

# ECGN Status

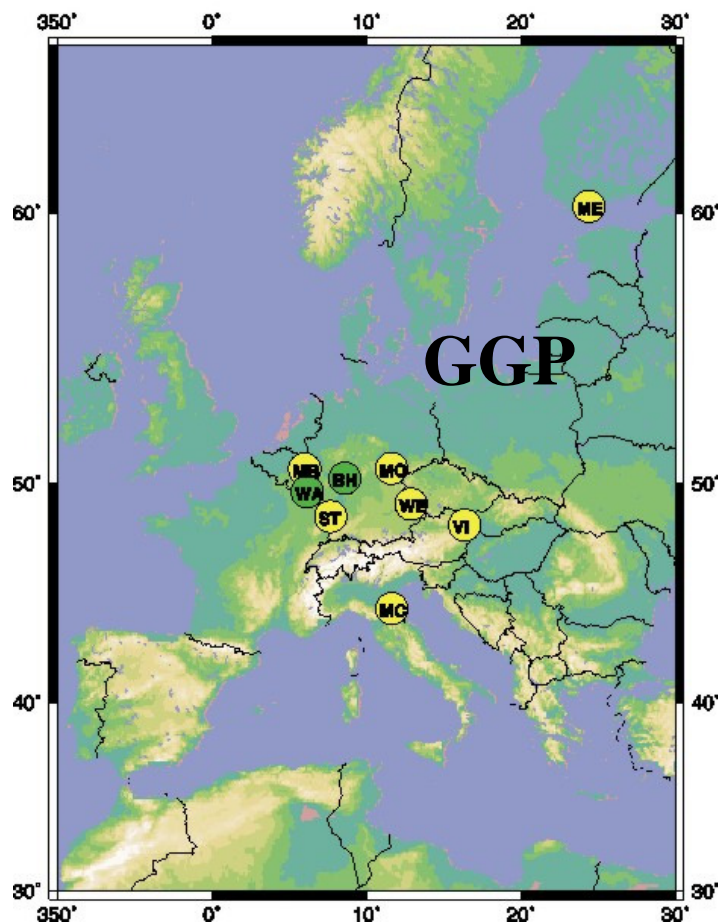
ECGN was initiated by  
IAG Sub-Commission for Europe EUREF (SC1.3a)  
and  
IAG Sub-Commission for Europe of the International  
Gravity and Geoid Commission (IGGC)  
with relationship to

- [Joint Research Centre \(JRC\) of the European Commission \(EC\)](#)
- [Consultative Committee for Mass and Related Quantities \(CCM\) of Bureau International des Poids et Mesures \(BIPM\)](#)
- [IAG Inter-Commission Project Vertical Reference Frames \(ICP 1.2\)](#)
- [IAG European Gravity and Geoid Project \(CP 2.1\)](#)
- [IAG Study Group on Comparison of Absolute Gravimeters \(SG 2.1\)](#)

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# Motivation – Starting Position

