Geothermal Potential Assessment in Northern Rwanda

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Ngaruye, Jean-Claude [1)]
Jolie, Egbert [2)]

[1)] Rwanda Geology and Mining Authority, OGMR
[2)] Federal Institute for Geosciences and Natural Resources, BGR

Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung

GEOTHERM

BGR Bundesanstalt für Geowissenschaften und Rohstoffe

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Outline

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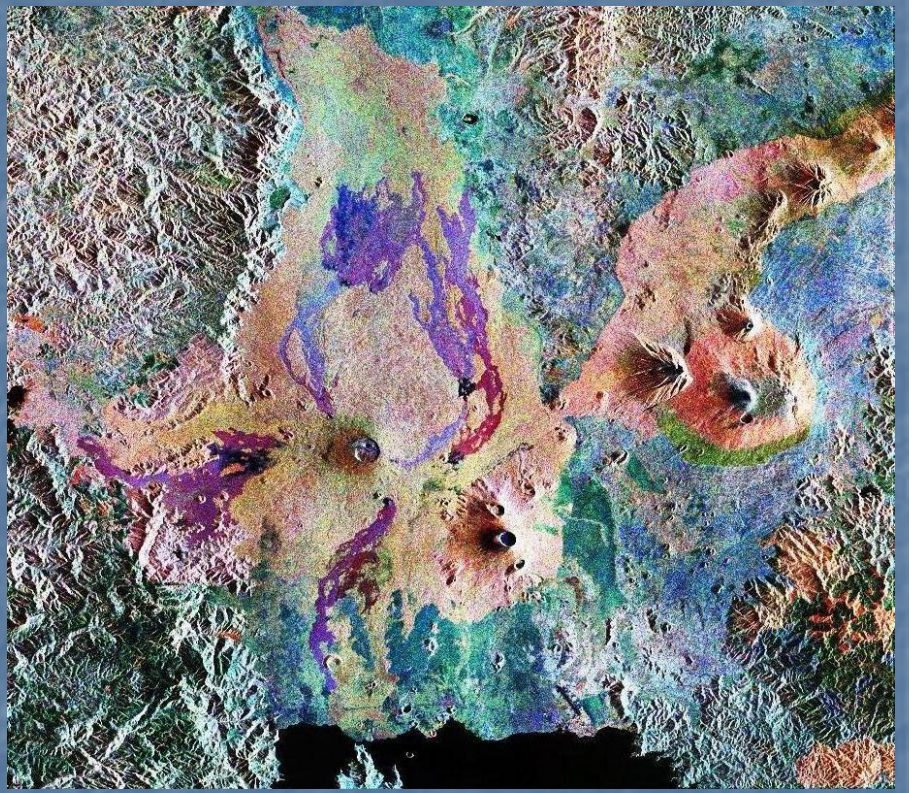
B) Geology of Rwanda

