ECGN Status 02/2009

Markku Poutanen

ECGN Working group

- ✓ Markku Poutanen
- ✓ Jaroslav Simek

- ? Martine Amalvict
- ? Carine Bruyninx
- ? Jaakko Mäkinen
- ? Johannes Ihde
- ? Herbert Wilmes
- ? Ambrus Kenyeres
- ? Olivier Francis
- ? Steve Shipman
- O Trevor Baker

What kind of WG should have in ECGN ?
- Representatives of all included techniques
- Representatives of EUREF-TWG
- Link to GGOS?
- ?

Tasks of ECGN WG
- Tbd.

European Combined Geodetic Network

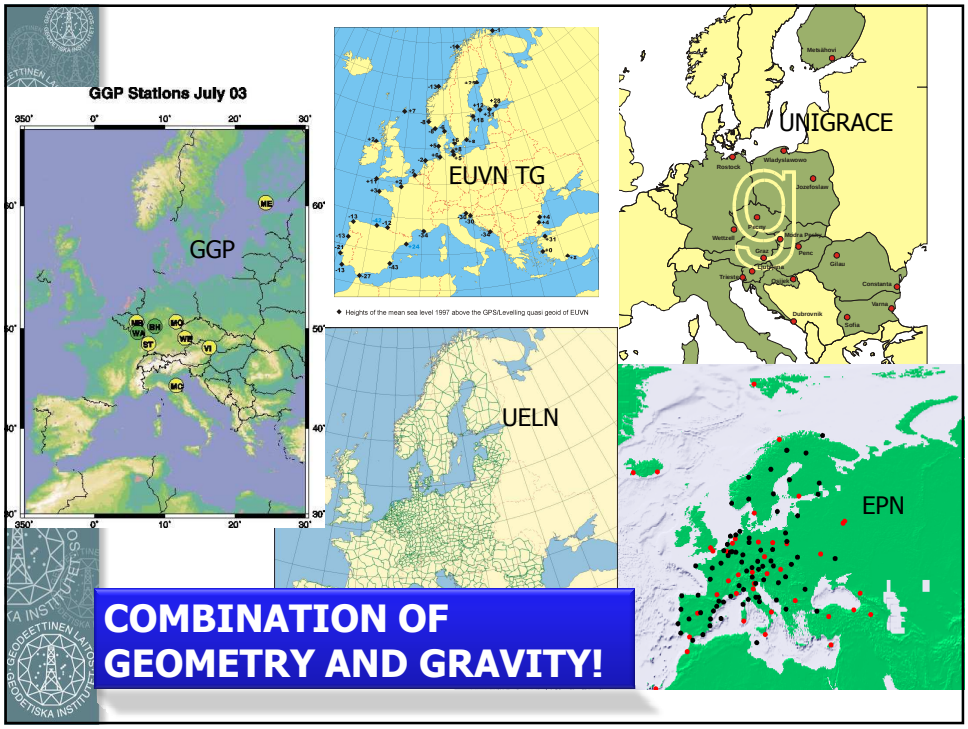
Objectives of the ECGN as an integrated European Reference System for Spatial Reference and Gravity are:

- Maintenance of a long time stability of the terrestrial reference system with an accuracy of 10^{-9} for Europe especially in the height component
- In-situ combination of geometric positioning (GPS) with physical height and other Earth gravity parameters in 1 cm accuracy level
- Modelling of influences of time-dependent parameters of the solid Earth of the Earth gravity field, the atmosphere, the oceans, the hydrosphere for different applications of positioning

Among the further aims rank

- contribution to the European gravity field modelling
- the modelling of gravity field components to validate the satellite gravity missions **CHAMP**, **GRACE** and **GOCE**
- and to be a platform for further geo-components (GMES, GEOSS, GGOS)

The ECGN is considered as a European contribution to the IAG project Global Geodetic Observation System (GGOS). At the business meeting of the IGGC at the Gravity and Geoid 2002 Symposium in Thessaloniki the ECGN project as a cross-commission project was approved. The primary concern of the project consists in connecting the height component with the gravity determination while allowing for measuring data that are acquired in the European coastal regions and above adjacent seas.



