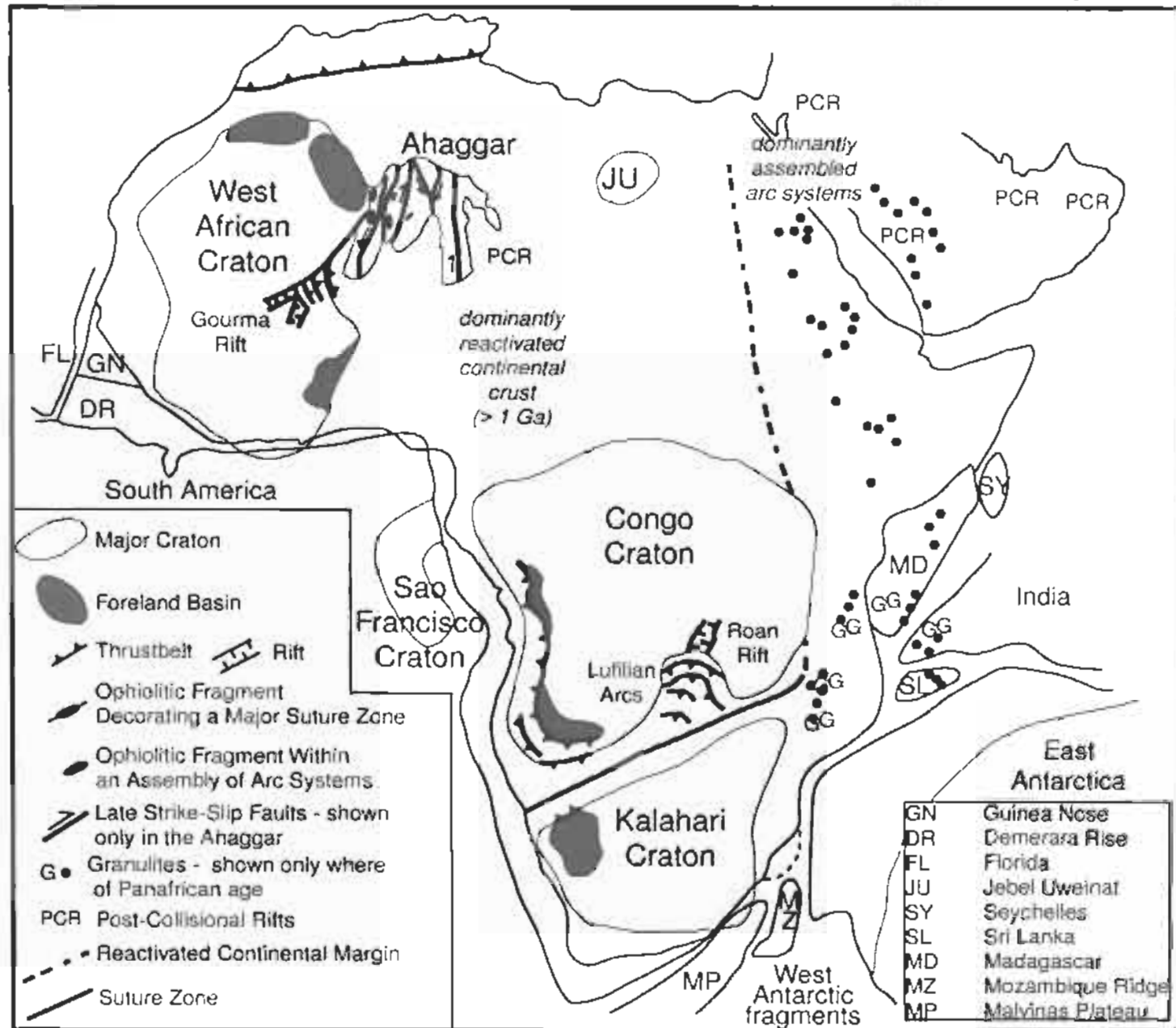


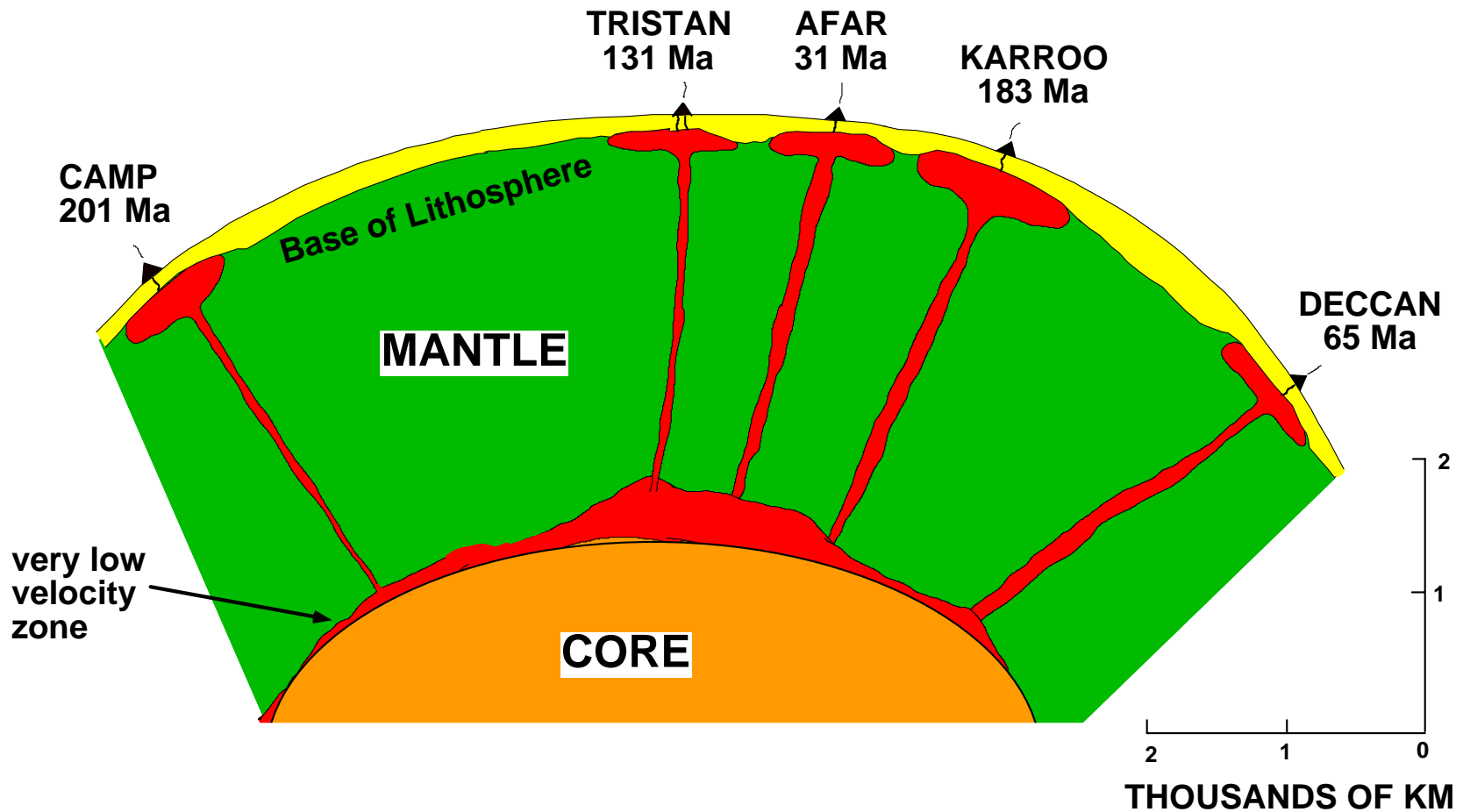
600 Million Years of African Geology

- Effects of Continental Collisions dominant from 600 Ma to 200 Ma: Panafrican, Laurussian and Pangean assemblies
- Those of Mantle Plumes dominant since 200 Ma.



