GGP Station Reports ETS 2013

Presentations included in this document:

BKG Stations, *H. Wilmes*
Larzac GEK Station, Montpelier, France, *C. Champillion*
Metsahovi Station, Finland, *H. Virtanen*
Moxa Station, Germany , by *T. Jahr*
Strasbourg France / Djougou Benin, *J. Hinderer*
Ny-Aleseund, Norway, *O. Omang*
Pecny, Czech Republic, *V. Palinkas*
Sutherland, South Africa, *C. Foerste*
Yebes, Spain, *B. Cordoba*
China SGs (Wuhan, Lhasa, Lijiang), *H.-P. Sun*

Superconducting Gravimeters

Superconducting gravimeters operated by BKG:

- **SG23** (single sphere): operational in Medicina (Italy) – no changes
- **SG44** (single sphere): operational in Bad Homburg – no changes
- **SG38** (single sphere): operational in Concepcion/Chile – no changes
- **SG30** (dual sphere): operational in Wettzell since Oct. 2010 in a new gravity building
- **SG29** (dual sphere): operational in Wettzell after rebuild into new dewar since July 2012 in the old gravity building

Absolute gravimeter measurements for SG instrumental drift determination

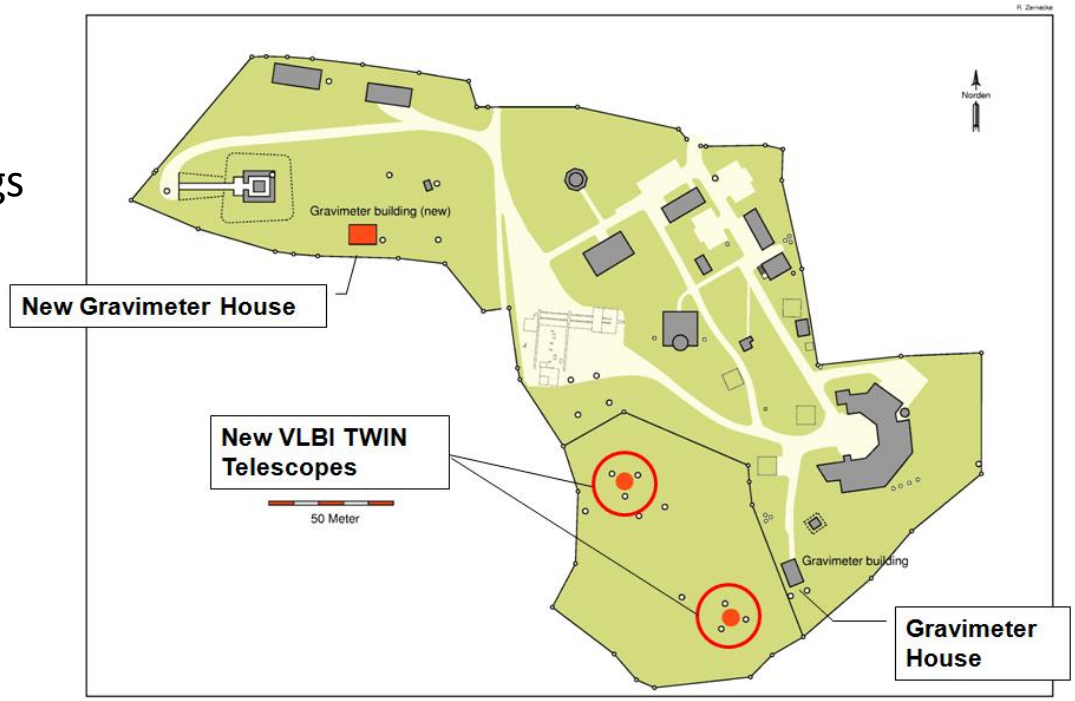
- Medicina: half-yearly measurements shared with ASI-team
- Bad Homburg: monthly measurements
- Wettzell: half-yearly measurements
- Concepcion: two-weekly measurements

GGP Upload Status

Gravimeter	Raw data (*00.ggp)	Logfiles (*.log)	Ground water (*.aux)	Total [years]
SG-44 Bad Homburg	02/2007-12/2012	02/2007-12/2012	02/2004-12/2012	5.8
SG-23 Medicina (Italy)	01/1998-12/2012	01/1998-12/2012	01/1998-12/2012	15.0
RT-38 TIGO, Concepcion, (Chile)	12/2002-06/2008 12/2009-12/2012	01/2003-06/2008 12/2009-12/2012	12/2002-06/2008 12/2009-12/2012	8.5
SG-29 Wettzell, old site	11/1998-10/2010 Since 08/2012, not yet uploaded	03/2001-10/2010 Since 08/2012, not yet uploaded	10/1998-10/2010 Since 08/2012, not yet uploaded	12.0
SG-30 Wettzell, new site	07/2010-12/2012	07/2010-12/2012	07/2010-12/2012	2.4
SG-103 Wettzell, old site	07/1996-09/1998			2.1
SG-30 Bad Homburg	02/2001-04/2007	02/2001-04/2007	05/2004-04/2007	6.1

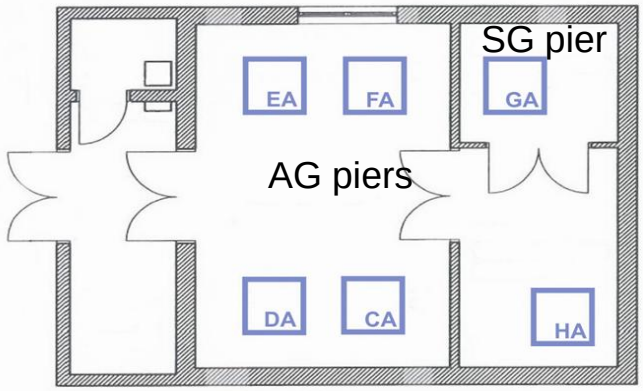
Wettzell geodetic observatory

- New VLBI Twin Radio Telescopes built in the vicinity of the old gravimeter house (distance to the gravimeter ~25m)
- New gravimeter house established in an undisturbed area of the station. Concept with 6 separate piers for SG and AG observations.
- Continuation of hydrological investigations on the grounds of the Wettzell station in a cooperation with the GFZ Potsdam (A. Güntner, B. Creutzfeldt)
- Plans to extend the investigations of hydrological influences to the wider surroundings of the station

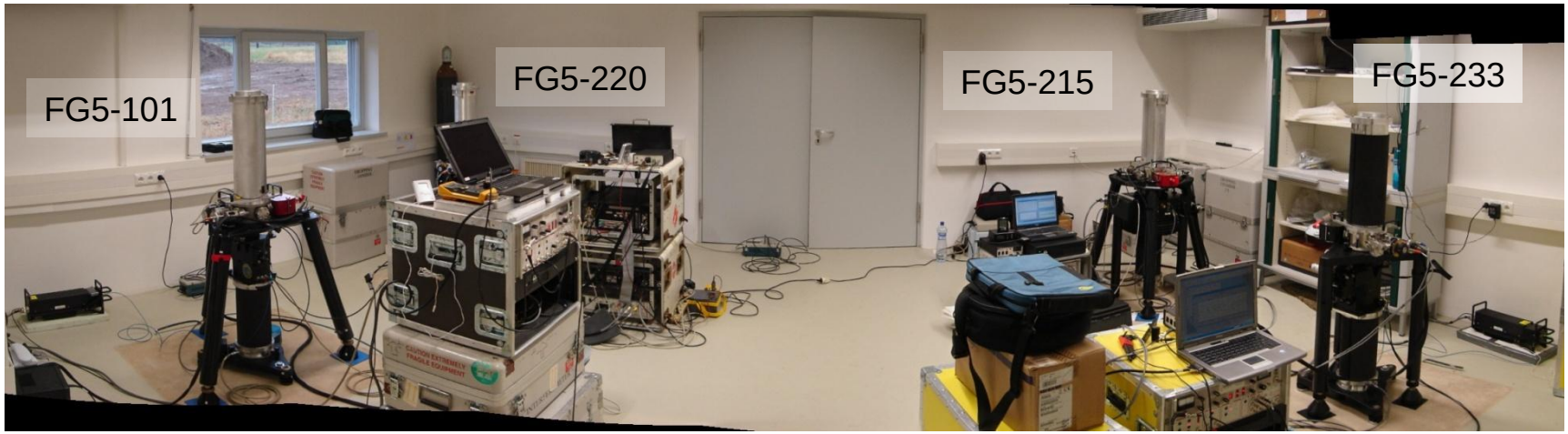


Gravity Reference Station Wettzell

Regional Comparisons of Absolute Gravimeters in 2010 and 2013 (RICAG 2010, RICAG 2013)



Floor plan



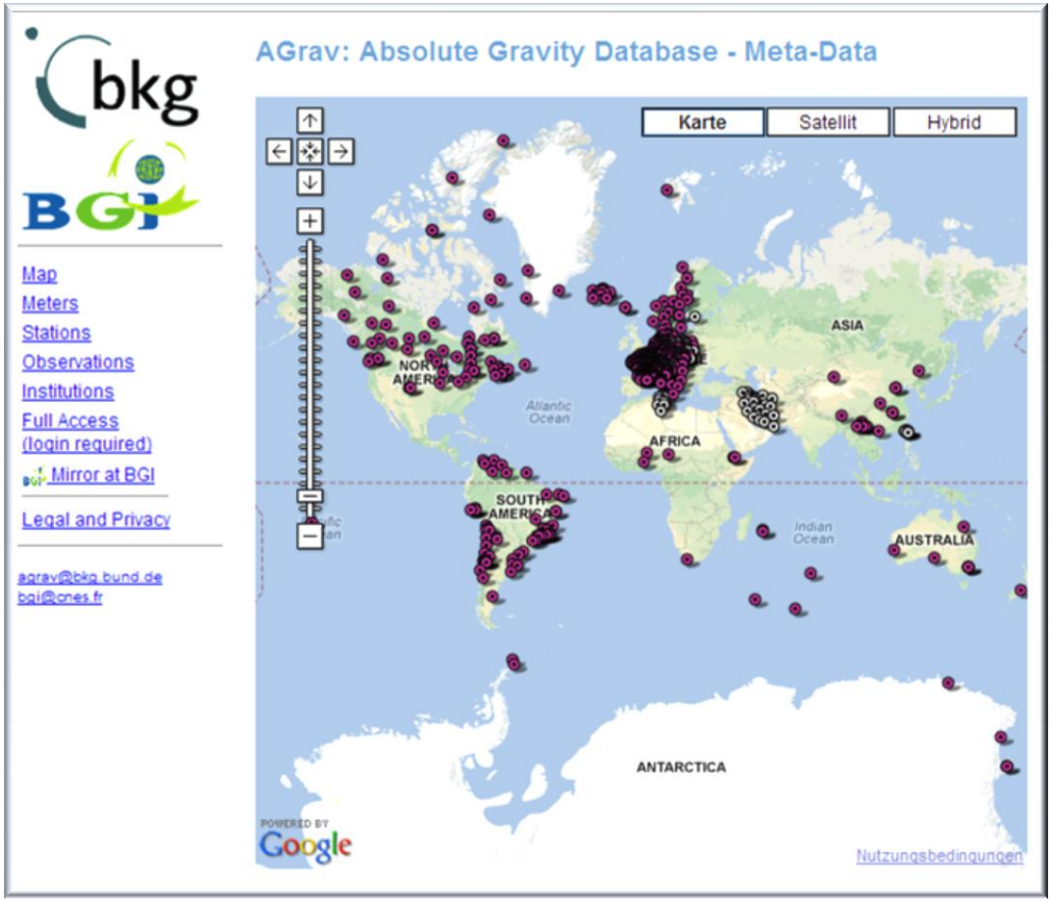
Absolute gravity database AGrav

- Absolute gravity database is part of the IAG International Gravity Field Service (IGFS) and the International Gravity Bureau (BGI)

- http://bgi.dtp.obs-mip.fr/
  http://agrav.bkg.bund.de/

  Growing support:
  - 42 instruments
  - 702 AG stations
  - 2471 AG observations

  (status April 2013)



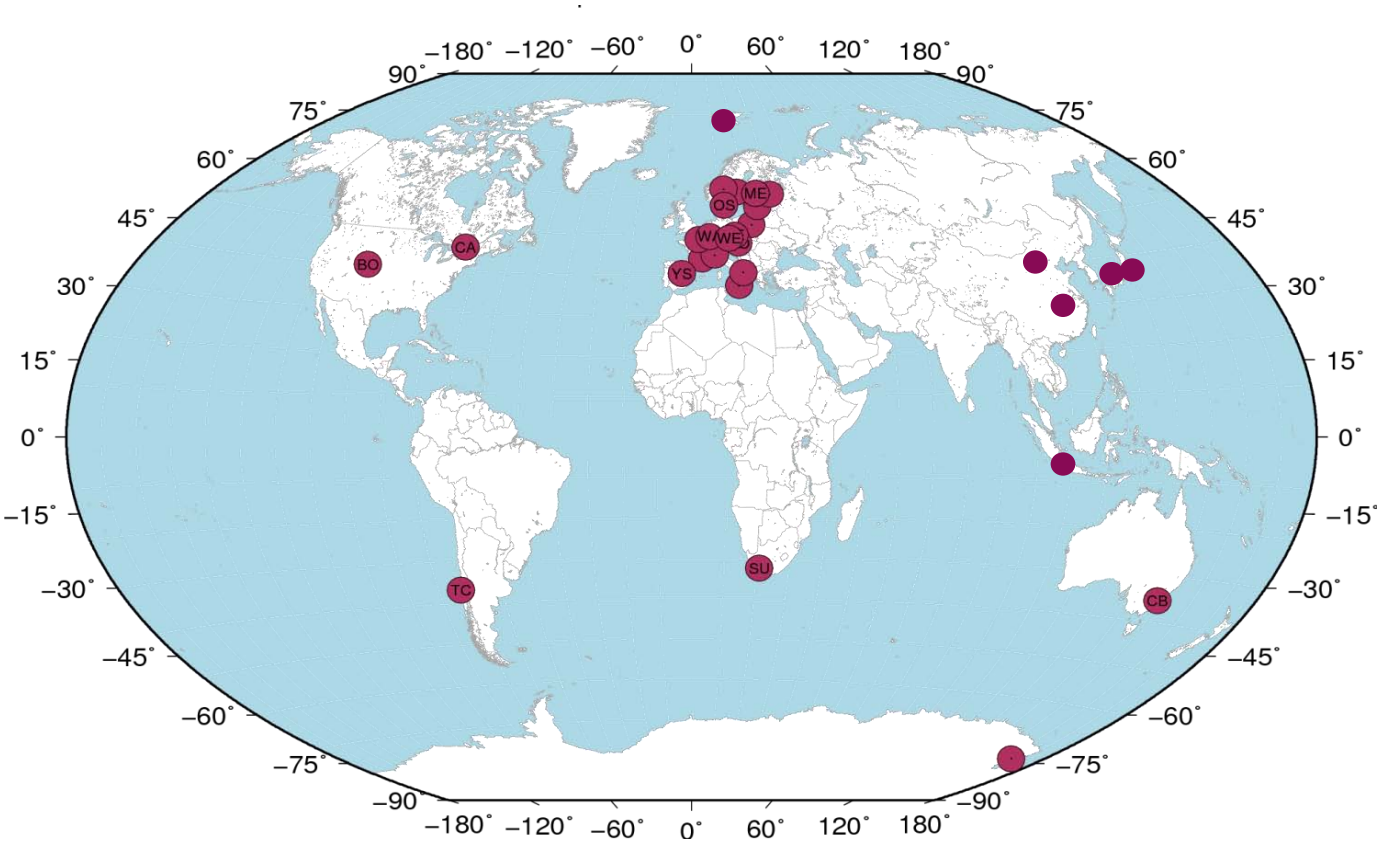
- Next improvements:
  - Visualisation tools for AG time series
  - Closer cooperation with Global Geodynamics Project GGP
  - Comparison results for AG instruments

Absolute gravity database AGrav

AGrav database with new features and new design

Federal Agency for Cartography and Geodesy

Proposed Gravity Reference Sites

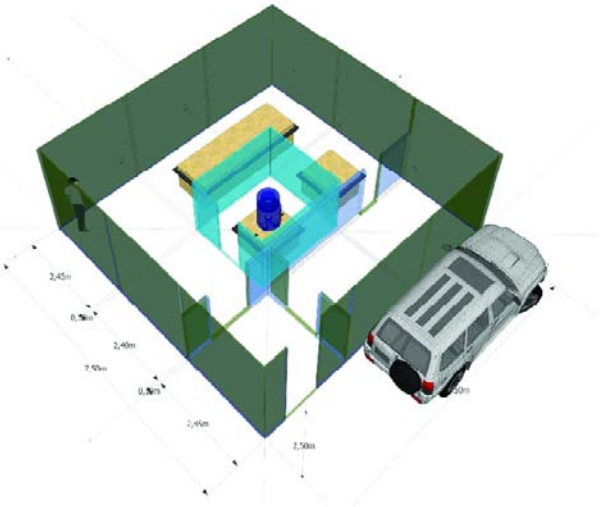


Result of a survey in 2011 conducted within the IAG Working Group an Absolute Gravimetry and the Global Geodynamics Project (GGP)

Observatory of karstic water (GEK observatory, Larzac, France)

