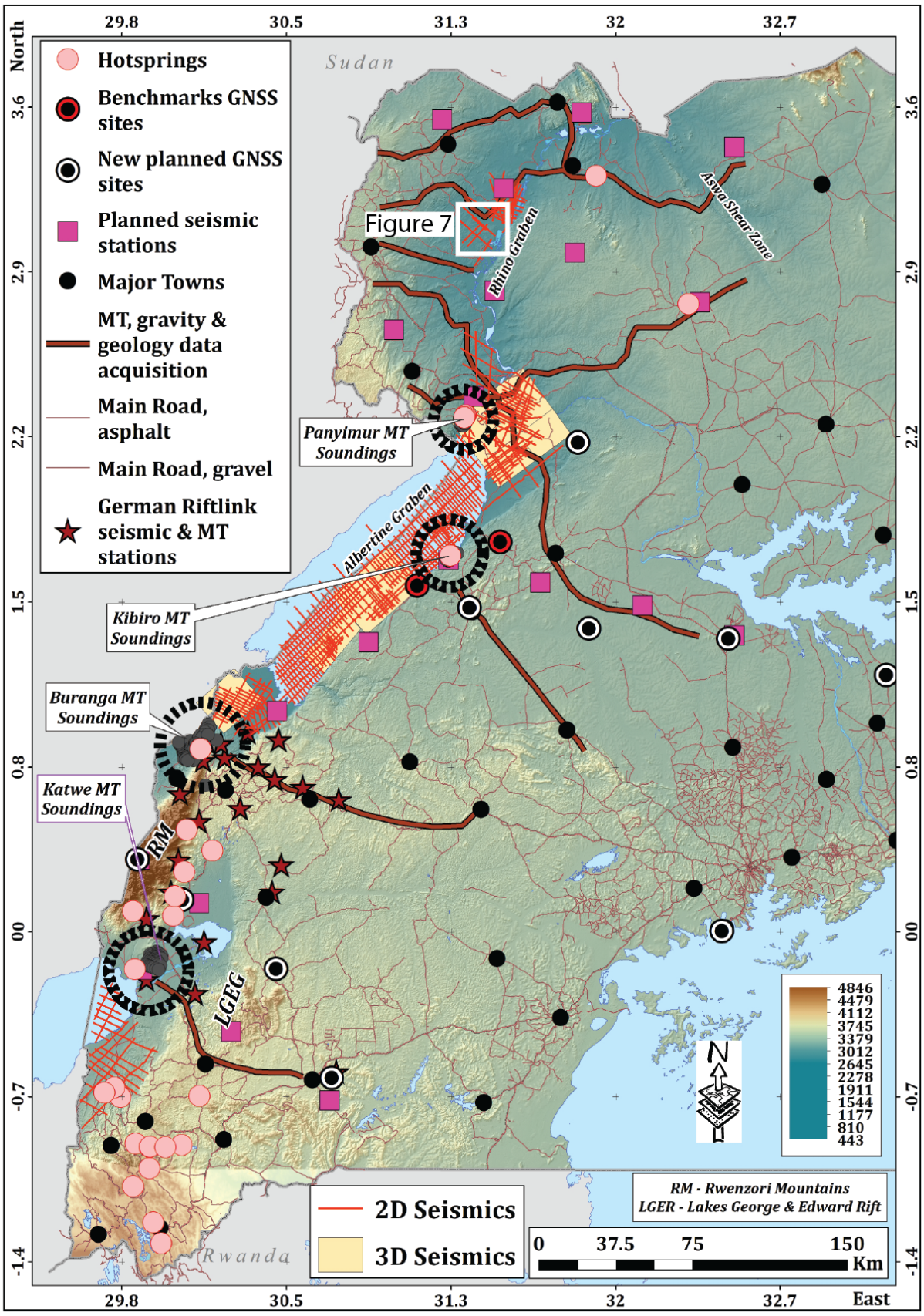
Advances of the DRIAR Project: Dry-Rifting In the Albertine-Rhino Graben, Uganda