GGP Stations July 03



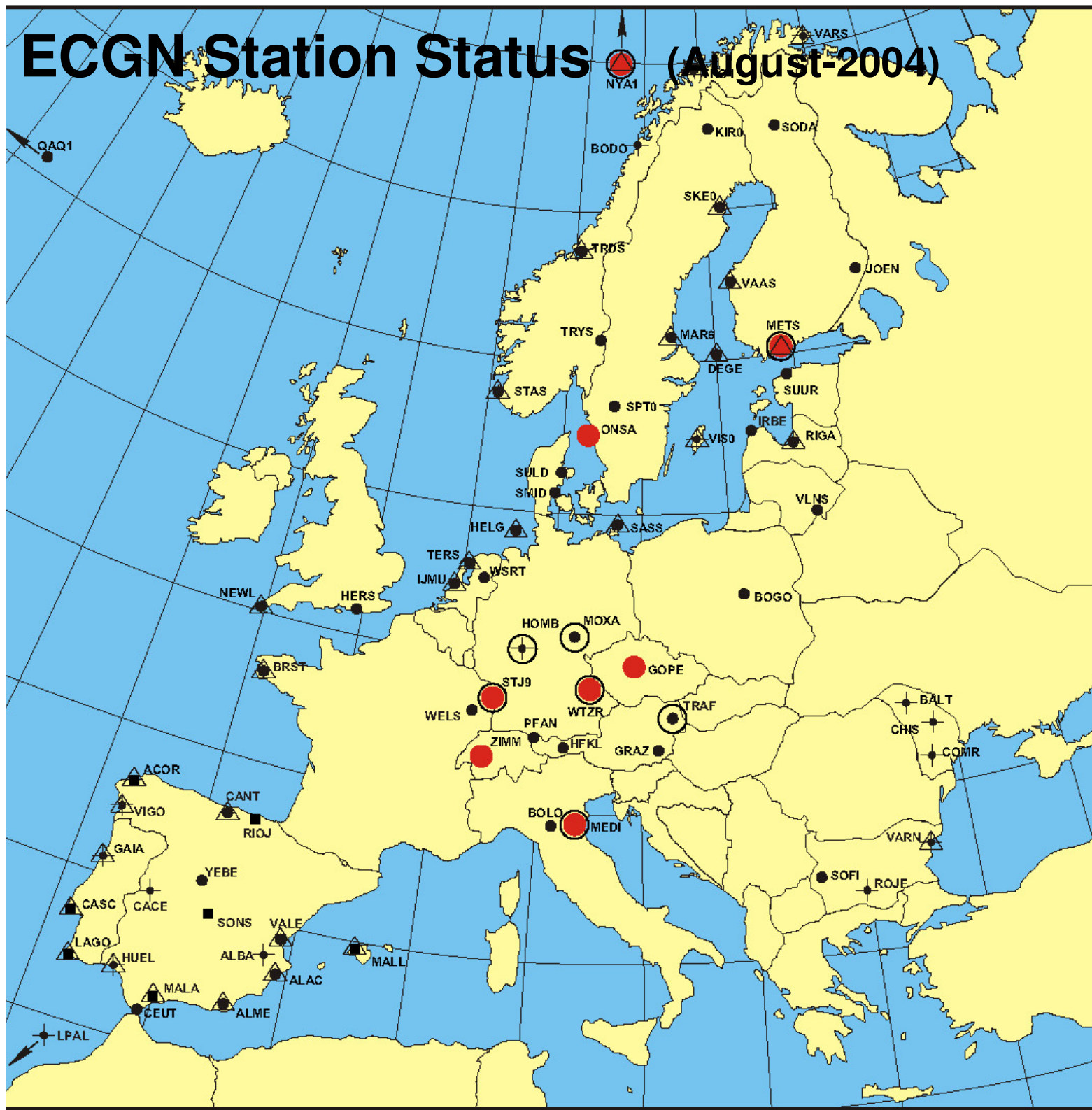
European Projects



# Principles

- **Observation system (GGOS Observing System)**
- **Time series and periodic observations**
- **Combination of space geodesy and gravity at terrestrial reference stations (local ties)**
- **Using of available infrastructure and standards as far as possible**
- **Stepwise realization:**
  - 1<sup>st</sup> Call: Network infrastructure**
  - 2<sup>nd</sup> Call: Data processing, combination**
- **Level of combination:**
  - I. at the stations**
  - II. in the network**
  - III. with external observations ( e.g. GRACE)**

# ECGN Station Status (August-2004)



## ECGN status 1<sup>st</sup> call proposals

- 20 countries
- 72 stations with
  - GPS (EPN)
  - absolut gravity
  - levelling to EVRS
  - 6 super conducting grav.
  - 15 tide gauges
- ❖ 8 ECGN core
- ❖ 42 ECGN
- ❖ 7 candidate
- ❖ 15 proposed



# Standards and Guidelines

- for each main observation technique (GPS, gravity measurements, levelling, tide gauge) guidelines and forms for acquisition of data were prepared
- generally already existing data bases will be used for ECGN project
- GPS
  - all ECGN stations should be included to the European Permanent GPS network (EPN) see: <http://www.epncb.oma.be>
- Gravity measurements
  - ECGN Standards for absolute gravity measurements (see ECGN Website – PDF File)
  - Standard for SG observations - Global Geodynamic Project GGP see: <http://www.eas.slu.edu/GGP/ggpas.html>

- **Levelling**
  - all ECGN stations should be connected to the United European Levelling Network - UELN (see <http://evrs.leipzig.ifag.de>)
- **Tide Gauges**
  - for Tide Gauge measurement the data of Permanent Sea Level Observing System (PSMSL) (<http://www.pol.ac.uk/psmsl/datainfo/contrib.html>) and the project European Sea Level Service (ESEAS) shall be used
- **Local Ties**
  - each type of observation has its own marker and one marker has to be declared as main marker
  - ECGN Standard for Local Ties Determination (see ECGN Website – PDF File)
- **Meta Data Base**
  - ECGN Meta Data Form (see ECGN Website – PDF/TXT File)

