NEWSLETTER #17

5 June 2006

Prepared by Jacques Hinderer and David Crossley.

# 1. Minutes of the GGP Business Meeting and Workshop, Jena, Germany – March 30, 2006.

D. Crossley (DC) welcomed the participants and showed the agenda of this GGP meeting. A list of the Jena attendees can be found in Appendix A

Agenda
1. Station Review
2. Report on ICET Database / Calibrations
3. GGOS Initiative
4. Discussion of IRIS proposal for archiving high rate data
5. Will there be a GGP3? - Scientific goals?
6. Next Meeting – IUGG 2007?

1.1 Station Review

DC showed a map with the GGP stations existing in 2005 and new stations installed in Taiwan. The different groups gave short reports on the status of their stations.
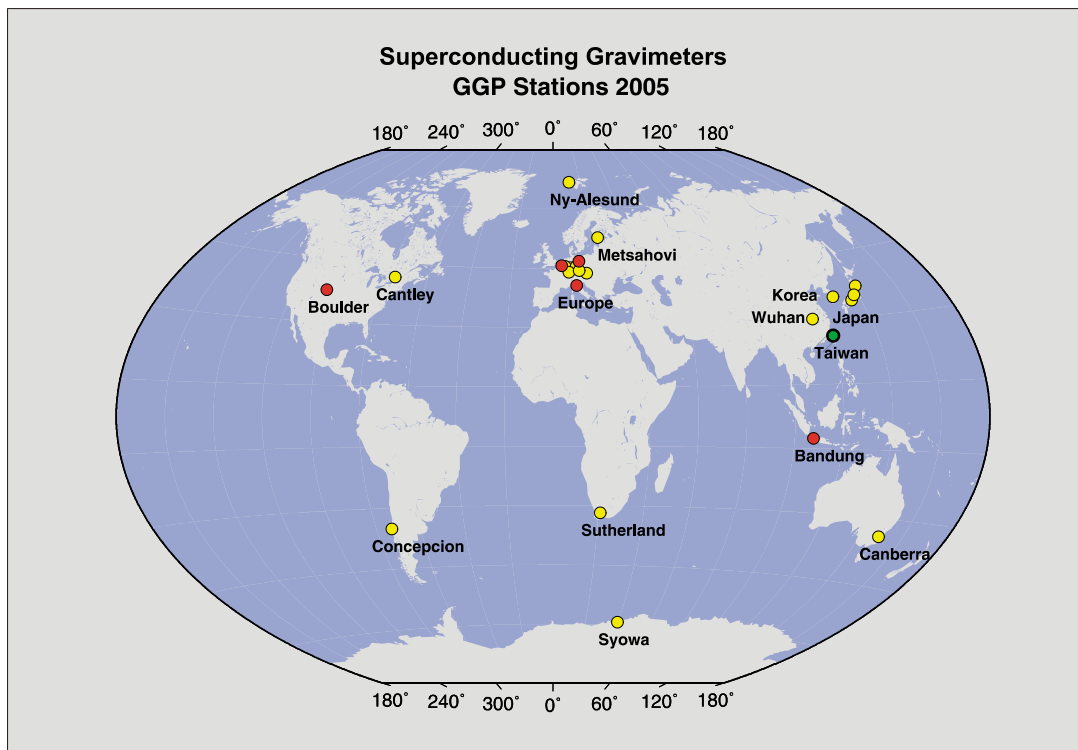
Herbert Wilmes (HW) gave an overview of the German stations operated by BKG. This includes Bad Homburg and Wettzell in Germany, Medicina in Italy, and TIGO in Chile. He noted that regular AG measurements are also carried out at these GGP stations, more or less twice a year.

Tadahiro Sato (TS) presented the situation for the Japanese stations. One of these is in Canberra, Australia, which is now operating normally after the Mt Stromlo fire in 2002. Also operating normally is Matsushiro in Japan. There are some tilt noise problems at the stations Esashi and Kyoto in Japan. The new instrument in Syowa (Antarctica) exhibits a strong drift which is fortunately very linear. The old SG which was operated in Syowa is now installed in the large underground neutrino detection facility in Kamiokande. The data are not yet in the GGP data base but they should be available in the future. The station in Svalbard (Ny Alesund, Norway) is still running and there are negotiations to set up a new agreement between Norway and Japan to continue the SG measurements in future. The station Bandung in Indonesia is still inoperative following the flood that damaged the instrument, but there are plans to reinstall the SG in another place in the same country when funds are available.