Panafrican Tectonic Elements

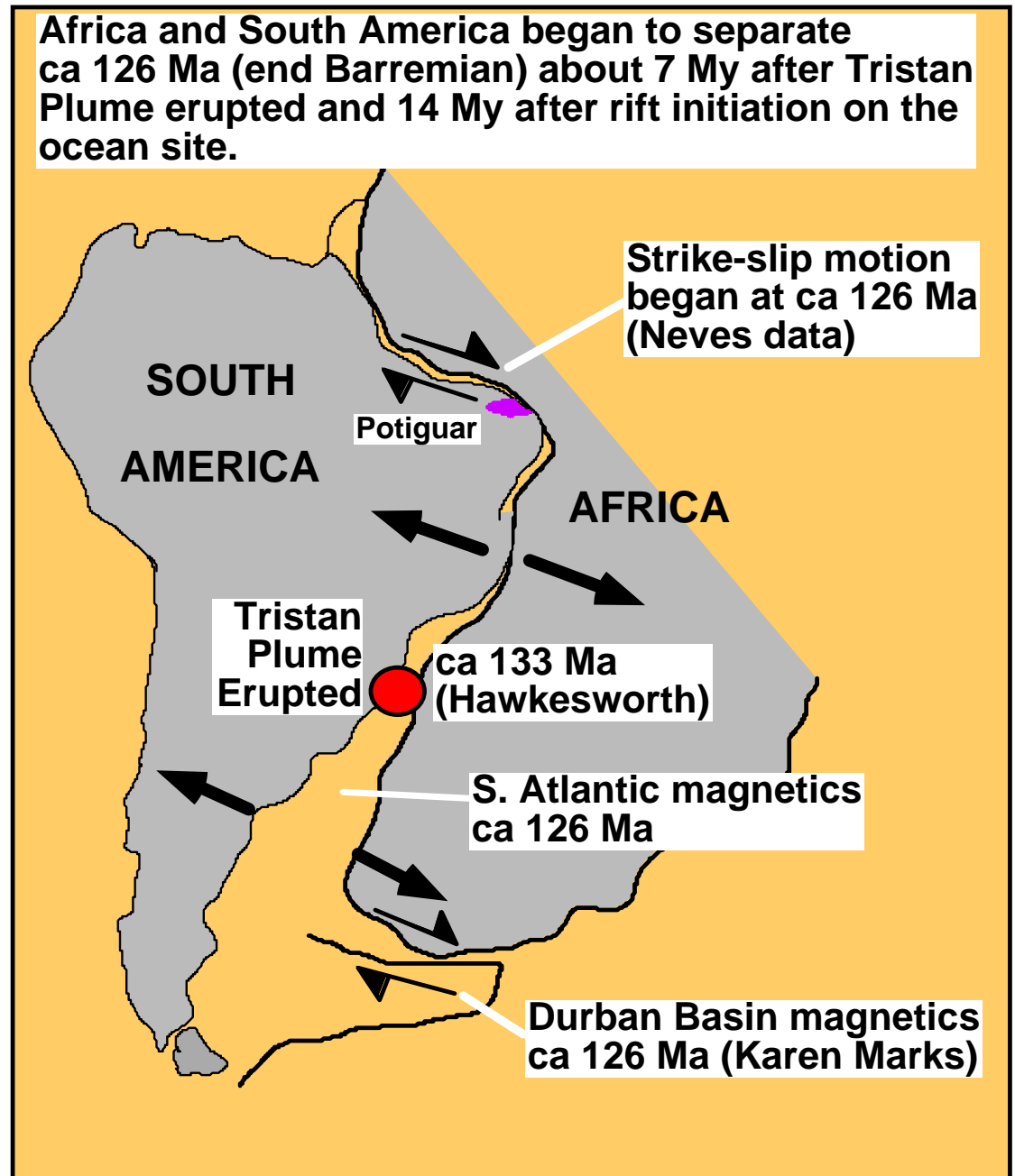


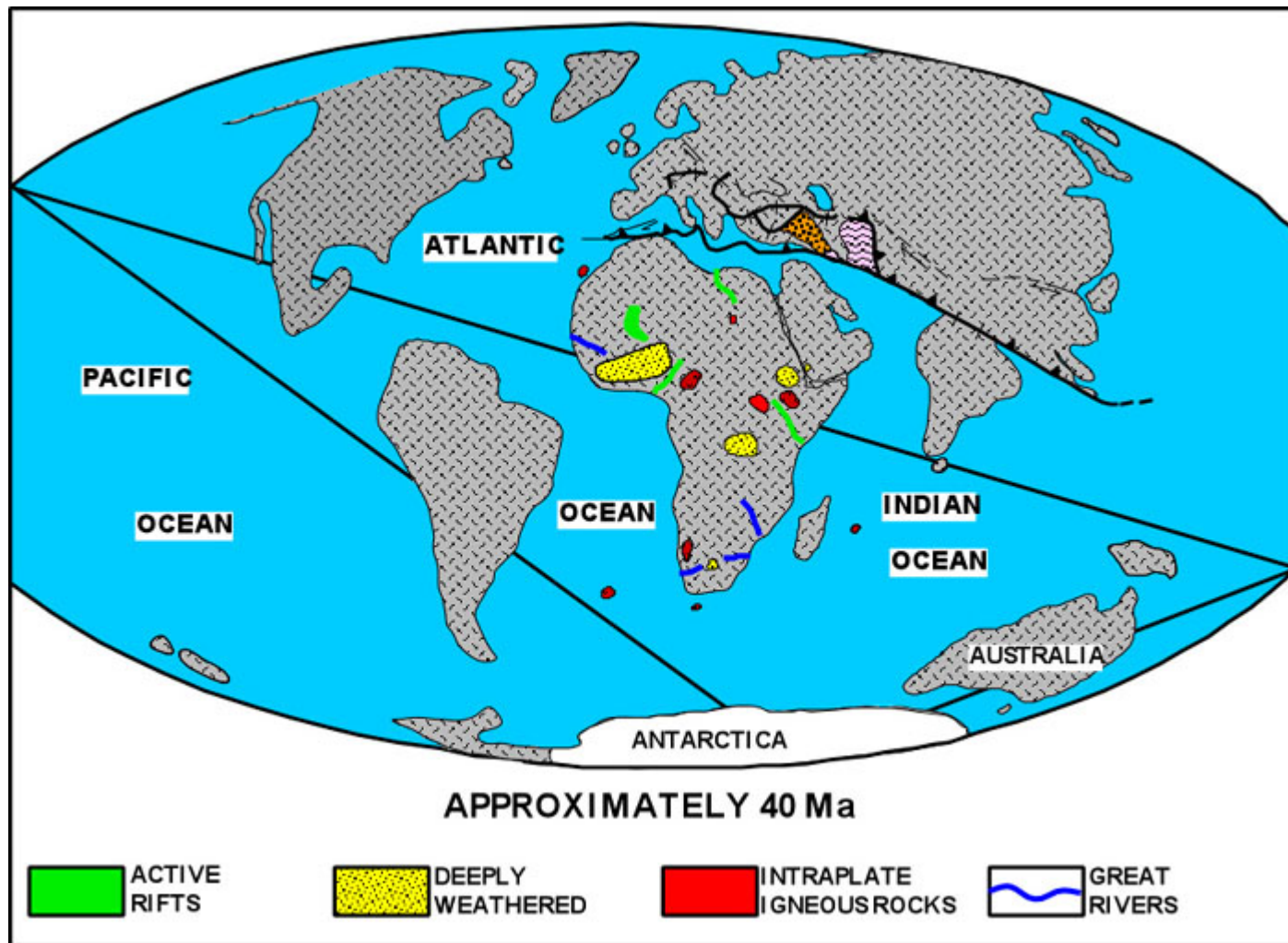


FIVE GIANT PLUMES THAT IMPINGED ON THE BASE OF THE LITHOSPHERE IN THE AFRICAN REGION. KARROO PINNED THE LITHOSPHERE FROM 180-130 Ma AND AFAR FROM 30-5 Ma. BASINS, SWELLS AND RIFTS THAT FORMED DURING THE TWO EPISODES OF ARREST WERE CRITICAL TO OIL AND GAS DEVELOPMENT.

OLDEST SOUTH ATLANTIC OCEAN FLOOR:

- M11 (131Ma ?)
Off Durban
- *M4 (126 Ma ?)
Off Namibia
- 3 anomalies strike obliquely into the shore between the Cape and the Walvis Ridge.
- *Oldest Marine faunas Ca.126 Ma.
- *Subaerial ocean floor formed north of the Walvis ridge: No Magnetic anomalies and No marine faunas





End of a quiet time for Afro-Arabia
 Igneous activity integrated for the 65-35 Ma interval

Image courtesy of The Geological Society of South Africa.

