



Welcome to Part 2: Synoptic Studies of the East African Rift System

Conveners:

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¹ Massachusetts Institute of Technology

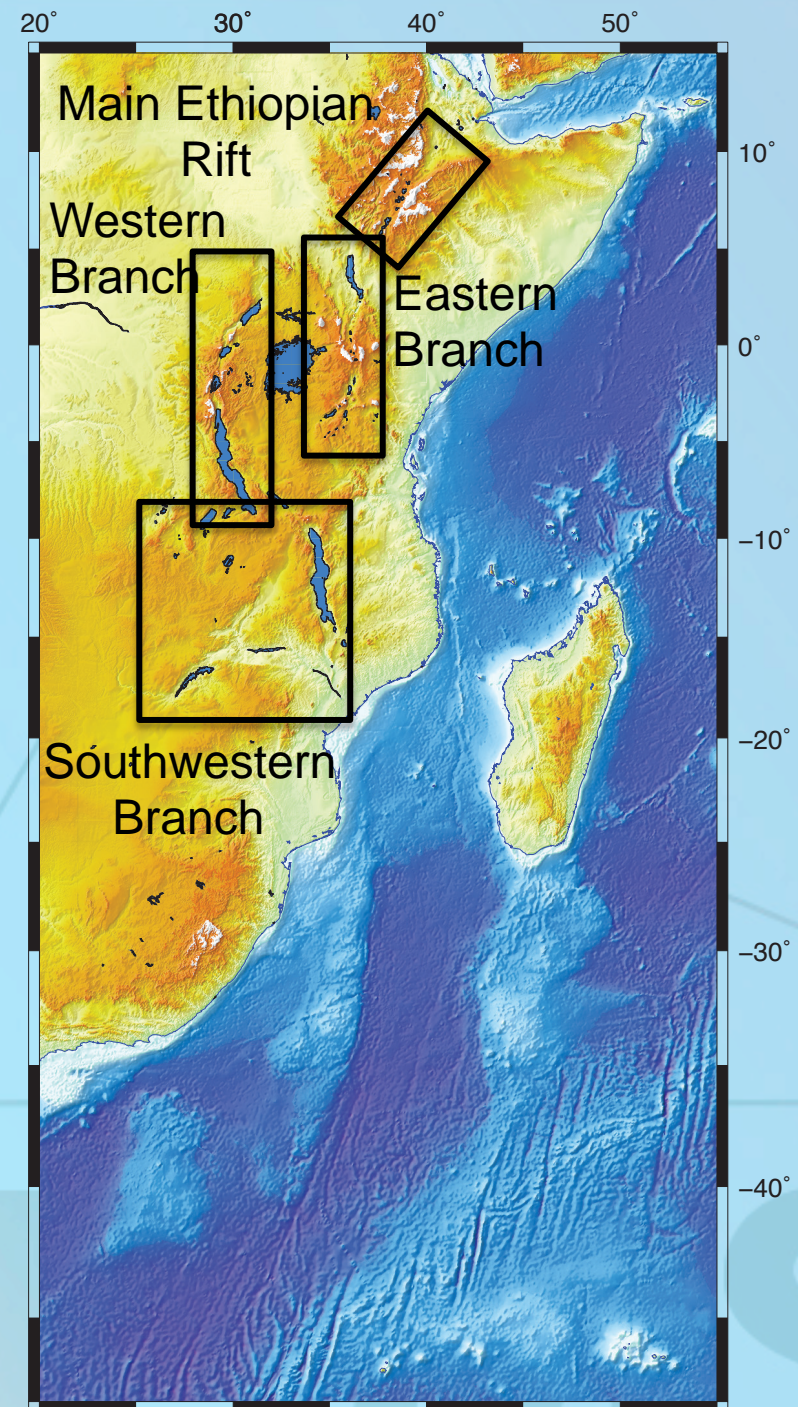
² University of Houston

³ Syracuse University

⁴ Penn State University

The East African Rift System (EARS)

- 4 major rift branches
 - Main Ethiopian Rift
 - Western Branch
 - Eastern Branch
 - Southwestern Branch



QUESTION 1:

What questions are of interest to the community that concerning synoptic studies of the east African Rift System?

QUESTION 2:

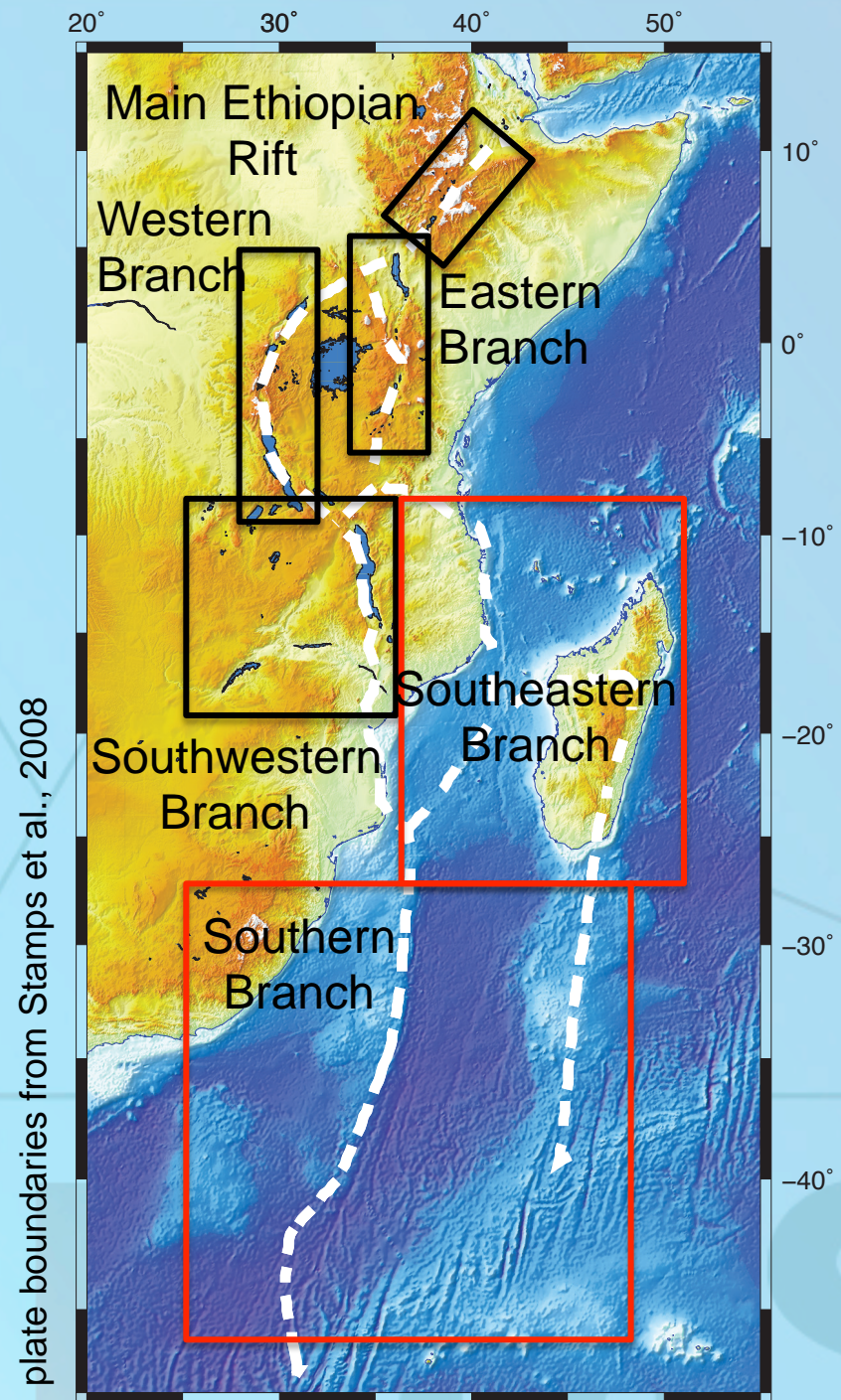
What datasets exist and what is needed to address system-wide studies of the East African Rift?

