



HYDROCARBON EXPLORATION IN THE ALBERTINE GRABEN OF THE EAST AFRICAN RIFT SYSTEM

GEOPRISM; EAST AFRICAN RIFT SYSTEM PLANNING WORKSHOP

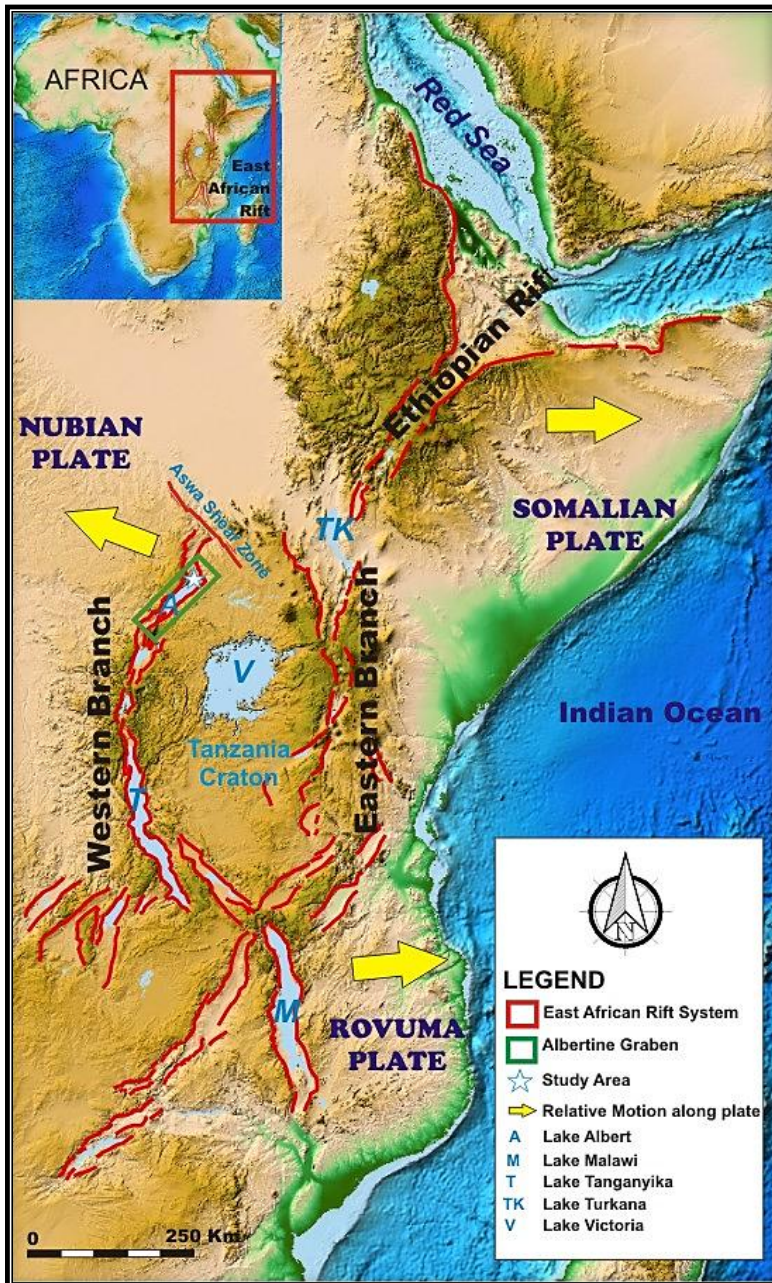
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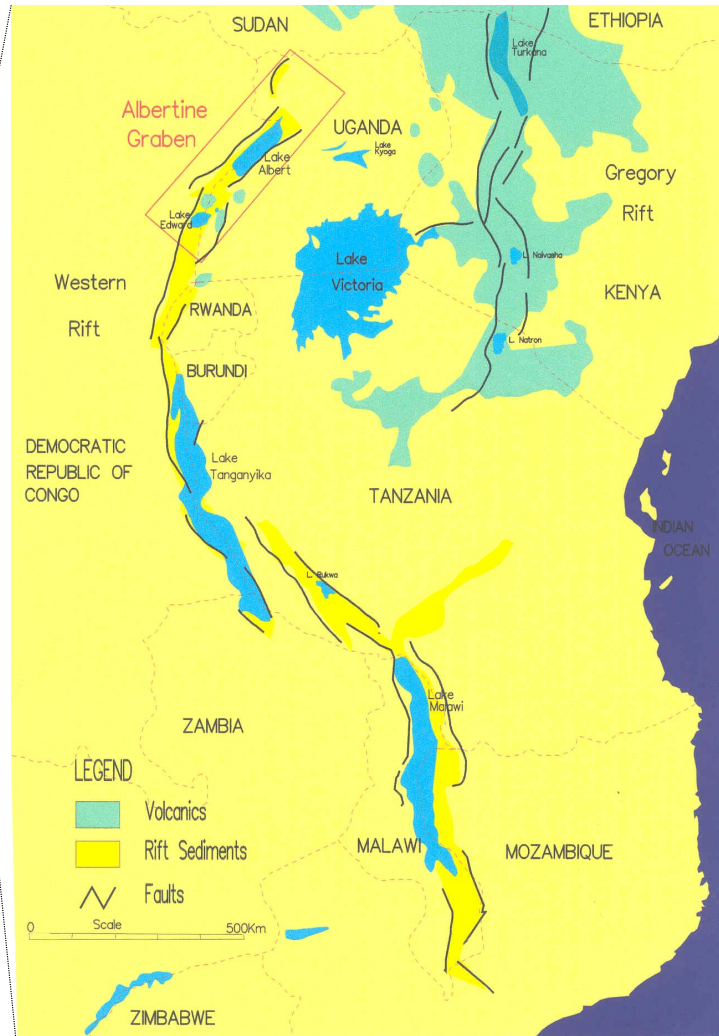
BACKGROUND

- ❖ The East Africa Rift System is now a hot spot for hydrocarbon exploration
- ❖ Exploration started in the Early 20th Century. With the discovery of hydrocarbons in the East African Rift System in Uganda and Kenya, focus has been drawn to this Area.
- ❖ The Uganda Government is undertaking two research projects:
 - Harmonization of the different stratigraphic schemes within the Albertine Graben and
 - Petroleum Systems Analysis of the Albertine Graben
- ❖ Being done in collaboration with IOC, and other Researchers



- ❖ The East African Rift System bifurcates into the eastern, western and the south western Arms
- ❖ The western arm is less magmatic compared to the western arm
- ❖ Recent research has shown existence of Victoria, Somalia and Rovuma Micro plates with slight extension direction variation from the main Nubia plate.