Techniques

Technique	Objective	Accuracy	Component(s)
VLBI	Point positioning relative to space	0.001 ppb 0.1 mas	Surface displacement; Earth rotation; Reference frame
SLR	Point positioning relative to many satellites	< 1 cm (range) 1-2 cm	Surface displacement; Earth rotation; Reference frame
GNSS	Point positioning relative to a satellite system	E: 1-2 cm *) C: 1-2 mm	Surface displacement; Reference frame
DORIS	Point positioning relative to satellites	1-5 cm	Surface displacement; Reference frame
Levelling	Height differences of points relative to the geoid	< 1 mm/km$^{1/2}$	Surface displacement; Reference frame
Tide gauges	Height of points relative to sea level	E: 10 cm C: 1 cm	Surface displacement; Reference frame
Absolute gravimeters	Absolute gravimetric accelerations	2-3 µGal	Surface displacement; Earth rotation; Gravity; Reference frame
Superconducting gravimeters	Relative gravimetric accelerations	0.1 µGal (< 1 nGal periods)	Surface displacement; Earth rotation; Gravity; Reference frame
Spring gravimeters	Relative gravimetric accelerations	2-3 µGal	Gravity; Reference frame

*) *E means episodical and C continuous measurements*

Topics / Techniques included

- GNSS = EPN (All ECGN stations should be included to the European Permanent GPS network (EPN). Therefore the stations have to fulfill the requirements of EPN)
- Gravity (absolute gravity, superconducting gravimeters (GGP))
- Levelling = UELN (All ECGN stations should be connected to the United European Levelling Network - UELN)
- Tide gauge = PSMSL, ESEAS (For Tide Gauge measurement the data of Permanent Seal Level Observing System - PSMSL and the project European Sea Level Service - ESEAS should be used)
- **What else? (geoVLBI, SLR, DORIS, …)**

ECGN - 1st call

Call for Participation - Implementation of ECGN stations

The paper of the 1st call for Participation (PDF, 300 kB) was sent out to about 150 potential institutions and organisations in Europe as starting point for the ECGN project.

As response of the 1st Call more than 20 European countries sent proposols. About 70 stations were proposed to participate in the ECGN.

At ECGN Working Group Meetings at EUREF Symposium 2003 in Toledo and September 4-5, 2003 in Frankfurt/Main an agreement about the criteria to evaluate the proposals of the 1st call was founded and the individual proposals were discussed.

A validation of the proposed stations were done. As result the a station list with status in four criteria

- core
- ok
- candidate
- proposed

was evaluated. This actual status of stations is now available. Details see topic **STATIONS**

The need of additional stations especially in regions and countries which are not well covered yet, was stressed. ***Generally the first ECGN call is still open. Further proposals will be accepted.***

ECGN - 2nd call

Call for analysis and investigations of ECGN

planned

Status / GNSS

- EPN up and running
- Fully organized
- Operational and analyzing centers exist
- Data base exist
- Easy access to data and results
- Standards for becoming a GNSS EPN Station
- Connections to GGOS (via IGS, IERS)

✓ **This component is ready and operational.**
✓ **Produces data and results for global and regional use**
✓ **In the viewpoint of the ECGN no further action is needed**

How to select stations to be included in ECGN or are all EPN stations automatically in ECGN?

Status / gravity

- ECGN Standards for Absolute Gravity measurements
- Standard for SG observations (Global Geodynamic Project GGP)

ECGN Standards
for Absolute Gravimeter (AG)

During the Meeting on September 4-5, 2003 it was agreed that the absolute gravity data format for archiving as proposed by BGI has not yet reached a status that it might be applicable for the groups working with the FG5 gravimeters within the ECGN project. The necessary specifications for the ECGN project should be fulfilled in an easy way making use of the procedures already applied by the majority of applicants and avoiding additional effort by reformatting or duplicating the information which is already available after the measurements.

