhomme et al. (1978), cited in Cahen et al. (1984)
Kenya	868 ±148	Rb-Sr	Hornblende-biotite gneiss, north of Mwatate	3.28S	38.22E	Shibata (1975), cited in Cahen et al. (1984)
Kenya	819 ±15	U-Pb	Monazite from Baragoi	2.00N	36.30E to 37.00E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Kenya	865 ±30	K-Ar	Hornblende from amphibolite inclusion in charnockite from Cheptopek	1.28N	35.14E	Snelling (1965b), cited in Cahen et al. (1984)
Kenya	1000	Nd-Sm	Amphibolite from Sekerr	~2N	~35.30E	Harris et al. (1984), cited in Berhe (1990)
Libya	980	Rb-Sr	Biotite-hornblende granite	29.04N	17.48E	Schurmann (1974), cited in Cahen et al. (1984)
Mozambique	950	Rb-Sr	Chert associated with Mourra ophiolite			Saachi et al. (1984), cited in Berhe (1990)
Mozambique	939 ±61	Rb-Sr	Granitic batholith, Tete Province	~15.05S	~31.40E	Carta Geologica de Mozambique (1987)
Mozambique	1000 800	U-Pb	Upper and lower concordia intercepts of granite	~12.05S	~37.02E	Carta Geologica de Mozambique (1987)
Mozambique	927 ±54	Rb-Sr	Paragneiss near Chure Novo	~13.25S	~39.40E	Carta Geologica de Mozambique (1987)

Mozambique	842 ±50	Rb-Sr	Syenite / mangerite	~14.40S	~36.55E	Carta Geologica de Mozambique (1987)
Mozambique	837 ±26	Rb-Sr	Enderbite gneiss	~14.45S	~36.25E	Carta Geologica de Mozambique (1987)
Mozambique	948 ±39	Rb-Sr	Ultramafic rocks, Morrua Group	~16.00S	~38.00E	Carta Geologica de Mozambique (1987)
Mozambique	804 ±46	Rb-Sr	Gneiss, Mecuburi Group	~14.30S	~40.15E	Carta Geologica de Mozambique (1987)
Mozambique	965 ±37	Rb-Sr	Granulite gneiss, Lurio Supergroup	~14.50S	~40.05E	Carta Geologica de Mozambique (1987)
Mozambique	948 ±47	Rb-Sr	Migmatitic granite	~15.00S	~38.45E	Carta Geologica de Mozambique (1987)
Namibia	800 ±20	U-Pb	Naauwpoort lava, Nosib Group	20.30S	15.15E	Burger and Walraven (1977), cited in Cahen et al. (1984)
Namibia	847 ±22	Rb-Sr	Oas syentie	20.22	14.42	Frets (1969)
Namibia	910 ±10	Rb-Sr	Gariep volcanic units			Allsopp et al. (1979), cited in Goodwin (1991)
Namibia	934 ±30	Rb-Sr	Bremen intrusive complex, older member?	27.50S	17.55E	Allsopp et al. (1979) cited in Cahen et. al. (1984)
Nigeria	907 ±50	Rb-Sr	Charnokite from Bauchi	~10.20N	~9.50E	Hurley et al. (1966), cited in Cahen et al. (1984)
Rwanda	977 ±13	Rb-Sr	Granite from Kirengo	1.50S	29.37E	Gerards and Ledent (1976), cited in Cahen et al. (1984)
Saudi Arabia	901 ±22	Rb-Sr	Granodiorite from Bidah	21.35N	41.30E	Marzouki et al. (1982), cited in Cahen et al. (1984)
Saudi Arabia	895 ±173	Rb-Sr	Granodiorite from Wadi Khadrah	20.30N	40.08E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	890 ±67	Rb-Sr	Granodiorite from Biljurshi	19.51N	41.36E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	853 ±79	Rb-Sr	Granodiorite from Wadi ash Shaqah and ash Shamiyah	20.20N	40.56E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	848 ±181	Rb-Sr	Granodiorite from Biljurshi	19.51N	41.34E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	846 ±82	Rb-Sr	Granodiorite from Wadi Makhdhul and Wadi Tarib	18.08N	43.38E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	838 ±134	Rb-Sr	Granodiorite from Wadi Asmak	19.46N	42.18E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	837 ±50	Rb-Sr	Granodiorite from An Nimas	19.03N	42.12E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	816 ±4	U-Pb	Granodioirte from An Nimas	19.03N	42.12E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	818 ±95	Rb-Sr	Granodiorite from Wadi Tarj	19.43N	42.20E	Fleck et al. (1979), cited in Cahen et al. (1884)
Saudi Arabia	820 to 870	U-Pb	Gabbro from Thurwah ophiolitic complex	~23N	~`39.30E	Pallister et al. (1988), cited in Berhe (1990)
Saudi Arabia	838 ±10	U-Pb	Gabbro from Bir Umq	~24N	~41E	Pallister et al. (1988), cited in Berhe (1990)
Saudi Arabia	823 ±11	U-Pb	Tulahal plagiogranite	~19N	~43.30E	Pallister et al. (1988), cited in Berhe (1990)
Saudi Arabia	847 ±14	U-Pb	Tulahah plagiogranite	~19N	~43.30E	Pallister et al. (1988), cited in Berhe (1990)
Saudi Arabia	709 ±15	U-Pb	Ad Dafinah quartz diorite	~19N	~43.30E	Pallister et al. (1988), cited in Berhe (1990)
Saudi Arabia	751 ±16	U-Pb	Ad Dafinah quartz diorite	~19N	~43.30E	Pallister et al. (1988), cited in Berhe (1990)
South Africa	809 ±51	Rb-Sr	Rooiberg granite	28.40S	17.20E	Allsopp et al. (1979) cited in Cahen et al. (1984)
South Africa	960 ±40	U-Pb	Granite	31.50S	21.26E	Burger and Coertze (1973), cited in Cahen et al. (1984)
South Africa	812 ±40	U-Pb	Granite	32.01S	23.23E	Burger and Coertze (1973), cited in Cahen et al. (1984)
South Africa	990 ±40	U-Pb	Granite	30.54S	26.05E	Burger and Coertze (1973), cited in Cahen et al. (1984)
South Africa	910 ±40	U-Pb	Zircon from Biesiesfontein granite	~31S	~18E	Burger and Coertze (1973), cited in Thomas et al. (1996)
South Africa	995 ±15	U-Pb	Rietberg & Concordia granite	~29.40S	~17.40E	Clifford et al. (1975), cited in Cahen et al. (1984)
South Africa	920 ±70	U-Pb	Rietberg & Concordia granite	~29.40S	~17.40E	Clifford et al. (1975), cited in Cahen et al. (1984)