QUESTION 3:

**Is there interest in a community-driven proposal?
(Yes/No/Maybe)**

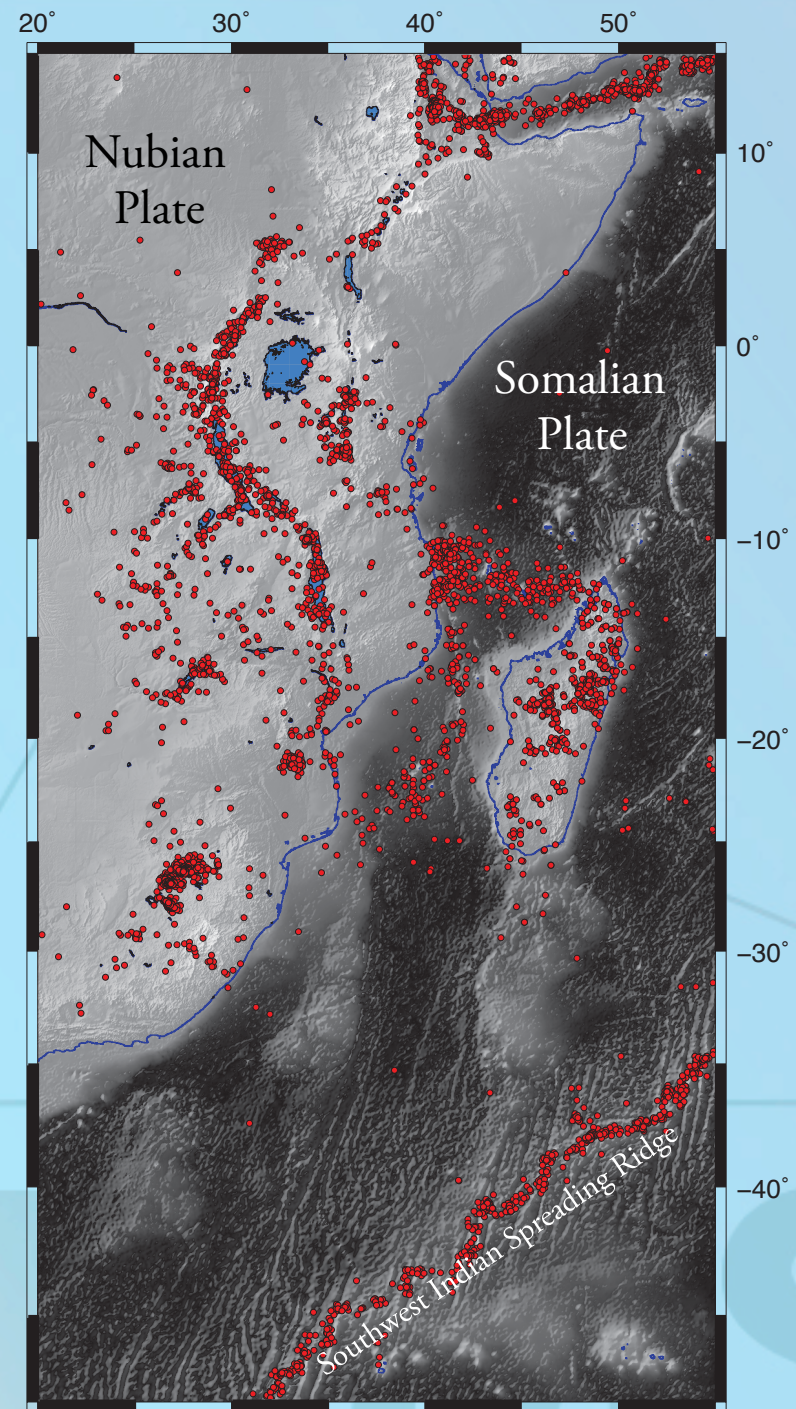
Example EARS Synoptic Study

- **6 major rift branches ?**
 - Main Ethiopian Rift
 - Western Branch
 - Eastern Branch
 - Southwestern Branch
 - **Southeastern Branch ?**
 - **Southern Branch ?**