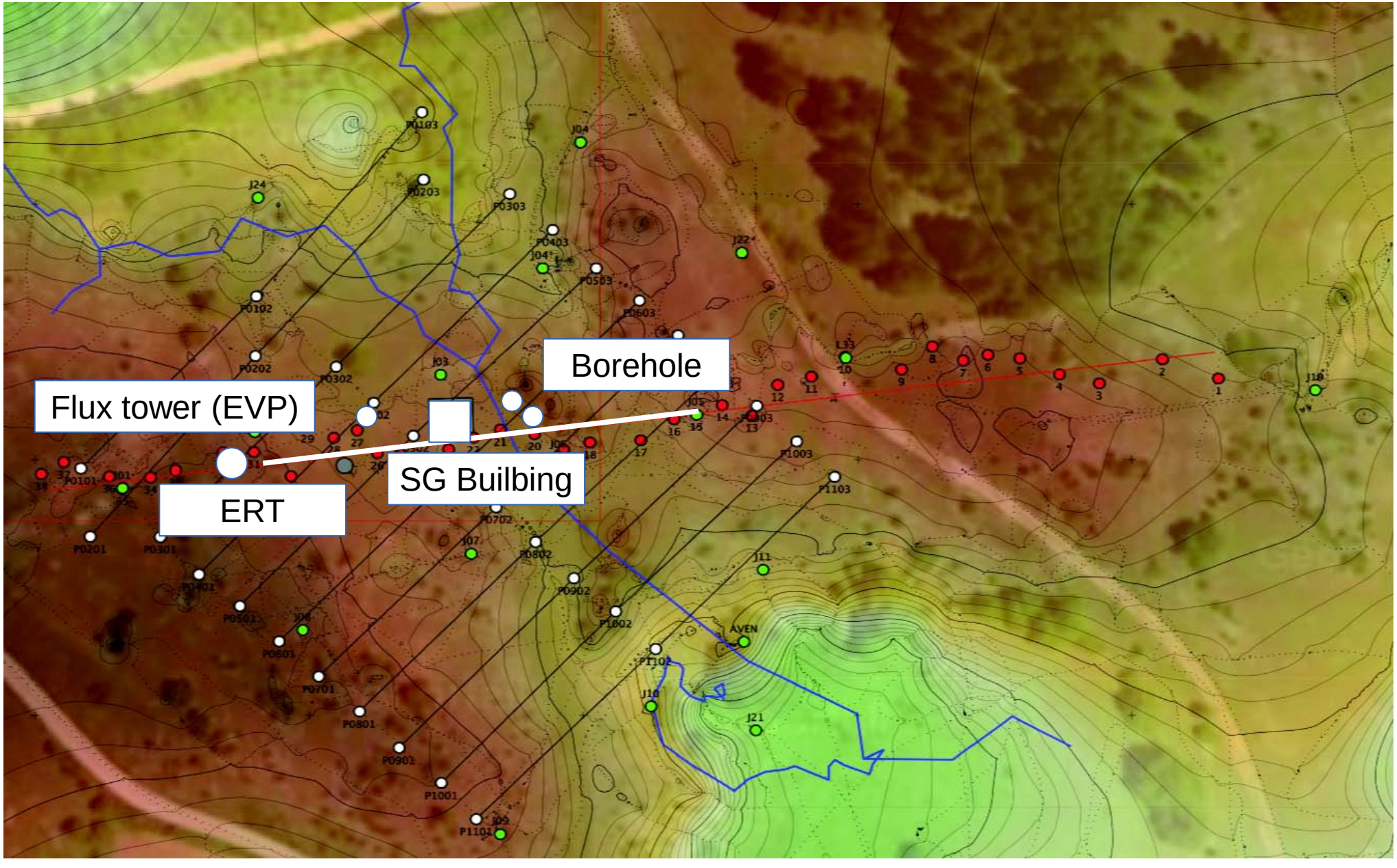
Champollion C., Le Moigne N., Chéry, C., Doerflinger, E.

The GEK Observatory

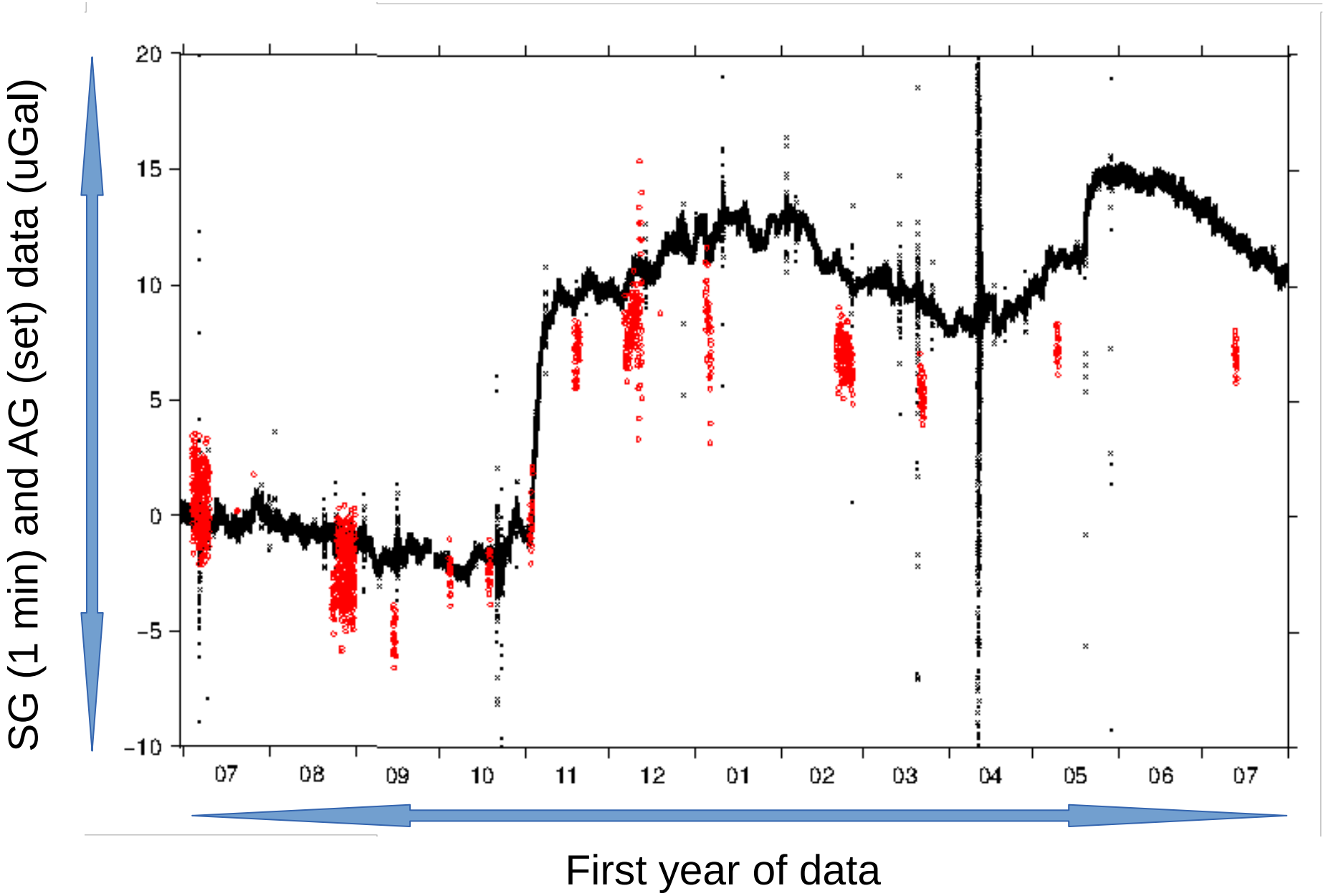


iGrav #002 et FG5 #228
More details available in the poster !

Site overview



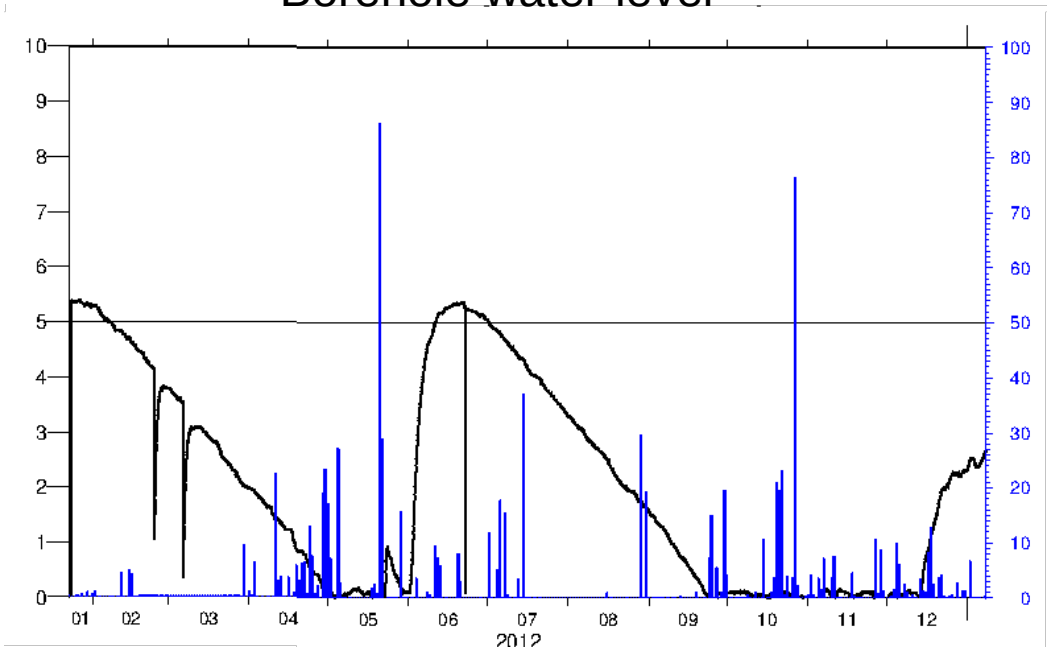
First SG data analysis



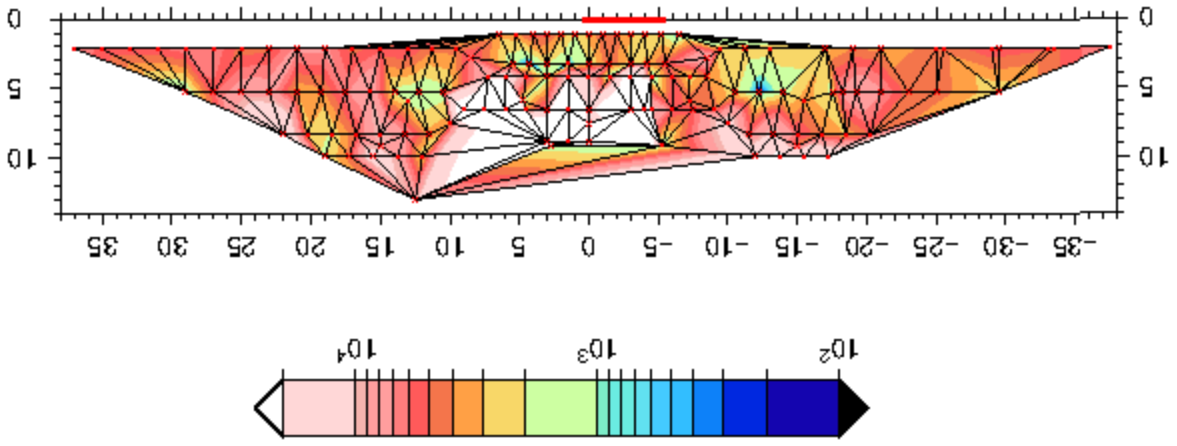
In-situ data

Other geophysical data

Borehole water level



Electrical resistivity tomography



GGP BUSINESS MEETING

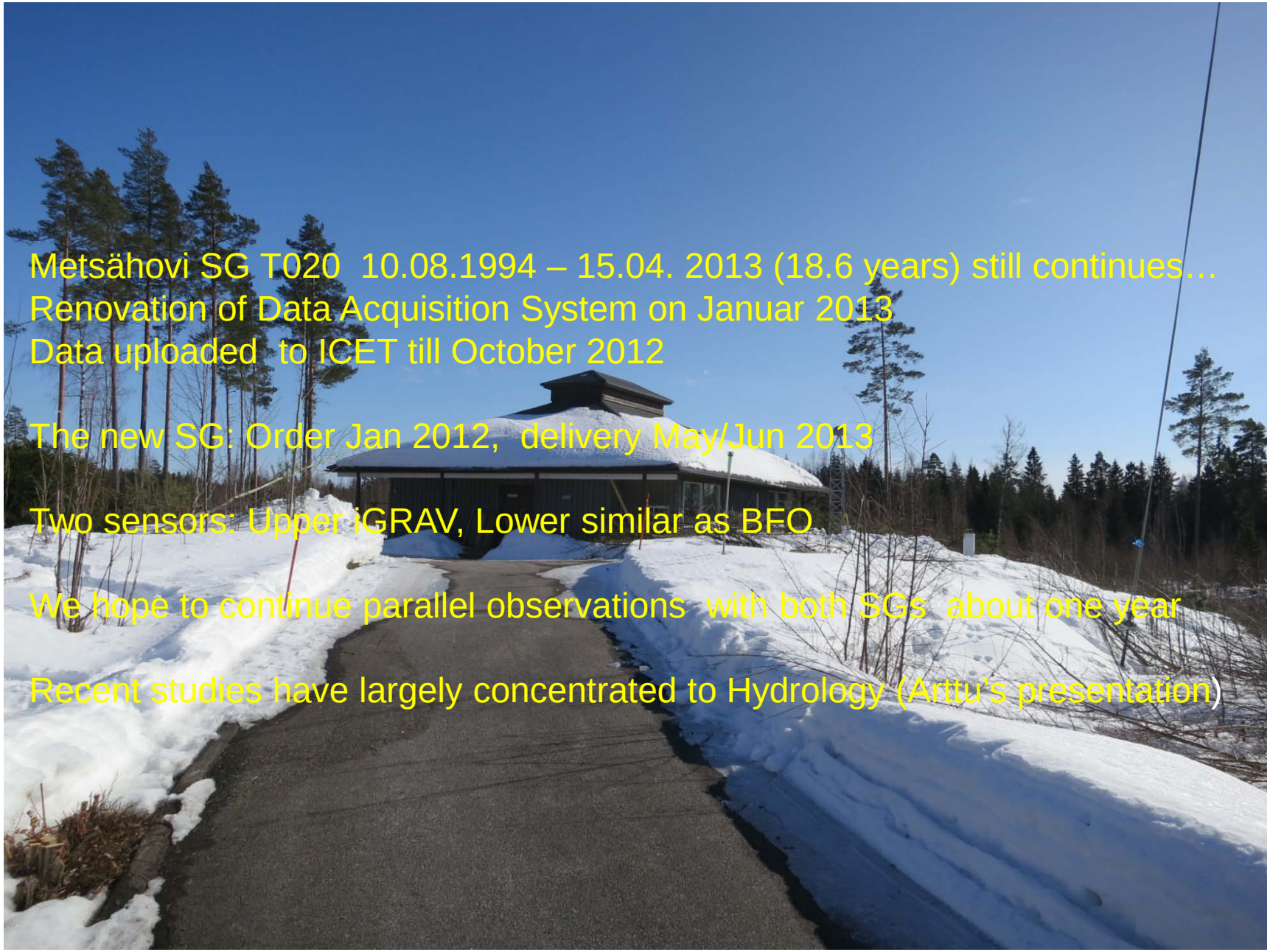
METSÄHOVI STATUS REPORT

H. Virtanen, A. Raja-Halli

FINNISH GEODETIC INSTITUTE

heikki.virtanen@fgi.fi

FINNISH GEODETIC INSTITUTE



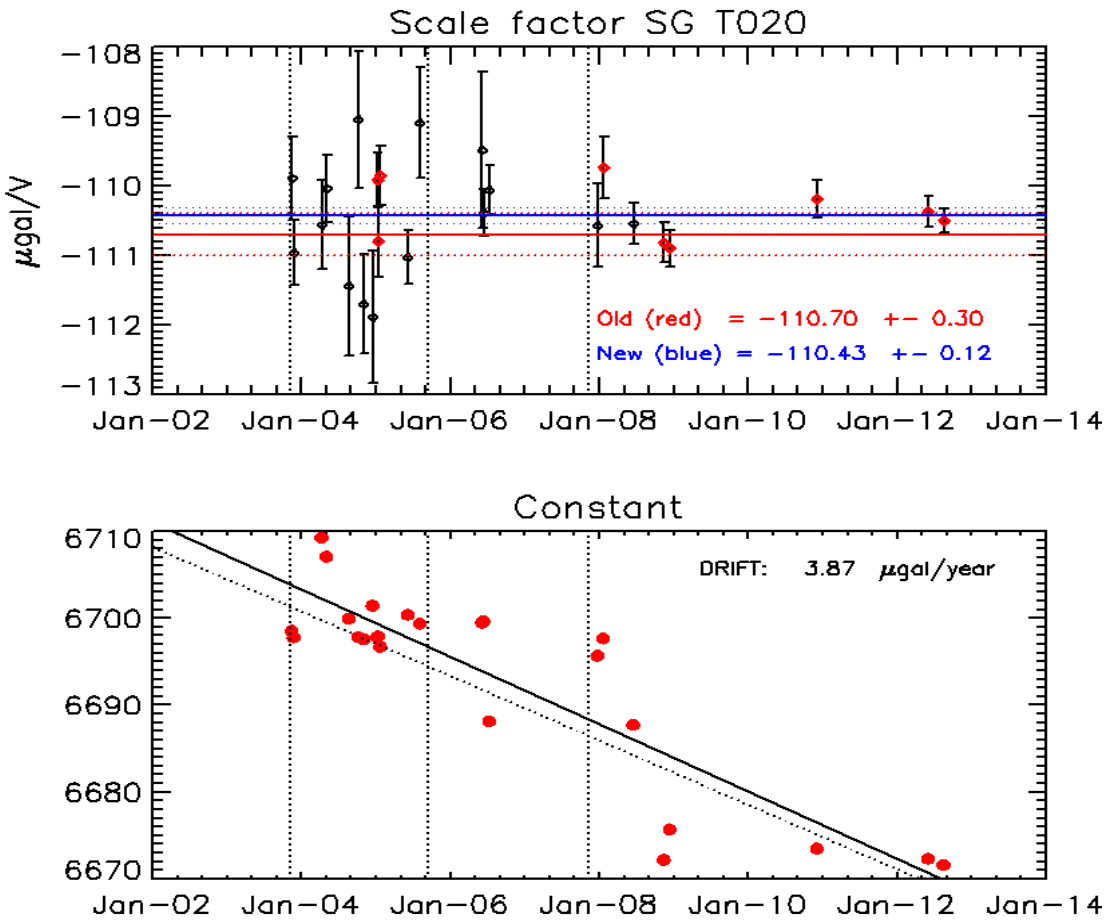
Metsähovi SG T020 10.08.1994 – 15.04. 2013 (18.6 years) still continues…
Renovation of Data Acquisition System on Januar 2013
Data uploaded to ICET till October 2012