South Africa	950 ±25	U-Pb	Rietberg & Concordia granite	~29.40S	~17.40E	Clifford et al (1975), cited in Cahen et al. (1984)
South Africa	996	Rb-Sr	Phlogopite in marble	30.38S	31.24E	Nicolaysen and Burger (1965), recalculated by Cahen et al. (1984)
South Africa	990	Rb-Sr	Biotite from charnokite	31.00S	30.15E	Nicolaysen and Burger (1965), recalculated by Cahen et al. (1984)
Sudan	912	K-Ar	Pink biotite granite Sinkat sheet, E Sudan	~19.00N	~37.00E	Technoexport (unpublished 1976), cited in Cahen et al. (1984)
Sudan	832 ±26	Sm-Nd	Gebeit mine volcanics	~21N	~36.30E	Kröner et al. (1987), cited in Berhe (1990)
Sudan	850	U-Pb	Haya terrane granodioirte	~21N ?	~36.30E ?	Kröner et al. (1987), cited in Berhe (1990)
Sudan	920	Sm-Nd	Haya terrane volcanics	~21N ?	~36.30E ?	Kröner et al. (1987), cited in Berhe (1990)
Sudan	812 ±18	U-Pb?	Adalamet diorite	~19N	~36E	Kuster et al. (1993), cited in Wipfler (1996)
Sudan	810 ±12	U-Pb?	Jebel Tala granodiorite	~19N	~36E	Kuster et al. (1993), cited in Wipfler (1996)
Sudan	851 203	K-Ar	Foliated metagabbro	9.08N	24.37E	Vail and Rex (1971, cited in Cahen et al. (1984)
Tanzania	935 ±45	K-Ar	Biotite from acid gneiss at Mikese Railway Quarry	6.46S	37.59E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	844 ±40	K-Ar	Biotite from acid gneiss at Pandambili Hill, Mpapwa	6.06S	36.44E	Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	908 ±38	Rb-Sr	Gneiss from Pare Mountains			Spooner et al. (1970), cited in Cahen et al. (1984)
Tanzania	812 ±37	Rb-Sr	Gneiss from Pare Mountains			
Tanzania	814 ±120	Rb-Sr?	Granite	~10.03S	~34.47E	Lenoir et al. (1993)
Tanzania	810 ±25	K-Ar	Gagwe Kabuye lavas, base of Bukoban Group	~4.30S	~30E	De Poope et al. (1991), cited in Meert et al. (1995)
Tanzania	842 ±80	?		~9.00S	~34.10E	Lenoir et al. (1994)
Zambia	955	U-Pb	Porphyry	15.01S	29.44E	Barr, Cahen, and Ledent (1978), cited in Cahen et al. (1984)
Zambia	927	U-Pb	Granite	15.01S	29.44E	Barr, Cahen, and Ledent (1978), cited in Cahen et al. (1984)
Zambia	843	U-Pb	Lusaka granite	15S	29E	Barr, Cahen, and Ledent (1978), cited in Cahen et al. (1984)
Zambia	870 ±42	?	Microcline veins in Lower Roan			Cahen, Delhal, and Ledent (1970)
Zambia	879 ±36	K-Ar	Biotite from gneiss, Isoka District	10.17S	32.45E	Snelling et al. (1972), cited in Cahen et al. (1984)
Zambia	899 ±36	K-Ar	Biotite from gneiss, Isoka District	10.17S	32.45E	Snelling et al. (1972), cited in Cahen et al. (1984)

Lower Sinian 800-670 Ma (Figure 9)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	755 ±21	Rb-Sr	Ounane granodioritic complex	~25.00N	~7.25E	Latouche and Vidal (1974), cited in Cahen et al. (1984)
Algeria	705 ±20	Rb-Sr	Tiuhaoliarene granite complex	~22.00N	~4.00E	Boissonnas et al. (1969), Gravelle (1972), cited in Cahen et al. (1984)
Burundi	774 ±44	Rb-Sr	Alkaline massif, Upper Ruvubu River	3.00S	29.37E	Cahen et al. (1979b), cited in Cahen et al. (1984)
Cameroon	750 ±20	Pb-Pb	Zircon from dacite in Bouba Njida Unit of the Rei Bouba Group	~8.45N	~14.29E	Pinna et al. (1993)
Cameroon	677 ±40	Rb-Sr	Bam/Sinassi batholith	~8.50N	~14.30E	Pinna et al. (1993)
Congo	733	U-Pb	Noqui peralkaline granite	5.52S	13.26E	Cahen et al. (1976b), cited in Cahen et al. (1984)
Congo	733 ±19	Rb-Sr	Mativa granite	~5.52S	~13.26E	Cahen et al. (1976b), cited in Cahen et al. (1984)
Congo	743 ±16	Rb-Sr	Yoyo granite	~5.52S	~13.26E	Cahen et al. (1976b), cited in Cahen et al. (1984)
Congo	725 ±130	Pb-Pb	Copper sulphides	~12.40S	~32E	Ngoyi et al. (1993)
Egypt	677 to 750	U-Pb	Trondhjemite and gneiss	~25N	~34E	Kröner et al. (1992), cited in Fritz et al. (1996)

