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

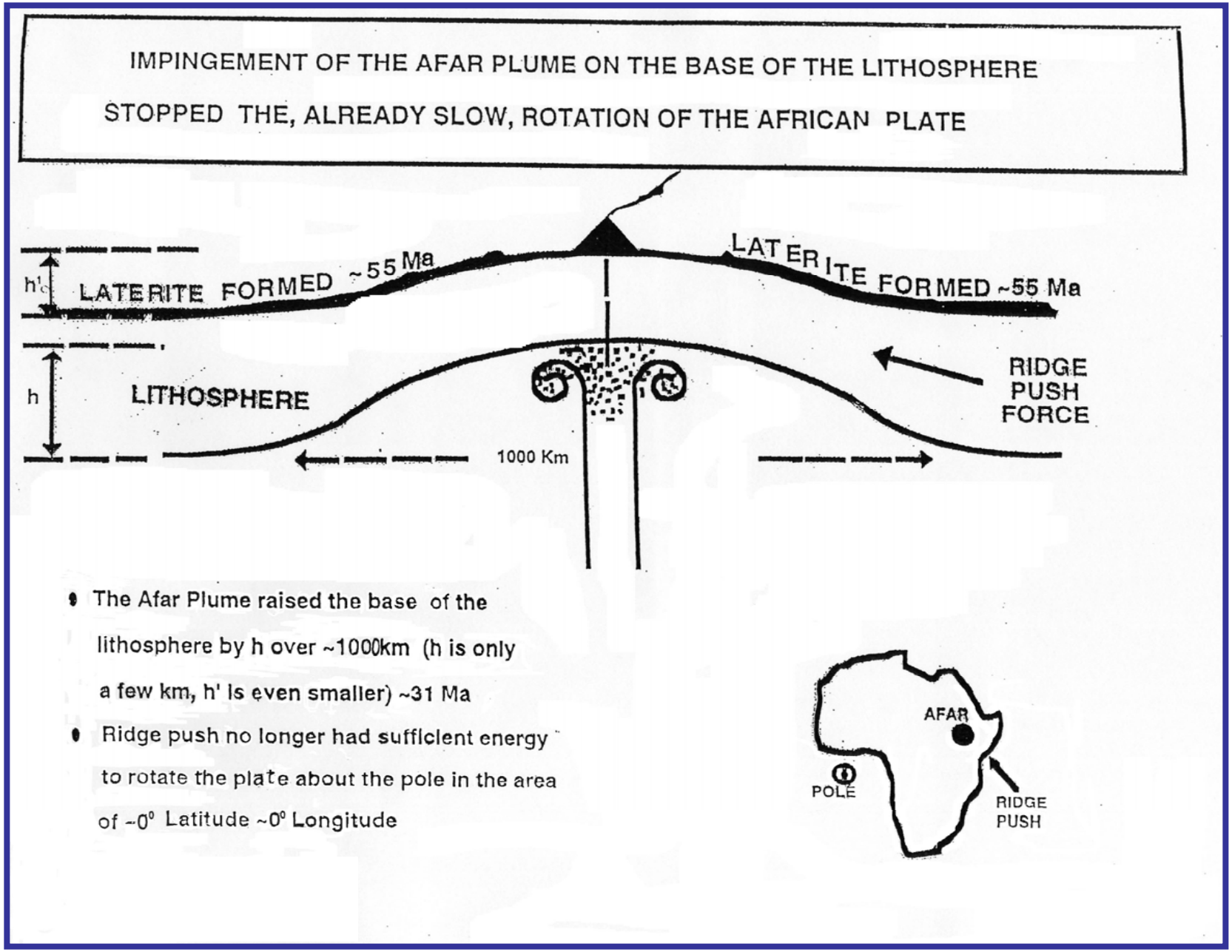