C) Site selection

D) Geoscientific approach

E) Preliminary Results

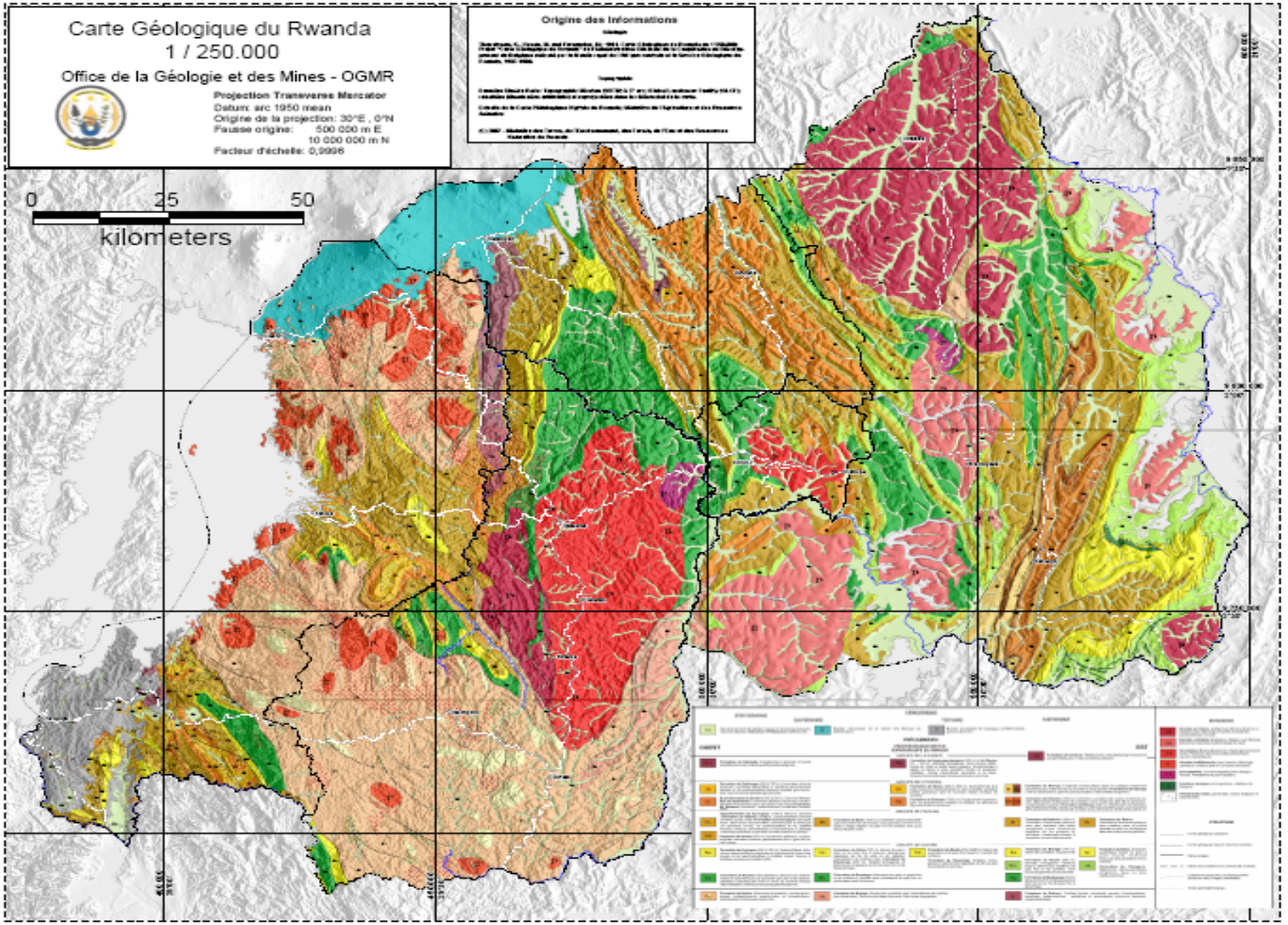
F) Conclusion & Outlook



Source: Nasa, PIA01736

RWANDA IN THE EAST AFRICAN RIFT SYSTEM

Geology of Rwanda



Site selection

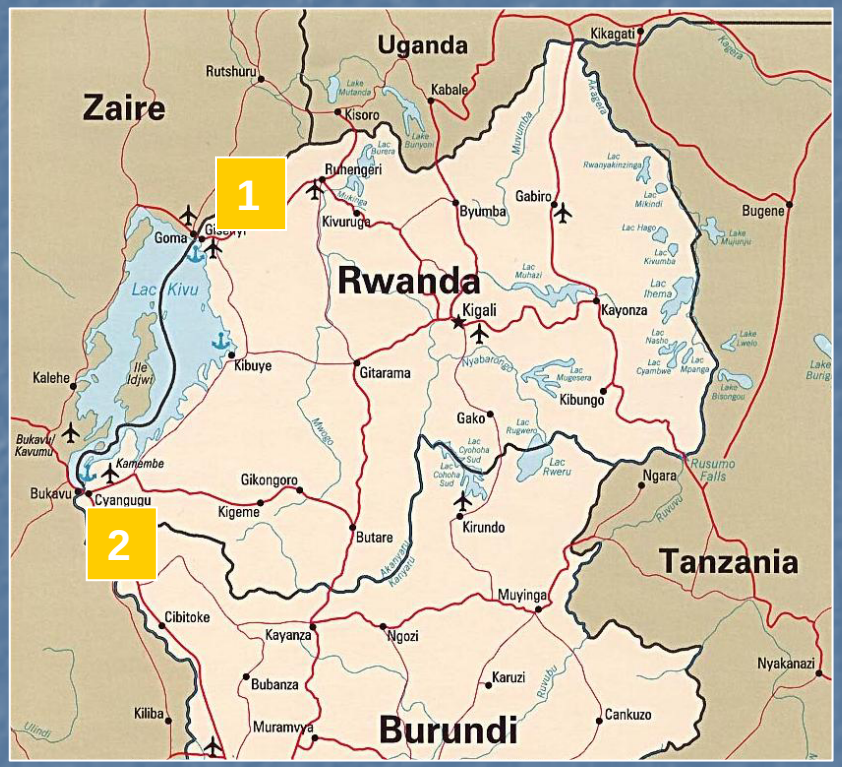
From previous studies:

1) **Gisenyi Prospect**

- Volcanoes National Park
- Data set of main springs available
- Possible high-temperature resource

2) **Mashyuza Prospect**

- Bugarama Graben
- Poor data set
- Recognised as low-moderate temperature resource



Source: University of Texas Libraries

Basis of decision

Desktop study revealed poor data base at both sites (reconnaissance stage)

