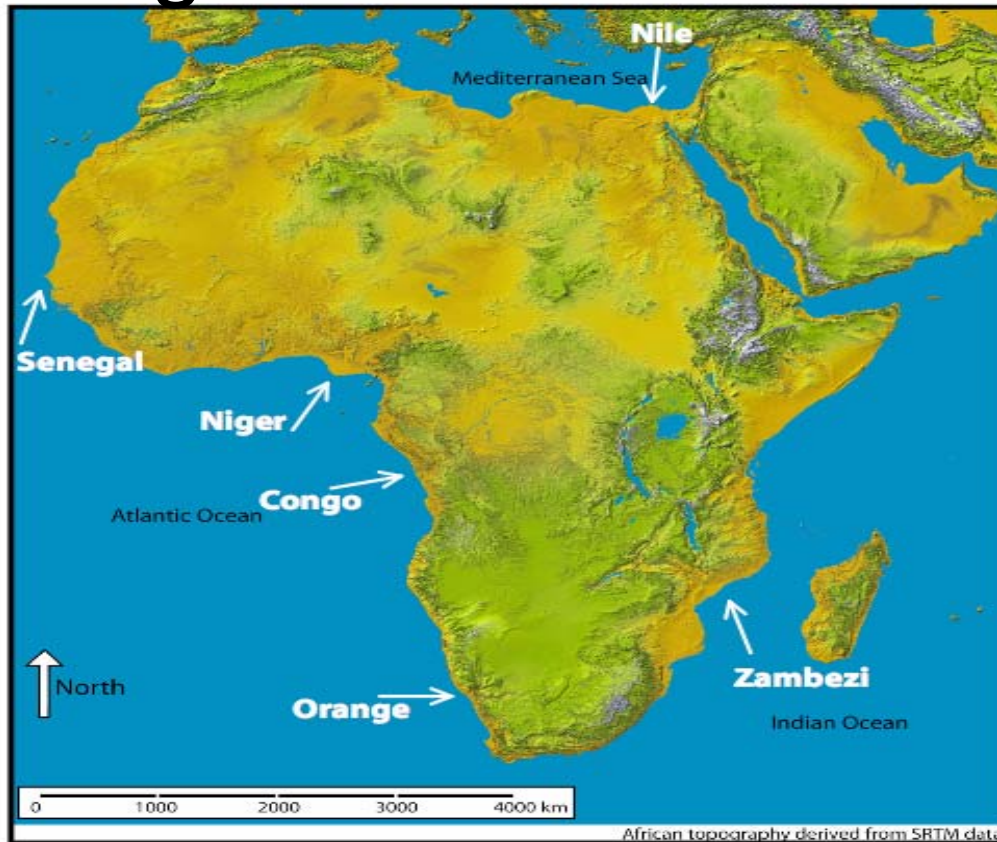


# Deposition during the past 30 My in Africa's great deltas and deep sea fans

Six Examples



Only thin sedimentary sections ( $< 1$  km) have accumulated in interior basins since 30 Ma.

Lakes Malawi and Tanganyika probably hold several km

Thanks to Tim Chapman for delta and deep water work.