Bernard Ducarme (BD) indicated that Membach station, Belgium, continues without problems and **Heikki Virtanen** (HV) reported the same situation for Metsahovi, Finland. For Moxa, Germany, **Corinna Kroner** (CK) mentioned that permanent GPS is now available with the support of BKG (Frankfurt). **Jacques Hinderer** (JH) indicated that the data from the station Strasbourg, France are more noisy than before since a lightning strike that hit in summer of 2005. There will be a need to exchange the GGP2 board because the present one fails at almost every large earthquake. **Jurgen Neumeyer** (JN) confirmed that Sutherland station in South Africa is running fine; there is a plan to acquire a second SG at GFZ may be this year and suggestions for a remote location of interest are welcome.

For Wuhan, China, **He-Ping Sun** reported that the station was operating normally. The following table shows stations currently operating that are sending data to GGP, or will shortly be sending data (i.e., the new stations in S. Korea and Taiwan).

Table 1. SG stations of the GGP Network, as of 6 June 2006
**Most recent coordinates are given**

#	Code	Location	Country	Responsible	Institute	Latitude	Long
						+N, -S	+E, -W
1	**BH**	Bad Homburg	Germany	H. Wilmes	BKG Frankfurt	50.2285	8.6113
2	**CA**	Cantley	Canada	J. Liard	GSC Ottawa	45.5850	284.1929
3	**CB**	Canberra	Australia	T. Sato	NAO Mizusawa	-35.3206	149.0077
4	**ES**	Esashi	Japan	T. Sato	NAO Mizusawa	39.1511	141.3318
5	**KY**	Kyoto	Japan	Y. Fukuda	Kyoto U.	35.0278	135.7858
6	**MA**	Matsuchiro	Japan	Y. Imanishi	U. Tokyo	36.5430	138.2070
7	**MB**	Membach	Belgium	M. van Camp	ROB Brussels	50.6093	6.0066
8	**MC**	Medicina	Italy	H. Wilmes	BKG Frankfurt	44.5219	11.6450
9	**ME**	Metsahovi	Finland	H. Virtanen	FGI Masala	60.2172	24.3958
10	**MG**	MunGyung	S. Korea	J.-W. Kim	Sejong U.	36.6402	128.2147
11	**MO**	Moxa	Germany	C. Kroner	FSU Jena	50.6447	11.6156
12	**NY**	Ny-Alesund	Norway	T. Sato	NAO Mizusawa	78.9306	11.8672
13	**ST**	Strasbourg	France	J. Hinderer	EOST Strasbourg	48.6217	7.6838
14	**SU**	Sutherland	S. Africa	J. Neumeyer	GFZ Potsdam	-32.3814	20.8109
15	**SY**	Syowa	Antarctica	K. Shibuya	NIPR Tokyo	-69.0067	39.5857
16	**TC**	Concepcion	Chile	H. Wilmes	BKG Frankfurt	-36.8437	286.9745
17	**TW**	HsinChu	Taiwan	C. Hwang	Nat. Chiao Tung U.	24.7890	120.9710
18	**VI**	Vienna	Austria	B. Meurers	U. Vienna	48.2493	16.3579
19	**WE**	Wettzell	Germany	H. Wilmes	BKG Frankfurt	49.1440	12.8780
20	**WU**	Wuhan	China	H.-P. Sun	IGG Wuhan	30.5159	114.4898
21	na	Kamiokande	Japan	Y. Fukuda	Kyoto U.	na	na

