

EUVN Densification Action: completion of a continental GPS/leveling network

EUVN_DA WORKING GROUP:

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OUTLINE

- HISTORICAL OVERVIEW
- 'QUASI'-FINAL STATUS
- RELATION TO EVRS2007

HANDLING OF THE PERMANENT TIDE

- RESULTS AND EXPLOITATION OF THE DATABASE

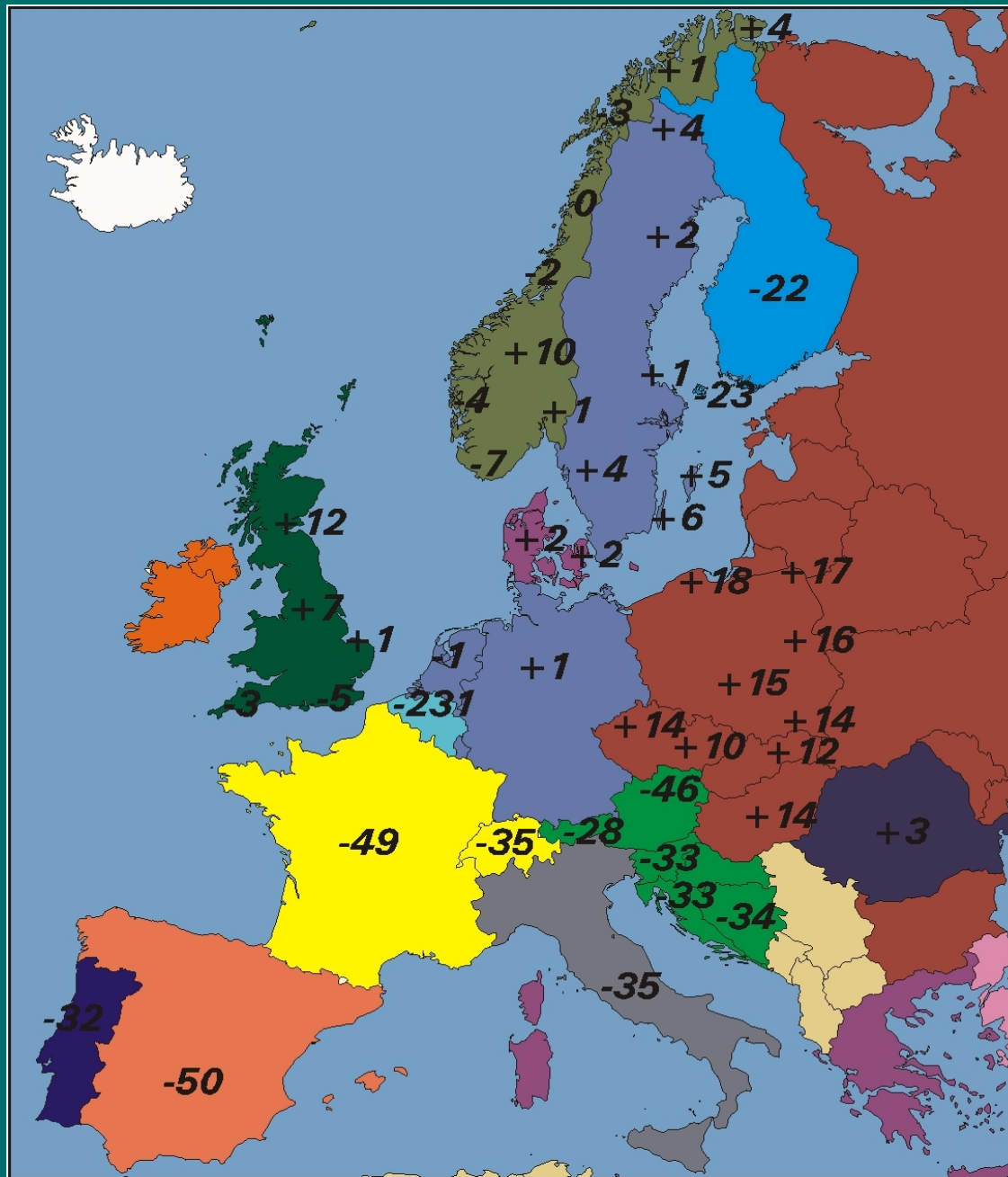
EUVN_DA BASICS

EUVN_DA: Densification Action of the European Unified Vertical Network (EUVN)

Homogeneous, 'sufficiently dense', continental GPS/leveling network

- Datum and test of the continental geoid solutions
- contribution to the realization of EVRS2007
- support the realization of a continental height reference surface consistent with UELN/EVRS and ETRS89 for GNSS applications
- scientific studies

Height datum differences from EUVN



BUILDING UP OF EUVN_DA

- Selection from the national networks following general guidelines and accuracy requirements
- New measurements (e.g. Croatia, Czech R., Hungary)