EAST AFRICAN RIFT SYSTEM



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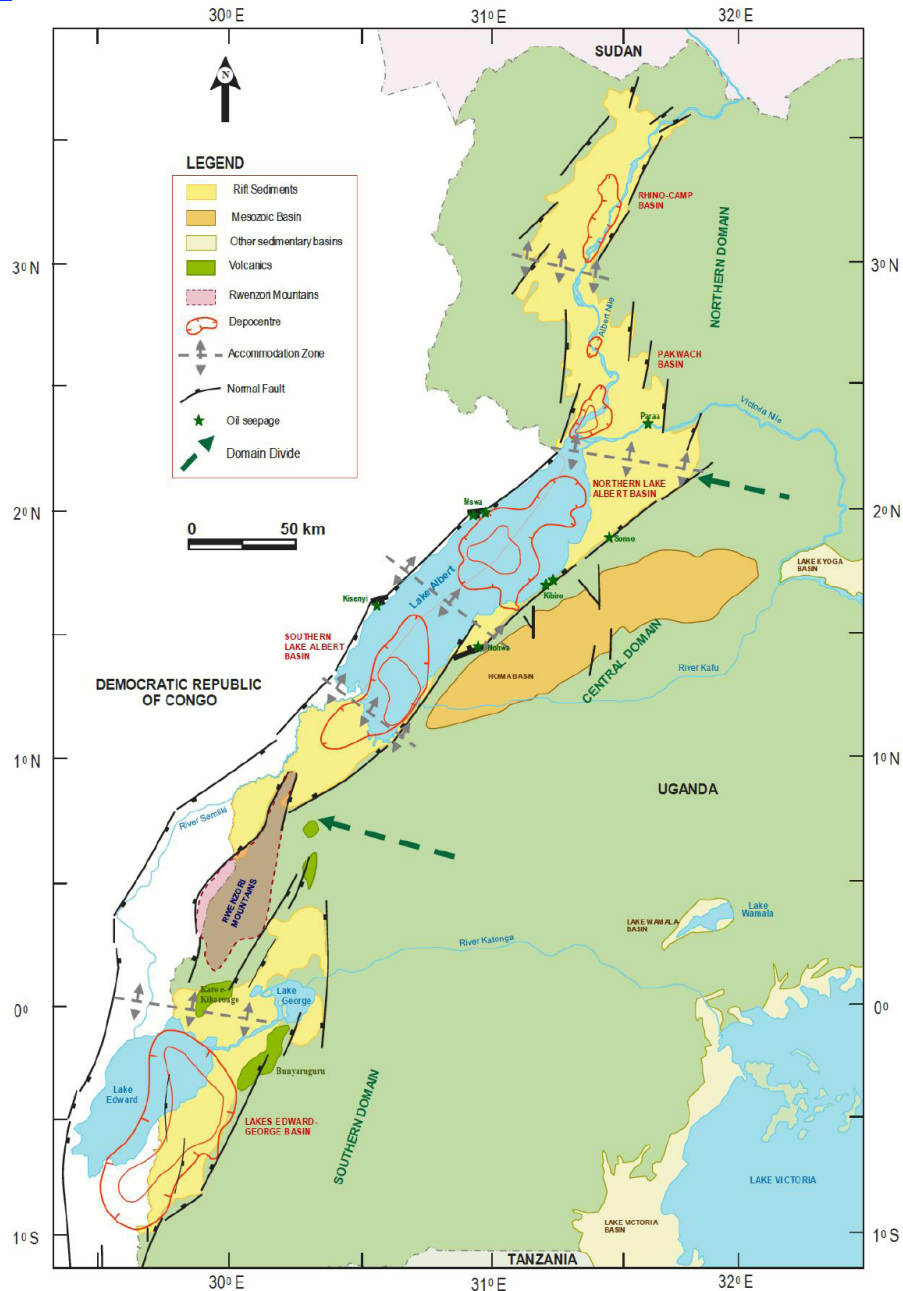
Albertine Graben

❖ A Tertiary rift basin at the northern most part of the Western arm of the EARS along the Uganda DRC border

❖ Rifting started during Early-Mid Miocene. Pre - Cambrian fabric influenced rift geometry

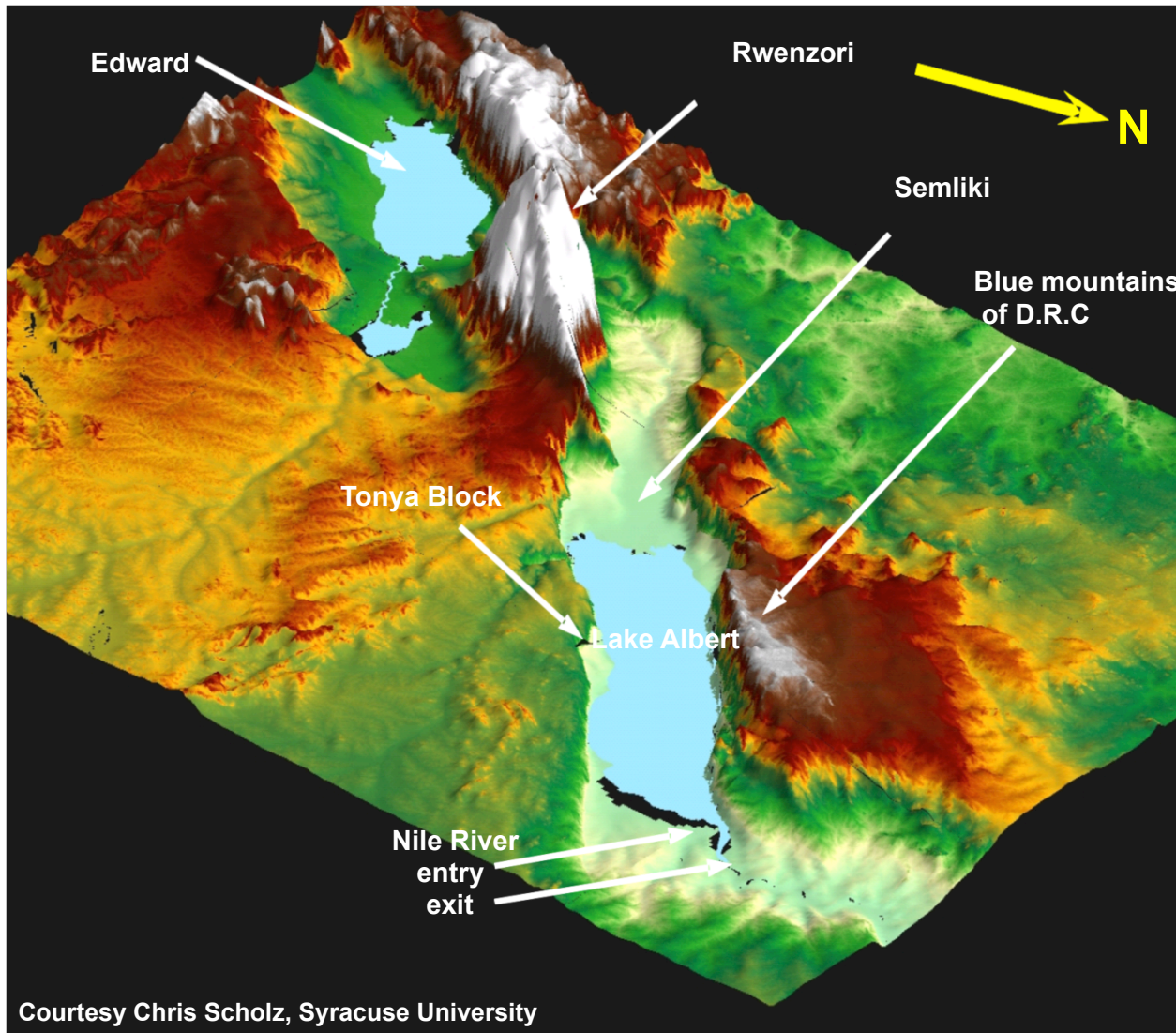
❖ Compression structures have been observed in the Rukwa rift (NW – SE) and in the Albertine Graben (NE - SW) against a N – S general trend. Could it be some sort of transform?

STRUCTURAL SETTING OF THE ALBERTINE GRABEN

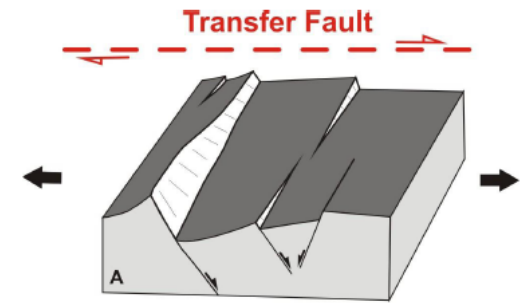


- ❖ Grabens and half grabens separated by accommodation zones
- ❖ Graben strongly shaped by;
 - Continental Extension – NW-SE
 - Strike slip tectonics
- ❖ Three structural domains:
 - Northern trends in a NNE-SSW
 - Central trends in a NE-SW
 - Southern trends in a NNE-SSW
- ❖ An imposing Rwenzori Mountain ranges stand at an altitude of 5109m, an altitude not seen in any other extension setting. The cause of its uplift is not yet known.

