TECTONIC CONTROL ON GEOTHERMAL SITES WITH SPECIFIC REFERENCE TO THE ALBERTINE GRABEN

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At the

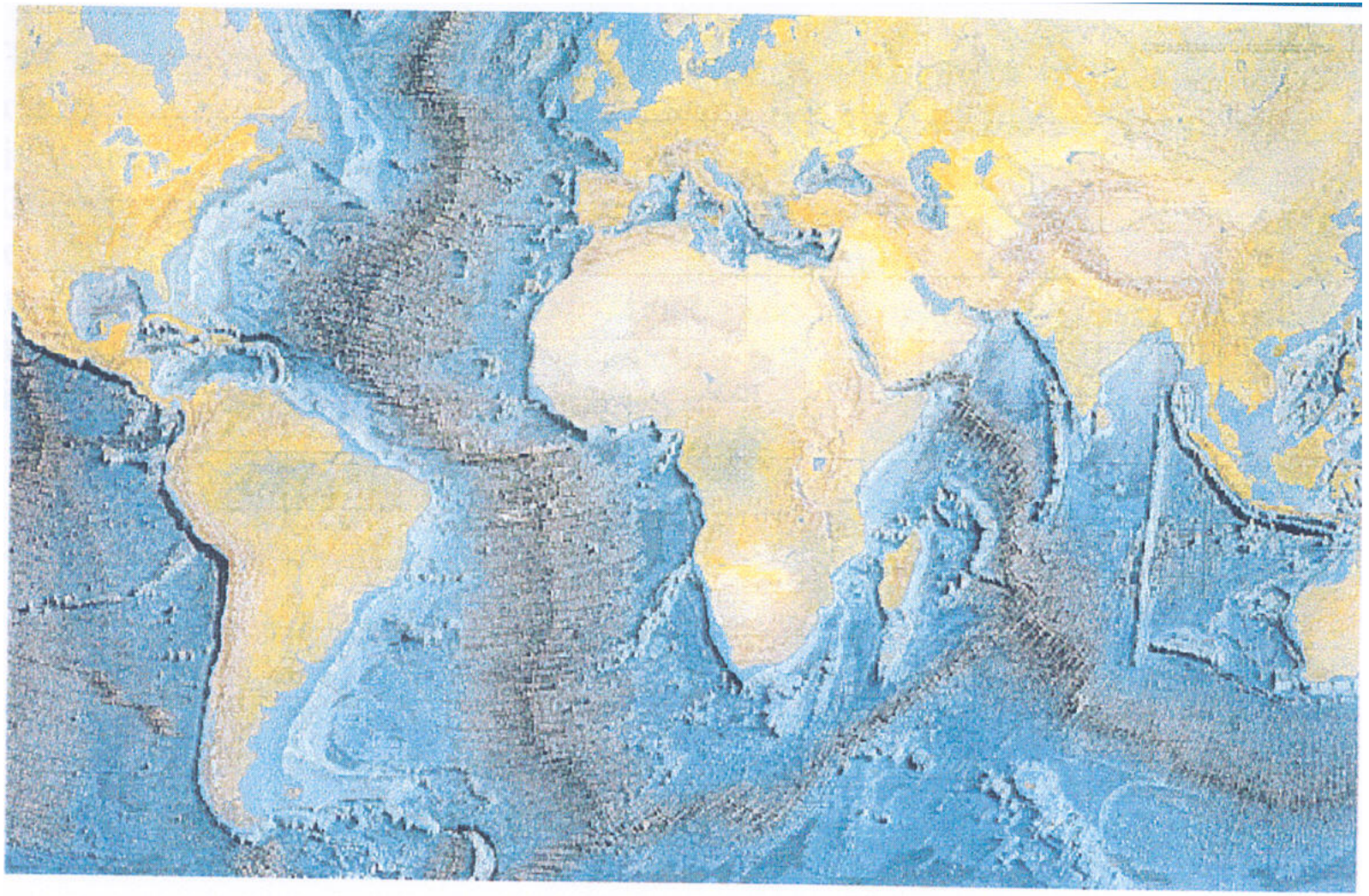
SECOND AFRICAN RIFT GEOTHERMAL CONFERENCE

Imperial resort Beach Hotel 24th – 25th November 2008.

TOPICS TO COVER.