Generation of a first detailed data set for one site

Gisenyi prospect with the more favorable geochemistry (BRGM, Chevron)

Volcanoes National Park with possibility for volcanic heat source

GEOSCIENTIFIC APPROACH

- Desktop study: Collection and exploitation of existing data: aerial photographs, satellite images, topographic maps (1/50 000), geological maps (1/100 000), « Plan minéral du Rwanda» and other various geoscientific reports on the concerned areas;
- Structural analysis (Remote sensing);
- Geochemical exploration
- Geophysical survey (MT and TEM)

Three main columns of investigation

Method	Object of investigation	Information
Remote sensing	Fault system	Possible flow paths of fluids
Geochemistry	Cat-/ Anion Stable isotopes (O, H) Tritium Strontium isotopes Gas (CO_2, He)	Geothermometry, Fluid evolution Origin of fluid (recharge area) Mean residence time Flow path Magmatic heat source?
Geophysics	MT, TEM	Localisation of geothermal reservoir, Well siting

Geology

Western branch of EARS

Study area in accommodation zone between Kivu and Albert main basins

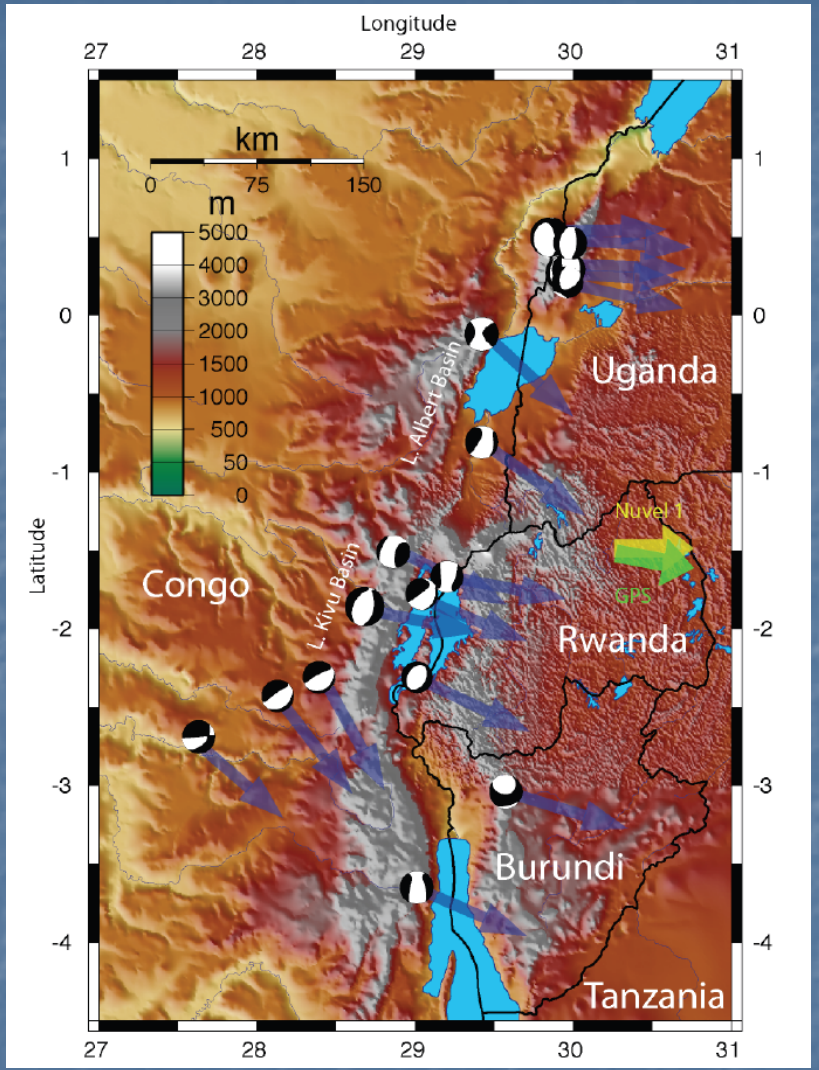
Filling with volcanic rocks

WNW-ESE extension

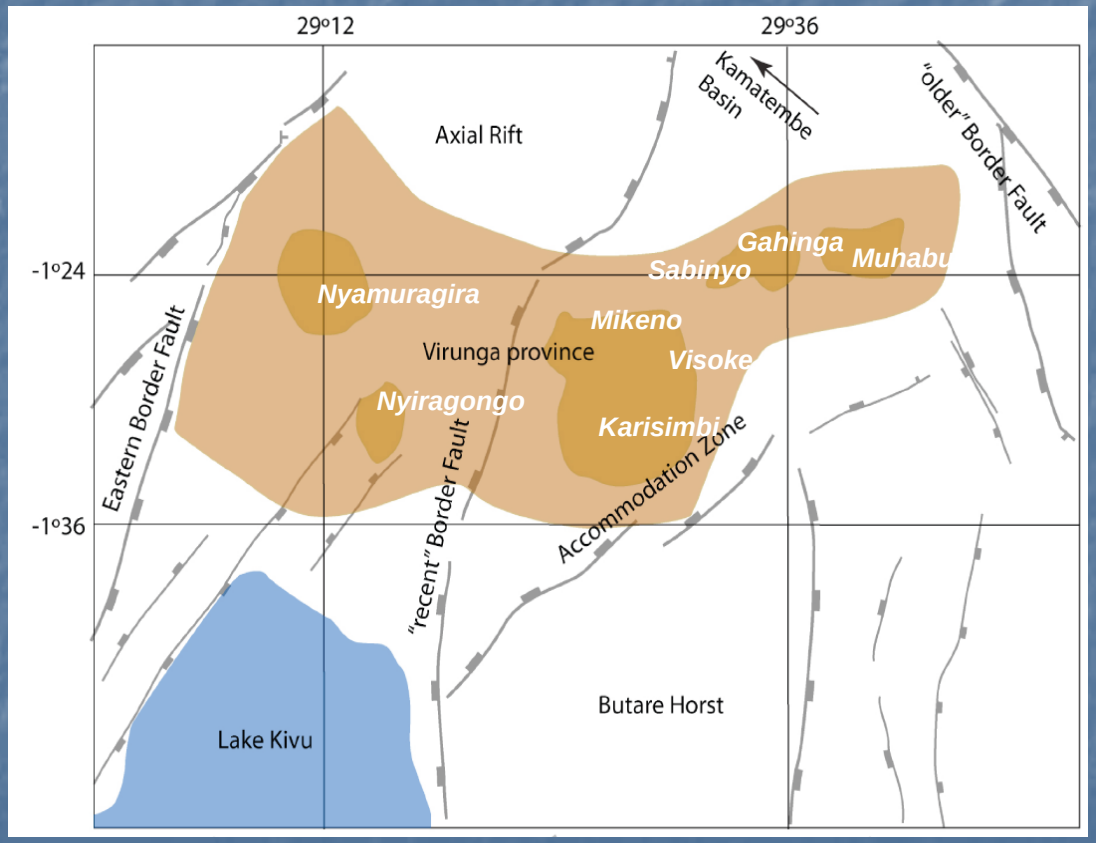
Extremely elevated basement, probably induced by ascending asthenosphere

No active but recent volcanoes in Rwanda

Seismic activity (e.g. earthquake February 2nd, 2008)

