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

EUVN_DA WORKING GROUP:

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OUTLINE

- HISTORICAL OVERVIEW
- ACTUAL 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

- testing 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

EUVN_DA BASICS

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

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

Homogeneous in terms of spatial distributiuon and quality

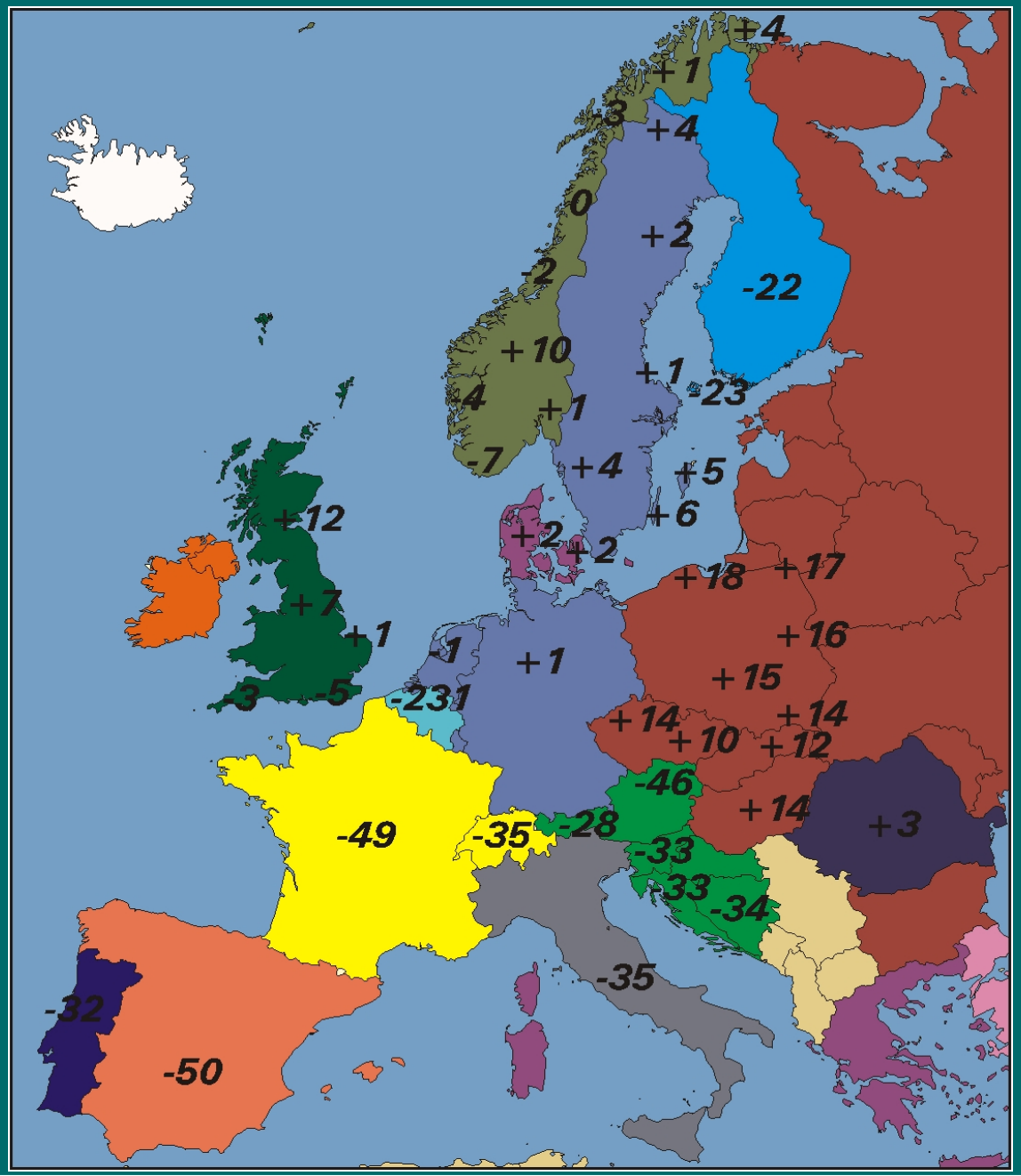
Difficulties of homogeneity:

- 25 countries, 13 height datums

  (UELN connects only a subset of leveling benchmarks)

- Independent ETRS89 realizations

Height datum differences from EUVN



EUVN_DA BASICS

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

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

- reliable modelling of the gravimetric and GPS-leveling geoid differences
- 50-100 km mean site separation → ~ 1500 marker
- compromise between costs and benefits