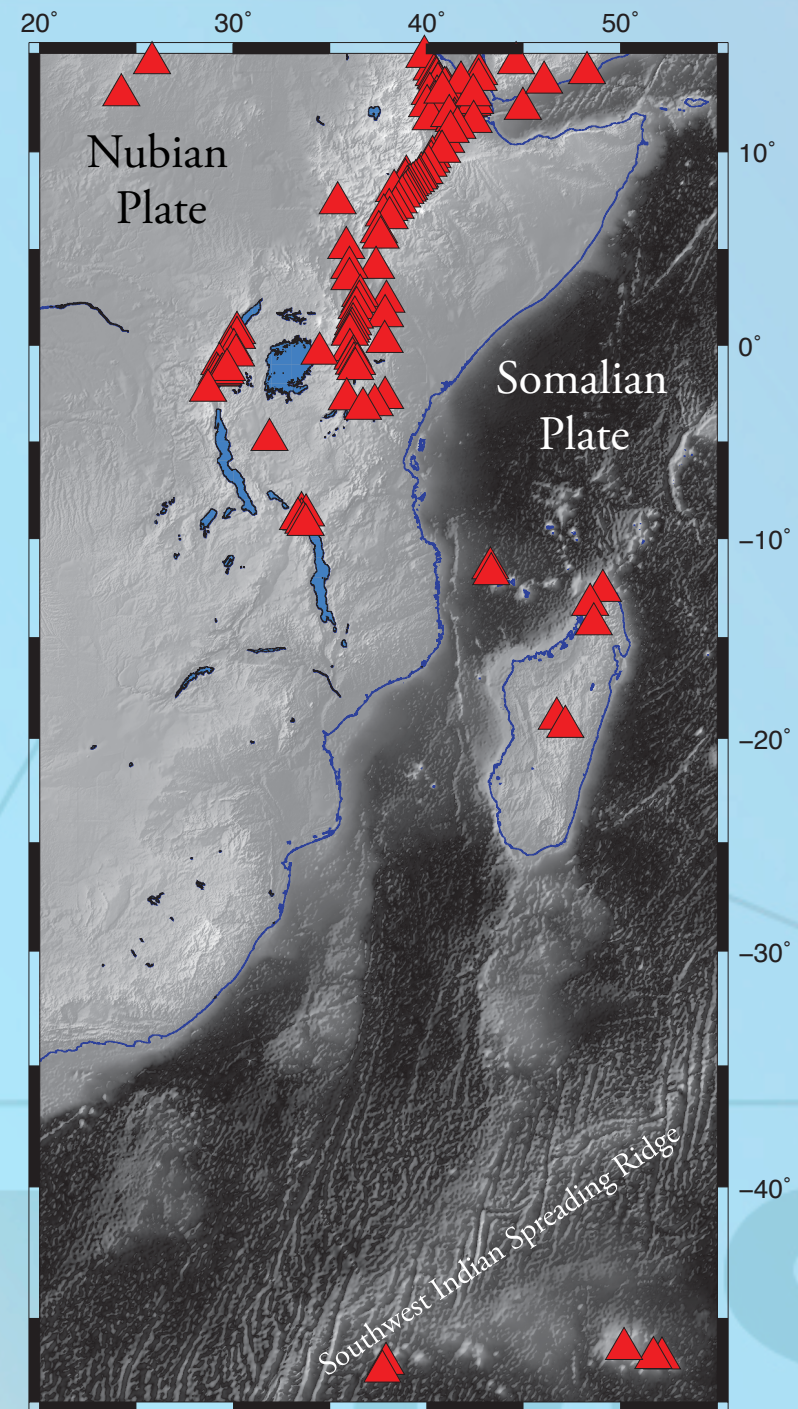
Example EARS Synoptic Study

- **Distribution of seismicity**
(NEIC catalog + Rambolamanana
Madagascar network $>M_o$ 4)
- **vs. distribution of volcanic
activity** (NGDC)



