ECGN

A regional geodetic observing system?

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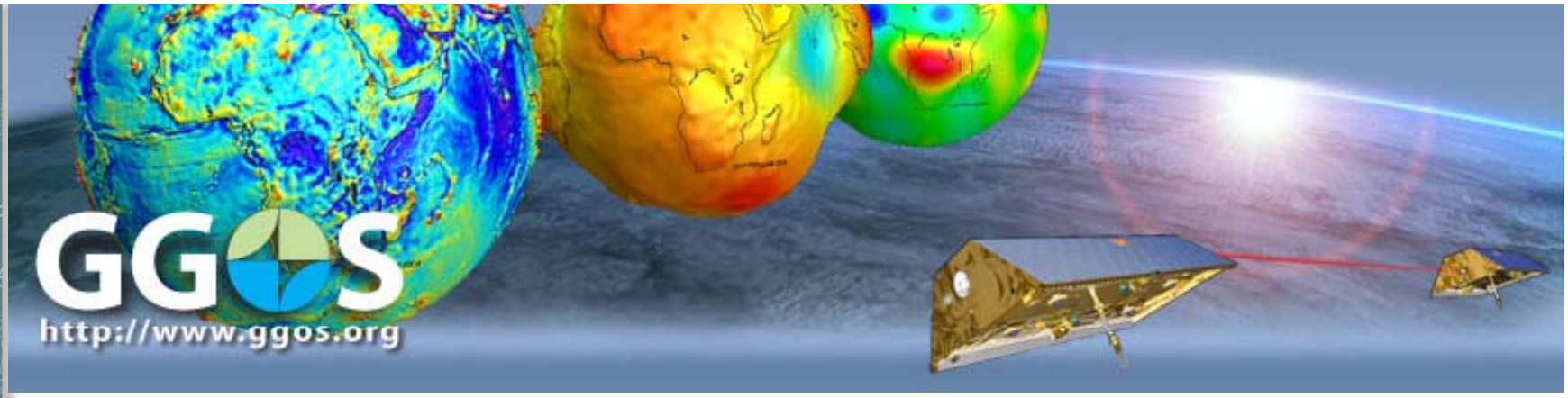


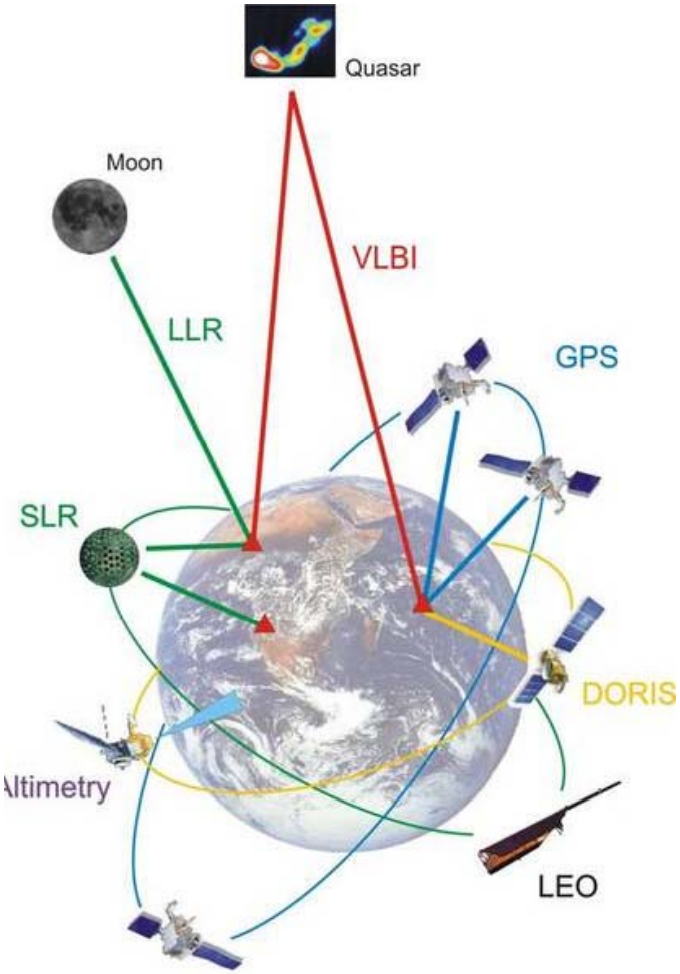
Second Level: Three Pillars of GGOS
(geodesy)