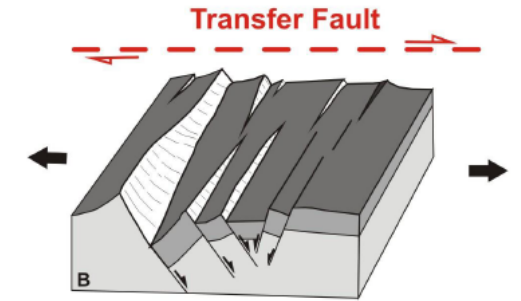
STRUCTURAL SETTING OF THE ALBERTINE GRABEN



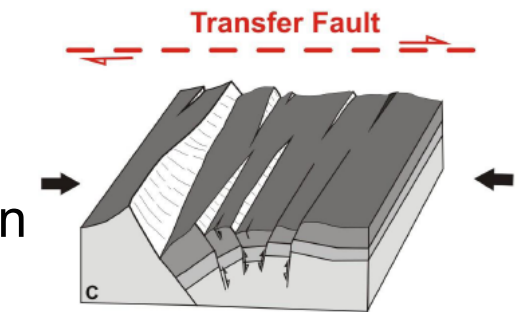
Initiation of rifting



Main extension episode



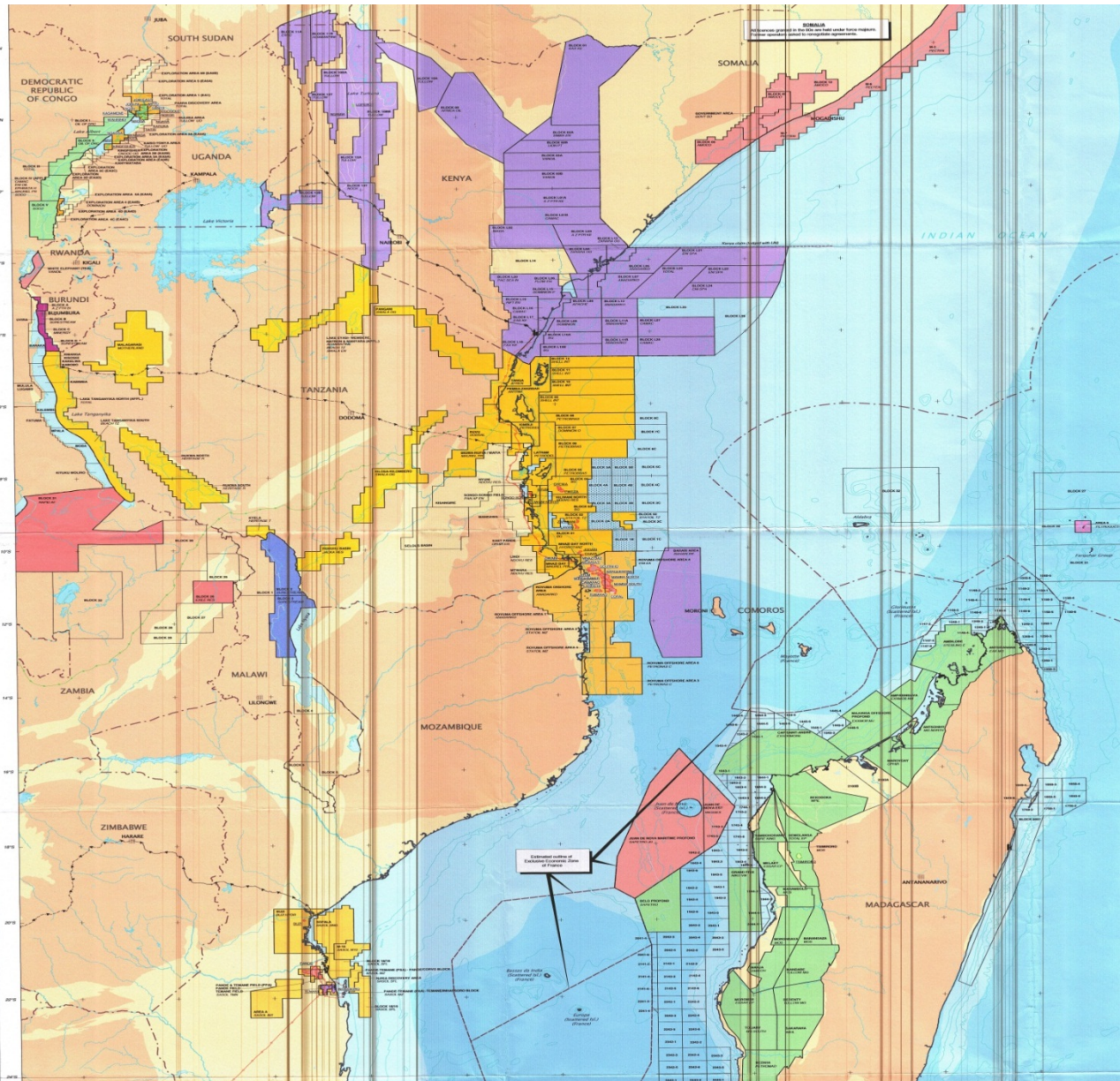
Inversion/ reactivation episode



These episodes of rifting and uplift have magnificent features within the Rift System

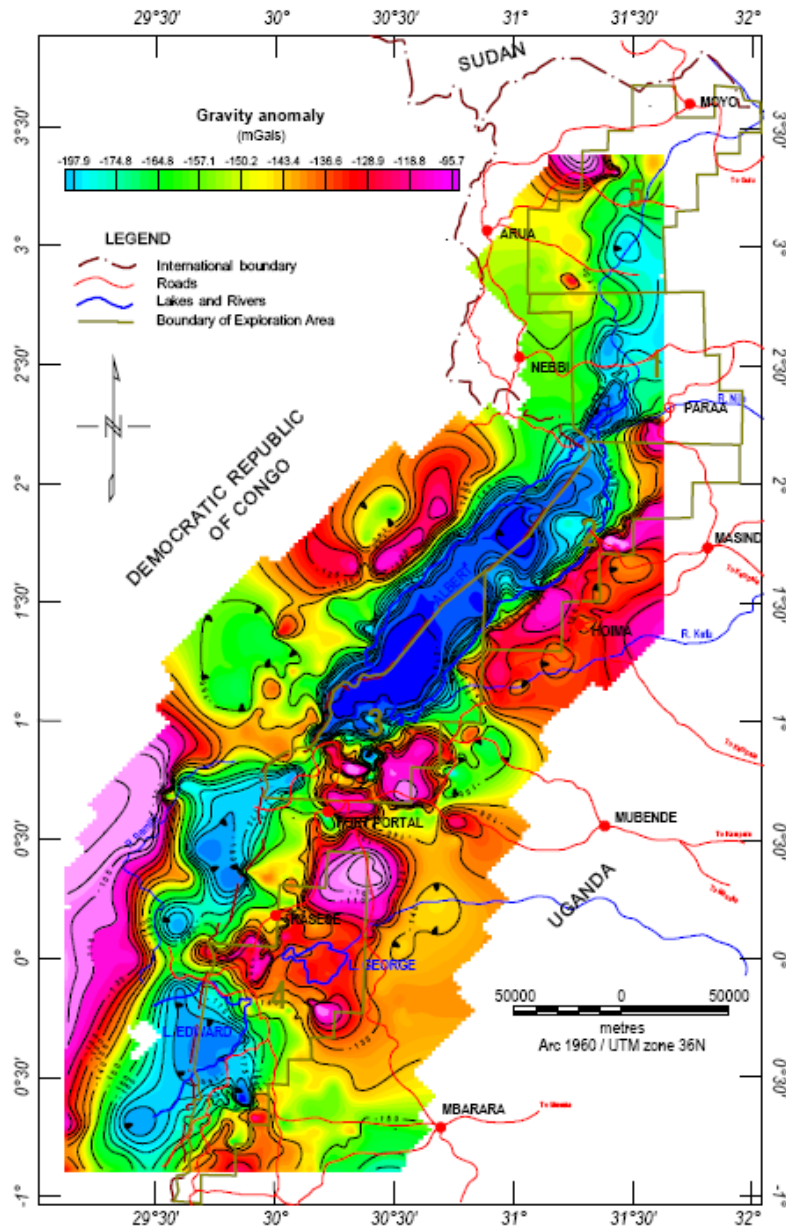
East Africa

- ❖ Hydrocarbon Exploration in the East African Rift System started in the early 20th century, stagnated but is now gaining pace
- ❖ Discoveries in the Albertine Graben in Uganda and in the Turkana basin in Kenya has increased interest in the Area.