BUILDING UP OF EUVN_DA

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

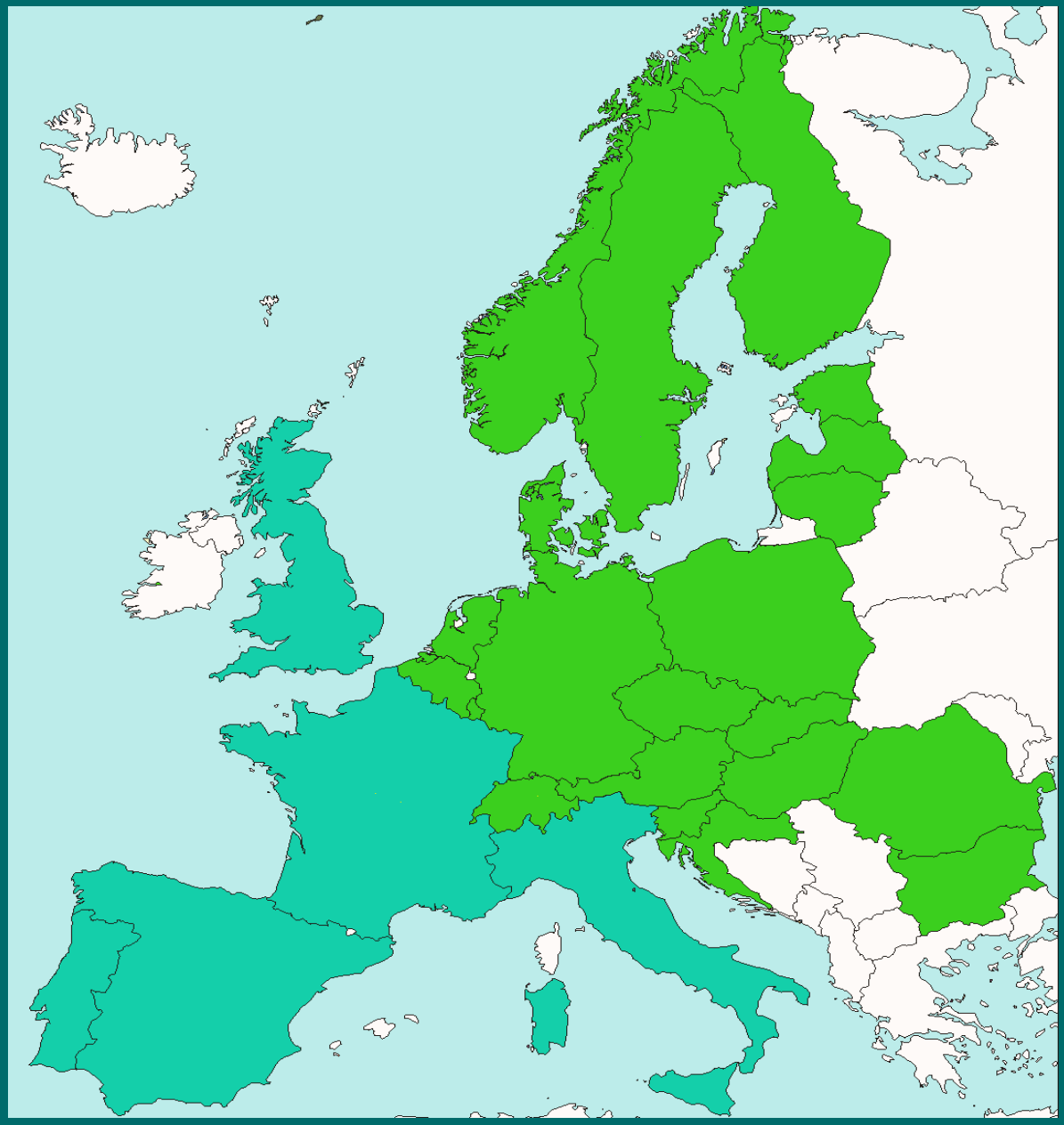
GPS guidelines

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

Leveling data criteria

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

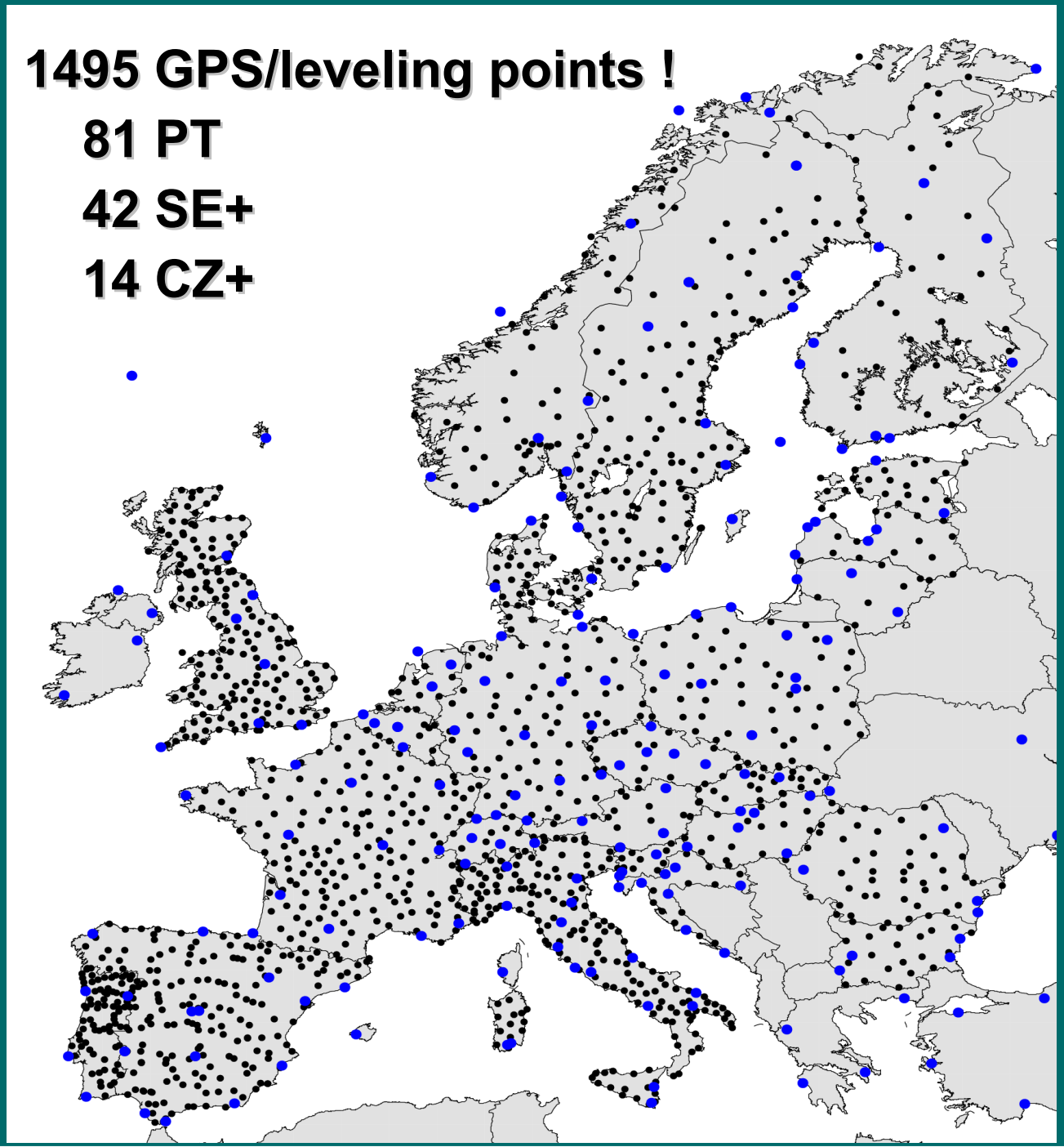
PARTICIPATION - JUNE 2008



DATA CORRESPONDS TO THE HIGHEST REQUIREMENTS

SHORTER GPS OBSERVATION SESSIONS BUT DENSER NETWORK

EUVN_DA POINT DISTRIBUTION



STATUS OF EUVN_DA

PROJECT TERMINATION POSTPONED ! ! !
(AUTUMN 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