Ethiopia	680 ±30	Rb-Sr	Syntectonic granite, Adola Moyale Belt	~5N	~39E	Gilboy (1970), cited in Berhe (1990)
Kenya	766 ±40	Rb-Sr	Granite gneiss from Mbooni Hills, Machakos area			Shibata and Suwa (1979), cited in Cahen et al. (1984)
Kenya	528 ±16	K-Ar	Granite gneiss from Mbooni Hills, Machakos area			Shibata and Suwa (1979), cited in Cahen et al. (1984)
Libya	789 ±78	Rb-Sr	Metarhyolite porphyry, Upper Tibestiaen	23.40N	15.25E	Schurmann (1974), cited in Cahen et al. (1984)
Morocco	787 ±10	Rb-Sr	Age of contact metamorphism, Bou Azzer area	30.20N	6.30E	Clauer (1974, 1976), cited in Cahen et al. (1984)
Morocco	697 ±11	Rb-Sr	Askaoun granodiorite, Siroua massif	30.30N	8.00W	Charlot (1978), cited in Cahen et al. (1984)
Morocco	688 ±23	Rb-Sr	Granite near Tisserant	~29.00N	~10.00E	Benziane (1974); Yazidi (1976); Charlot (1978), cited in Cahen et al. (1984)
Morocco	689 ±19	Rb-Sr	Granite near Tisserant	~29.00N	~10.00E	Benziane (1974); Yazidi (1976); Charlot (1978), cited in Cahen et al. (1984)
Mozam-bique	756 ±95	Rb-Sr	Migmatite	14.34S	39.32E	Araujo (1976), cited in Cahen et al. (1984)
Mozam-bique	752 ±57	Rb-Sr	Migmatite	14.37S	39.13E	Araujo (1976), cited in Cahen et al. (1984)
Mozam-bique	748 ±17	Rb-Sr	Migmatite 100km west of former Porto Amelia			Araujo (1976), cited in Cahen et al. (1984)
Namibia	728 ±40	U-Pb	Naaujwpoort Formation, alkali rhyolite	~20.30S	~15.15E	Miller and Burger (1983)
Namibia	750 ±65	U-Pb	Naauwpoort Formation, alkali rhyolite	~20.30S	~15.15E	Miller and Burger (1983)
Namibia	780 ±10	U-Pb	Lekkersing granitic complex, intruding Stinkfontien Formation, Gariep Group	~29.00S	~17.05E	Allsopp et al. (1979), cited in Goodwin (1991) and Cahen et al. (1984)
Niger	730	U-Pb	Algerian equivalent of Nigerian granite			Caby and Andreopoulos-Renaud (1987), cited in Liegeois et al. (1993)
Nigeria	677 ±43	Rb-Sr	Granite gneiss	9.2420 9.2410	9.1320 9.1620	Van Breemen et al. (1977), cited in Cahen et al. (1984)
Saudi Arabia	747 ±178	Rb-Sr	Granodiorite from Wadi Mushira	19.34N	41.59E	Fleck et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	743 ±11	Rb-Sr	Granodiorite from Thurrat	20.12N	41.48E	Marzouki et al. (1982), cited in Cahen et al. (1984)
Saudi Arabia	724 ±93	Rb-Sr	Granodiorite from Al Qarah quadrangle	20.08N	43.08E	Fleck et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	723 ±107	Rb-Sr	Granodioirte from J. Umm al Hashiyah	20N	42.55E	Fleck et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	684 ±43	Rb--Sr	Granodiorite from Wadi Malahah	18.22N	43.45E	Fleck et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	678 ±10	U-Pb	Granodiorite from Bishah	20.06N	42.47E	Cooper et al. (1979)
Saudi Arabia	776 ±9	U-Pb	Plagiogranite from Jabal al Wask	~26N	~38E	Ledru and Auge (1984), cited in Berhe (1990)
Saudi Arabia	743 ±24	Sm-Nd	Jebel Ess gabbro	~26N	~38E	Claesson et al. (1984), cited in Berhe (1990)
Saudi Arabia	728 ±38	Sm-Nd	Jabal al Wask gabbro	~26N	~38E	Claesson et al. (1984), cited in Berhe (1990)
Saudi Arabia	740 ±11	U-Pb	Jabal al Wask gabbro	~26N	~38E	Pallister et al. (1988)
Saudi Arabia	694 ±8	U-Pb	Gabbro from Al Amar ophiolite	~23.30N	~45E	Stacey et al. (1984)
Somalia	c. 800	?	Gabbro-syenite suite, northern Somalia	~10N	~44.30E	Sassi et al. (1989) and Kröner and Sassi (1996), cited in Abdallah et al. (1996)
Sudan	712 ±58	Rb-Sr	Nafirelieb volcanics	~19.30N	~37E	Fitches et al. (1993), cited in Berhe (1990)
Sudan	723 ±6	Rb-Sr	Kadawab volcanics	~19.30N	~37E	Klenenic (1985), cited in Berhe (1990)

Sudan	671 ±8	Rb-Sr	Homogar volcanics	~19.30N	~37E	Klenenic (1985), cited in Berhe (1990)
Sudan	c. 700	Nd-Sm	Gebel Gerf ophiolite	~22.30N	~35E	Zimmer et al. (1987), cited in Berhe (1990)
Sudan	740	K-Ar WR	Dolorite, J. Hamashaweib	20.40N	37.00E	Whiteman (1968), cited in Vail (1978)
Sudan	770	K-Ar WR	Granodioirte at J. Ankur E.	21.15N	36.20E	Technoexport (1974), cited in Vail (1978)
Sudan	760 ±23	?	Wadi Agwamt granite	~19N	~36E	Kroner et al. (1992), cited in Fritz et al. (1996)
Tanzania	645 ±10	U-Pb	Granulite	4.0958S	37.5500E	Muhongo and Lenior (1994)
Tanzania	695 ±10	U-Pb	meta-anorthosite	7.0200S	37.3003E	Muhongo and Lenior (1994)
Tanzania	755 ±25	K-Ar (?)	Biotite from Mbozi syenite-gabbro complex			Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	714 ±49	U-Pb	Wami River complex NE Tanzania	6.20S	38.30E	Mabako et al. (1985), cited in Mabako and Nakamura (1995)
Tanzania	724 ±6	U-Pb	Zircon from late mylonitic Kalunduru granite	10.03S	34.47E	Theunissen et al. (1992)
Togo	900-700	Nd-Sm	Eclogite from Monts Ahito			Bernard-Griffiths et al. (1985), cited by Affaton (1993)
Zambia	718 ±20	Rb-Sr	Songwe syenite			Ray (1974), Ray and Crow (1975), cited in Cahen et al. (1984)