# Niger Delta

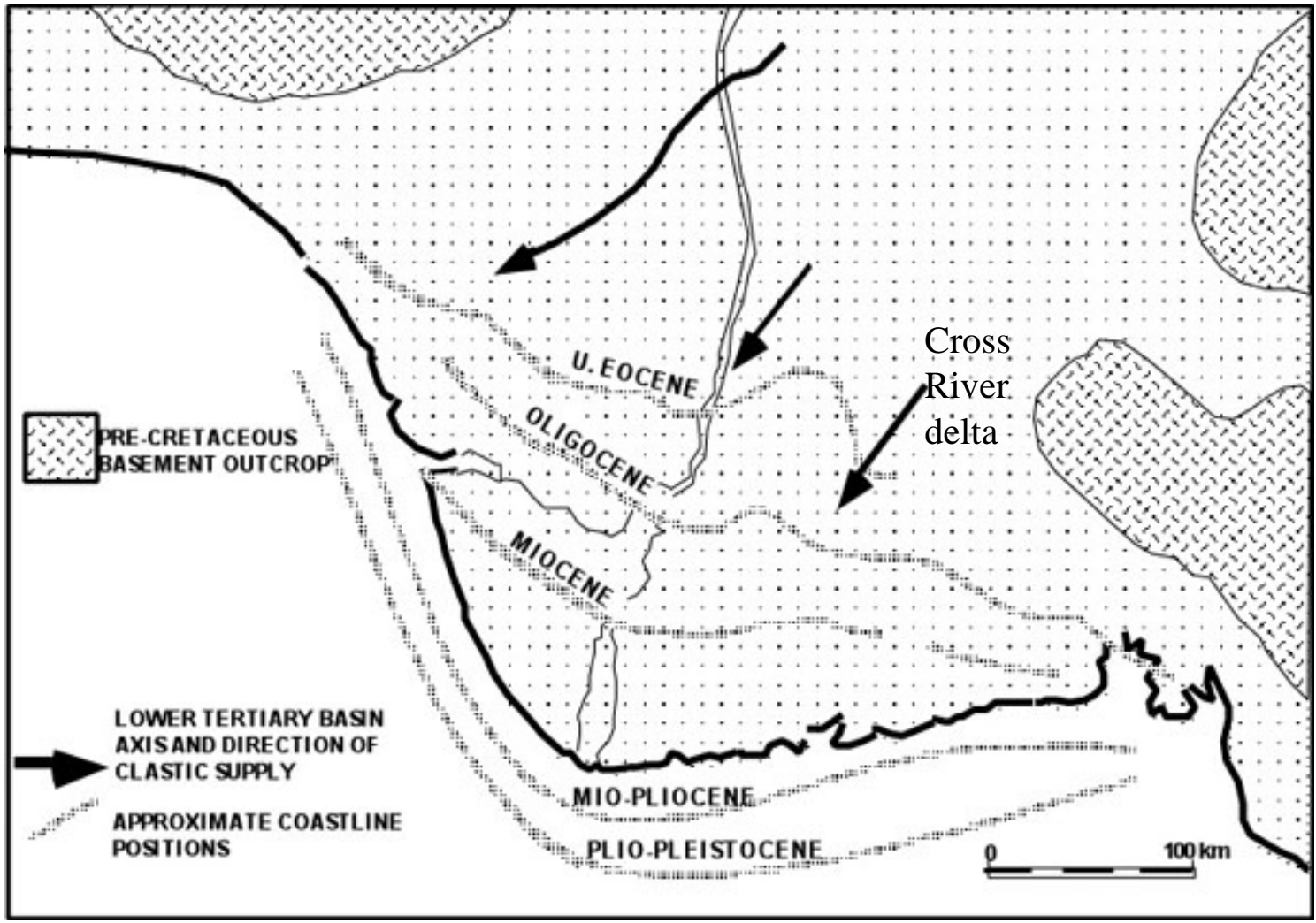


Image courtesy of NASA and USGS.

# Niger



Image courtesy of NASA and USGS.



Niger delta progradation since 38 Ma from Burke (1972)

Modified from Short & Stauble (1970)

Progradation of the Niger delta since 34 Ma as a result of increased erosion of the African continent since that time. From Short and Stauble (1972)

Image courtesy of The Geological Society of South Africa.

# Niger

pers. coms. (To Tim) from Exxon Mobil  
Kevin's speculations are in blue

- 23.8 Ma major unconformity
- 28.3 Ma major unconformity when shelf started developing (major sedimentation starts)
- Consequence of plate arrest ?
- 31 Ma minor unconformity (minor eustatic change, major stratigraphic change) Consequence of plate arrest ?
- 34 Ma major unconformity

East Antarctic Ice-sheet  
Formed ?

# Senegal Delta

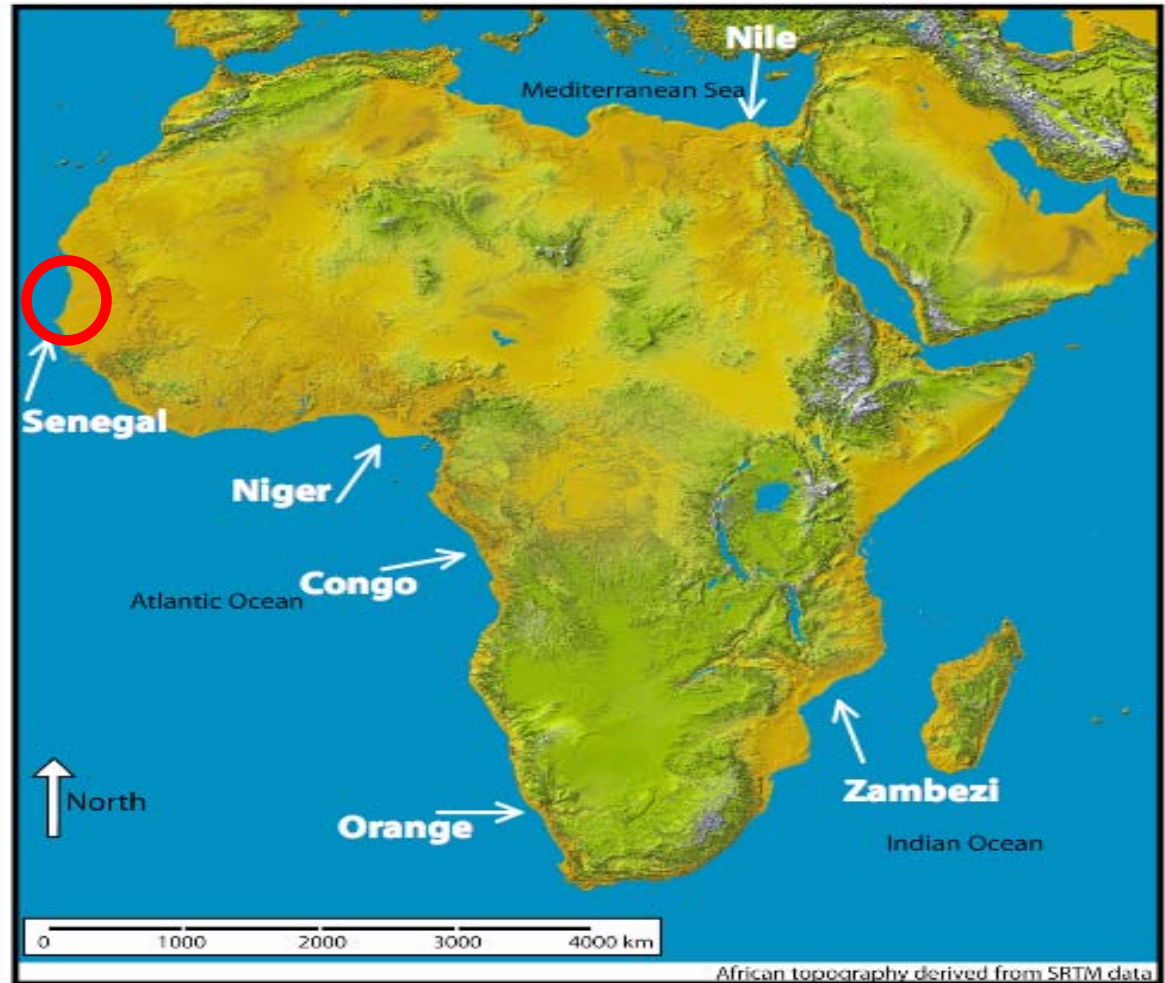


Image courtesy of NASA and USGS.

Nouakchott (N.headland) Cape Vert, Dakar (S. headland). Senegal R. diverted by active Dakar dome. Niger inland delta on E. of image.

