GGP Newsletter #3 - 26 April 1997

Contents

Prepared by David Crossley, April, 1997.

GGP Pilot Period Will End Soon

The testing period for GGP will end on 30 June of this year and the project itself will start on 1st July. Therefore, all GGP groups should be in their final phases for installing new equipment, testing data acquisition systems etc. As far as we can tell, there should be more than ten groups that are already recording satisfactorily and will be able to start on time. Other groups should of course make extra effort to complete their preparations as soon as possible so as to be able to contribute data for the Observing Period.

GWR Announces New Filter Board

After much delay we are happy to report that GWR will be able to supply new filter boards for the start of the Observing Period. There should be enough time to do a quick board replacement that will result in superior recording characteristics for GGP. Details are contained in the attached product announcement supplied by GWR.

This board is highly recommended for all groups who wish to sample at 1s or 2s and have not themselves developed special electronics to replace the standard GWR package. Not only is the anti-aliasing filter ideal for normal mode data, but the superior thermal characteristic of the board should give noticeably better stability to the gravity signal.

You are urged to seriously consider adopting the new board if at all possible. Please contact GWR immediately to discuss your needs. We are indeed sorry for the delay in getting this board to production, but now that it is finally a reality we hope you can take advantage of it.

GGP Data Formats

Headers

Currently, the suggested header for GGP files is completely free and gives information about the site and instrument. After some thought, it might be useful to freeze the content of the first 8 lines of this header in a standard format, so that the reading program can use some of the information for subsequent data processing.

With a very slight change, I therefore suggest the following format:

`Line 1:`	`Filename, [name of file]`	`(a15,a20)`
`Line 2:`	`Station, [name of station]`	`(a15,a20)`

Line 3:	Instrument, [name of instrument]	(a15,a20)
Line 4:	N. Latitude, [latitude]	(a15,f10.5)
Line 5:	E. Longitude, [longitude]	(a15,f10.5)
Line 6:	Height m, [height]	(a15,f10.5)
Line 6:	Gravity [g calibration]	(a15,f10.5)
Line 8:	Pressure, [p calibration]	(a15,f10.5)
Lines 9	unspecified character strings	
C****	end of header	