Upper Sinian 670-590 Ma (Figure 10)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	592 ±20	Rb-Sr	Iskel post tectonic granite	~22.35N	~4.15E	Boissannas et al. (1969), cited in Cahen et al. (1984)
Algeria	604 ±13	U-Pb	Adaf pluton complex	~23.50N	~8.30E	Bertrand et al. (1975), cited in Cahen et al. (1984)
Algeria	670 ±53	Rb-Sr	Ouzzaf granodiorite	~24.10N	~5.40E	Data from Vialette and Vitel (1979), recalculated by Cahen et al. (1984)
Benin	638 ±16	Rb-Sr	Metasyenite			Vachette (1979), cited in Cahen et al. (1984)
Benin	610 ±18	Rb-Sr	Migmatite			Vachette (1979), cited in Cahen et al. (1984)
Benin	609 ±30	Rb-Sr	Migmatite			Vachette (1979), cited in Cahen et al. (1984)
Burundi	640 ±28	Rb-Sr	Au breccias, NW Burundi	~`5N	~29E	Brinckmann et al. (1994)
Cameroon	600 ±39	Rb-Sr	Orthogneiss in the Mamfe-Kumba region			Lasserre and Soba (1976b), cited in Cahen et al. (1984)
Cameroon	639 ±20	Pb-Pb	Zircon from "syntectonic" granite, Landou syncline	~8.30N	~14.00E	Pinna et al. (1993)
Central African Republic	615 ±50	Rb-Sr	Biotite from granite at Ouanda Koto	8.30N	23.53E	Cahen and Snelling (1966), cited in Vail (1978)
Central African Republic	600	Rb-Sr	Biotite from gneiss, Quijoux Massif	~8.50N	~22.20E	Cahen and Snelling (1966), cited in Vail (1978)
Congo	708 7	K-Ar	Metamorphic biotite from Katangan mafic rocks			Cosi et al. (1992), cited in Kampunzu and Cailteux (1999)
Egypt	605	Rb-Sr WR	Adamellite from Um Silmann S	22.40N	33.34E	El Shazly et al. (1973), cited in Vail (1978)
Egypt	654	Rb-Sr WR	Rhyolite from J. Abu Swayel	22.50N	33.43E	El Shazly et al. (1973), cited in Vail (1978)
Egypt	665	Rb-Sr WR	Rhyolite from bir Haimur	22.43N	33.46E	El Shazly et al. (1973), cited in Vail (1978)
Egypt	595.9 0.5	Ar-Ar	Muscovite from shear zone associated with core complex	~26N	~34E	Fritz et al. (1996)
Egypt	588.2 0.3	Ar-Ar	Muscovite from shear zone associated with core complex	~26N	~34E	Fritz et al. (1996)
Egypt	614 8	U-Pb	Abu Ziran granite, Meatiq metamorphic core complex	~26N	~34E	Stern and Hedge (1985), cited in Fritz et al. (1996)
Egypt	602 13	Rb-Sr	Dokhar volcanics, interbedded with Hammamat "molasse" sediemnts	~26N	~34E	Ries et al. (1983), cited in Fritz et al. (1996)

Egypt	616 9	Rb-Sr	Dokhar volcanics, interbedded with Hammamat "molasse" sediments	~26N	~34E	Ries et al. (1983), cited in Fritz et al. (1996)
Egypt	585 14	U-Pb	Meatiqu granite	~26N	~34E	Sturchio et al. (1993), cited in Fritz et al. (1996)
Ethiopia	630-690	?	Biotite gneiss and syntectonic granite, Adola-Moyale area	~5N	~39E	Gilboy (1970) and Chater (1971), cited in Berhe (1990)
Mali	616 ±11	U-Pb	Diorite and quartz monzonite, Kidal block, Adrar des floras	~18N	~4E	Black et al. (1979a), cited in Cahen et al. (1984)
Mauritania	638 ±25	Rb-Sr	Mica from Guidimaka granite and granodiorite	~15N	~13E	Sonet and Lille (1968), cited in Cahen et al. (1984)
Mauritania	621 ±62	RbSr	El Kleouat granite in the El Kleouat nappe			Bonhomme (1962), cited in Cahen et al. (1984)
Morocco	615 ±12	U-Pb	Bleida granodiorite	~30.20N	~6.30E	Ducrot and Lancelot (1978), cited in Cahen et al. (1984)
Morocco	610 ±15	U-Pb	Granodiorite, Ourika (High Atlas) region	~31.00N	~8.00W	Juery et al. (1975), cited in Cahen et al. (1984)
Morocco	609 ±13	Rb-Sr	Illoun granite, Ourika region	~29.10N	~10.00W	Charlot (1978), cited in Cahen et al. (1984)
Morocco	662 ±14	Rb-Sr	Granite near Tisserant	~29.00N	~10.00E	Benziane (1974); Yazidi (1976); Charlot (1978), cited in Cahen et al. (1984)
Morocco	609 ±15	Rb-Sr	Trachyte , Ifni inlier	~29.00N	~10.00E	Benziane (1974); Charlot (1978), cited in Cahen et al. (1984)
Morocco	604 ±7	Rb-Sr	Taoulecht granite and rhyolite , Ifni inlier	~29.30N	~9.20E	Benziane (1974); Charlot (1978), cited in Cahen et al. (1984)
Morocco	625 ±21	Rb-Sr	Tarsouat granite, Kherdous inlier	~29.00N	~10.00E	Charlot (1978), cited in Cahen et al. (1984)
Niger	645	U-Pb	Early foliated pluton, Assode terrane, Air Massif			Liegeois et al. (1993)
Niger	600	Rb-Sr	Early foliated pluton, Assode terrane, Air Massif			Liegeois et al. (1993)
Niger	666	Rb-Sr WR	Ranatt anatectic potassic leucogranite, Assode terrane, Air Massif			Liegeois et al. (1993)
Niger	664	U-Pb	Zircon from high level K calc-alkaline pluton (cuts nappe structure) in Barghot terrane, Air Massif			Leigeois et al. (1993)
Nigeria	605 ±10	U-Pb	Granite gneiss	9.2420N 9.2410N	9.1320E 9.1620E	Van Breemen et al. (1977), cited in Cahen et al. (1984)
Nigeria	596 ±6	Rb-Sr	Foliated granite east of Bauchi	10.1710 N 10.1600 N	9.5600E 10.020E	Van Breemen et al. (1977), cited in Cahen et al. (1984)
Nigeria	654 ±22	Rb-Sr	Bauchites and granite from Rahama	10.2440 N	8.4110E	Van Breemen et al. (1977), cited in Cahen et al. (1984)
Nigeria	658 ±22	Rb-Sr	Naiinchi granodiorite	12.52N	6.10E	Ogezi (1977), cited in Cahen et al. (1984)
Rwanda	645 ±10	Rb-Sr	Granite from Kirengo	1.58S	29.37E	Gerards and Ledent (1976), cited in Cahen et al. (1984)
Saudi Arabia	666 ±8	U-Pb	Granodioirte from J. Yahikh	20.47N	43.41E	Cooper et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	664 ±12	U-Pb	Granodiorite from Markas	18.59N	43.47E	Cooper et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	663 ±9	U-Pb	Granodiorite from Wadi Atf	17.41N	43.03E	Cooper et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	660 ±7	U-Pb	Granodiorite from Wadi Tarib	18.15N	43.18E	Cooper et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	626 ±17	Rb-Sr	Tindaha post-orogenic pluton	18.20N	42.53E	Fleck et al.(1979), cited in Cahen et al. (1984)
Saudi Arabia	636 ±21	Rb-Sr	Wadi Shuwas post- orogenic pluton	20.00N	41.53E	Fleck et al.(1979), cited in Cahen et al. (1984)
Saudi Arabia	614 ±13	Rb-Sr	Jabal Qui, J. Barkouk, and J. Ayu post-orogenic pluton	18.44N	42.08E	Fleck et al. (1979), cited in Cahen et al. (1984)
Saudi Arabia	623 ±18	Rb-Sr	Wadi Musayrah post-orogenic pluton	20.17N	43E	Fleck et al.(1979), cited in Cahen et al. (1984)
Saudi Arabia	618 ±12	Rb-Sr	J. at Tuwalah peralkalic post-orogenic pluton	25.30N	41E	Baubron et al. (1976), cited in Cahen et al. (1984)