CONTROLS ON AFRICAN CHANGE DURING THE PAST 34 MILLION YEARS

East Antarctic Ice Sheet: 34 Ma to now

West Antarctic and Greenland Ice Sheets: 14 Ma to now

Sea Level lowered at 34 Ma again at 14 Ma

Many Submarine Canyons initiated at 34 Ma

Pinning by Afar plume 31 Ma

Shallow Mantle convection set up 31 Ma). Persists today

Basins and Swells developing over shallow
convection pattern from 31 Ma till now

Parts of Eastern Rift active 31 Ma till now

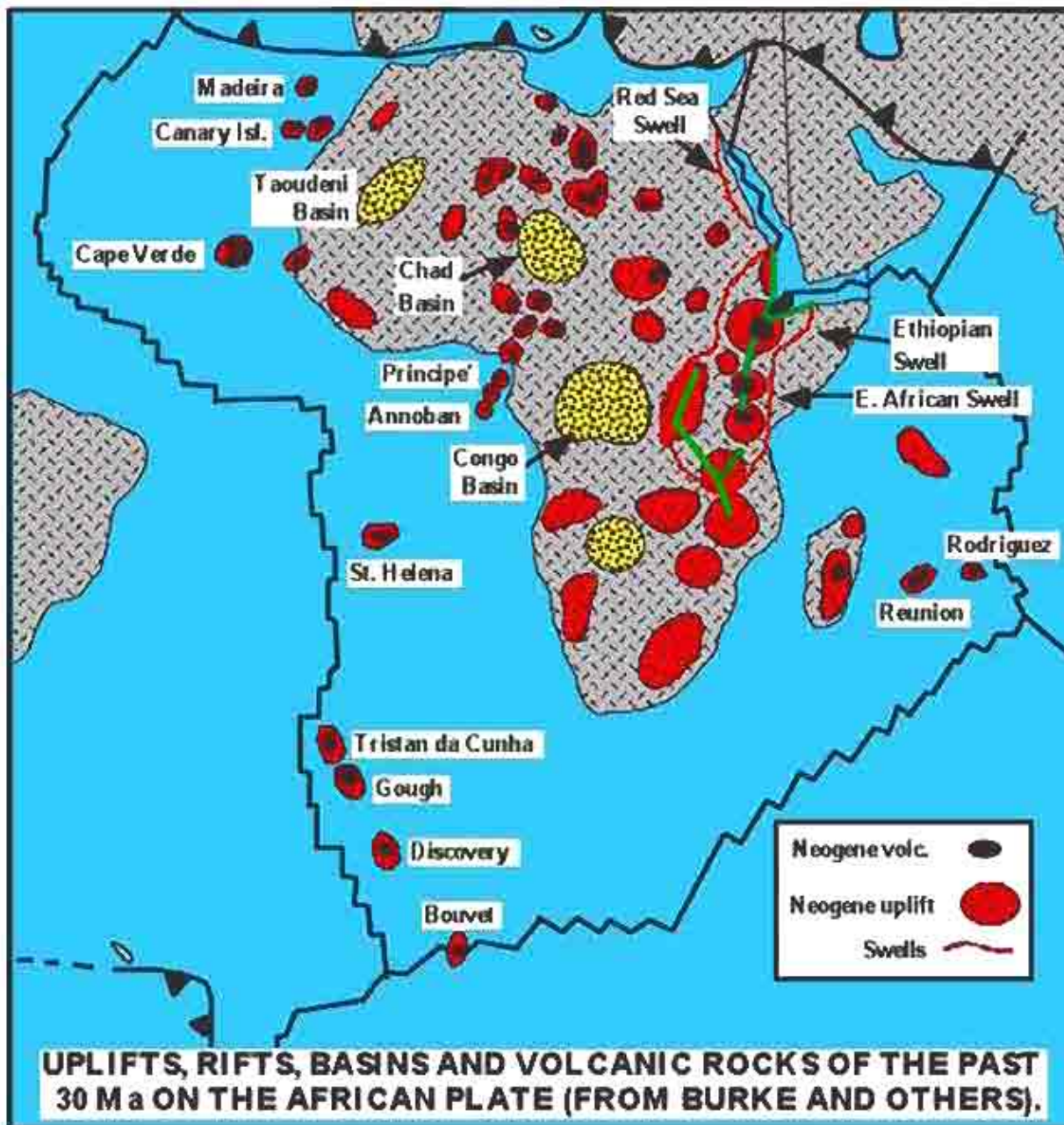
Zagros collision at 15 Ma

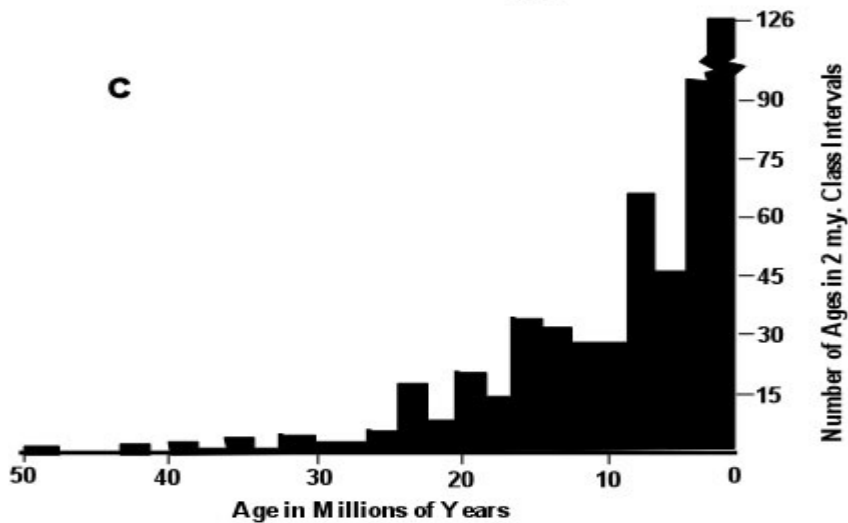
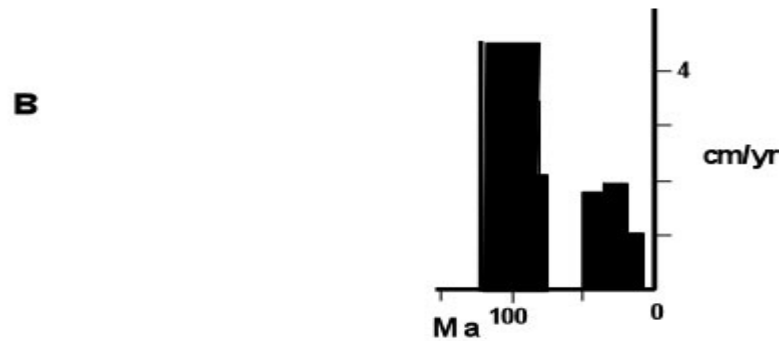
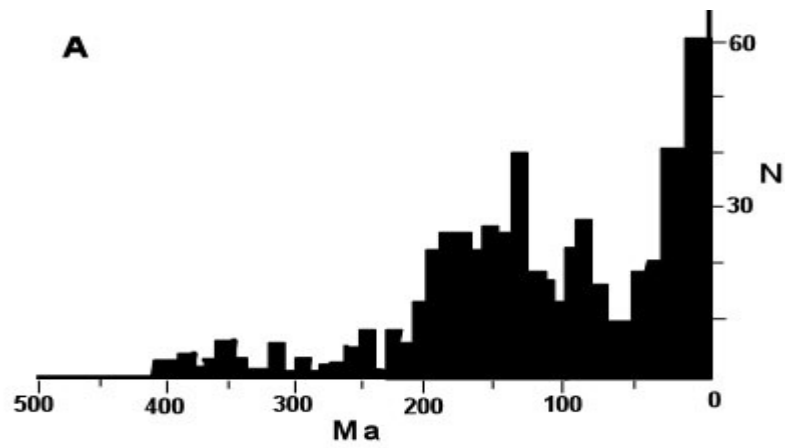
Western Rift active from 15 Ma till now

Arabia-Somali-Nubia plates distinct beginning ca 15 Ma

Climate changes: 34 Ma, 14 Ma. Indian ocean monsoon.

Oscillations since 3 Ma (Sahara) linked to northern
hemisphere glaciations





Published ages of igneous rocks on the African Continent showing an increase in activity at ca. 30 million years ago

Image courtesy of The Geological Society of South Africa.

