

Status of EVRS2007

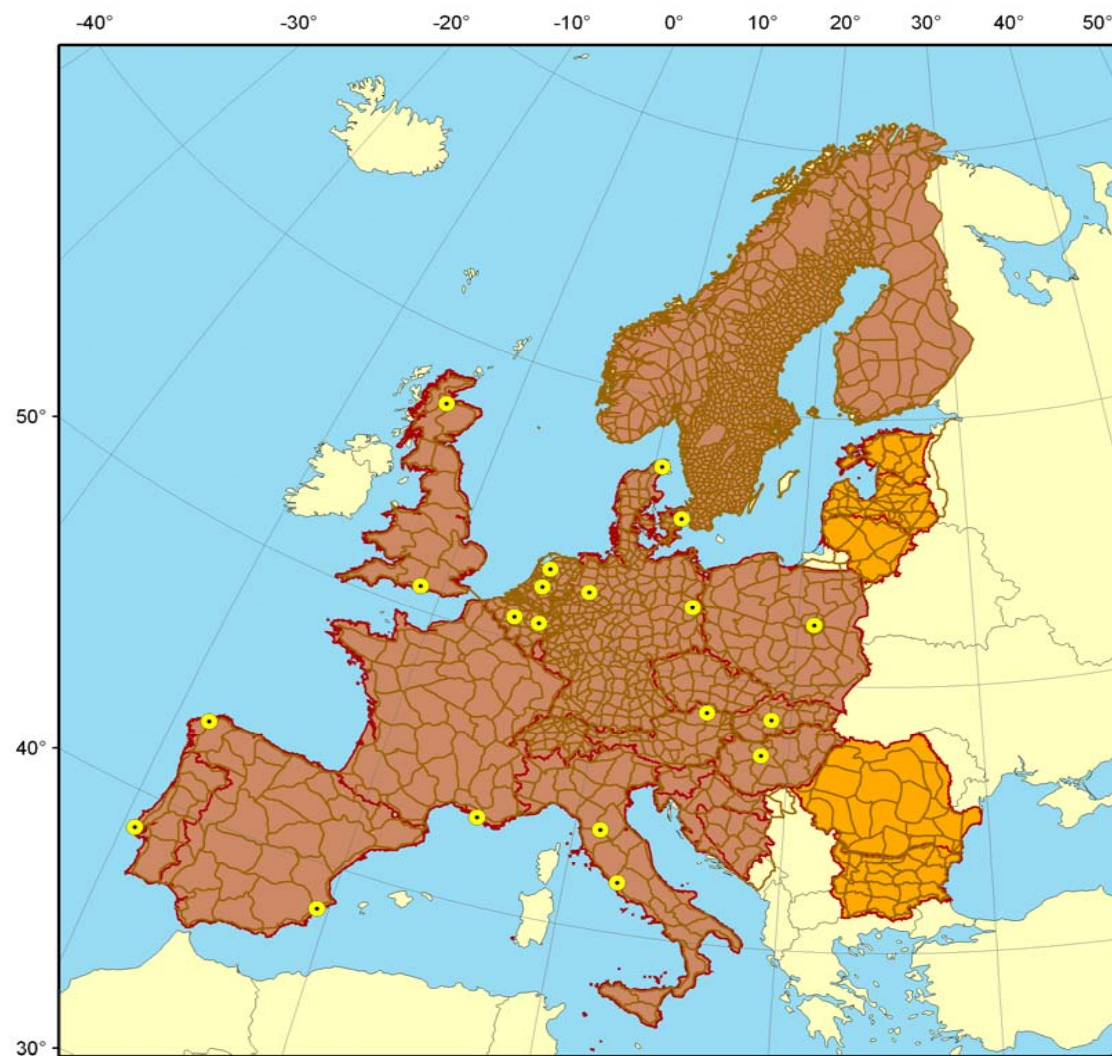
New data since 2007

- **Slovakia (1997-2002)**
 - 170 nodal points
 - 183 lines
 - $s_0 = 1.61 \text{ kgal} \cdot \text{mm}$
- **Lithuania (1998-2006)**
 - 67 nodal points
 - 72 lines
 - $s_0 = 0.72 \text{ kgal} \cdot \text{mm}$
- **Portugal (?-2005)**
 - 16 nodal points
 - 23 lines
 - $s_0 = 2.21 \text{ kgal} \cdot \text{mm}$
- **Poland (1999-2003)**
 - 263 nodal points
 - 401 lines
 - $s_0 = 0.86 \text{ kgal} \cdot \text{mm}$