# Conclusions for Continuation, Data Analysis, 2<sup>nd</sup> Call

In a second call it will be asked for:

- Investigations for the combination of space technique observations with gravity field related data
- AG/SG combination
- AG/SG array for GRACE/GOCE validation
- Combination of space techniques (GPS/GLONASS, GALILEO, VLBI, SLR)
- Single station analysis of different observation techniques
- Data and analysis centers

**ECGN workshop planned in spring 2005**



# News

- New ECGN home page design
- Address: <http://www.bkg.bund.de/ecgn>
- Levelling Forms of the stations Stationen SMILD/SULD (Denmark) are available
- Stations Höfn und Reykjavik in Island are in preparation
- Absolute gravity measurements for HERS announced for spring 2005

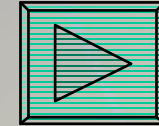
*Sometimes the progress is a snail*



# ECGN Web Site

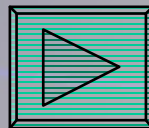
- ECGN Home Page

Address: <http://www.bkg.bund.de/ecgn>



- ECGN Website *Guidelines and Forms* with links to guidelines and forms for the different observation techniques

Startpage - Guidelines



- or Links from BKG-Website

<http://www.bkg.bund.de>

Rubriks Geodesy or Information Services

# Contents

- **Objectives**
- **Network Infrastructure**
- **Standards, Guidelines**
- **Examples**
- **Conclusions for Continuation**



# (1) Objectives of ECGN

## Realization of an integrated European Terrestrial Reference Frame for Spatial Reference and Gravity

- Realization of a terrestrial reference system and maintenance of long time stability with an accuracy  $10^{-9}$  for Europe especially in the vertical component
- In-situ combination of space geodesy (GPS) with Earth gravity parameters (gravity, heights)
- Modelling of influences of time depended parameters to TRF (of the solid Earth of the Earth gravity field, the atmosphere, the oceans, the hydrosphere)
- Modelling of terrestrial gravity field components to validate satellite gravity missions
- Geodetic platform in Europe for geo-initiatives (GMES, INSPIRE, GEOSS, GGOS)

## (2) Network Infrastructure

1st Call for Participation (April 2003):  
Implementation of ECGN Stations

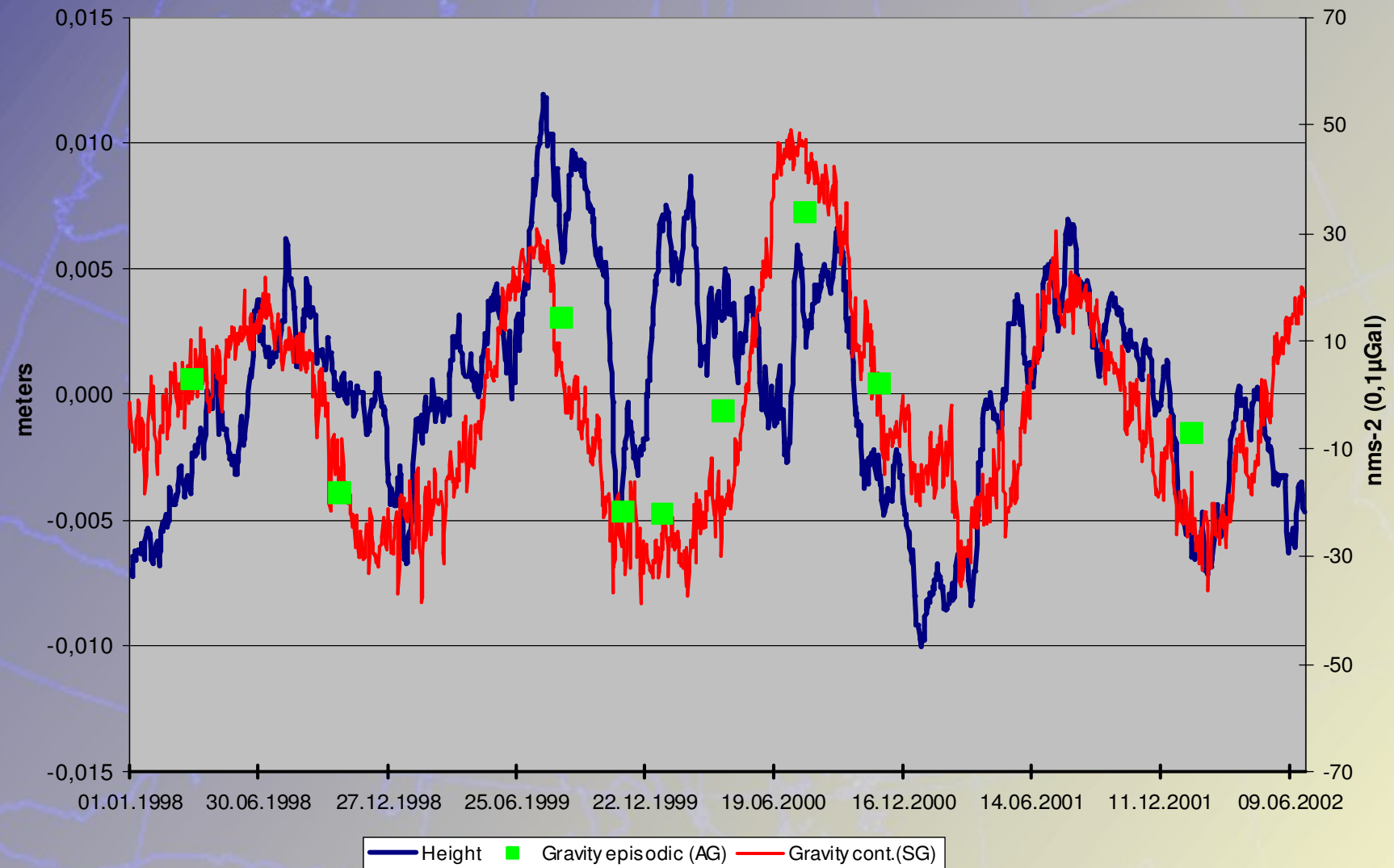
This call concerns the elaboration of the observation network of ECGN stations with the standard observation techniques:

- **GNSS** (GPS/GLONASS, GALILEO) – permanent
- Gravity (**super conducting gravimeter and/or absolute gravimeter**) – permanent or repeated
- **Levelling** connections to the of UELN/EVRS – repeated
- **Tide gauges** – permanent
- **Meteorological parameters** – permanent.



# Example 2: Medicina

Time Variation of Crustal Deformation Monitored by  
Gravity and Space Techniques at Medicina / Italy  
(trend removed)  
(Zerbini/Richter 2003)



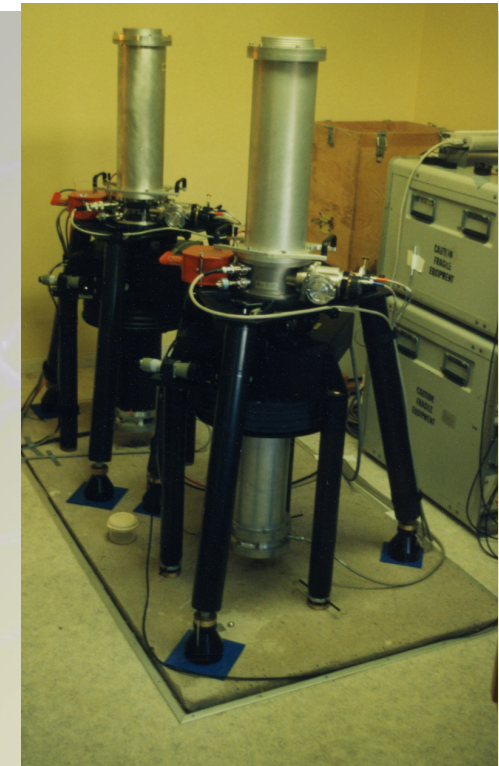
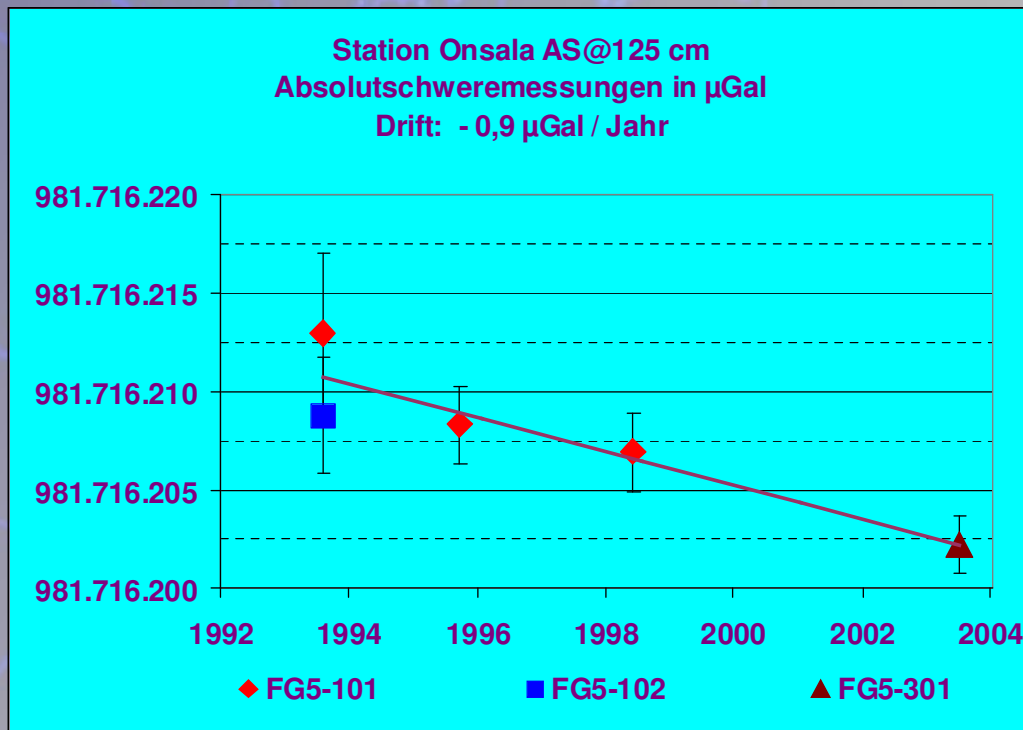
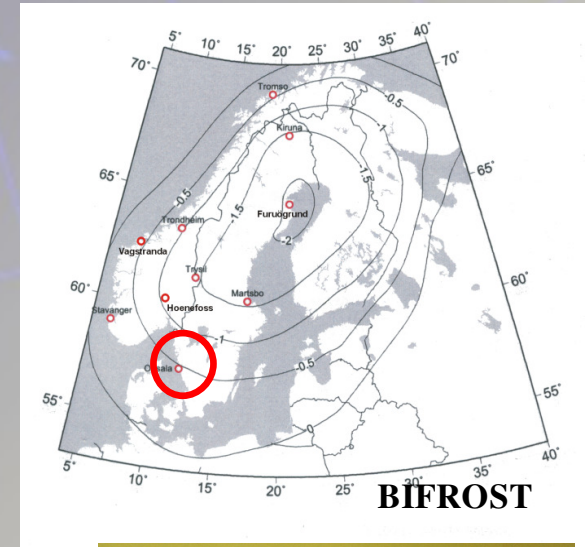
# Examples for Time Variations of Heights

- **SEASONAL VARIATIONS**
  - compare SG variations with GRACE data
  - mass variations (from GRACE) give surface loading changes and hence seasonal variations in GPS/SLR/VLBI
- **SECULAR VARIATIONS**
  - GPS vertical rates have accuracy of 2-3mm/year (reference frame)
  - AG obs. give independent vertical rates
  - also compare EPN at coastline with geological rates and tide gauge rates.