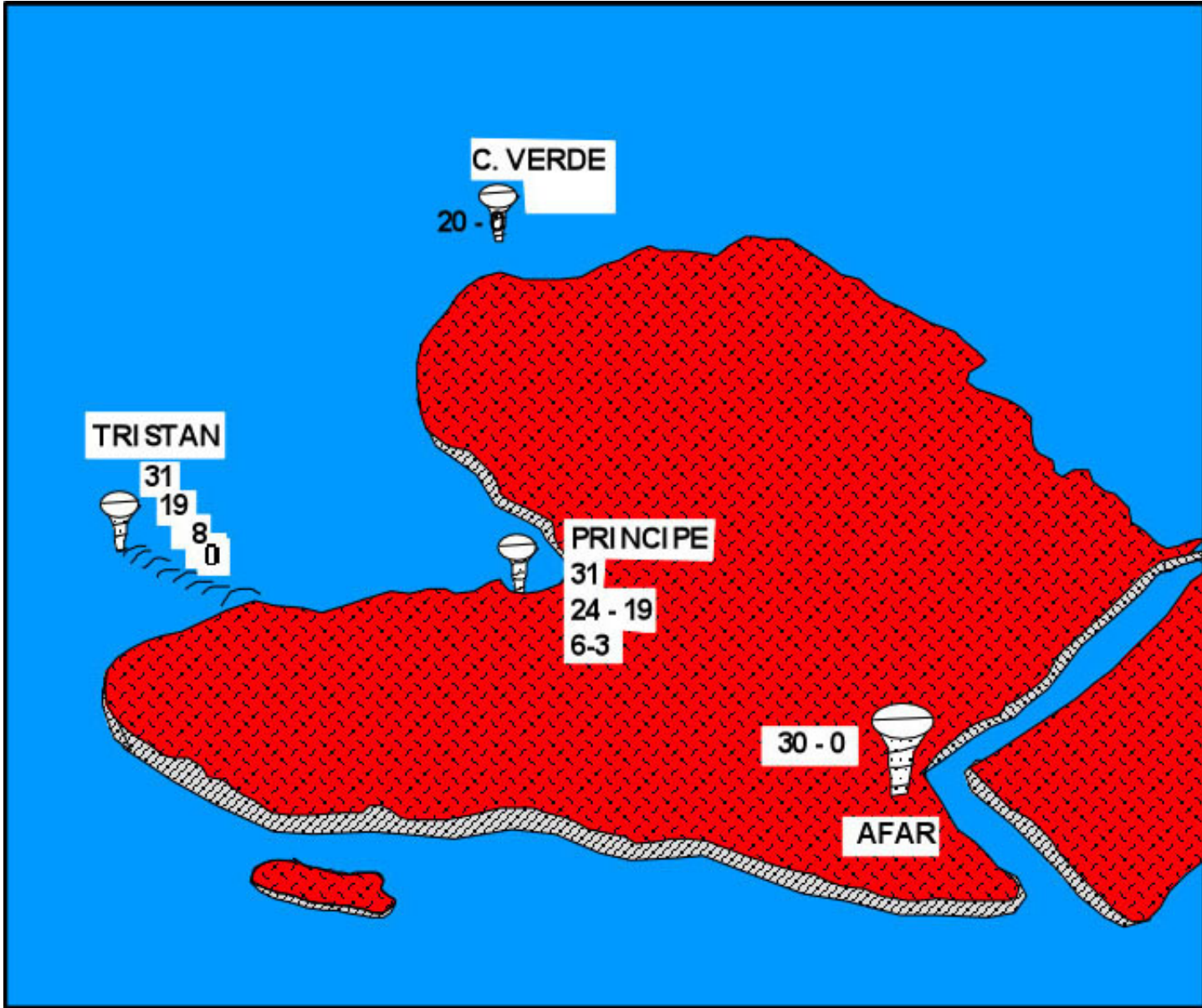
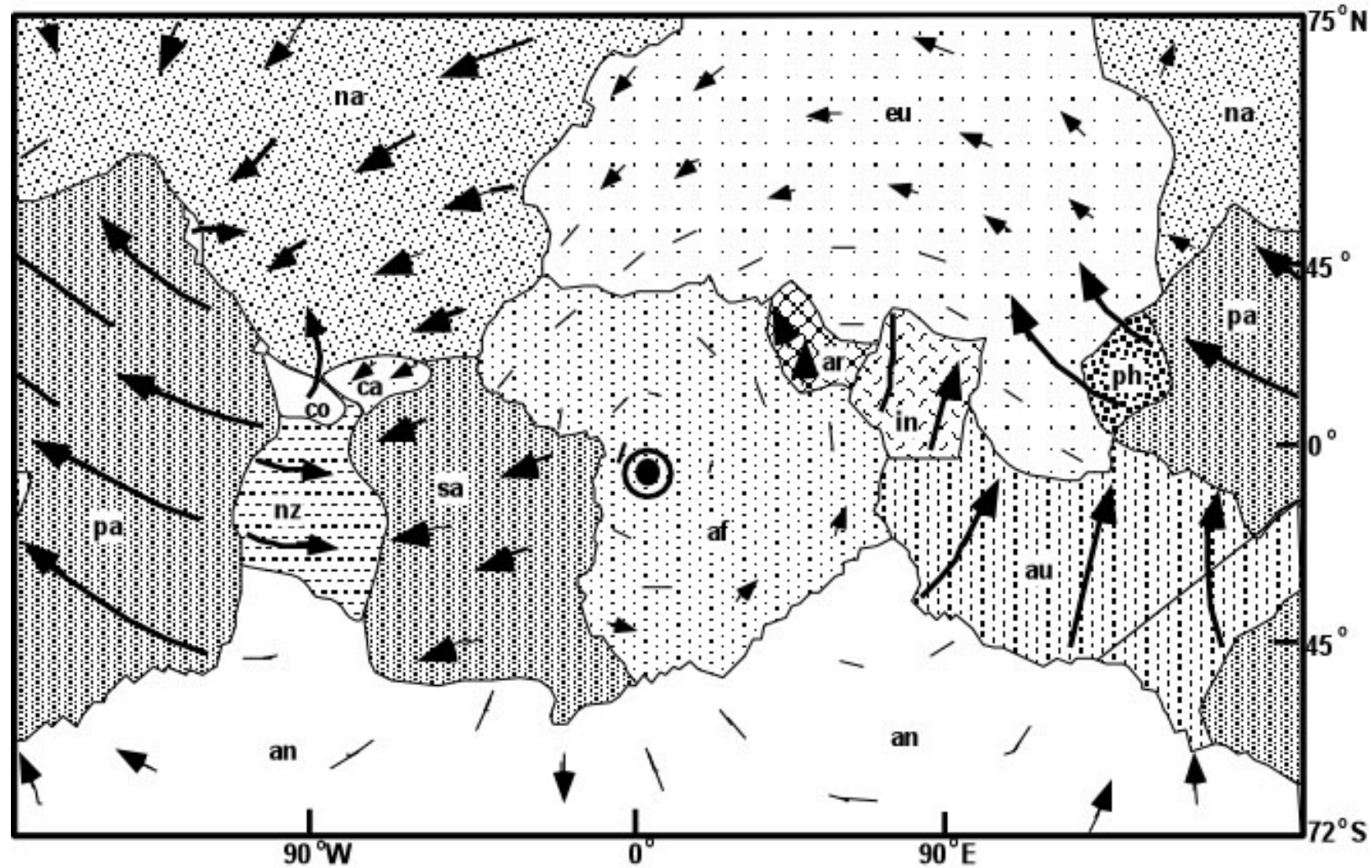