1. INTRODUCTION
2. REGIONAL SETTING OF THE EARS
3. GEOTHERMAL POTENTIAL OF UGANDA
4. CONCLUSIONS

1. INTRODUCTION: Location of Geothermal Sites

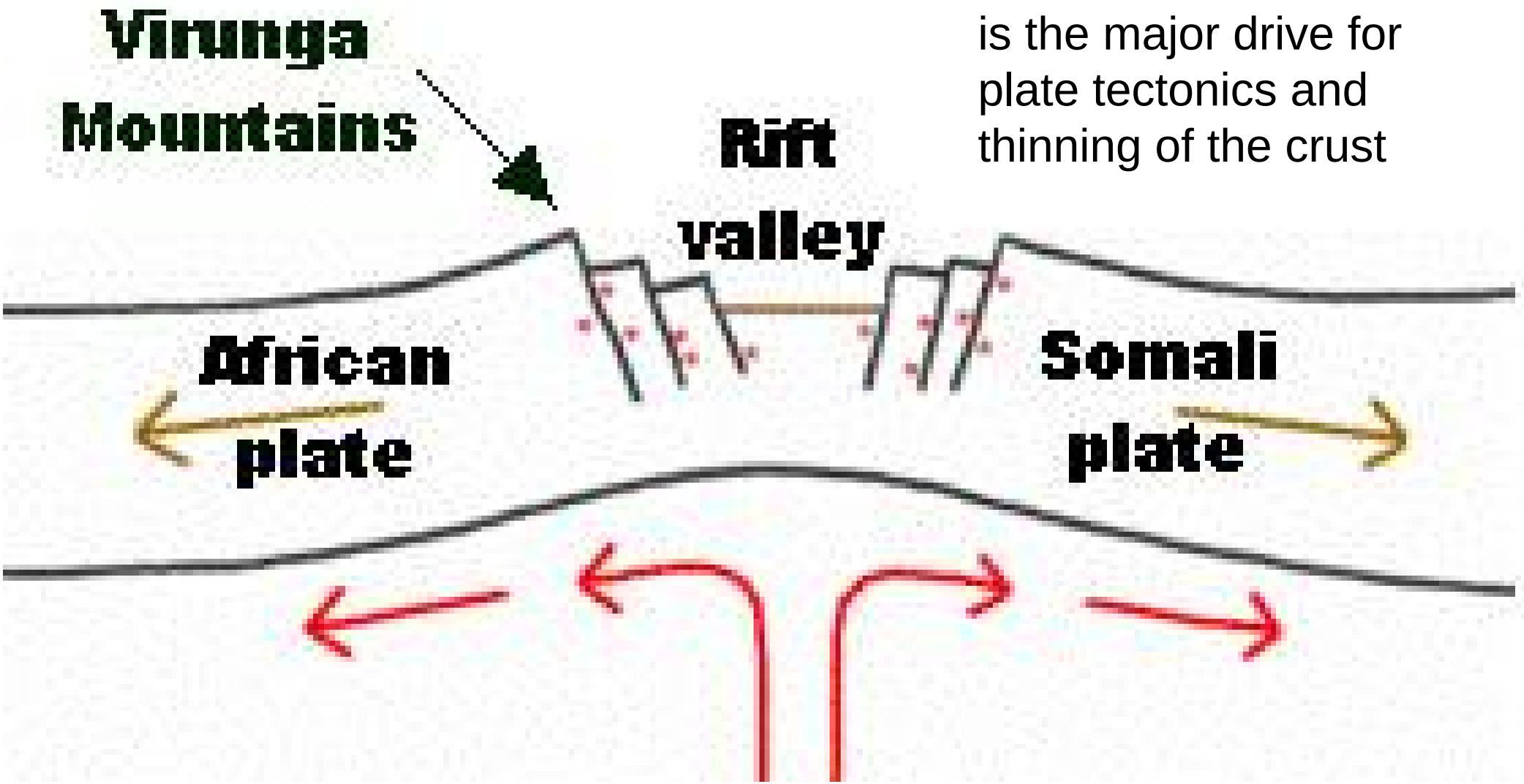


Geothermal Sites influenced by Plate Boundaries

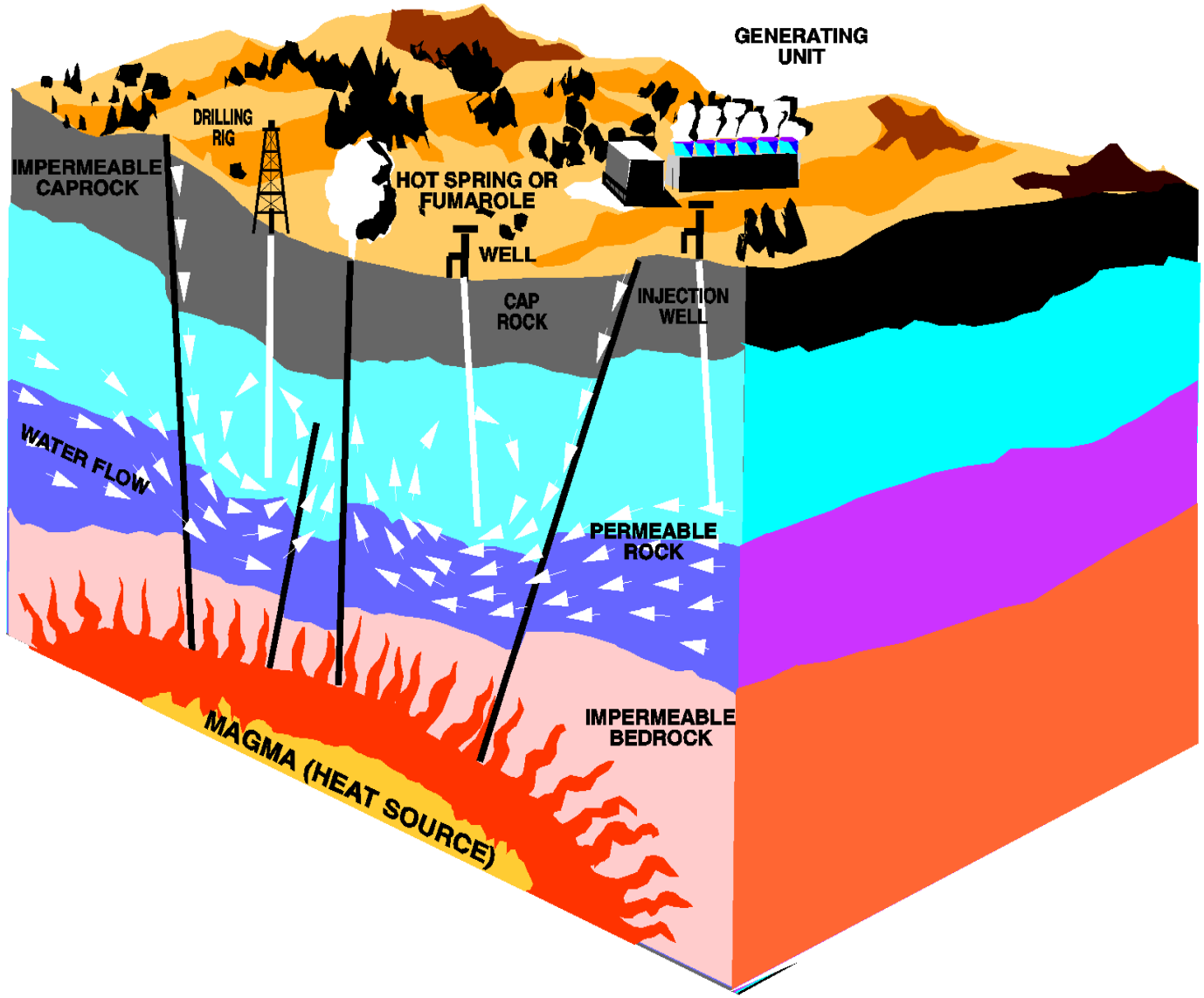
- Divergent
  -Extension
- Convergent
  -Compression
- Conservative
  -Strike Slip

1. INTRODUCTION: Location of Geothermal Sites

Convection of the mantle is the major drive for plate tectonics and thinning of the crust



1. INTRODUCTION Source of Geothermal Energy



Geothermal fields Associated with active plate boundaries

- Convergent Zones
- Divergent Zones
- Strike slip Zones

Water circulation along deep seated faults

1. INTRODUCTION: Surface expression of Geothermal Energy

Common Surface Expression of Geothermal energy are Hot springs, Geysers, fumaroles

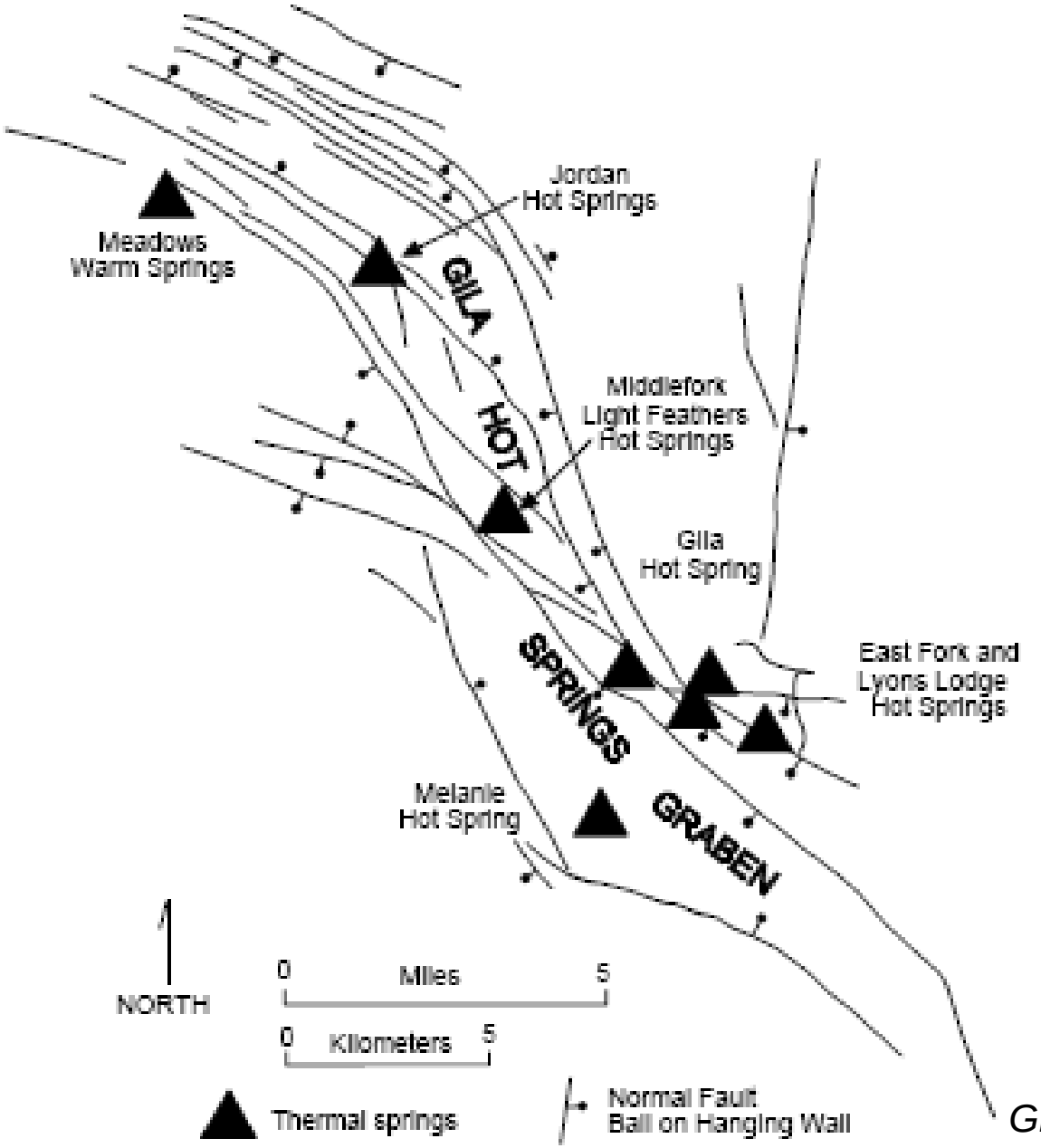
A **hot spring** is a spring that is produced by the emergence of geothermally heated ground water from the earth's crust.