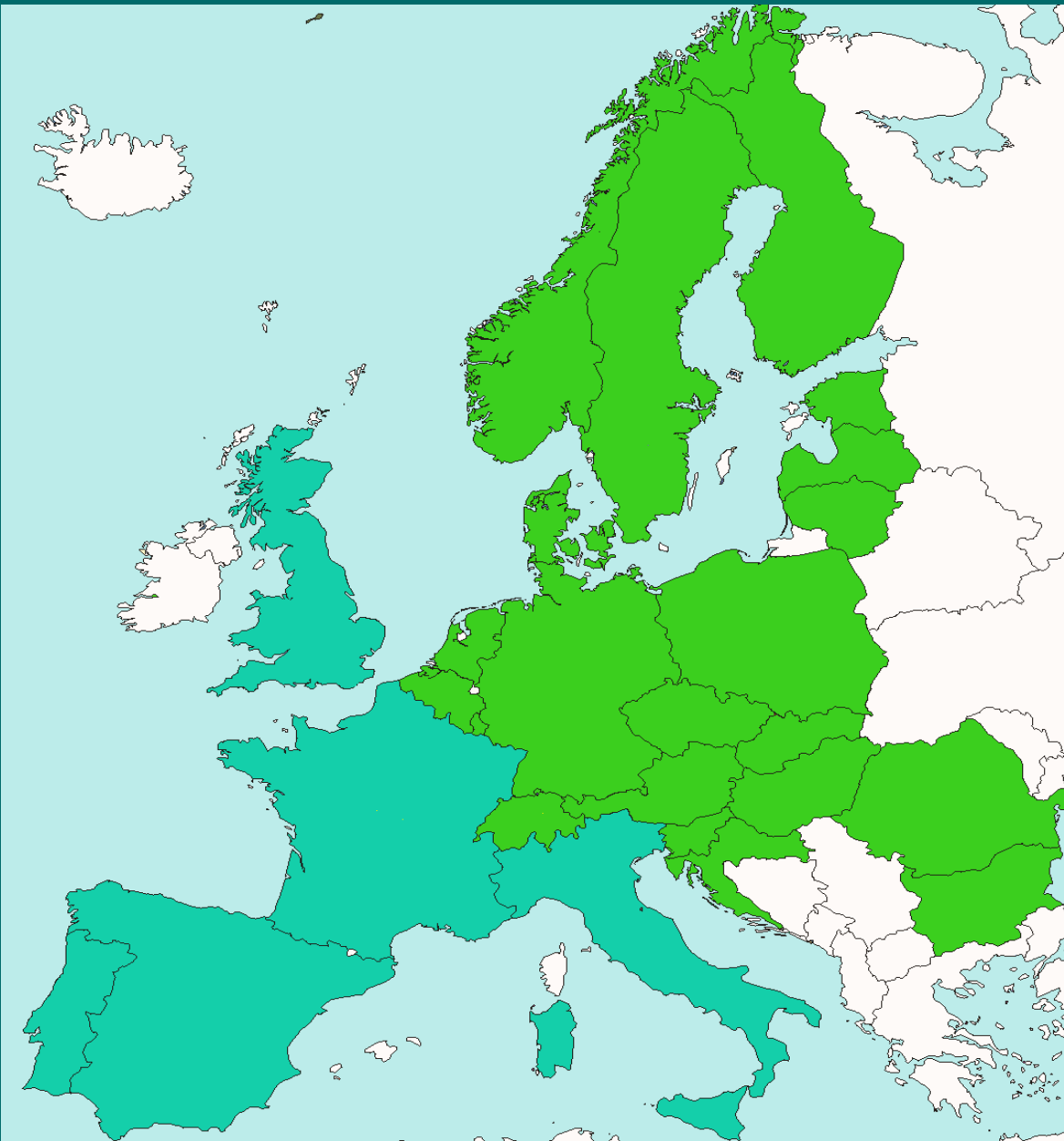
GPS guidelines

- GPS derived ellipsoidal heights (ETRS89/GRS80)
- optimally 24 h of measurement

Leveling data criteria

- connection to UELN benchmarks (to ensure accuracy and consistency)

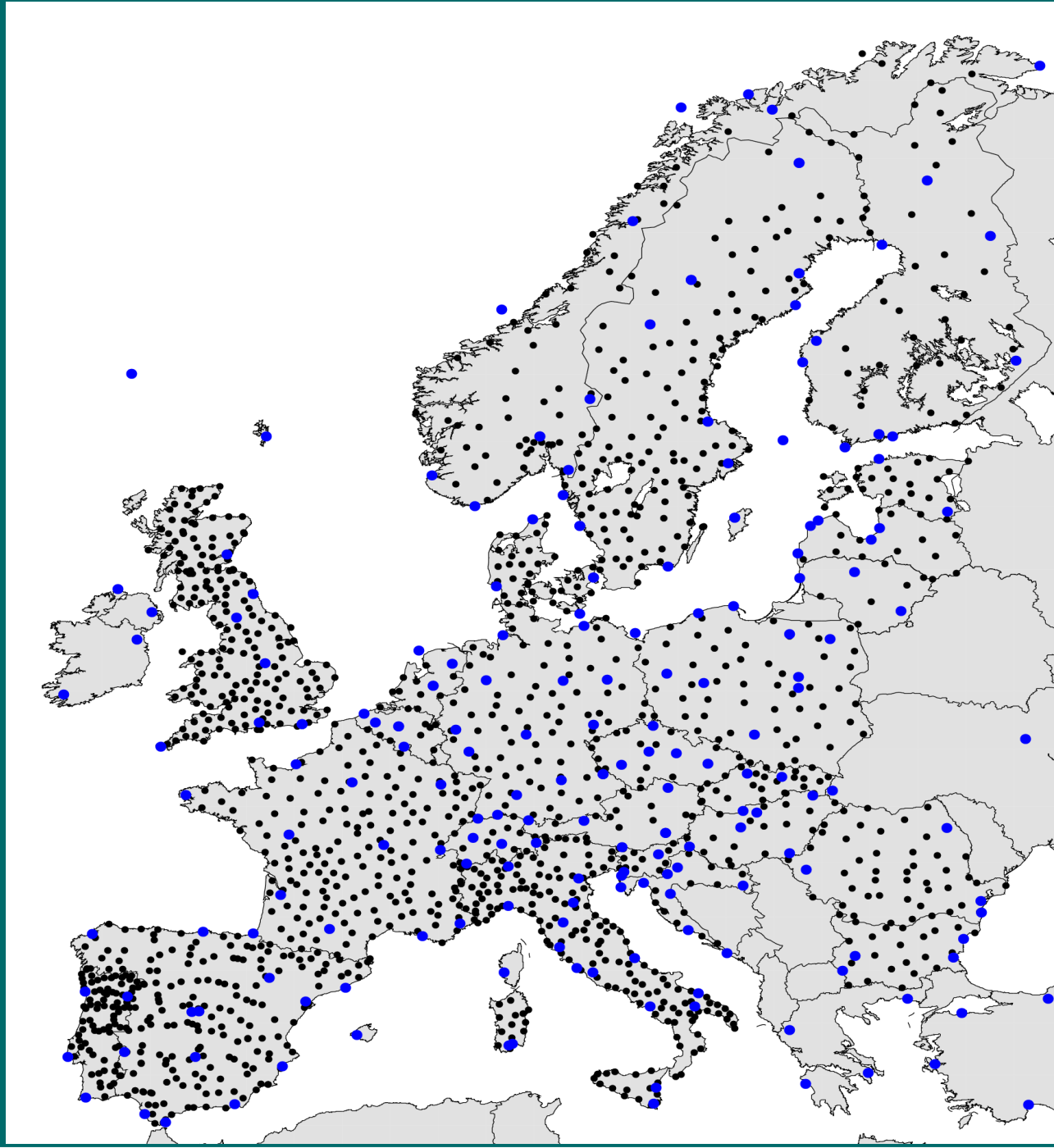
PARTICIPATION



**DATA CORRESPONDS TO THE
HIGHEST REQUIREMENTS**

**SHORTER GPS
OBSERVATION SESSIONS
BUT DENSER NETWORK AND
NO DIRECT CONNECTION TO
UEN (EXCEPT FRANCE)**

EUVN_DA POINT DISTRIBUTION



STATUS OF EUVN_DA

PROJECT TERMINATION POSTPONED IN 2008

REASONS:

- WAITING FOR THE ACCEPTANCE OF **EVRF2007**
 - NEW UELN ADJUSTMENT, THE EUVN_DA PART SCHEDULED LATER
 - DIFFERENT HANDLING OF THE PERMANENT TIDE (LEVELING, GPS, GEOID)
- UPDATED EUROPEAN GEOID SOLUTION EGG2008
- **COUNTRY-SPECIFIC INCONSISTENCIES**

HANDLING OF THE PERMANENT TIDE

UELN/EVRS2007: ZERO TIDE

EGG2008 GEOID: ZERO TIDE

ELLIPSOIDAL HEIGHTS: TIDE FREE CRUST

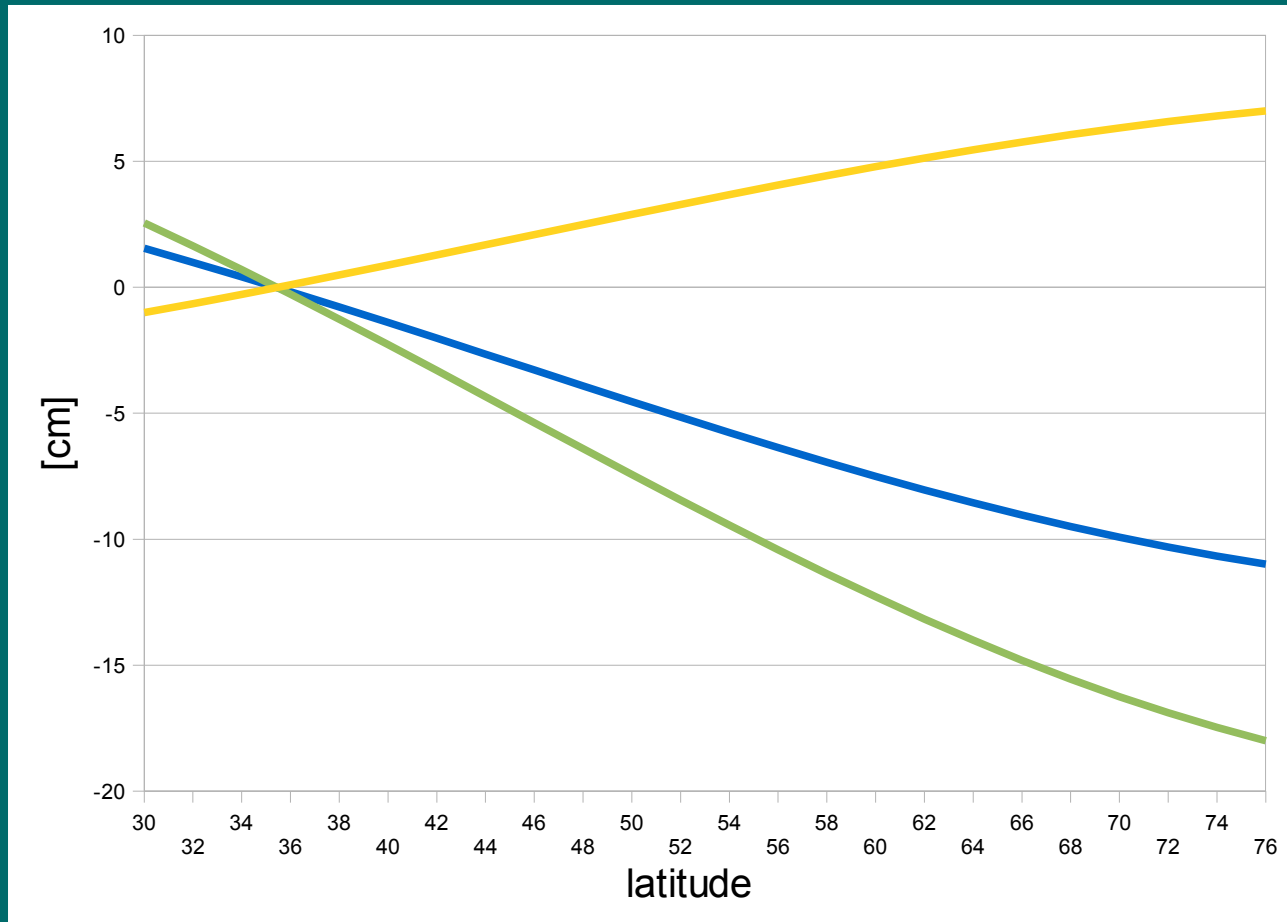
UELN/EVRS2000: MEAN TIDE

tide free: all tidal (time variable and permanent) effects (shape, potential) are removed

mean tidal: all effects of the permanent tide (Earth shape and potential) are retained