Saudi Arabia	598 ±58	Rb-Sr	Yanufi post-orogenic pluton	23.27N	43.04E	Baubron et al. (1976), cited in Cahen et al. (1984)
Saudi Arabia	657 ±13	Rb-Sr	Sabkhra al Khalpost-orogenic pluton	23.12N	42.00E	Baubron et al. (1976), cited in Cahen et al. (1984)
Saudi Arabia	643 ±20	Rb-Sr	Wadi Halal post-orogenic pluton	17.36N	43.49E	Baubron et al. (1976), cited in Cahen et al. (1984)
Saudi Arabia	680-640	?	Movement on Al Amar suture			Stoeser and Stacy (1988), cited in Abdelsalam and Stern (1996)
Somalia	~630	?	Granodiorite, NE Somolia			Lenoir et al. (1993)
Somalia	~600	?	Granodiorite, southern Somalia			Lenoir et al. (1993)
Sudan	660	K-Ar WR	Lamprophyre, Erkowit B.	18.50N	37.13E	Brook and Rundel (1974), cited in Vail (1978)
Tanzania	633 ±7	Sm-Nd	Meta-anorthosite from Uluguru Mountains; cooling age	~7.05S	~37.35E	Maboko and Nakamura (1995)
Tanzania	618 ±16	Sm-Nd	Granulite cooling age, Uluguru mountains	~7.05S	~37.35E	Maboko and Nakamura (1995)
Tanzania	652 ±10	U-Pb	Zircon from Furua granulites	~9S	~36.30E	Coolen et al. (1982), cited in Maboko and Nakamura (1995)
Tanzania	597 ±10	U-Pb	Uraninite from mica pegmatite, Uluguru Mountains			Cahen and Snelling (1966), cited in Cahen et al. (1984)
Tanzania	611 ±10	Pb-Pb	?			Cahen and Snelling (1966), cited in Cahen et al. (1984)
Uganda	635 ±30	U-Pb	Zircon in gneiss from Labwor Hills	2.45N	33.40E	Leggo (1974), cited in Vail (1978)
Uganda	650 ±25	K-Ar	Biotite from gneiss from Gulu-Kitgum area	2.59N	32.38E	Cahen and Snelling (1966), cited in Vail (1978)
Uganda	660	K-Ar	Biotite from charnockite near Okollo	2.41N	31.09E	Cahen and Snelling (1966), cited in Vail (1978)

Cambrian-Ordovician 590-438 Ma (Figure 11)

Country	Age	Type	Rock Type	Lat	Long	Reference
Algeria	575 ±12	Rb-Sr	Tioueline post- tectonic granite	~24.50N	~3.45E	Boissannas et al. (1969), cited in Cahen et al. (1984)
Algeria	572 ±72	Rb-Sr	Oued Aha'n'Souri granodioirte-diorite complex	~23.35N	~6.35E	Boissannas et al. (1969), cited in Cahen et al. (1984)
Algeria	585 ±14	U-Pb	Post- tectonic granite in Adaf pluton complex	~23.50N	~8.30E	Bertrand et al. (1975), cited in Cahen et al. (1984)
Algeria	580 ±5	Rb-Sr	Tisselliline post- tectonic granite, Gour Oumelalen region	~24.55N	~7.15E	Latouche and Vidal (1974), cited in Cahen et al. (1984)
Algeria	550 ±7	Rb-Sr	Teferkit biotite-muscovite post- tectonic granite	~24.10N	~5.15E	Data from Vialette and Vitel (1979), recalculated by Cahen et al. (1984)
Algeria	514 ±8	Rb-Sr	In Akoulmou calc-alkaline granite	~24.20N	~5.40E	Data from Vialette and Vitel (1979), recalculated by Cahen et al. (1984)
Algeria	538 ±30	Rb-Sr	Zize rhyolite	~23.30N	~2.30E	Picciotto et al. (1965), cited in Cahen et al. (1984)
Algeria	588 ±18	Rb-Sr	Muscovite from pegmatite, Tesnou area, Hoggar	~24.30N	~4.00E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	546 ±30	K-Ar	Muscovite	~24.30N	~4.00E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	541 ±28	Rb-Sr	Biotite schleiren, from Tin-Akkar area, Hoggar	~24.10N	~4.00E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	592 ±10	Rb-Sr	Microgranite, Iskel area, Hoggar			Boissonnas et al. (1969), cited in Cahen et al. (1984)
Algeria	575 ±12	Rb-Sr	Granite and quartz- syenite, Tioueline area, Hoggar			Boissonnas et al. (1969), cited in Cahen et al. (1984)
Algeria	538 ±20	Rb-Sr	Peralkaline granite, Adjemamaye area, Hoggar			Boissonnas et al. (1970), cited in Cahen et al. (1984)
Algeria	490 ±25	K-Ar	Muscovite greissen, Taessa area, Hoggar	~22.40N	~4.50E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	478 ±25	K-Ar	Biotite from pegmatite, Aheleheg area, Hoggar	~22.30N	~5.30E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	588 ±18	Rb-Sr	Muscovite from pegmatite, In Tounine area, Hoggar	~22.30N	~5E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	533 ±25	Rb-Sr	Biotite from pegmatite, In Tounine area, Hoggar	~22.30N	~5E	Boissonnas (1974), cited in Cahen et al. (1984)