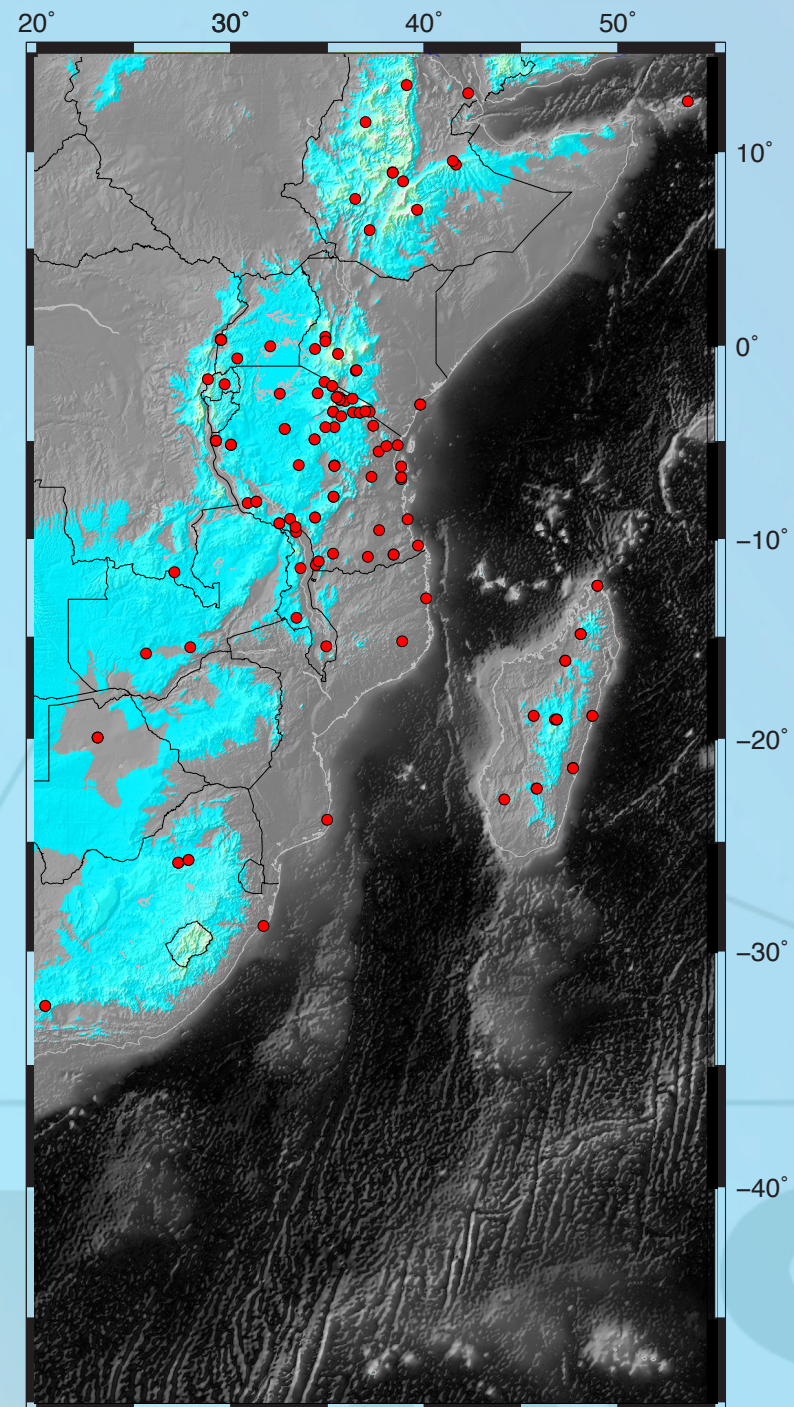
Example EARS Synoptic Study

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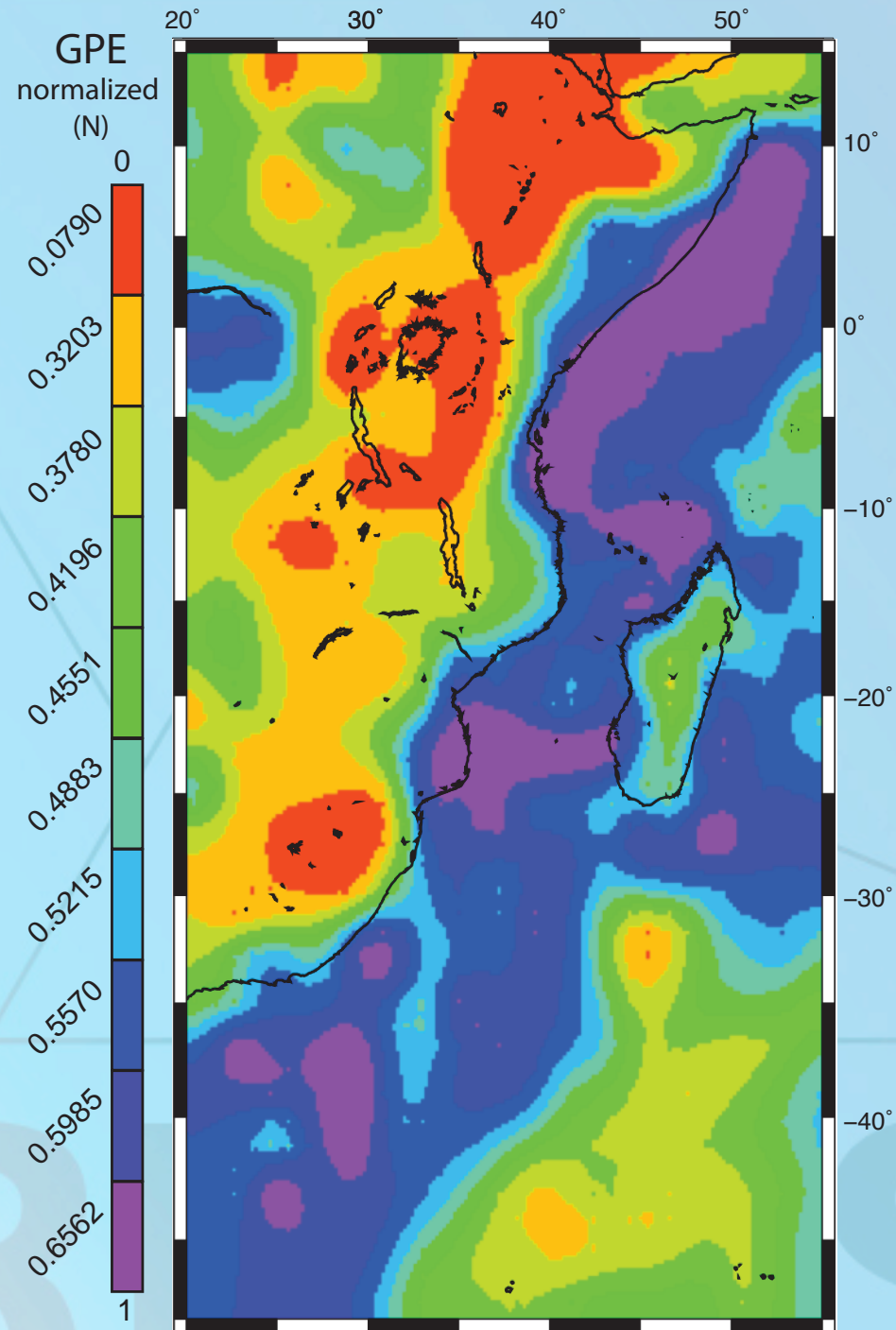
Example Dataset

- GPS data available at www.unavco.org
- Search AFREF African Reference Frame initiative for additional continuous GPS stations/data



Example Dataset/ Base Model

- **Gravitational Potential Energy Calculations**
 - Stamps et al., 2010
 - CRUST2.0 (Bassin et al., 2000)
 - Lateral variations in upper mantle density and uniform mantle density available



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Community Driven Proposals / Experiments

Jim Gaherty
Syracuse University

What makes a Community Experiment?

- **The community acquires a large (geophysical) data set.**
- **PI's are supported only to perform experiment and collect data**
- **Involvement and training of junior scientists and students.**
- **The data become publicly available immediately.**
- **Mechanism for ensuring rapid turnaround of necessary data processing**
- **Money to support individual research analyses (including students, etc.) is provided through subsequent, separate proposals**

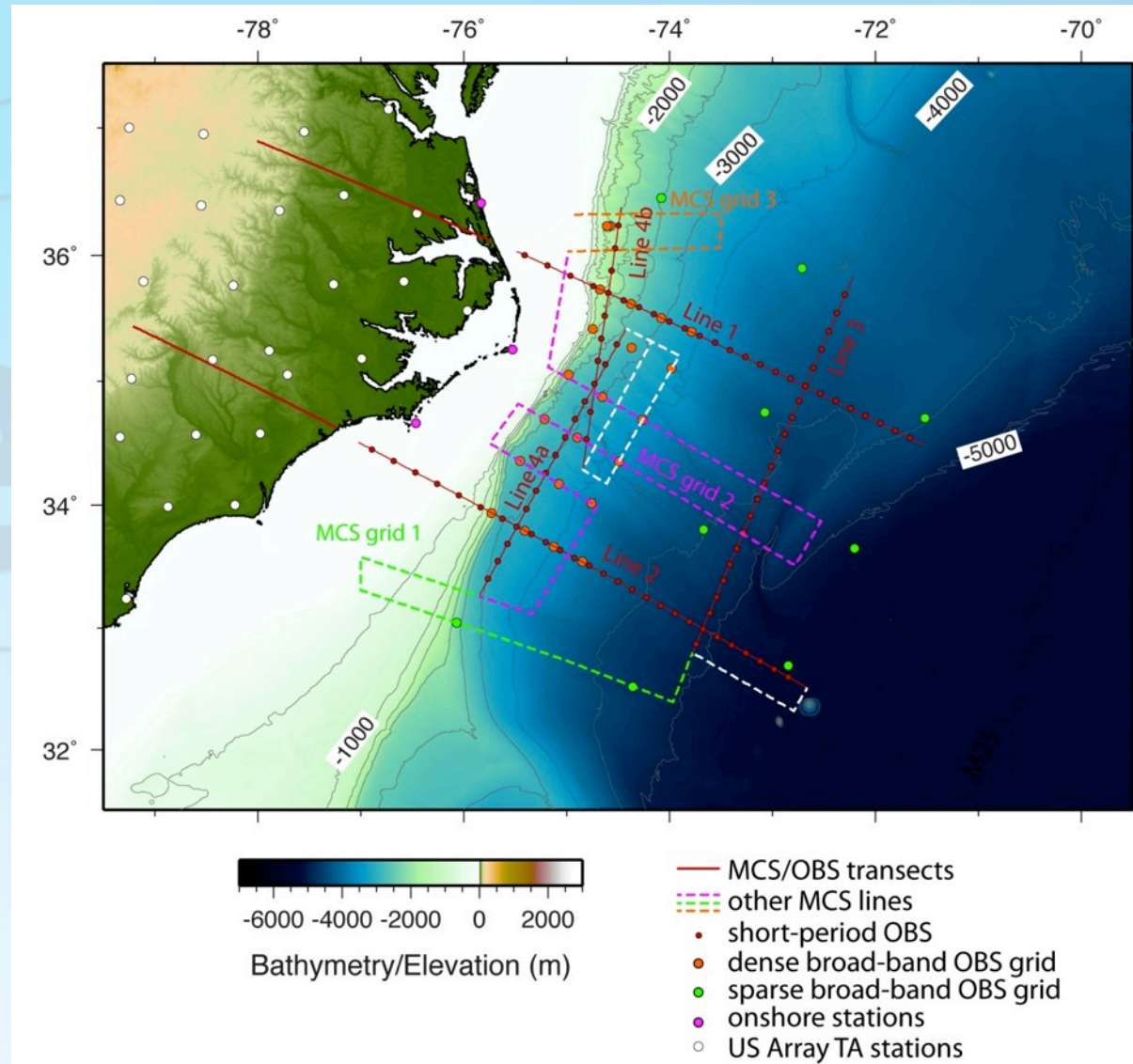
Examples of Community Experiments

- **EarthScope's Transportable Array and Plate Boundary Observatory**
- **Cascadia Initiative**
- **Holbrook Cascadia Langseth Experiment**
- **GeoPRISMS Eastern North American Margin experiment**

What makes a Community *Proposal*?