zero tidal: only the tide generating potential is removed

CORRECTIONS DUE TO THE PERMANENT TIDE



h/tide free/ - H/mean/

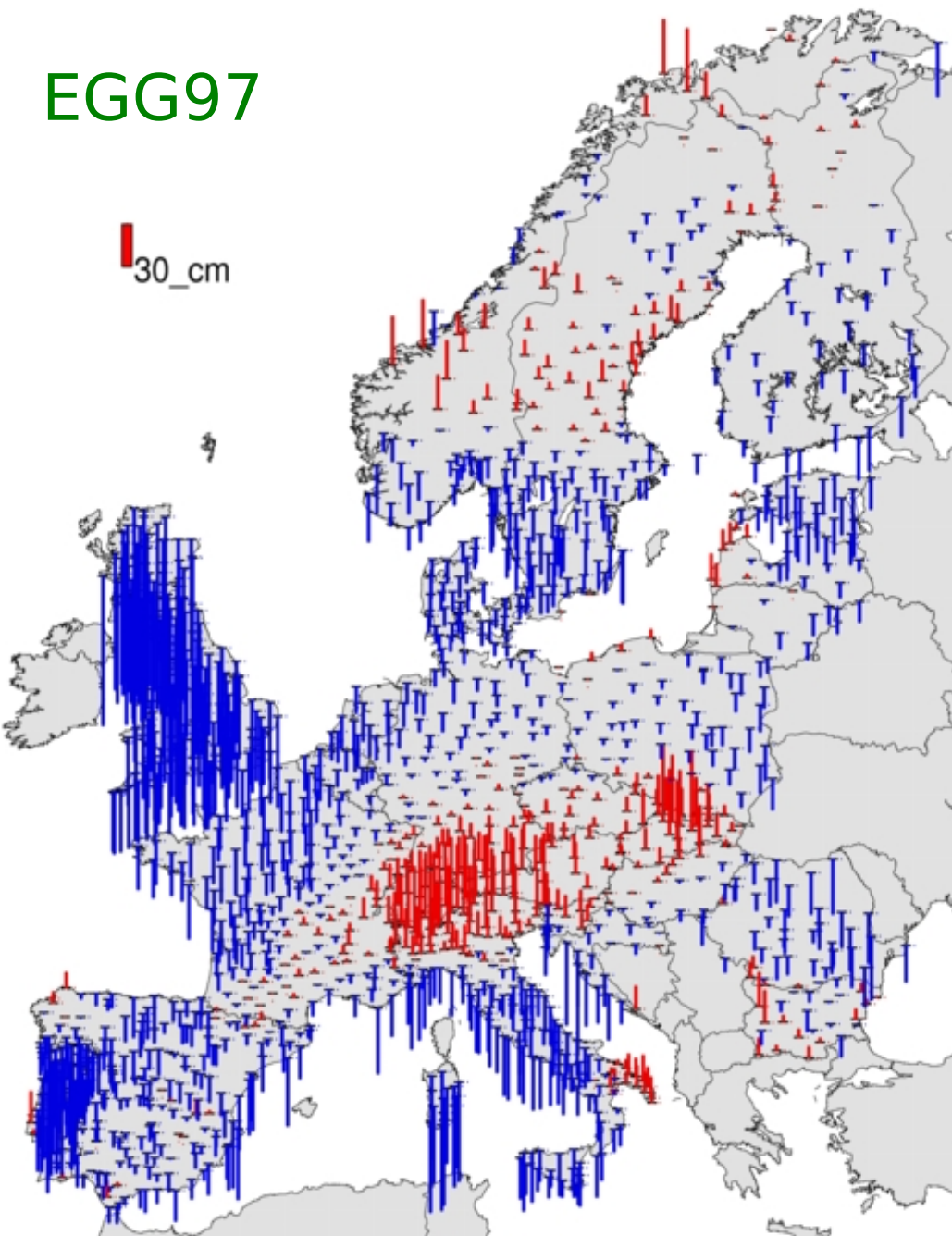
tide free to zero crust