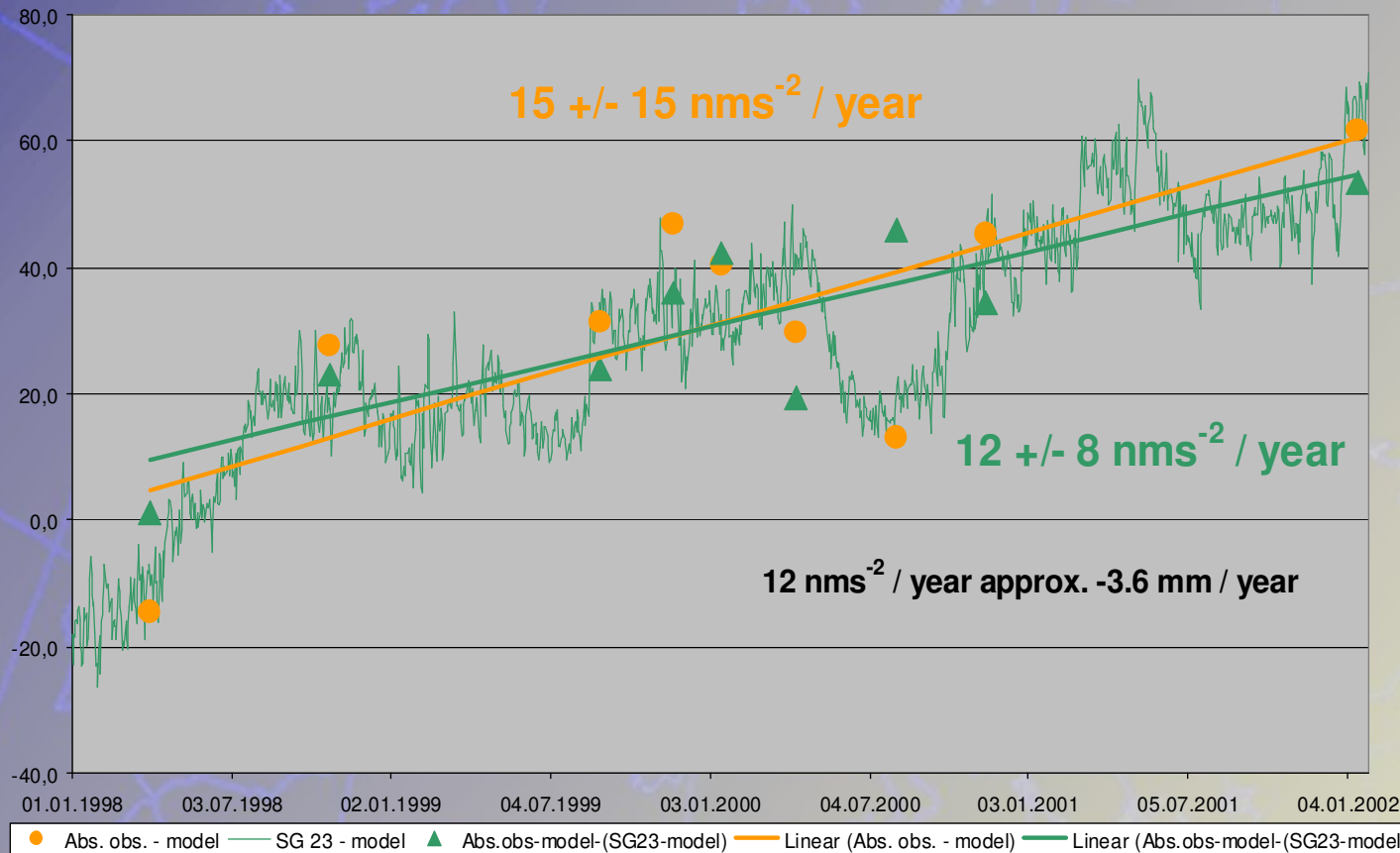


# Example 1: Observed gravity changes

Onsala / Schweden



## Example 2: Long-Term Crustal Deformation Monitored by Gravity and Space Techniques at Medicina / Italy



Height trends for Medicina by

- IGS - 3.6 mm / year
- EUREF - 4.2 mm / year
- Local - 2.2 mm / year
- Gravity - 3.6 mm  
+/- 2.7 mm / year