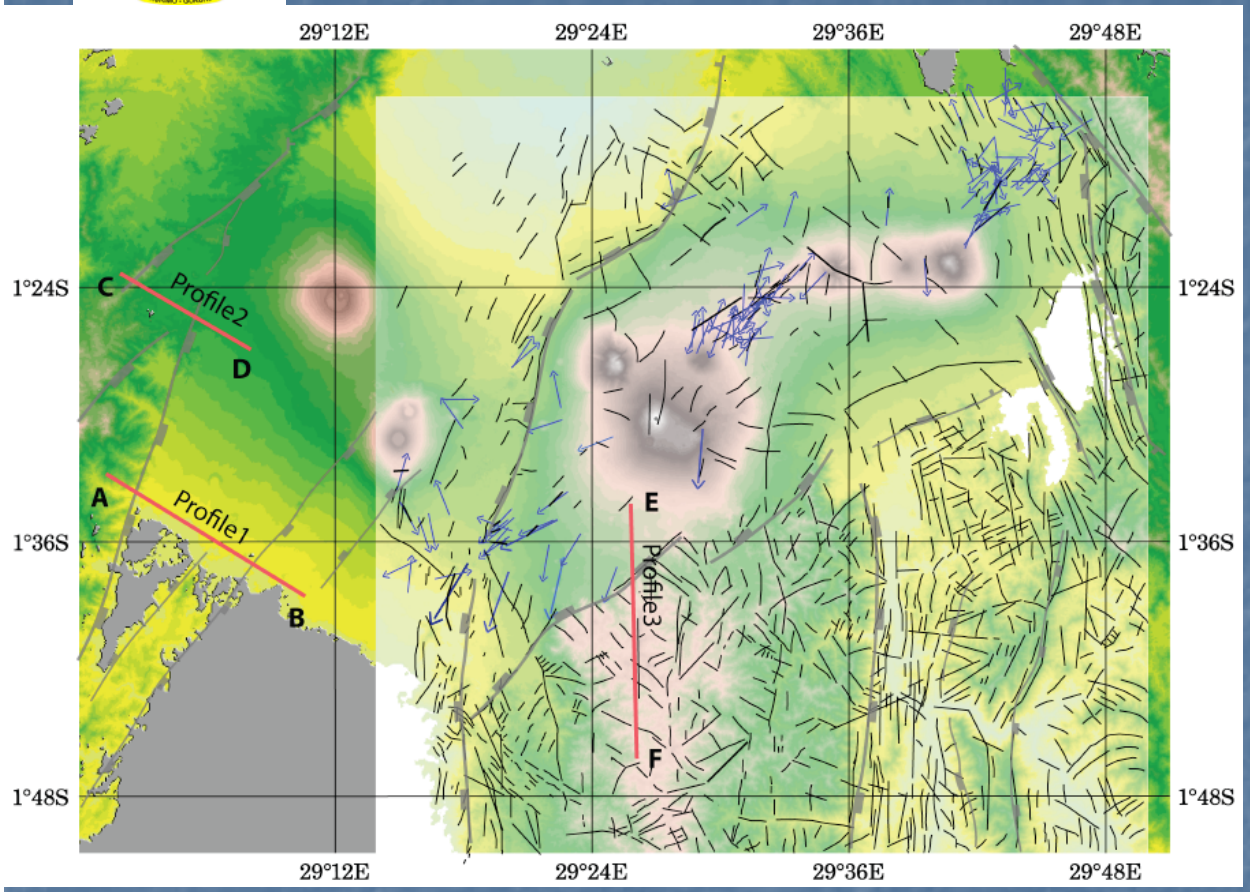


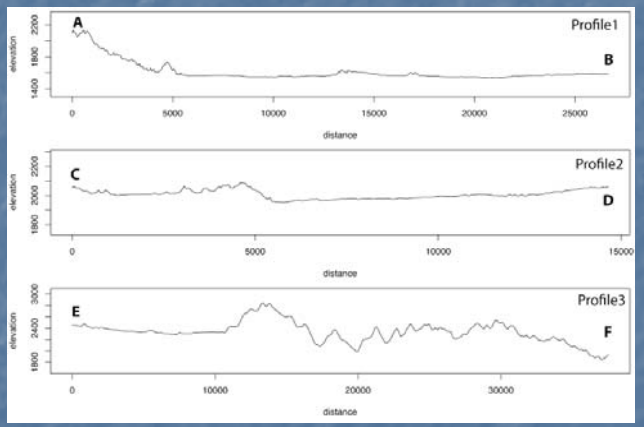
Preliminary Results Tectonics I



The main structural trends of this area are controlled by the older basement structures with a NW – SE and N-S orientations.
the young geologic formation present SW-NE normal faults.
The accommodation zone marks the boundary between the basement rocks and the volcanic rocks.

Preliminary Results Tectonics II





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Preliminary Results Geochemistry

- Field work extended from january to june 2008,
- Work divided into 3 parts: measurements in situ, water and soil gas sampling.
- 24 sampling sites with 10 soil gas samples, 9 Helium samples, 25 complete water samples, 7 warm / hot springs.
- Samples analyzed in BGR laboratories;
- Additional to the springs concerned by the BRGM & Chevron reports, eight new spots have already been sampled and analyzed: Karago, Mbonyebyombi, Mubona, Nyakageni, Mpenge river, Iriba, Rubindi and Mariba.
- Majority of results and interpretations are now available (BGR official report still to come)

