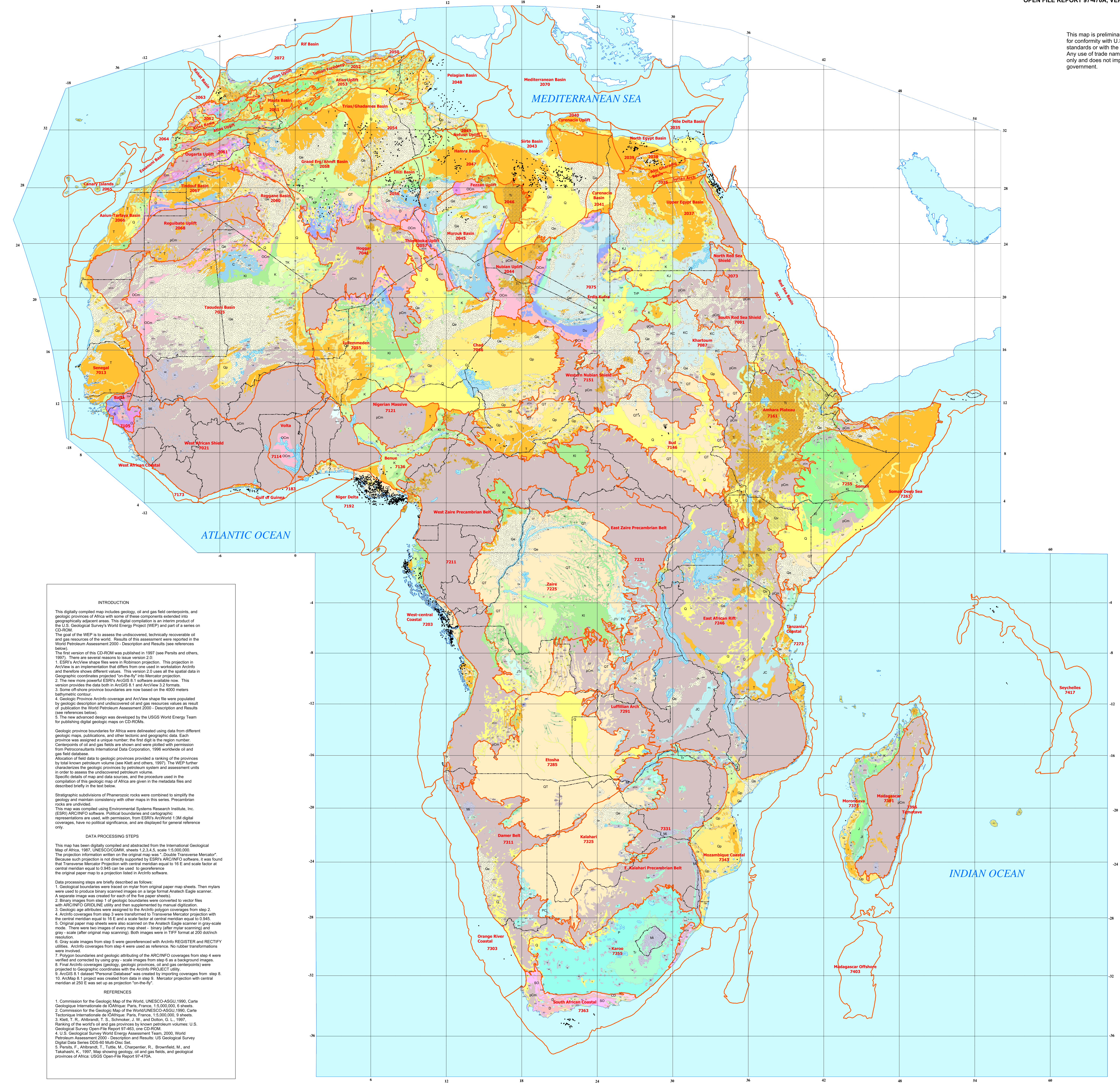


This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the International Stratigraphic Code. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. government.