The new SG: Order Jan 2012, delivery May/Jun 2013

Two sensors: Upper iGRAV, Lower similar as BFO

We hope to continue parallel observations with both SGs about one year

Recent studies have largely concentrated to Hydrology (Arttu's presentation)



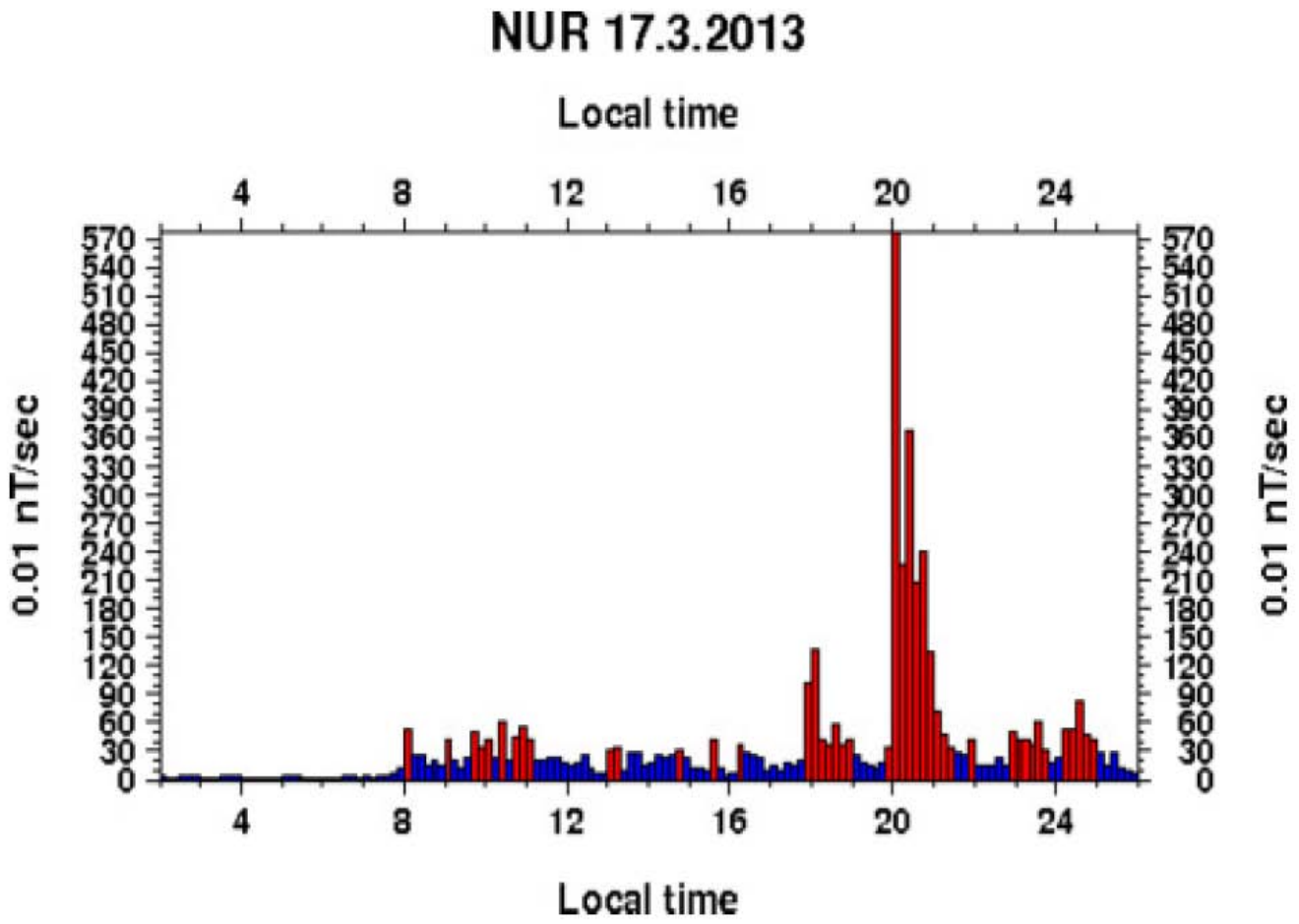
Scale factor change: 110.70 → 110.43 (0.24%)

res_plot_time_fg5_ets

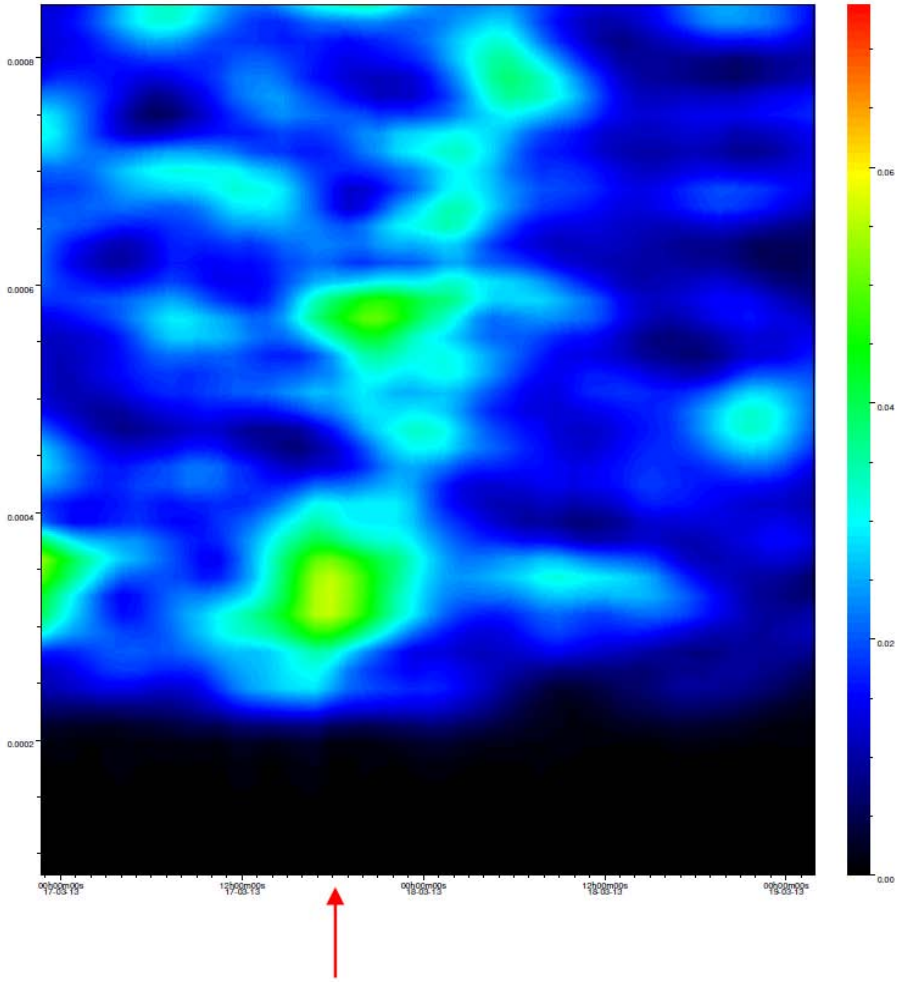

Snow shoes
Snow sampler


Snow cover by photogrametric methords

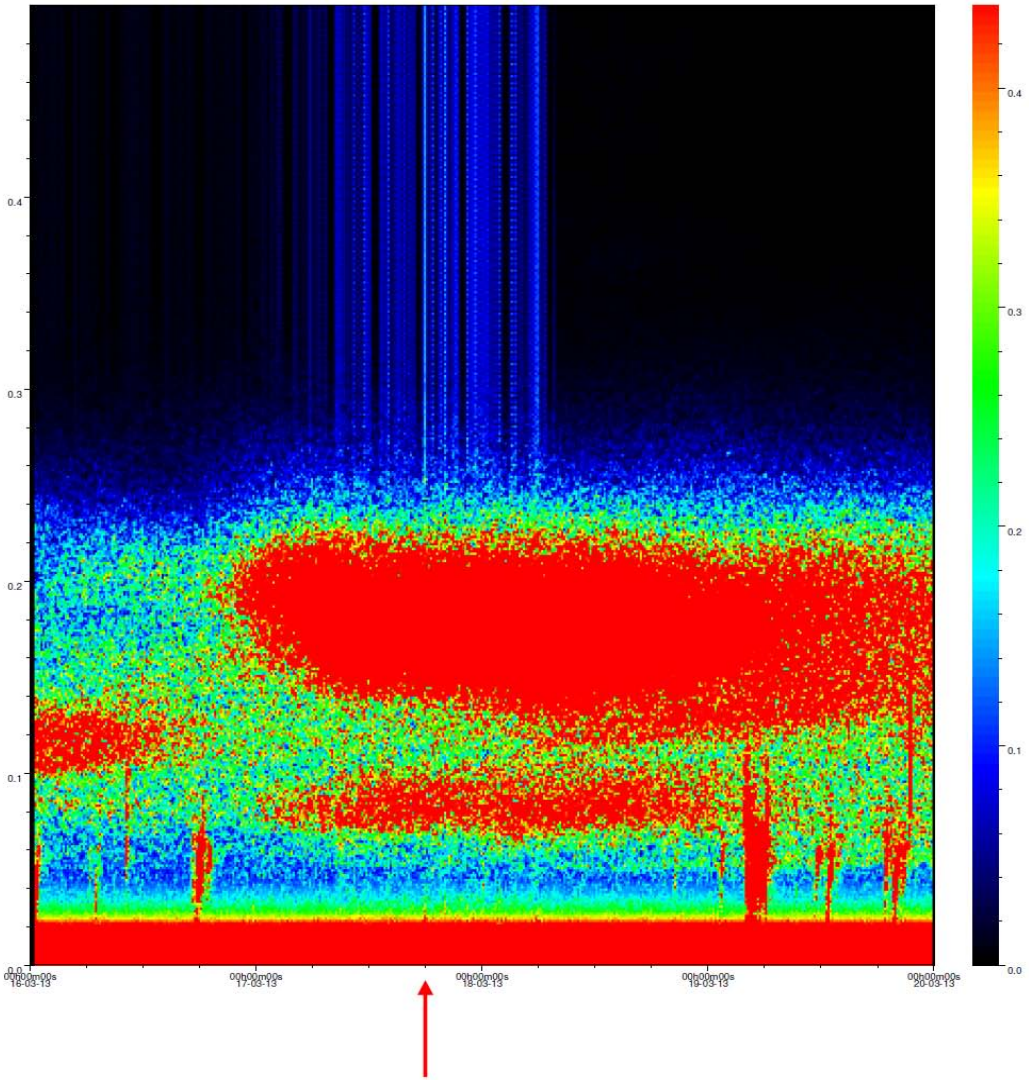
Aurora Borealis in Helsinki 17.03.2013 UT 18:30



Magnetic disturbance level at Nurmijärvi observatory (http://aurora.fmi.fi/public_service/)



Moving window FFT spectrum SG T020 (17.03. – 19.03.2013), 1024 min (64 min). Red arrow shows maximum (0.35 mHz), 18 UT. (1-min data)



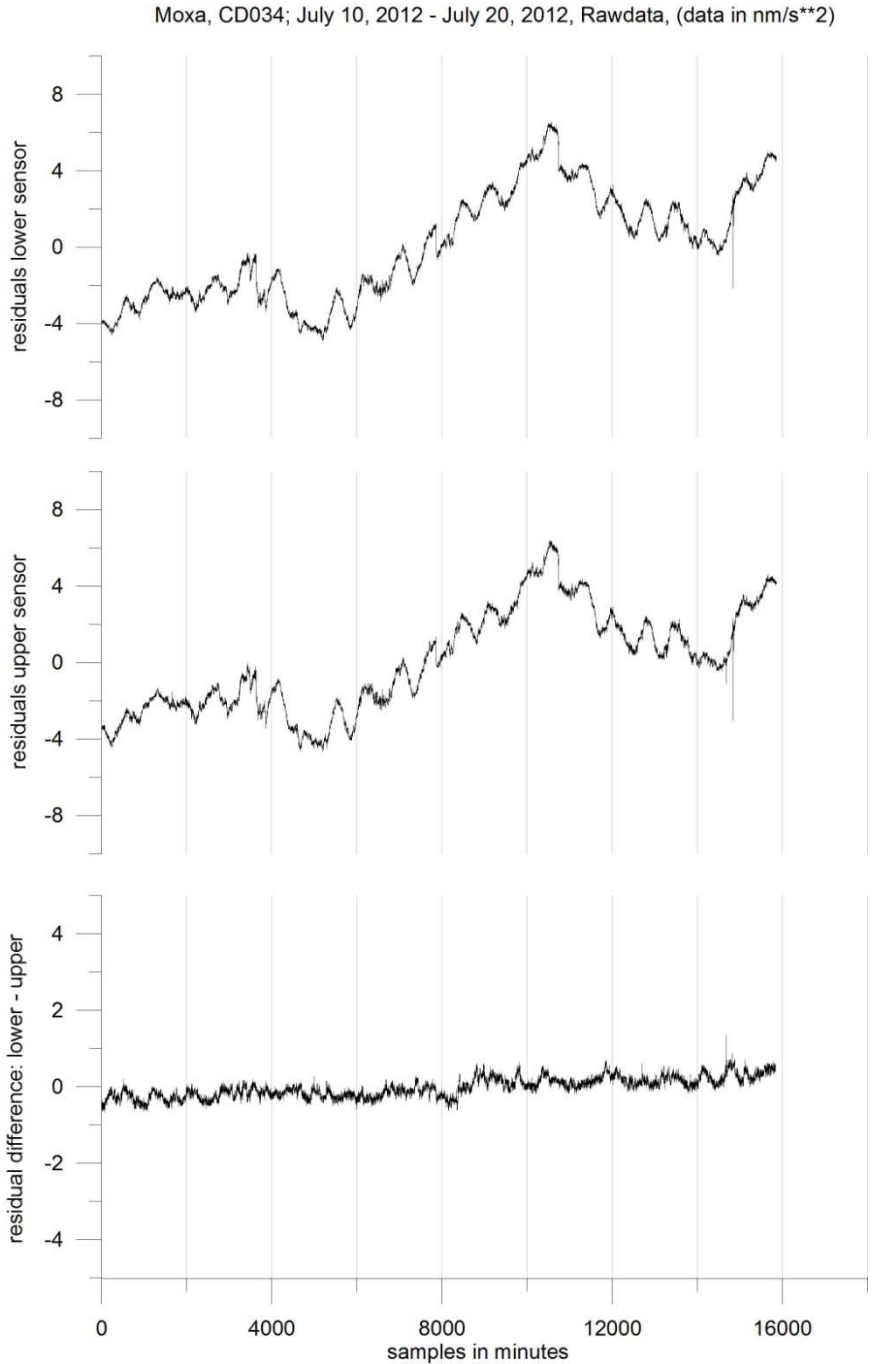
Moving window FFT spectrum (16.03 – 20.03 2013), 2048 sec (64 sec). 1-second data. Red color (0.18 Hz) due to microseism.