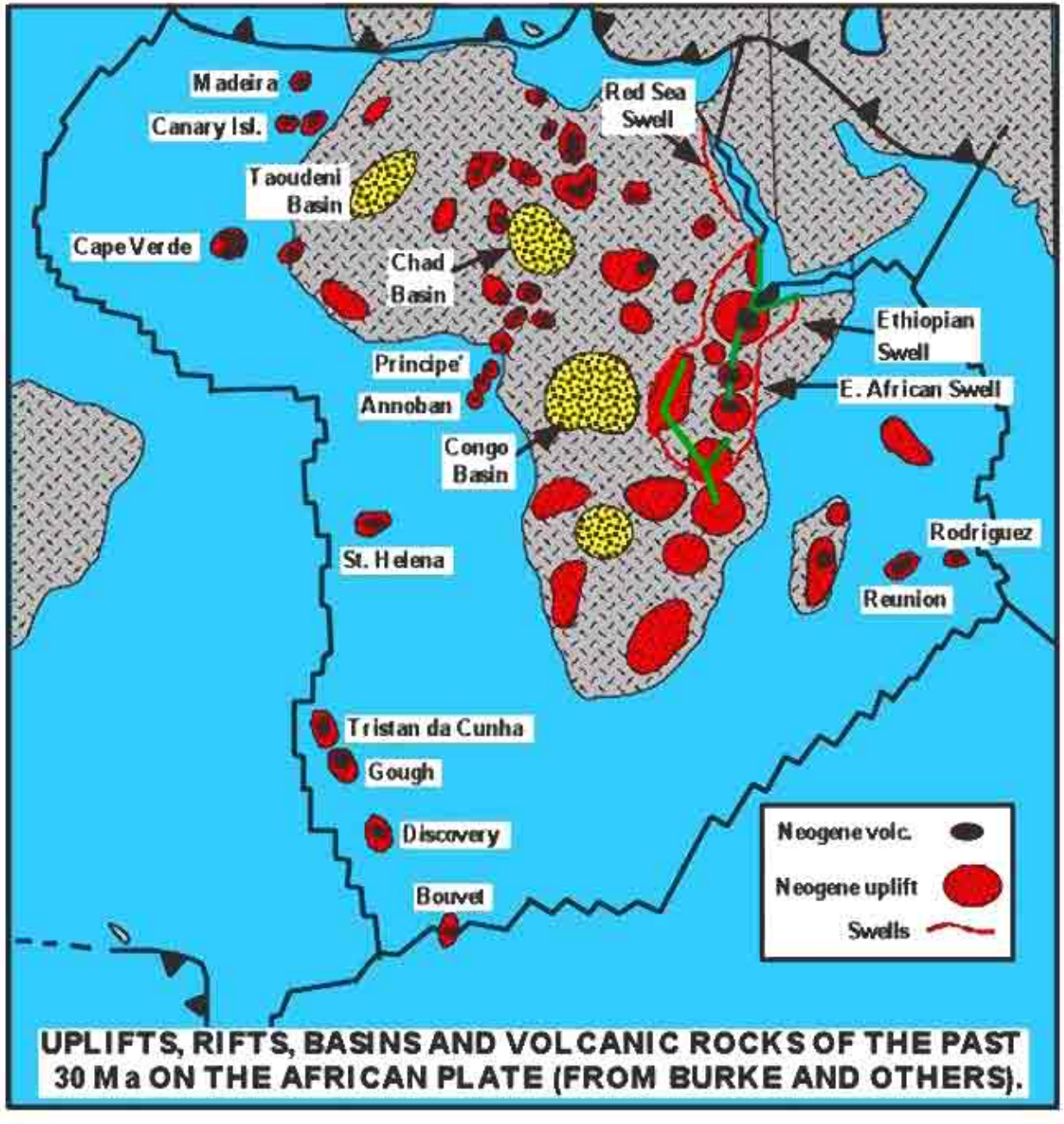
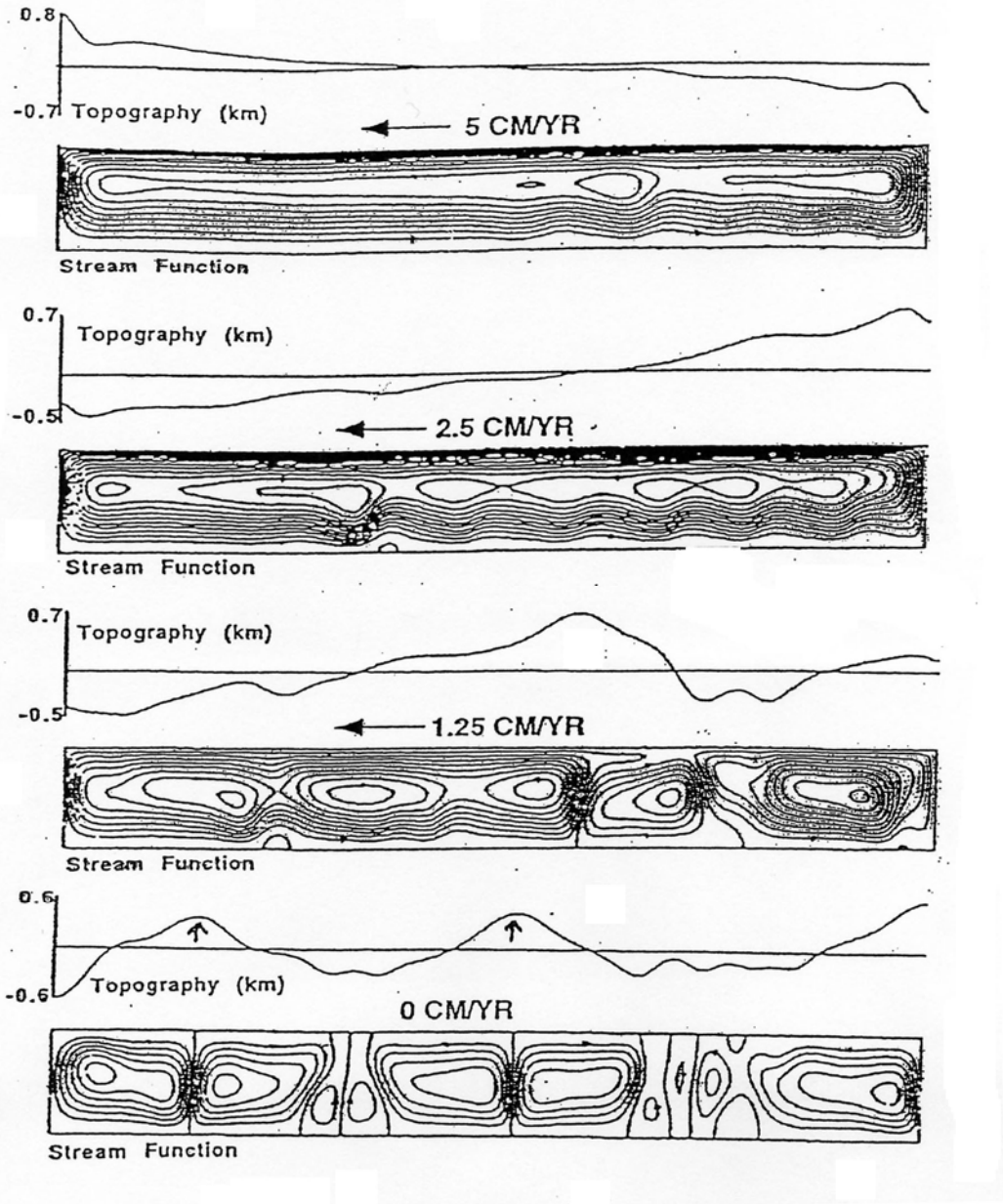