Source of heat: from the Earth's interior

- Tectonically active areas; Through deep seated faults
- Volcanic areas; Contact with Magma

Deildartunguhver, Iceland: the highest flow hot spring in Europe

1. INTRODUCTION: Location of Geothermal Sites



Tectonic setting of Gila hot springs region, New Mexico, USA.

•Springs associated with deep seated extensional faults

GHC Bulletin, December 2002

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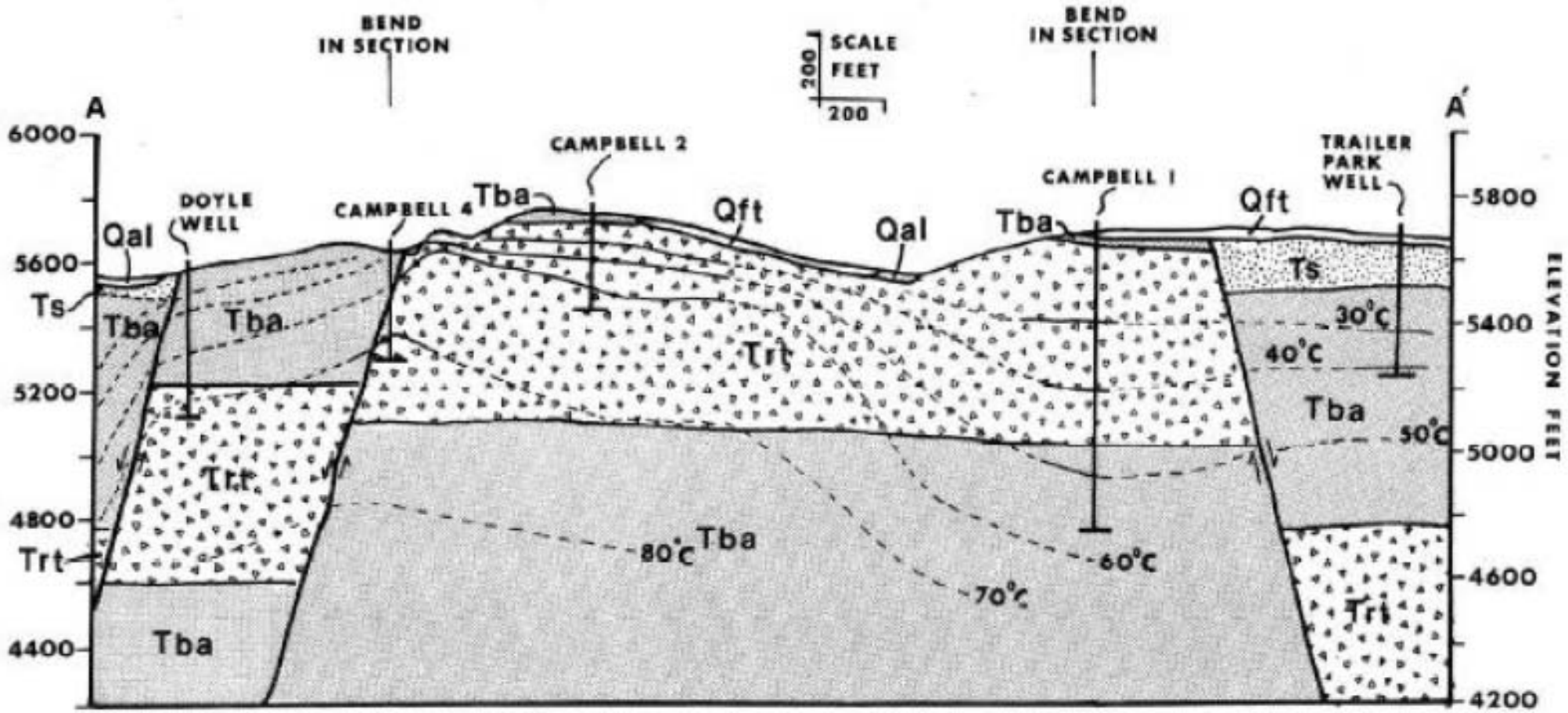
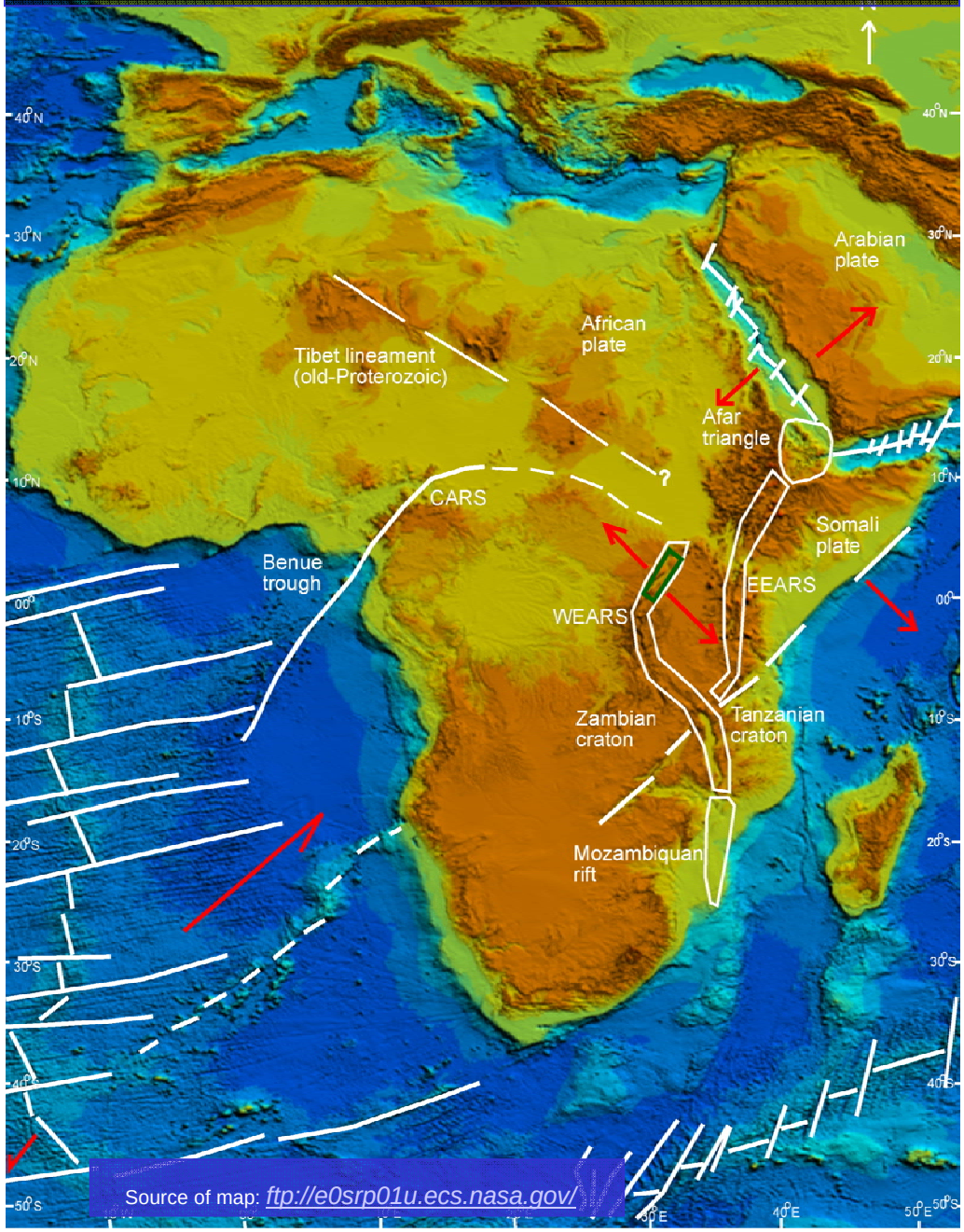


