



GGP and GGOS

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With respect to the role of GGP

(a) What is the role the GGP should and want to play in the GGOS family?

- GGP: practical users group concerned with the day-to-day operation of SGs and the questions that arise from the exchange of SG data.
- GGP's role would initially be to make its data available to GGOS through the ICET/ISDC (GFZ) data portal.
- GGP part of the larger GGOS umbrella organization for gravity and geodetic data
- It remains to be seen what else GGP might contribute to GGOS.

With respect to the role of GGP

(b) What individual outside relations does the GGP want to continue independently of GGOS?

- GGP is a joint project within Commissions 2 and 3 of IAG.
- GGP has no formal relationships with other organizations.
- Nevertheless, GGP data is also being prepared by GFZ for the IRIS seismic database in Washington, USA and we anticipate that this collaboration will continue.

With respect to the role of GGP

(c) Would the GGP be ready to implement and adhere to standards agreed upon in GGOS, both as a reaction of internal decisions and outside requirements?

- Depend somewhat on what those outside requirements might be.
- GGP is happy with its own internal standards of data reporting, as they seem appropriate for the SG data that is our main concern.
- GGP holds Workshops and Business Meetings to advance the science of gravimetry and to discuss issues related to data exchange.
- Any future arrangements with GGOS should allow these activities to continue and permit GGP a decision-making role should there be any substantial changes.

With respect to the role of GGP

d) What does GGP expect from GGOS, and, in particular, what new functions would GGP like GGOS to fill?

- GGP concerned about the current inadequate archiving and accessibility of absolute gravity data at SG sites, and would ideally like to incorporate such data in the GGP database.
- Inter-comparison of absolute and relative gravimeters is of continuing importance to GGP, and we would like to move ahead on this topic.
- Increasingly important for GGP stations to be collocated with geometric technique.

With respect to the role of GGP

(e) Where does GGP see the added value of GGOS as a family?

- *Benefit of belonging to GGOS for GGP is that our SG data used and valued by a wider community.*
- *Same advantage as to distribute our data to the seismic community through IRIS.*

With respect to the GGOS 2020 Strategy process

(a) Does GGP agree with the organizational structure of GGOS?

- *No detailed comments.*

(b) Thoughts and comments concerning the technical components of GGOS:

- *GGP internationally recognized organization for recording and archiving time-varying ground-based gravity data.*
- *Complement satellite surveys such as GRACE.*

(c) To which of these components would the GGP contribute?

- *Any component that involves ground-based time-varying gravity, or interaction between relative and absolute gravimetry.*

(d) Does GGP find itself appropriately represented and described in the document?

- *GGP not necessarily seeking a wider role for itself within GGOS.*
- *Single representative who interacts with GGOS appears sufficient for the time being*

With respect to standardization & the GGOS portal

(a) What would be the appropriate level of standardization needed for a GGOS portal?

- *GGP data is currently archived through ICET and the ISDC (under the control of GFZ in Potsdam),*
- *GGP data distribution need to be discussed with their involvement.*
- *In general, the easiest approach is simply to link the various GGOS databases through a centralized portal, but otherwise do not physically move the location of existing databases.*

(b) The data of all services should be linked through a common portal?

- *As stated above, this is not a problem - unless exclusivity becomes an issue.*

(c) Only meta-data should be made available at the GGOS portal?

- *Our limited use of meta-data suggests that it should always be stored with the actual data.*
- *Perhaps copies of meta-data files could be kept with GGOS.*

With respect to standardization & the GGOS portal

(d) Would GGP as a service be ready to comply to GGOS meta-data standards to be delivered by the service with each product?

- *Depends on what GGOS is willing to adopt as meta-data standards for SH type relative gravity data.*
- *GGP/ ICET / GFZ would need to be involved.*
- *GGP remains open to the needs and expectations of the wider community of GGOS.*

(e) Should there be a common layout of web-pages for all the services contributing to GGOS?

- *This could be done if the template were fairly general and yet kept simple as a front end to existing services.*
- *No advantage to duplicating complex websites that already exist for each kind of data.*

Proposal: collocated absolute gravity measurements

Starting point: Collocated absolute gravity and displacement measurements provide a constraint for the tie between the Center of Mass of the Earth system and the reference frame origin

Wahr et al. (1995): Collocated observations give information on current mass changes.

Proposal: collocated absolute gravity measurements

Wahr et al. (1995):

$$\Delta = (1 + \alpha\beta)u - \alpha\delta g$$

$\beta = -0.3086 \text{ nm/s}^{-2}$: gradient

$\alpha = 0.650 \text{ mm}/(\text{nm/s}^{-2})$: from postglacial rebound models

Δ depends on presentday mass changes, only.