Preliminary Results Geochemistry

Additional mineralised/ hot springs

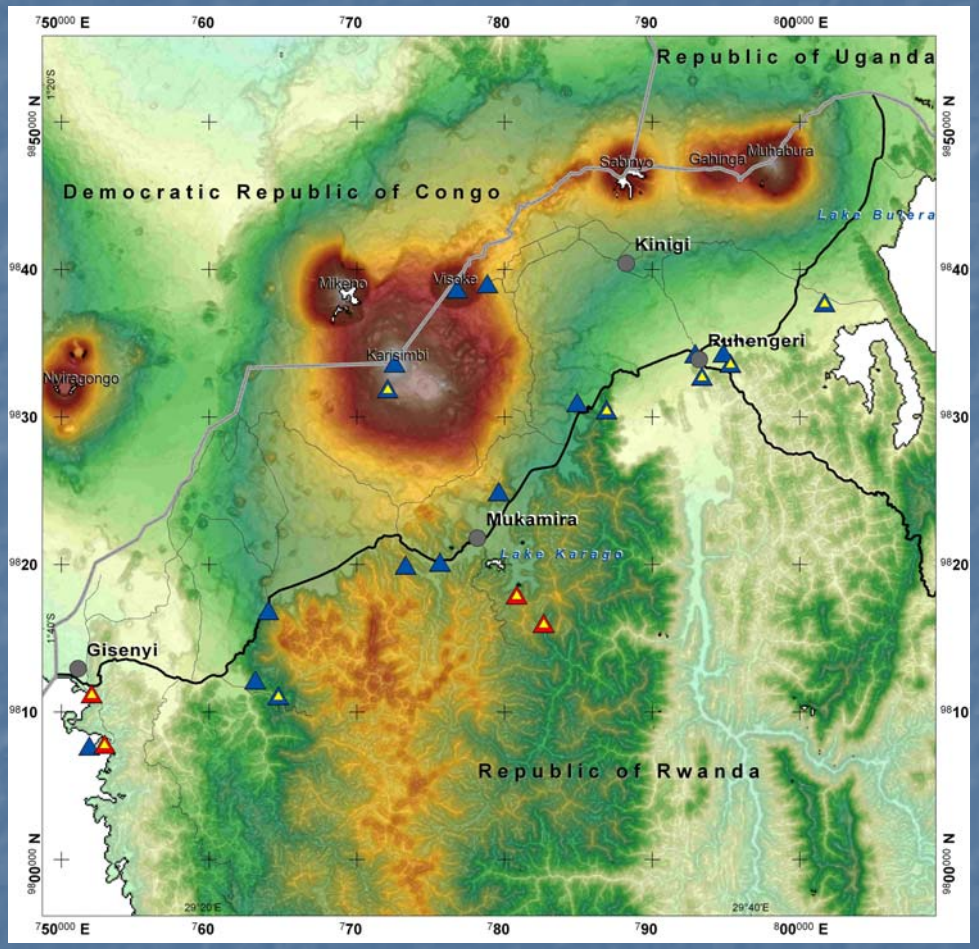
- T ranges between 31,2°C - 73,1°C
- El. Cond. up to 4080 µS/cm

Springs in basement rocks

Geothermometers applied by BRGM and Chevron indicate reservoir temperatures between 150°C – 210°C