- overarching science, and the general experiment location, are specified by community consensus
 - via a workshop, open meetings, online polls, etc.
- broad group (perhaps self selected, but not exclusively so) volunteers to write the proposal, and serve as PI's on the experiment
- Expresses science motivation, and articulates a particular experiment to address science, but no research.
 - Broad enough to allow for multiple subsequent analysis
 - focused enough to be tractable and compelling
- Utilize participant support funding to involve and train junior scientists and students
 - Data acquisition
 - Data processing

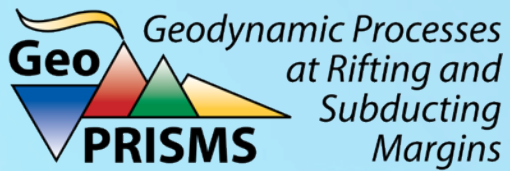
ENAM Community Seismic Experiment Plan



Data acquisition on land and at sea in April 2014, Sept/Oct 2014

Challenges of Community Experiments

- **Proposal must sell science, but without analyses spelled out or guaranteed**
- **PI commitment likely larger than funded, and unpredictable**
- **Logistics! Field experiments are hard! Tons of busywork (shipping, establishing partnerships, pursuing leveraging opportunities, managing expenses). Do you want to do this for something that is not “yours”?**
- **Producing community-ready data volumes is very tough, especially on a tight schedule. Have a very specific plan, and make sure funding is adequate to support it**



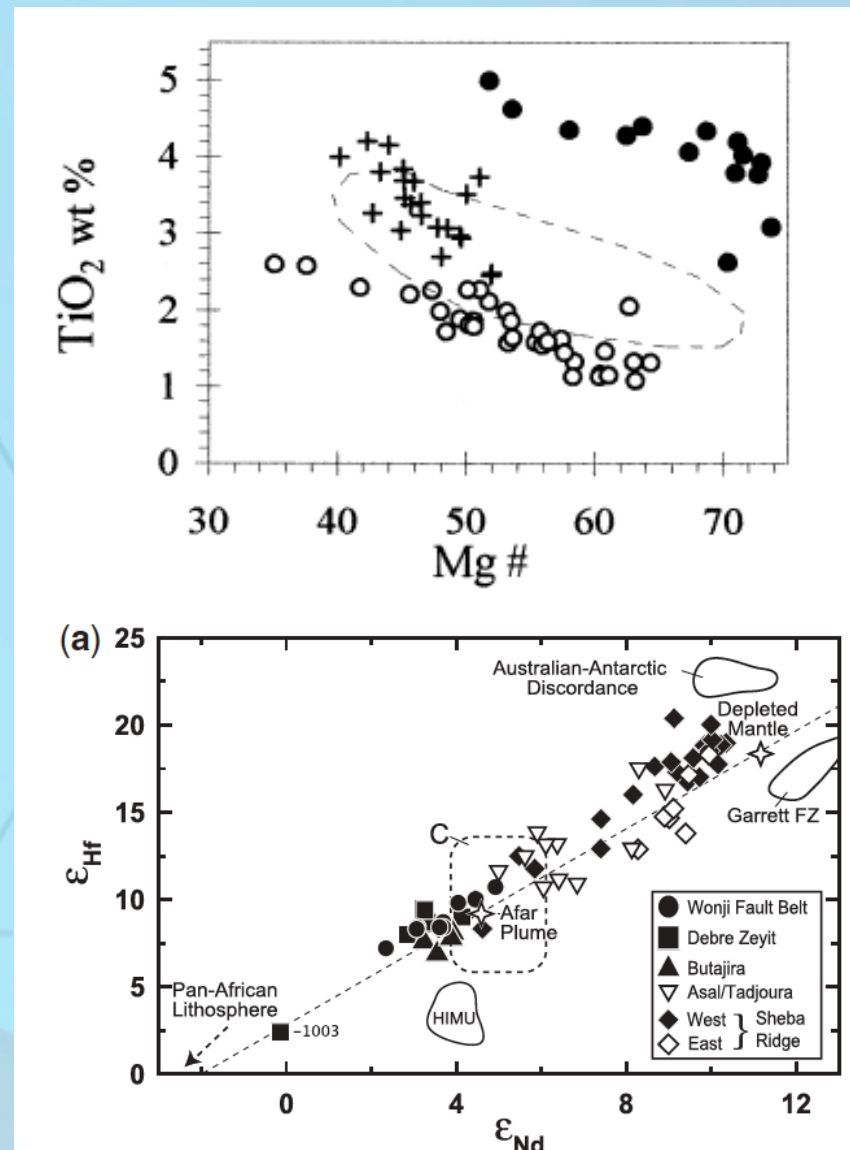
Datasets

Wendy Nelson², Rob Moucha³, Andy Nyblade⁴

- ¹ University of Houston
- ² Syracuse University
- ³ Penn State University

Geochemical Data Sets

- Volcanism over 45 Ma
- Data consists of
 - Whole rock and mineral compositional data.
 - Melt inclusion compositional data
 - Volatile contents preserved in minerals
- Major element, trace element, and isotopic data.
- Age Determinations



Pik et al., 1998 (top); Rooney et al. 2012 (bottom)


Geochemical Data Sets


- EarthChem by NSF (<http://www.earthchem.org/>)
 - “...community driven effort to facilitate preservation, discovery, and access and visualization of data...”


EarthChem Portal Holdings

Partner Database	Total References	Total Samples	Total Chemical Values
NAVDAT	1,480	64,985	1,147,854
PetDB	1,580	57,999	2,049,255
GEOROC	9,221	222,823	5,580,394
USGS	1	414,103	9,344,774
SedDB	404	65,868	540,040
MetPetDB	109	1,762	604
GANSEKI	197	5,400	n/a
TOTAL	12,992	832,940	18,662,921

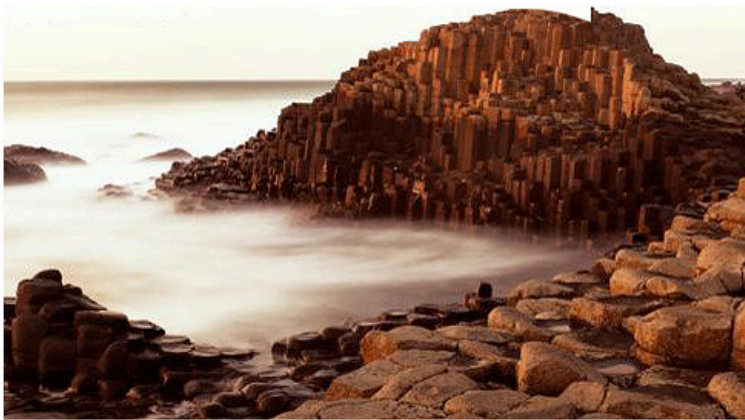
Geochemical Data Sets

 IEDA

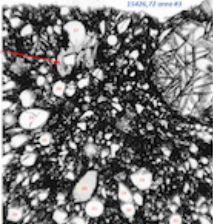
 EarthChem



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Featured Dataset



IEDA Data Rescue Mini-Award: Lunar Samples

An enduring legacy of the Apollo program is the lunar sample collection that is currently maintained and curated at Johnson Space Center in Houston, TX. These samples, obtained at tremendous cost and great risk, are the only samples that have ever been returned by astronauts from the surface of another planetary body. However, despite the fastidious care and effort with which lunar samples are...