Algeria	494 ±25	K-Ar	Biotite from pegmatite, In Tounine area, Hoggar	~22.30N	~5E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	530 ±30	K-Ar	Biotite from pegmatite, Renaissance area, Hoggar	~21N	~5E	Boissonnas (1974), cited in Cahen et al. (1984)
Algeria	530 ±30	K-Ar	Lithium mica from pegmatitle, Ouan-Rechla area, Hoggar	~4.30N	~20.30E	Boissonnas (1974), cited in Cahen et al. (1984)
Angola	540 ±15	Rb-Sr	Granulite	~16.30S	~12.30E	Torquato (1974a), cited in Cahen et al. (1984)
Angola	509 ±26	Rb-Sr	Alkalic granite	~16.30S	~12.30E	Torquato (1974a), cited in Cahen et al. (1984)
Angola	592 ±9	Rb-Sr	Granite and gneiss	~16.30S	~12.30E	Torquato and Allsopp (1973), cited in Cahen et al. (1984)
Benin	586 ±8	Rb-Sr	Sinende, Save, and Fita granites	~8N	~2.30E	Vachette (1975), cited in Cahen et al. (1984)
Benin	540	K-Ar	"Basement" gneiss and granite	~11.10N	~2.50E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	524	K-Ar	"Basement" gneiss and granite	~10.20N	~2.10E	No reference; date on map page 364, Cahen et al. (1984)
Benin	525	K-Ar	"Basement" gneiss and granite	~10.10N	~2.20E	No reference; date on map on page on 364, Cahen et al. (1984)
Benin	541	K-Ar	"Basement" gneiss and granite	~9.45N	~1.40E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	533	K-Ar	"Basement" gneiss and granite	~9.25N	~2.10E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	524	K-Ar	"Basement" gneiss and granite	~8.05N	~2.20E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	528	K-Ar	"Basement" gneiss and granite	~8.03N	~2.15E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	522	K-Ar	"Basement" gneiss and granite	~7.45N	~2.10E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	520	K-Ar	"Basement" gneiss and granite	~7.15N	~1.55E	No reference; date on map on page 364, Cahen et al. (1984)
Benin	517	K-Ar	"Basement" gneiss and granite	~10.05N	~2.25E	No reference; date on map on page 364, Cahen et al. (1984)
Cameroon	516 ±8	Rb-Sr	Nyibi leucocratic calc-alkaline granite	6.27N	14.50E	Lasserre and Soba (1976b), cited in Cahen et al. (1984)
Cameroon	562 ±10	Rb-Sr	Kongolo hololeucocratic alkaline granite	6.00N	14.00E	Lasserre and Soba (1976b), cited in Cahen et al. (1984)
Cameroon	565 ±22	Rb-Sr	Migmatite near Yaounde			Lasserre and Soba (1976b), cited in Cahen et al. (1984)
Cameroon	557 ±17	Pb-Pb	Viamba granite, Rei Bouba area	~8.30N	~14.00E	Pinna et al. (1993)
Cameroon	568 ±57	Rb-Sr	Viamba granite, Rei Bouba area	~8.30N	~14.00E	Pinna et al. (1993)
Congo	625 ±25	Rb-Sr	Vista Alegre granite near Boma	~5.50S	~13.00E	Cahen et al. (1979), cited in Cahen et al. (1984)
Congo	536 ±10	Rb-Sr	Noqui granite, WR, 6 pt	~5.52S	~13.26E	Cahen et al. (1979), cited in Cahen et al. (1984)
Congo	599 ±15	Rb-Sr	Migmatite at Boma	~5.50S	~13.00E	Dalhal and Ledent (1976), cited in Cahen et al. (1984)
Congo	530 ±12	Pb-Pb	Mpozo metarhyolite, Matadi area	~5.50S	~13.25E	Dalhal and Ledent (1976), cited in Cahen et al. (1984)
Congo	502 ±9	Rb-Sr	Syenite, Matadi area	~5.50S	~13.25E	Dalhal and Ledent (1976), cited in Cahen et al. (1984)
Central African Republic	550	Rb-Sr	Biotite from granite, Ouandja-Djalle area	~8.54N	~22.48E	Cahen and Snelling (1966), cited in Vail (1978)
Central African Republic	560	Rb-Sr	Biotite from granite; Djalle Massif	~9.20N	~23.00E	Cahen and Snelling (1966), cited in Vail (1978)
Egypt	580 ±23	Rb-Sr	Iqna granite	28.52N	33.42E	Steinitz (1977), cited in Cahen et al. (1984)
Egypt	576 ±7	Rb-Sr	Givat Shachmit granite	28.58N	33.43E	Halpern (1980), cited in Cahen et al. (1984)
Egypt	576 ±54	Rb-Sr	Wadi Selh porphyritic rhyolite	28.58N	33.35E	Halpern (1980), cited in Cahen et al. (1984)
Egypt	596 ±27	Rb-Sr	Two rhyolites and a granite	29.13N	34.44E	Halpern (1980), cited in Cahen et al. (1984)
Egypt	576 ±15	Rb-Sr	Aswan Red Graite	~23N	~34E	Recalculation of data of Hashad et al. (1972) and Leggo (1968) by Cahen et al. (1984)