# Senegal

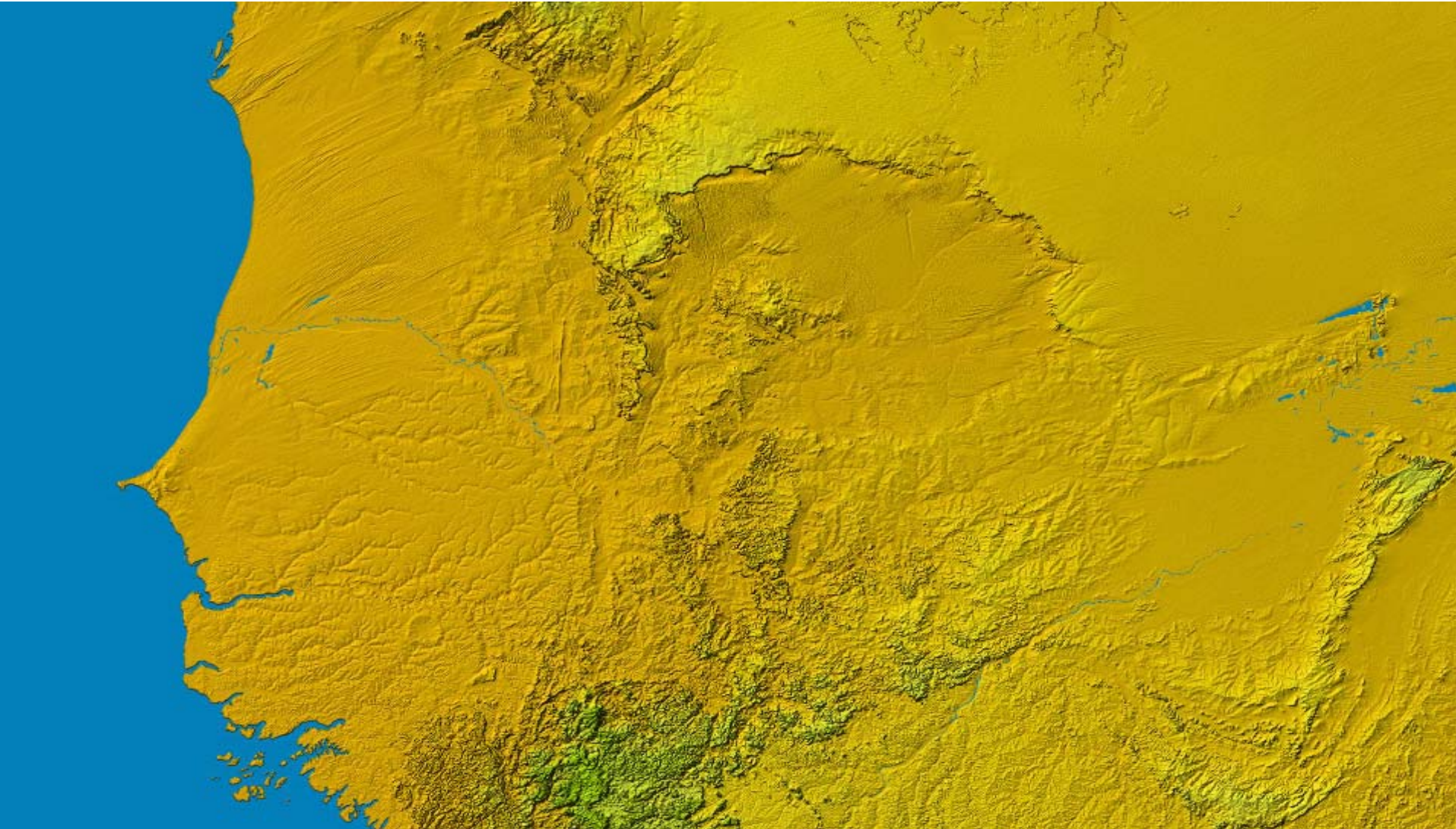


Image courtesy of NASA and USGS.

# Congo Fan



Image courtesy of NASA and USGS.