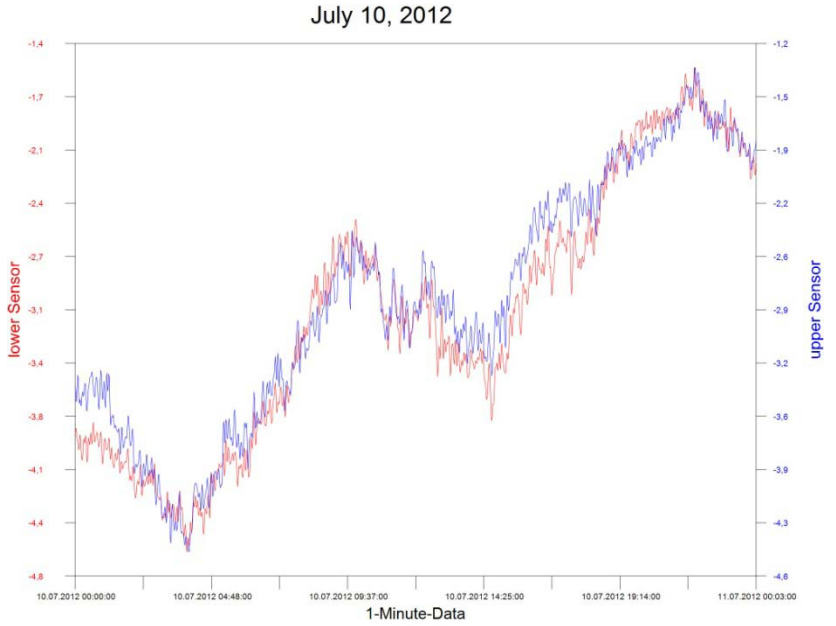

THANKS FOR YOUR ATTENTION

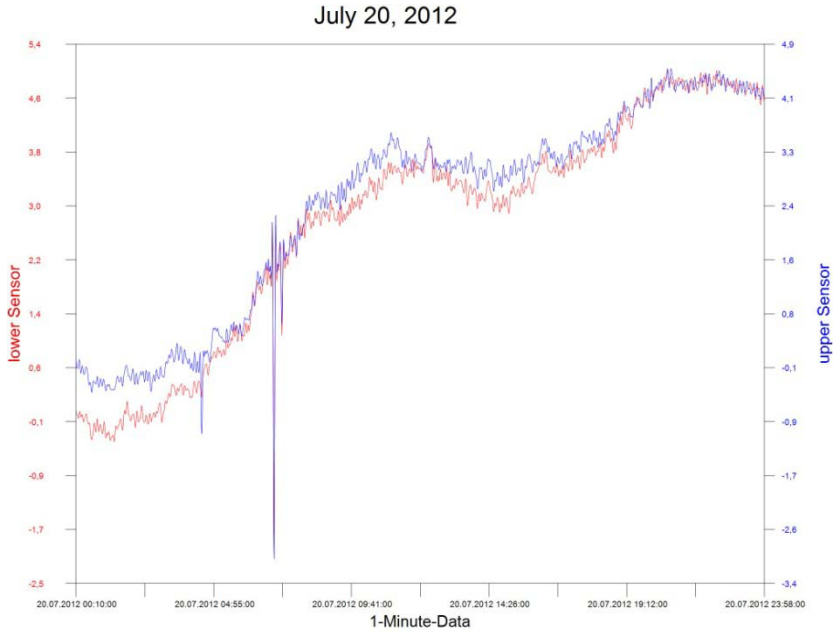
Statusreport GGP station Moxa

- CD034 was running without problems until October 2012

- Example : July 10-20, 2012


Moxa, CD034; July 10, 2012 - July 20, 2012, Rawdata, (data in nm/s**2)
residuals lower sensor
residuals upper sensor
residual difference: lower - upper
8
4
0
-4
-8
2
-2
0
4000
8000
12000
16000
samples in minutes

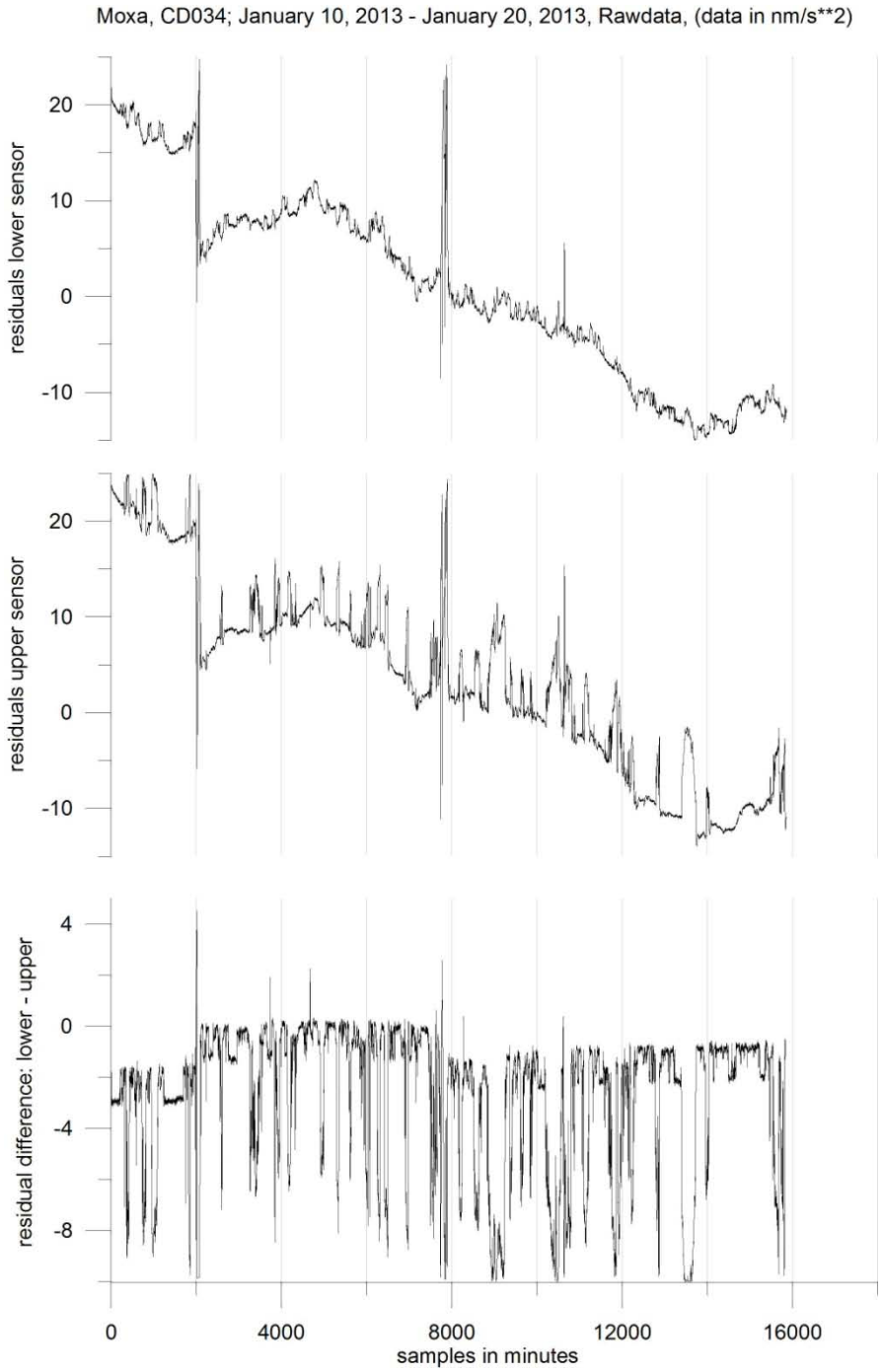

July 10, 2012
lower Sensor
upper Sensor
10.07.2012 00:00:00
10.07.2012 04:48:00
10.07.2012 09:37:00
10.07.2012 14:25:00
10.07.2012 19:14:00
11.07.2012 00:03:00
1-Minute-Data

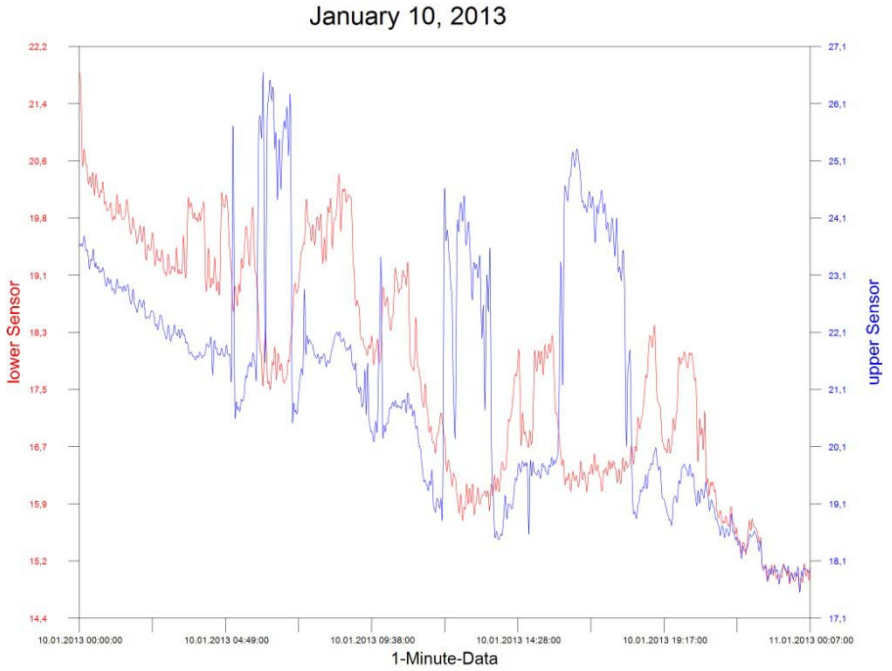

July 20, 2012
lower Sensor
upper Sensor
20.07.2012 00:10:00
20.07.2012 04:55:00
20.07.2012 09:41:00
20.07.2012 14:26:00
20.07.2012 19:12:00
20.07.2012 23:58:00
1-Minute-Data

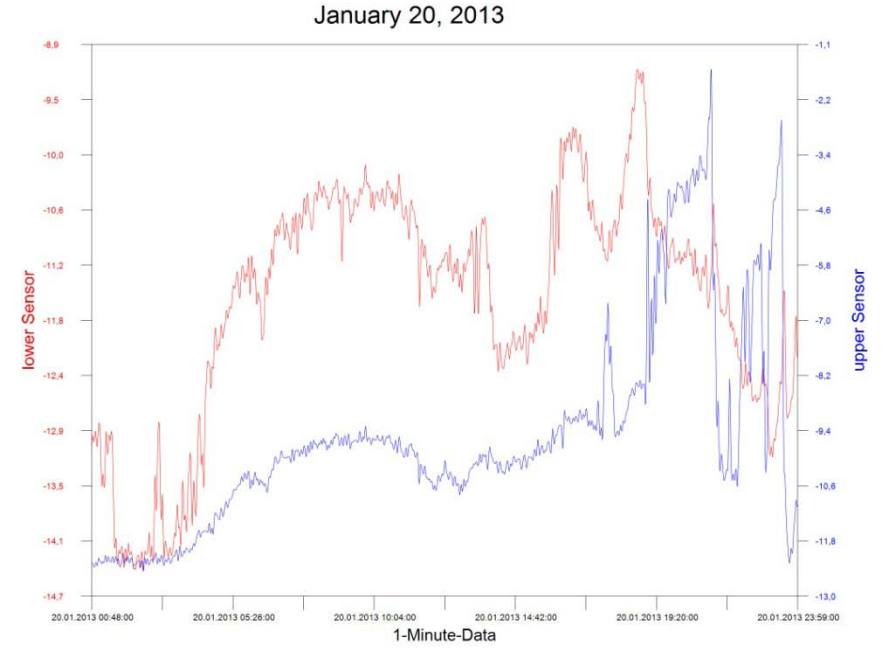
Problems since October 2012

- Small steps on lower sensor
- Some weeks later bigger steps on upper sensor
- Disturbances increase until March 2013

- Example: January 10-20, 2013


Moxa, CD034; January 10, 2013 - January 20, 2013, Rawdata, (data in nm/s**2)
residuals lower sensor
residuals upper sensor
residual difference: lower - upper
samples in minutes
0
4000
8000
12000
16000


January 10, 2013
lower Sensor
upper Sensor
1-Minute-Data


January 20, 2013
lower Sensor
upper Sensor
1-Minute-Data

Actions to solve the problem

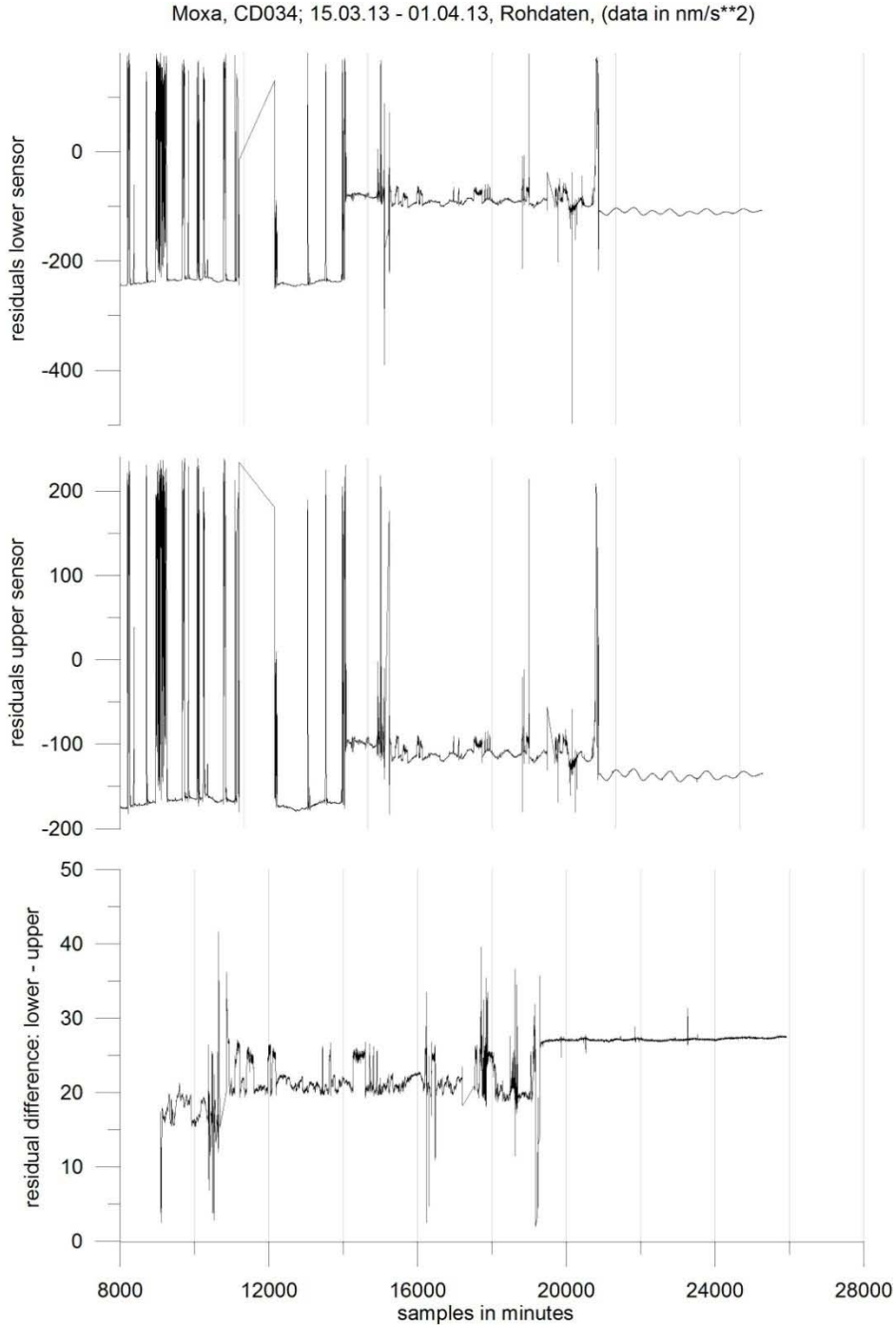
- Contact to P. Wolf (BKG) a.o.
- Contact to GWR
- GWR send another GEP2 unit
- Tests with tilt compensation and electronics
- Intensive study of all control data

- …but no success until end of March 2013

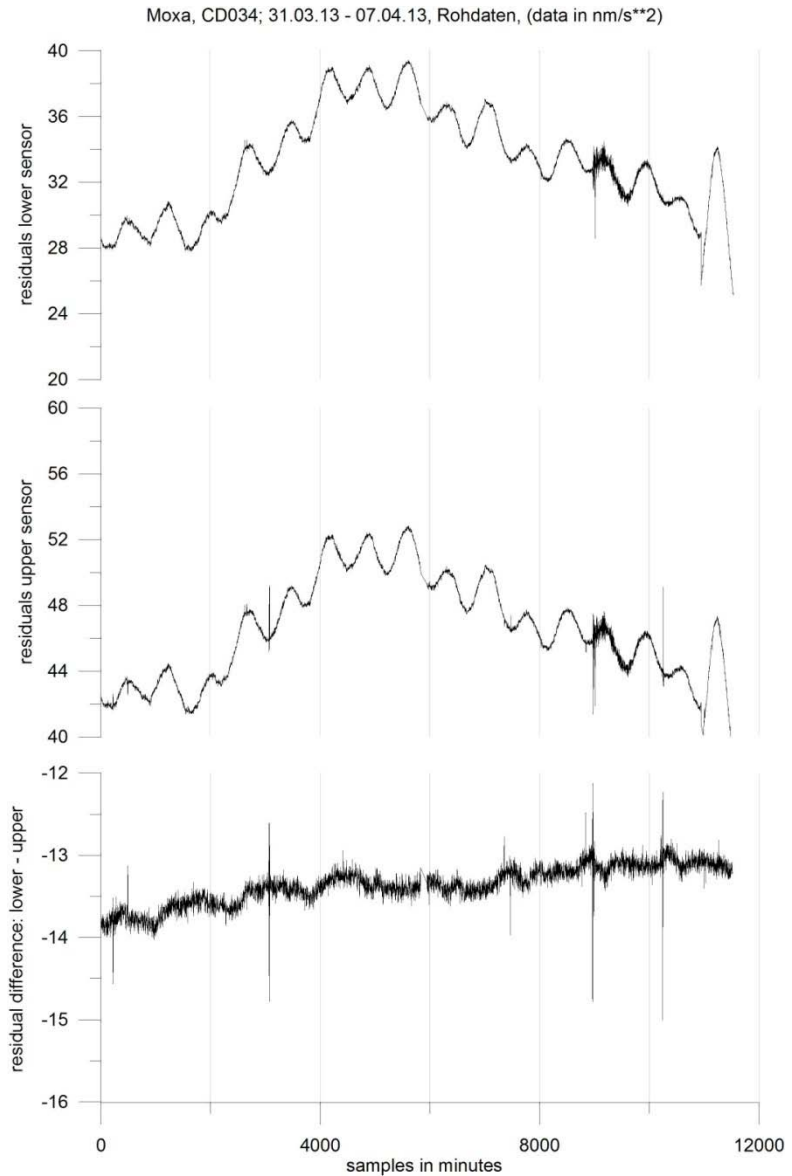
Information from Wernfrid Kühnel (engineer of the Observatory Moxa)

„Now the SG is running with the GEP2-unit from GWR but with – mainly –
our electronic cards. I found the real error of our unit and – I hope – I eliminated
it.
Finally it was a problem with the power supply. The +15V had at the end about
12V only and they were not stable! (propably the real cause, slowly increasing).
In addition the +15V show an oscillation (some kHz) with an amplitude of
about 1V, which could also not be good. Both I have repaired“

„Momentan läuft das SG mit dem GEP2-Einschub von GWR, aber mit -im Wesentlichen-
unserem Kartensatz. Den eigentliche Fehler in unserem Einschub hab ich aber inzwischen
gefunden und -so hoffe ich- auch beseitigt.
Letztendlich war es ein Stromversorgungsproblem. Die +15V lagen am Schluss noch bei
ca. 12V und waren nicht mehr stabil ! (vermutlich die eigentliche Ursache, schleichend
entstanden) Außerdem hatte die -15V noch ein Schwingen (mehrere kHz) bei einer Amplitude
von ca. 1V obendrauf, das konnte auch nicht gut sein. Beides habe ich beseitigt.“


Moxa, CD034; 15.03.13 - 01.04.13, Rohdaten, (data in nm/s**2)
residuals lower sensor
0
-200
-400
residuals upper sensor
200
100
0
-100
-200
residual difference: lower - upper
50
40
30
20
10
0
8000
12000
16000
20000
24000
28000
samples in minutes

Since end of march, 2013



hopefully it runs well for the next 15 years

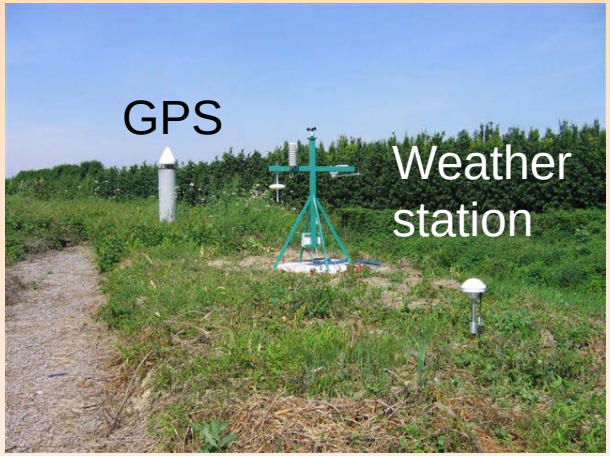
Strasbourg GGP station (ST)

GWR C026 Superconducting Gravimeter installed in an old fort near Strasbourg

• high precision and low drift gravity continuous monitoring **since 1996**

• complementary instrumentation (FG5 absolute gravimeter, GPS, meteorological station, humidity sensors (FDR, electrical resistivity), piezometer, LP STS-2 seismometer, ET gravimeter, high resolution barometers, tiltmeters).