U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY

**EXPLANATION**

- Geologic Province Outline
- Chad Geologic Province Name
- 7066 Geologic Province Code
- Center of Oil or Gas Field
- Country Boundary
- Quaternary (undivided)
- Holocene
- Pleistocene
- Cenozoic
- Tertiary
- Mesozoic
- Tertiary and Cretaceous
- Cretaceous
- Lower Cretaceous
- Cretaceous and Jurassic
- Jurassic
- Lower Jurassic
- Jurassic and Triassic
- Triassic
- Lower Triassic
- Mesozoic and Paleozoic
- Cretaceous through Carboniferous
- Jurassic through Carboniferous
- Paleozoic
- Permian
- Triassic and Permian
- Permian-Carboniferous
- Carboniferous
- Carboniferous and Devonian
- Devonian
- Upper and Middle Devonian
- Devonian and Silurian
- Silurian
- Silurian-Ordovician
- Ordovician
- Ordovician-Cambrian
- Cambrian
- Precambrian (undivided)
- Paleozoic-Precambrian
- Quaternary extrusive and intrusive rocks
- Tertiary extrusive and intrusive rock
- Mesozoic extrusive and intrusive rock
- Mesozoic-Paleozoic extrusive and intrusive rock
- Paleozoic extrusive and intrusive rock
- Kimberlite
- Subsurface salt dome
- Internal Water Body
- SEA
- Area outside of African Continent



**INTRODUCTION**

This digitally compiled map includes geology, oil and gas field centerpoints, and geologic provinces of Africa with some of these countries outlined geographically adjacent areas. This digital compilation is an interim product of the U.S. Geological Survey's World Energy Project (WEP) and part of a series on CD-ROM.

The goal of the WEP is to assess the undiscovered, technically recoverable oil and gas resources of the world. Results of this assessment were reported in the World Petroleum Assessment 2000 - Description and Results (see references below).

The first version of the CD-ROM was published in 1997 (see Persis and others, 1997). There are several reasons to issue version 2.0:

1. ESR's ArcView shape file was in Robinson projection. This projection is an implementation that differs from one used in workstation ArcInfo and therefore shows different values. This version 2.0 uses all the spatial data in Geographic coordinates projected "on-the-fly" into Mercator projection.
2. The new more powerful ESR's ArcGIS 8.1 software available. This version provides the data both in ArcGIS 8.1 and ArcView 3.2 formats.
3. Some offshore province boundaries are based on the 4000 meters bathymetric contour.
4. Geologic Province ArcInfo coverage and ArcView shape file were populated by geologic description and undiscovered oil and gas resources values as result of publication of the World Petroleum Assessment 2000 - Description and Results (see references below).
5. The new advanced design was developed by the USGS World Energy Team for publishing digital geologic maps on CD-ROMs.

Geologic province boundaries for Africa were delineated using data from different geologic maps, publications, and other isotopic and geographic data. Each province was assigned a unique number: the first digit is the region number. Centerpoints of oil and gas fields are shown and were plotted with permission from Petroconsultants International Data Corporation, 1996 worldwide oil and gas field database.

Allocation of field data to geologic provinces provided a ranking of the provinces by total known petroleum volume (see Klett and others, 1997). The WEP further characterizes the geologic provinces by petroleum system and assessment units in order to assess the undiscovered petroleum volume.

Specific details of map and data sources, and the procedure used in the compilation of this geologic map of Africa are given in the metadata file and described briefly in the text below.

Stratigraphic subdivisions of Phanerozoic rocks were combined to simplify the geology and maintain consistency with other maps in this series. Phanerozoic rocks are undivided.

This map was compiled using Environmental Systems Research Institute, Inc. (ESRI) ArcInfo software. Political boundaries and cartographic representations are used, with permission, from ESR's ArcView 3.2M digital coverages, have no political significance, and are displayed for general reference only.