Courtesy of IHS

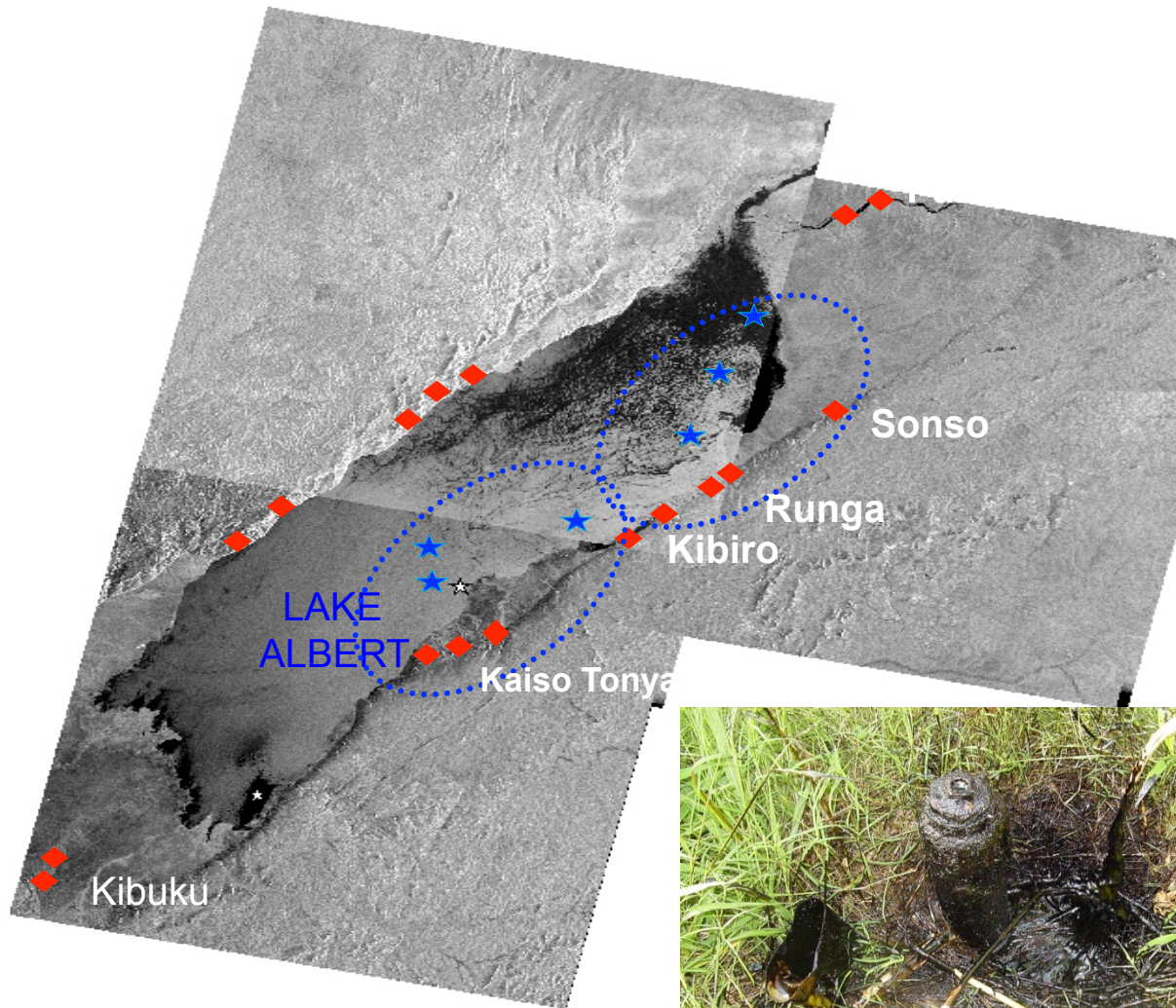
HYDROCARBON EXPLORATION



- ❖ Magnetic and Bouguer gravity anomaly acquired since 1983 has delineated five depocentres with potential for Hydrocarbon generation in the Albertine Graben (Aeromagnetic data now covers the entire country).
- ❖ Seismic data acquired since 1998 has confirmed these depocentres, but also indicated structures that can trap hydrocarbons
- ❖ Deepest and largest depocentre located under Lake Albert

HYDROCARBON EXPLORATION

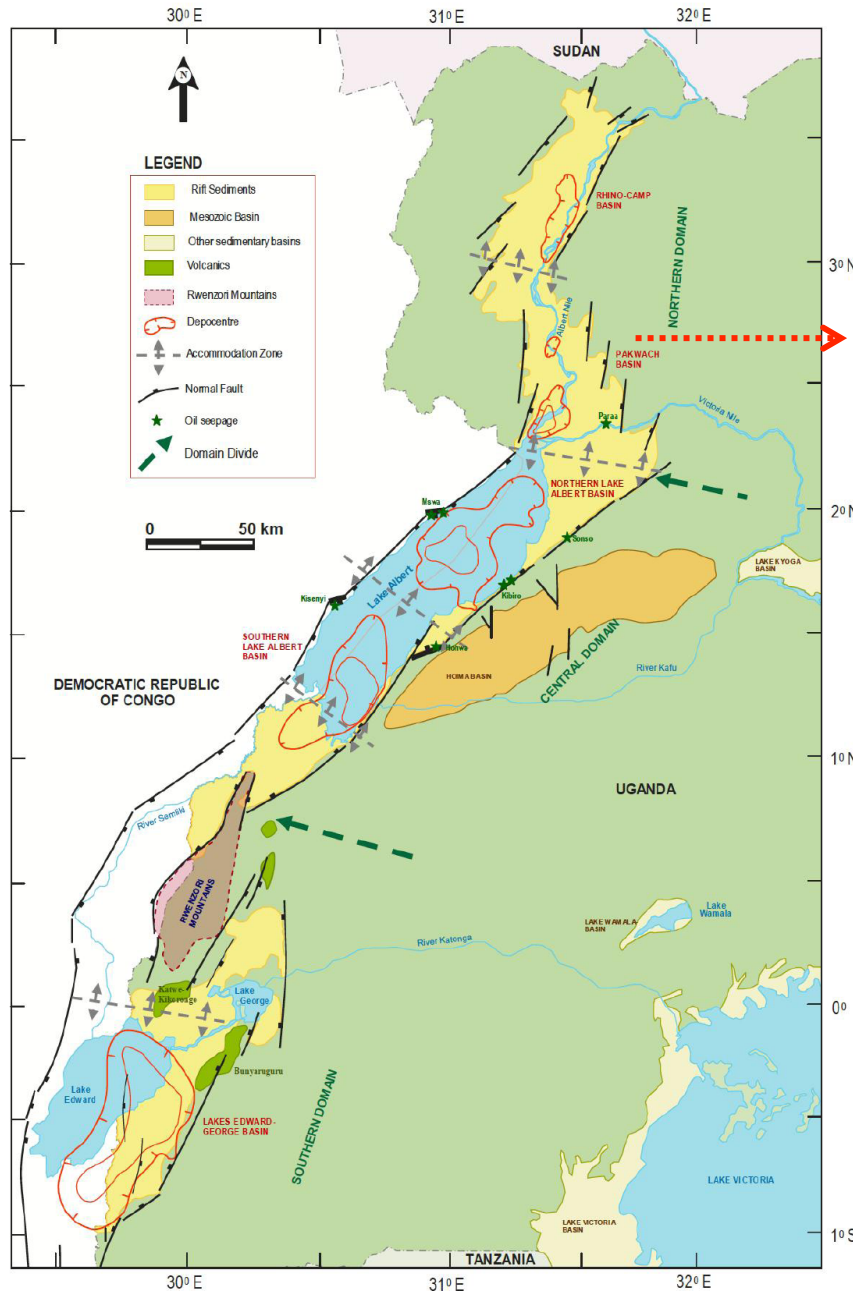
Oil Seep occurrence along transfer zones