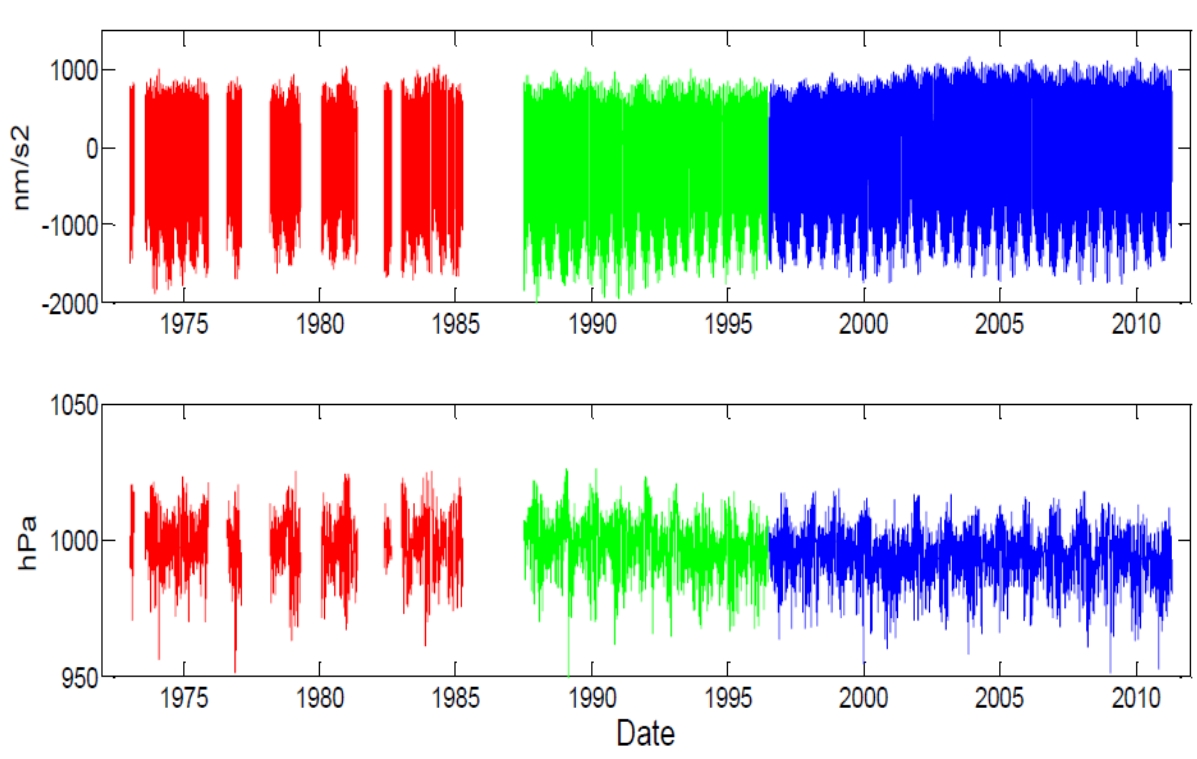
FDR humidity sensor



GWR SG C026

FG5#206 Absolute gravimeter (calibration, long term drift of SG)

Strasbourg Gravimetry Observatory (ST)



LaCoste-Romberg ET005

SG TT70-T005

SG C026

25 years

- GEP-2 failure (tilt control boards) in 2008
- Replacement in 2010 by GEP-2 from BKG with GGP1 filter
- Installation of ET gravimeter in 2010 (courtesy BFO)
- further development in local hydrology monitoring this year

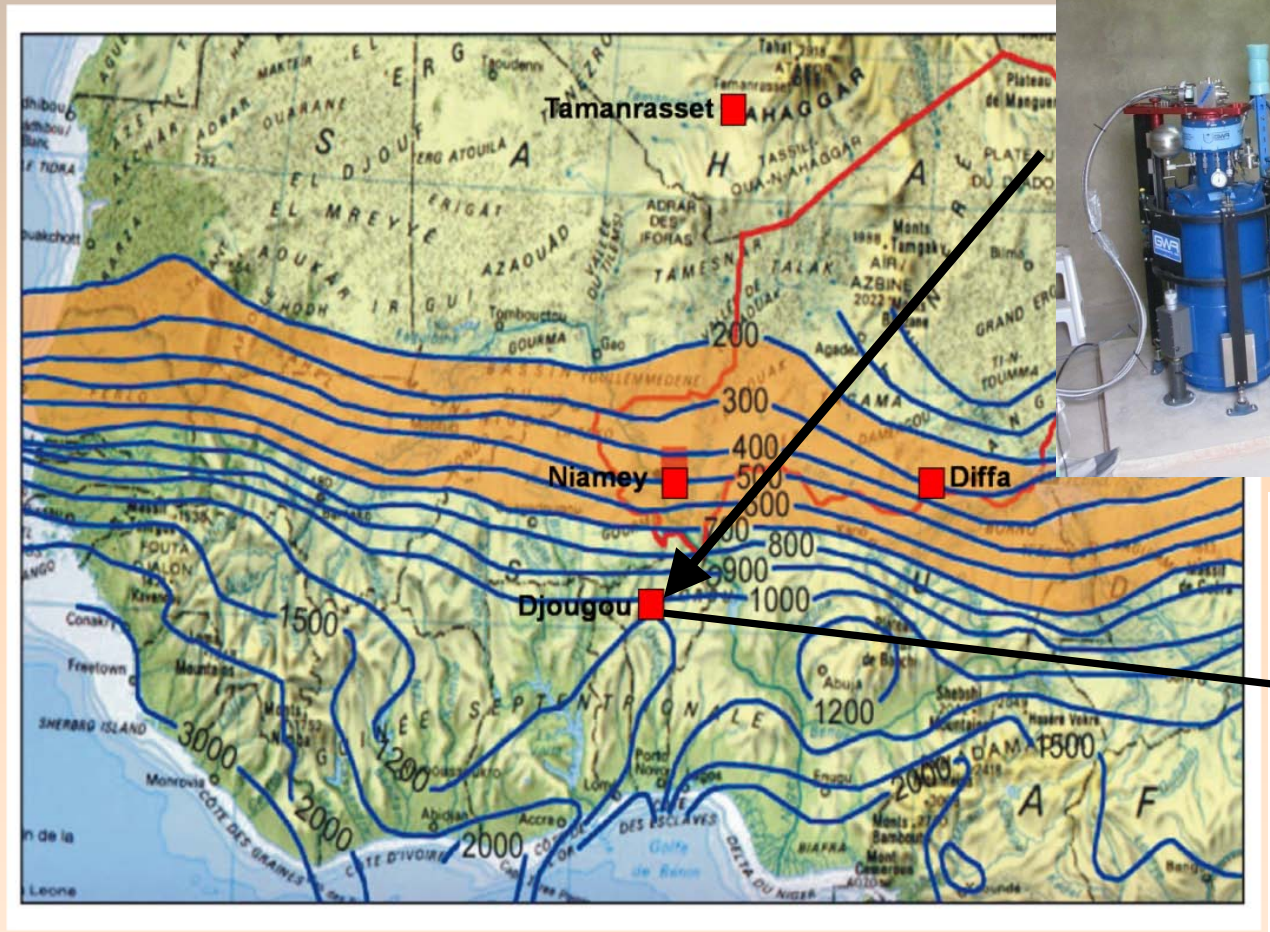
- Replacement of instrument confirmed with order in 2013 and new installation planned in 2014

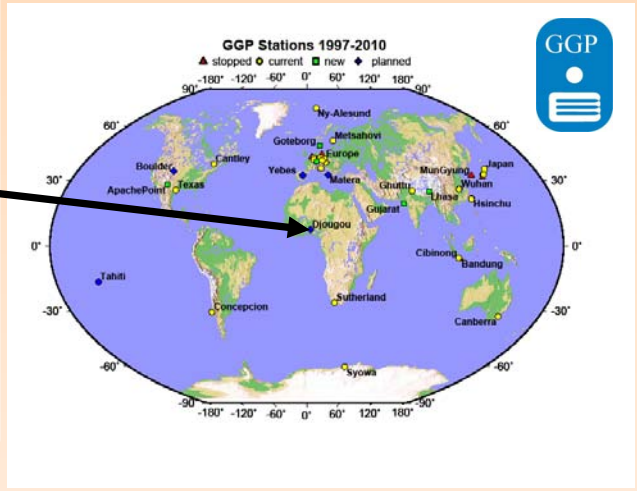
***i*OSG** experimental model with heavy sphere and ≠ Q

Operation of a new gravity station in West Africa (Djougou, Benin) since July 2010

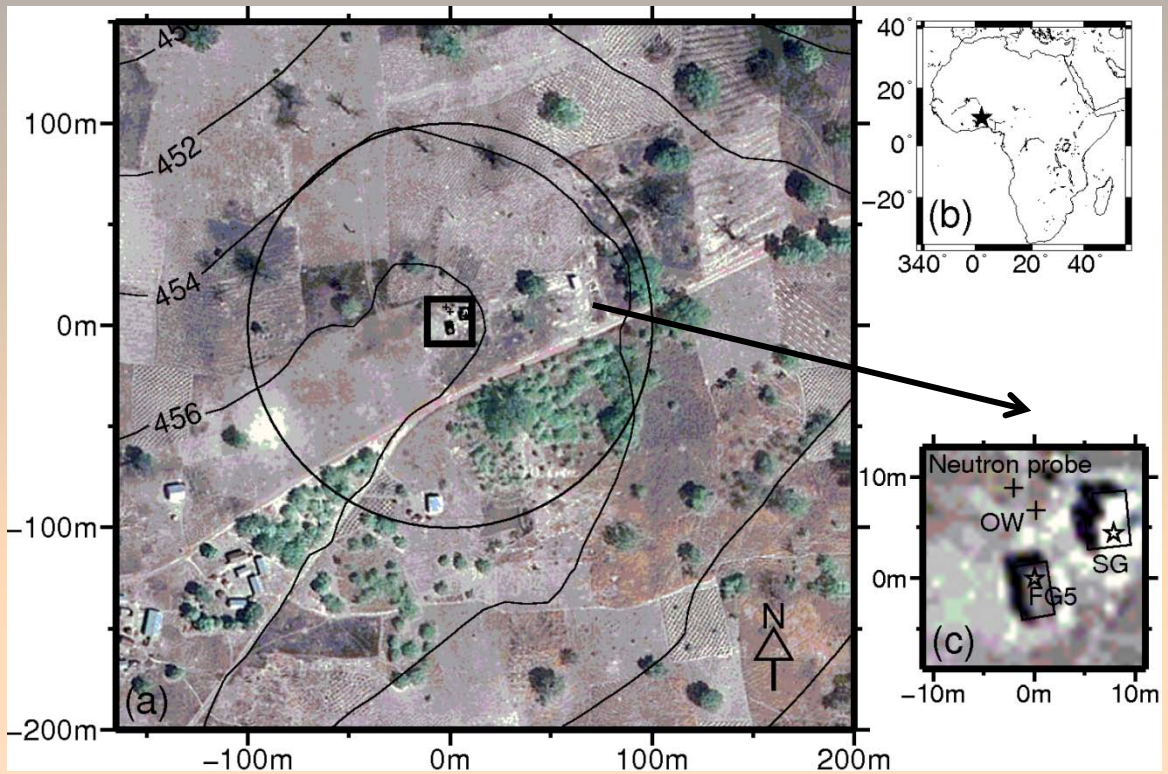
Location: Ara catchment ORE AMMA-CATCH
Hydro-meteorological Observatory

GWR SG-060





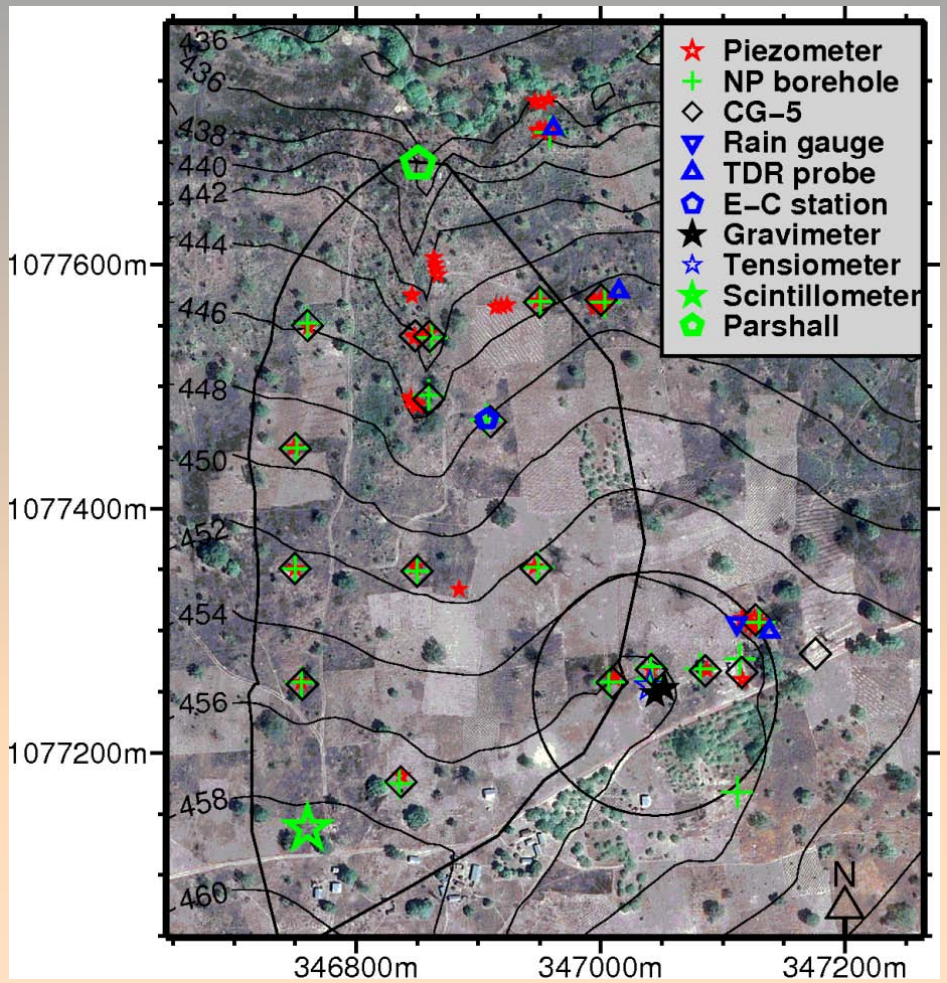
Djougou Benin West Africa

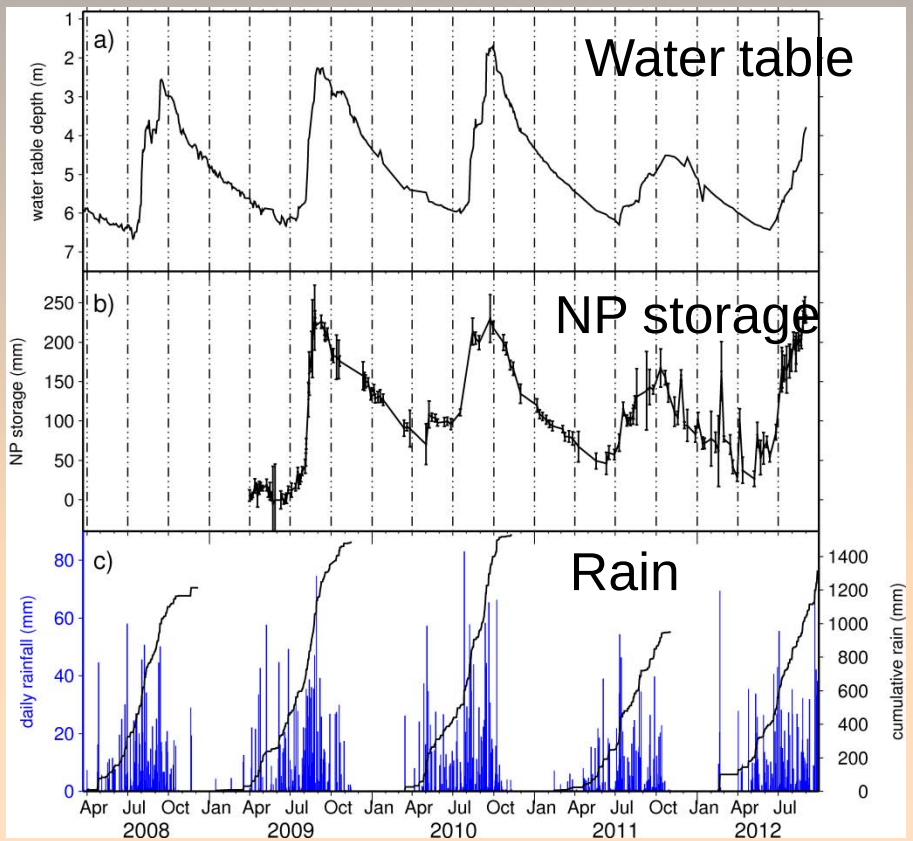


Superconducting gravimeter (SG)