Image courtesy of The Geological Society of London.

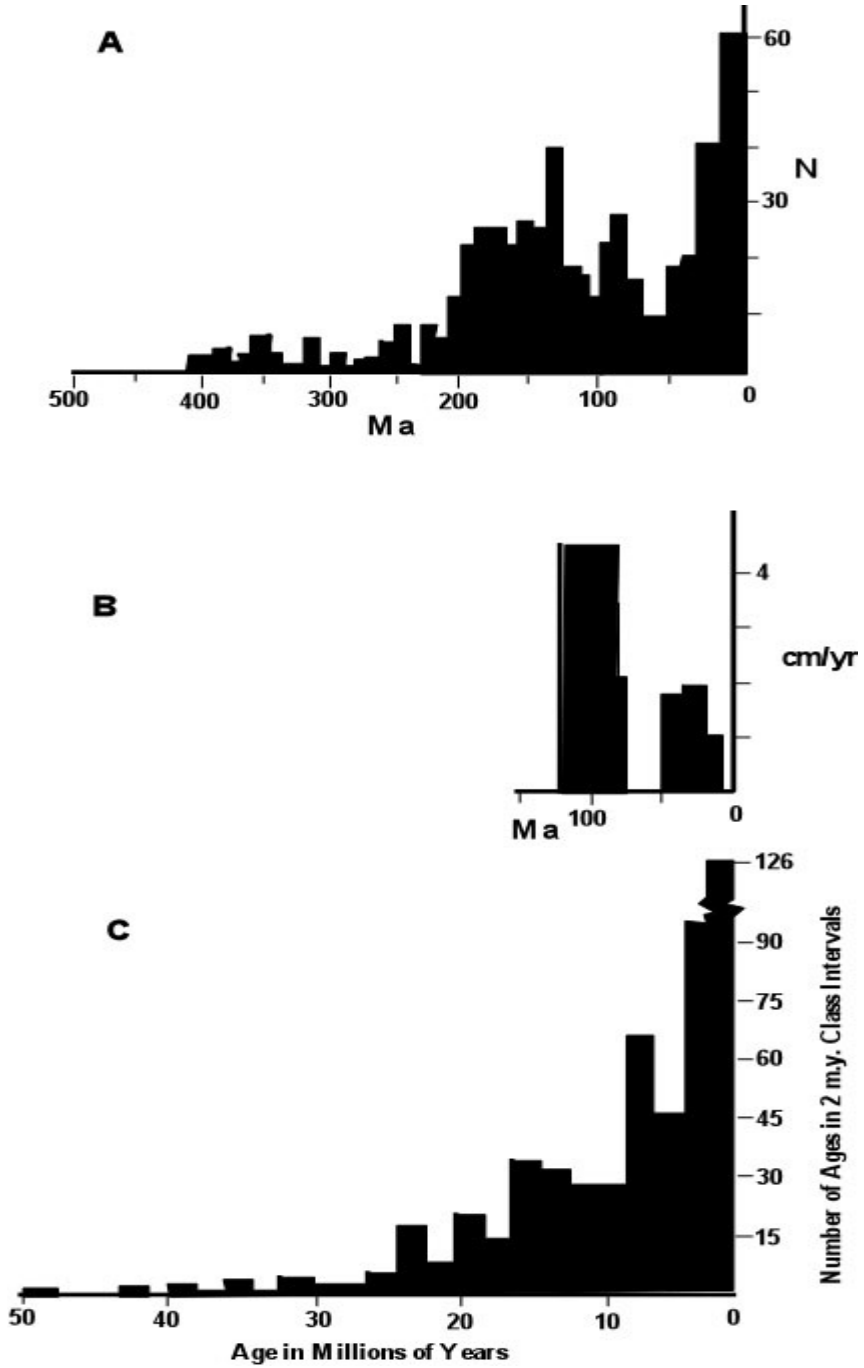


UPLIFTS, RIFTS, BASINS AND VOLCANIC ROCKS OF THE PAST 30 Ma ON THE AFRICAN PLATE (FROM BURKE AND OTHERS).



Results of numerical experiments by England & Houseman showing little relief on a plate moving over a shallow convecting mantle. Basins & Swells form only when the plate is at rest.

Image courtesy of The Geological Society of London.



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.