# Example 3: GPS re-analysis 1/2000 – 12/2003

36 European sites (IGS, EUREF, GREF)

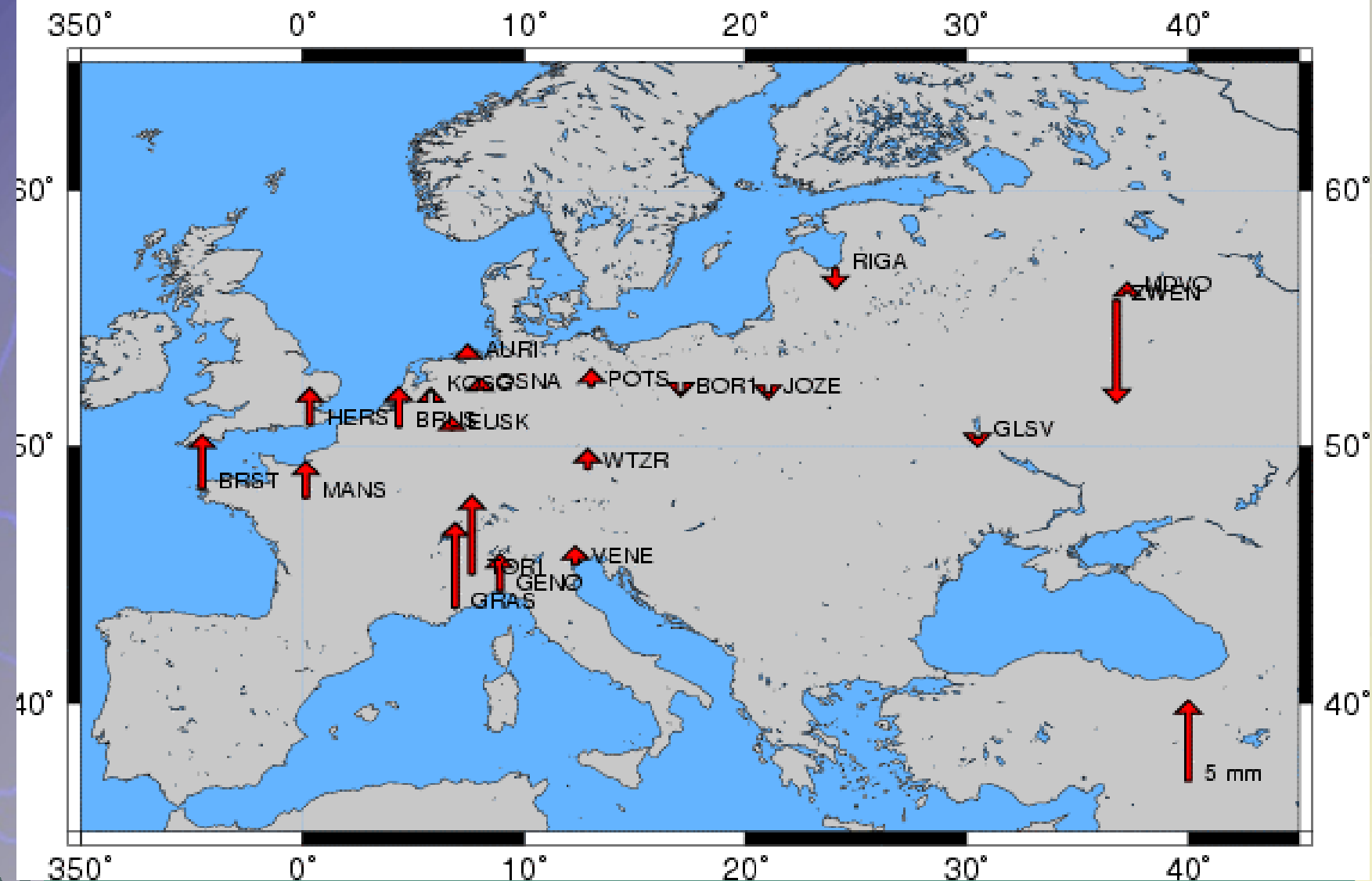
(Söhne/Schwahn 2004)





