Appendix to GGP Newsletter #6 - 27 July 1998

Contents

Prepared by David Crossley and Jacques Hinderer, July 27, 1998, crossley@eas.slu.edu, jhinderer@eost.u-strasbg.fr

---

Clarification of GGP data files

After two weeks preparing data for GGP, it has become evident that some of the existing instructions are inadequate to deal with all the issues that arise in preparing the data. We have therefore arrived at the following suggestions that should be followed if possible by all groups. If you have further questions, please do not hesitate to contact us and we will reply as soon as possible.

Treatment of Missing Data

Sometimes data is missing entirely due to instrument failure or similar problems. In all cases, the value 999999.999 (f10.3) should be used to fill places where there is a missing data value, in either the gravity and pressure, or in the auxiliary file.

All Files Should be Sent

There are times when you may be tempted to not send a file because it contains no useful information. For example, log files may have nothing to report for several months, or an auxiliary file may contain no useful data. Even in these cases we recommend:

All files must be sent for all months

There are two reasons for this:

(1) The presence of the file tells ICET that the file has been sent for that month for that station, so you will not be unpleasantly reminded to send the data, and

(2) Any program that is written to read a sequence of files from a station may not like to have files missing. So, even if they contain nothing, or contain only '999 ...', the presence of the file will ensure continuity of the time sequence.

UPPER CASE Names

For those of you who work in the DOS/Windows world, upper and lower case letters are interchangeable. In Unix however, filenames with lower and upper case letters are treated differently. In order not to cause trouble between different systems, we recommend that

All filenames should be UPPER CASE

e.g. `ST970700.AUX`, not `st970700.aux`.

What About Errors?

The discussion at the First GGP Workshop was quite clear about the need to specify the errors in the data that is being collected, as well as supplying errors for the calibration factors. It is also good physics practice to supply errors for all measured quantities.

In practice, it is often difficult to realistically estimate errors. In many instances, it would be easy to assume that for all numbers the least significant digit indicates the formal 'error' (more correctly, the standard error of the mean). This may seem convenient, but it is rarely adequate because this is really the **precision** of the measurement, and always underestimates the true error. What is required is the **accuracy** of a measurement or calibration, and this can only be found out by some form of experiment.

We therefore recommend that in the header, you always provide an estimate of the error, according to the following types of error estimate:

(a) **nominal error** the expected error from a typical estimate, e.g. the error that may come from an instrument manufacturer,

(b) **estimated error** the error estimated from local conditions, e.g. the supposed accuracy of a geographic location, known more or less from local surveys, or

(c) **measured error** the error obtained from an actual experiment, e.g. using a calibration device which statistically is able to place bounds on the mean calibration value.

One of these 3 words (nominal, estimated or measured) should be placed after the error value, beginning in column 30. An example is shown from Strasbourg:

```
Filename                  ST970910.GGP
Station              Strasbourg, France
Instrument                     GWR C026
Phase Lag (deg/cpd)     0.1500   0.0100             nominal
N Latitude (deg)       48.6220   0.0010             estimated
E Longitude (deg)       7.6840   0.0010             estimated
Height (m)            180.0000   1.0000             estimated
Gravity Cal (ugal/v) -792.0000   1.0000             measured
Pressure Cal(mbar/v)  200.0000   1.0000             nominal
Author               (jhinderer@eost.u-strasbg.fr)
yyyymmdd hhmmss   gravity(V) pressure(V)
C*****************************************
77777777
19970901 000000  0.075913  0.420192
...
```

Auxiliary Data

What to Include

For GGP purposes, auxiliary data for the moment means only rainfall, groundwater level, and soil moisture measurements. Even though you may be collecting other environmental data (such as humidity and temperature), or data that refers to the health of the instrument (such as tilts, heater power, and helium consumption), please

Send only Rainfall, Groundwater Level, and/or Soil Moisture as Auxiliary Data

Experience suggests that the most important environmental effects on gravity are due to hydrogeology, so this should suffice for GGP at this time. We can review this policy at the next workshop.

Header

It is not necessary to repeat the complete header used for the gravity/pressure file. We suggest the following simpler form is adequate:

```
Filename                  ST970910.AUX
Station              Strasbourg, France
Instrument                     GWR C026
Calibration (m/v)       1.0200   0.0100              estimated
```

```
Author               (jhinderer@eost.u-strasbg.fr)
yyyymmdd hhmmss   water level(V)
C****************************************
77777777
19970901 000000  5.170252
...
```

Log File

What to Include

The log file is very important. It should be constructed as follows:

1. Go through your station notes, and make a note in the log file of all significant events, such as start of recording, change of instrument or repair, helium refills, cold head maintenance, power interruptions, etc.
2. Look at the raw 1 minute GGP data for gravity, pressure and auxiliary data. If there are disturbances visible to the eye, and these correspond to events you have noted, then make sure they appear in the log file. If there are disturbances that are mysterious, and you cannot think of a reason, make a statement such as:

   'offset of unknown origin',
   'disturbance of unknown origin',
   'glitch probably due to computer malfunction', or
   'data missing from unknown cause'

   This will be very helpful to the other GGP groups.

3. Refrain from noting all small gaps and spikes, as these will be clear in the data, unless there is a recurring data problems due to some known cause, e.g. 'Joe Bloggs always has a beer at 6pm and kicks the instrument before leaving' (hopefully not).

File Format

The log file header and format can be quite simple, but also should follow the style of the other files:

```
Filename                  ST970910.LOG
Station              Strasbourg, France
Instrument                     GWR C026
Author               (jhinderer@eost.u-strasbg.fr)
yyyymmdd hhmmss   comment
C****************************************
77777777
...
19990705 050330  15 microgal offset of unknown origin
...
19990712 220610  power loss due to lightening strike
...
```

Earthquake Data

Header

Please give a one line comment (just before the C********** line) stating which earthquake is being sent, i.e. Origin Time, and Location, including Latitude and Longitude.

Pressure Data

It is necessary to have pressure data also for earthquakes. If possible, the gravity and pressure should be in the same file (as for the GGP data), even though the sampling is different. If this is not possible, the pressure should be sent as a separate file.

Filenames

Our specifications of the earthquake data filenames has not been very precise. We suggest the following:

```
[Station Code][yymmdd].[ext]
```

where the extension `[ext]` is as follows:

```
S1   gravity and pressure together, 1 sec sampling
S2   gravity and pressure together, 2 sec sampling
...
G1   gravity alone, 1 sec sampling
P1   pressure alone, 1 sec sampling
G2   gravity alone, 2 sec sampling
P2   pressure alone, 2 sec sampling
...
```

e.g. `ST980325.S2` for gravity and pressure together, 2 sec sampling.

top