Egypt	Ca 565	U-Pb Pb-Pb	Aswan Red Graite	~23N	~34E	Abdel-Monem and Hurley (1978), cited in Cahen et al. (1984)
Ethiopia	555-500	?	Post-tectonic granitoids in the Adola-Moyale area			Gilboy (1970) and Chater (1971), cited in Berhe (1990)
Libya	586 ±23	K-Ar or Rb-Sr	Granite and adamellite, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Ghuma and Rogers (1976), cited in Cahen et al. (1984)
Libya	556 ±7	K-Ar or Rb-Sr	Granodiorite and gabbro, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Ghuma and Rogers (1976), cited in Cahen et al. (1984)
Libya	550 ±11	Rb-Sr	Granite, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Ghuma (1978), cited in Cahen et al. (1984)
Libya	534 ±21	Rb-Sr	Granite, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Pegram et al. (1976), cited in Cahen et al. (1984)
Libya	573 ±18	Rb-Sr	Granite and gabbro, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Pegram et al. (1976), cited in Cahen et al. (1984)
Libya	522 ±3	Rb-Sr	Pegmatite, Ben Ghnema batholith, northern Tibesti Mountains	~23.30N	~15.30E	Pegram et al. (1976), cited in Cahen et al. (1984)
Libya	544 ±25	K-Ar	Metasediments, Sarir oilfield well	~23.30N	~17.00E	Shackleton and Grant (1974), cited in Cahen et al. (1984)
Libya	568 ±22	K-Ar	Biotite from granite and adamellite, Sarir oilfield well	~23.30N	~17.00E	Shackleton and Grant (1974), cited in Cahen et al. (1984)
Malawi	489 ±7	Rb-Sr	Syenite	13.47S	34.26E	Darbyshire, in personal communication with Cahen et al. (1984) in 1979
Mali	586 ±13	U-Pb	Alkaline granite from the Kidal ring complex	~18N	~4E	Black et al. (1979a), cited in Cahen et al. (1984)
Morocco	578 ±15	U-Pb	Bou Ourhioul rhyolite of the Ouarzazate group	~31.00N	~7.40W	Juery et al. (1974), cited in Cahen et al. (1984)
Morocco	563 ±20	U-Pb	Meltsen granite	~31.00N	~7.40W	Juery et al. (1974), cited in Cahen et al. (1984)
Morocco	534 ±10	U-Pb on zircon	Jbel Boho syenite	~30.20N	~6.30W	Ducrot, Leblanc, and Lancelot (1976); Ducot and Lancelto (1977), cited in Cahen et al. (1984)
Morocco	560 ±9	Rb-Sr	Tiyourzha granite, Ifni inlier	~30.00N	~8.30W	Benziane (1974), Charlot (1978), cited in Cahen et al. (1984)
Morocco	549 ±10	Rb-Sr	Tafraout granite of the Kerdous inlier	~30.00N	~8.30W	Charlot (1978), cited in Cahen et al. (1984)
Morocco	556 ±12	Rb-Sr	Agouni Yessine granite	~30.00N	~8.30W	Charlot (1978), cited in Cahen et al. (1984)
Namibia	521 ±6	Rb-Sr	Donkerhoek batholith	22.39S	15.48E	Blaine (1977), cited in Cahen et al. (1984)
Namibia	505 ±11	Rb-Sr	Donkerhoek batholith at Davetsaub Gorge	22.24S	16.12E	Blaine (1977), cited in Cahen et al. (1984)
Namibia	525 ±25	Rb-Sr	Donkerhoek batholith at Nomatsaus	21.21S	16.15E	Blaine (1977), cited in Cahen et al. (1984)
Namibia	515 ±45	Rb-Sr	Granite in Goas	22.17S	15.50E	Blaxland et al. (1979), cited in Cahen et al. (1984)
Namibia	572 ±20	Rb-Sr	Salem granodiorite	21.21S	15.24E	Haak, Gohn, and Klein (1980), cited in Cahen et al. (1984)
Namibia	572 ±15	Rb-Sr	Okombahe granodiorite	20.40S	14.30E	Kröner (1979a) and in personal communication with Cahen et. al. (1984) in 1979
Namibia	479 ±26	Rb-Sr	Baukwab quartz- monzonite	21.15S	15.21E	Haack et al. (1980), cited in Cahen et al. (1984)
Namibia	473 ±41	Rb-Sr	Granite	21.06S	15.20E	Haack et al. (1980), cited in Cahen et al. (1984)
Namibia	479 462 3126	Rb-Sr	Omaruru Kalkfeld quartz-monzonite	20.58S	16.07E	Haack et al. (1980), cited in Cahen et al. (1984)
Namibia	510-455	Rb-Sr	Rössing Uranium Mine			Kröner (1982), cited in Bowden et al. (1993)
Namibia	542 ±8	Rb-Sr	Leucogranite, Ida dome			Miller (1983), cited in Bowden et al. (1993)
Namibia	521 ±6	U-Pb	Zircon from syenite from post-Nama Kuboos Complex	~18.30S	~16.50E	Allsopp et al. (1979), cited in Goodwin (1991)

Niger	487 5	Rb-Sr	Granite, Adrar Bouss, Air	~20.10N	~9.00E	Karche and Vachette (1976), cited in Cahen et al. (1984)
Niger	420 4	Rb-Sr	Granite, Adrar Bouss, Air	~20.10N	~9.00E	Bowden et al. (1976), cited in Cahen et al. (1984)
Niger	460 12	Rb-Sr	Granite, Tamgak, Air	~19N	~8.30E	Karche and Vachette (1976), cited in Cahen et al. (1984)
Niger	431 7	Rb-Sr	Granite, Agalak, Air	~18N	~8.30E	Karche and Vachette (1976), cited in Cahen et al. (1984)
Niger	427 19	Rb-Sr	Granite, Iskou, Air	~18N	~8.30E	Karche and Vachette (1976), cited in Cahen et al. (1984)
Niger	421 15	Rb-Sr	Granite, Enfoud, Air	~18.30N	~9E	Bowden et al. (1976), cited in Cahen et al. (1984)
Niger	440 19	K-Ar	Sanidine from basic tuff, Bilete, Air	~17 N	~8E	Bonhomme and Pacquet (1977), cited in Cahen et al. (1984)
Niger	422 10	K-Ar	Biotite from granite, Guissat, Air	~17.30N	~8E	Bonhomme and Pacquet (1977), cited in Cahen et al. (1984)
Nigeria	523 ±10	Rb-Sr	Granite and aplite from Kusheriki granite	10.3355 N	6.2555E	Grant (1979) and Hurley et al. (1966), cited in Cahen et al. (1984)
Nigeria	504	K-Ar	"Basement" gneiss and granite	~7.15N	~3.15E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	487 to 578	K-Ar	"Basement" gneiss and granite	~7.30N	~4.00E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	528	K-Ar	"Basement" gneiss and granite	~8.20N	~5.30E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	462 to 539	K-Ar	"Basement" gneiss and granite	~8.40N	~5.30E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	550	K-Ar	"Basement" gneiss and granite	~10.15N	~6.10E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	519	K-Ar	"Basement" gneiss and granite	~10.00N	~9.25E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	539 to 544	K-Ar	"Basement" gneiss and granite	~10.15N	~9.45E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	504	K-Ar	"Basement" gneiss and granite	~10.50N	~5.25E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	524 to 560	K-Ar	"Basement" gneiss and granite	~11.50N	~6.57E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	542	K-Ar	"Basement" gneiss and granite	~11.25N	~7.30E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	550	K-Ar	"Basement" gneiss and granite	~11.20N	~7.30E	No reference; date on map on page 364, Cahen et al. (1984)
Nigeria	540 ±36	?	Pyroxene granite from Katsina ala	~7N	~10E	Umeji and Caen-Vachette (1984), cited in Ekwueme and Caen-Vachette (1992)
Nigeria	547 ±37	?	Granite from Jkur Gboko	~7N	~10E	Umeji and Caen-Vachette (1984), cited in Ekwueme and Caen-Vachette (1992)
Sierra Leone	560 ±10	K-Ar	Muscovite from mica schist, Marampa Group	~8.40N	~12.30W	Beckinsale et al. (1981), cited in Cahen et al. (1984)
Sierra Leone	562 ±15	K-Ar	Muscovite from mica schist, Marampa Group	~8.40N	~12.30W	Beckinsale et al. (1981), cited in Cahen et al. (1984)
Sierra Leone	539 ±10	K-Ar	Biotite from tectonized bioitite-epidote gneiss, Kenema assemblage	~8.40N	~12.30W	Beckinsale et al. (1981), cited in Cahen et al. (1984)
Sierra Leone	585 ±10	K-Ar	Biotite from sheared tonalite gneiss, Kenema assemblage	8.40N	12.30E	Beckinsale et al. (1981), cited in Cahen et al. (1984)
South Africa	525 ±60	Rb-Sr	Kuboos Complex	28.30S	17.00E	Allsopp et al. (1979) cited in Cahen et al. (1984)
South Africa	582 ±35	Rb-Sr	Kuboos Complex	29.00S	17.05E	Allsopp et al. (1979) cited in Cahen et al. (1984)
South Africa	541 ±8	Rb-Sr	Cape granite	~34S	~18E	Allsopp and Kolbe (1965), cited in Cahen et al. (1984)
South Africa	585 ±20	Pb-Pb	Cape granite	~34S	~18E	Schooch, Leygonie, and Burger (1975) cited in Cahen et al. (1984)
South Africa	516 ±15	Pb-Pb	Cape granite	~34S	~18E	Schooch, Leygonie, and Burger (1975) cited in Cahen et al. (1984)
South Africa	508 ±15	Pb-Pb	Cape granite	~34S	~18E	Schooch and Burger (1976) cited in Cahen et al. (1984)
Saudi Arabia	574 ±5	Rb-Sr	J. Khanzir calc-alkalic late pluton	23.08N	43.51E	Baubron et al. (1976), cited in Cahen et al. (1984)