# Congo/Zaire

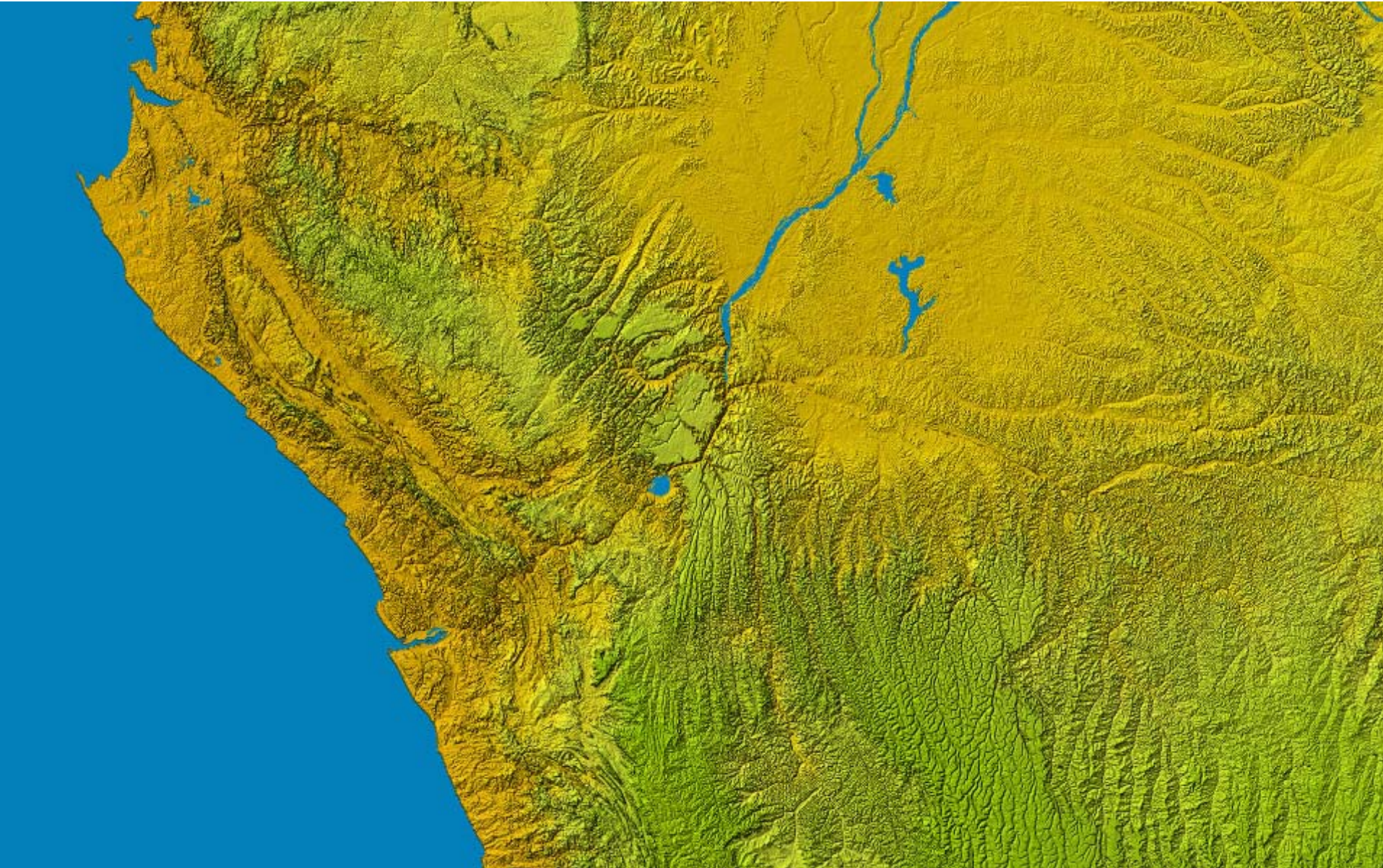


Image courtesy of NASA and USGS.

# Orange River Delta



Image courtesy of NASA and USGS.