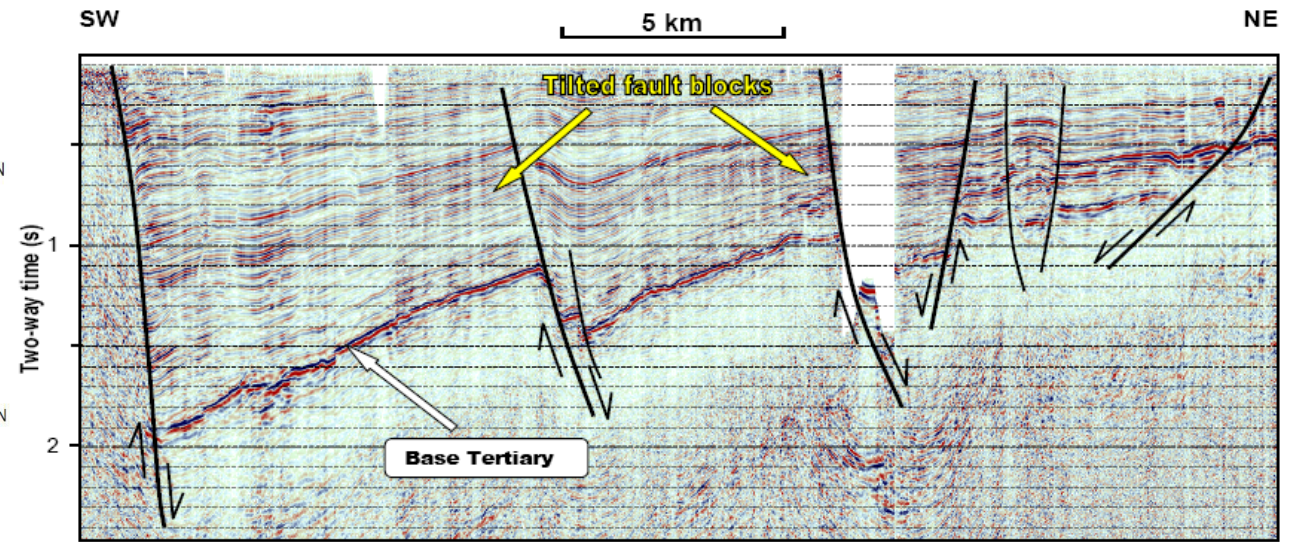
- ◆ Oil seeps
- ★ SAR seeps

- ❖ 2004-2006 mapping project documented several hydrocarbon seeps along relay ramps
- ❖ Rift development plays a key role in structural trap formation

HYDROCARBON EXPLORATION

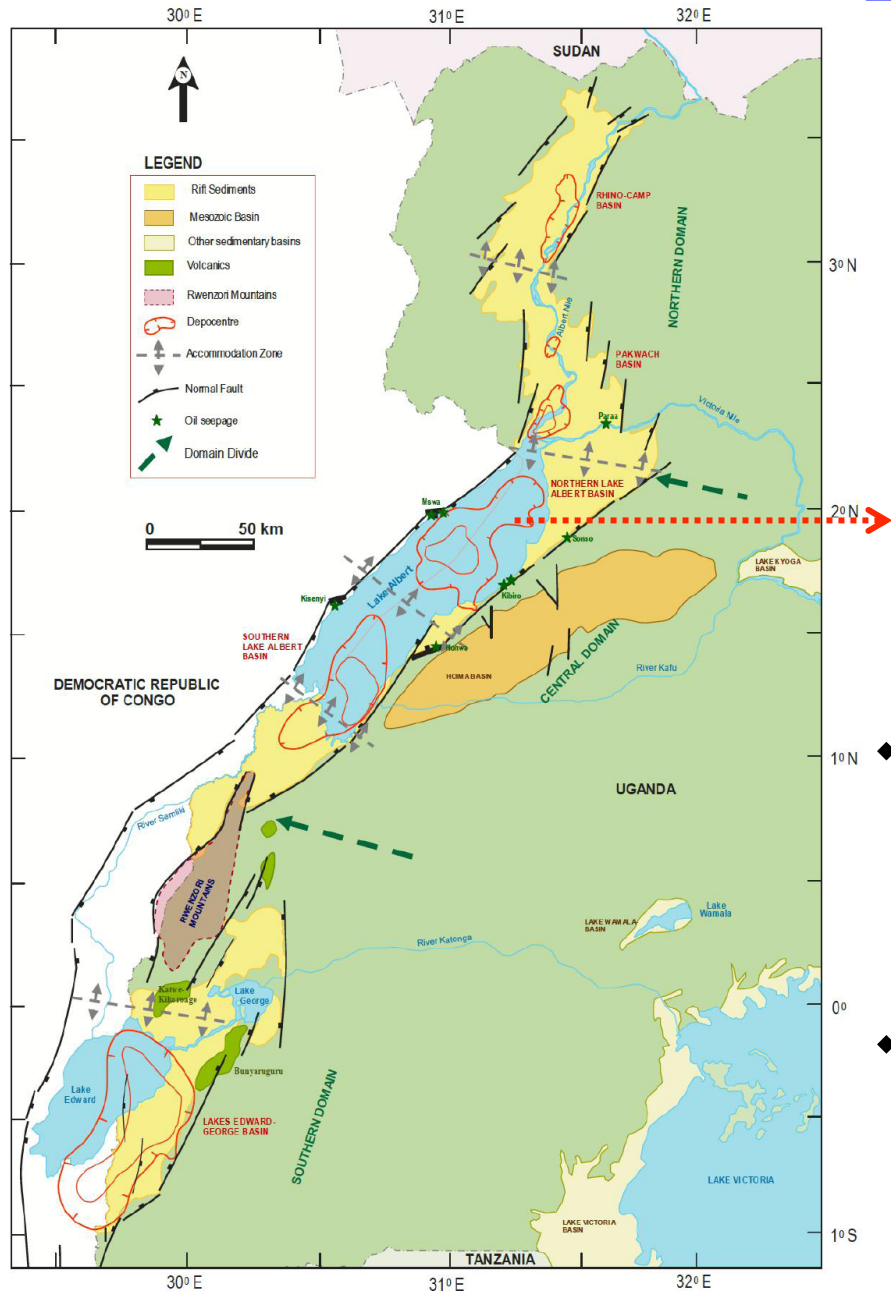


PAKWACH BASIN

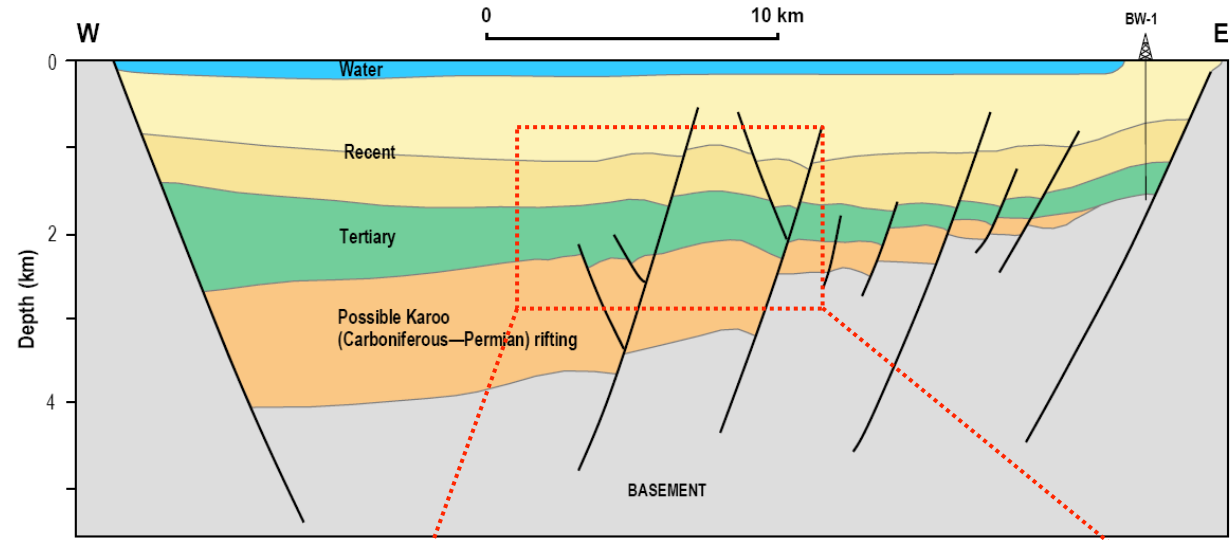


- ❖ Domino style faulting with development of antithetic faults
- ❖ Tilted fault blocks
- ❖ Extension related folding
- ❖ Potential stratigraphic traps