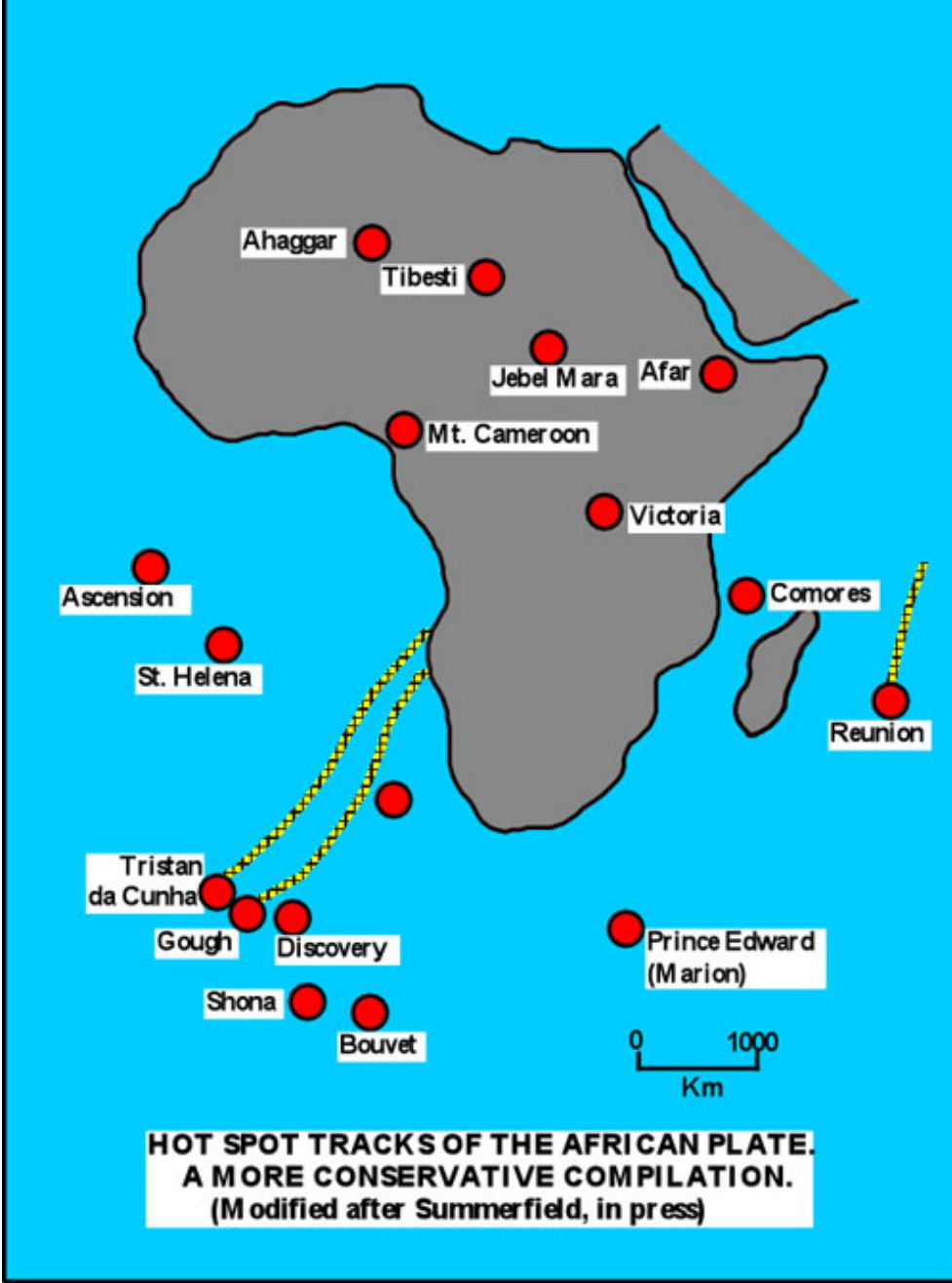
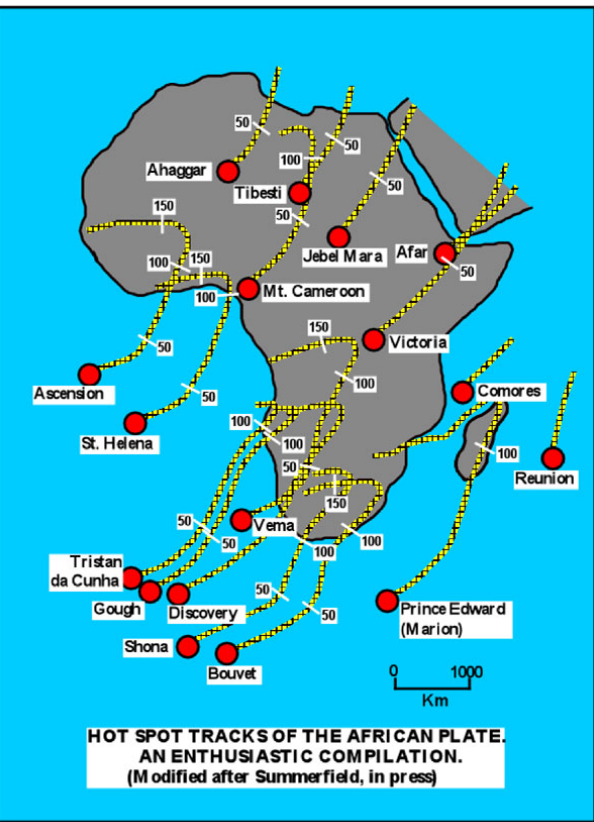
Image courtesy of The Geological Society of South Africa.

Volcanic rock ages from four places showing that activity has persisted in the same ca 200 km diameter areas for ca. 30 million years. More could have been plotted. Significant progression with a consistent azimuth has not been demonstrated.



Gripp & Gordon's 1990 sketch showing slowly moving Africa in a hot-spot reference frame over ca.3.7 Ma.

Since then slow relative motion of Nubian, Arabian and Somali plates over the same interval has been discerned .



Numerous hot-spot tracks have been reported from the African plate. Only the track of Tristan forming the Walvis Ridge stands up to scrutiny. Reunion is trackless.

Image courtesy of The Geological Society of South Africa.

At Dakar a shallow-sourced Mantle plume has been erupting for ca 25 My. basement is elevated but the “Mammelles” volcanoes are at sea level because the Senegal and Casamance Rivers have eroded the rising dome. Thick sediments eroded from what is now the Sahara are in deep water Offshore.