# Orange

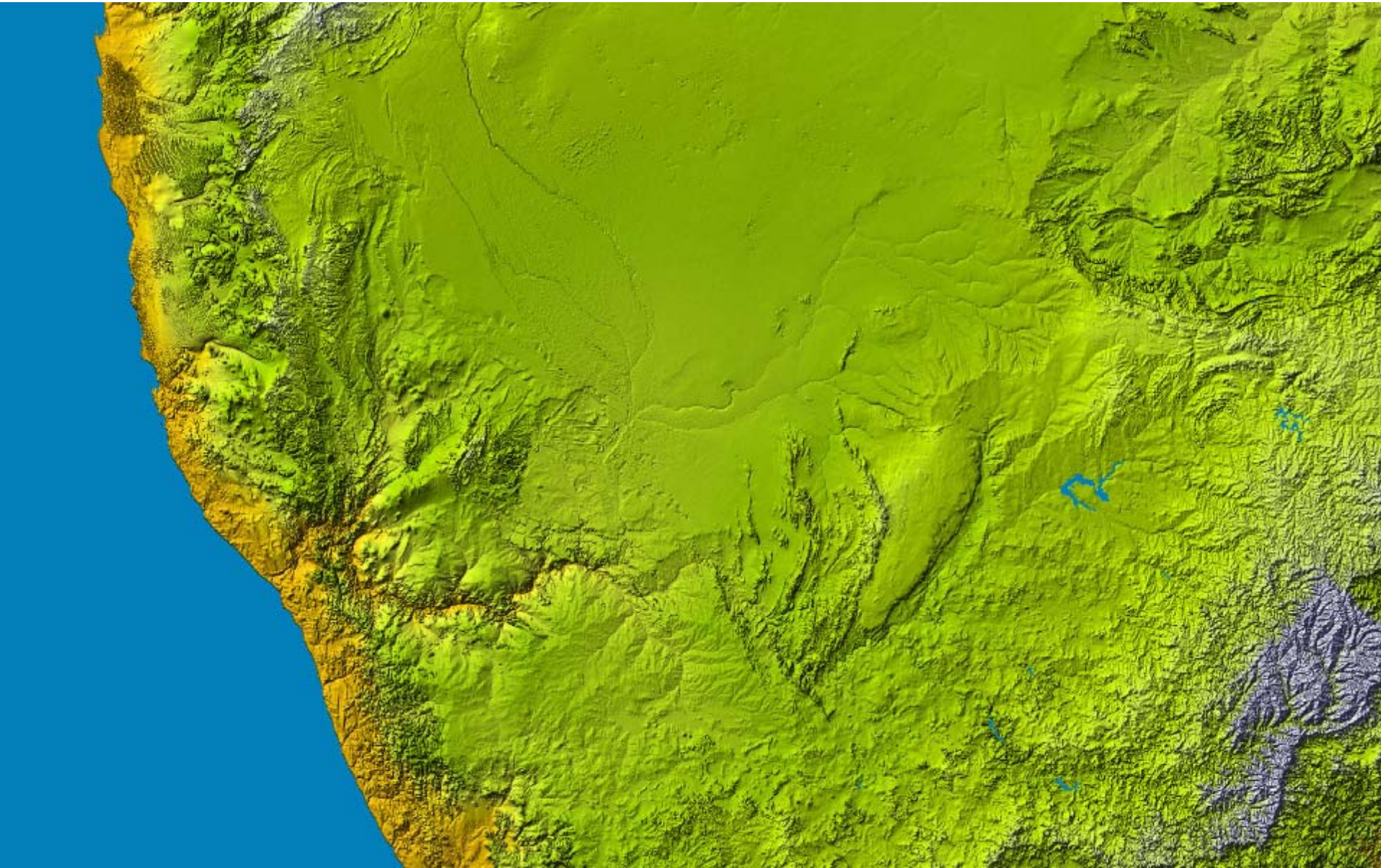
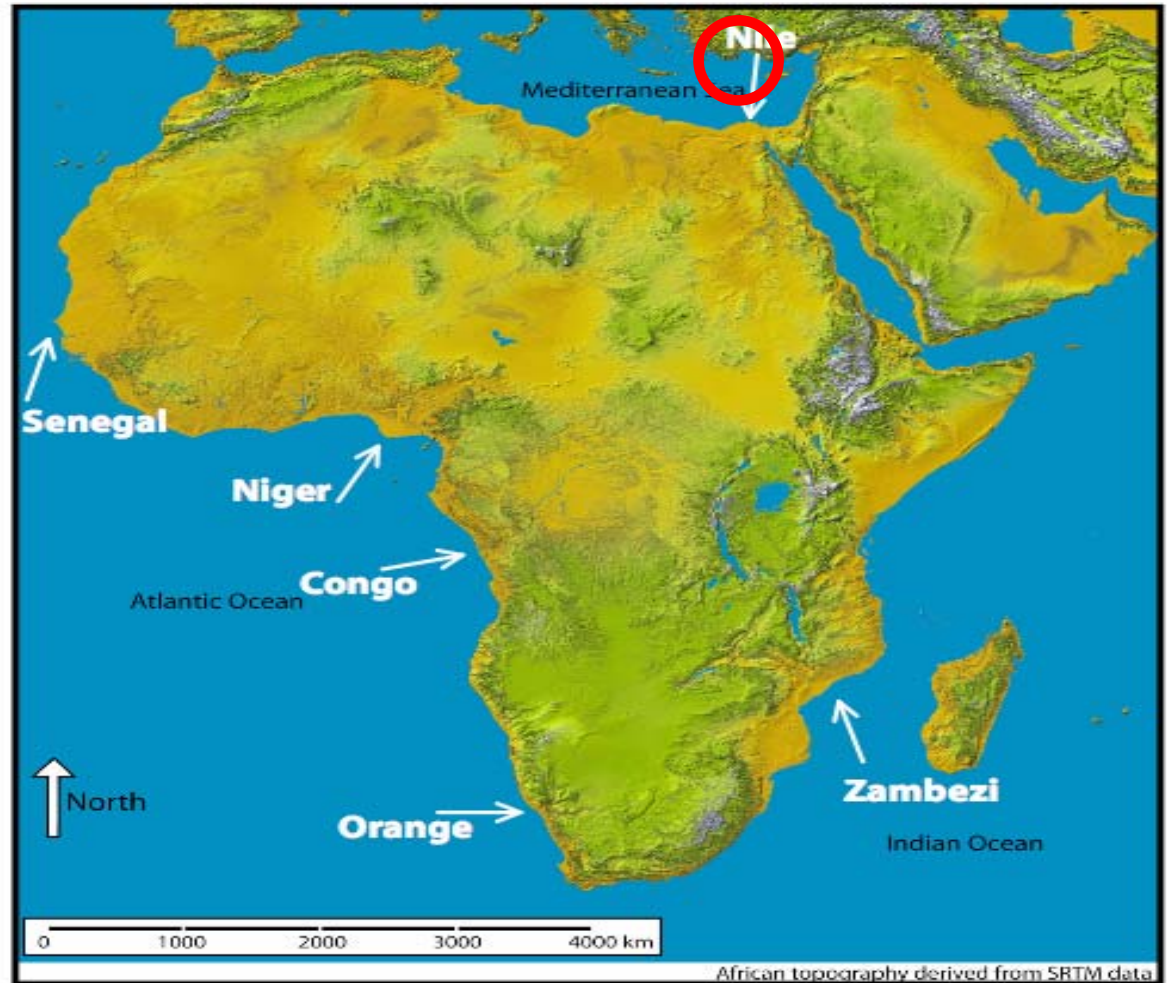


Image courtesy of NASA and USGS.