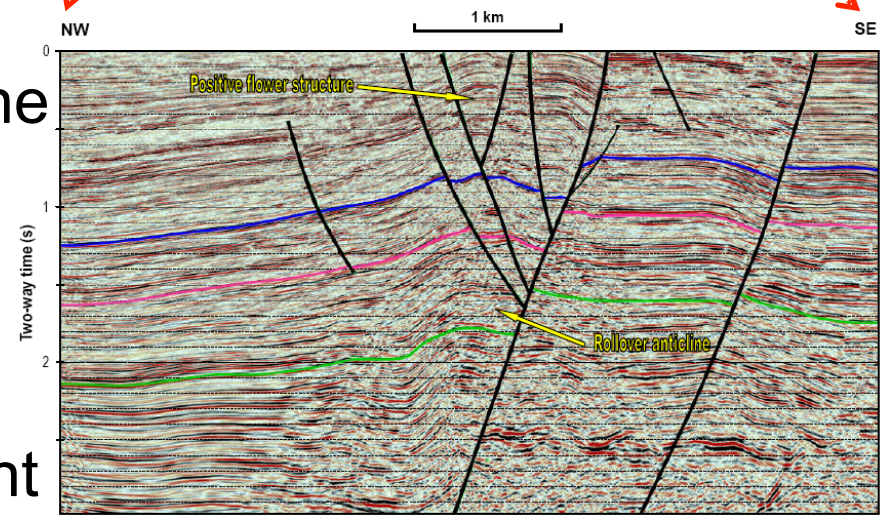
HYDROCARBON EXPLORATION

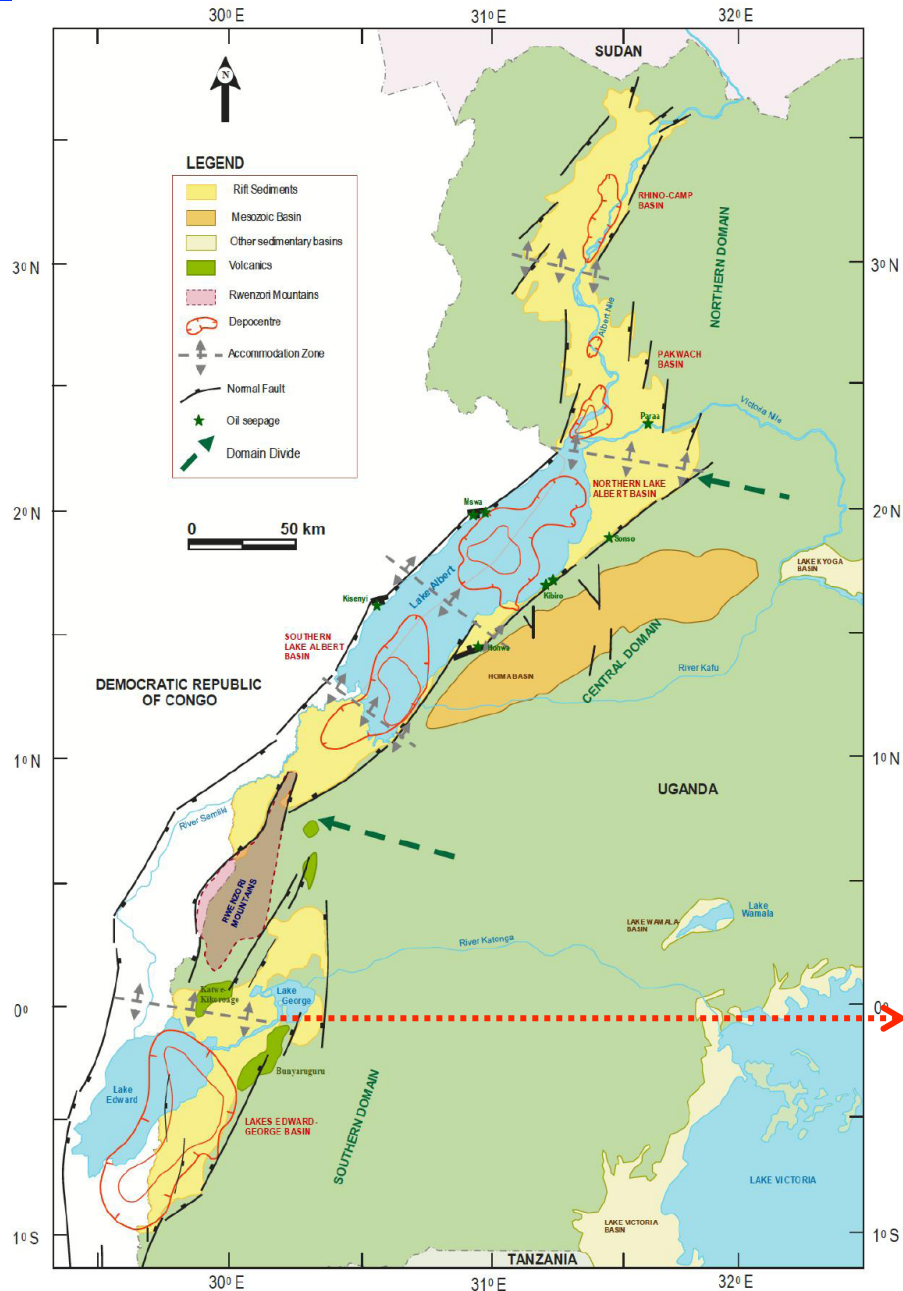


LAKE ALBERT BASIN

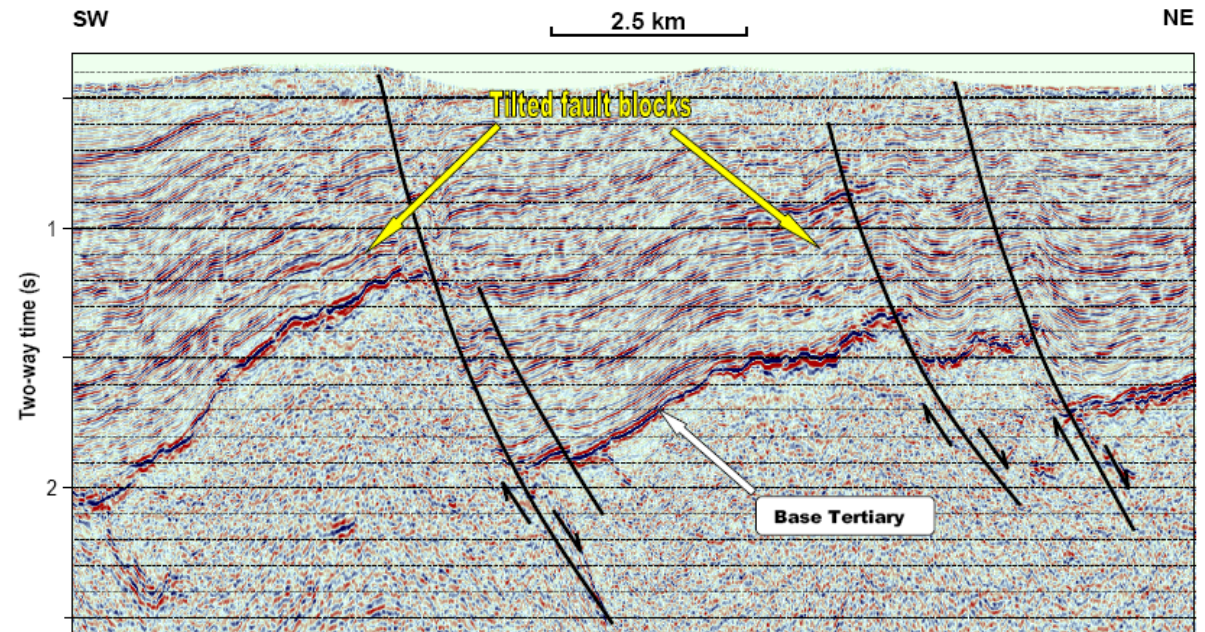