mean to zero tidal heights

EUVN_DA EGGyy COMPARISON

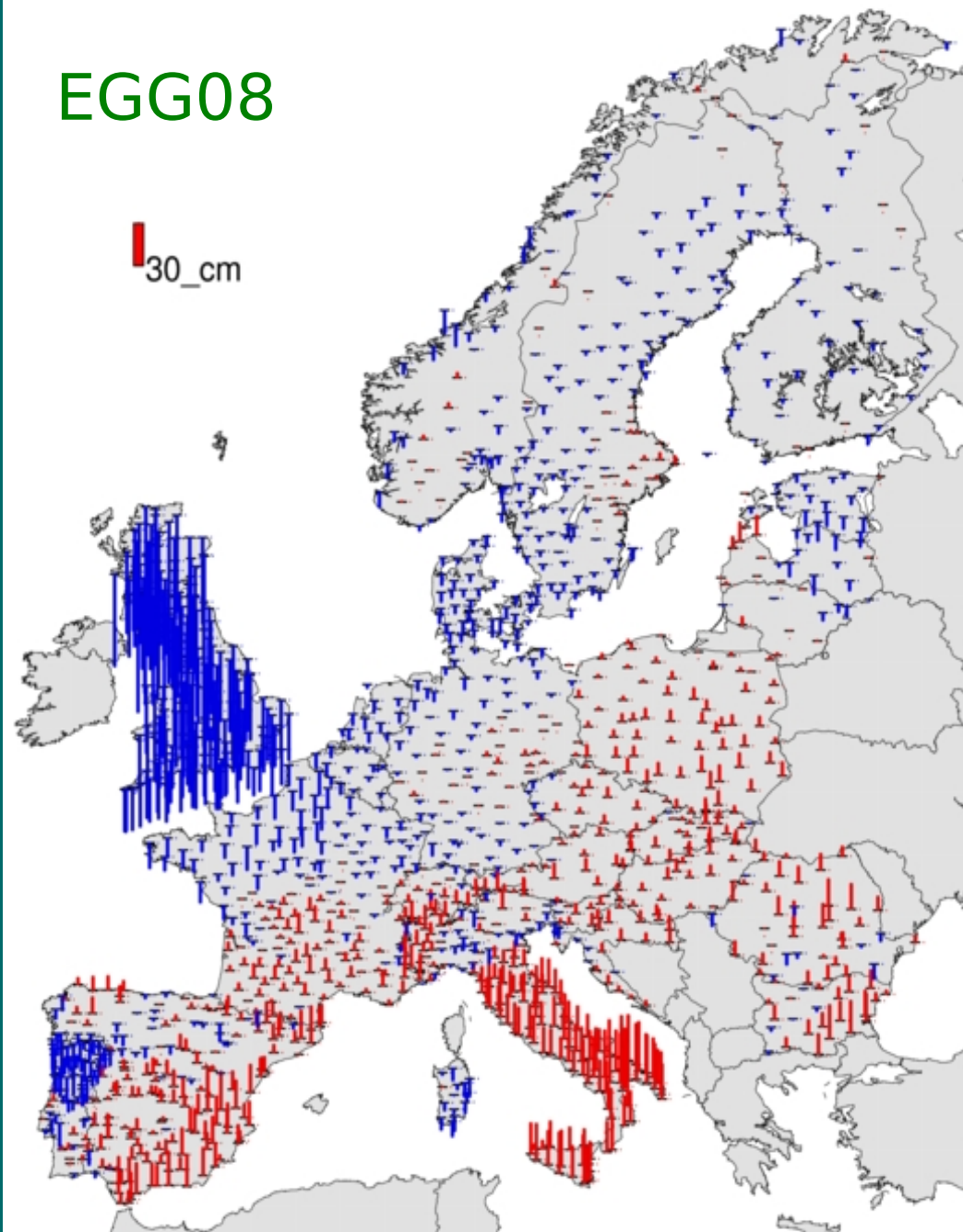
EGG97

30_cm



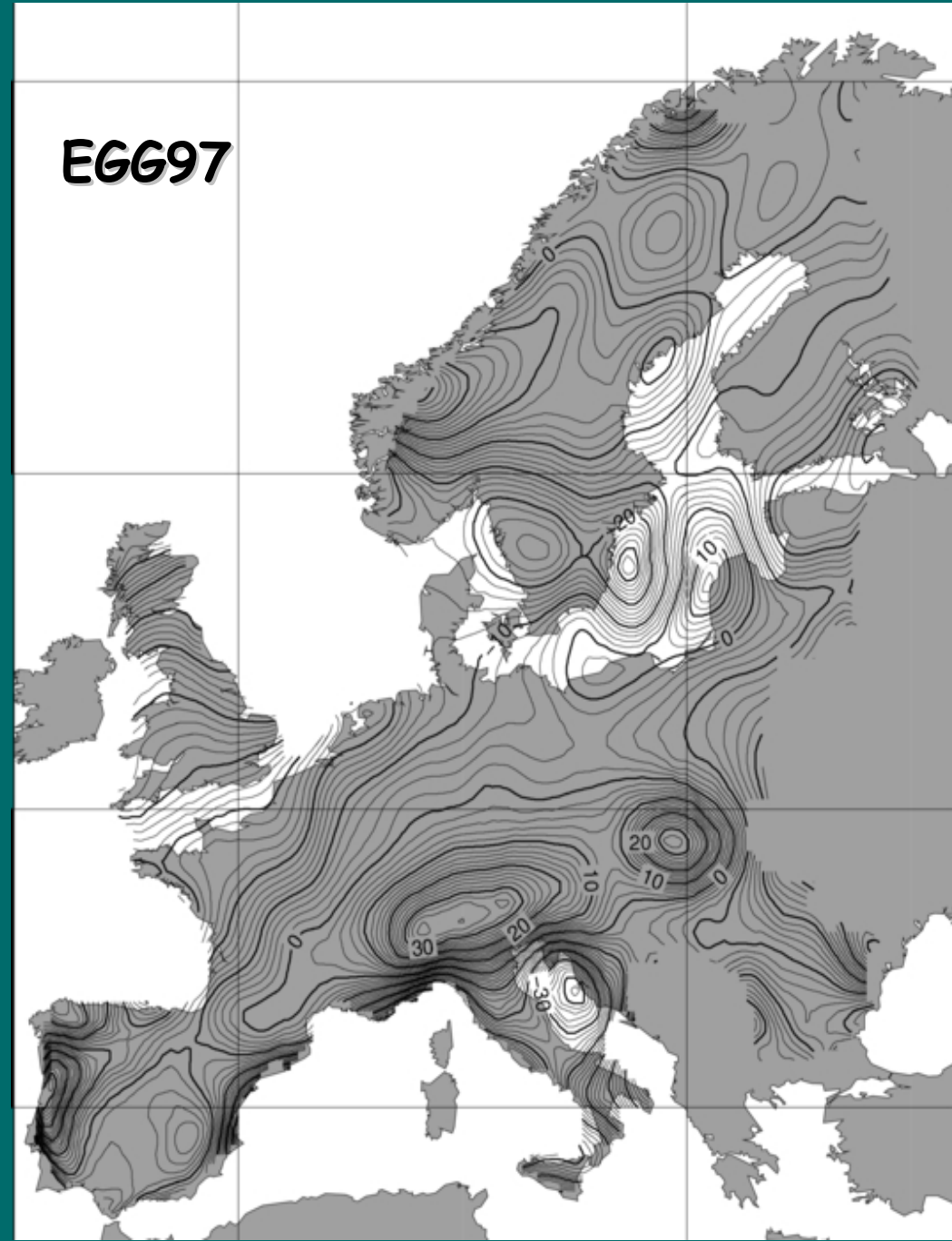
EGG08

30_cm

