



AfricaArray Background

- **Started in 2004**
 - founding partners: Penn State, Univ. of the Witwatersrand (Wits), Council for Geoscience (aka Geol. Survey of South Africa (CGS) (+ IRIS support)
- **Goal: establish a public-private partnership to support capacity building and research in the geosciences (Earth, Atmospheric and Space sciences) in Africa, with an initial focus on solid earth geophysics and Wits University**
- **“AfricaArray” = array of training programs + array of research projects + array of partnerships and collaborations + array of scientific observatories (networks)**
- **Key components to a multifaceted initiative:**
 - 1) seismic, GPS, weather networks in Africa
 - 2) Graduate research and education programs (Africa and US)
 - 3) Diversity programs (Africa and US)
 - 4) public-private partnership base (academic, gov't, industry)

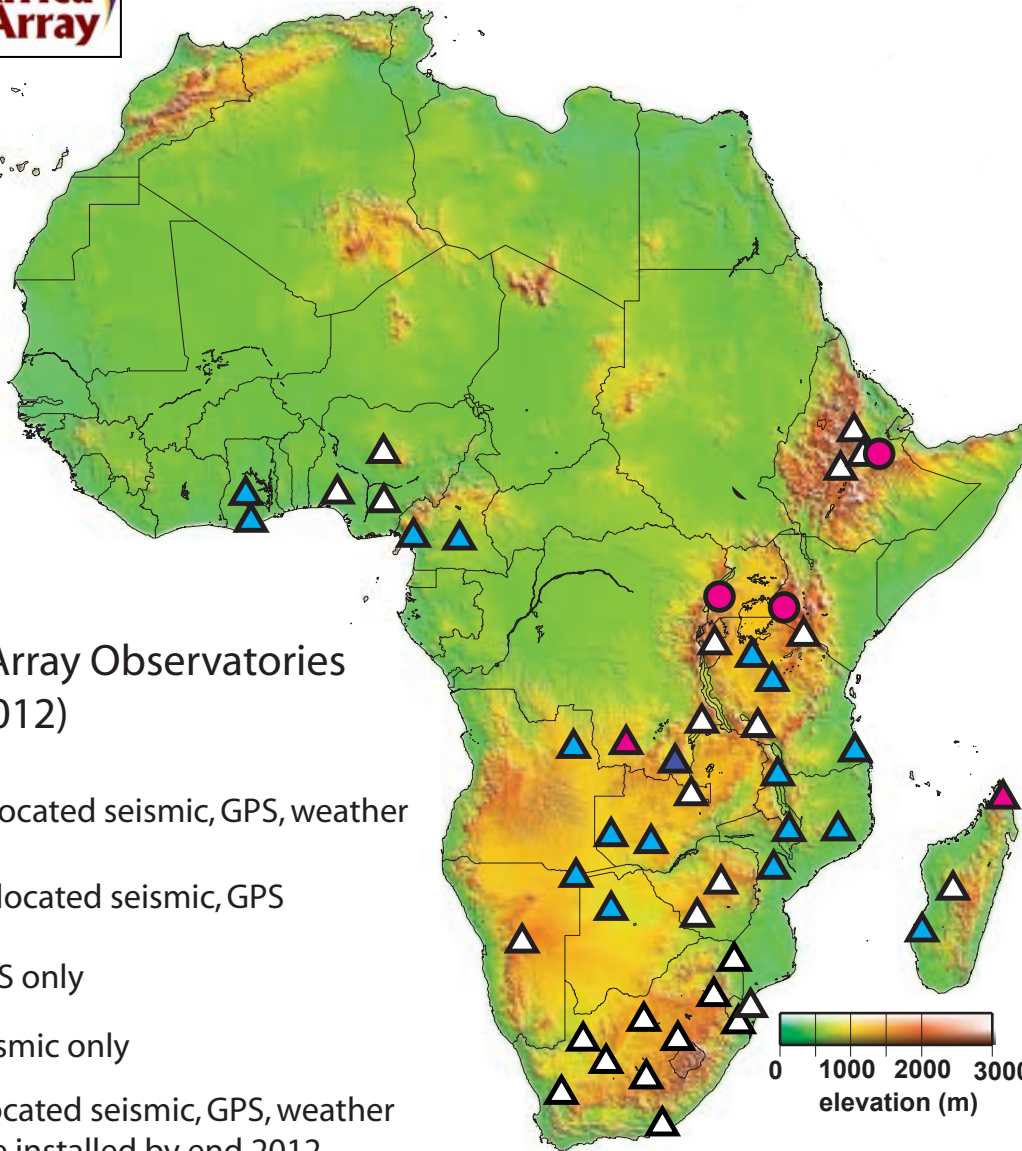


AfricaArray Observatory Network

- 44 seismic stations
- 18 GPS/met stations
- 2 GPS stations
- 3 seismic/GPS/met in const.
- 18 countries
- Continuous recording
- Data recovery 70-80%
- Data retrieval:
 - S. Africa, Mozambique, Botswana, Kenya - real-time using cell modems and internet
 - Elsewhere - manual
 - 2013 focus - getting more stations online

AfricaArray Observatories (Oct 2012)

- ▲ collocated seismic, GPS, weather
- ▲ collocated seismic, GPS
- ▲ GPS only
- ▲ seismic only
- collocated seismic, GPS, weather to be installed by end 2012