GGP Stations in NE Asia

DC pointed out the quite large density of stations that is now available in Asia (Japan, South Korea, Taiwan, China) as shown below.
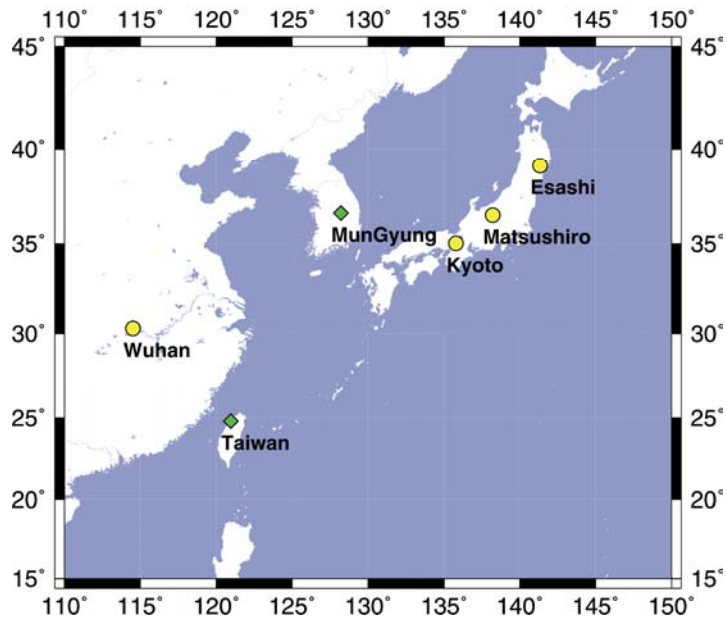
GGP Europe Stations 02-05
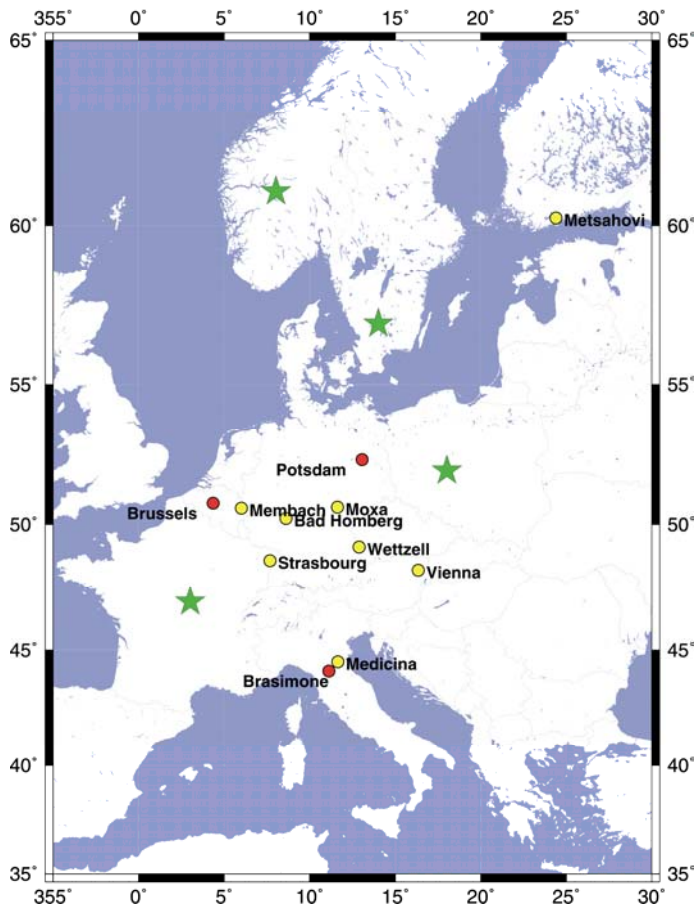
An extended European GGP array with new sites (e.g. Central France, Denmark, Norway, Sweden, Poland) would be useful in Europe to fill gap between Metsahovi and existing stations (yellow). Note in the figure such sites are shown in green and discontinued stations in red.

All the studies devoted to the ground calibration of gravity satellite data would benefit from such an extension.