[read about more featured datasets...](#)

earthchem library
publication & preservation of data

earthchem portal
single-point access to
geochemical databases

~~data synthesis~~
PetDB, NAVDAT, SedDB, and
other topical data collections

data compliance
data management plans & data
compliance reports

contribute data
submit and publish your data in
EarthChem data systems

Quick Links

- ~~EarthChem Portal~~
- ~~EarthChem Library~~
- ~~PetDB~~
- ~~NAVDAT~~
- SedDB
- Geochron
- Data Templates
- SESAR

IEDA: EarthChem Homepage

Welcome to EarthChem.

This web site gives you access to data systems and services for geochemical, geochronological, and petrological data, developed and maintained by EarthChem, including the EarthChem Library, the EarthChem Portal, PetDB, NAVDAT, SedDB, and Geochron.

EarthChem develops and maintains databases, software, and services

Recent News

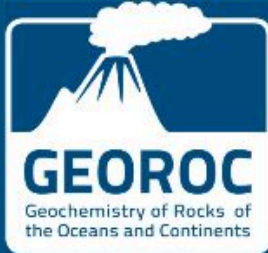
Release of PetDB v2.7.0
Oct 2013. Check out the new version of PetDB, v.2.7.0, with new features and bug fixes that improve access to data.

EarthChem's Lehnert and Walker receive Distinguished Service Awards
Sept 2013. On Thursday, August 29th, the Geochemical Society had the 2013 Distinguished Service Award Ceremony at the Goldschmidt Conference.

Geochemical Data Sets

- **GEOROC** (<http://georoc.mpch-mainz.gwdg.de>)
 - Geochemistry of Rocks of Oceans and Continents
 - ****Most comprehensive database for EARS volcanic rocks and xenoliths****
 - Maintained by Max Planck Institute for Chemistry (Germany)

Geochemical Data Sets



Home

Query by

Bibliography

Geological Setting

Geography

Chemistry

Petrography and Sam

Expert Datasets

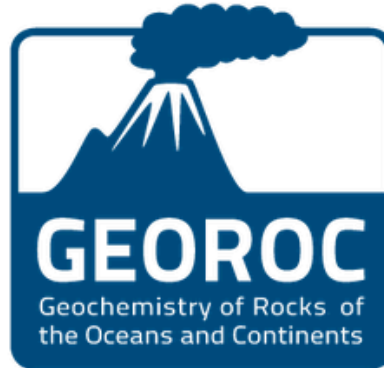
Precompiled Files:

Locations

Rocks

Minerals

Inclusions



Th

The database GEOROC (Geochemistry of Rocks of the Oceans and Continents) is maintained by the Max Planck Institute for Chemistry in Mainz. The database is a comprehensive collection of published analyses of volcanic rocks and mantle xenoliths. It contains major and trace element concentrations, radiogenic and nonradiogenic isotope ratios as well as analytical ages for whole rocks, glasses, minerals and inclusions. Samples come from 11 different geological settings. Metadata include, among others, geographic location with latitude and longitude, rock class and rock type, alteration grade, analytical method, laboratory, reference materials and references

Currently, GEOROC contains about 673,000 analyses of almost 355,000 samples, published in more than 11,900 papers (for a complete list of references available in GEOROC, [click here](#)).

Applications of the database GEOROC are numerous in the study of volcanic rocks but also in sedimentary, palaeoceanographic, as well as atmospheric research ([more](#)).

GEOROC can also accessed by the [EarthChem's web portal](#) that offers distributed searches across several databases including the databases [PetDB](#) and [NAVDAT](#). Datasets in GEOROC are cross-linked with [GeoReM](#), an MPI database for reference materials of geological and environmental interest, such as rock powders, synthetic and natural glasses as well as minerals, isotopic, biological, river water and seawater reference materials.

Geochemical Data Sets

- GEOROC

Continental Flood Basalts		
Download	Size (KB)	Last Actualization
ANTARCTICA - KAROO AND FERRAR PROVINCES.csv	1,170	6/12/2013
AUSTRALIA.csv	292	6/12/2013
CENTRAL ATLANTIC MAGMATIC PROVINCE - CAMP.csv	1,849	6/12/2013
CHIFENG FLOOD BASALTS.csv	25	6/12/2013
CHILCOTIN PLATEAU BASALTS.csv	41	6/12/2013
DECCAN.csv	2,550	6/12/2013
EMEISHAN.csv	1,126	6/12/2013
ETENDEKA PROVINCE.csv	478	6/12/2013
ETHIOPIAN PLATEAU.csv	490	6/12/2013
FRANKLIN LARGE IGNEOUS PROVINCE.csv	35	6/12/2013
HIGH ARCTIC LARGE IGNEOUS PROVINCE.csv	323	6/12/2013
HURONIAN FLOOD BASALT PROVINCE.csv	44	6/12/2013
KAROO PROVINCE - AFRICA.csv	1,252	6/12/2013
KUZNETSK BASIN OR KUZBASS TRAPS.csv	5	6/12/2013
MADAGASCAR FLOOD BASALT.csv	342	6/12/2013
MARATHON LARGE IGNEOUS PROVINCE.csv	61	6/12/2013
MIDCONTINENT RIFT SYSTEM - KEWEENAWAN.csv	806	6/12/2013