- ❖ Almost full graben to the west
- ❖ Flower structure development





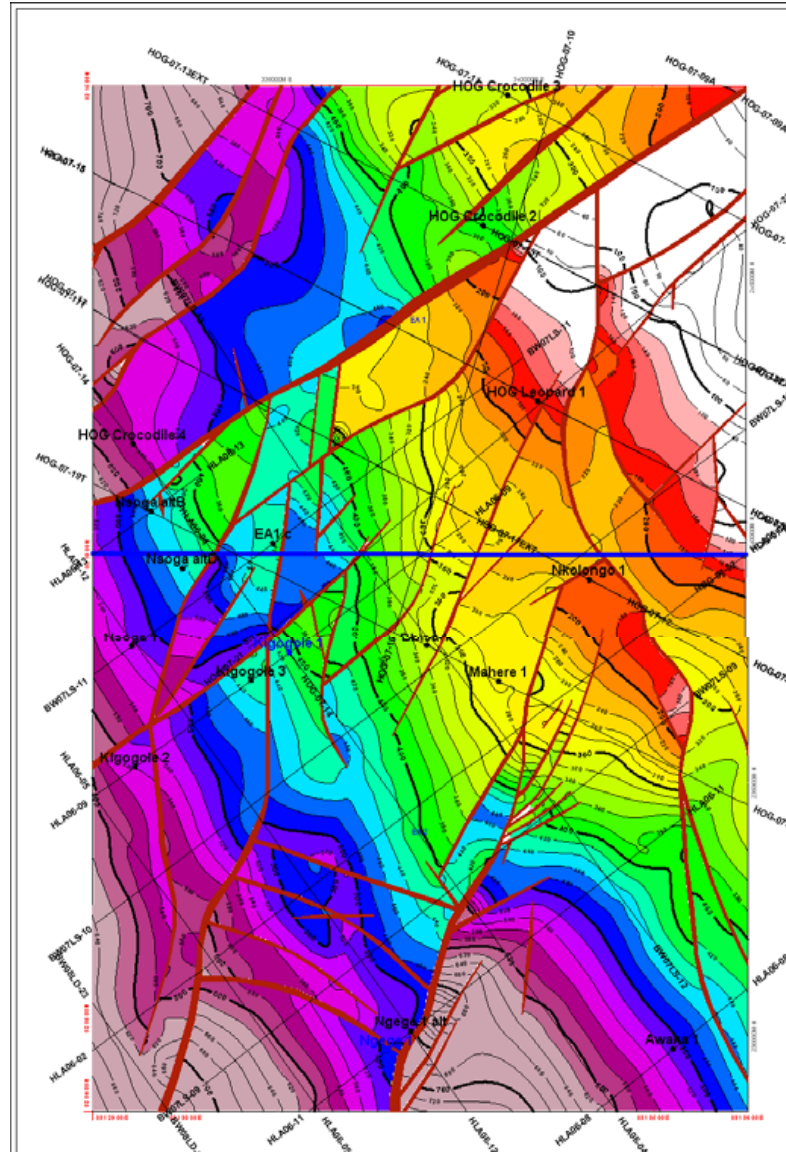
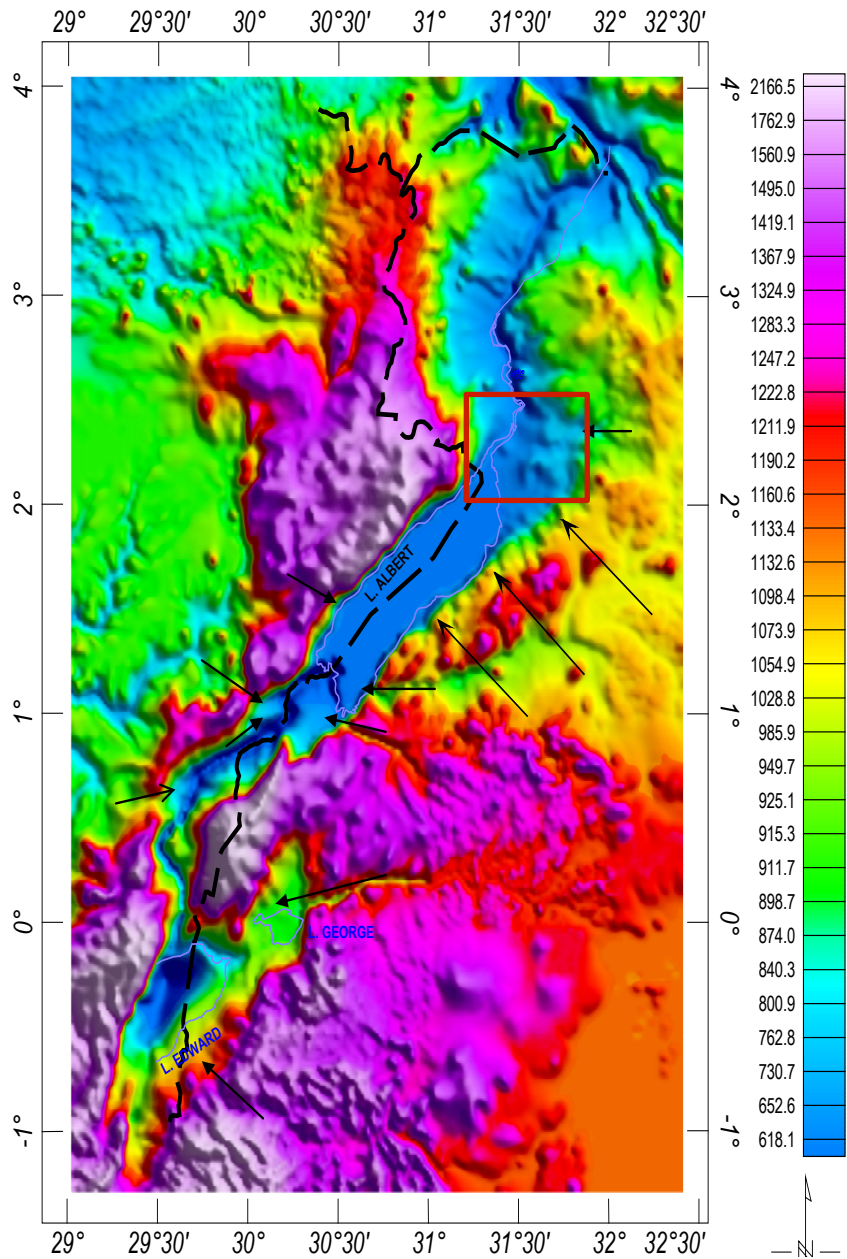
LAKE EDWARD-GEORGE BASIN