Therefore a specification in three levels was presented. This proposal is based upon the assumptions that all participating groups use measurements with the FG5 gravimeter and apply the producer-provided g-software.

Status / levelling

- UELN network exists
- ECGN Standards Levelling Connection of the ECGN Station
- ECGN Levelling Form

ECGN Standards

for the Levelling Connection of the ECGN Station

General Requirements

The levelling height of the ECGN marker has to be determined in relation to the European Vertical Reference System (EVRS). The current realization of the EVRS is the EVRF2000 which is realized by the geopotential numbers and normal heights of nodal points of the United European Levelling Network 95/98 (UELN 95/98) extended for Estonia, Latvia, Lithuania and Romania .

The connection has to be determined between the ECGN levelling marker and the

a) UELN 95/98 for all countries which are members of the UELN (see http://evrs.leipzig.ifag.de/)
b) National height system for islands whose levelling network is not connected to the European continent and for all countries which are not members of UELN.

In case you are unsure about the position of the UELN points in your country you can get the information at martina.sacher@bkg.bund.de.

Status / Tide gauges

- For Tide Gauge measurement the data of Permanent Seal Level Observing System - PSMSL and the project European Sea Level Service - ESEAS should be used.
- ECGN Standards for Tide Gauge measurements

ECGN Standards
for Tide gauge measurements

General Requirements

The tide gauges measurements have to satisfy the general recommendations of the Intergovernmental Oceanographic Commission (http://www.pol.ac.uk/psmsl/manuals) in order to fulfill the standards of the international sea-level centers, networks and services (e.g. Permanent Service for Mean Sea Level – PSMSL, European Sea Level Service - ESEAS, Global Sea Level Observing System – GLOSS). This comprises the technology of the tide gauge, sampling intervals, data processing etc. Special attention has to be put on the regular geodetic fixing of the tide gauge to ensure the necessary long-term stability and reliability of the measurements. The height differences between the tide gauge contact point, tide gauge benchmark, the GPS benchmark and possible further benchmarks should be determined at least once a year. Results of these measurements have to be documented in order to monitor possible deformations or settlements over a long period. It is recommended to implement all tide gauge stations participating at the ECGN in the frame of the GPS Tide Gauge Benchmark Monitoring Pilot Project - TIGA-PP.

Further useful hints and recommendations concerning continuous GPS measurements at tide gauge stations may be found at http://www.soest.hawaii.edu/cgps_tg.