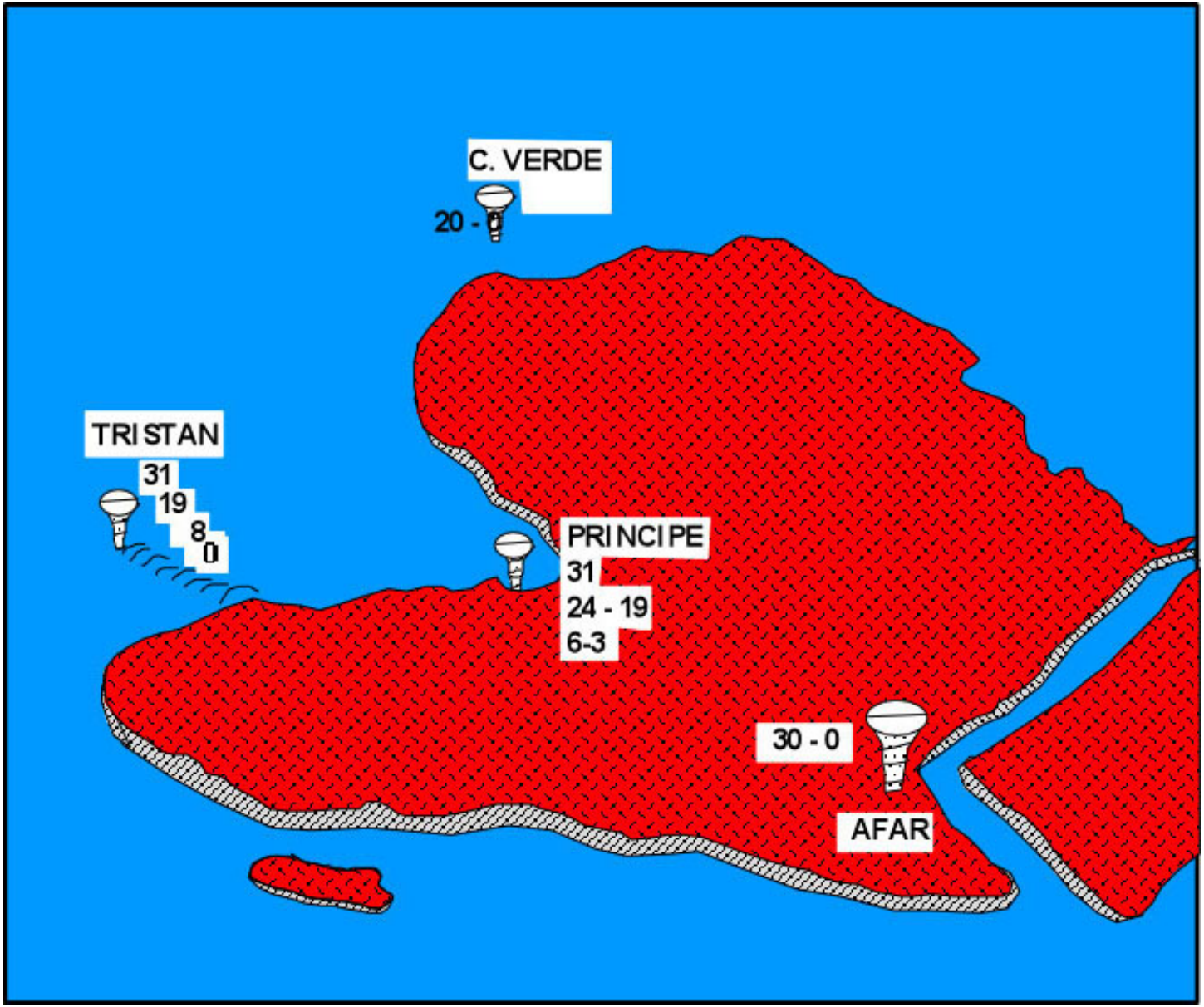
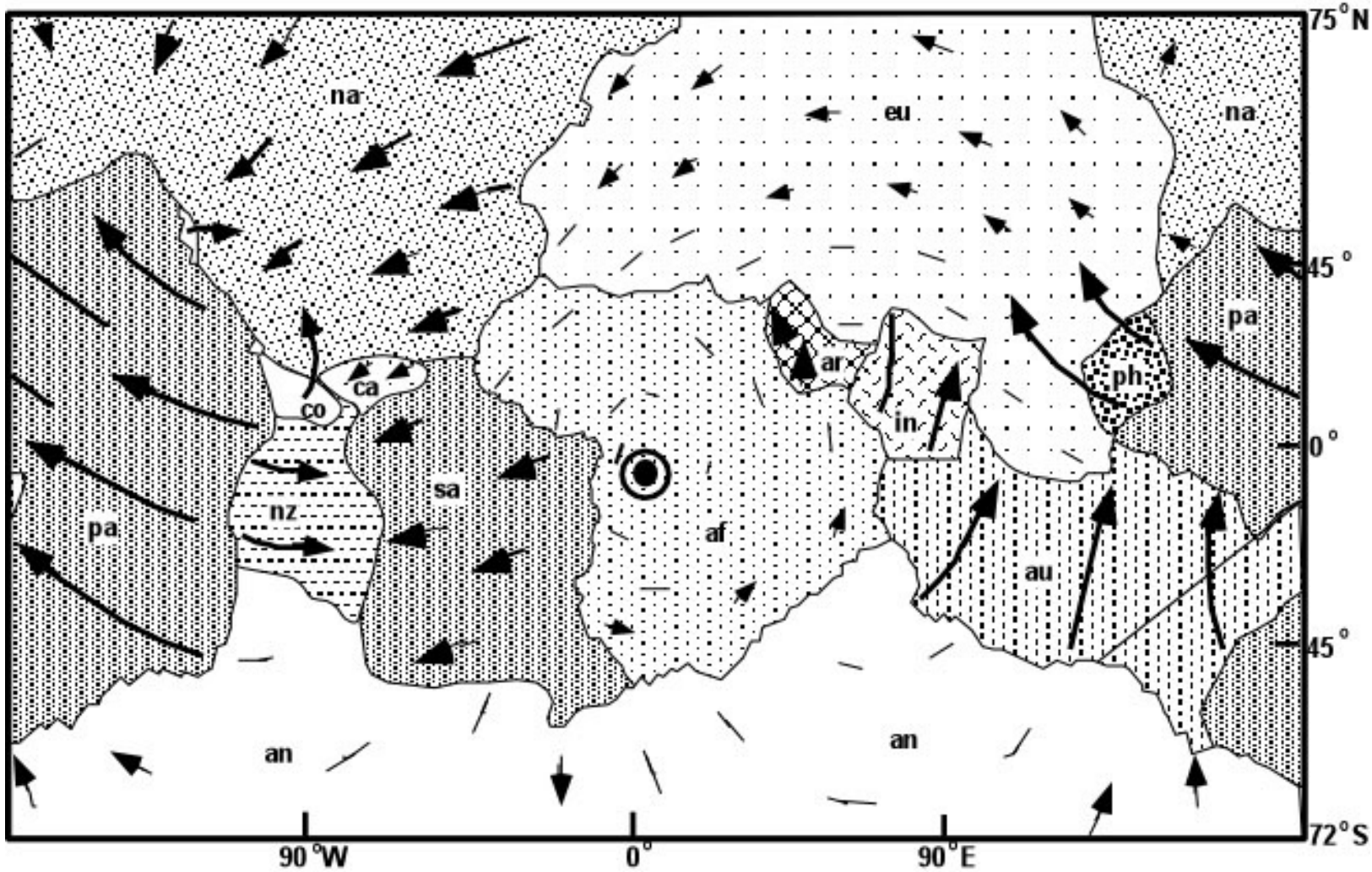
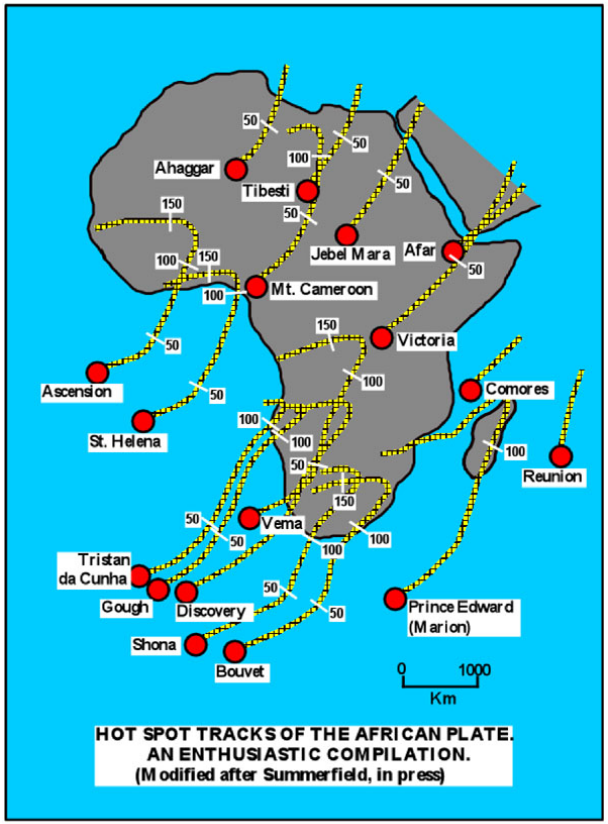