# Nile Delta



# Nile

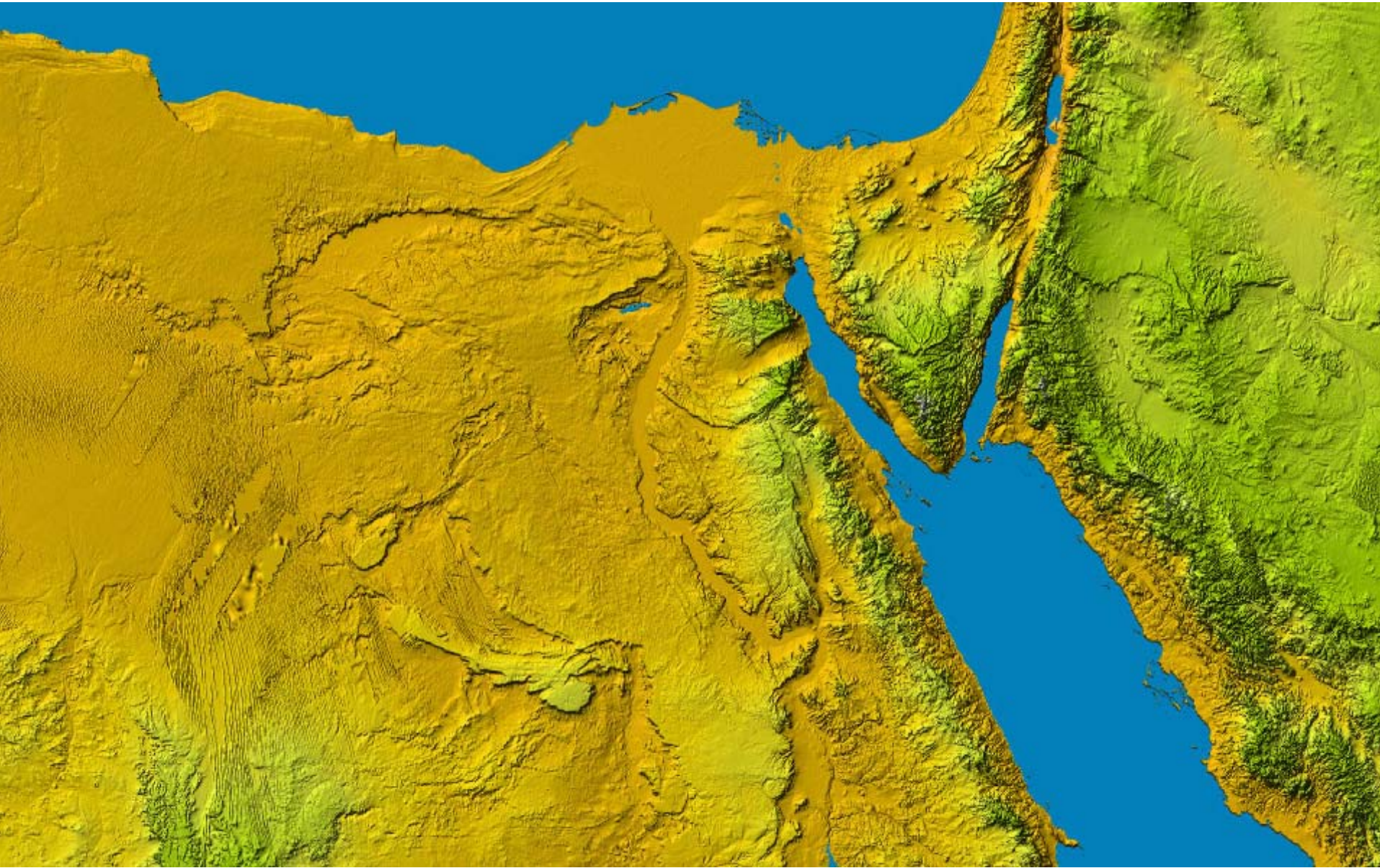
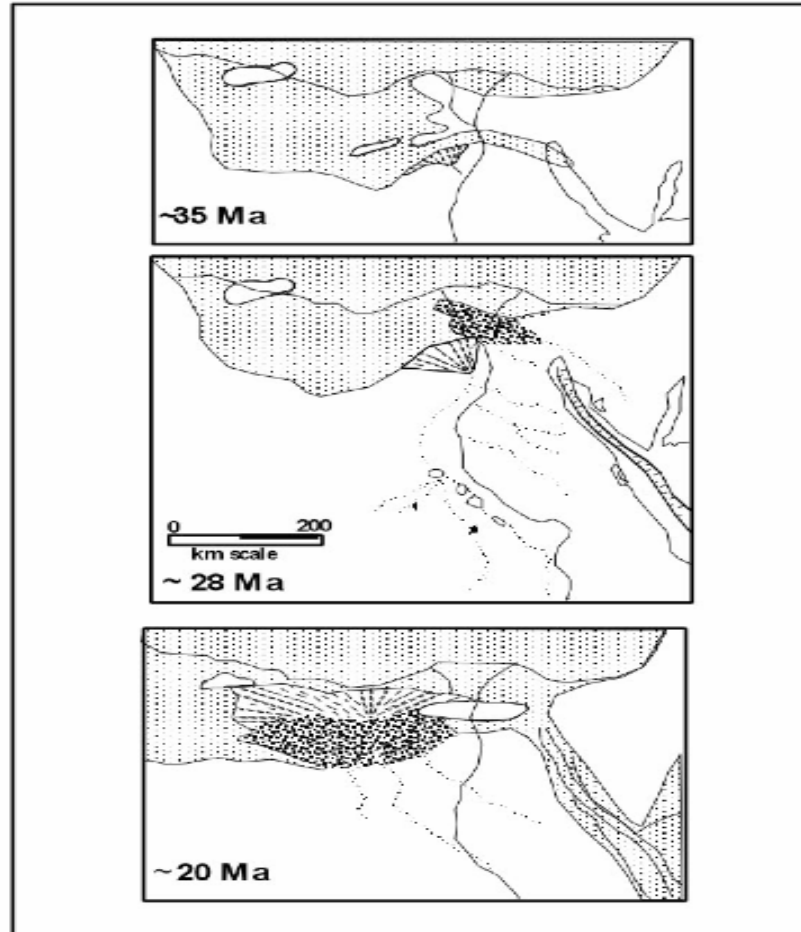


Image courtesy of NASA and USGS.

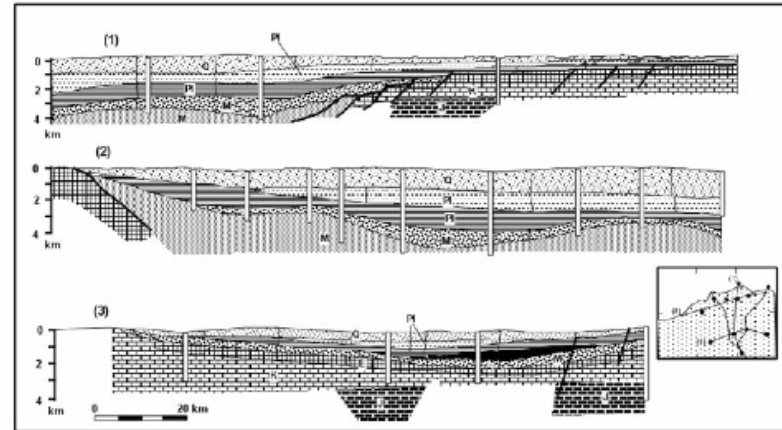
There was no Nile  
Delta at 35 Ma but  
Fayum shore was  
Well-developed

By 28 Ma delta was  
growing

A mature Nile delta  
150 km SE of present  
Site by 20 Ma



**Figure 45** Sketch maps simplified from Said (1993, figure 1.16) showing that there was hardly a Nile delta at ~35 Ma (top). A delta with associated fluvial deposits, indicated by a pebble ornament, which was nearly 100 km wide had formed by ~28 Ma (center). By ~20 Ma the Nile delta was fully formed and was centered perhaps 150 km southwest of the position to which it has now prograded (bottom).