Absolute gravimeter (FG5)

Micro-gravimeter (CG5)

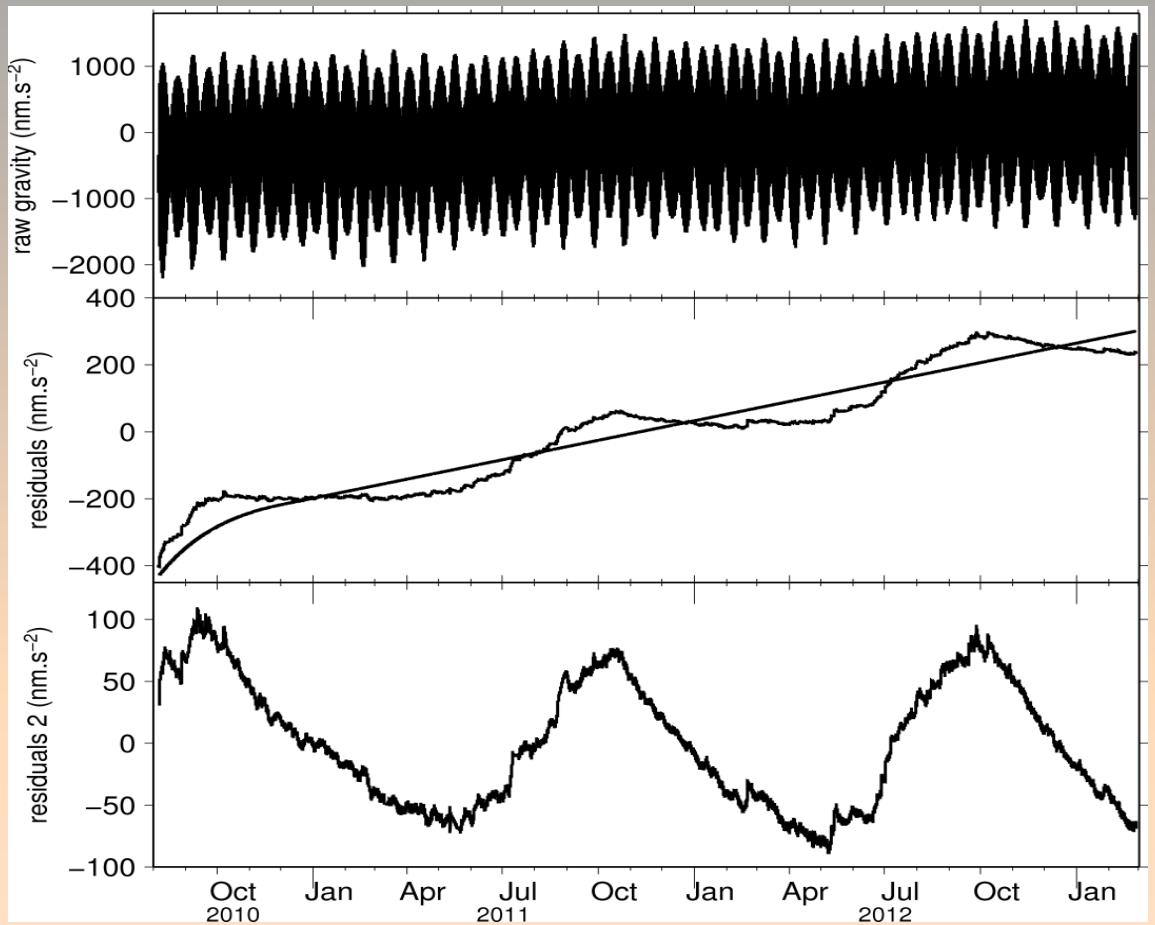




- Highly instrumented catchment
- Neutron Probe & water table monitoring
- Gravimeters on the top of the hill

- Rain: ***1200*** ***300*** mm/yr
- Potential evapo-transpiration: ***1280*** ***40***mm/an (≈ rain)

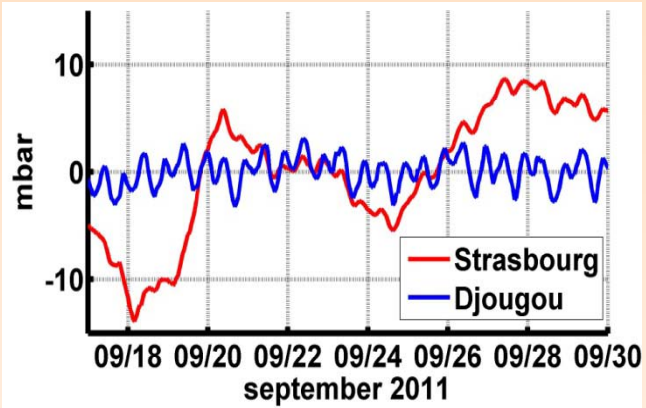
Gravity observations (2010-2012)

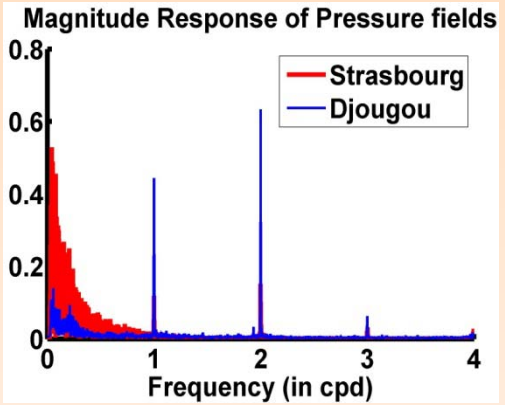


Pressure effects:

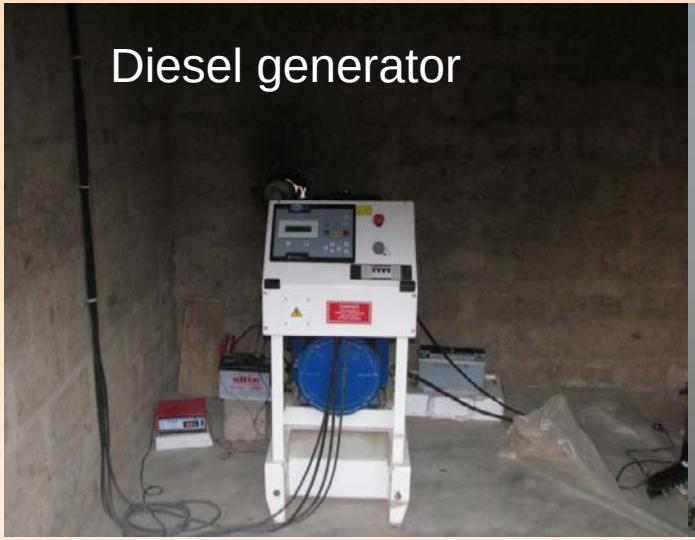
- Regional pressure is dominated by S_1 and S_2

- Strong elastic (Non-Local) effect.





OSG-060 Djougou Bénin



Installation of thermal isolation kit in April 2011

Thank you for your attention

Kartverket

Ny-Ålesund, Svalbard

Ove Omang
GGP business meeting
ETS2013; April 15, 2013

Current status of the Geodetic observatory at Ny-Ålesund

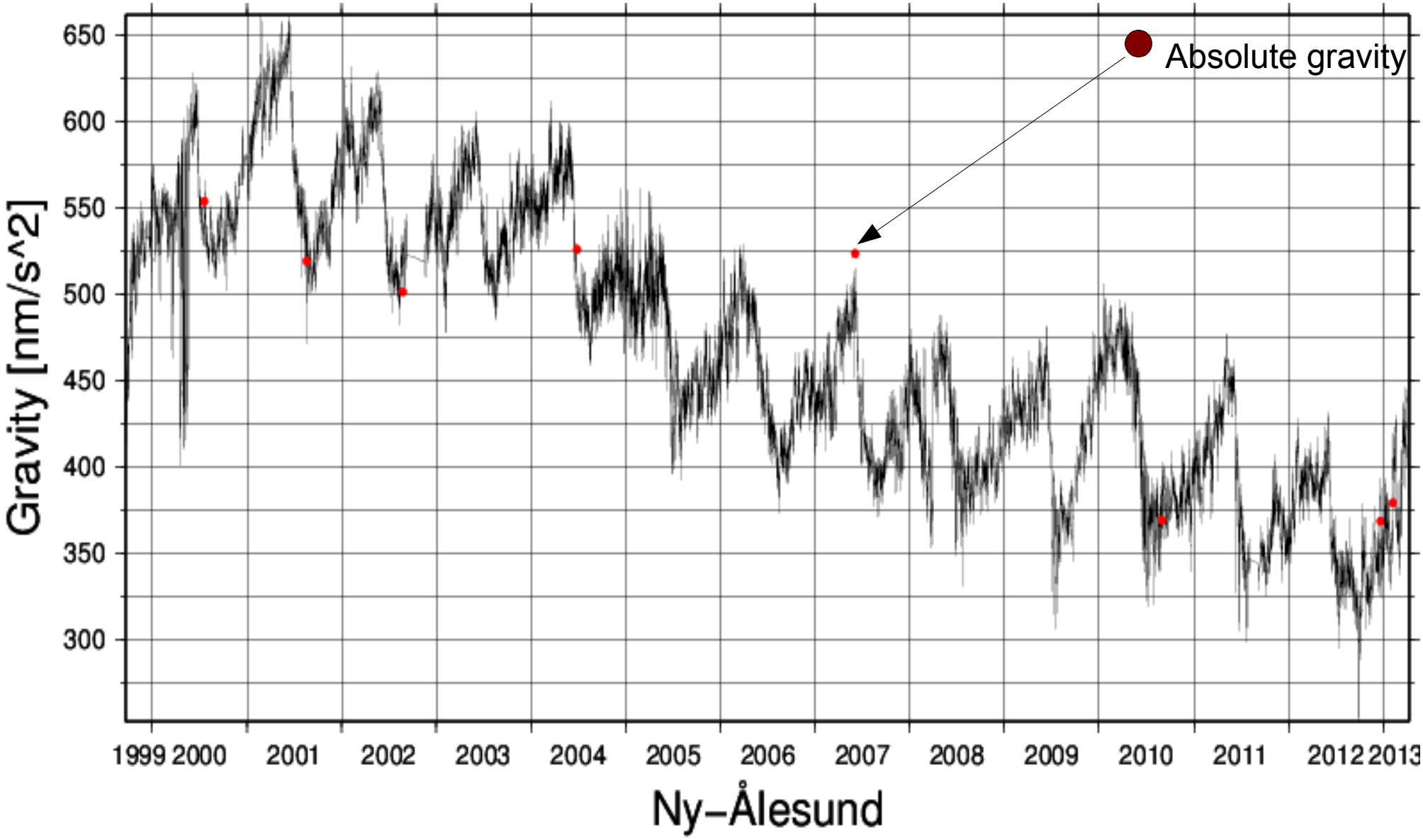
Continuous measurements

- SG (1999-)
- 2 GPS(IGS) (1991-)
- VLBI (1994-)
- DORIS (1997-)
- TG (1976-)

Campaigns

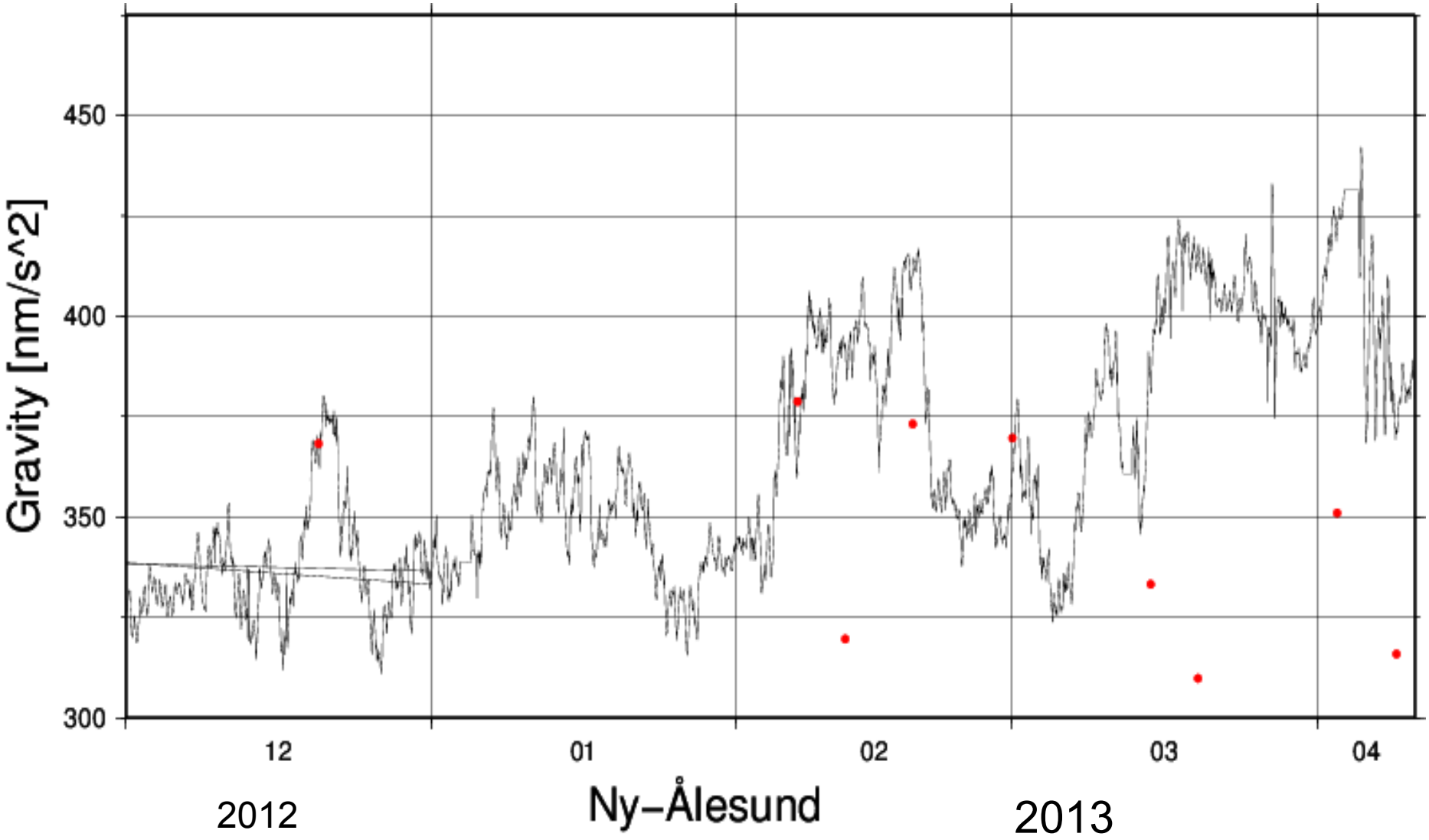
- AG (1998 → every 2-3 year)
- Local ties, network, stability measurements, PRARE, GPS, relative gravity

Superconducting gravity data since September 1999



Kartverket

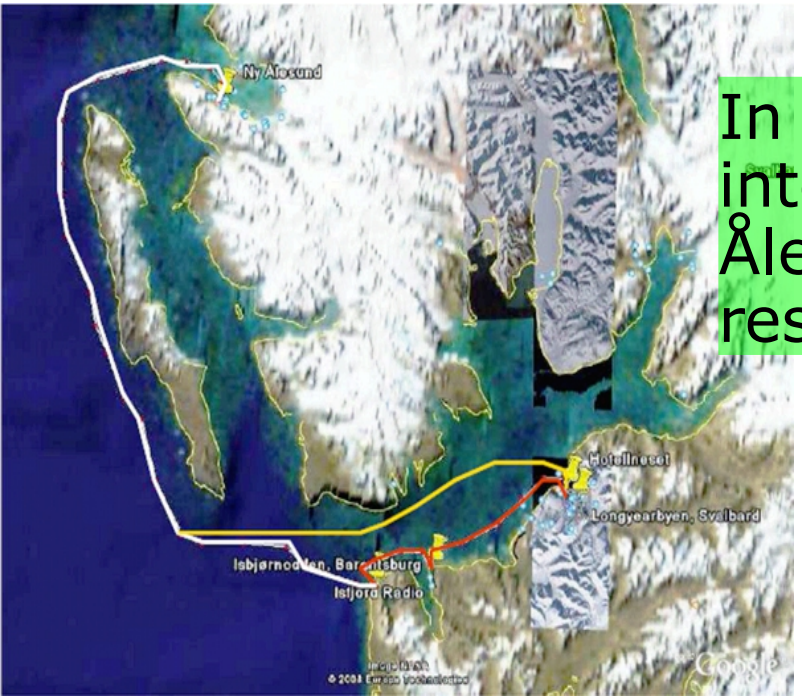
Extensive AG campaign this winter/spring



Kartverket

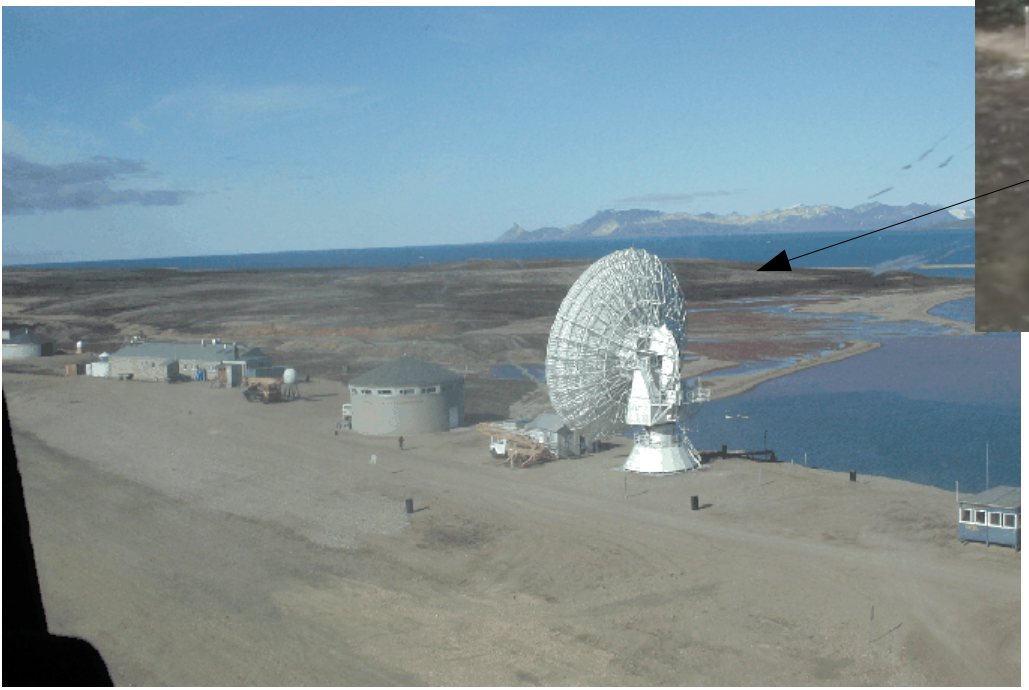
An iGrav will arrive late this summer!