Saudi Arabia	572 ±10	Rb-Sr	J. ar Rahadah calc-alkalic late pluton	25.41N	41.34E	Baubron et al. (1976), cited in Cahen et al. (1984)
Saudi Arabia	589 ±9	Rb-Sr	J. Bidayah peralkalic late pluton	25.05N	41.12E	Baubron et al. (1976), cited in Cahen et al. (1984)
Sudan	514 ±20	K-Ar	Biotite from granite gneiss at J. Qurien	13.32N	34.47E	Vail and Rex (1971), cited by Vail (1978)
Sudan	528 ±25	K-Ar	Hornblende from amphibolite at J. Hamlab	17.51N	36.08E	Vail and Rex (1971), cited by Vail (1978)
Sudan	530	K-Ar WR	Alkali granite at J. Umm Arad	21.15N	36.14E	Technoexport (1974), cited by Vail (1978)
Sudan	533 ±20	K-Ar	Mica from gneiss	16.10N	32.50E	Vail and Rex (1971), cited by Vail (1978)
Sudan	540	K-Ar WR	Granite at Bau	11.20N	34.04E	Vail and Rex (1971), cited by Vail (1978)
Sudan	545 ±54	Rb-Sr WR	Granite in Red Sea Hills	21.52N 22.00N	36.09E 36.12E	Gass and Neary (1970), in written comm. With Vail in Nov 1974, cited by Vail (1978)
Sudan	560 ±22	K-Ar	Biotite from gneiss at J. Waranja	9.24N	24.05E	Vail and Rex (1971), cited by Vail (1978)
Sudan	570	K-Ar	Biotite schist from Tohamiyau	18.20N	36.32E	Vail and Rex (1971), cited by Vail (1978)
Sudan	448	K-Ar	Biotite from granite gneiss at Burgwad Bilal	15.56	28.22	Vail and Rex (1971), cited in Vail (1978)
Sudan	490	K-Ar	Biotite from granite gneiss at Idd Abu Sufyan	15.30	27.52	Vail and Rex (1971), cited in Vail (1978)
Tanzania	577 30	Rb-Sr	Biotite from Uluguru Mountains			Muhongo (1990), cited in Muhongo (1994)
Tanzania	563 3	Rb-Sr	Biotite from Uluguru Mountains			Muhongo (1990), cited in Muhongo (1994)
Tanzania	550 10	Rb-Sr	Biotite from Uluguru Mountains			Muhongo (1990), cited in Muhongo (1994)
Uganda	515 ±18	K-Ar	Biotite from granite dyke, Kaabong	3.31N	34.09E	Cahen and Snelling (1966), cited in Vail (1978)
Uganda	540 ±20	K-Ar	Biotite from granulite, Obongya River	3.30N	32.35E	Cahen and Snelling (1966), cited in Vail (1978)
Uganda	540 ±20	K-Ar	Fuchsite from gneiss, Kango Hill	2.36N	30.51E	Cahen and Snelling (1966), cited in Vail (1978)
Uganda	565 ±20	Rb-Sr WR	Granite dyke, Kaabong	3.35N	34.07E	Cahen and Snelling (1966), cited in Vail (1978)
Uganda	575 ±20	K-Ar	Boitite from pyroxene gneiss, Nakothongwan	3.39N	34.04E	Cahen and Snelling (1966), cited in Vail (1978)
Zambia	539 ±20	Rb-Sr	3 pt whole-rock isochron from gneiss? near Lusaka			Barr et al. (1978), cited in Cahen et al. (1984)
Zambia	557 ±4	K-Ar	Average of 4 K -Ar ages on gneiss (?) near Lusaka			Snelling et al. (1972), and Barr et al. (1978), averaged in Cahen et al. (1984)
Zambia	497	U-Pb	Pegmatite near Lundazi	12.15S	33.00E	Snelling et al. (1972), cited in Cahen et al. (1984)
Zambia	570 to 530	?	Hook granite massif			Hanson et al. (1993), cited in Kamona (1994)

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