Responses to the circular letter

country	answer	proposed datum point	proposed ECGN station
A	x	AT01(connected to 102105)	GRAZ, TRFB
B	x	200038	BRUS
CH	x	not expedient	ZIMM
D	x	401110, 401668	SASS, WTZR, BADH
DK			
E	x	600157, 600224	ALAC, YEBE, RIOJ, (Santiago)
F	x	700359	MARS
I	x	800432, 800441	MSEL
NL	x	913000,913011,913018	WSRT
PT			
H	x	1103000	PENC
CZ			
GB	x	1300364, 1300383	NEWL, HERS
NO	x	not expedient	STAS, TRO1, Trysil
SE	x	not expedient	SPT0, KIR0, MAR6, ONSA, SKE0, VIS0
FIN	x	not expedient	METS, JOEN, SODA, VAAS
PL	(x)	1706115	
SLO			
SK	x	EH-V	
HR	x		
LV	x	not applicable	
EST		not applicable	
RO	x	not applicable	
LIT	x	not applicable	VLNS, Klaipeda
BG	x	not applicable	SOFI

Proposed datum points



Status August 2007

• proposed datum points

Height changes in the datum points in in mm (mean tide)

Country	Point	1D-1999	19D-1999	17D-1999	14D-1999
A	102105	6.3	6.1	4.9	7.4
B	200038	-8.8	-9.0	-10.2	-7.7
D	401110	-5.0	-5.2	-6.4	-3.9
	401658	-9.0	-9.2	-10.3	-7.8
DK	514004	-7.4	-7.6	-8.8	-6.3
	514182	-8.4	-8.5	-9.7	-7.2
E	600157	16.9	6.2	5.0	7.5
	600224	0.4	-10.3	-11.5	-9.0
F	700359	-1.9	-2.0	-3.2	-0.7
I	800432	6.6	6.5	5.3	7.8
	800441	6.5	6.4	5.2	7.7
NL	913000	0.0	-0.2	-1.4	1.1
	913011	3.1	2.9	1.7	4.3
PT	1000623	21.1	19.3	18.1	20.6
H	1103000	4.5	4.4	3.2	5.7
GB	1300364	-10.0	-10.2	-11.3	-8.8
	1300383	-10.0	-10.1	-11.3	-8.8
PL	1706115	7.5	7.3	6.1	8.6
SK	1905325	13.5	13.3	12.1	14.6

Height changes in the datum points in mm (zero tide)

Country	Point	1D-1999	19D-1999	19Dshift-1999	17Dshift-1999
A	102105	-66.1	-65.2	19.7	19.2
B	200038	-85.7	-84.8	0.1	-0.4
D	401110	-88.8	-87.8	-3.0	-3.5
	401658	-90.5	-89.6	-4.7	-5.1
DK	514004	-105.6	-104.6	-19.8	-20.2
	514182	-96.1	-113.9	-29.1	-29.5
E	600157	-34.7	33.8	51.1	50.7
	600224	-26.2	-25.3	59.6	59.2
F	700359	-43.0	-42.1	42.8	42.4
I	800432	-38.1	-37.1	47.7	47.3
	800441	-28.8	-27.8	57.0	56.6
NL	913000	-86.6	-85.7	-0.8	-1.2
	913011	-80.0	-79.1	5.8	5.4
PT	1000623	1.7	2.6	87.5	87.1
H	1103000	-60.7	-59.8	25.1	24.7
GB	1300364	-87.2	-86.3	-1.5	-1.9
	1300383	-118.8	-117.9	-33.0	-33.4
PL	1706115	-70.4	-69.5	15.4	15.0
SK	1905325	-66.8	-65.8	19.0	18.6