Kartverket



In 2014 a 260 km long high-speed internet cable will connect Ny-Ålesund to Longyearbyen and the rest of the world!

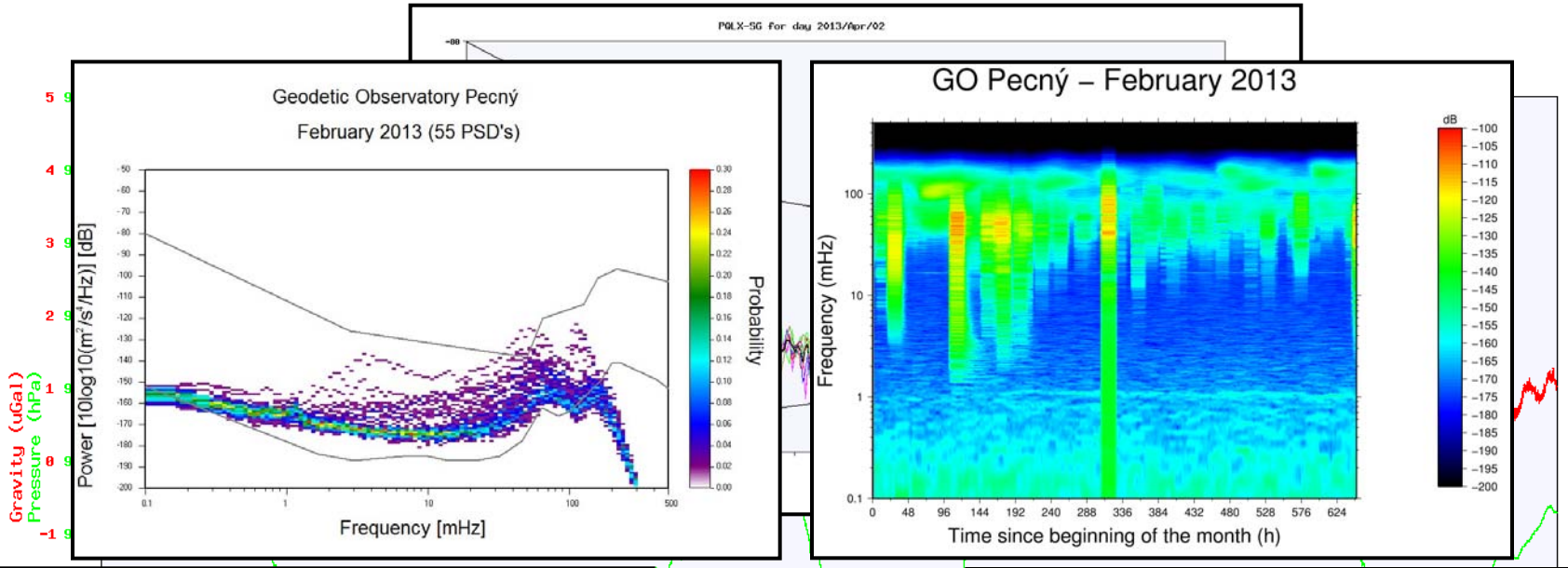
In 2018 we will get VLBI2010

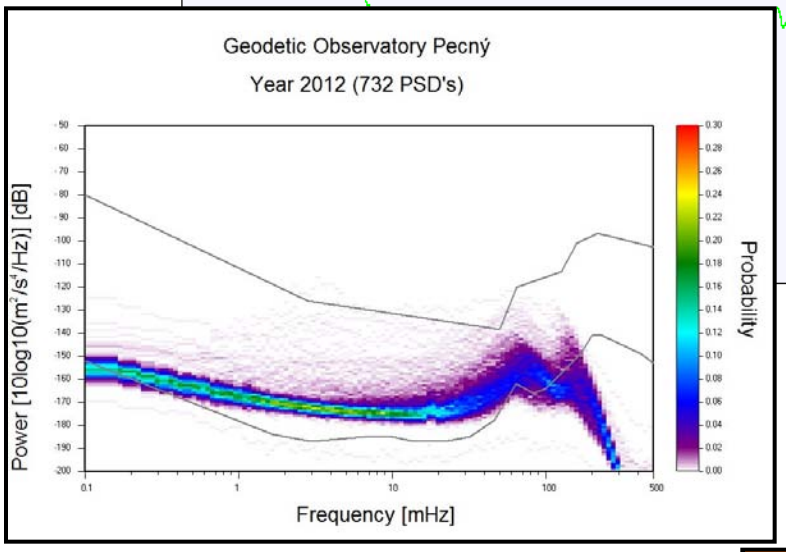


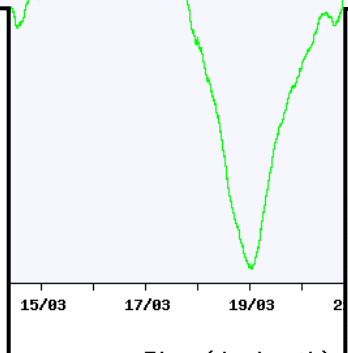
New gravity station, but the old one will be kept!