Mongu, Zambia



Met
sensor

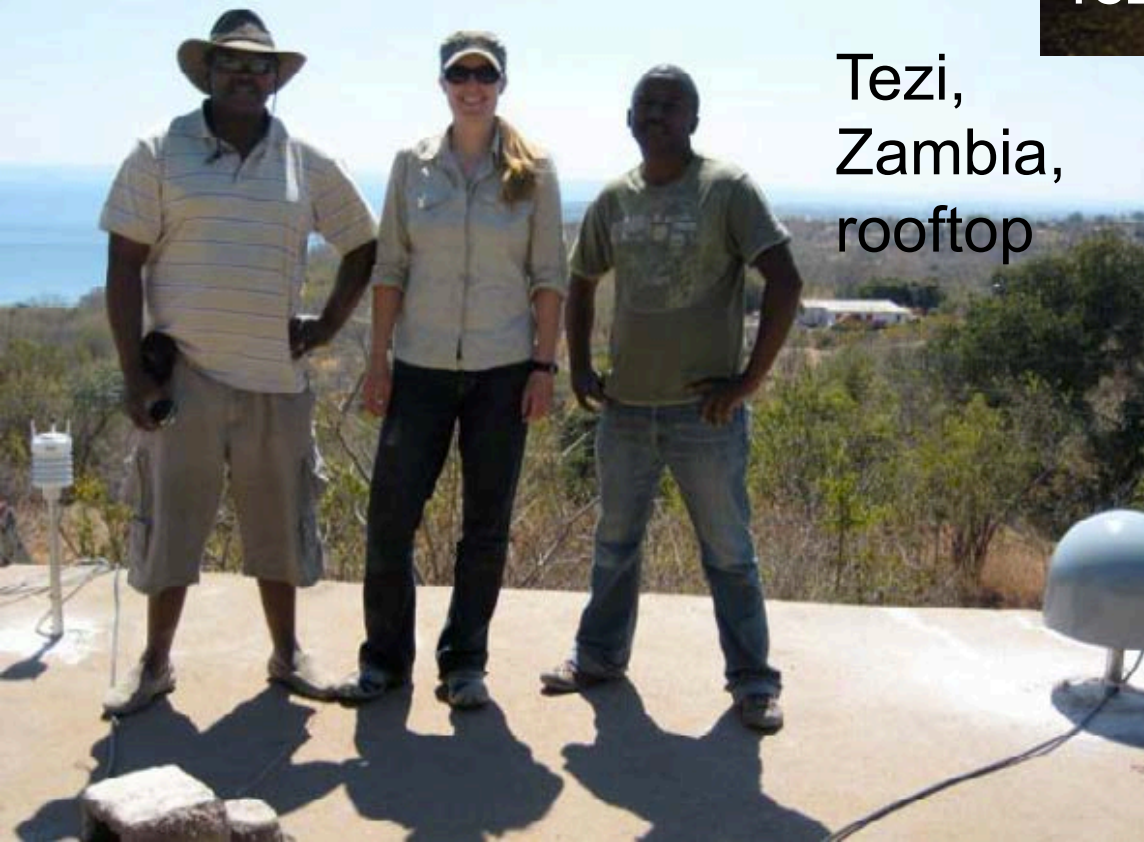
GPS

Tezi, Zambia

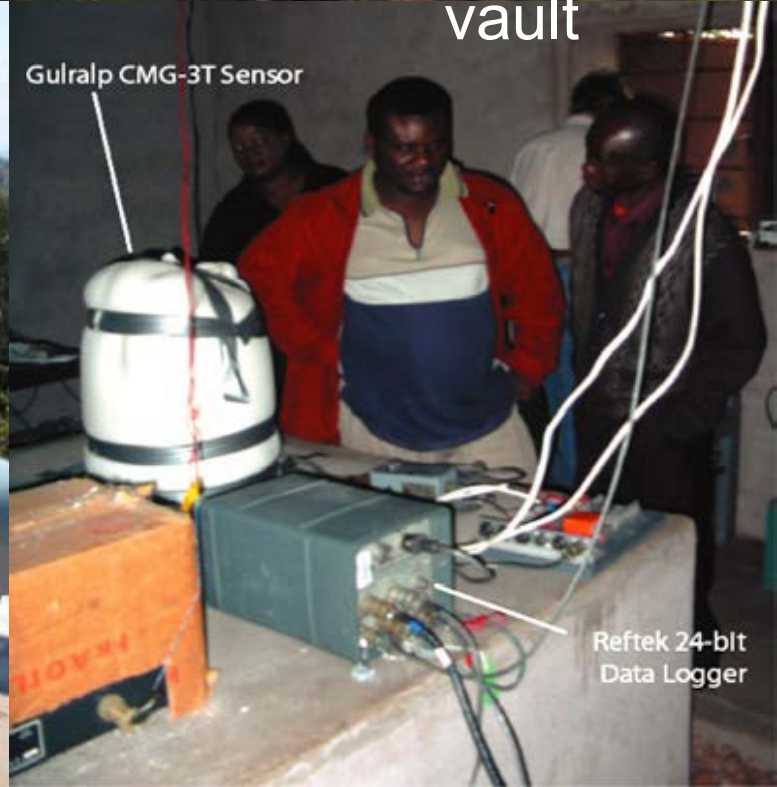


Seismic
vault

Tezi,
Zambia,
rooftop



Guralp CMG-3T Sensor



Reftek 24-bit
Data Logger

Data archiving and access

GPS/Met data available from UNAVCO – all open

Seismic data available from IRIS – 12 stations open to anyone; all open to projects with African collaborators; 3 yr embargo on others

UNAVCO Data Archive Interface v2

Current results: 16 items

4-char ID(s)	Interval	name	lat	lon	earliest data	latest data
ACRA	30.0 sec	ACRA	5.5581	-0.203	2011 Jan 25 17:56	2011 Oct 3
DOOM	15.0 sec	Dodoma	-8.1865	35.7482	2010 Sep 22 08:58	2011 Nov 1
EKON	15.0 sec	Busa - Ekona	4.2336	9.3272	2011 Jan 30 11:34	2011 Nov 1
ETBE	15.0 sec	Entebbe	0.0536	32.4823	2010 Oct 01 00:00	2011 Jan 0
GETA	15.0 sec	GETA	-2.9	32.2	Pending	Pending
KUKU	15.0 sec	KURUKANTUMI	6.1923	-0.3685	2011 May 02 13:49	2011 Oct 0

IRIS DMC MetaData Aggregator

http://www.iris.edu/mda/AF

IRIS DMC MetaData Aggregator

Network summary (2 time spans)

Network AF :: Africa Array :: [AF Network Map](#)
 Start Year 2009
 End Year 2012

Stations for AF network 2009 to 2012 (56 stations)