GEOMETRY
GPS, Altimetry,
INSAR
Remote Sensing
Leveling
Sea Level

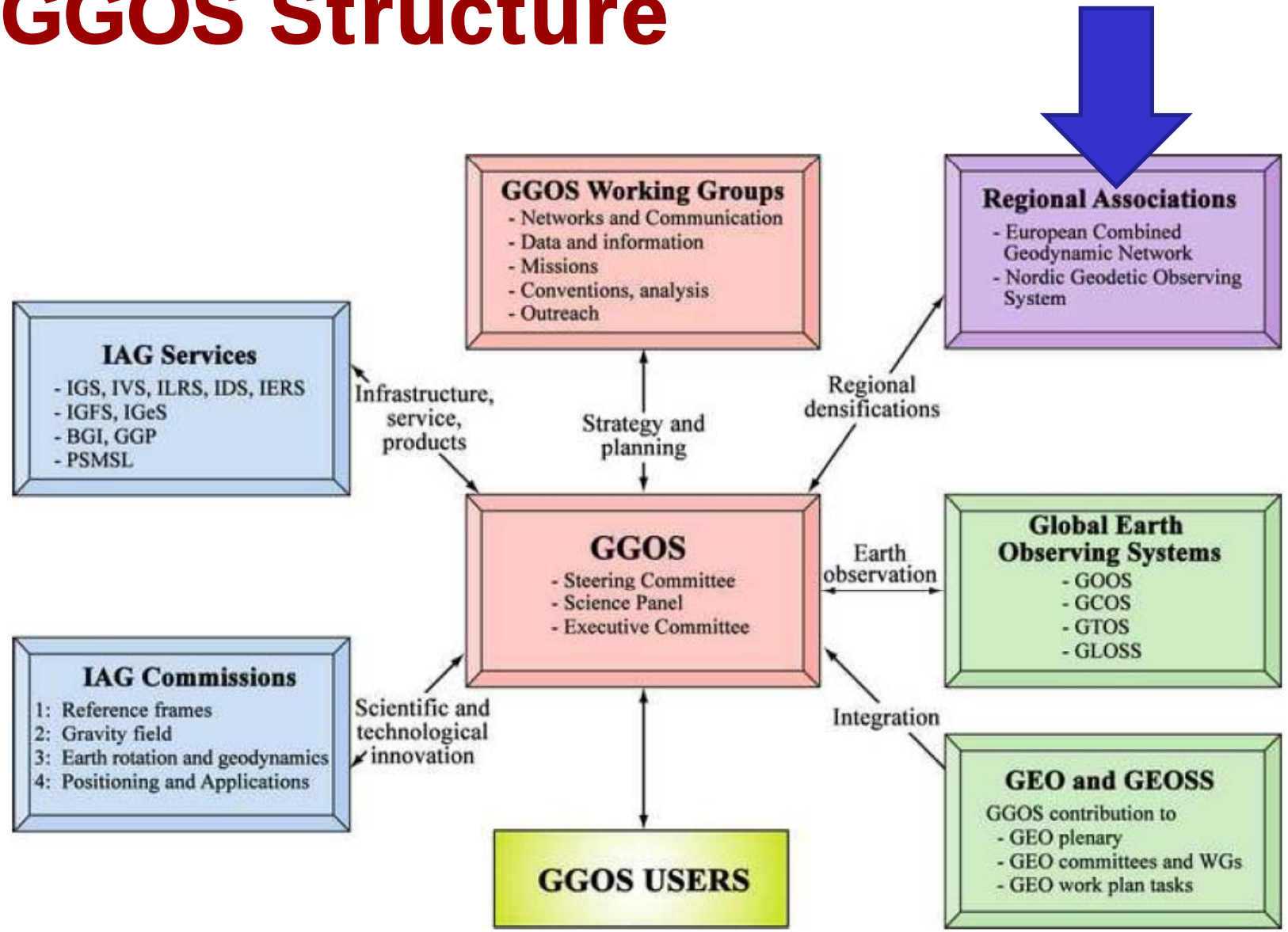
REFERENCE SYSTEMS
VLBI, SLR, LLR,
GPS, DORIS

EARTH ROTATION
VLBI, SLR, LLR,
GPS, DORIS
Classical: Astronomy
New: Ringlasers, Gyros