**DATA PROCESSING STEPS**

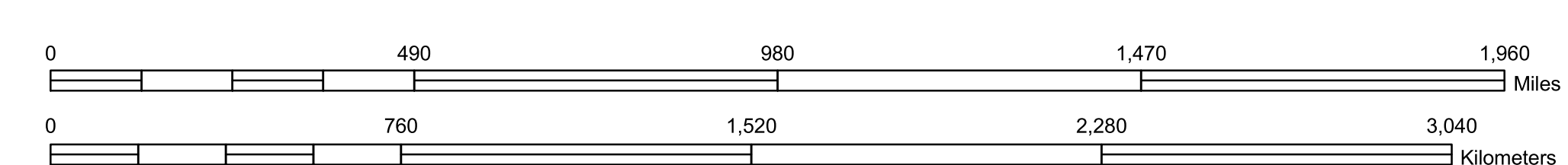
This map has been digitally compiled and abstracted from the International Geological Map of Africa, 1987, UNESCO/CGRW, sheets 1:2,4 & 3, scale 1:5,000,000. The projection information written on the original map was "Double Transverse Mercator". Because such projection is not directly supported by ESR's ArcInfo software, it was found that Transverse Mercator Projection with central meridian equal to 16 E and scale factor at central meridian equal to 0.98 can be used to georeference the original paper map to a projection listed in ArcInfo software.

Data processing steps are briefly described as follows:

1. Geologic boundaries were traced on mylar from original paper map sheets. Then mylar were used to produce binary scanned images on a large format Anatech Eagle scanner.
2. Binary images were created for each of the five paper sheets.
3. Binary images from step 1 of geologic boundaries were converted to vector files with ARC/INFO DRG file utility and then implemented by manual digitization.
4. Geologic age attributes were assigned to the ArcInfo polygon coverages from step 2.
5. Geologic coverages from step 3 were transformed to Transverse Mercator projection with the central meridian equal to 16 E and a scale factor at central meridian equal to 0.98.
6. Original paper map sheets were also scanned on the Anatech Eagle scanner in gray-scale mode. There were two images of every map sheet - binary (after raster scanning) and gray-scale (after original map scanning). Both images were in TIFF format at 300 dots/inch resolution.
7. Gray-scale images from step 6 were georeferenced with ArcInfo REGISTER and RECTIFY utilities. ArcInfo coverages from step 4 were used as reference. No rubber transformations were involved.
8. Polygon boundaries and geologic attributing of the ARC/INFO coverages from step 4 were verified and corrected by using gray-scale images from step 6 as a background image.
9. Final ArcInfo coverages (geology, geologic provinces, oil and gas centerpoints) were projected to Geographic coordinates with the ArcInfo PROJECT utility.
10. ArcGIS 8.1 dataset "Personal Database" was created by importing coverages from step 8.
11. ArcGIS 8.1 project was created from data in step 10. Mercator projection with central meridian at 20 E was set up as projection "on-the-fly".

**REFERENCES**

1. Commission for the Geologic Map of the World, UNESCO/ASGU, 1990, Carte Geologique Internationale de l'Afrique, Paris, France, 1:5,000,000, 8 sheets.
2. Commission for the Geologic Map of the World/UNESCO/ASGU, 1990, Carte Tectonique Internationale de l'Afrique, Paris, France, 1:5,000,000, 9 sheets.
3. Klett, T. R., Ahlbrandt, T. S., Schmalzer, J. W., and Dolan, G. L., 1997, Ranking of the world's oil and gas provinces by known petroleum volume, U.S. Geological Survey Open-File Report 97-463, one CD-ROM.
4. U.S. Geological Survey World Energy Assessment Team, 2000, World Petroleum Assessment 2000 - Description and Results: US Geological Survey Digital Data Series (DDS-60) Multi-Scale Set.
5. Persis, F., Ahlbrandt, T., Tuttle, M., Charpentier, R., Brownfield, M., and Takahashi, K., 1997, Map showing geology, oil and gas fields, and geologic provinces of Africa, USGS Open-File Report 97-470A.



# MAP SHOWING GEOLOGY, OIL AND GAS FIELDS, AND GEOLOGIC PROVINCES OF AFRICA

Digitally compiled by Feliks M. Persits, Thomas S. Ahlbrandt, Michele L. Tuttle, Ronald R. Charpentier, Michael E. Brownfield, and Kenneth I. Takahashi

Projection - Mercator  
False Easting: 0.000000  
False Northing: 0.000000  
Central Meridian: 25.000000  
Standard Parallel: 0.000000