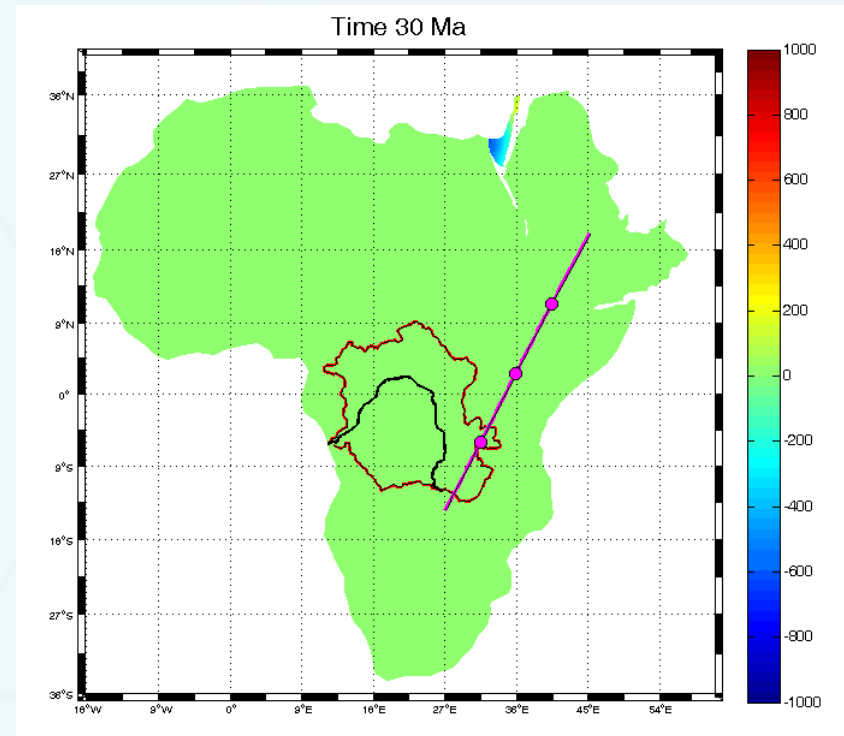
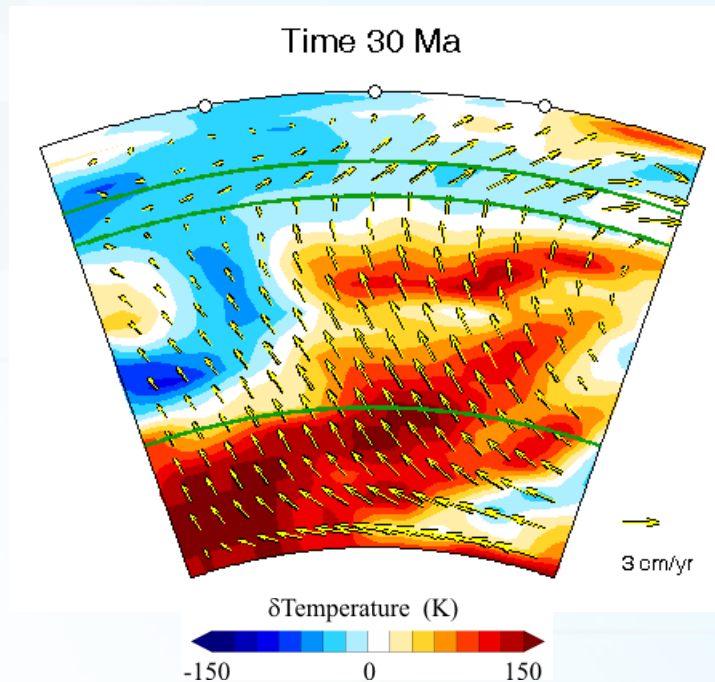
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 - Geochemistry of Rocks of Oceans and Continents
 - ****Most comprehensive database for EARS volcanic rocks and xenoliths****
 - Maintained by Max Planck Institute for Chemistry (Germany)
- **PetDB** (<http://www.earthchem.org/petdb>)
 - Petrological Database of the Ocean Floor
 - Maintained by EarthChem and supported by NSF
 - Limitations:
 - Igneous and metamorphic rocks of the ocean floor
 - Mantle xenoliths (new)

“Other” Geochemical Data Sets

- **GERM** (<http://earthref.org/GERM>)
 - Geochemical Earth Reference Models
 - Supported by Scripps and Oregon State University (NSF sponsored)
 - Limitations:
 - Good resource for global reference materials, partition coefficients, etc.
 - Does not contain basic data published in location-specific papers.
- **Geochron** (<http://www.geochron.org>)
 - Maintained by EarthChem and supported by NSF
 - Limitations:
 - New database
 - Clunky user interface

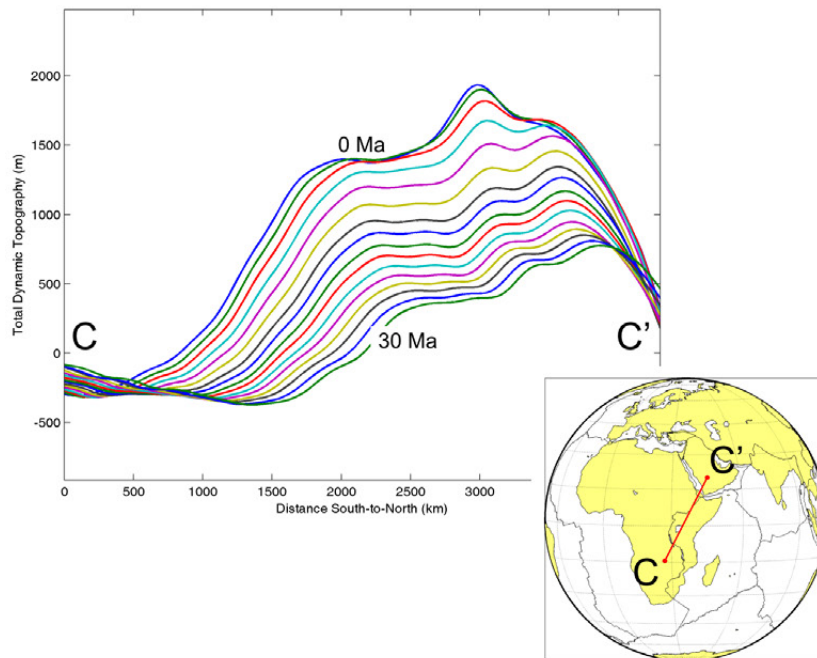
Changing Dynamic Topography of the African Continent



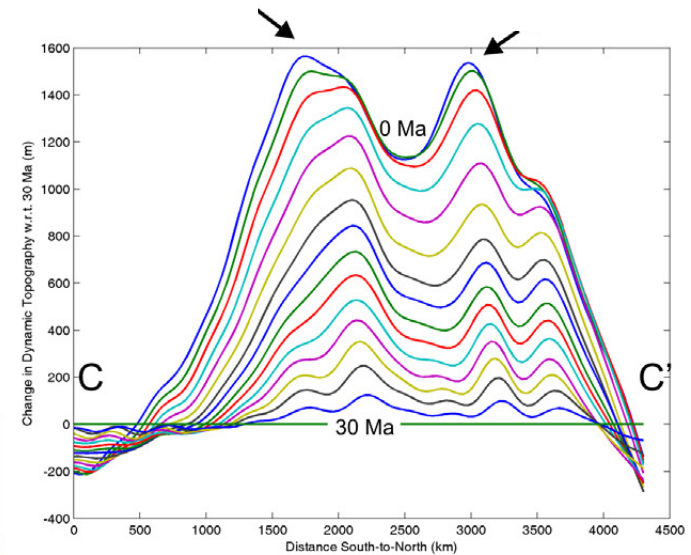
(Moucha et al., Nature Geo, 2011)