Image courtesy of The Geological Society of South Africa.

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.

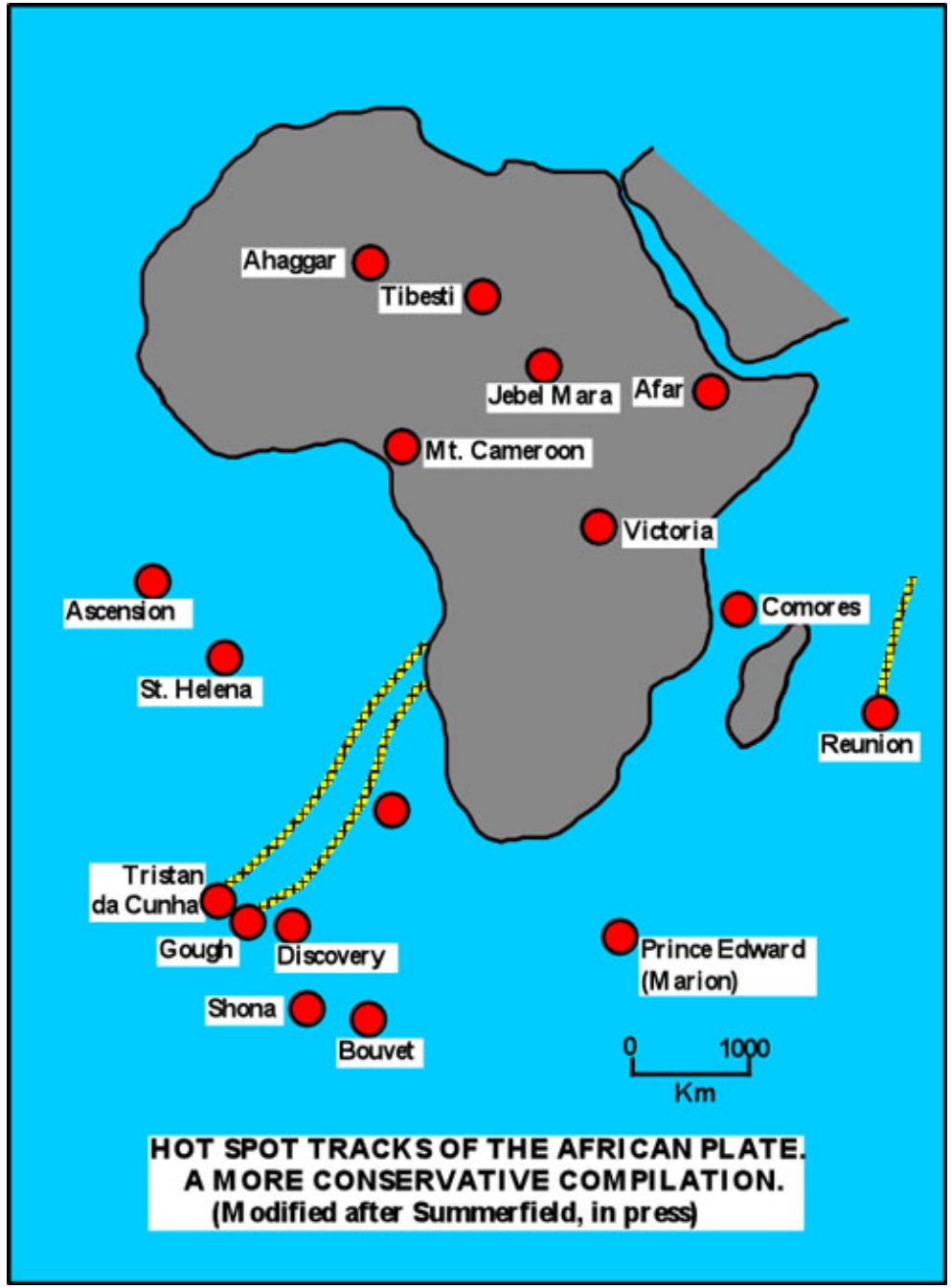


Image courtesy of The Geological Society of South Africa.

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.