GHC Bulletin, December 2002

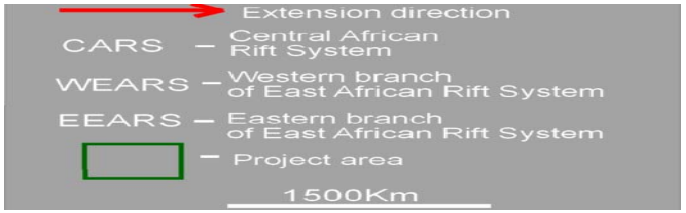
Geologic cross section across Gila hot springs. The hot springs are associated with deep seated faults

2. TECTONIC SETTING OF EARS



- Tertiary rift
- Rifting avoided the stable Cratons. Utilised the mobile belts.
- Pre-Cambrian fabric influenced rift geometry
- Extension direction is nearly E-W
- Albertine graben forms the northern most termination of the Western branch of EARS

Legend



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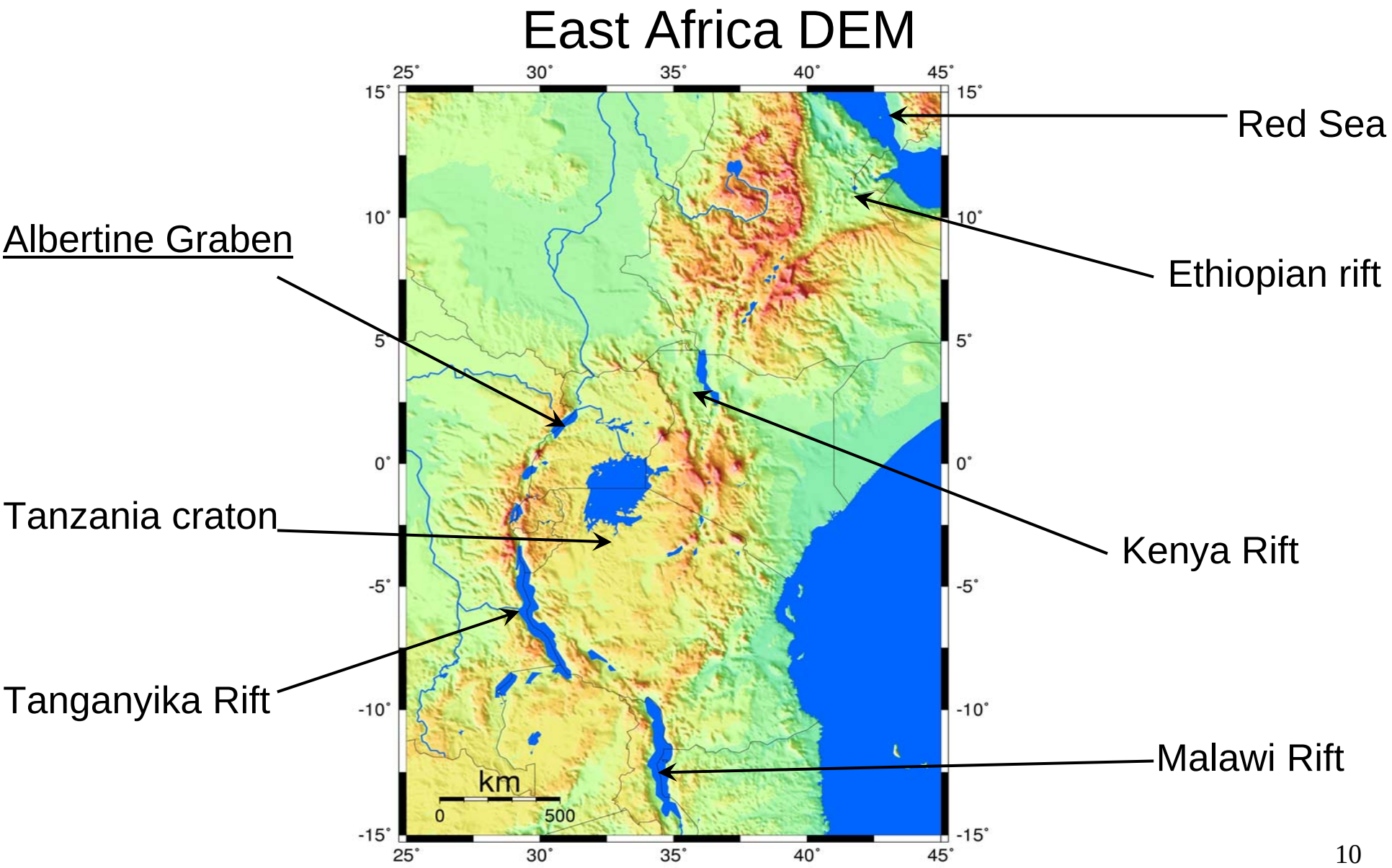
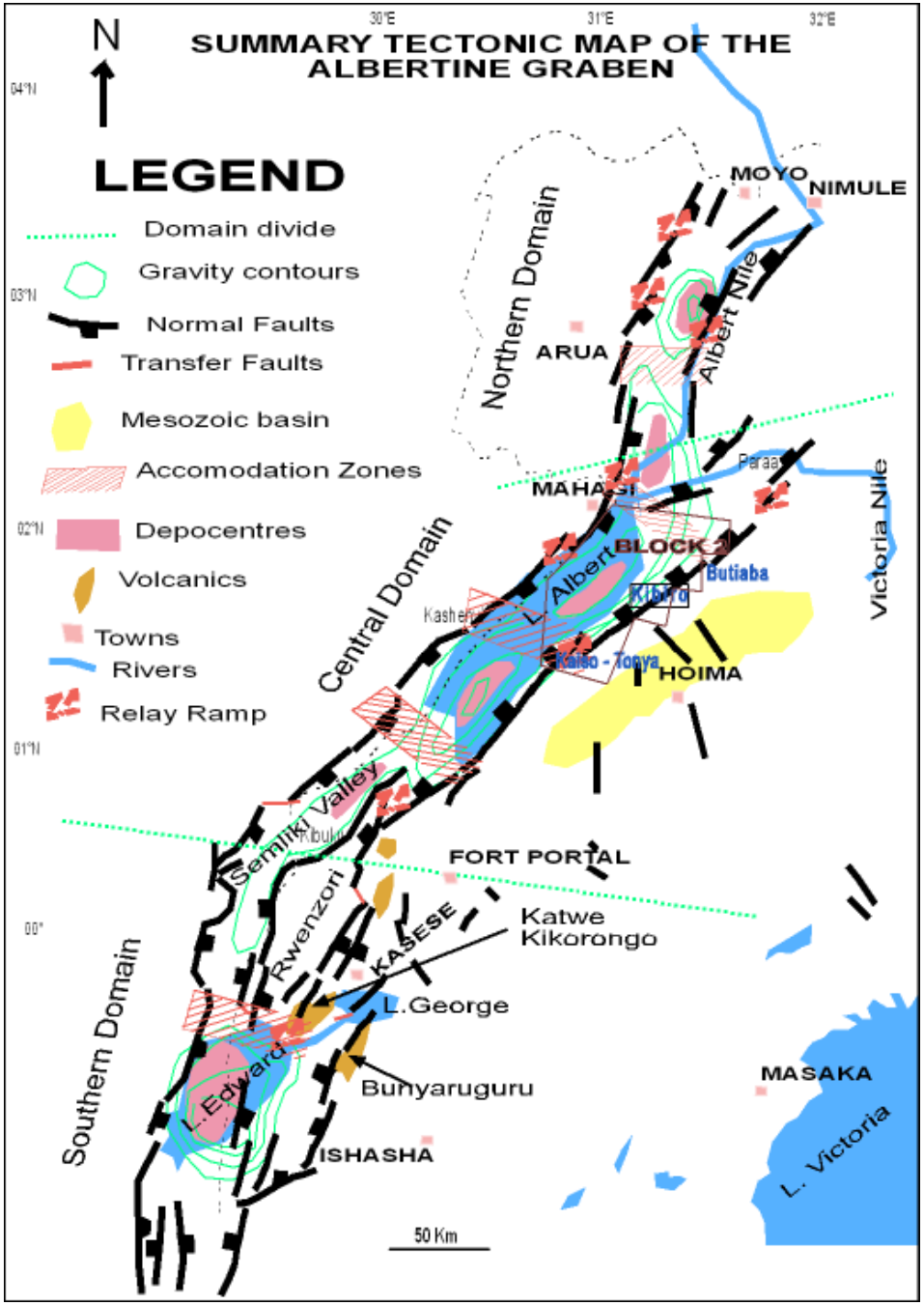