**Figure 44** Three cross-sections through oil wells drilled in the Nile delta. The sections show that the Nile delta contains rocks as old as Miocene (M) in age and that the delta has been cut down into underlying carbonate sediments of Eocene (E), Cretaceous (K) and Jurassic (J) age. The delta consists of Miocene (M), Pliocene (Pl) and Quaternary (Q) sediments which together (see section 2) reach a total thickness of more than 4 km. The black layer shown in section 3 is basalt that was erupted about 25 Ma. The record indicates that the Nile or its ancestor rivers first began to flow by Miocene times. Figure based on figure 1.15 of Said (1993).

## NILE delta growth

Since ca.23 Ma  
The Nile delta  
Has prograded  
Onto the  
Mediterranean  
Ocean floor

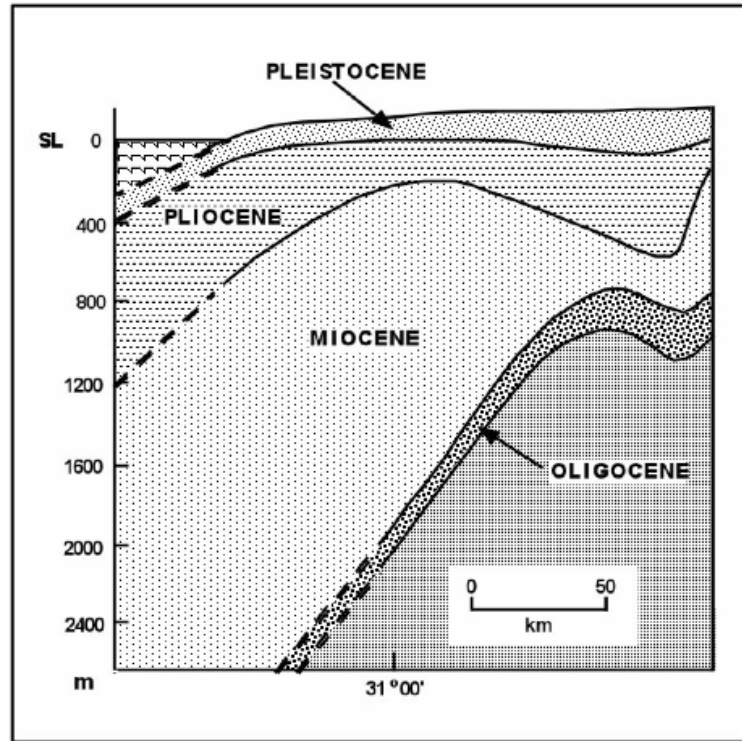


Figure 46 A cross-section based on well data showing how the Nile delta has prograded nearly 200 km since the beginning of the Miocene at about 22 Ma. Figure based on Elzarka & Radwan (1986).