1.2 Report on GGP Database / Calibration

DC showed a plot (below) indicating the duration of the data sets available in the GGP database. It can be seen there are several stations that have now passed the 100 month level of achievement. Congratulations to Boulder, Cantley, Membach, Metsahovi, Strasbourg and Wettzell. Who will get to 200 months first?
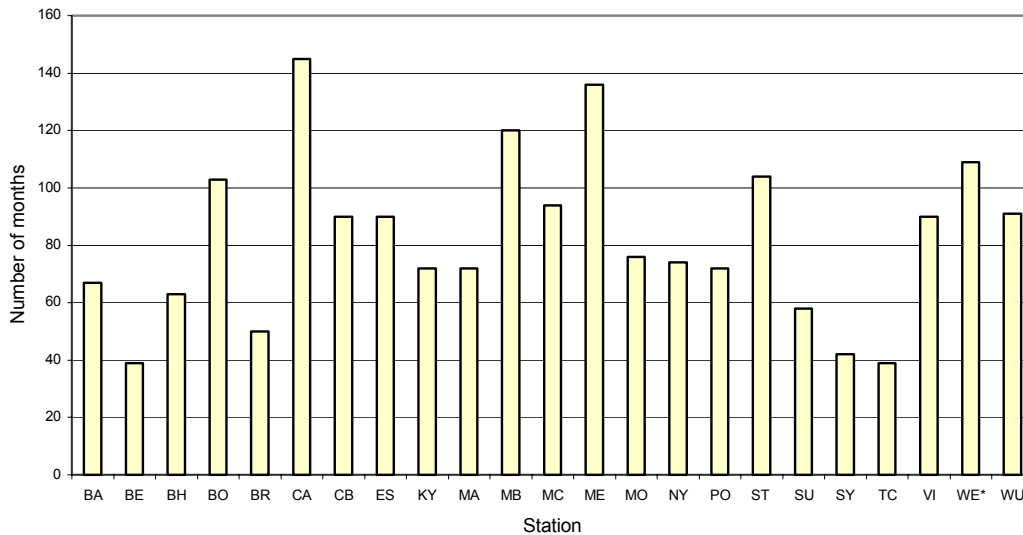
GGP STATION DATA AT ICET

Table 2. Number of months of one minute data at ICET, as of 6 June, 2006
Data is being added continuously, so this is only a snapshot representation.

Station	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	1997	1998	1999	2000	2001	2002	2003	2003	2004	2005	2006	2007	Total
							<-- pre-GGP -->											<-- GGP Phase 1 -->						GGP Phase 2				
BA																1	12	12	12	12	12	6	¶					67
BE	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	6	12	12	9	¶								39
BH																		11	12	6			6	12	12	4		63
BO														9	12	12	12	12	12	12	12	6	4	¶				103
BR									r	r	r	r	r	1	12	12	12	12	1	¶								50
CA								2	12	12	12	10	x	7	12	6	12	12	12	12	12	6	6					145
CB																6	12	12	12	12	12	6	6	12				90
ES							r	r	r	r	r	r	r	r	r	6	12	12	12	12	12	6	6	12				90
KY							r	r	r	r	r	r	r	r	r	6	12	12	12	12	12	6						72
MA														r	r	6	12	12	12	12	12	6						72
MB														9	12	12	12	12	12	12	12	6	6	6	9			120
MC															r	r	12	12	12	12	12	6	6	12	10			94
ME													4	12	12	12	12	12	12	12	12	6	6	12	12			136
MO																		r	12	12	12	6	6	12	12	4		76
NY																		4	12	12	12	6	6	12	10			74
PO											5	12	12	12	12	12	7	¶										72
ST						r	r	r	r	r	r	r	r	r	r	10	12	12	12	12	12	6	6	12	10			104
SU																			10	12	12	6	6	12				58
SY												D	D	D	D	6	12	12	12	D	D	D						42
TC																						1	6	12	12	2		39
VI														r	r	6	12	12	12	12	12	6	6	12				90
WE*							r	r	r	r	r	r	r	r	6	12	12	6	12	12	12	6	6	12	12	1		109
WU						r	r	r	r	r	r	r	r	r	r	1x	12	12	12	12	12	6	6	12	7			91
																							total					1896

Notes:
- **r** recorded data not in ICET database
- **x** recording interrupted (e.g. computer problem, instrument change or upgrade)
- **¶** recording stopped, instrument decommissioned
- **D** Syowa raw data 93/8/1 - 03/1/31 available on DVD
- ***** Data for WE after 01/04 is available only in post-processed format

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There is an important point that was discussed: the need to provide, in addition to the scale factor and phase delay values, the **uncertainties** on these values. Only a few stations do provide these values. We strongly encourage the GGP members to update their calibration values and to provide this missing information on the error. In principle, using AG/SG parallel comparisons for the scale factor and the experimental method by Van Camp et al. (2000) to measure the phase delay will allow the user to estimate these errors.