3. GEOTHERMAL POTENTIAL OF UGANDA: structural setting of Albert Rift



Deep Seated Faults

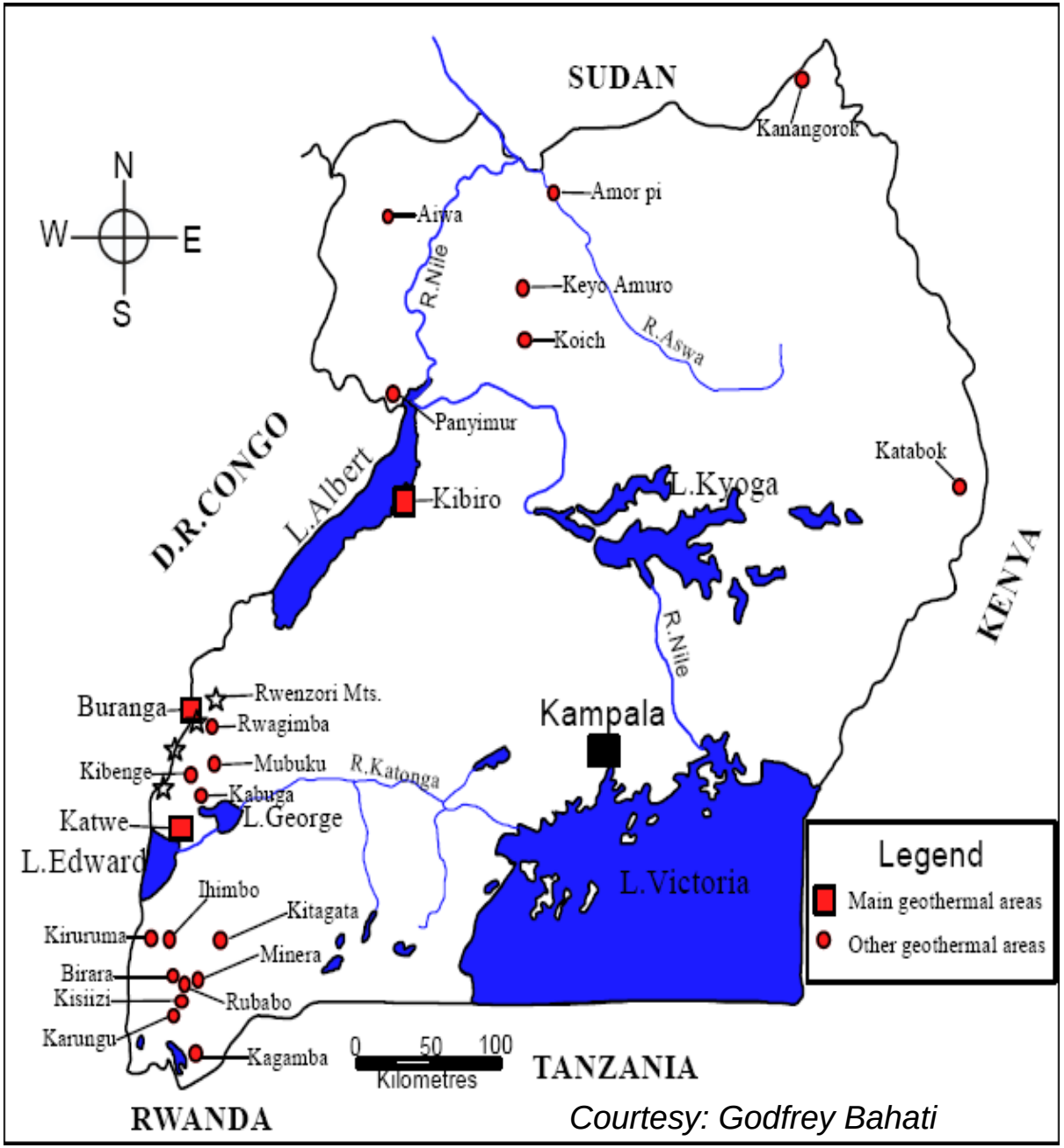
General Trends

- Northern trends in a NNE-SSW
- Central trends in a NE-SW
- Southern trends in a NNE-SSW

Highly segmented faults

Limited volcanism from the southern part

3. GEOTHERMAL POTENTIAL OF UGANDA: Hot spring occurrence



Courtesy: Godfrey Bahati

Hot Springs aligned along the Albertine Graben

Over 40 hot springs studied

Three with highest potential

- Katwe - Kikorongo
- Buranga
- Kibiro

3. GEOTHERMAL POTENTIAL OF UGANDA: Katwe Area

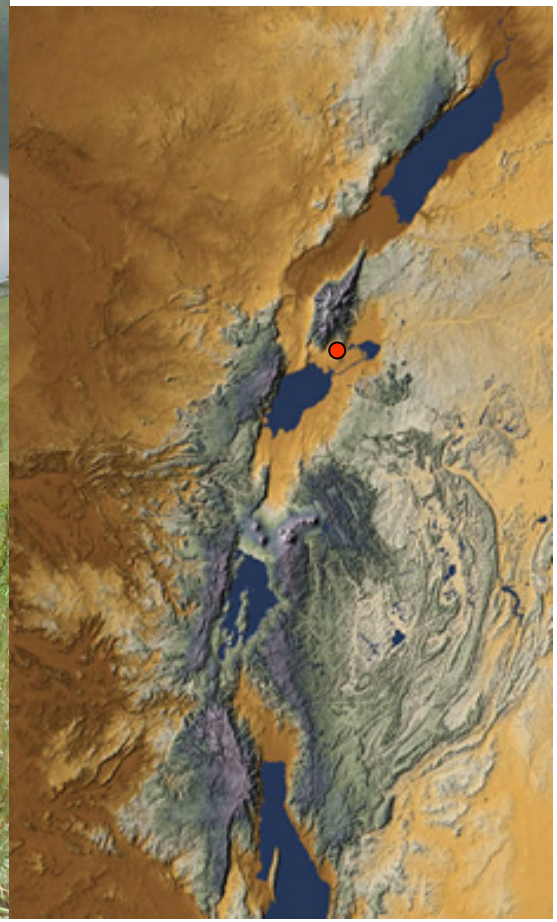
Katwe - Kikorongo and Bunyaruguru volcanic provinces