GRAVITY FIELD
Orbit Analysis
Satellite Gradiometry
Ship-& Airborne Gravimetry
Absolute Gravimetry
Gravity Field Determination



GGOS Structure

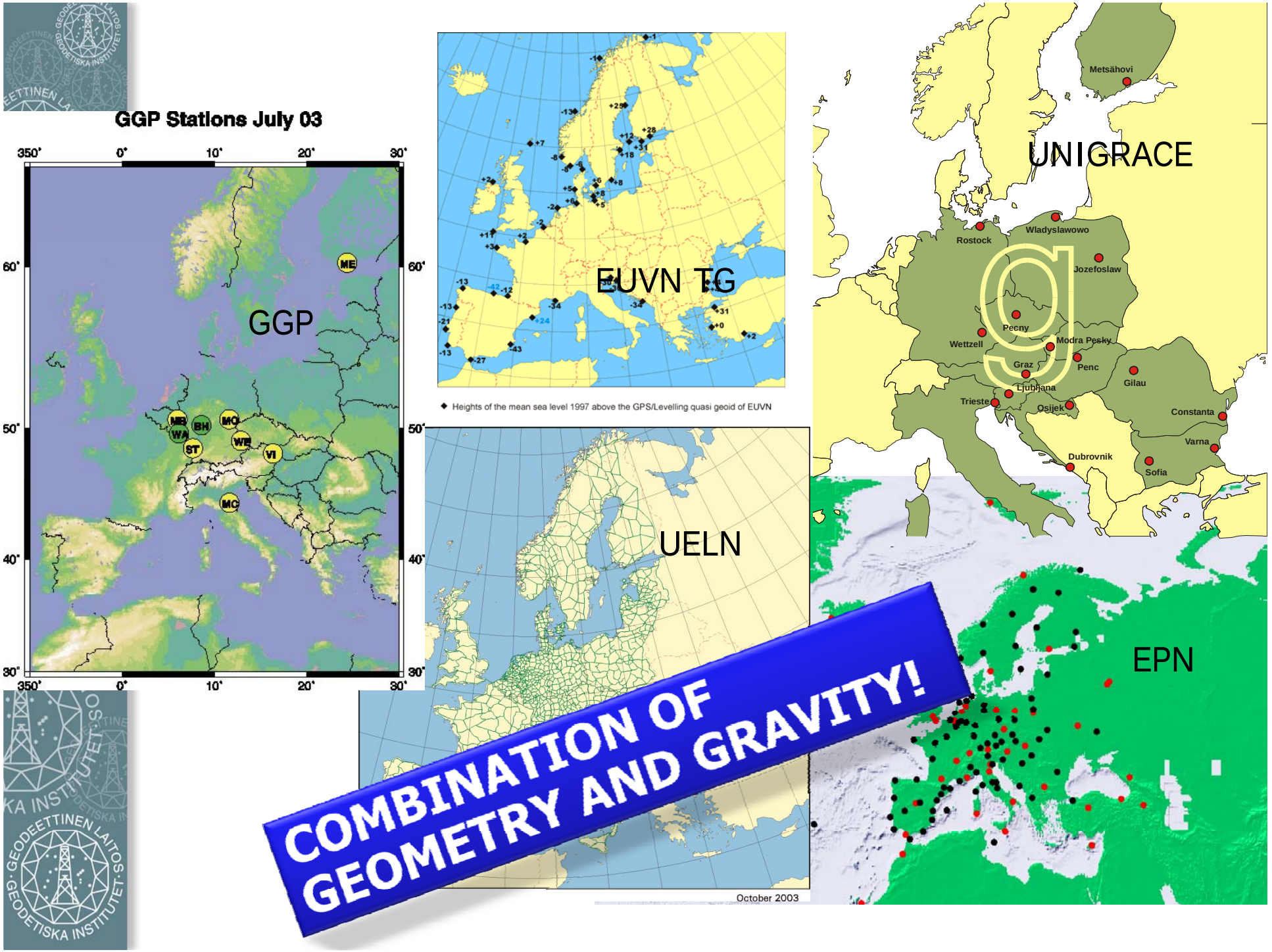


European Combined Geodetic Network

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

- 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)

The ECGN is considered as a European contribution to the IAG's 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.