Bernard Ducarme has now compiled a complete list of the calibration factors for all the instruments, as derived from the uploaded files by the users.

1.3 GGOS Initiative

GGOS (Global Geodetic Observing System) is a leading project of IAG which was initiated at the last IUGG meeting in Sapporo, 2003. The scientific objectives and the actions that are proposed can be found on the GGOS Web site (http://www.ggos.org/).

GGP has been asked to participate in GGOS discussions for integrating the various databases in gravimetry and geodesy. In particular, JH mentioned that the chair of GGOS Markus Rothacher called the GGP secretary to provide two names for the GGP representative and substitute to join the GGOS steering committee. After a short discussion, the GGP members chose Jacques Hinderer to be the GGP representative and Corinna Kroner as a substitute. The GGOS planning meeting at the EGU in Vienna next week will be attended by JH. For the moment, we do no anticipate more action than making available the GGP database for GGOS participants and hence strongly enforce the contribution in terms of temporal variations of the gravity field.

1.4 Discussion of IRIS proposal for archiving high rate data

DC reported on several discussions he had with Rich Benson who is the Director of Operations at the IRIS DMC. DC commented the proposal which was sent to the GGP mailing list before the meeting. The original IRIS Proposal is given in full in Appendix B at the end of this Newsletter. Several updates discussed with R. Benton have not been included.

The proposal received a supporting email from our colleague **Michel Van Camp** who has already started to send SG data (rapid sampling) from the Membach station (Belgium) directly to IRIS.

Excerpts from the comments of MVC:
1) I have never tested the GGP to SEED conversion. The ROB is sending SG data to IRIS using a Quanterra Q330 datalogger, which provides miniSEED format automatically (10 Hz and 1 Hz sampling rate). See http://www.iris.washington.edu/servlet/quackquery/budFileSelector.do?network=SG
2) I have not yet experimented with the process to create myself SEED metadata, but plan to do it soon.
3) The SG is a great LP seismometer. The reason why the SG data from Membach are sent to IRIS (and ORFEUS in Europe) … it is the only way to have our SG data used by seismologists.
4) Providing pole and zeros [requires] phase calibration of the SG … this has long been requested [of] GGP members. As this information is necessary for seismologists, this could be the incentive to finally do it. Incidentally a Q330 allows the user to perform this experiment very easily.

A discussion started on the advantages of sending our GGP raw data directly to IRIS. **W. Zürn** expressed the opinion that it is a great advantage to do so since most if not all seismologists will go directly to IRIS for downloading data for their studies. We have the example of the French GEOSCOPE network in seismology which has its own data base in Paris but also appears as an identified network in IRIS; consequently most seismologists will access directly IRIS and download the GEOSCOPE data from there. He also indicated that the delay to upload IRIS with SG data should be as short as possible and in any case will be far shorter than the existing delay for the standard 1 min samples. The IRIS proposal was also supported by **Rudi Widmer-Schnidrig** as a means of ensuring the lasting archive and availability of seismic data.

A lively discussion began on the problem of sending the rapid sampling data only to IRIS or first via the GGP data base. **Bernd Ritschel** (GFZ, Potsdam) strongly favored the second option and several GGP members expressed their opinions. T. Sato raised the issue of the lack of time to discuss the sending the rapid data to IRIS within the Japanese community. DC answered that time was indeed short but as usual in the GGP community the success is mainly based on the willingness of the members. Further, this IRIS initiative should not be seen as an imposed rule or obligation but rather as an opportunity to make our GGP data more available to a larger geophysical community and that any study pointing out the quality of these data can only be positive for our project.

As a result of the discussion the following compromise proposals were agreed upon. The points have been posed again as a questionnaire directly to the SG operators, whose responses are now being assessed:

1. GGP raw data to be archived at IRIS in SEED format according to IRIS proposal (March 2006)
2. ISDC to receive GGP raw data and forward to IRIS in SEED format with minimum delay
3. ISDC to archive GGP raw data in SEED format on ISDC portal
4. IDC to provide GGP raw data in GGP (PRETERNA) format on ISDC portal only after standard GGP time delay (1 year, unless otherwise agreed)
5. GWR, ICET, and ISDC to assist GGP groups in creating and validating GGP metadata for dataless SEED files for IRIS

When all the responses have been received, the outcome will be forwarded to IRIS and GFZ to work out the arrangements with the operators.