D. Sarah Stamps (Virginia Tech, USA), Estella Atekwana (University of California, Davis, USA), Eliot Atekwana (University of California, Davis, USA), Suzan van der Lee (Northwestern University, USA), Michael Taylor (University of Kansas, USA), Andrew Katumwehe (Midwestern State University, USA), Rob Evans (Woods Hole Oceanographic Institution, USA), Fred Tugume (Ministry of Energy and Mineral Resources, Uganda), John Mary Kiberu (Makerere University, Uganda), Stewart Fishwick (Leicester University, U.K.), Peter H. Barry (Woods Hole Oceanographic Institution, USA), Saemundur Halldorsson (University of Iceland, Iceland), Folarin Kolawole (Columbia University, USA), Georg Rümpker (Goethe Universitat, Germany), Asenath Kwagalakwe (Virginia Tech, USA), Daniel Mongovin (University of Kansas, USA), Hillary Mwongyera (University of Kansas, USA), Joy Fuluso (University of California, Davis), Albert Kabanda (Northwestern University), Ben Alonzo (Northwestern University), Esha Islam (Virginia Tech, USA), Crystal Lee (Virginia Tech, USA), Damiloa Ola (Midwestern State University, USA), Patrick Boston (Midwestern State University, USA)

Continental rifting is a critical component of plate tectonics, and is known to occur in more than one mode, phase, or stage. While rifting is typically accompanied by abundant magmatism, some rifts are not. This project focuses on advancing our understanding of the fundamental processes associated with magma-poor (dry) rifting and uses the Albertine-Rhino Graben, Uganda as the natural laboratory. Here, we provide an overview and progress on the NSF-funded DRIAR project, which means Dry Rifting In the Albertine-Rhino graben, Uganda. The goal is to apply geophysical, geological, geochemical, and geodynamic techniques to investigate the Northern Western Branch of the East African Rift System in Uganda. We test 3 hypotheses: (1) in magma-rich rifts, strain is accommodated through lithospheric weakening from melt, (2) in magma-poor rifts, melt is present below the surface and weakens the lithosphere such that strain is accommodated by upper crustal extension, and (3) in magma-poor rifts, there is no melt at depth and strain is accommodated along pre-existing structures such as inherited compositional, structural, and rheological lithospheric heterogeneities. Observational methods include: passive seismic to constrain lithospheric structure and flow patterns; gravity to constrain variations in crustal and lithospheric thickness; magnetics to constrain the thermal structure of the upper crust; magnetotellurics to constrain lithospheric thickness and the presence of melt; Global Navigation Satellite System (GNSS) observations to constrain surface motions, extension rates, and help characterize mantle flow; geologic mapping to document the geometry and kinematics of active faults; seismic reflection analyses of intra-rift faults to document temporal strain migration; geochemistry to identify and quantify mantle-derived fluids in hot springs and soil gases; and geodynamic modeling to develop new models of magma-poor rifting processes. Fieldwork began in January 2022 with 4 GNSS instruments installed and a magnetotelluric survey is actively underway.The first DRIAR project training school is planned for July 2022, and geodynamic modeling work is already underway.


29.8
30.5
31.3
32
32.7
North
3.6
2.9
2.2
1.5
0.8
00
-0.7
-1.4
East
Hotsprings
Benchmarks GNSS sites
New planned GNSS sites
Planned seismic stations
Major Towns
MT, gravity & geology data acquisition
Main Road, asphalt
Main Road, gravel
German Riftlink seismic & MT stations
Sudan
Figure 7
Rhino Graben
Aswa Shear Zone
Panyimur MT Soundings
Albertine Graben
Kibiro MT Soundings
Buranga MT Soundings
Katwe MT Soundings
RM
LGEG
Rwanda
4846
4479
4112
3745
3379
3012
2645
2278
1911
1544
1177
810
443
N
2D Seismics
3D Seismics
RM - Rwenzori Mountains
LGER - Lakes George & Edward Rift
0
37.5
75
150
Km