GGP Stations July 03
GGP
EUVN TG
Heights of the mean sea level 1997 above the GPS/Levelling quasi geoid of EUVN
UNIGRACE
Metsähovi
Rostock
Wladyslawowo
Jozefoslaw
Pecny
Wettzell
Modra Pesky
Graz
Penc
Gilau
Ljubljana
Trieste
Osijek
Constanta
Varna
Dubrovnik
Sofia
UELN
October 2003
EPN
COMBINATION OF
GEOMETRY AND GRAVITY!

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^{½}	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*

ECGN - Stations

Status: 2007-01-23

Status and Techniques (Standard: GPS, absolute gravity, levelling)

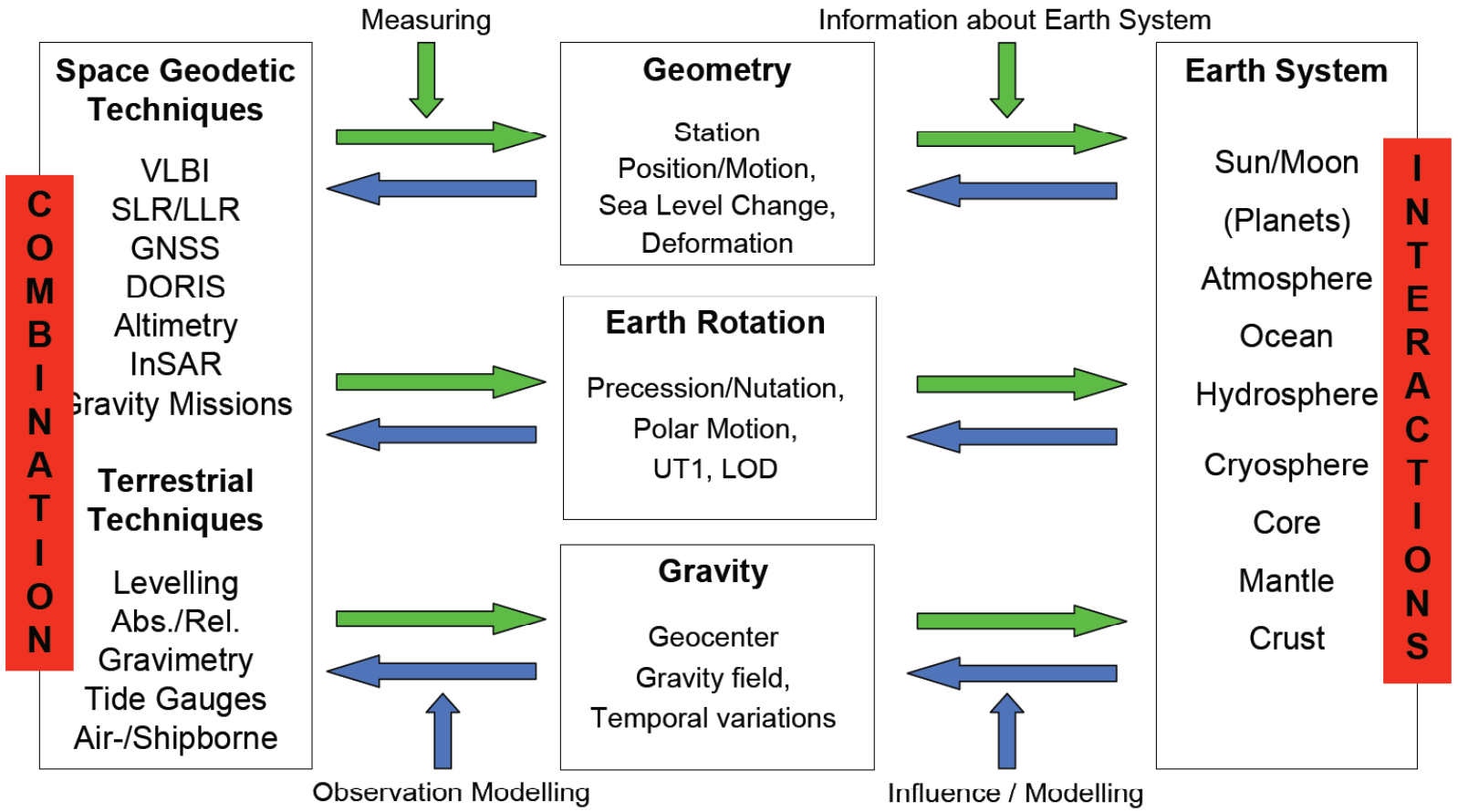
core station	●	super conducting gravimeter	○
station	•	tide gauge	△
candidate station	■		
proposed station	✦		

Why ECGN?