# Zambezi Delta

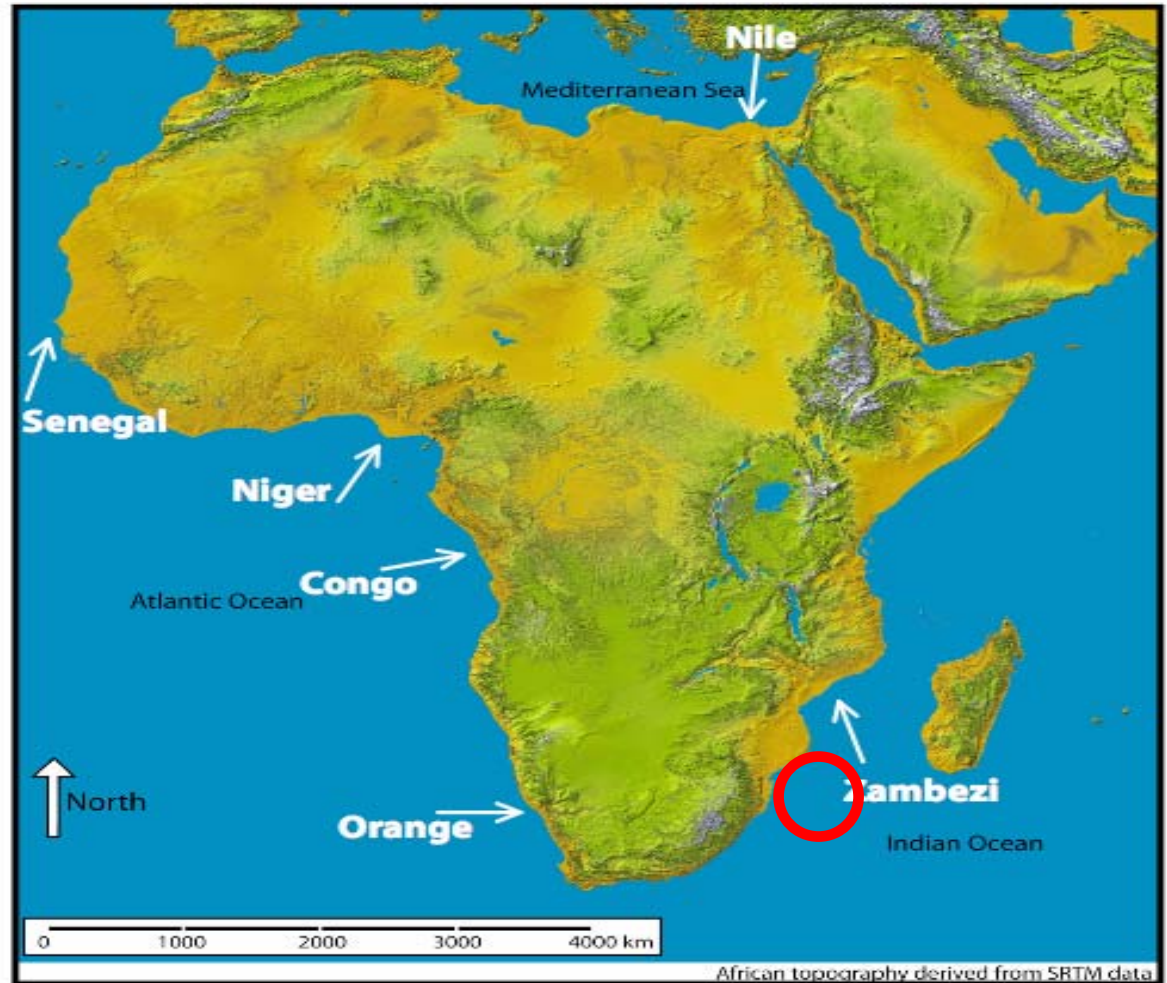


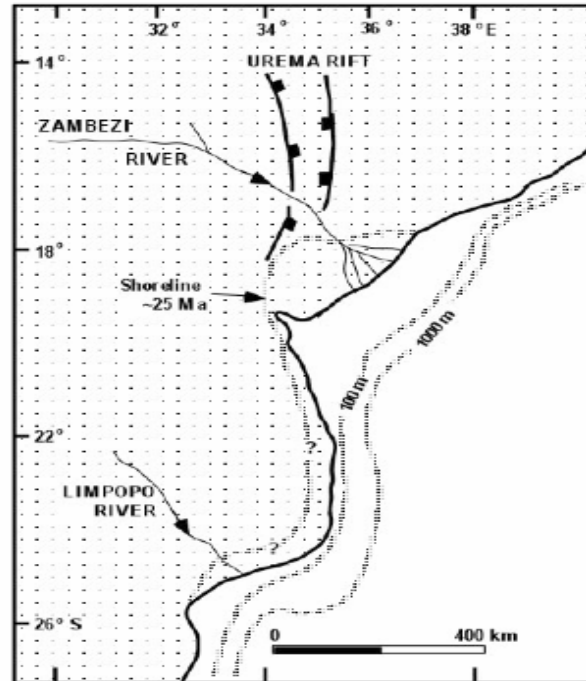
Image courtesy of NASA and USGS.

# Zambezi



Image courtesy of NASA and USGS.

Zambezi delta  
Was much  
Smaller 25 Ma



**Figure 47** Sketch map based on figures in De Buyl & Flores (1986) and Droz & Mougnot (1987) showing how the Zambezi delta has prograded more than 200 km since 25 Ma. The progradation of the Limpopo delta has been much smaller. The position of the Urema graben, which extends south from the Shire valley in Malawi, is indicated. This structure was mainly active during the Cretaceous, but there are indications of activity on some of its faults within the past 30 My

At 25 Ma most  
Of the sediment  
Entering the  
Deep channel  
Between  
Madagascar and  
Mozambique  
Came from the  
Rift to the north.  
Now deposition from  
The Zambezi  
dominates

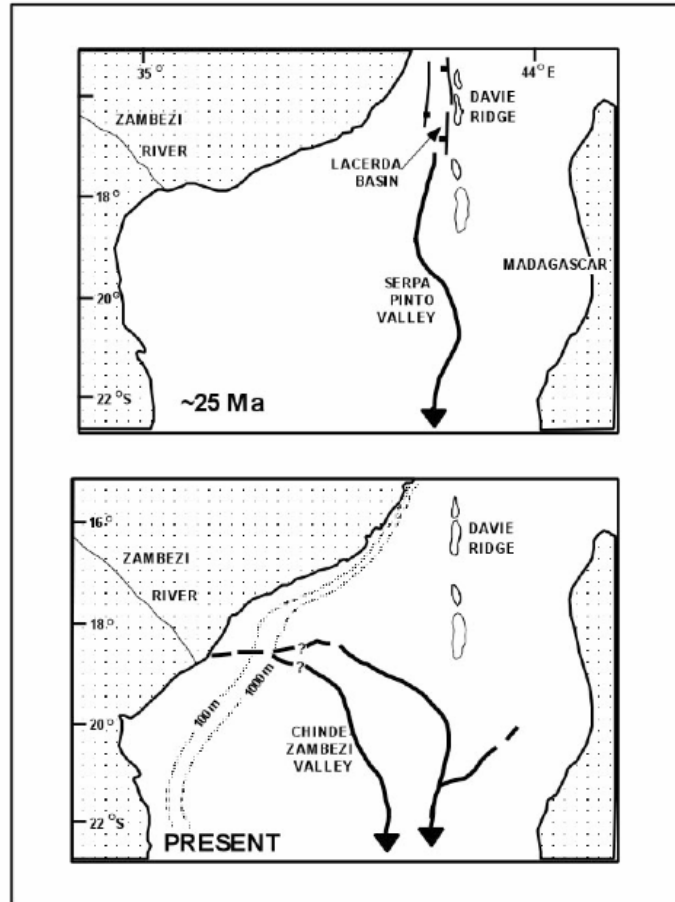


Figure 48 Deep sea channels on the upper part of the Mozambique deep sea fan were fed from the Lacerda Basin Rift ~25 Ma (top figure), but in Quaternary times, channels from the Zambezi delta had become dominant as that great delta prograded. Based on figure 13 in Droz & Mougnot (1987).

# CONCLUSION:

**AFRICAN PLATE WAS PINNED AT 30 Ma**

# CONSEQUENCES:

Shallow mantle convection was set up as a result of which:

- (1) Basins, Swells and Rifts are forming.
- (2) Intraplate volcanic activity on swells.
- (3) Erosion of high ground.
- (4) Deposition, mainly offshore.

Secondary consequences include establishment of a benign environment for human evolution, deep water oil formation, huge Precambrian outcrop (half of the continent's area of 31 M km<sup>2</sup>). There are many mineral deposits in those outcrops.