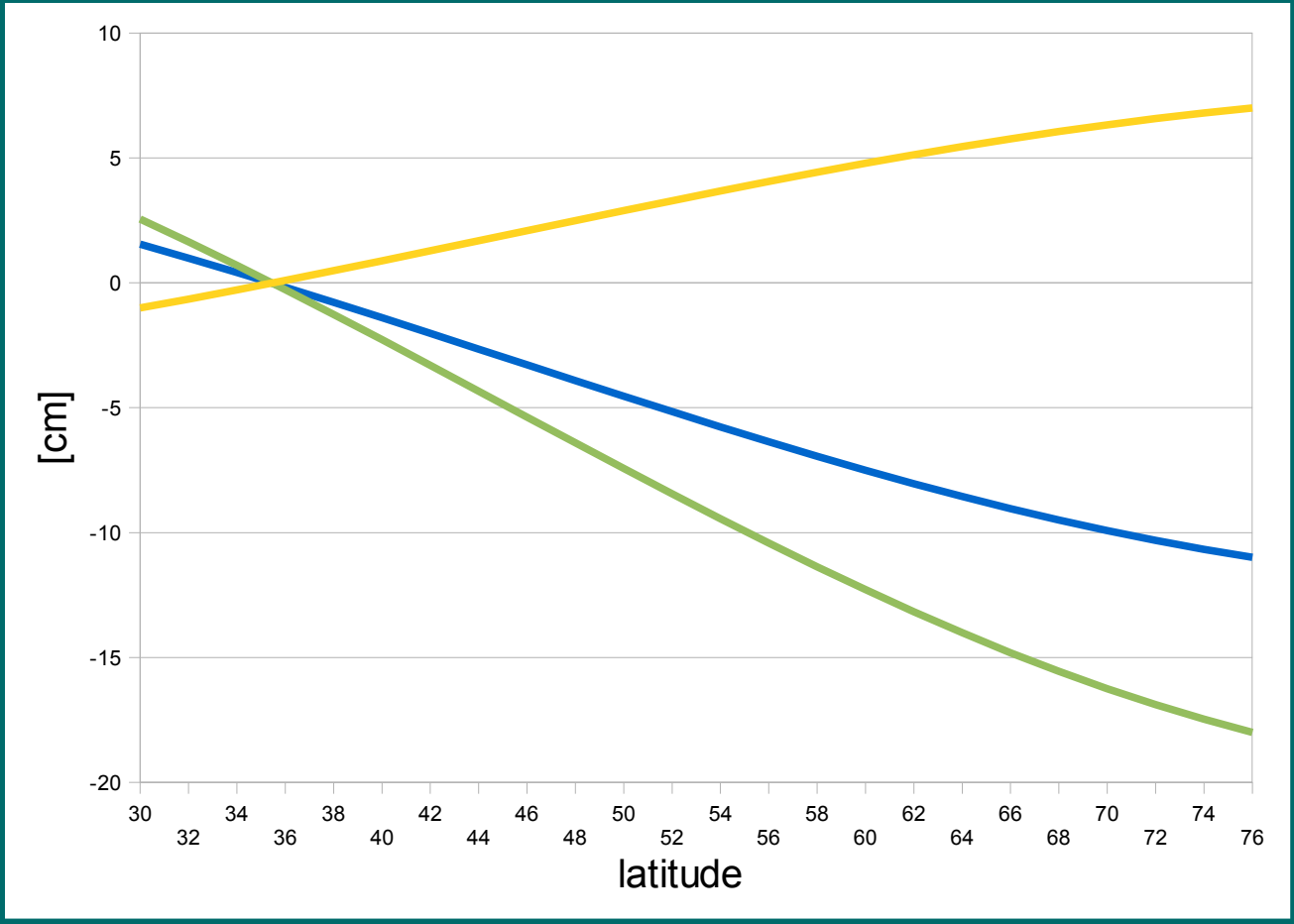
HANDLING OF THE PERMANENT TIDE

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

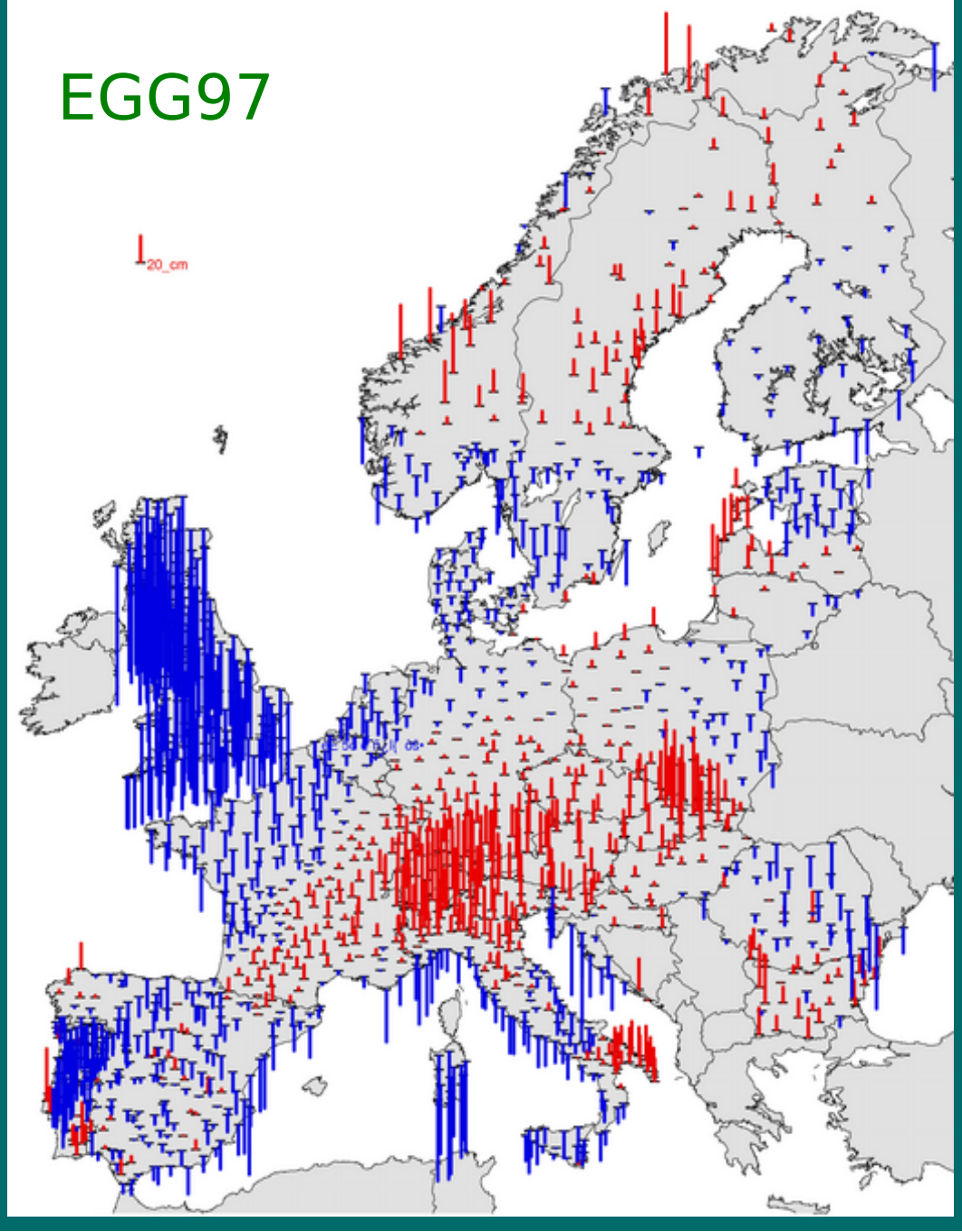
STATISTICS OF THE COMPARISONS with EGGyy