Volcanic line trend same as the basin margin faults

3. GEOTHERMAL POTENTIAL OF UGANDA: Katwe Area

Kitagata Hotsprings

Katwe-kikorongo area



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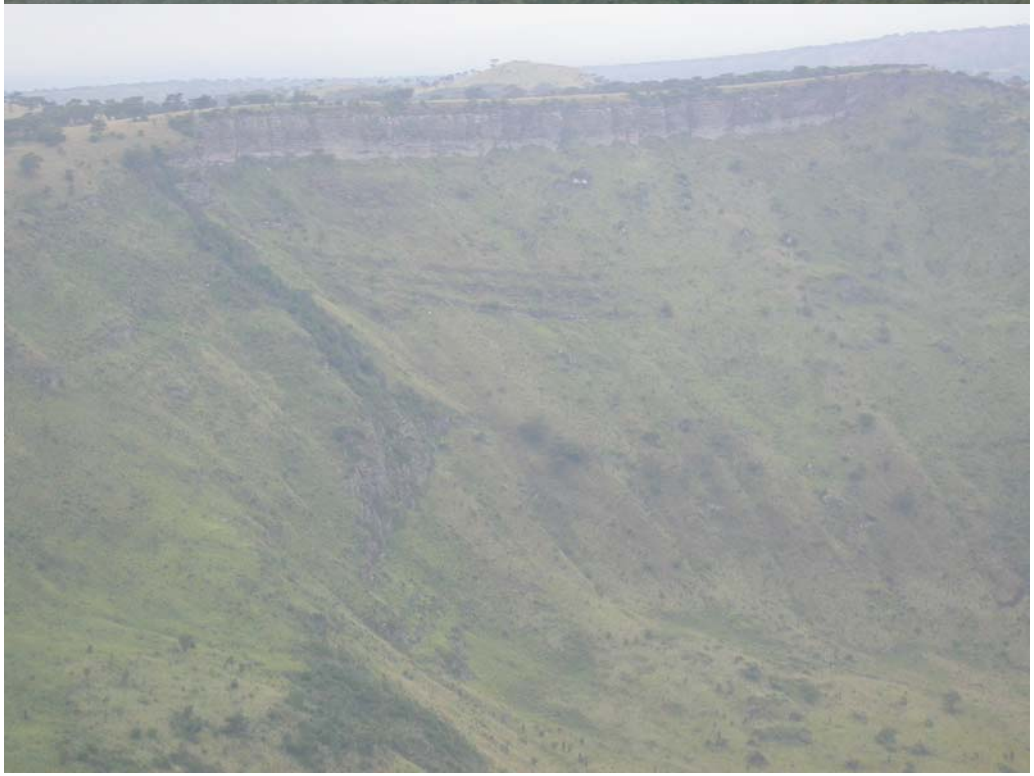


The Katwe Kikorongo Geothermal Potential related to a thinned crust

The thinned crust responsible for the volcanic province

Located in the Accommodation zone of the Lake Edward and Semlki basins

3. GEOTHERMAL POTENTIAL OF UGANDA: Katwe Area

Muhokya Hot springs

Eastern flanks of the Rwenzori Mountains

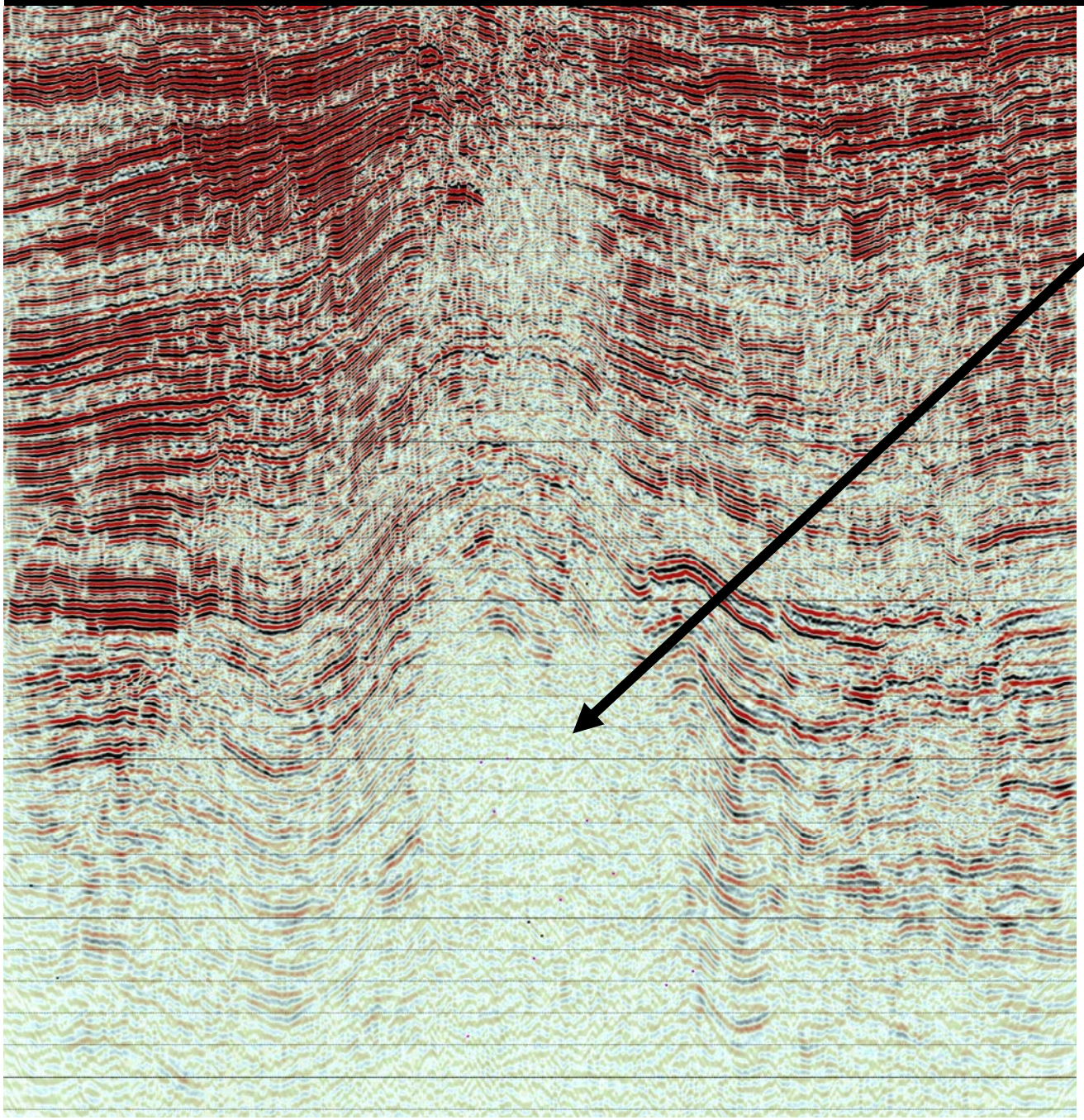
The tufa limestone deposits in the area related to hot springs along the NNE – SSW trending faults