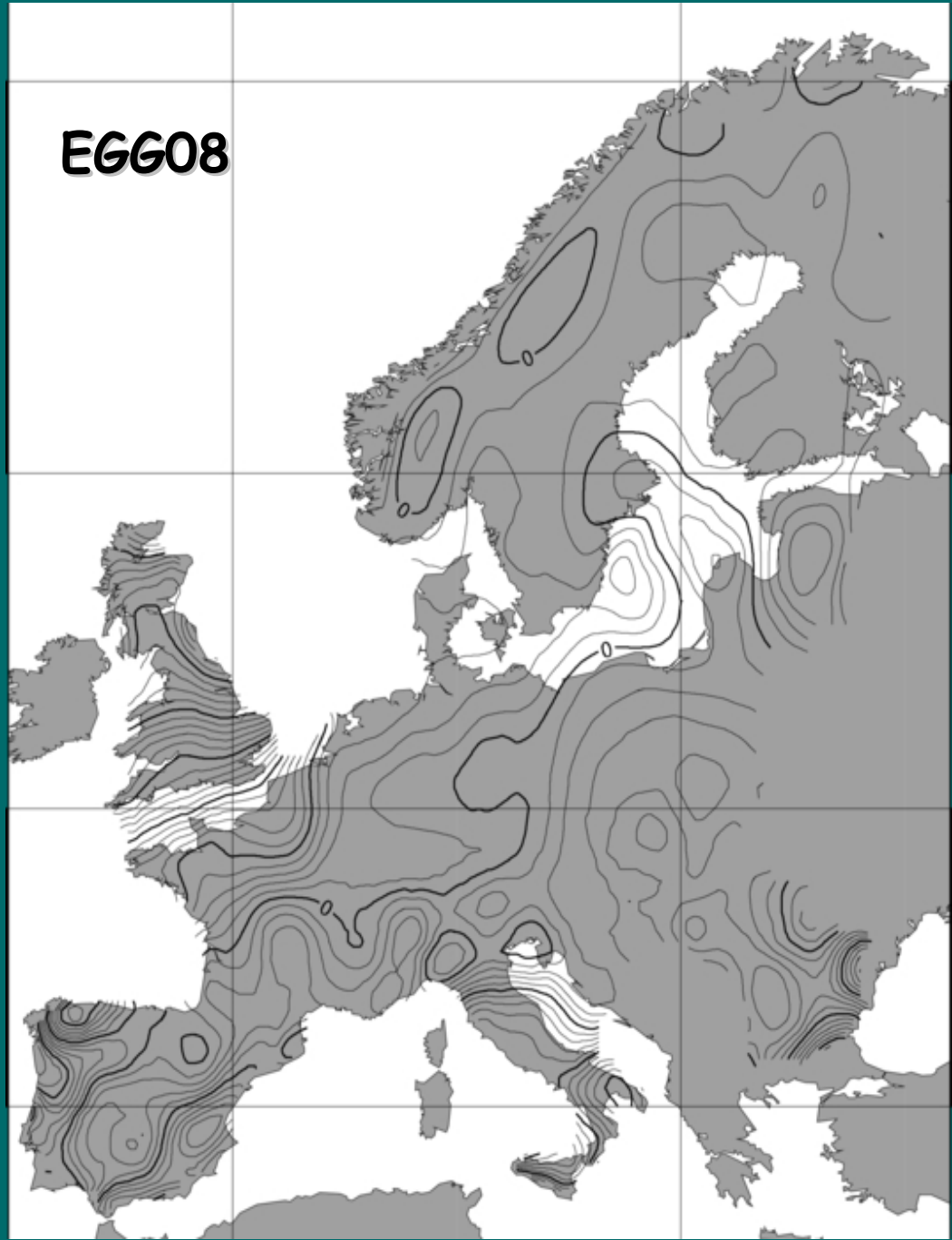


EUVN_DA EGGyy COMPARISON

EGG97

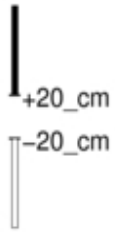


EGG08

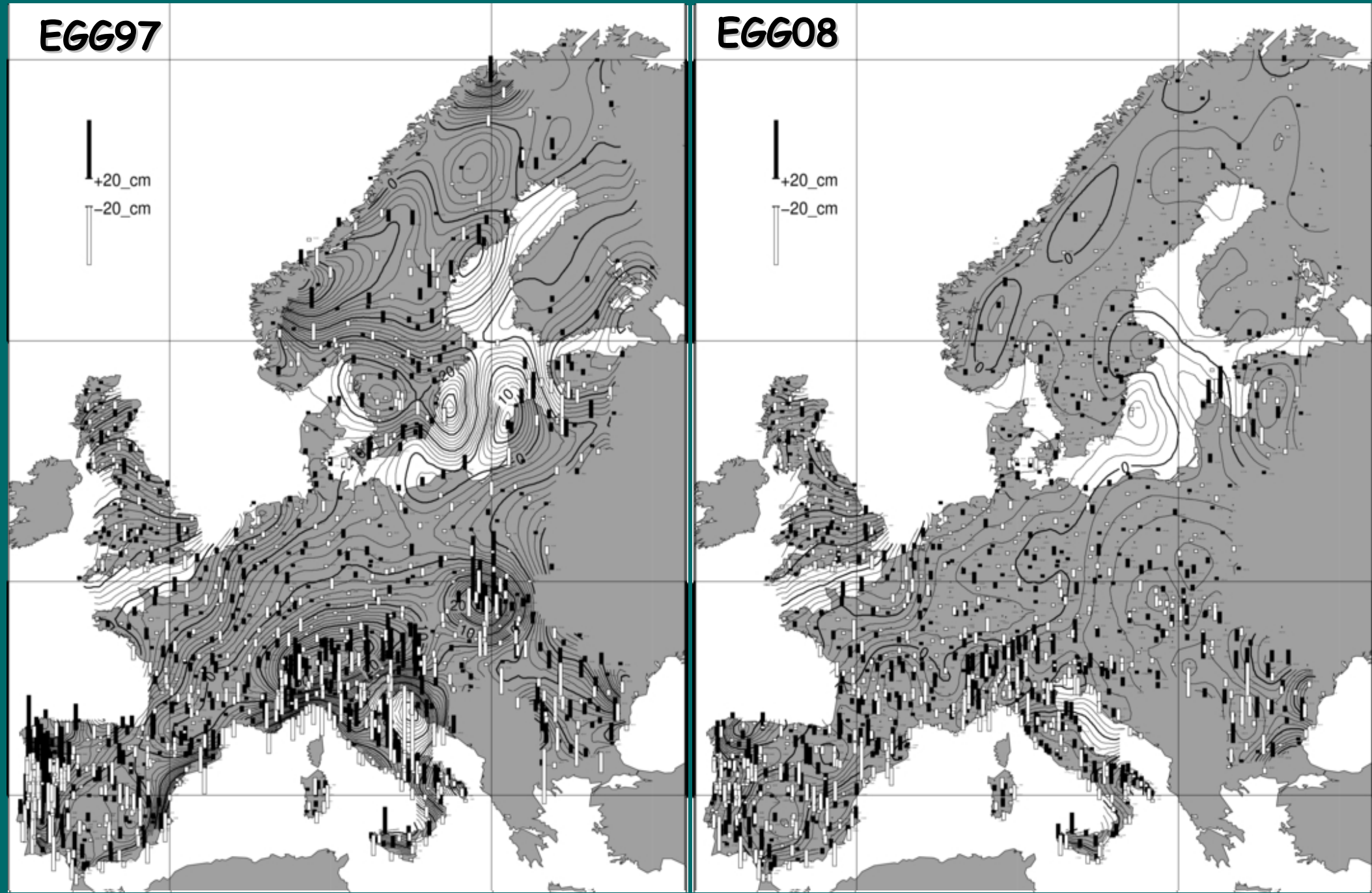
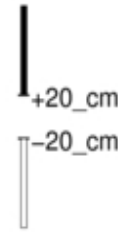