Plag et al. (2007):

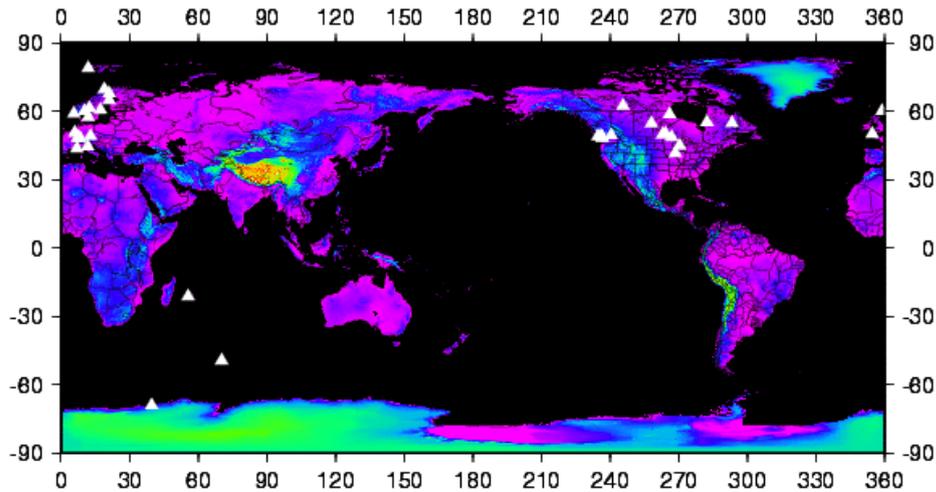
$$\Delta = (1 + \alpha\beta)(u + v) - \alpha\delta g$$

with

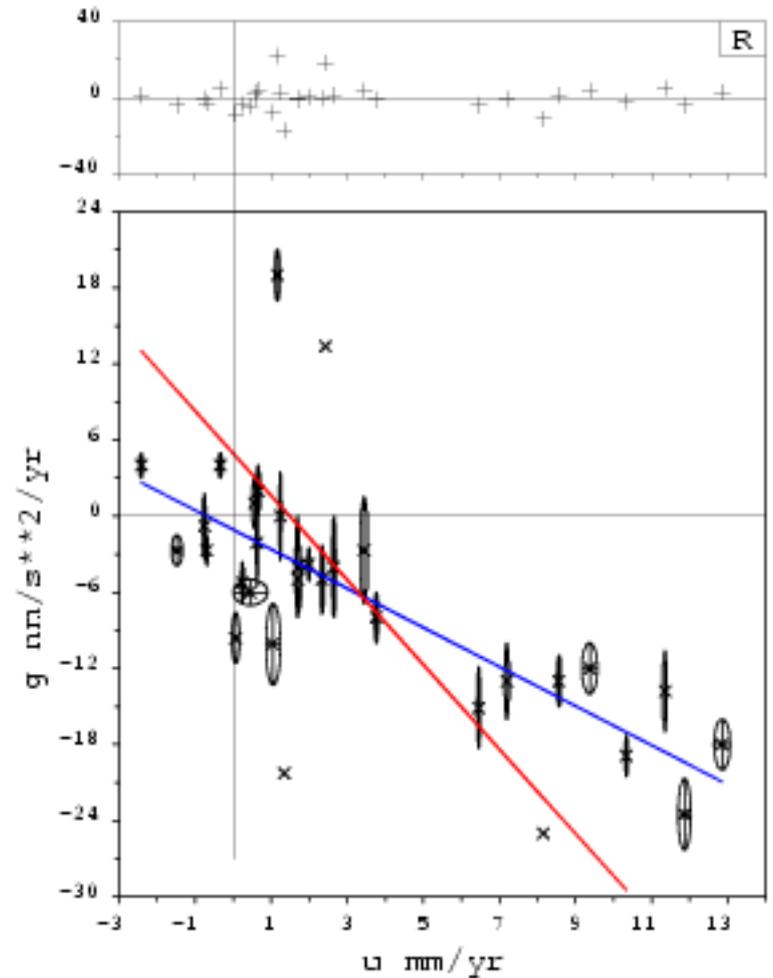
$$\begin{aligned} v &= \langle \vec{d}, \vec{\hat{r}} \rangle \\ &= d_x \sin \theta \cos \phi + d_y \sin \theta \sin \phi + d_z \cos \theta \end{aligned} \tag{1}$$