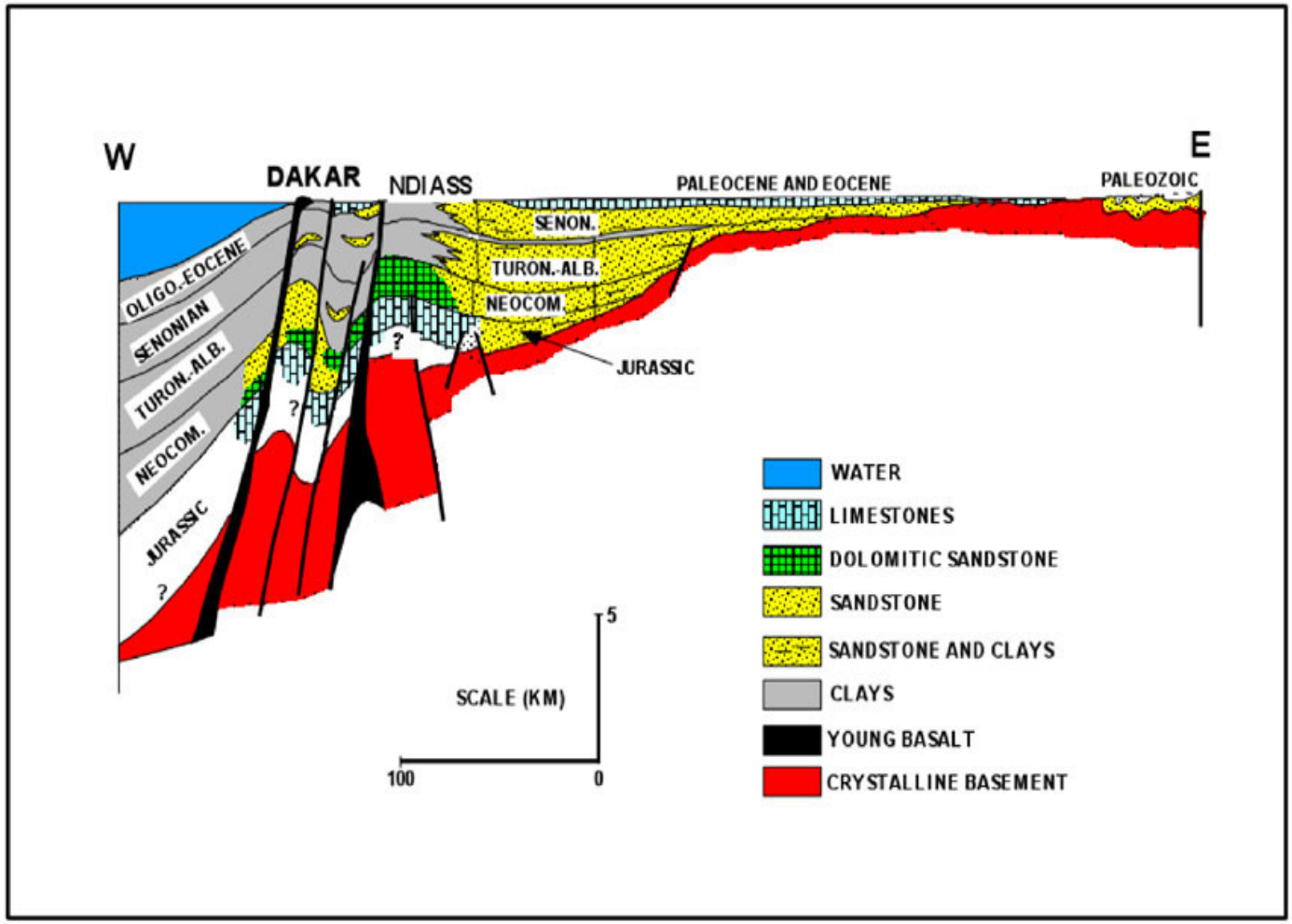
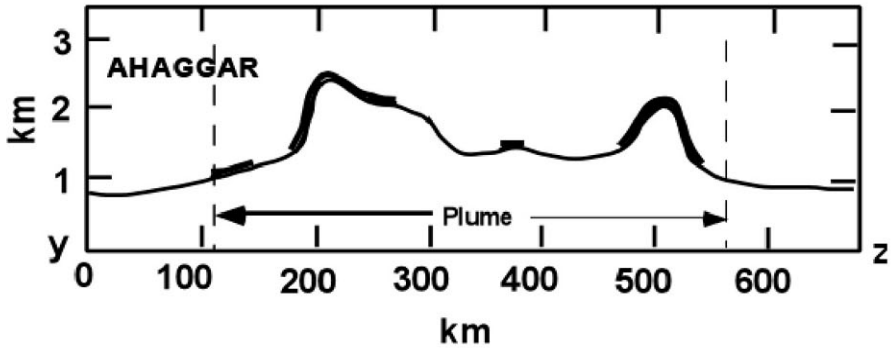


Image courtesy of The Geological Society of South Africa.

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.