EUVN_DA EGGyy COMPARISON

EGG97



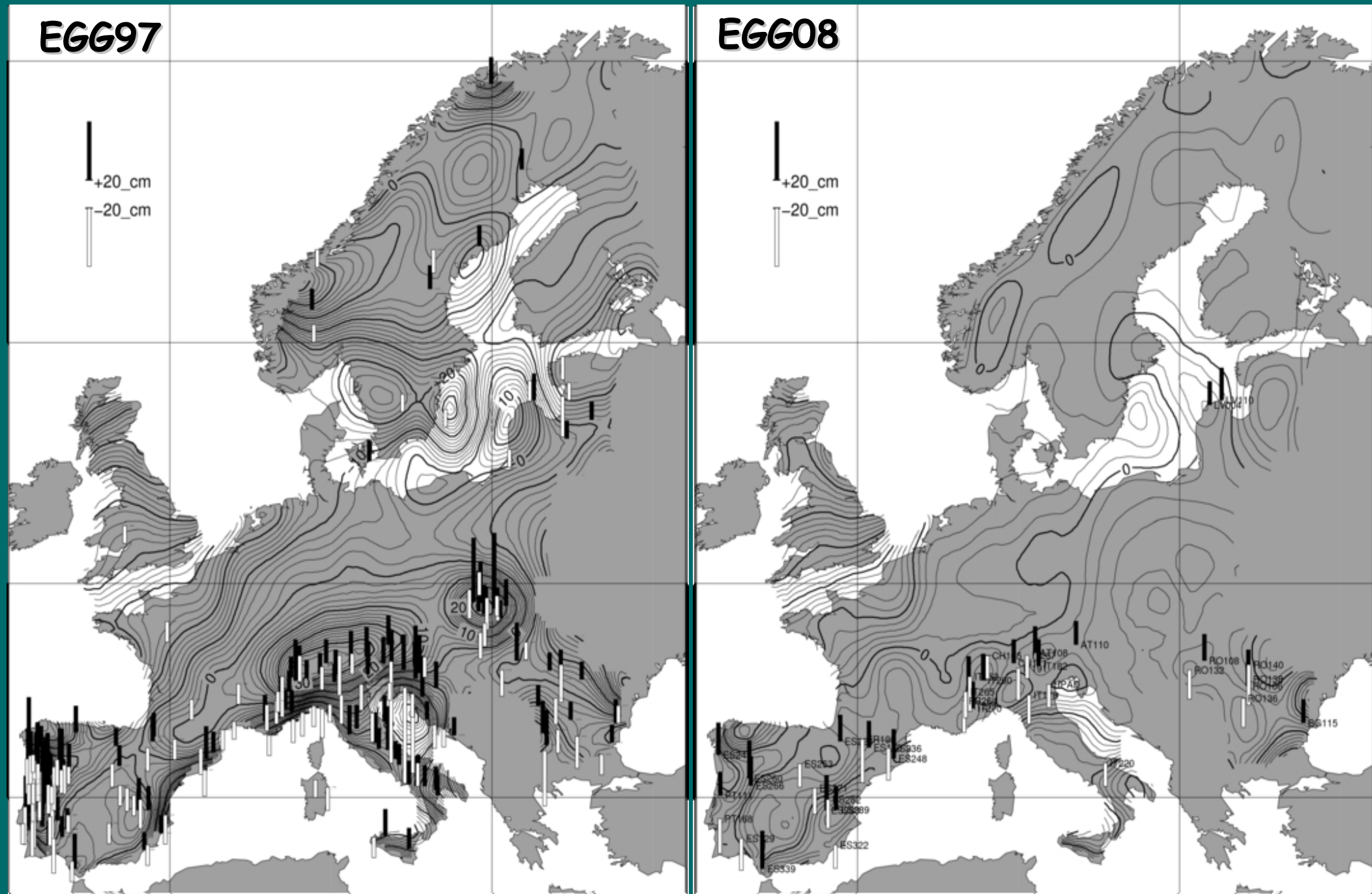
EGG08



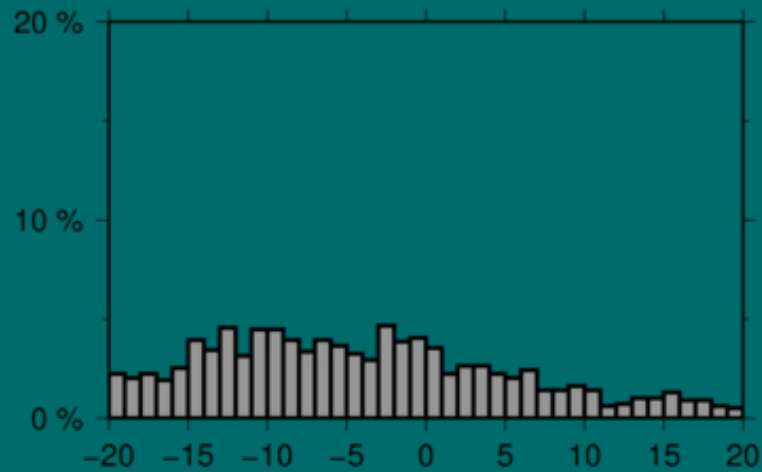
EUVN_DA / EGGyy $\Delta N > 7$ CM

EGG97

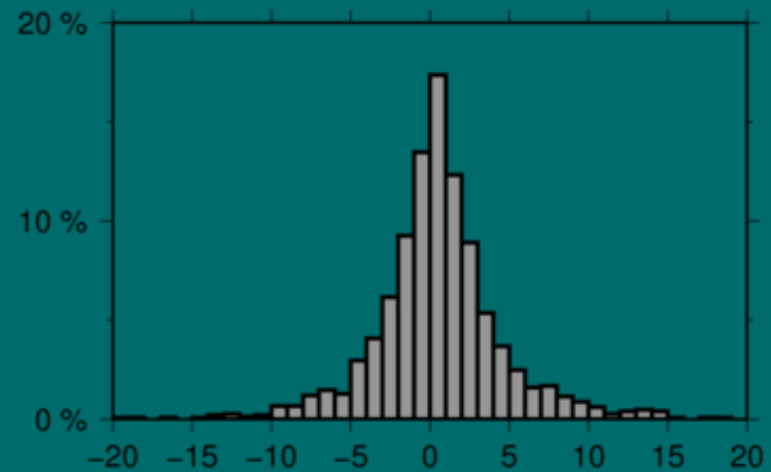
EGG08



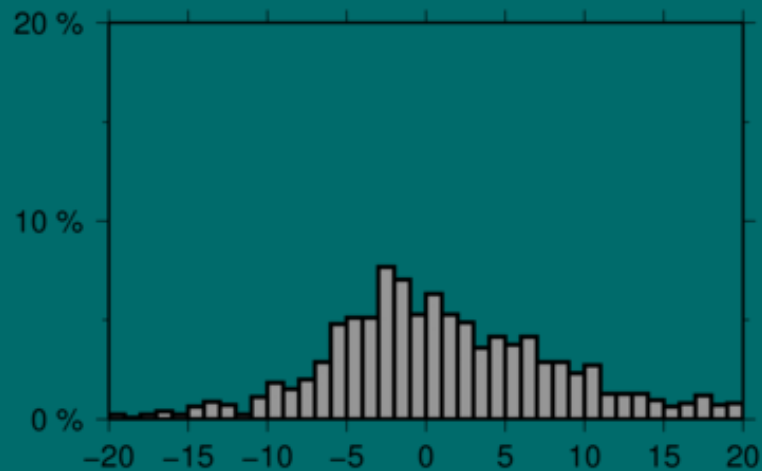
HISTOGRAMMS OF THE DIFFERENCES



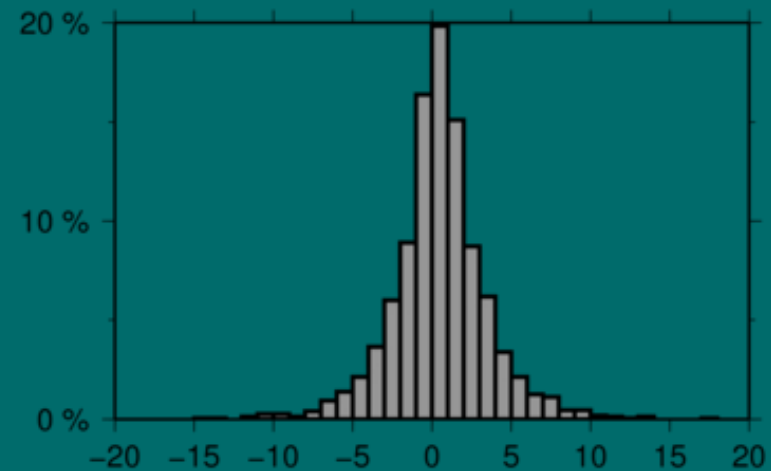
EUVN_DA-EGG97 differences



EUVN_DA-EGG97 fit residuals



EUVN_DA-EGG08 differences



EUVN_DA-EGG08 fit residuals

CONCLUSIONS OF THE COMPARISON

- EGG08 MADE ABOUT 50% IMPROVEMENT OVER EGG97 AT THE COMPARISONS WITH EUVN_DA,
- THE RMS OF THE EGG08/EUVN_DA DIFFERENCES IS WELL BELOW 10 CM
- THE DIFFERENCES CAN BE EASILY MODELED BY LOW ORDER LOCAL POLINOMIALS, THE RESIDUAL RMS IS 3 CM.
- THE DATABASE MAKES FEASIBLE THE REALIZATION OF THE CM-ACCURACY CONTINENTAL HEIGHT REFERENCE SURFACE
- THIS WILL BE DONE IN COOPERATION BETWEEN EGGP AND EUREF, WHEN THE CURRENT HIGH DISCREPANCIES ARE CLARIFIED.

SKELETONS IN THE CUPBOARD ...

- UK
 - EUROTUNNEL CONNECTION NOT YET FINALIZED
 - TILT IN THE UK LEVELING NETWORK
(ALREADY PUBLISHED IN 1959)
- FRANCE - TILT IN THE HEIGHT NETWORK
- BALKAN - WEAK GEOID DATABASE
- SPAIN - OLD DATA, SOON UPDATED
- ITALY - SYSTEMATIC DISCREPANCY OF EGG AND GPS/LEVELING BEING CLARIFIED