Correction on Spaces

So far there has been almost no resistance (if one believes no news is good news) to the proposed GGP data formats. The only minor problem has been a request from ICET that the exact PRETERNA format be used in the GGP files. As indicated in the previous Newsletter (#2), following the header and the lines:

```
C***********************************************
77777777 00000000 ...
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the date, time, gravity and pressure variables should appear in the following format:

(i8,1x,i6,2f10.6)

It is **not correct** to insert additional spaces in front of the gravity and pressure values, as would appear to be indicated in the Newsletter (even though this would ensure that these variables could be read in free format). Users who wish further clarification should contact Francis Olivier at ICET.

Earthquake Data

ICET has suggested that earthquake data (at 1s, 2s or 10s, but no longer a sampling interval) be also put into GGP format, i.e. a time-stamped form. This would result in much larger files than the format proposed in Figure 2 of Newsletter #2, but does have the advantage of consistency with the 1 GGP minute files.

These points will be discussed at the Workshop in Brussels.

ICET Needs Your Data

Olivier Francis has requested that users who have not yet sent him any data, please do so as soon as you can, to test the file transfer rates and other protocols. Please contact ICET to get your user names and passwords that will enable you to read and write into your own directory.

Also, ICET has set up a directory where earthquake data may be sent and saved:

address: **ftpserver.oma.be**

login: **anonymous**

password: **your email address**

directory: **/pub/astro/ggp/bigquakes**

A list of candidate earthquakes for 1990-96 is given in the previous Newsletter.

GGP Workshop

The GGP Workshop is going ahead as previously announced. Brussels. A preliminary timetable is shown below and further details will be given the Third Circular of the International Symposium on Earth Tides, to be sent out in May.

Proposed Schedule: Monday 21 July 1997, Royal Observatory, Brussels

9:00	**(1) Data Exchange**
	D. Crossley: Results of Pilot Study and Test Format

	General discussion on data exchange protocols and formats
10:00	**(2) Calibration**
	B. Richter: Results of pre-GGP calibrations
	General discussion on SG calibration, comparisons with Absolute Gravimetry
11:00	**(3) SG Data Acquisition Systems**
	R. Warburton: GWR developments
	General discussion on Filters, Electronics and Instrumentation
12:00	Lunch
13:00	**(4) Data Repair Techniques**
	D. Crossley and J. Hinderer: Approaches to data treatment
	General discussion on data interpolation and repair
14:00	**(5) Tidal Loading**
	O. Francis: Models available through ICET
	General discussion of tidal loading
15:00	**(6) Atmospheric Pressure**
	J. Hinderer: Availability of Global Data
	General discussion of pressure corrections to gravity
16:00	**(7) SG Instrument Siting**
	T. Sato: The Western Pacific SG Network
	General discussion GGP Network and Siting
16:15	**(8) The 1999 Solar Eclipse Experiment**
	L. Mansinha
16:30	**(9) Summary of Discussions**
	concerning the GGP Observing Period
17:00	Close

Participants are encouraged to bring their own data and examples connected with the above items, or any other issues related to SG measurements, to the Workshop.

If any of the presenters wish to change this schedule, please contact D. Crossley

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GWR Product Announcement

GWR INSTRUMENTS, Inc.

New Product Release: GWR Gravity Card Rev. 2, 4/24/97

Overview

The superconducting gravimeter is used for studying properties of the Earth's interior, plate tectonics, polar motion, sea level changes, volcanic activity, and other physical and geophysical phenomenon. Its usefulness is attributed to its and over time.

Starting July 1, 1997 operators of superconducting gravimeters all over the world will be participating in a project organized by the Global Geo-Dynamics Project (GGP). The goals of the GGP include facilitating the sharing and combining (stacking) of data sets. This may allow signals from the Earth's interior to be detected that could not be detected using a single instrument. In order to realize this goal users are encouraged to gather data in a standardized manner, and to condition the signals with a standard anti-aliasing filter. Users are also encouraged to characterize each instrument with respect to amplitude and phase response.

To aid in accomplishing the goals of the GGP, GWR Instruments, Inc. has designed a new gravity circuit card that is a direct replacement for the card supplied in past versions of the GEP2 and GEP-2B electronics. The new revision targets specific features that have been identified as either problems or inadequacies of the current circuit. These include but may not be limited to the following:

Anti-aliasing filter

The revision 2 gravity card is equipped with an on-board anti-aliasing low-pass filter that conforms with recommendations put

forth by the GGP. This filter output is accessible through GJ5 (pins 6 and 14) on GEP-2 electronics and the HR_GRAV connector output on GEP-2B electronics. The filter attenuates signals at frequencies greater than .5Hz by 100 dB. This configuration is intended for a sampling rate of 1 sample per second. To accommodate users who wish to sample the filter output at 0.5 samples per second, the filter can be jumper selected to half the corner frequency. The filter characteristics are summarized below.

Filter specifications for fc = 61.5 mHz jumper configuration.

a) Filter type:	Bessel, 8 pole
b) Topology:	Sallen-Key unity gain
c) Intended sampling rate:	1 sample / second
d) Corner frequency (f -3dB):	61.5 mHz. (16.3 second period)
e) Attenuation (ultimate):	-160dB / decade
f) Attenuation at f_{Nyq}	100.0 dB attenuation at .5 Hz
g) Time Delay:	linear, 0.034 degrees / cpd
h) Flat to within 1\% of unity gain	± 0.086dB below 0.01 Hz (100 sec. Period).
i) Flat to within 4\% of unity gain	± 0.086dB below 0.02 Hz (50 sec. period).

Filter specifications for fc = 30.8 mHz jumper configuration.

a) Filter type:	Bessel, 8 pole
b) Topology:	Sallen-Key Unity gain
c) Intended sampling rate:	0.5 sample / second
d) Corner frequency (f -3dB):	30.8 mHz. (32.6 second period).
e) Attenuation:	-160dB / decade (ultimate)
f) Attenuation at f_{Nyq}	100.0 dB attenuation at .25 Hz
g) Time Delay:	Linear, 0.65 degrees / cpd
h) Flat to within 1\% of unity gain	± 0.086dB below 0.005 Hz (200 sec.period)
i) Flat to within 4\% of unity gain	± 0.086dB below 0.01 Hz (100 sec. period)

Step response and frequency response circuit

A current adder circuit is incorporated into the feedback loop so the operator can input a step function or drive the feedback coil at various frequencies. This allows simplified characterization of instrumental amplitude and phase response. Removing a jumper allows characterization of the mechanical system (sphere and magnetic field only) with the gravimeter operating out of feedback. With the jumper installed, the system can be characterized in feedback, in its normal operating configuration. Access to the adder circuit is achieved by detaching the front panel of the GEP2 electronics and inserting a cable supplied with the circuit card. The cable is terminated with a BNC connector.

Improved shielding and ground path routing

The circuit card incorporates a four layer design to aid in isolation of the excitation and sense circuits. This design reduces signal leakage between the two systems minimizing phase errors in the lock-in amplifier. Phase instabilities can be a major contributor to DC changes in the output of the lock-in. Signal leakage is also reduced by careful shielding of the lock-in amplifier and input amplifier. These changes result in improved time and temperature stability.

Component Selection

Great care has been taken to select the highest quality critical components. Filter capacitors are hermetically sealed, with Metalized Polycarbonate dielectric. These features minimize temperature and humidity effects. Filter and Integrator resistors are ultra-stable Vishay 15ppm/oC or better.

High frequency filter

A second anti-aliasing filter has been added in parallel with the 8 pole filter described above. This is a simple two pole Bessel filter with the corner frequency set at 5 seconds. This filter is intended to attenuate noise sufficiently if the signal is digitized at a much faster rate.

Availability

GWR is scheduled to begin shipping circuit boards June 5, 1997. Customer's orders will be filled based on the date on which purchase orders were received. This schedule should allow on site testing and instrument characterization prior to the start of the GGP observation period scheduled to start July 1, 1997

Note: If your group is interested in ordering this item, please contact GWR as soon as possible. This will aid GWR in predicting demand and will reduce the possibility of shortages. It may be possible to reserve a unit before placing a formal purchase order.

Pricing

For pricing information, contact GWR Instruments, Inc. USA

For Pricing in Japan, contact Toshiki Ishizawa, Marubun Corporation, Tokyo

Ordering

Orders can be placed directly with GWR Instruments Inc., or with your local GWR representative.

All specifications, terms, and conditions are subject to change or revision without notice.

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