Additional sites with gas emanations, no hydrothermal alteration zones

Between Karisimbi volcano and Lake Kivu high permeability of volcanic rocks



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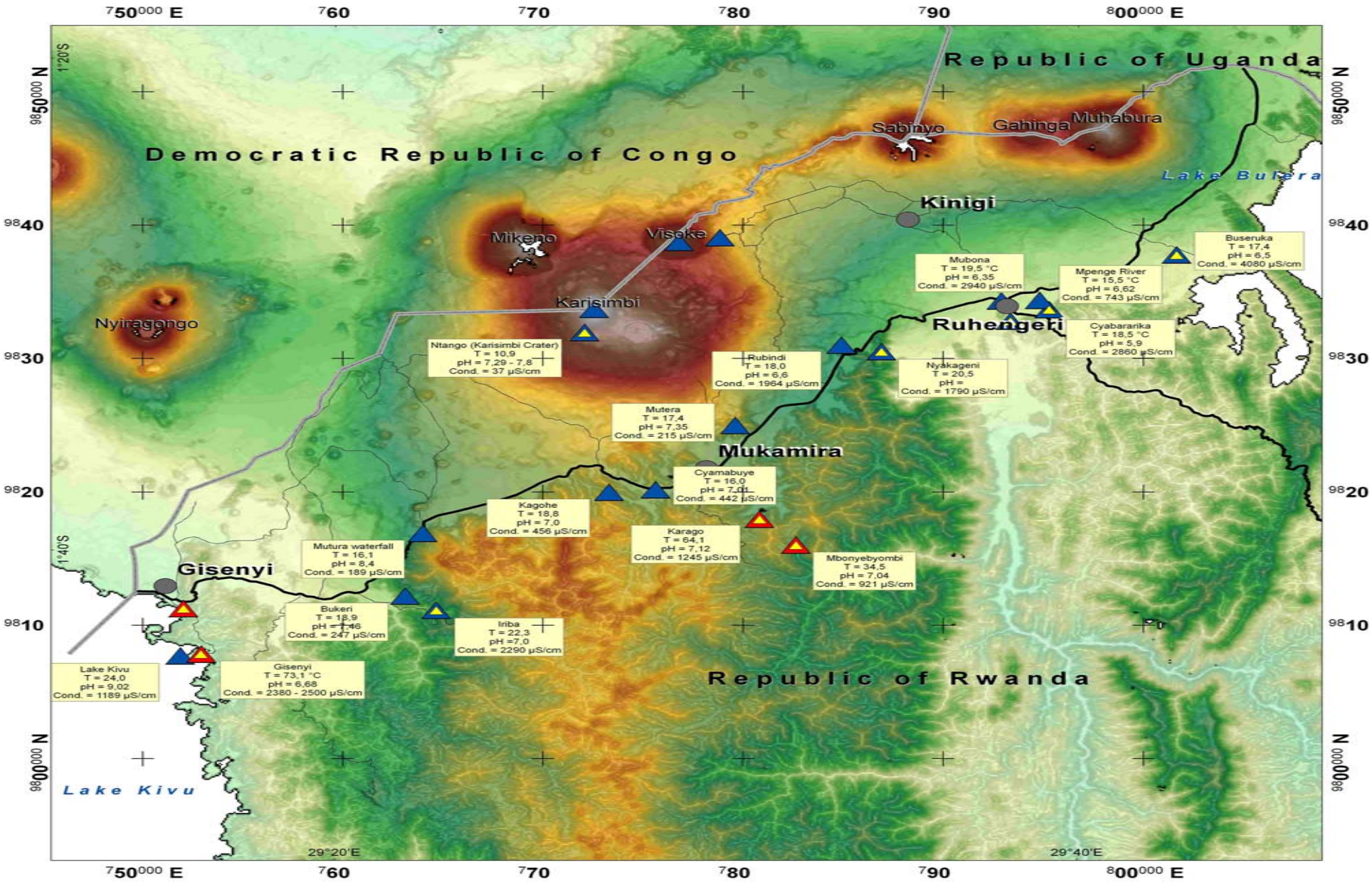