Half graben structures

- ❖ Slightly listric faults
- ❖ Rotated fault blocks

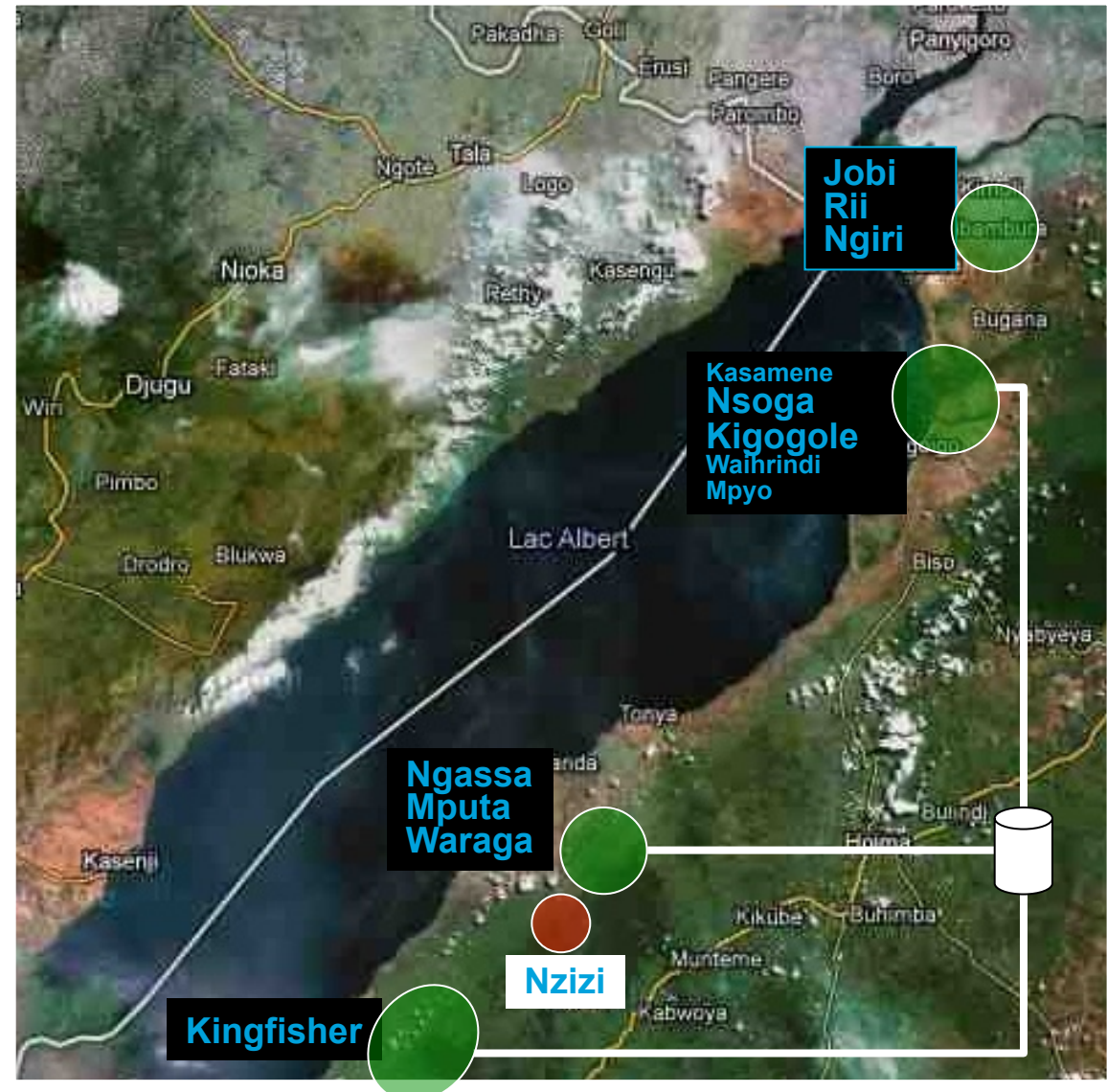
HYDROCARBON EXPLORATION



Highly faulted accommodation zone coupled with a change in fault trend from NE – SW to an almost N – S trend created rotated fault blocks that have trapped hydrocarbons

Resource Potential

- ❖ 20 oil and/or gas discoveries made to date
- ❖ Discovered resources currently estimated at over 3.5 billion bbls of oil equivalent in place
- ❖ Type of crude is 30-34 API low sulphur, waxy crude, Pour point of ~40 degrees Celsius.

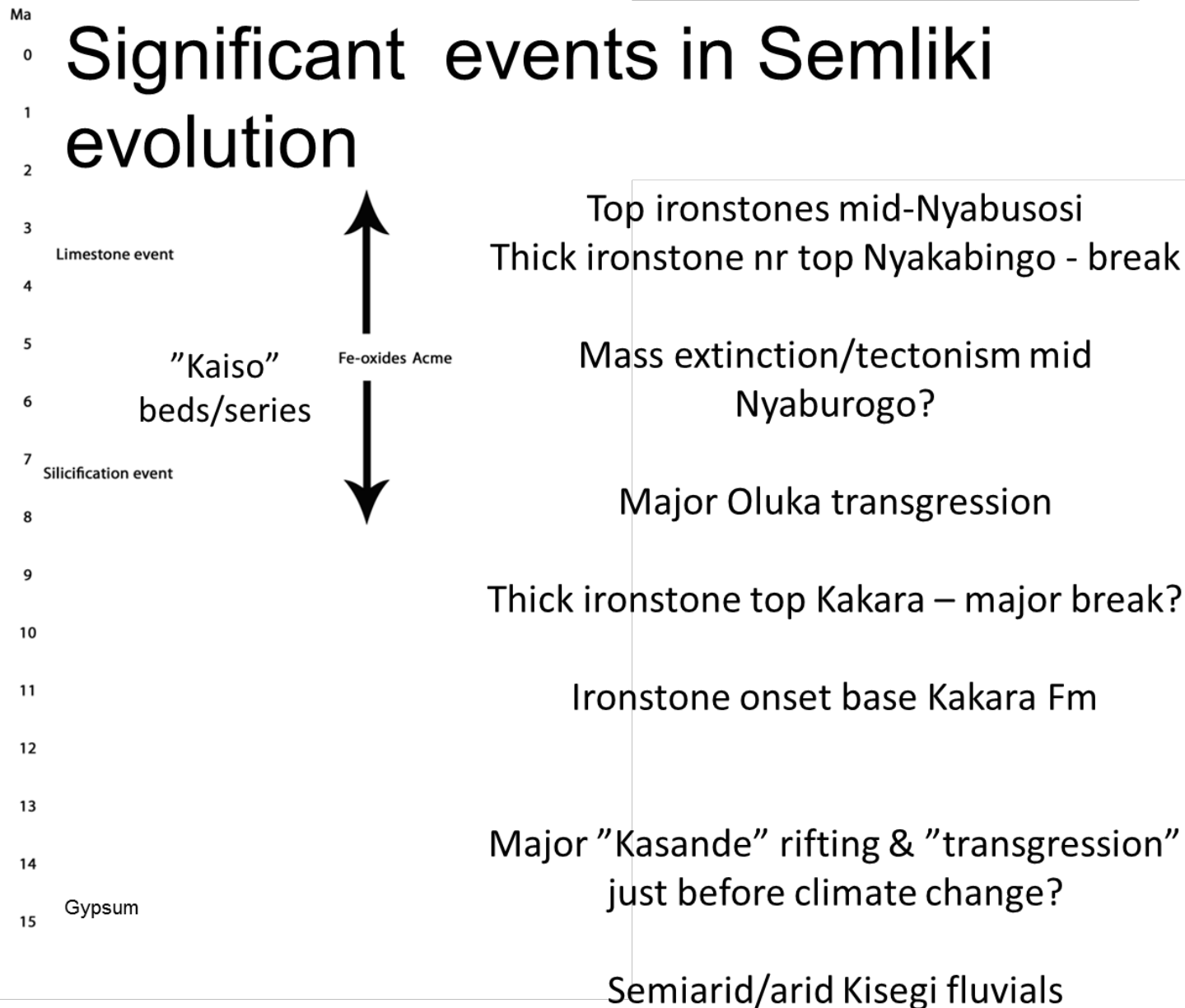


ONGOING STRATIGRAPHIC WORK



- ❖ Harmonization of the different stratigraphic schemes used by IOCs
- ❖ The Semliki Area presents the most complete sedimentary succession in the Albertine Graben
- ❖ Fresh road cuts have exposed a condensed section of the succession in the basin

ONGOING STRATIGRAPHIC WORK



❖ This evolution as presented represents ongoing work by the stratigraphy study group set up by the Uganda Government

CONCLUDING REMARKS

- ❖ Efforts on petroleum exploration in Uganda has been on for the last 50 years and has generated substantial amount of data.
- ❖ Exploration effort have led to the discovery of over 3.5 billion barrels of oil equivalent in place in the country and this is expected to increase.
- ❖ The discovery of commercial reserves has de-risked the entire East African Rift System.
- ❖ In the Albertine Graben, studies are now focussed towards understanding the basin to better plan production.