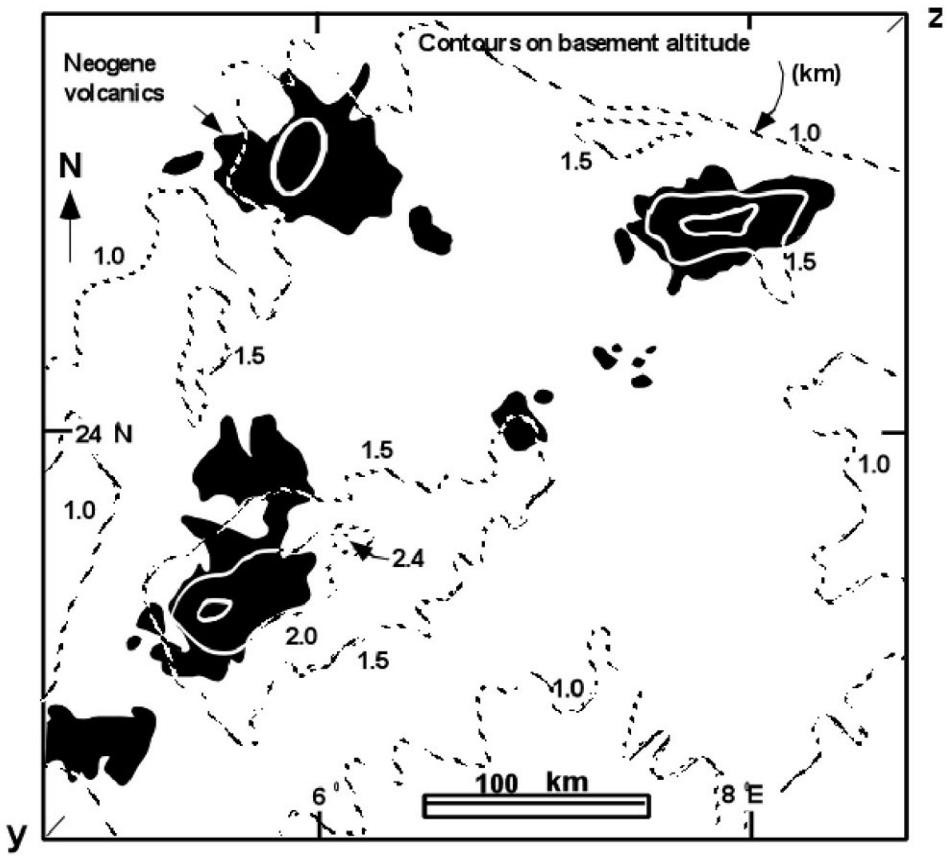
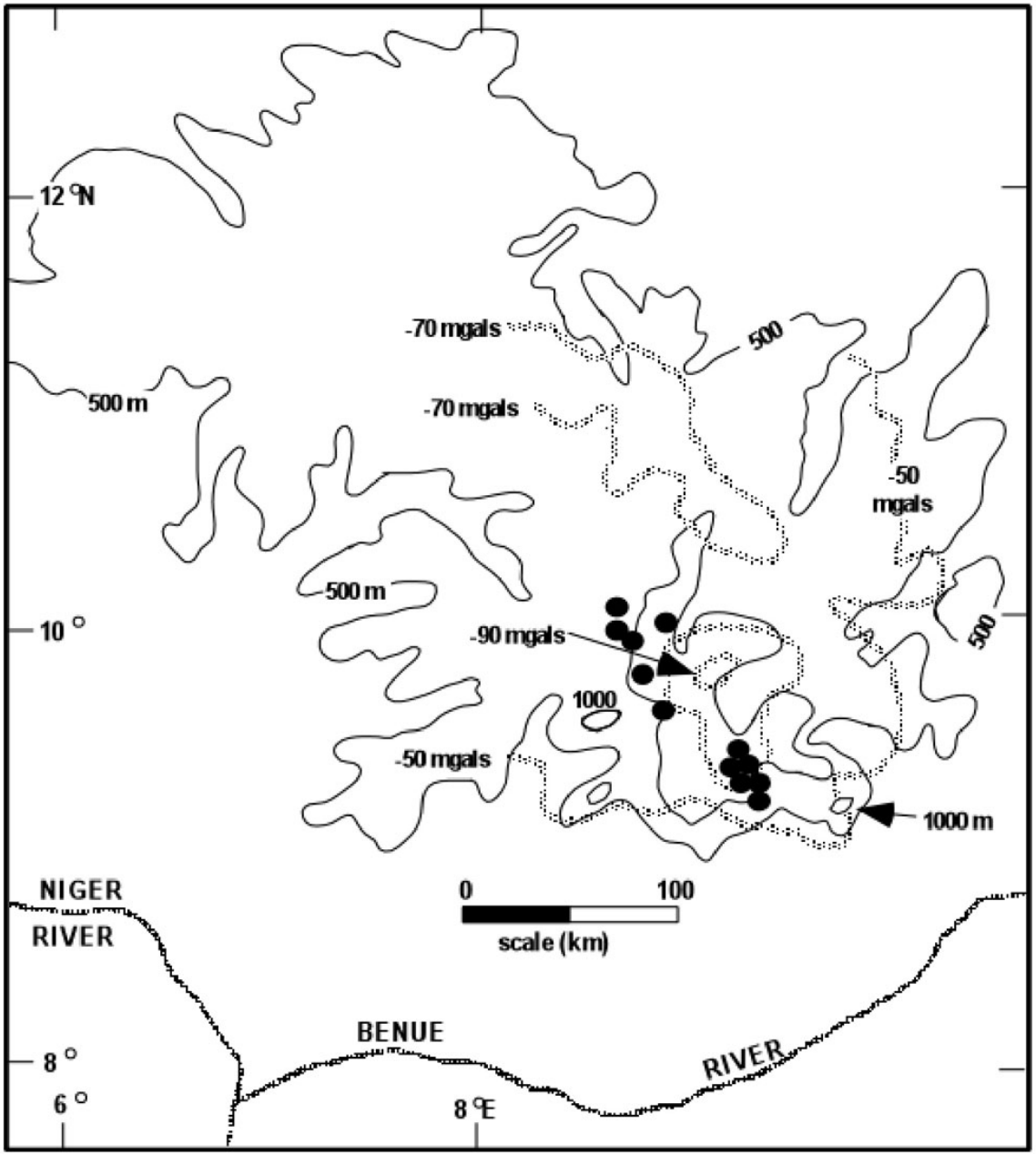


Image courtesy of The Geological Society of South Africa.