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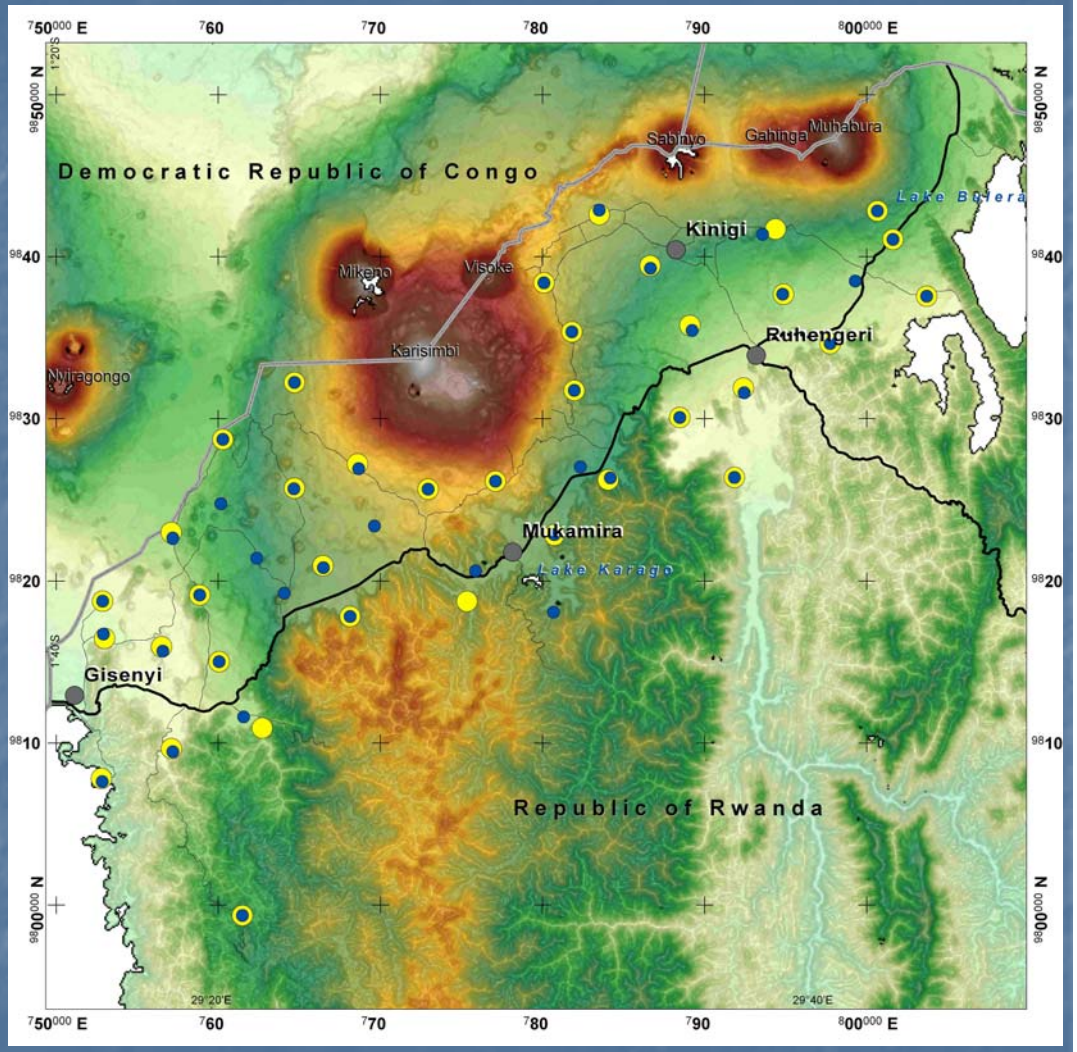
Geophysical sampling campaign