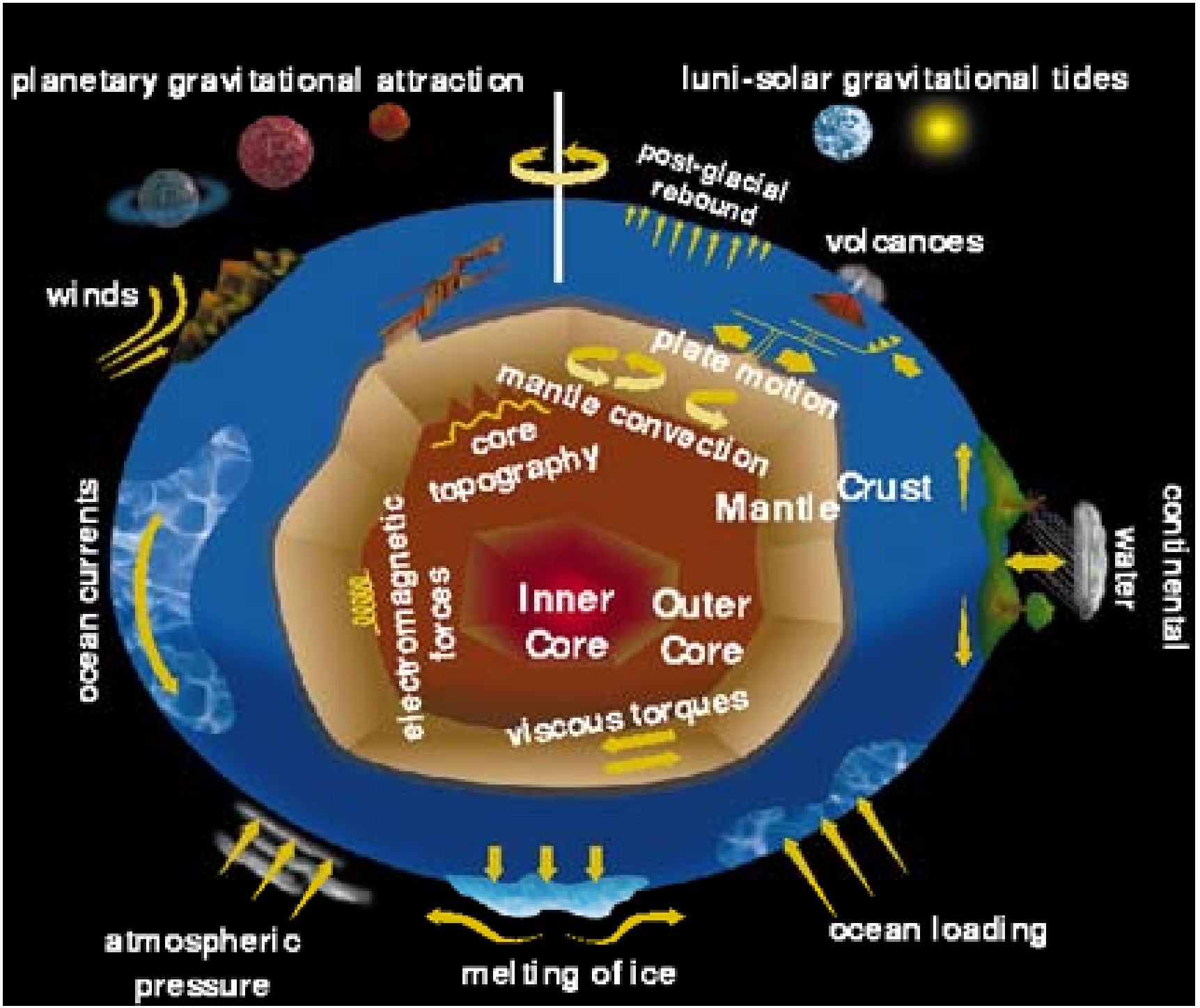
- Geodetic networks of different techniques separated (reference frames, levelling, gravity)
- Connection of observations of different techniques
- Availability of data, access of data
- Quality control of data
- Continuation and stability of the infrastructure
- Response to political and societal needs
- Delivery or products to the end users
- Unawareness of geodetic methods

How?