Other techniques

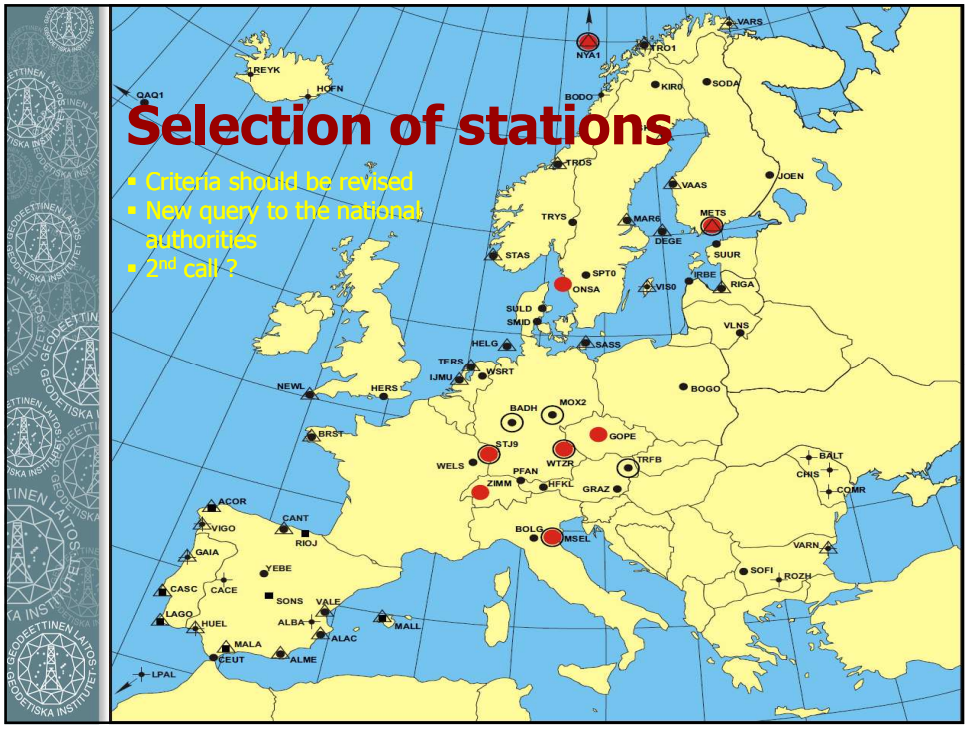
- geoVLBI
- SLR
- DORIS

All these are included in the IAG services. There is no need to establish any other organization. We should establish a link in ECGN to the respective services.

Station hierarchy

- **Core stations**: if criteria for ECGN are fulfilled and there are additionally some special conditions like fundamental station/observatory and/or measurements of SG exist
- **Ok**: if criteria are fulfilled at present or will fulfilled in the future e.g. are planned
- **candidate station**: few of the criteria are not fulfilled (e.g. perm GPS not yet realised)
- **proposed station**: some more criteria are at present and perhaps will not be fulfilled in the future

Should this hierarchy be revised, based e.g. on the number of techniques, quality of local ties, ...



Ihde, Feb. 2007:

… we have not made good progress with regard to the mass of the stations regarding the metadata (station descriptions, the connection levellings and the gravimetric data)…

… in the next step I see that a progress must be reached regarding the safeguarding of the gravimetric data. For this at BKG a database for absolute gravity measurements was conceived …

… There are a number of projects in the meantime which deal with the combination of geodetic information, gravity measurements and the data of the satellite gravity field missions…

Status of ECGN Metadata

Status: 2007-02-09

yes = available

	Site Name	Station Code (GPS)	GPS Status (EPN)	Metadata Form					Additional Forms				
		[..] code not available, temporary defined code	(p) = planned	Form	GPS	Lev	Grav	Ties	GPS Form	ECGN Levelling Form	Gravity	Local ties	Miscellaneous
AT													
AT	Graz	GRAZ	EPN	-	-	-	-	-	yes	yes	yes	yes	
AT	Innsbruck / Hafelekar	HFLK	EPN										
AT	Bregenz, Pfaender, Moos	PFAN	EPN	-	-	-	-	-	yes	yes	no	yes	
AT	Pernitz / Trafelberg	TRFB	EPN	-	-	-	-	-	yes	yes	yes	yes	
BG													
BG	Rozhen	[ROZH]	perm										
BG	Sofia	SOFI	EPN										
BG	Varna	[VARN]	perm (p)										
CH													
CH	Zimmerwald	ZIMM	EPN	yes	yes	yes	yes	yes			yes (Report)		
CZ													
CZ	Ondrejov, Pecny, Geodetic Observatory	GOPE	EPN										
DE													
DE	Bad Homburg	BADH	EPN	yes	yes	national height	yes	*yes*	yes	at present not possible			
DE	Helgoland Island	HELG	EPN	yes	yes		yes	yes	yes	not possible (Island)			
DE	Moxa	MOX2	perm	yes	yes	yes	yes	yes	yes	yes	yes	yes	
DE	Sassnitz	SASS	EPN	yes	yes	national height	yes	yes	yes		yes	yes	
DE	Bad Kötzting / Wettzell	WTZR	EPN	yes	yes	yes	yes	yes	yes	yes	yes	yes	
DK													
DK	Smidstrup, Velje	SMID	EPN							yes (2x)			
DK	Suldrup	SULD	EPN							yes (2x)			
DK	Qaqortoq, Julianehaab (Greenland)	QAQ1	EPN										
EE													
EE	Suurupi	[SUUR]	perm (problems)										
ES													
ES	A Coruna	ACOR	EPN										
ES	Albacete	ALBA	perm										
ES	Alicante	ALAC	EPN										