3. GEOTHERMAL POTENTIAL OF UGANDA: Sempaya Area

Buranga Hot Springs

Highest surface temperature

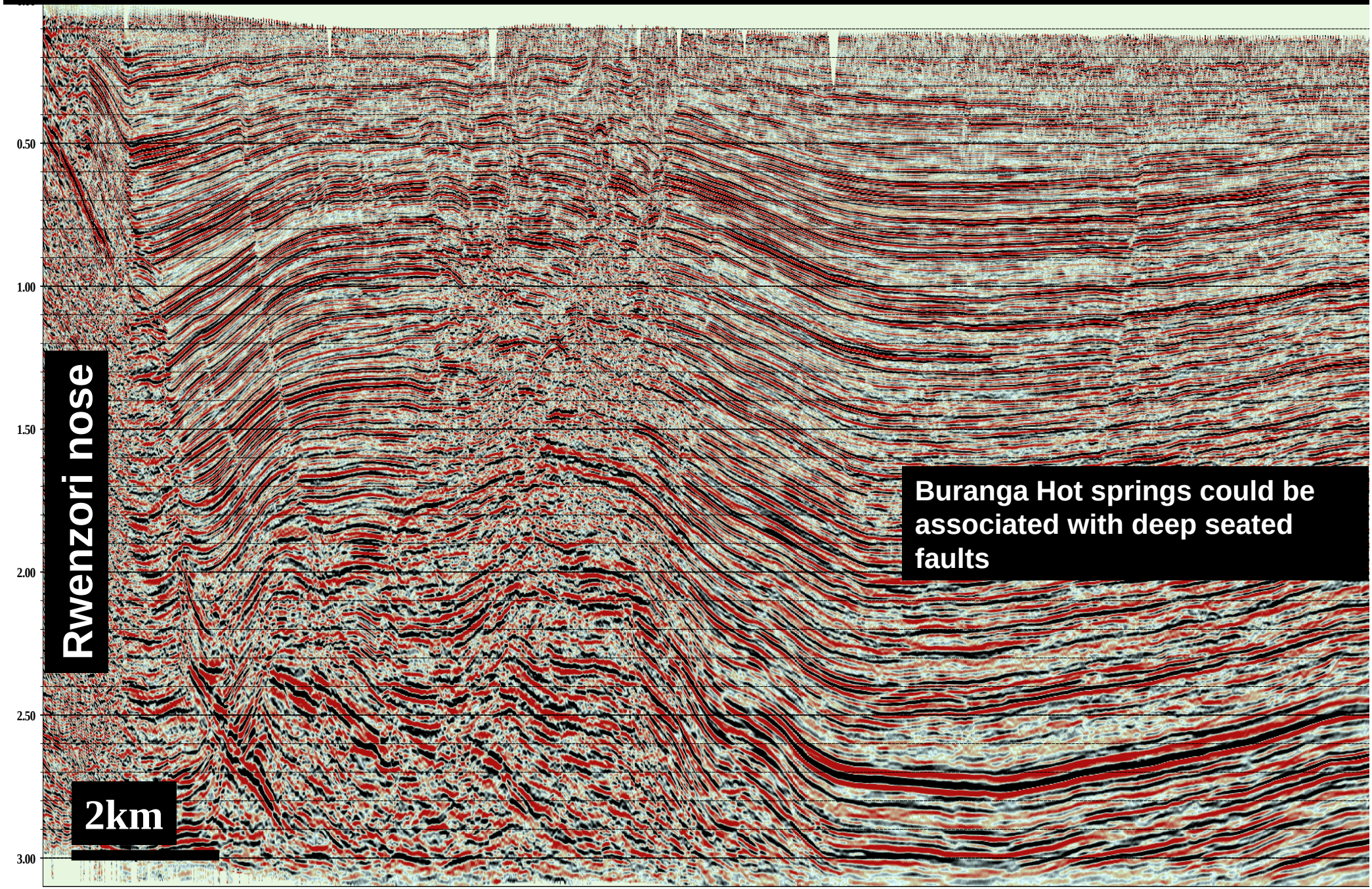
3.0 GEOTHERMAL POTENTIAL OF UGANDA: Sempaya Area