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



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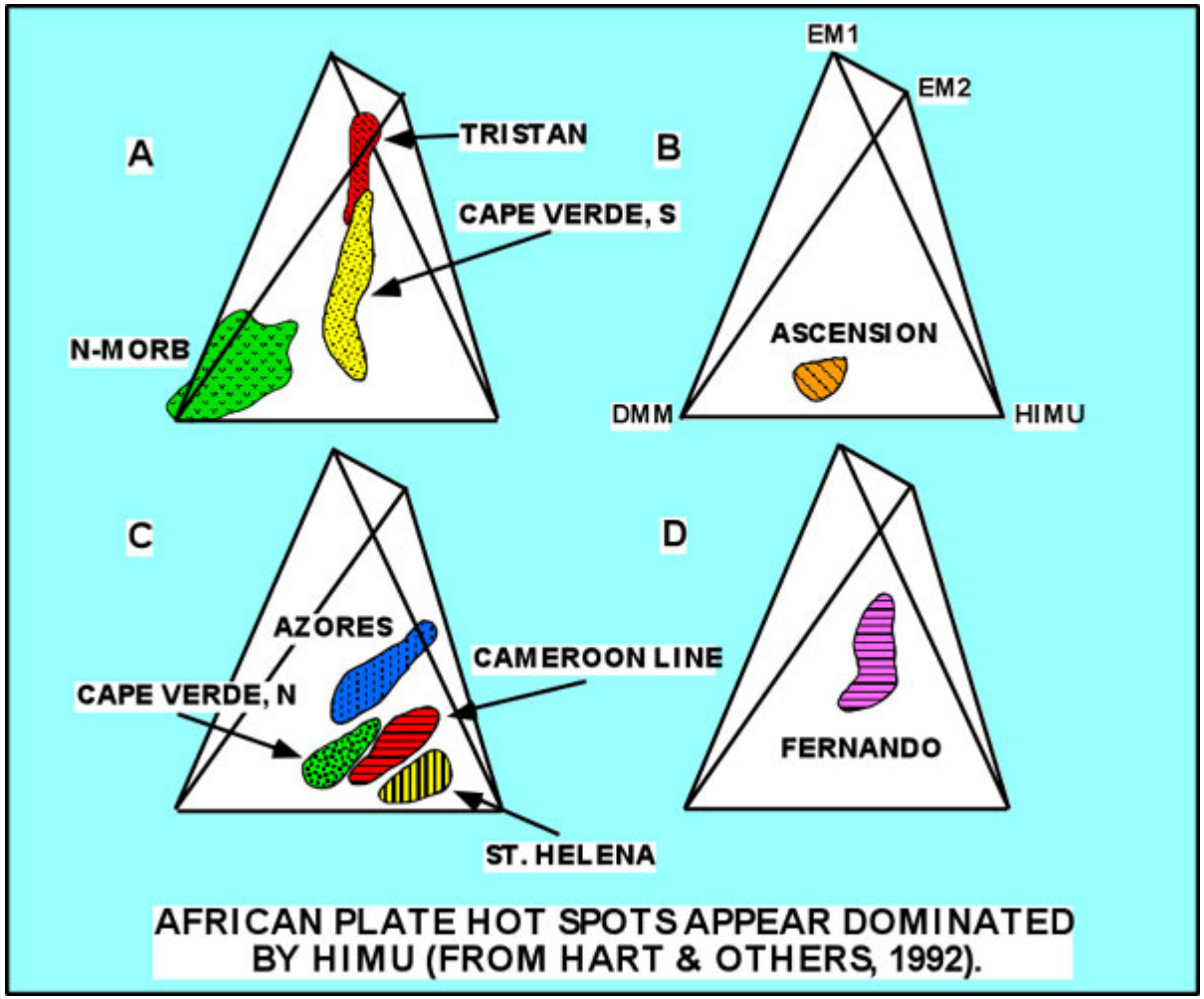
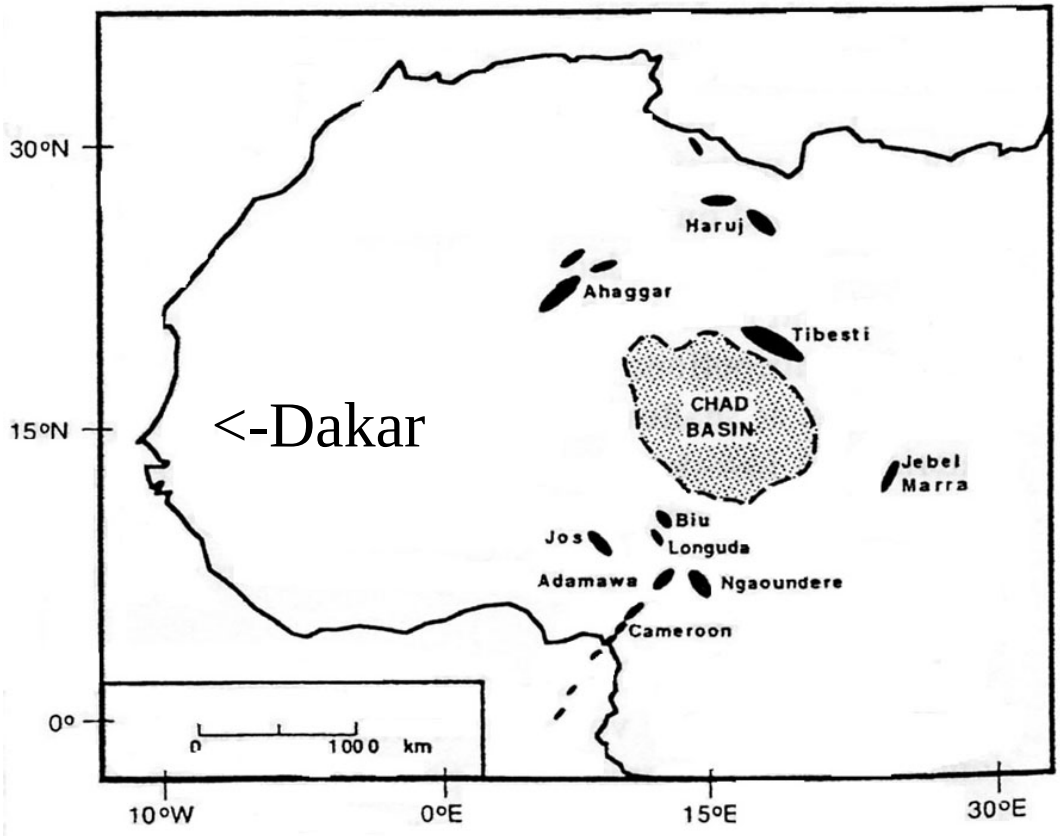


Image courtesy of The Geological Society of South Africa.

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

Possibly this relates to a shallow-mantle convection pattern.



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