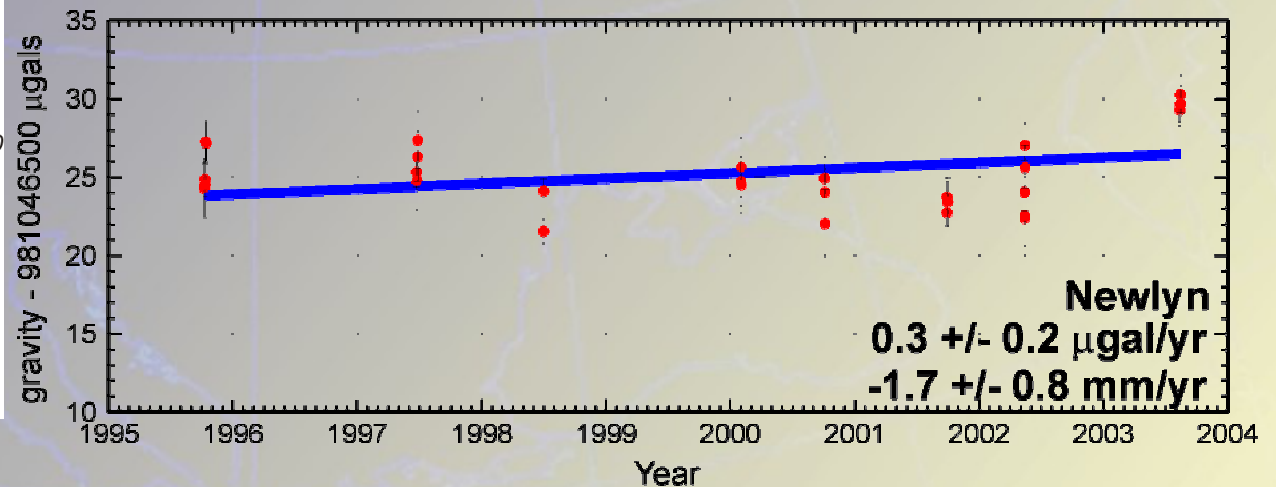
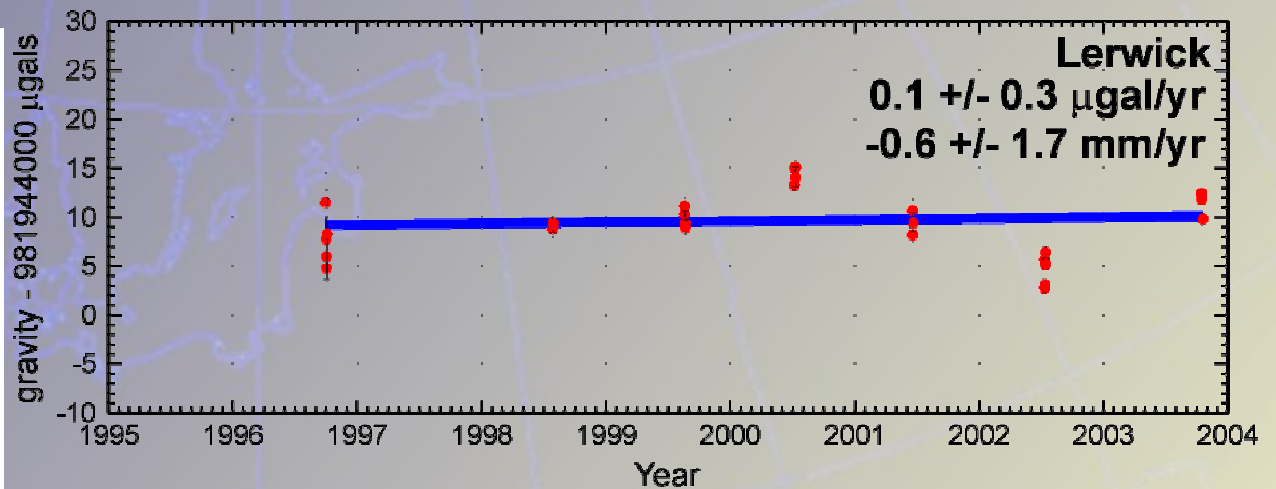
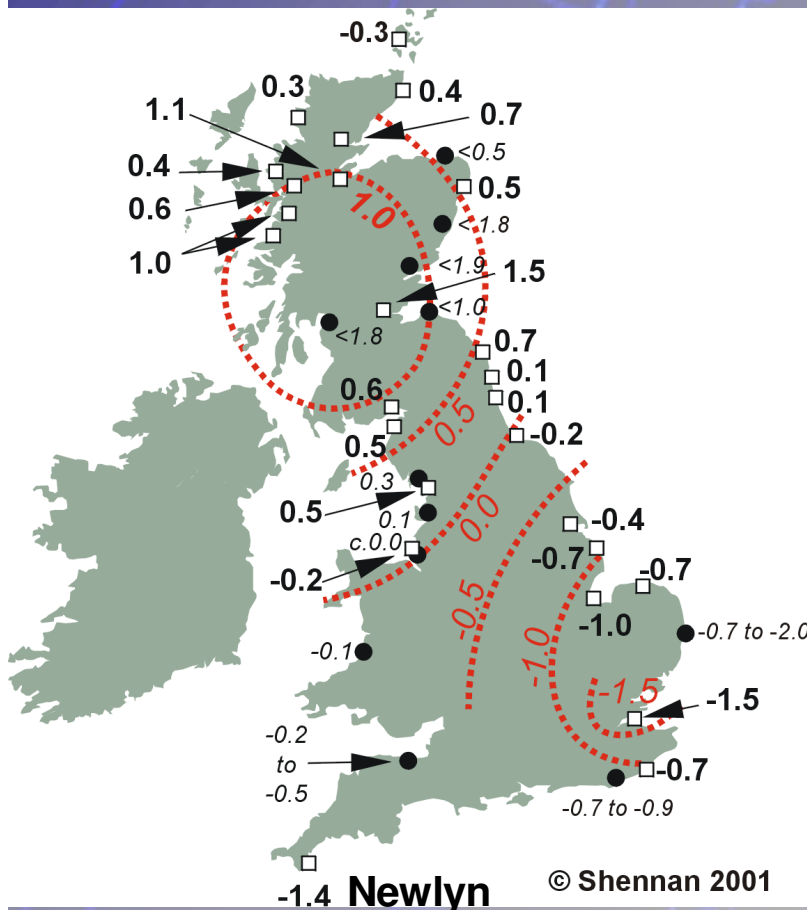
## Vertical residual amplitudes (HELG fixed)

Jan-22



# Comparison of time series of AG and tide gauge observations

- Lerwick



# Residuals of time series – vertical component

16-Apr-2004