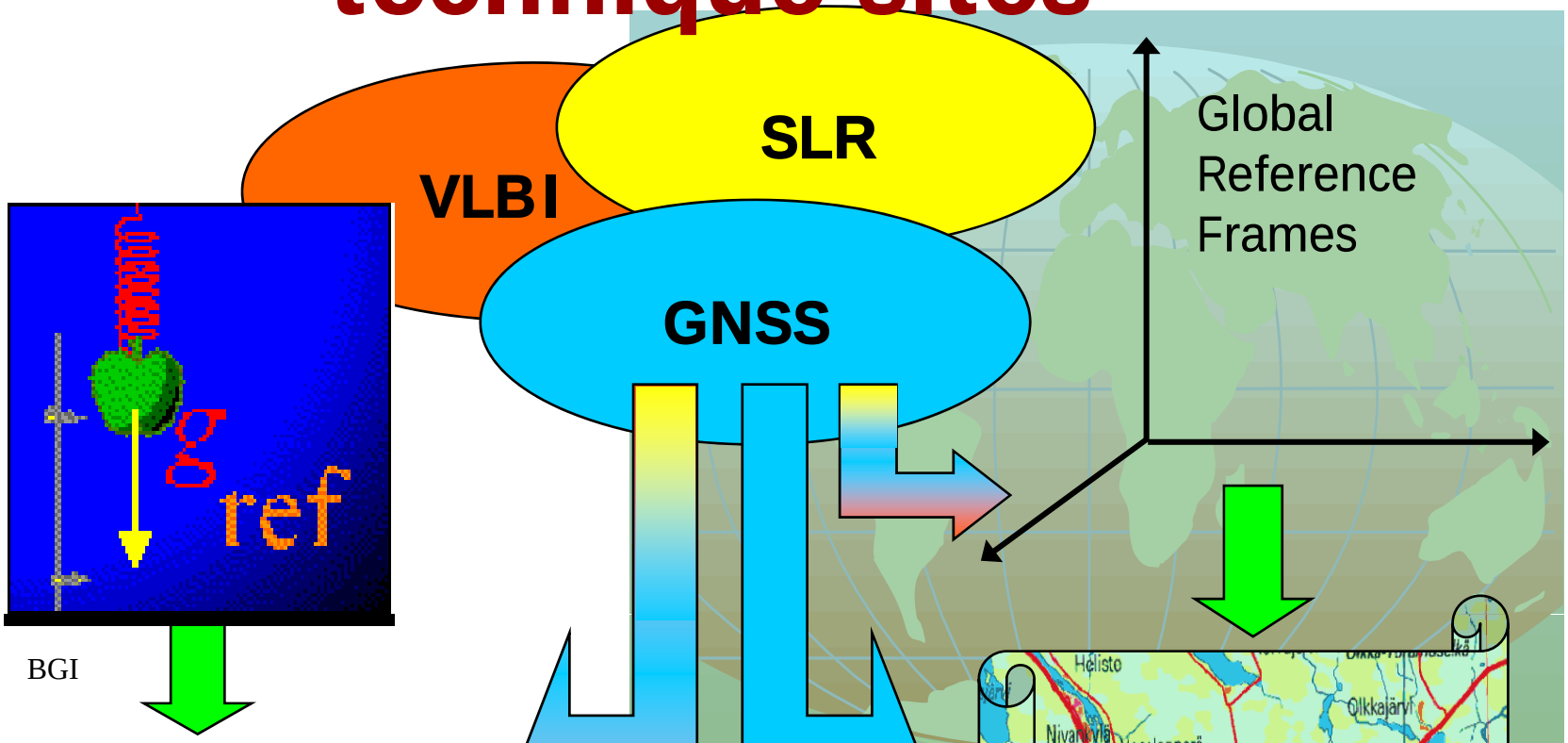
Measuring and Modeling the Earth‘s System



M. Rothacher


planetary gravitational attraction
luni-solar gravitational tides
post-glacial rebound
volcanoes
winds
plate motion
mantle convection
core topography
Crust
Mantle
Inner Core
Outer Core
electromagnetic forces
viscous torques
ocean currents
continental water
atmospheric pressure
melting of ice
ocean loading