1.5 What about GGP3? – Scientific Goals?

DC recalled that GGP2 will end next year in 2007 and that the continuation (i.e. GGP3) has to be discussed well in advance of the next GGP meeting. In particular, we need to have new scientific goals which rely strongly on our ground SG measurements.

1.6 Next GGP Meeting – IUGG 2007?

The GGP members agreed that the next GGP meeting will take place during the IUGG meeting in Perugia (Italy) in 2007. AT that time GGP will have to apply to IAG for an extension of the project if the participating members agree.

2. Missing GGP Data

The GGP database is currently missing recent data from some SG groups. General users of the ICET/GFZ data should in principle have access to data that is 1 year old, at most. The lack of data from recent stations is being addressed with the appropriate sources.

Appendix A: Attendees
(note this is a graphics image).

Worlshop Jena 27.32006 - 31.3.2006

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Appendix B: IRIS Proposal

A proposal to archive Global Geodynamics Project (GGP) Data at the IRIS Data Management Center (DMC)

Objectives:
To archive a secure, long-term, web-accessible database of the observations collected by the partners of the Global Geodynamics Project (GGP), with the aim of improving the collaboration and exchange of data between the network of superconducting gravimeters and a number of other related disciplines, notably the observational normal mode seismological community. While the GGP archive http://ggp.gfz-potsdam.de/ is available and provides excellent collaboration, curation and archiving between GGP network operators, we are specifically interested in bridging the access and data formatting so that seismologists can benefit from this rich data repository. It has been shown that the GGP network data are competitive with the best spring gravimeters and seismometers and that for modes below 0.6 mHz, and they have produced spectra with some of the highest signal-to-noise ratio so far. (*R. Widmer-Schnidrig, What can Superconducting Gravimeters contribute to normal mode seismology, 2003, attached) In* addition, the superb calibration factors in both phase (0.01s) and amplitude (0.1%) that are available from these instruments make these excellent research tools for the normal mode seismic community. *(See e.g. Park et al, Science, May 2005)*

Introduction:
The Incorporated Research Institutions for Seismology (IRIS) operates in an international leadership role by operating the Data Management Center for geophysical data, primarily seismic, and is host to data from a globally diverse collaboration of well-calibrated seismological networks. The DMC services data requests of seismologists and educators from around the world, and is currently managing approximately 50 terabytes of time series data (currently growing at a rate of more than10 Tb/year) that accurately records ground motion spanning more than 30 years, and is the primary archive for the International Federation of Digital Seismograph Networks (FDSN). The National Science Foundation, through its Division of Earth Sciences, funds IRIS. (http://www.nsf.gov/div/index.jsp?div=EAR)
As seismic data holdings continue to become openly accessible, and technology continues to expand the digital spectrum of what can be recorded, the DMC expresses a resolve to archive as complete a range of open, accessible, and perpetually viable scientific collections that will assist in our understanding of the structure of the deep earth.

Current archiving status of GGP data:
Beginning in October 2005, SEED format data began archiving in real-time from the Membach, Belgium GWR instrument operated by Dr. Michel Van Camp at the Royal Observatory of Belgium. This site is named MEM. Additionally, software was written by IRIS (ggp2mseed) that converts the GGP format data into the SEED (Standard for the Exchange of Earthquake Data, developed by IRIS), the most common exchange format for seismic data. This enabled testing of the proposed method conversion using data downloaded from the website http://www.eas.slu.edu/GGP/sumatra/second. The metadata for site MEM, including poles and zeroes from calibrations done by Dr. Van Camp were converted to dataless SEED format and can now be requested using any standard IRIS request mechanism by using the SG network code. (http://www.iris.edu/manuals/DATutorial.htm)

Statement of Work:

1. The IRIS DMC can archive the data that are currently being recorded by the Global Geodynamics Project (GGP) and assist in converting them to SEED, and act as the distribution point to the seismic community by integrating them into the IRIS web-accessible relational database. This can include, in addition to the gravity data, other streams, like unfiltered "gravity output" of the GWR instruments, rainfall, pressure, etc. This is open to discussion moving forward.

