

- 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 and 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 Observatories (Oct 2012)

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▲ collocated seismic, GPS, weather

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





#### 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:

1000 2000 3000

elevation (m)

0

- S. Africa, Mozambique, Botswana, Kenya - realtime using cell modems and internet
- Elsewhere manual
- 2013 focus getting more stations online

# Mongu, Zambia

### Met sensor

Tezi, Zambia, rooftop

GPS

Tezi, Zambia

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Gulralp CMG-3T Sensor

Seismic vault

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

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#### Network summary (2 time spans)

С	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
A	AAUS	Addis Ababa University, Ethiopia	9.03	38.77	2437.8	2006/01/10	2599/12/31
A	ANKE	Ankober, Ethiopia (near Debra Birhan)	9.58	39.74	2789.9	2009/05/07	2599/12/31
	AUG	Augrabies CMG-40T Earth data Low gain	-28.59	20.34	613	2011/03/03	2599/12/31
	BFT	Belfast CMG-40T Earth data Low gain	-30.52	29.41	1350	2006/03/07	2599/12/31
A	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
RA	CNG	Changalane, Mozambique	-26.29	32.19	100	2005/11/03	2599/12/31
RA	CVNA	Calvinia KS2000 Earth data Low gain	-31.48	19.76	1050	2006/05/11	2599/12/31
A	DESE	Dese, Ethiopia	11.12	39.63	2538	2006/07/27	2599/12/31
A	DODT	Dodoma, Tanzania	-6.19	35.75	1114	2007/02/11	2599/12/31
A	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
	FLIM	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
A	GETA	Geita, Tanzania	2.87	33.24	1267	2011/08/02	2599/12/31
A	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
RA	HVD	Gariep Dam CMG 40T Earth data Low gain	30.61	25.50	1433	2006/04/26	2599/12/31
A	IFE	Ife, Nigeria, Africa	7.55	4.46	283.8	2008/09/26	2599/12/31
	YAD.	Values Ninets Africa	10.43	7.64	679.1	2009/00/26	2500/12/31

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- 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:

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- 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, transf
- Benefits to station operators
  - technical training
  - degree training
  - access to data from the network
  - access to support network







# s 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