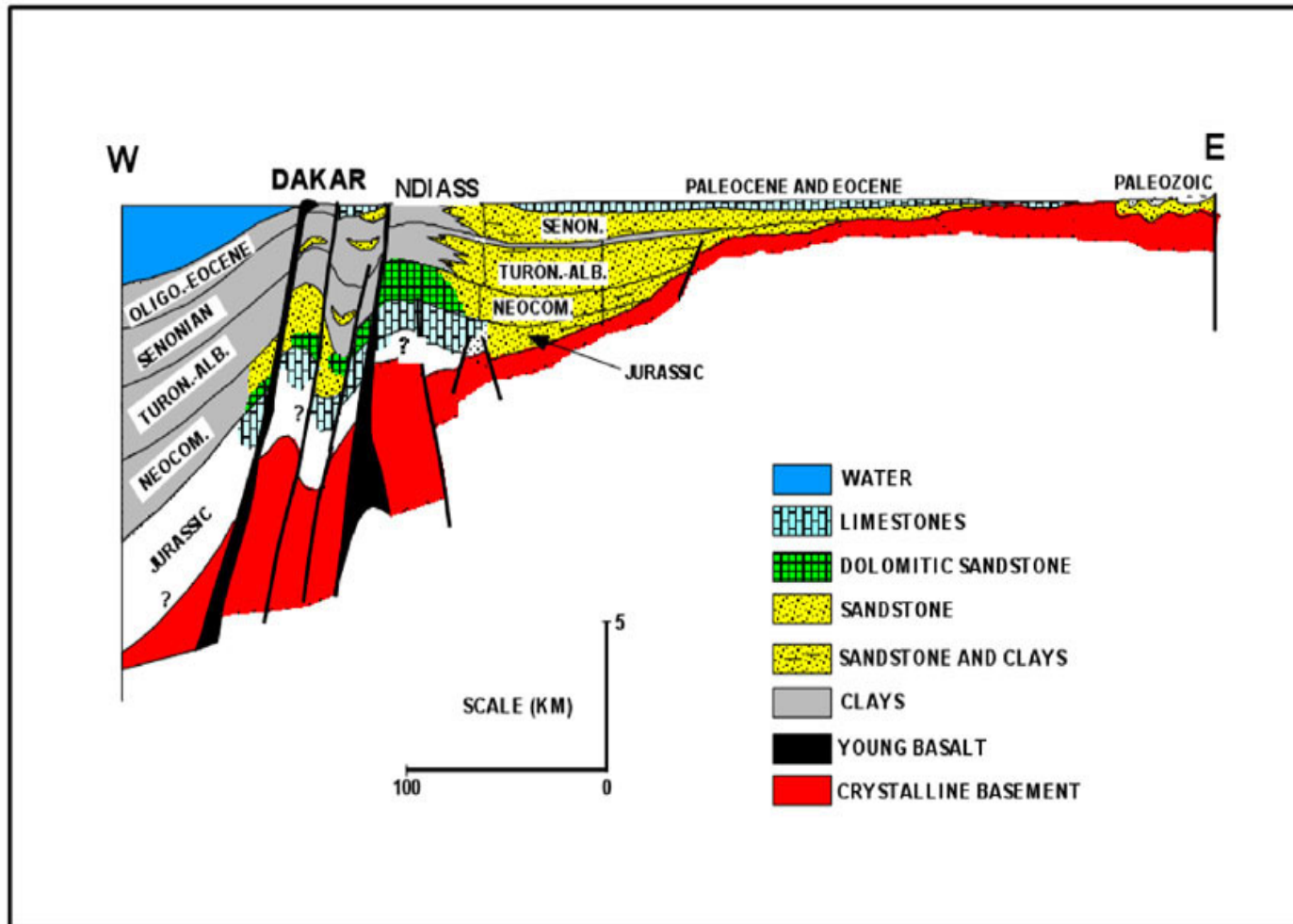
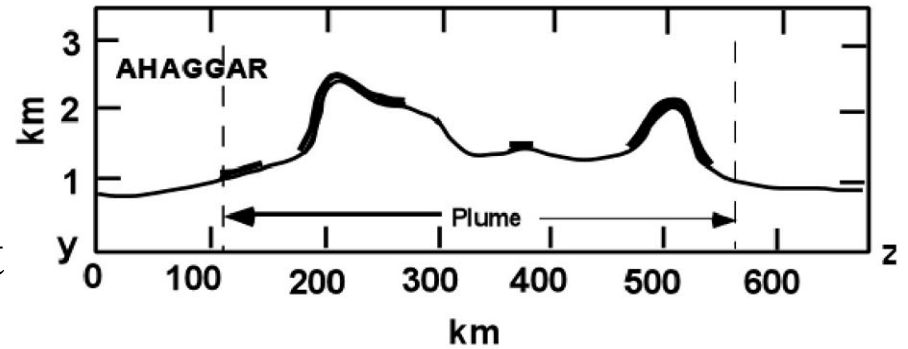


Image courtesy of The Geological Society of South Africa.

In the Ahaggar in the center of the Sahara a swell ca.1 M sq km in area has raised basement to ca.3 km asl in the past 30 My.



Volcanic rock volume, as is typical for the shallow-sourced mantle plume derived rocks of the African Plate, is very small.

Erosion of this swell carried a lot of sediment to the Niger delta before the Sahara desert first formed at ca.3 Ma.

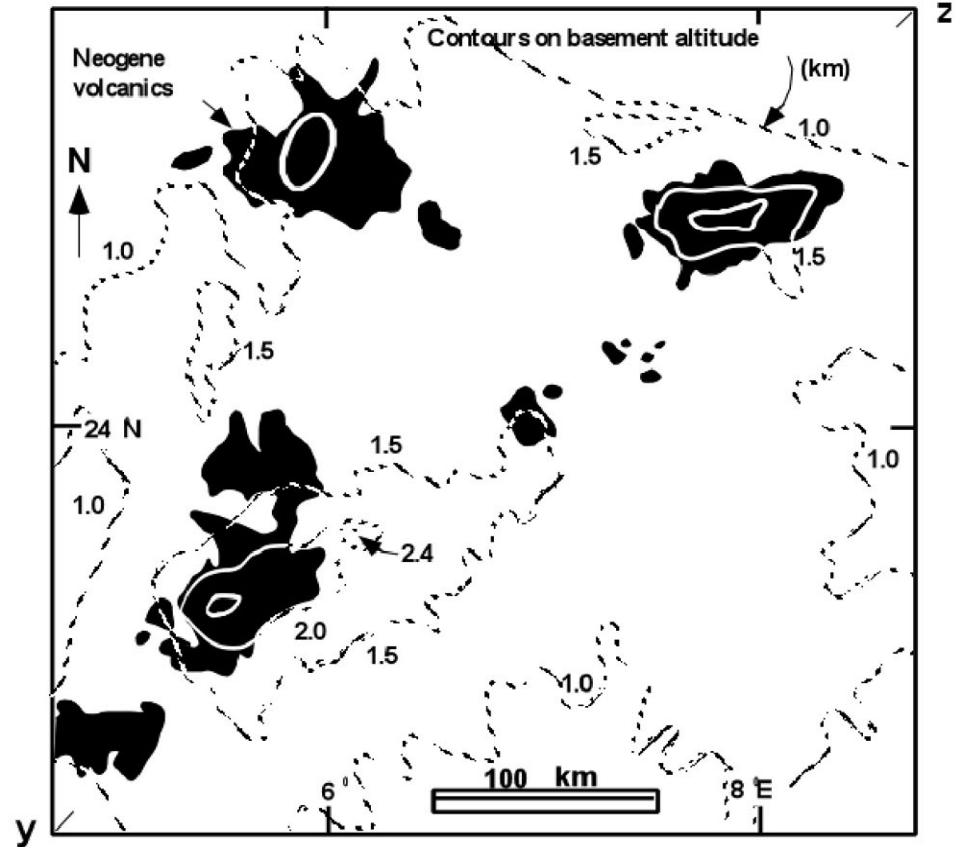


Image courtesy of The Geological Society of South Africa.