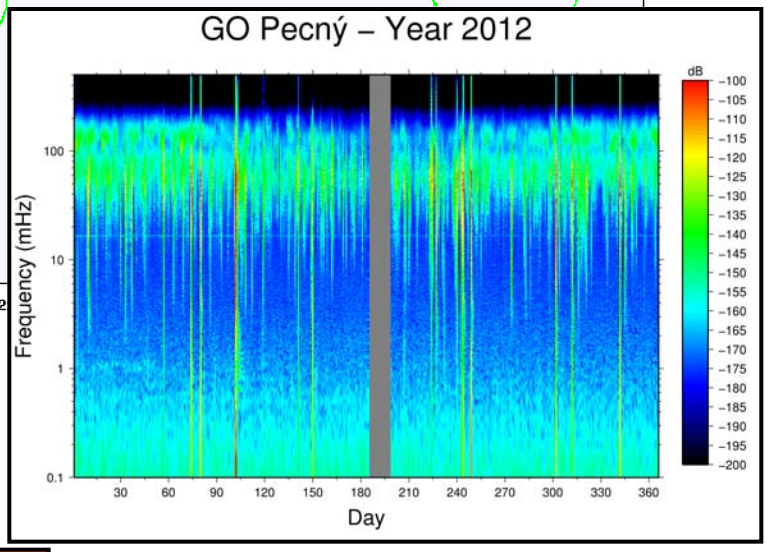
Pecný station (PE), Czech Republic

Programming tool SGNoise is is running at http://oko.asu.cas.cz/grav/





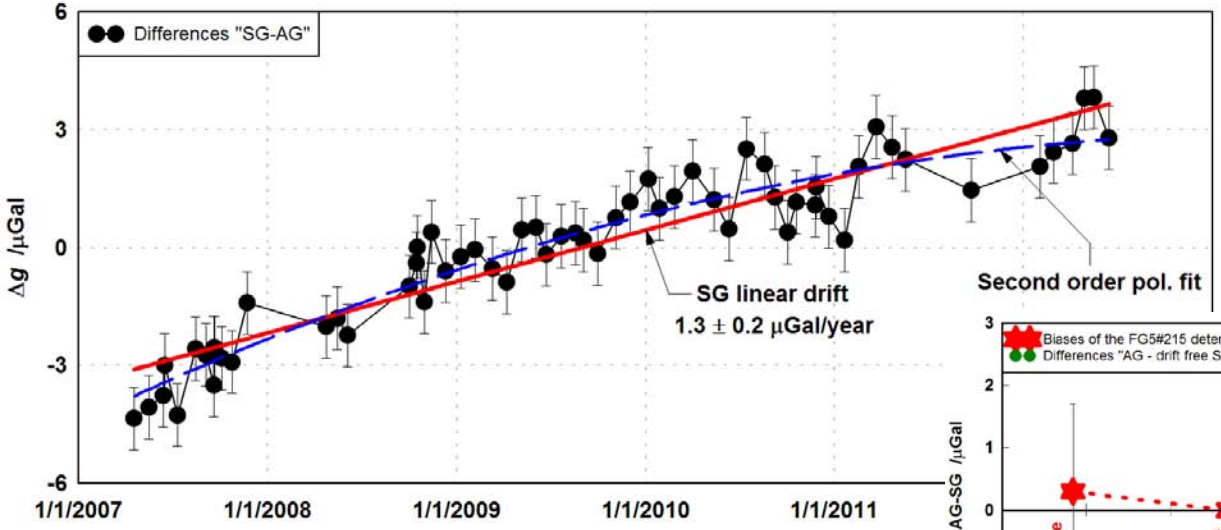


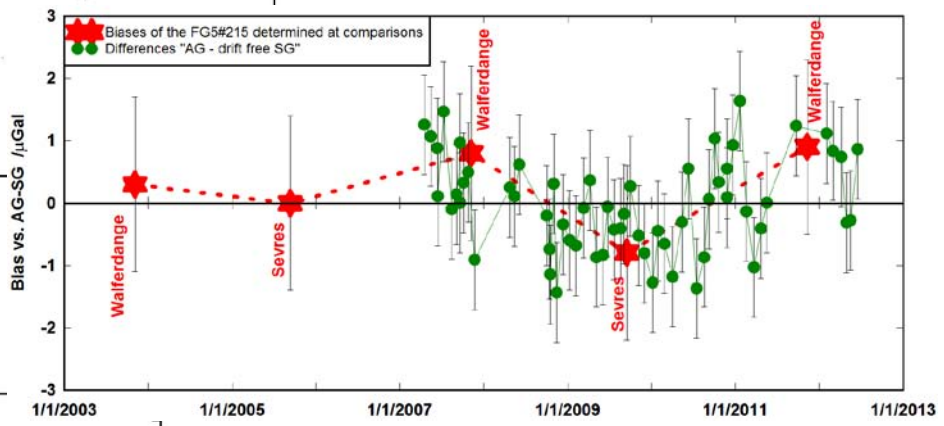


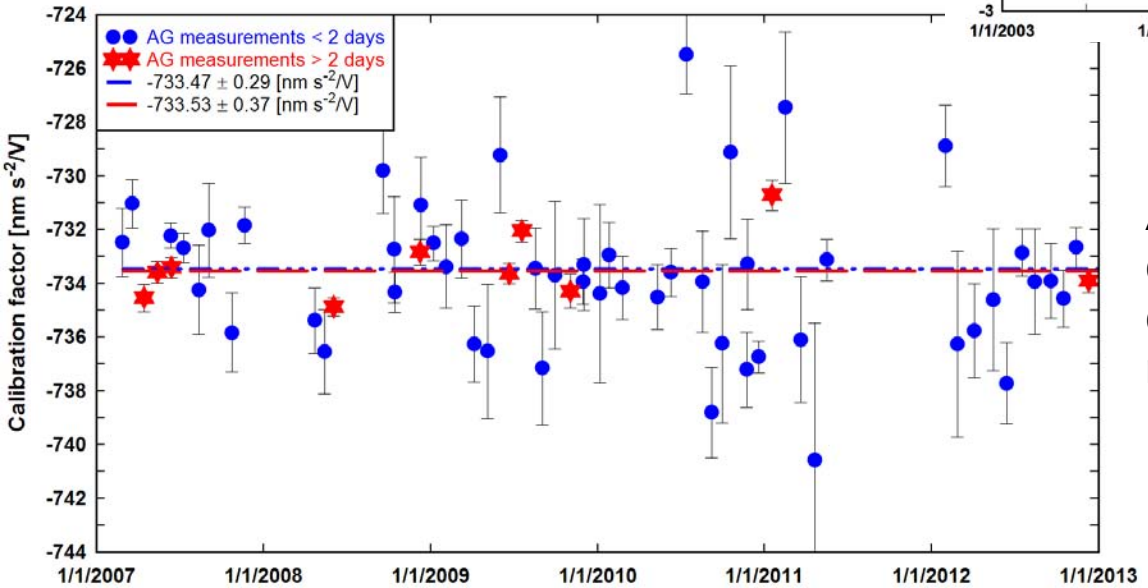
POSTER 1.5

Drift and calibration

POSTER 1.4

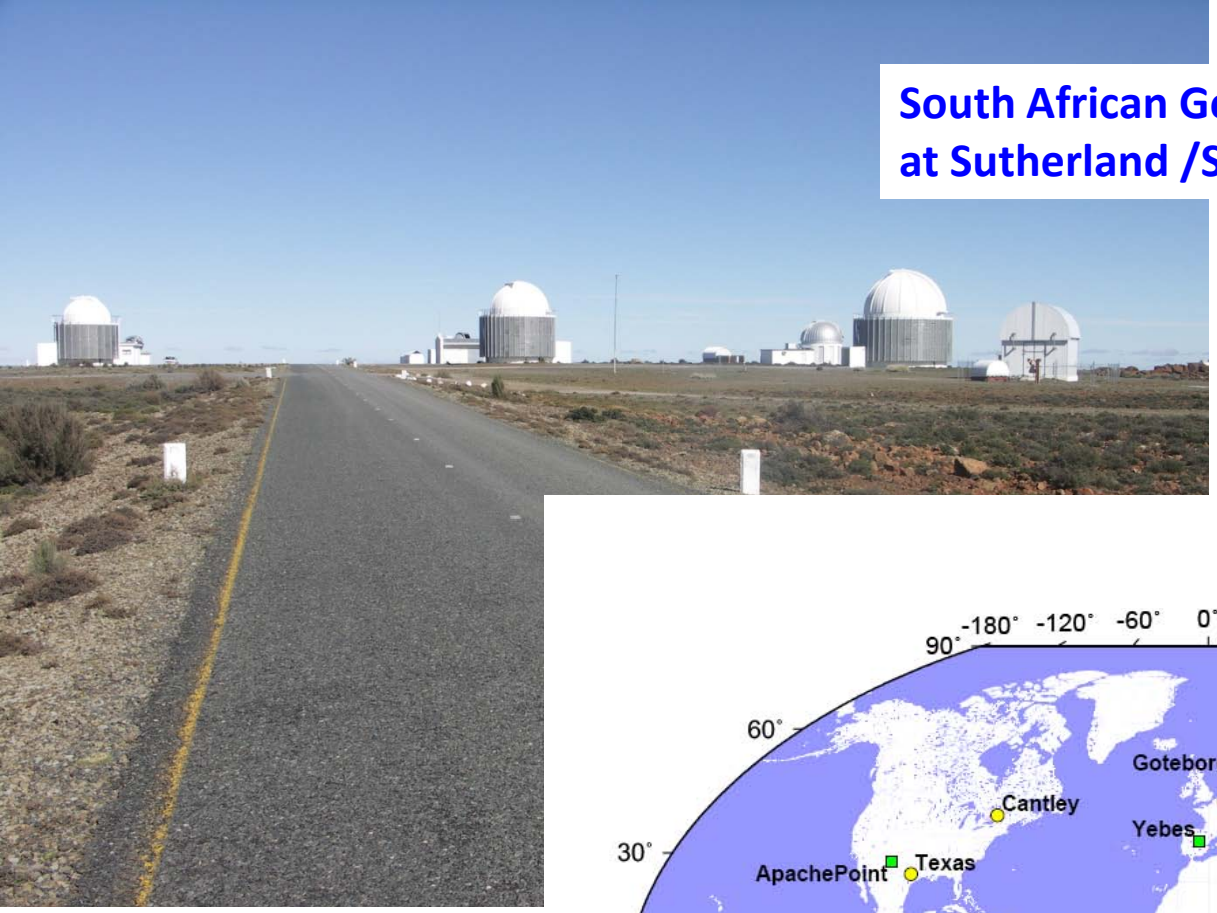


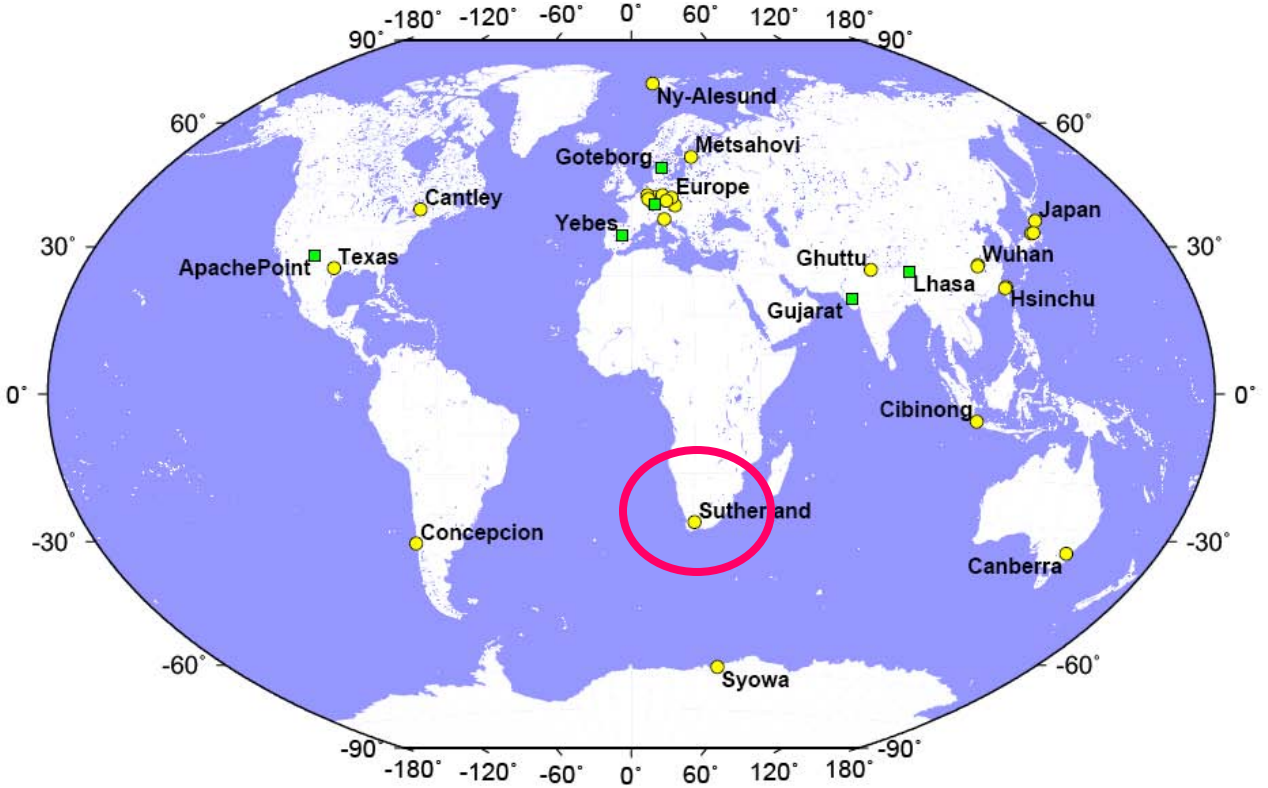




Accuracy better than 0.03% using 63 campaigns (altogether 78 days) of collocated absolute gravity measurements

South African Geodynamic Observatory at Sutherland /South Africa (SAGOS)





Status of the South African Geodynamic Observatory (SAGOS)

- Since 2000
- At the campus of the **South African Astronomical Observatory (SAAO)**
- In cooperation with the **National Research Foundation (NRF)**

Instrumentation:

- **2 Superconducting Gravimeters:**
  - **SG52** (single sphere) **& SG37** (dual sphere)
  - operation in parallel since 2009
  - SG52 is dedicated for a further GFZ SG station on the southern hemisphere (location not yet decided)

- a local network of **Hydrological sensors** (soil moisture, groundwater level, meteorology)
- a **GNSS station** as a core station of the International GNSS Service (IGS).
- a **Triaxial Magnetometer**, mainly used for pulsation research

Calibration:

- AG measurements Dec. 2011 (BKG Frankfurt, R. Falck)
- AG measurements March 2012 (Finish Geodetic Institute, J. Mäkinen)

´SG Data preprocessing:

- 2010 – 2012 done in cooperation with University Jena
- available at the GGP data base

GFZ Superconducting gravimeter station in Sutherland (South Africa)

GFZ Superconducting gravimeter station in Sutherland (South Africa)

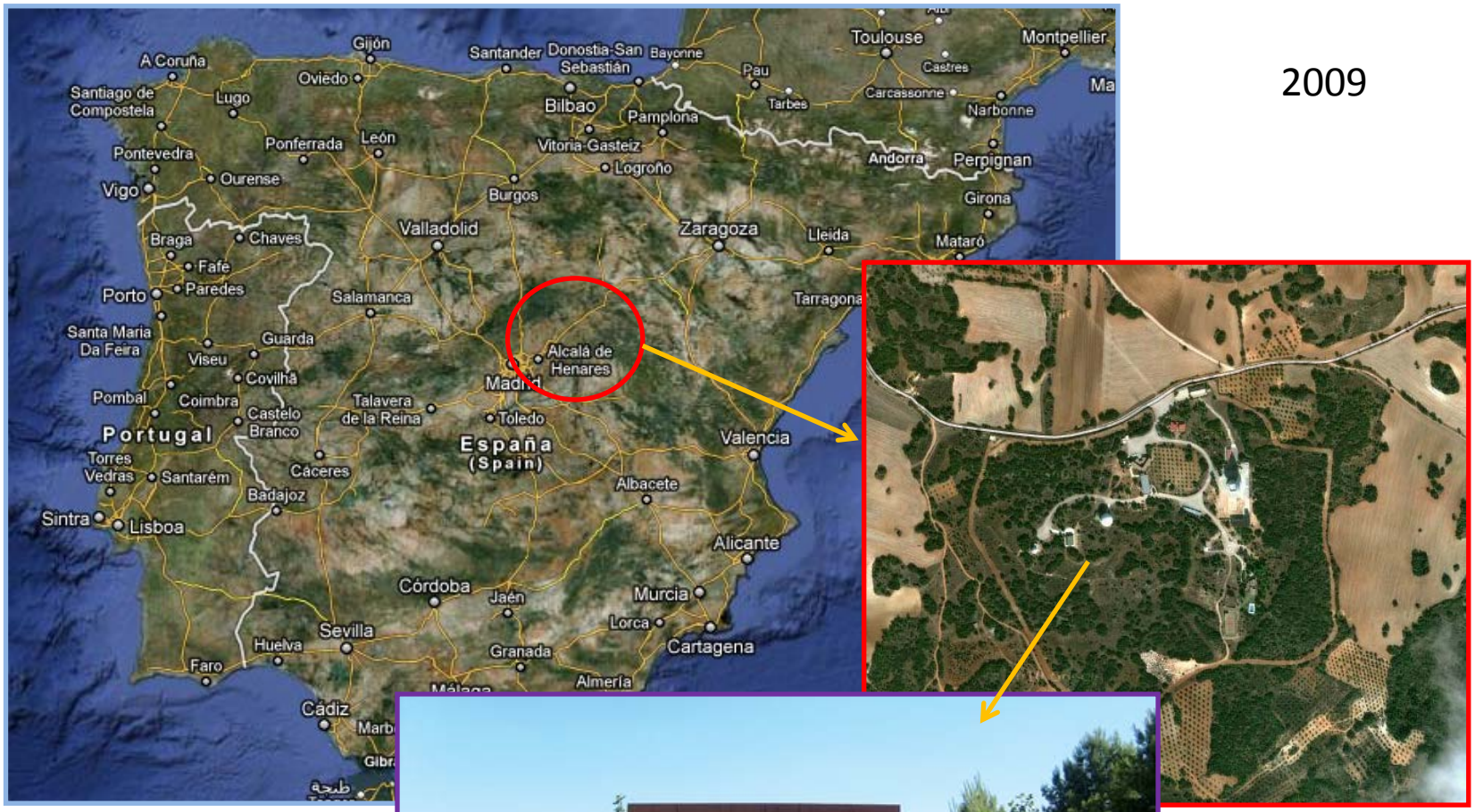
INSTITUTO GEOGRÁFICO NACIONAL

GOBIERNO DE ESPAÑA MINISTERIO DE FOMENTO

Spanish Gravimeter Station: Yebes

Yebes Observatory

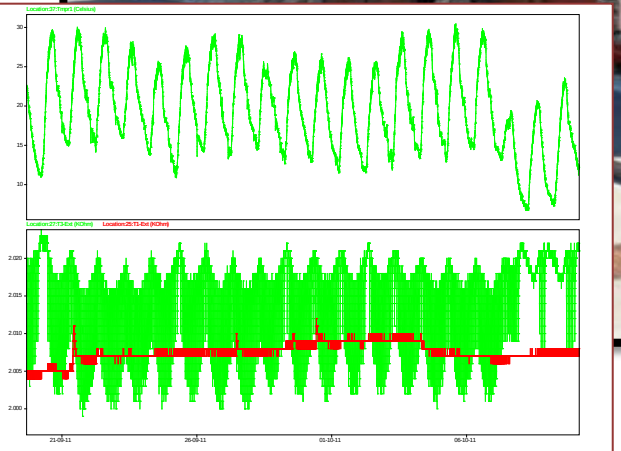
2009



Latitude: 40.524º N
Longitude: 9.090º W
Height: 917.7 m

Gravimeter Station

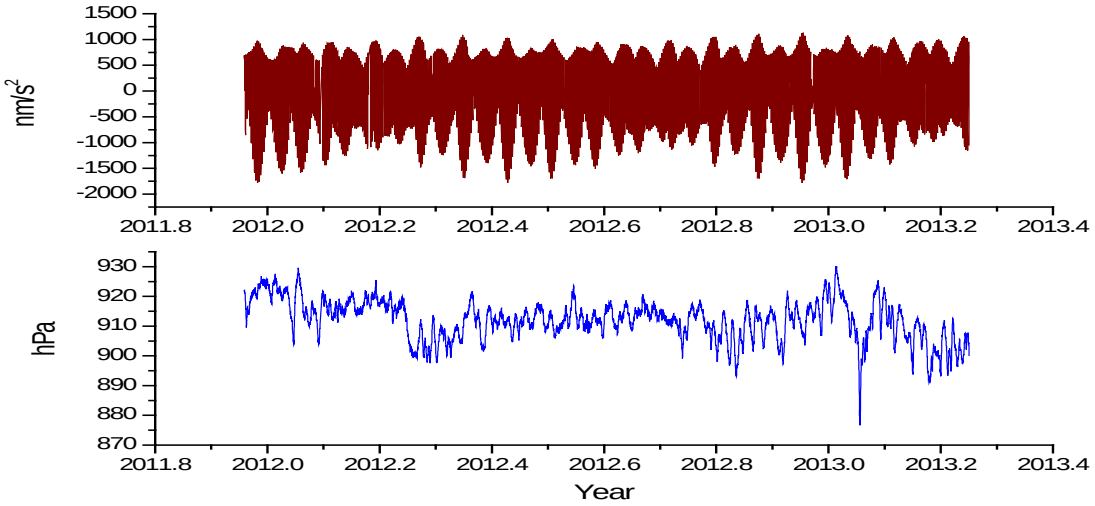
Carlos Albo



Thermal stability

SG#064
Since 15/12/2011

Estimated Yebes Tidal model from 1 year SG064 data			
Wave Group	**Amplitude (nm/s^2)**	**δ**	**Phase lead (º)**
O1	306.8689	1.1470 ± 0.00011	-0.2460 ± 0.0056
P1	142.7616	1.1468 ± 0.00022	0.2985 ± 0.0112
M1	24.1213	1.1430 ± 0.00138	0.6714 ± 0.0692
K1	431.3948	1.1342 ± 0.00008	0.3993 ± 0.0040
M2	434.3410	1.1505 ± 0.00006	4.4293 ± 0.0032
S2	202.0597	1.1818 ± 0.00014	2.8033 ± 0.0067
K2	54.9064	1.1795 ± 0.00057	2.9771 ± 0.0279
M3	6.4912	1.0644 ± 0.00160	-0.6367 ± 0.0860



Secondary instrumentation

1. GPS
2. Piezometer
3. Baromometer
4. Meteorological Station

In the near future:
Humudity Sensor

Why a superconducting gravimeter in Yebes?

Yebes Observatory

RAEGE Project ("Atlantic Network of Geodynamical and Space Station")

Intends to set up a Spanish-Portuguese Network of 4 Geodetic Fundamental Stations provided with:

* Geodetic VLBI 2010 radio telescope
* Gravimeter
* Permanent GNSS station

http://www.raege.net/

Geodetic Fundamental Stations:

- **Yebes (1)**
- Canary Islands (1) → Tenerife.
- Açores Islands (2) → Santa María, Flores.

The strategic location of these four stations will allow the monitoring of crustal dynamics of three tectonic plates: Eurasian (Yebes), African (Tenerife and Santa Maria), and American (Flores).

GGP in China

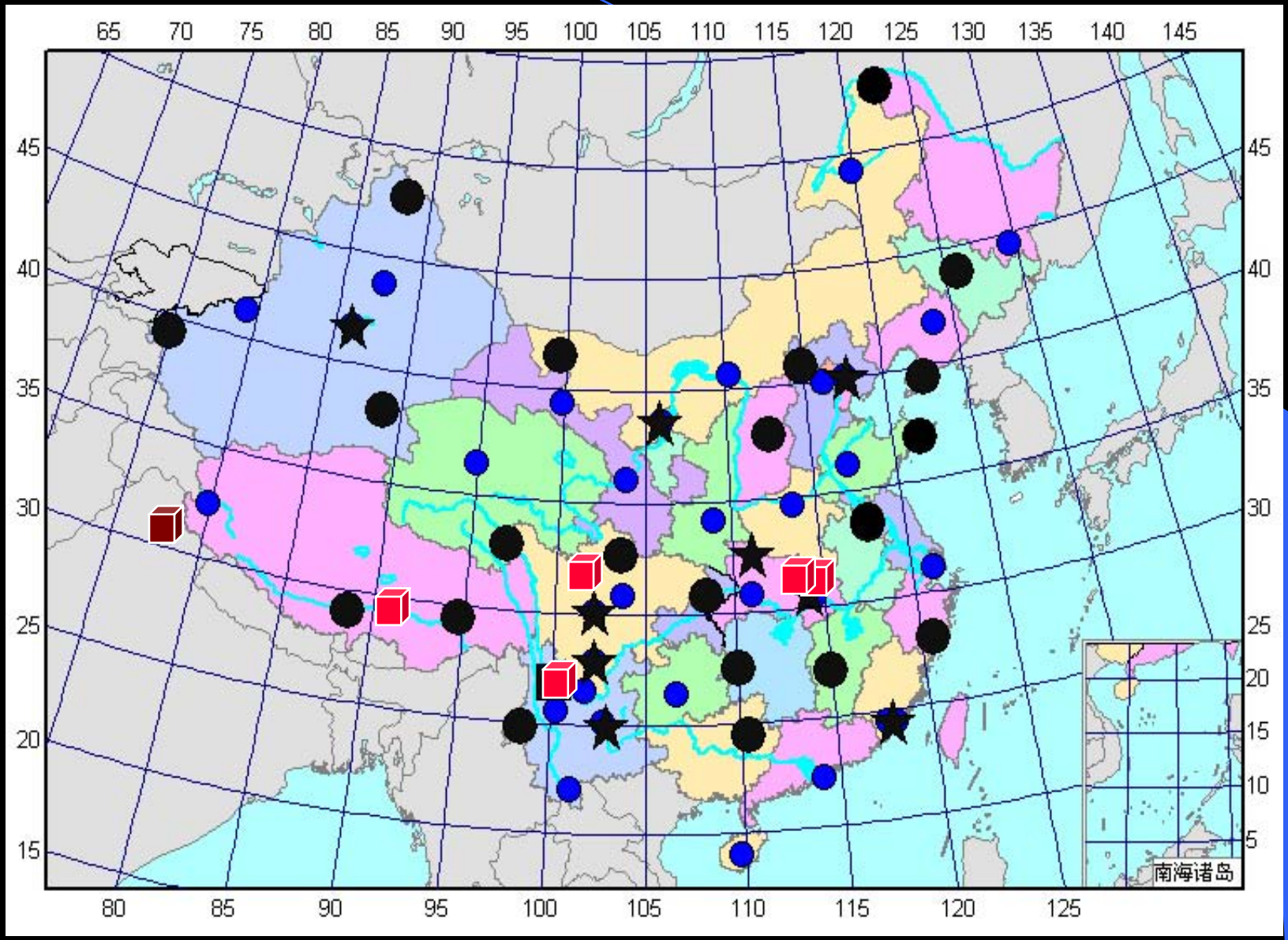
Heping SUN, Houtze HSU, Jianqiao XU, Xiang'e LEI

Institute of Geodesy and Geophysics

Chinese Academy of Sciences

April 15-19, 2013 Warsaw

Network of the Permanent Tidal Gravity Stations in China (56)



SG Present Situation in China

OSG053：Sep.2008 Wuhan, Hubei
OSG057：Dec. 2009 Lhasa, Tibet
OSG065：Mar. 2013 Wuhan (replaced old one)
OSG066：Mar. 2013 Lijiang,Yunnan
IGRAV007： …… Chengdu, Sichuan

Data upload to GGP center on time

Original sampling data: 10 s (tidal gravity and pressure)
Upload data:1 m (both original and processed)
1 h (processed)

Lasa Station, Tibet

OSG057
29°39′N 91°02′E
2009，12-

Wuhan (CEA)

OSG053
30°31′N　114°29′E
2008,9-

Wuhan (CAS)

OSG065
30°31′N 114°29′E
2013,3-

March 2013

Lijiang, Yunnan

OSG066
26°54′N 100°14′E
2013,3-

March 2013