Station	Site	Latitude	Longitude	Elevation	First start	Last end
AAUS	Addis Ababa University, Ethiopia	9.03	38.77	2437.8	2006/01/10	2599/12/31
ANKE	Ankober, Ethiopia (near Debra Birhan)	9.58	39.74	2789.9	2009/05/07	2599/12/31
AUG	Angrabies CMG-40T Earth data Low gain	-28.59	20.34	613	2011/03/03	2599/12/31
BUT	Belfast CMG-40T Earth data Low gain	-30.52	29.41	1350	2006/03/07	2599/12/31
BLWY	Bulawayo, Zimbabwe	-20.14	28.61	1348	2008/10/31	2599/12/31
BUFB	Buffelsbos L4-3D Earth data Low gain	-34.15	24.74	109	2008/09/24	2599/12/31
CER	Ceres KS2000 Earth data Low gain	-33.36	19.29	472	2006/05/12	2011/09/22
CER	Ceres L4-3D Earth data Low gain	-33.36	19.30	465	2011/09/23	2599/12/31
CNG	Changalane, Mozambique	-26.29	32.19	100	2005/11/03	2599/12/31
CVNA	Calvinia KS2000 Earth data Low gain	-31.48	19.76	1050	2006/05/11	2599/12/31
DESE	Dese, Ethiopia	11.12	39.63	2538	2006/07/27	2599/12/31
DODT	Dodoma, Tanzania	-6.19	35.75	1114	2007/02/11	2599/12/31
EKNA	Ekona, Cameroon	4.23	9.33	354	2007/01/23	2599/12/31
ELIM	Elim CMG-40T Earth data Low gain	-34.60	19.75	126	2007/03/11	2009/03/08
ELIM	Elim L4-3D Earth data Low gain	-34.60	19.75	126	2009/03/09	2599/12/31
ERPM	East Rand Propriety Mines L4-3D Earth data Low gain	-26.24	28.24	1611	2006/05/23	2599/12/31
GETA	Geita, Tanzania	2.87	33.24	1267	2011/08/02	2599/12/31
GRM	Grahamstown KS2000 Earth data Low gain	-33.31	26.51	610	2006/05/10	2599/12/31
HARE	Harare, Zimbabwe	-17.70	31.01	1501	2006/01/07	2010/12/31
HVD	Gariop Dam CMG-40T Earth data Low gain	-30.61	25.50	1433	2006/04/26	2599/12/31
IFE	Ife, Nigeria, Africa	7.55	4.46	283.8	2008/09/26	2599/12/31
KAD	Kaduna, Nigeria, Africa	10.43	7.64	670.1	2008/09/26	2599/12/31



Annual AfricaArray Workshop

- The next workshop will be Jan. 17-18, 2013 at Wits University in Jburg, S. Africa
- A technician training course will be held Jan 15,16 prior to the workshop for AA station operators
- Registration form can be downloaded from the AA website (www.africaarray.org)
- Deadline for requesting travel support is Nov 9, 2012

Progress so far



- **Education:**
 - In Africa: 50 BSc honors, 17 MSc, 9 PhD, 2 Postdocs supported
- **Network:**
 - 44 permanent seismic stations in 17 countries; 16 stations with *GPS/met*
- **Partners:**
 - Universities in Africa 15
 - Universities in US, Europe, Australia 14
 - Gov' t organizations in Africa 17
 - Gov' t organizations outside Africa 8
 - companies 19
 - Academic and industry societies 6
- **Research:**
 - Journal publications: >40



Network operation



- Funding for equipment: NSF, academic institutions, gov' t agencies
- Operations and maintenance
 - Baseline support comes from station operators in each country
 - Technical staff based in S. Africa for major repairs
 - Network Manager providing oversight (Damien Delvaux)
- Role of station operators in each country
 - Who are they? Universities, Geological Surveys, Meteorological Agencies
 - Station construction, routine maintenance, downloading data
 - Security
 - Covering costs of technical staff, training, etc.
- Benefits to station operators
 - technical training
 - degree training
 - access to data from the network
 - access to support network





Types of network data relevant to development in Africa

- **GPS/Met**

- Weather (in cases of real-time data transmission)
- Climate and human dimensions of global change
- Atmospheric water vapor
- Soil moisture
- Space weather
- Surveying

- **Seismic**

- Seismicity (location, magnitude, frequency)
- Ground shaking (attenuation, site amplification)
- Earth structure related to mineral resources





Relevance to Gov't agencies

- **Capacity building for science and technology in Africa**
 - **human capacity building**
 - effective training program for scientists and technicians
 - focus on diversity
 - **Observing network infrastructure**
 - provides new data sets for students, postdocs, scientists
 - **Partnerships**
 - building a science community around a shared facility - an environmental monitoring network