status: June 2008

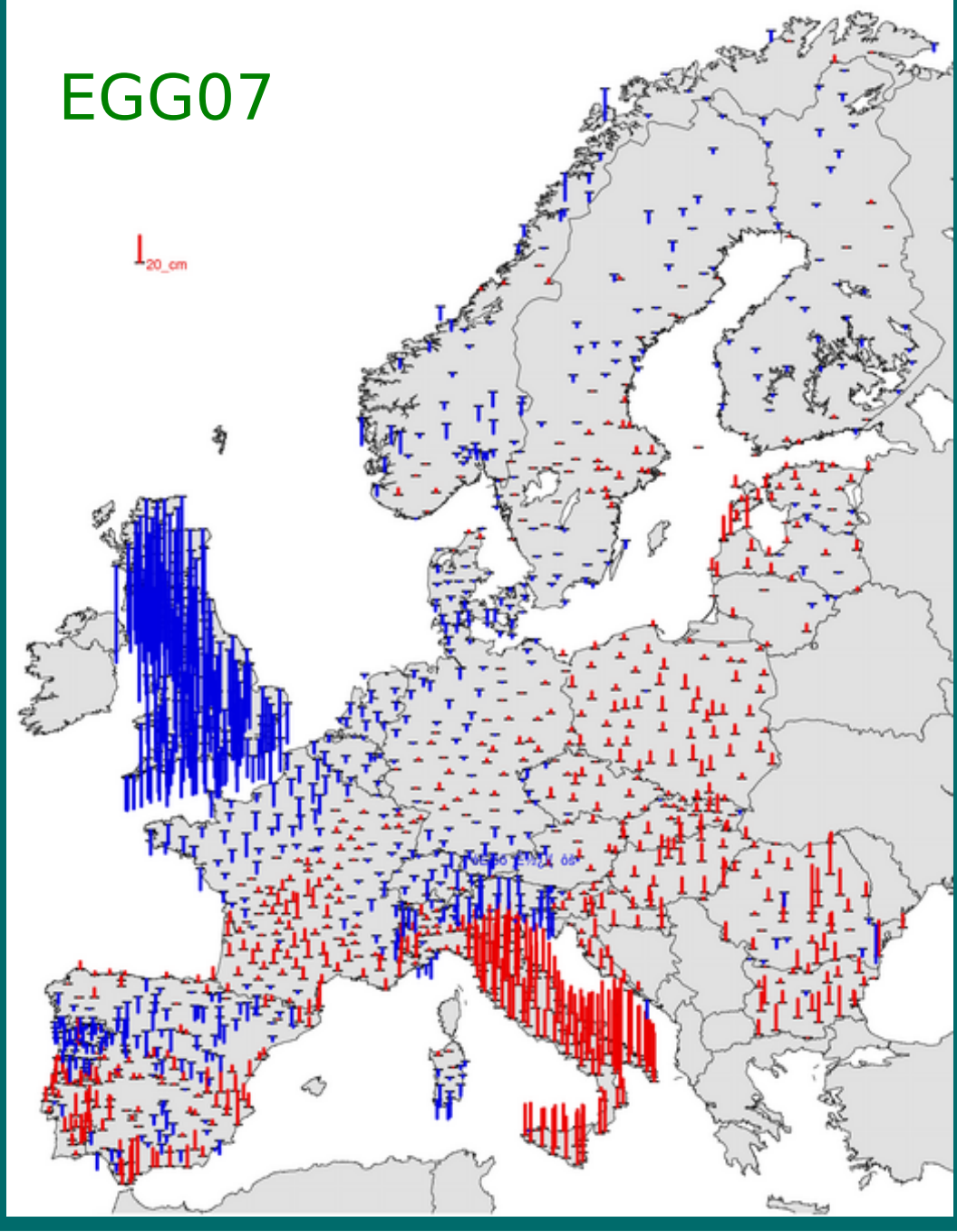
		RMS [cm]		MAX-MIN range	
	# of pts	EGG97	EGG07	EGG97	EGG07
Austria	17	11	6	33	20
Croatia	20	20	6	80	27
France	180	12	8	70	36
Germany	75	10	4	46	14
Great Br.	189	19	14	74	54
Hungary	20	9	3	40	11
Netherland	15	6	2	20	7
Norway	63	16	4	77	18
Poland	62	9	3	44	12
Slovakia	28	17	3	57	16
Slovenia	12	14	4	46	14
Spain	177	12	7	58	23
Sweden	84	12	3	85	15
Switzerland	20	10	5	31	16