Status Report: Database for Absolute Gravity Measurements

Hartmut Wziontek
Bundesamt für Kartographie und Geodäsie, Frankfurt / Main

Purpose

The growing number of absolute gravity measurements make it desirable to get an overview about existing observations,locations and gravimeters (meta-data) on the one hand and rapid, uniform access to processing results and a well defined storage format on the other. For this purpose, a prototype of a relational database is designed and implemented at BKG.

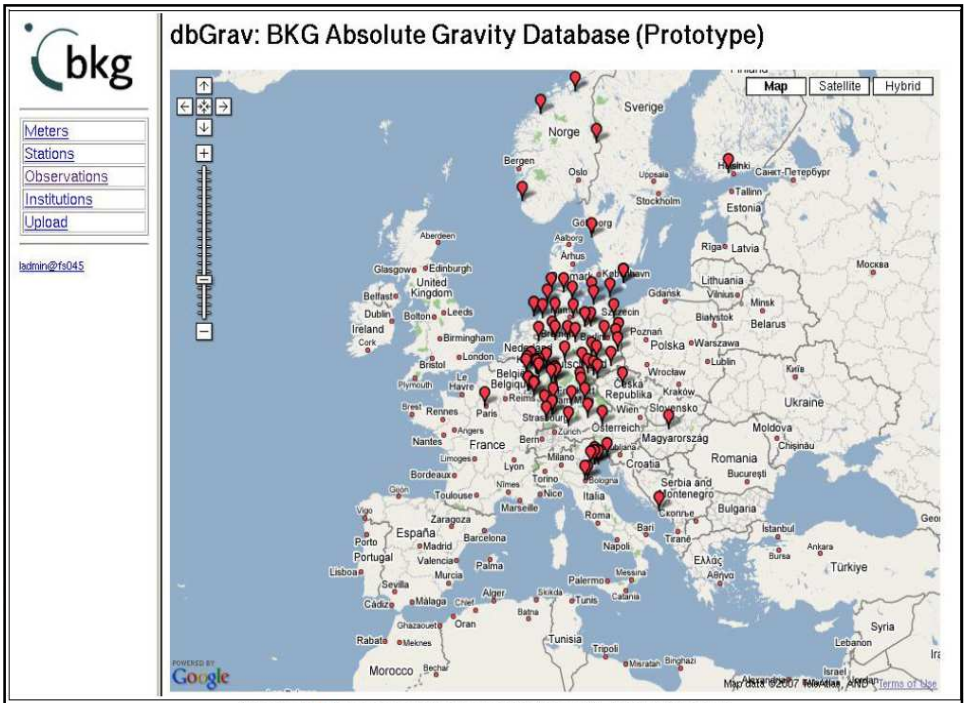


Figure 3: Frontpage of the user interface with interactive map

Recommendations, schedule and topics to be discussed

- Renewal of the Working Group (05/2009)
- Update objectives, tasks, guidelines (?/2009)
- Redefine/update the ECGN station criteria (?/2009)
- Inventory of current ECGN-related activities (?/2009)
- Update the 1st call (2009)
- (Meta)data portal
- Organizational aspects, status of ECGN

- Funding? EU FP7, COST, … ? (task of the WG to propose and seek for funding)
- How to keep on the activity? Where to get resources?