PRODUCTS OF EUVN_DA

EUREF PRODUCT

HIGH QUALITY, HOMOGENOUS, CONTINENTAL SET
OF REFERENCE GPS/LEVELING POINTS

WHEN ALL COUNTRIES AGREE WILL BE FREELY AVAILABLE

EGGP/EUREF PRODUCT

ACCURATE CONTINENTAL HEIGHT REFERENCE
SURFACE FOR THE PRACTICE

DEVELOPMENT IS FORESEEN, WHEN THE PENDING DATA
PROBLEMS SOLVED

EUVN_DA WEB PAGES

CRS.BKG.BUND.DE/EVRS/DRAFT_EUVNDA.HTML

USES THE CRS LAYOUT

- GENERAL DESCRIPTION
- COUNTRY SPECIFIC PAGES
 - ONLY METADATA AND A MAP OF SITE DISTRIBUTION
- COMPARISONS WITH THE EGG QUASIGEOID SOLUTIONS

-- SUMMARY --

- THE 1ST VERSION OF THE EUVN_DA DATABASE IS FINALIZED IN **NOVEMBER 2009**
- FINAL REPORT DISTRIBUTED SAME TIME
- THE EGG08/EUVN_DA COMBINED HEIGHT REFERENCE SURFACE CREATED AND PUBLISHED LATER
- THE EUVN_DA DATABASE WILL BE AVAILABLE FROM THE EVRS WEBSITE. REGISTERED, ACADEMIC USERS, WILL GET FREE ACCESS TO THE DATABASE
- THE EUVN_DA DATABASE WILL BE PERIODICALLY UPDATED AND MAINTAINED
- **ACKNOWLEDGEMENT OF THE DATA PROVIDERS.**

SPECIAL THANKS TO THE DATA PROVIDERS

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• Great Britain	C.Fane	OS
• Hungary	G.Virag	FOMI
• Italy	F.Cauli	IGM

SPECIAL THANKS TO THE DATA PROVIDERS

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