EUVN_DA EGGyy COMPARISON

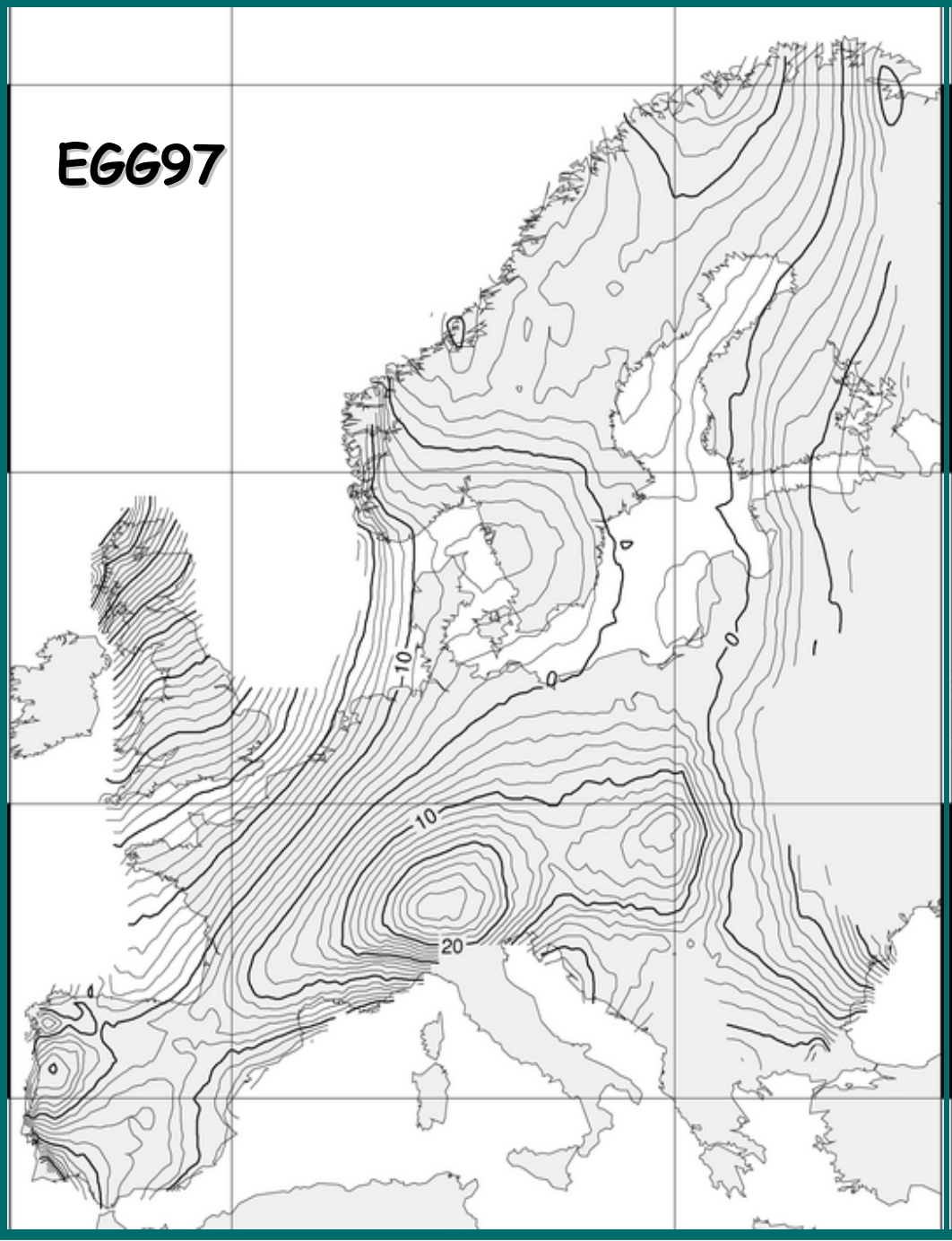
EGG97

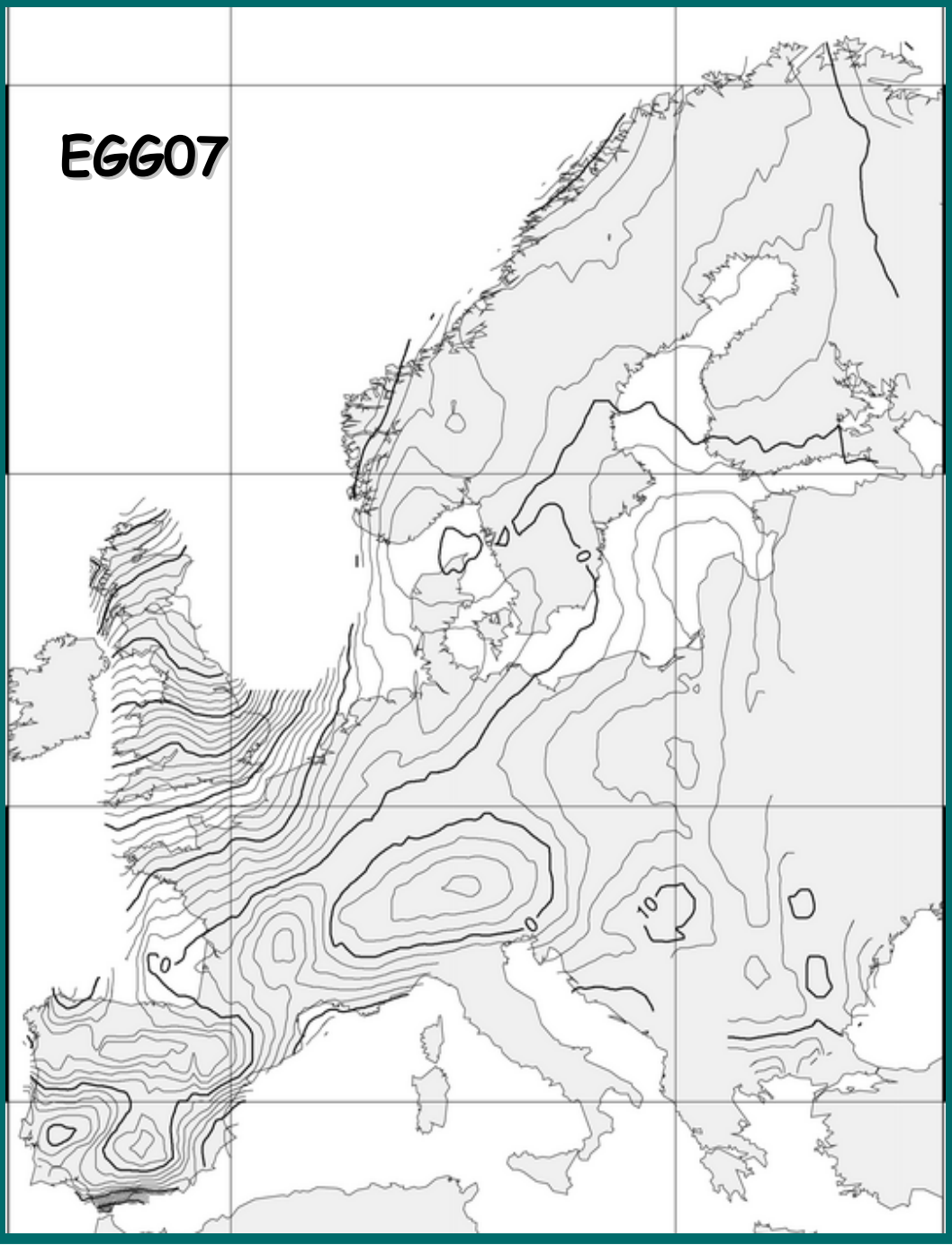


EGG07

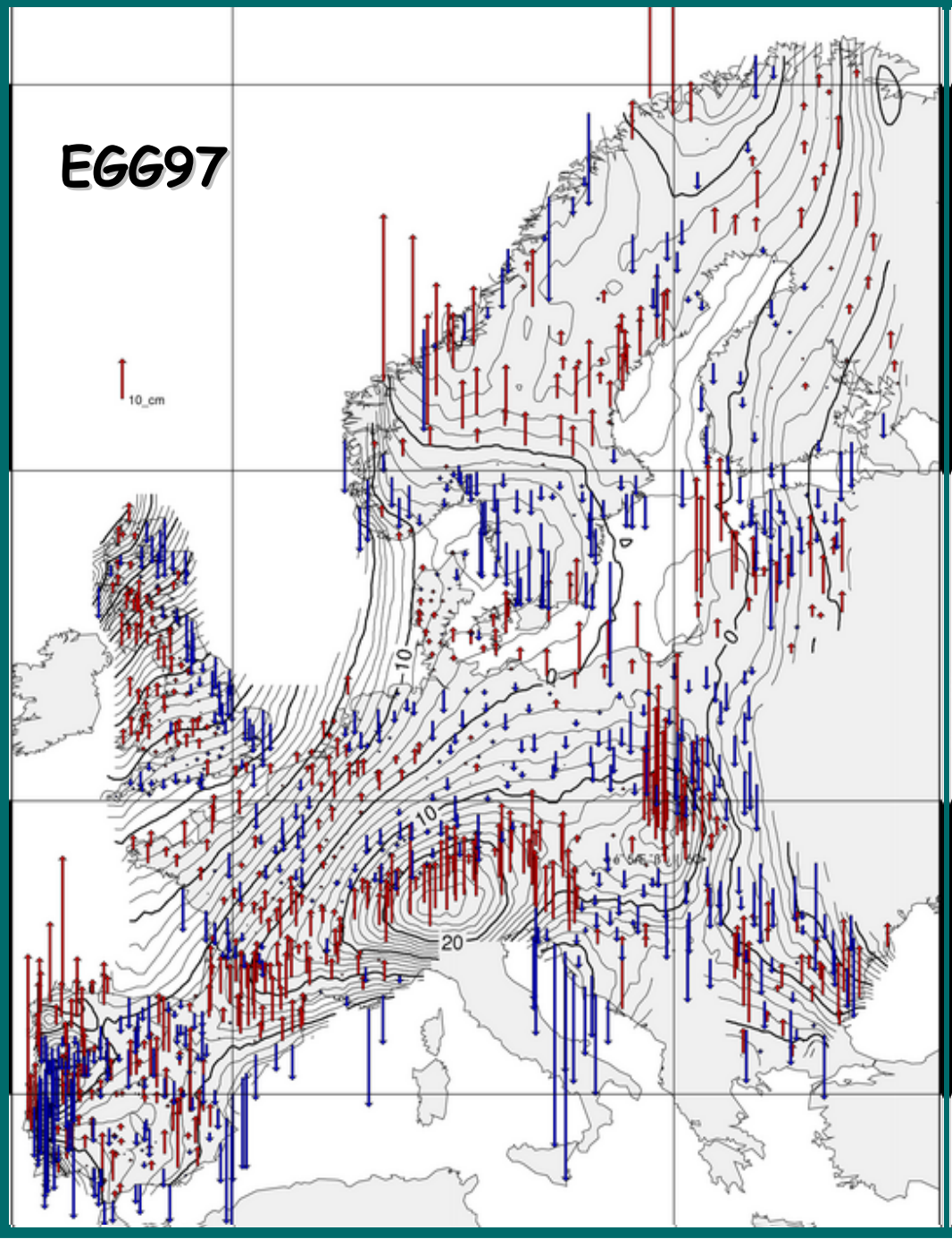


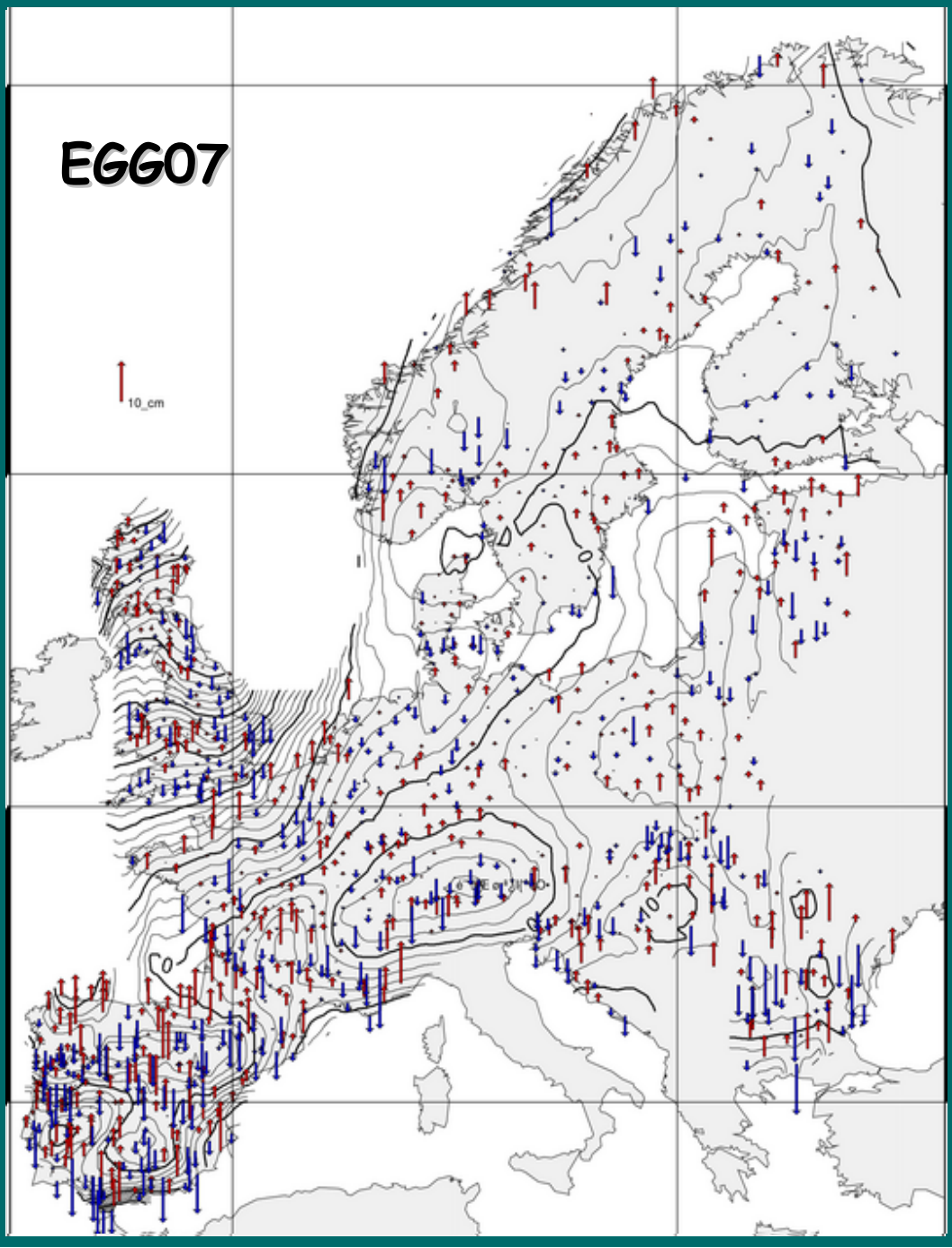
EUVN_DA EGGyy COMPARISON





EUVN_DA EGGyy COMPARISON





CONCLUSIONS OF THE COMPARISON

- EGG07 MADE ABOUT 50% IMPROVEMENT OVER EGG97 AT THE COMPARISONS WITH EUVN_DA. ADDITIONAL IMPROVEMENT IS EXPECTED AS EGG08 IS PUBLISHED,
- THE RMS OF THE EGG07/EUVN_DA DIFFERENCES IS WELL BELOW 10 cm
- EXCEPTIONAL PARTS ARE UK AND ITALY, WHERE FURTHER INVESTIGATIONS ARE NEEDED
- 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.

TASKS AND SCHEDULE
by the end of 2008

- NEW DATA AND UPGRADES (CZ, SE, ES? ...)
- DATA VALIDATION PER COUNTRY BEING FINISHED
  - LEVELLING INFORMATION CONSISTENCY (UELN DC)