2. As with all data managed at the IRIS DMC, restricted access to data for any latency time period can be requested by contributing network operators. Therefore, contributing data to the archive as quickly as possible does not mean that the data will be "open" and unsecured, but does enable users to quickly discover which data are collected, and offers the opportunity to conduct format verification and data issues dialogue, offering better communication as data are being collected. Open access is preferred, but GGP research activities are understood to be the primary motivation behind data collection, and that the interests of IRIS seismological community are secondary. If requested, we will impose restrictions to the time-series data. The registration and access restriction process that is in operation at the DMC will provide this. We would like to follow the lead set by Dr. Van Camp and enable real-time data exchange, as it creates the ability to automate many facets of the exchange. (Note: In his data center, he utilizes the Quanterra datalogger, capable of creating SEED format data. The general method for ingesting these GGP data, however, requires only the exchange of the GGP format files).

3. The GGP ASCII data will be converted with the cross-platform utility called *ggp2mseed* available online at: http://www.iris.edu/chad/ggp2mseed-0.7.tar.gz. The underlying SEED library is called libmseed (library of miniSEED) written by Chad Trabant, and will be supported by IRIS during the collection and conversion from GGP to miniSEED. The term miniSEED refers to the time series format conversion, and does not include the metadata conversion. (This will have to be done in a separate step, called dataless SEED, described below.

The construction of dataless SEED will require, at a minimum, the following type of information, showing by example the calibration and pole/zero information unique to the MEM site in Belgium, contributed by Dr Van Camp: (Note: See the next paragraph (5) for details on how to request a "template" dataless SEED file from the IRIS archive) Each site in the GGP network should have their own calibrations performed, and the included calibration factors are just examples of the results. One reason for this is that there is no "stock" supergravimeter calibration information, as there are two different versions of the GGP analog filter, for example. As a possible first-order solution, the information might be available from the manufacturer GRW.

Calibration factor:
GGP[counts]/544.38 = GGP[nm/s≤]

pole_GGP =

  0.0501 + 1.1926i
  0.0501 - 1.1926i
  0.0456 + 1.0519i
  0.0456 - 1.0519i
  0.2032 + 0.6389i

```
 0.2032 - 0.6389i
 0.2312 + 0.3262i
 0.2312 - 0.3262i
 0.1686 + 0.0707i
 0.1686 - 0.0707i

zero_GGP =

 -0.8703 + 0.6590i
 -0.8703 - 0.6590i
 -0.0439 + 1.2247i
 -0.0439 - 1.2247i
 -0.0131 + 1.0769i
 -0.0131 - 1.0769i
  0.1614
```

4. The use of existing SG network dataless SEED metadata is also an option to facilitate creating your own. This is the preferred method, as it embraces the philosophy that the network operators are the best resource, given the proximity to the instruments and sources of data. At any time, a dataless SEED for the existing SG network dataloggers can be requested from IRIS by emailing a breq_fast format request (http://www.iris.edu/manuals/breq_fast.htm) to the email account dataless@iris.washington.edu. A binary dataless SEED file will be made available to download via ftp, which can be subsequently imported into the **PDCC** software utility (cross-platform SEED writing/editing utility) available from http://www.iris.edu/manuals/pdcc_intro.htm. This enables the editing and customizing of the metadata for your installation. The PDCC toolkit bridges the gap between raw information and the SEED format for users who are either new to SEED or who don't archive their own data in SEED format.
5. Rick Benson, the Director of Operations at the IRIS DMC, will be the primary contact for questions, coordination, and format verification.
6. The DMC will provide statistics, on a quarterly basis, to all collaborating operators about how many researchers requested their data. In addition, every user (researcher) of the data who requests and downloads SG network data will be contacted (emailed) on a quarterly basis and be directed how to acknowledge the providers of these data.

I look forward to the opportunity to assist in the open exchange of GGP data with the IRIS community. Exchange of data, of course, is a two-way process, and we can and will provide help and data from the active seismic research community that might benefit the GGP community, as well.

Thank you,

 Rick Benson
 Director of Operations
 IRIS DMC
Attachment:
What can Superconducting Gravimeters contribute to normal mode seismology, R. Widmer