Evolution of East African Rift Topography

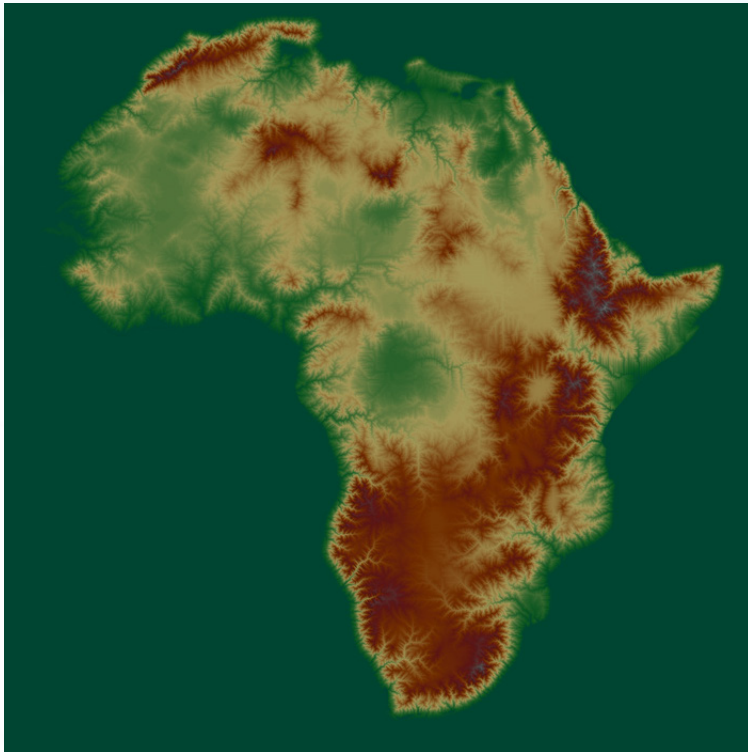
a) Dynamic Topography Profile



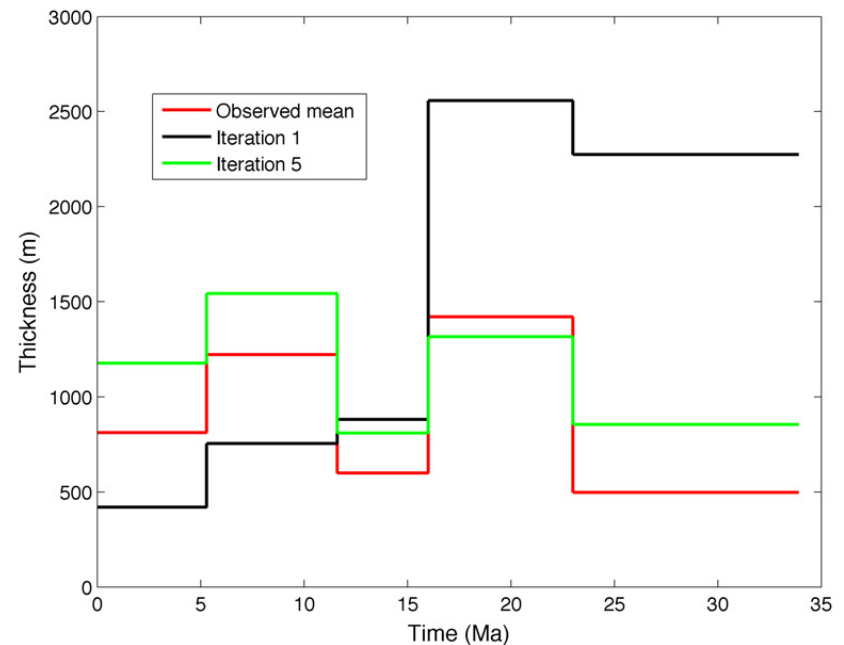
b) Dynamic Topography Profile with respect to 30 Ma



Landscape Evolution and the role of the EARS

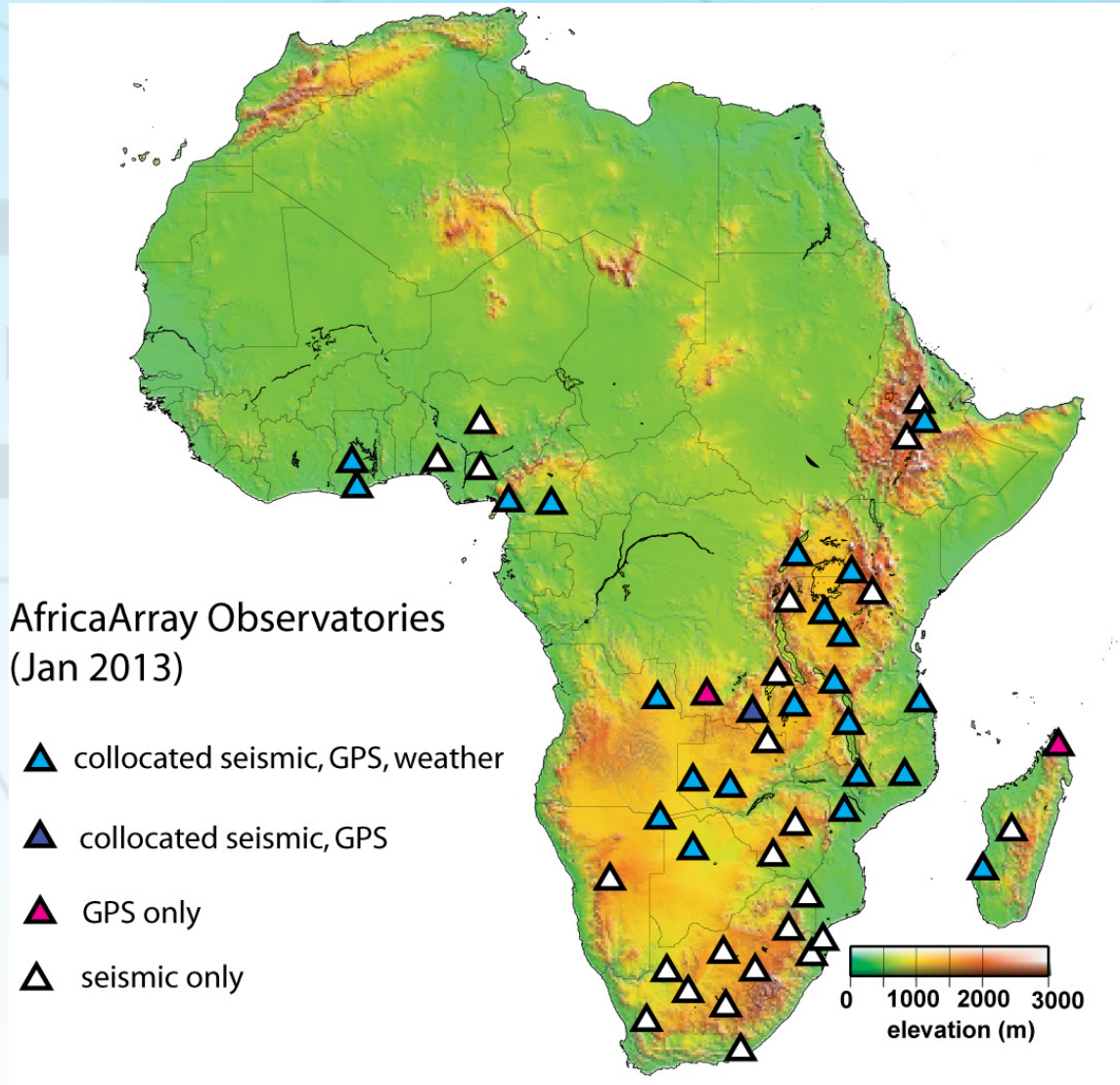


Iteration 5: TX2008V2, 30 Myr
Resolution: 4 x 4 km



Sedimentary flux Record
Congo Margin

AfricaArray Observatory Network



- 51 stations
- 48 seismic stations
- 27 GPS/met stations
- 19 countries
- Continuous recording
- Data recovery 70-80%
- Data availability: IRIS and UNAVCO
- Data retrieval:
 - A few countries - real-time using cell modems
 - Elsewhere - monthly

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