  - COMPARISON WITH EGG SOLUTIONS (FOMI SGO, IFE)
- INCLUSION OF EUVN_DA BENCHMARKS INTO THE UELN ADJUSTMENTS (UELN DC)
- WHEN EGG08 IS AVAILABLE:

  EUVN_DA – EGG08 COMBINATION TESTS
- FINAL REPORT (BASED ON THE AVAILABLE DATA)

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 IN PROGRESS

DATA AVAILABILITY

- THE 1ST VERSION OF THE EUVN_DA DATABASE WILL BE FINALIZED AND 'FREEZED' BY THE END OF 2008
- REPORT AND PUBLICATION PREPARED
- 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.

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
- COMPARISIONS WITH THE EGG QUASIGEOID SOLUTIONS

SUMMARY

- WITH SOME DELAY THE MISSION OF EUVN_DA WILL BE COMPLETED SUCCESSFULLY BY THE END OF 2008
- 25 COUNTRIES; ~ 1500 GPS/LEVELING POINTS
- WEB PAGES CREATED
- SIGNIFICANT IMPROVEMENT IN THE EGG - EUVN_DA COMPARISONS (EGG97 → EGG07)

  (EGG08 NOT YET AVAILABLE!)
- THE ACCURATE HEIGHT REFERENCE SURFACE WILL BE CREATED IN COOPERATION WITH EGGP
- DATA POLICY: AFTER PUBLICATION OF RESULTS THE DATABASE WILL BE AVAILABLE (PASSWORD PROTECTION) FOR RESEARCH PURPOSES
- ACKNOWLEDGEMENT OF THE DATA PROVIDERS

SPECIAL THANKS TO THE DATA PROVIDERS

• Austria	N.Hoggerl	BEV
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• Finland	M.Ollikainen	FGI
• France	F.&H.Duguenne	IGN
• Germany	M.Sacher	BKG
• Great Britain	C.Fane	OS
• Hungary	G.Virag	FOMI
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• Slovakia	K.Leitmanova	GKU
• Slovenia	K.Medved	SMA
• Spain	R.Quiros Donate	IGN Spain
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