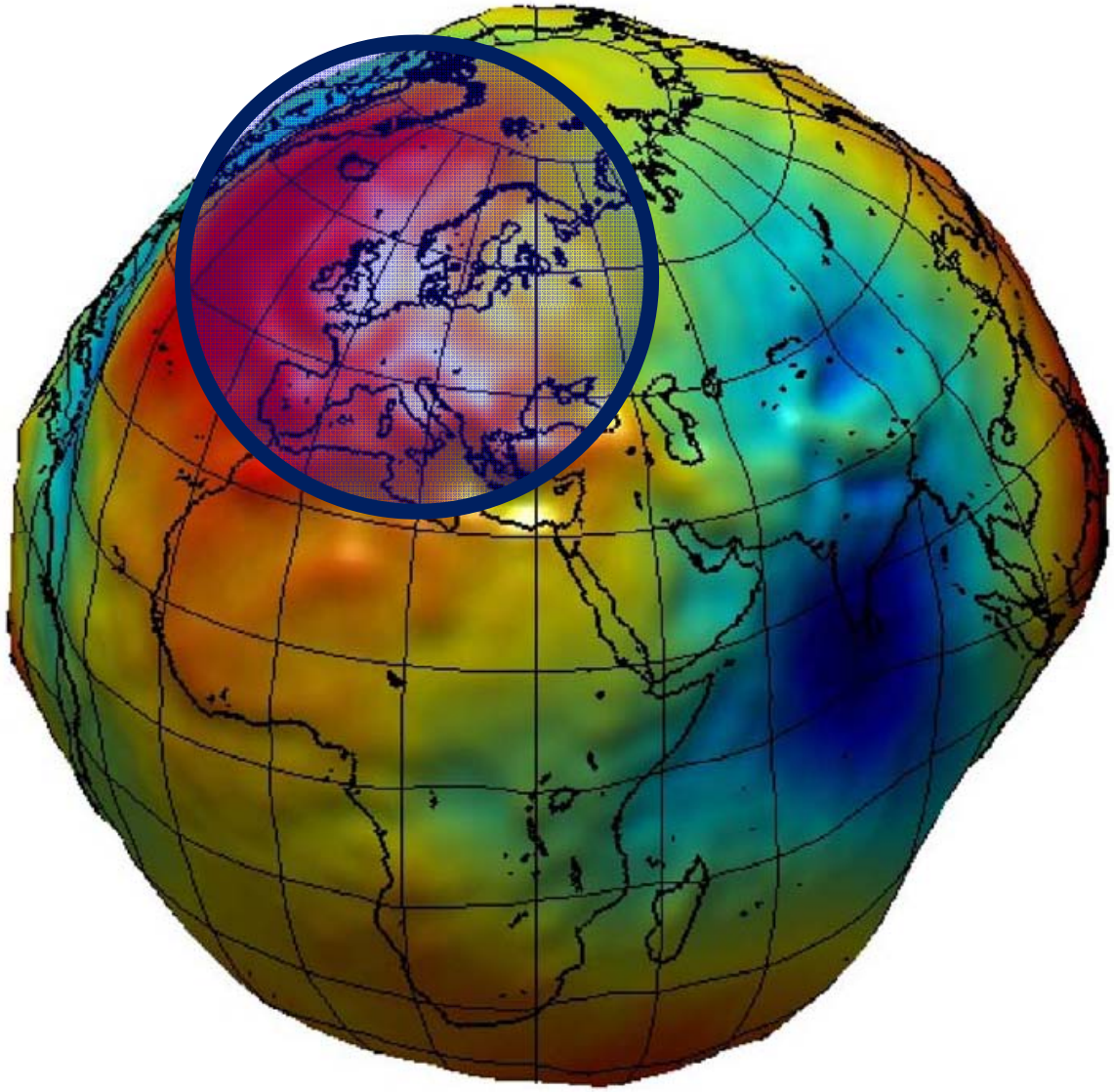
Motivation for multi-technique sites



Geodynamics
Postglacial rebound
Earth structure
Gravity changes
Vertical datums

Local coordinates

Future?



Challenge for geodesy

- Ignorance and unawareness of geodetic networks and importance of stable and well defined reference frames is common. Every civilized country needs up-to-date, easily accessible reference frames for its societal tasks, and such frames do not exist without continuous maintenance.
- Research of global change is an example of the need of geodesy: stable reference frames and precise geodetic observations

To do…

- Convince dear colleagues about the need of geodetic observing system(s)
- “Re-establishment” of the ECGN WG
- Create connections to other groups, organizations (GGOS, ...)
- 2-way benefit of GGOS: use GGOS results locally and contribute to GGOS
- Geodesy, geophysics, ... (multi-disciplinary project)

…but we're not going to re-invent a wheel