- 01/08 - 03/10/2008: Geophysical campaign (by KenGen);
- 43 Magnetotelluric soundings
- 36 Transient electromagnetic soundings
- Eight profiles oriented NW-SE spacing 5-6 km (regional overview)



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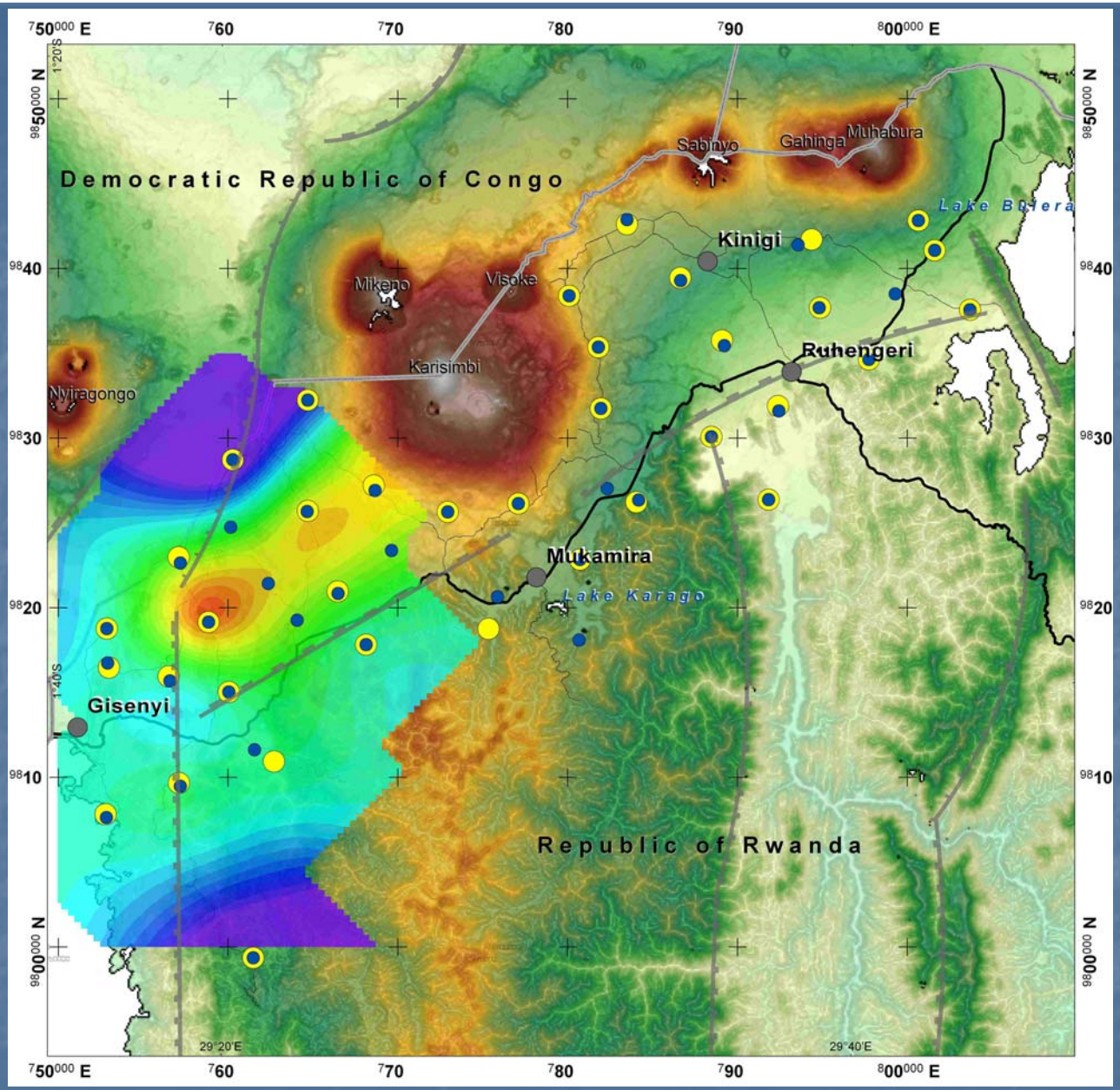

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Conclusion & Outlook

1. Detailed interpretation of geochemical data (ongoing)
2. Detailed analysis and interpretation of geophysical data (ongoing)
3. Additional geophysical field surveys (in preparation)
4. Development of conceptual model

THANK YOU

Contact BGR:

egbert.jolie@bgr.de

+49 (0) 511 – 643 2647

www.bgr.de/GEOTHERM

Contact OGMR:

jclaudengar@yahoo.fr

+250 (0) 8639557