Collocated absolute gravity and displacement measurements allow

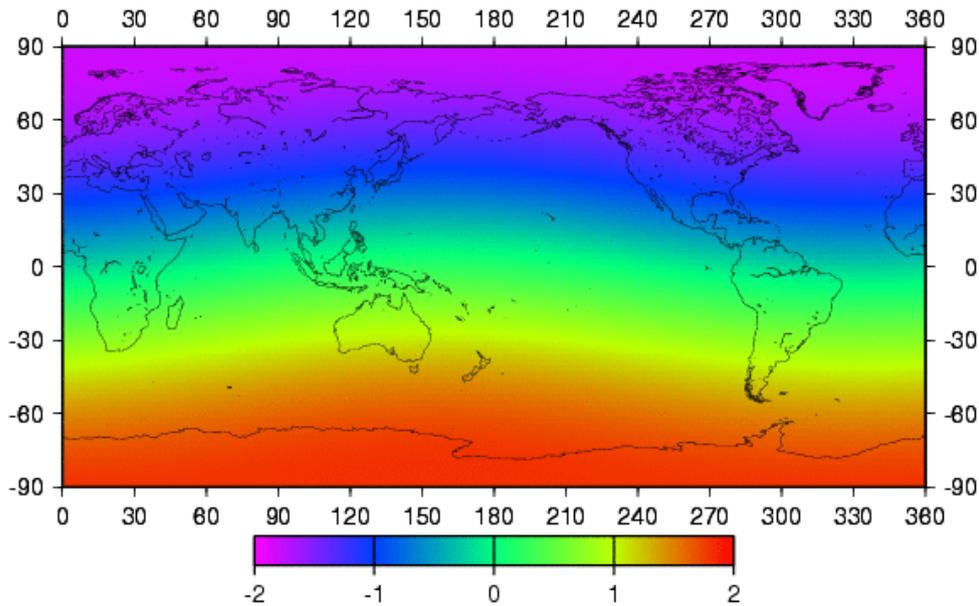
Proposal: collocated absolute gravity measurements



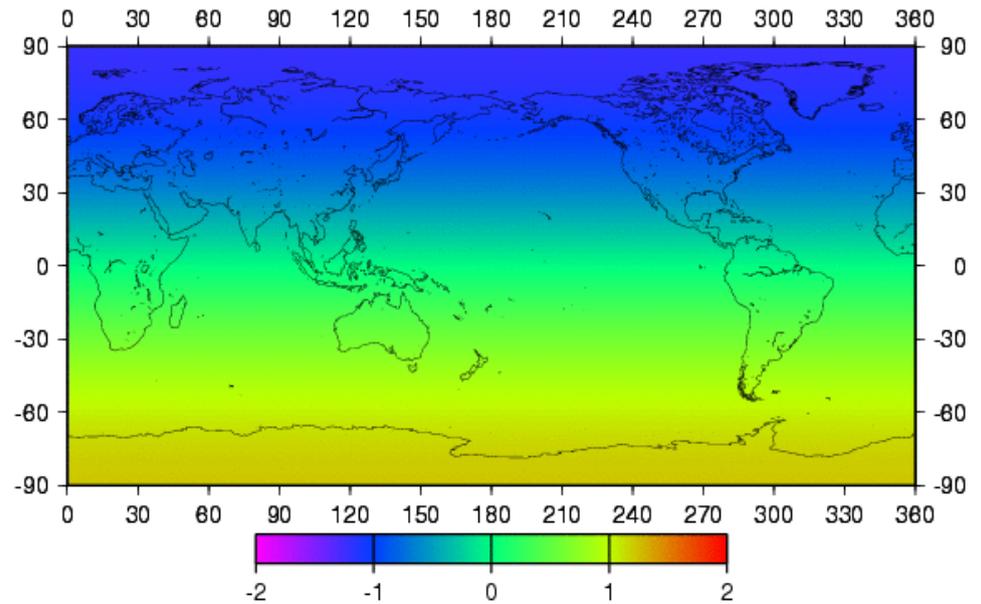
- Collected publish absolute gravity trends
- Analysed collocated GPS observations
- Due to station location, constrain only for Z-component
- Zero step: Regression with $v=\text{constant}$



Proposal: collocated absolute gravity measurements



- ITRF2000 – ITRF2005



- ITRF2000 – abs. grav. frame

- ITRF2000 – ITRF2005: $(-0.2, 0.1, -1.8)$ mm/yr
- ITRF2000 – abs. grav. frame: $(0.0, 0.0, -1.2 \pm 0.3)$ mm/yr
- Scandinavia alone: -1.6 mm/yr

Proposal: collocated absolute gravity measurements

Proposal:

- Collocate permanent absolute gravimeters with geometric sites
- Number of stations: 30 – 40(?)
- Global distribution
- Preferred sites with small on-going mass changes

On-going discussion with D. Crossley, J. Hinderer, T. Niebauer:

- optimal: combination of superconducting and absolute gravimeters
- absolute gravimeter can be automated, calibration free
- absolute gravimeter is better for low frequencies