The Jos plateau in Nigeria is a swell with 12 young crestal basaltic cones

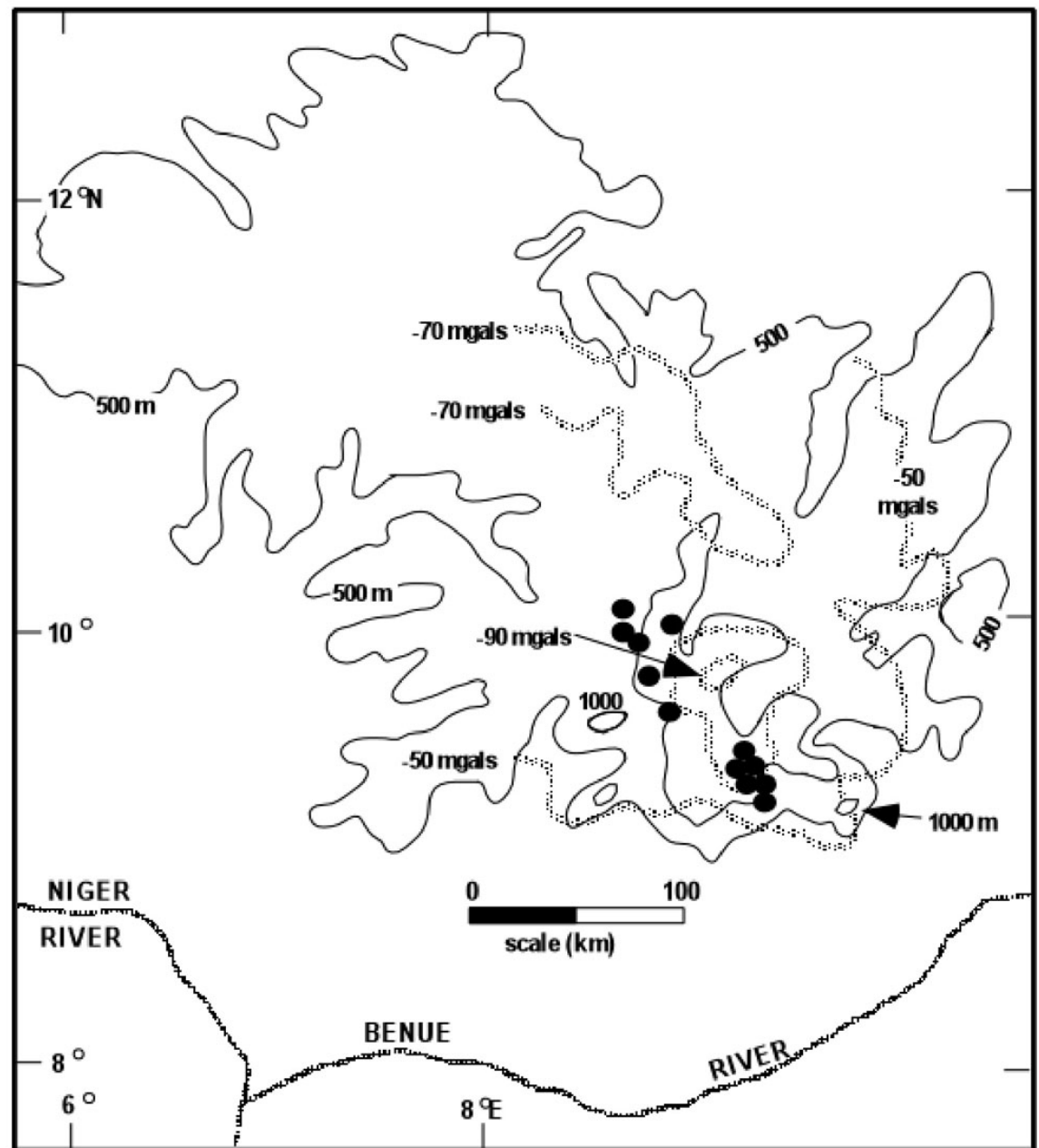
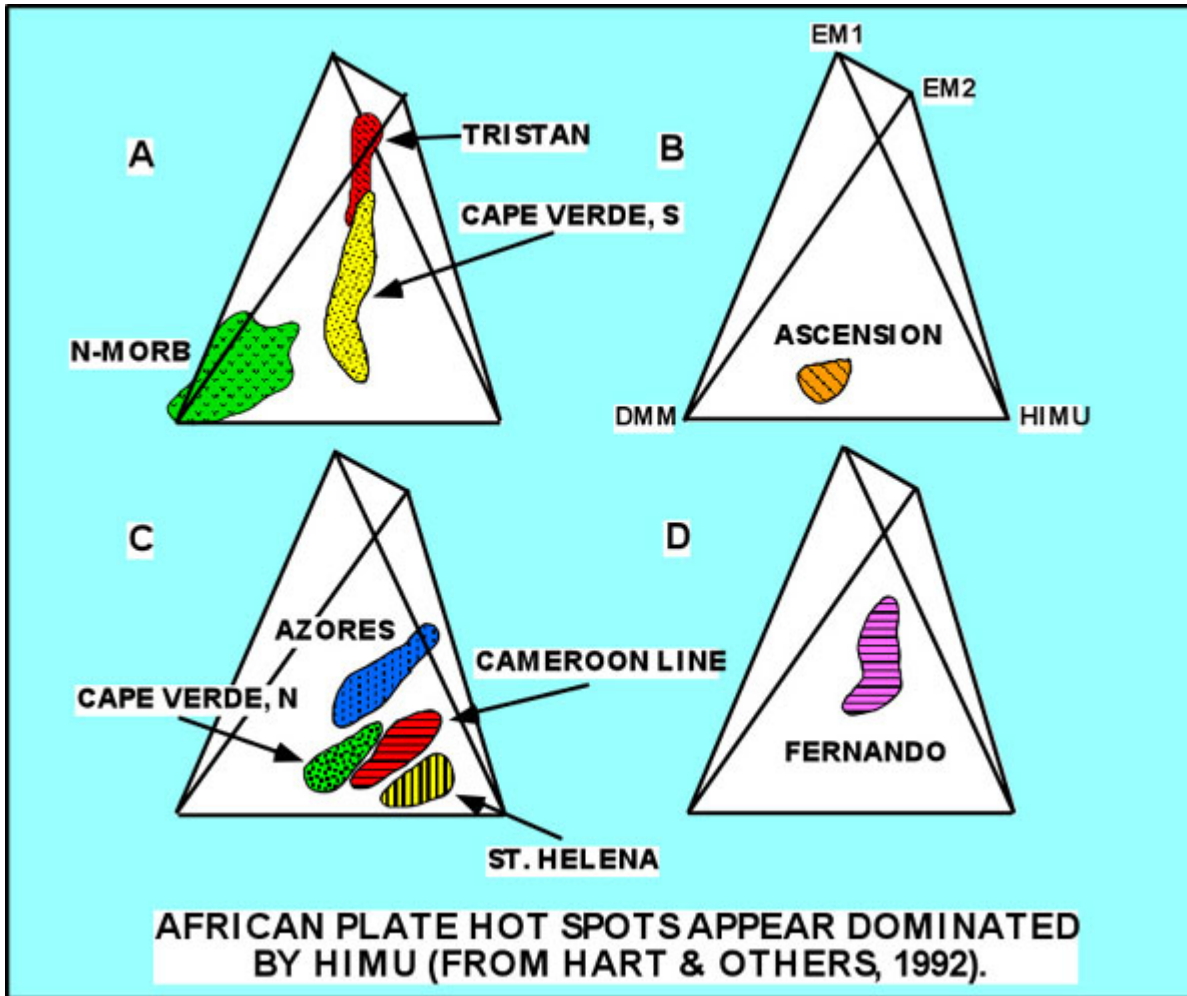


Image courtesy of The Geological Society of South Africa.



The Chad Basin is surrounded by 11 volcano-capped swells arranged in an ellipse.

Possibly this relates to a shallow-mantle convection pattern.