Rwenzori nose underneath Semliki Basin

- Probably Volcanic intrusion
- Gas Chimney above the structuring

3.0 GEOTHERMAL POTENTIAL OF UGANDA: Sempaya Area



3.0 GEOTHERMAL POTENTIAL OF UGANDA: Sempaya Area

Turaco wells drilled in Semliki basin encountered Carbon Dioxide

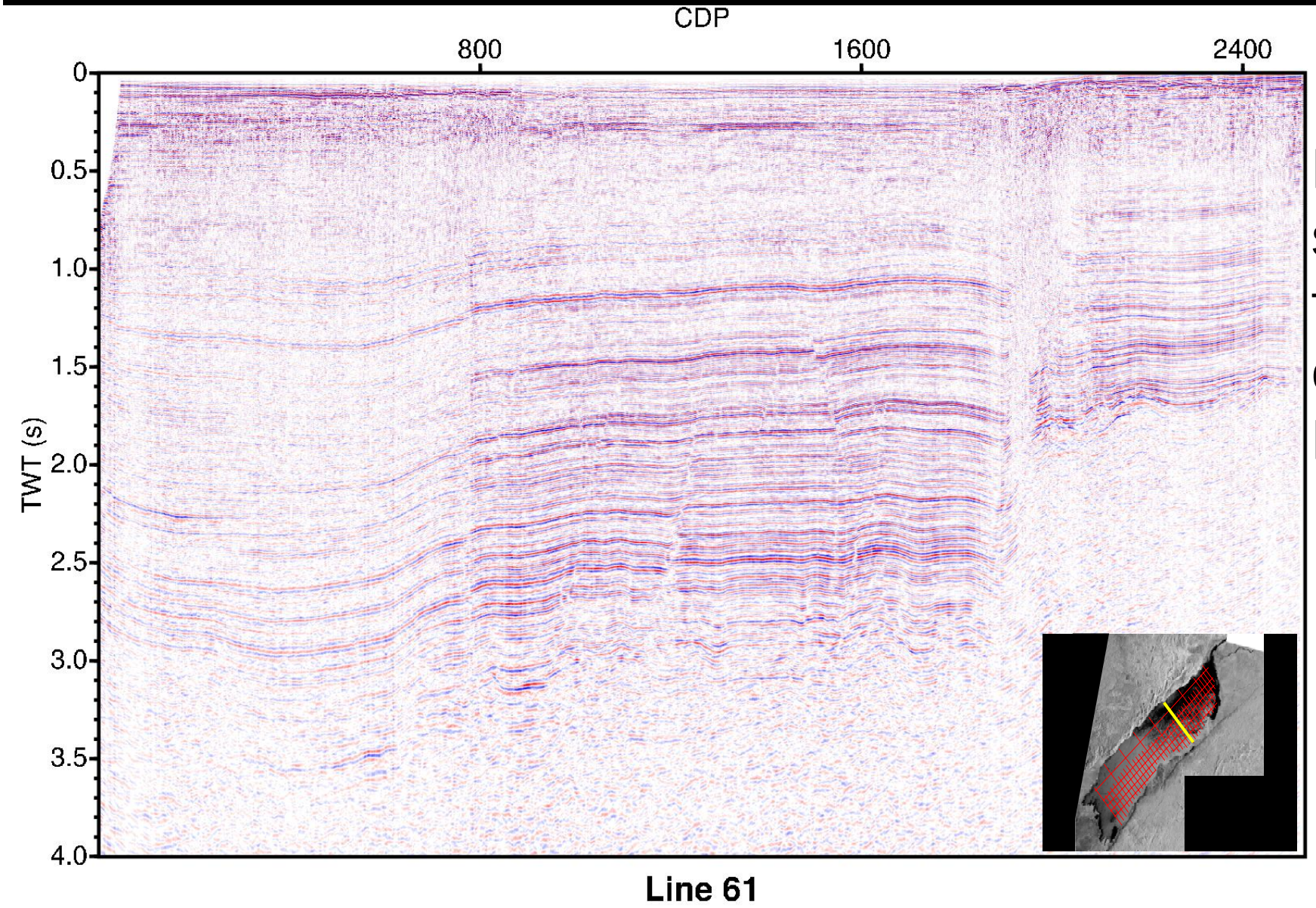
•Probably from a volcanic body

Geothermal Gradient 30^{o}C – 40^{o}C

3. GEOTHERMAL POTENTIAL OF UGANDA: Kibiro Area

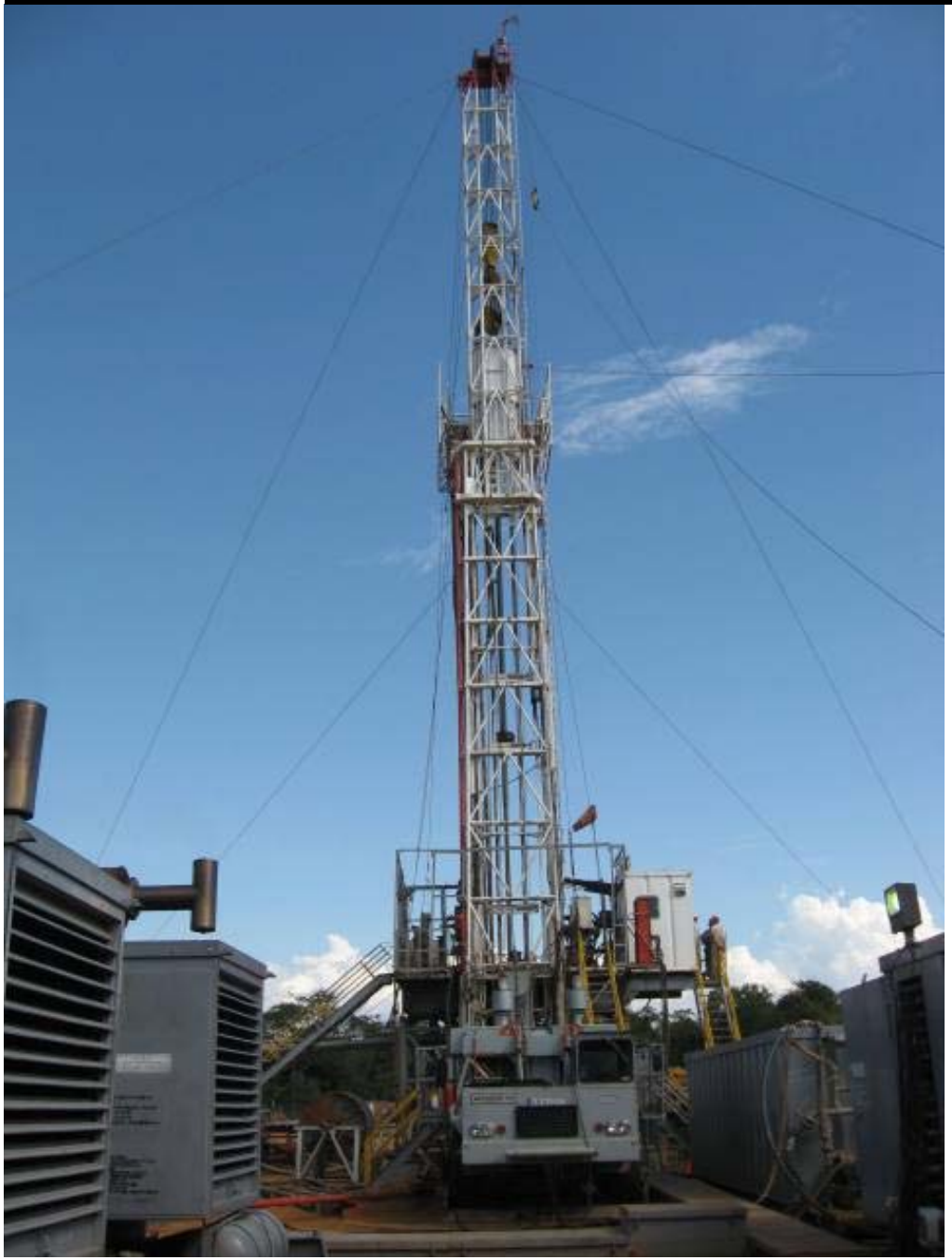
Kibiro hot springs associated with deep seated faults

3.0 GEOTHERMAL POTENTIAL OF UGANDA: Kibiro Area



Deep seated faults close to Kibiro

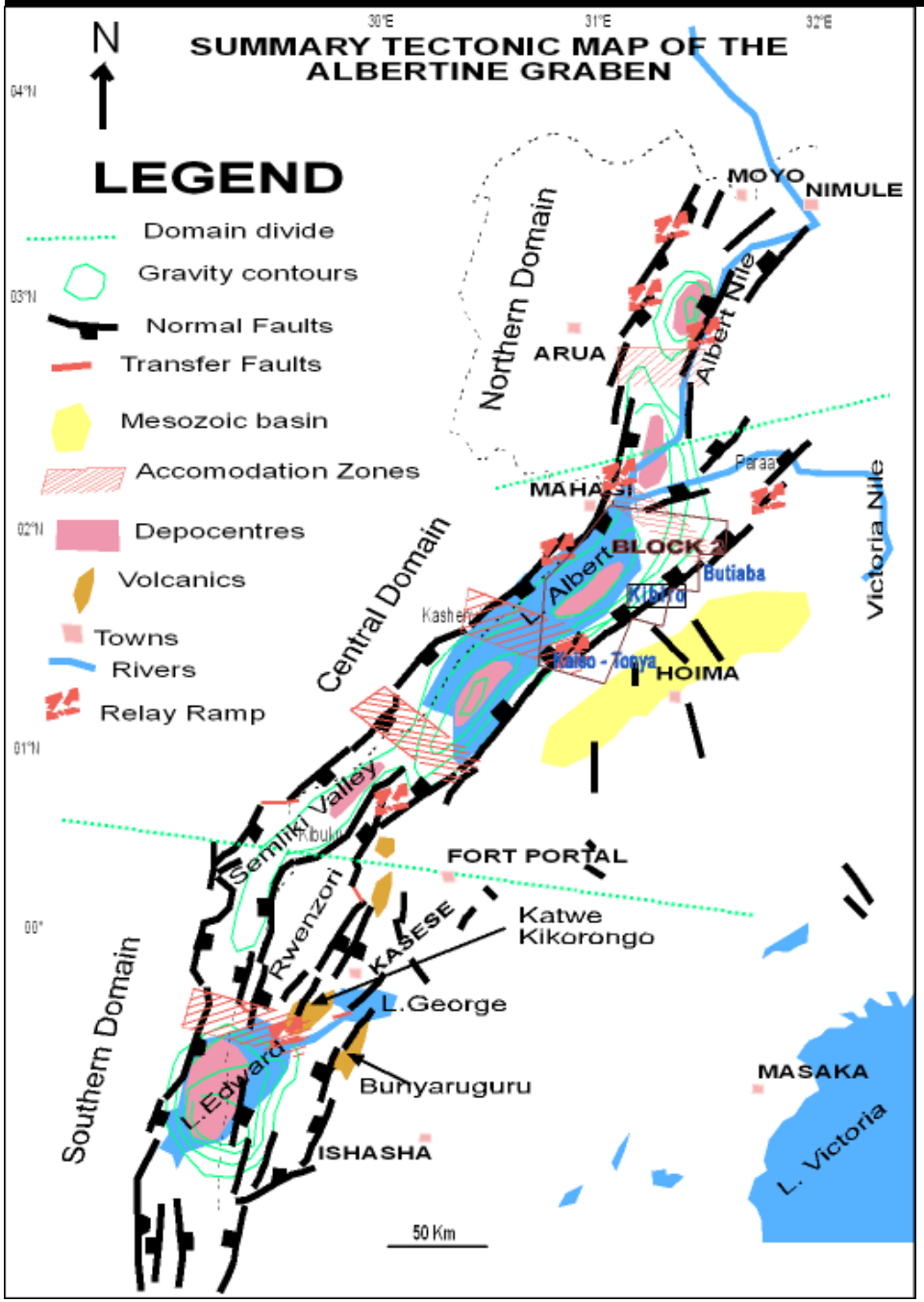
3.0 GEOTHERMAL POTENTIAL OF UGANDA: Kibiro Area



An Oil Drilling Rig at Taitai, a few km north of Kibiro

•Geothermal Gradient in the Butiaba – Wanseko area: 60^{o}C – 70^{o}C

4. CONCLUSIONS



Geothermal potential manifested by presence of hot springs

Source of heat is the mantle due to a thinned crust

Water circulation through deep seated faults

Accommodation zones have indicated high potential. Therefore wanseko area with high geothermal gradient needs follow up

Diversity of wildlife in the Albertine Graben