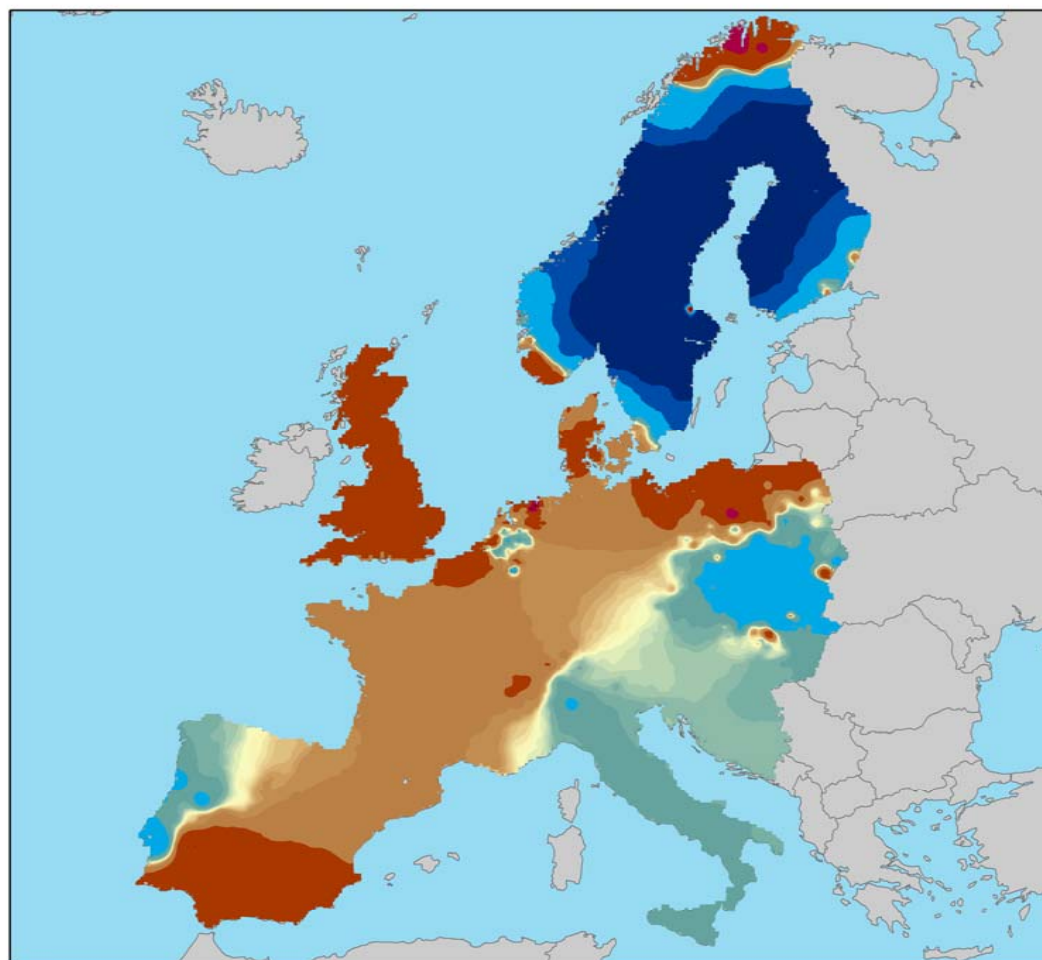
Mean offset to the results of UELN 95/98 in m (mean tide)

Country	1FP-1999	19D-1999	17D-1999	14D-1999
Austria	0.004	0.004	0.002	0.005
Belgium	-0.008	-0.009	-0.010	-0.007
Switzerland	-0.028	-0.028	-0.029	-0.027
Germany	-0.003	-0.003	-0.004	-0.002
Denmark	-0.008	-0.008	-0.010	-0.007
Spain	-0.006	-0.006	-0.008	-0.005
France	-0.006	-0.006	-0.007	-0.004
Italy	0.006	0.006	0.004	0.007
the Netherlands	-0.007	-0.007	-0.008	-0.005
Portugal	0.013	0.012	0.011	0.014
Hungary	0.006	0.006	0.005	0.007
Czech Republic	0.011	0.011	0.009	0.012
Great Britain	-0.010	-0.010	-0.011	-0.009
Norway	0.077	0.077	0.076	0.078
Sweden	0.178	0.177	0.176	0.179
Finland	0.083	0.083	0.082	0.084
Poland	0.002	0.002	0.001	0.004
Slowenia	0.004	0.003	0.002	0.005
Slovakia	0.015	0.015	0.013	0.016
Croatia	0.004	0.004	0.003	0.005
all points	0.009	0.009	0.007	0.010
without Scandinav.	-0.002	-0.002	-0.003	-0.001

Mean offset to the results of UELN 95/98 in m (zero geoid)

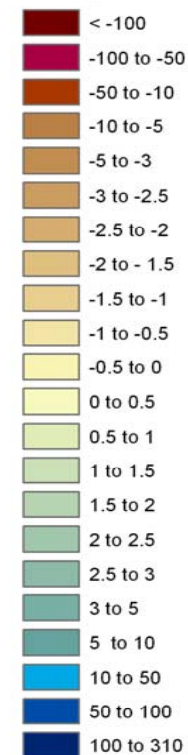
Country	1FP-1999	19D-1999	19D-1999shift	17D-1999shift
Austria	-0.062	-0.061	0.024	0.023
Belgium	-0.084	-0.084	0.001	0.001
Switzerland	-0.088	-0.087	-0.002	-0.003
Germany	-0.081	-0.080	0.004	0.004
Denmark	-0.107	-0.106	-0.021	-0.022
Spain	-0.035	-0.034	0.051	0.051
France	-0.063	-0.063	0.022	0.022
Italy	-0.037	-0.037	0.048	0.048
the Netherlands	-0.090	-0.089	-0.004	-0.005
Portugal	-0.008	-0.007	0.077	0.077
Hungary	-0.060	-0.059	0.026	0.026
Czech Republic	-0.068	-0.068	0.017	0.017
Great Britain	-0.102	-0.101	-0.016	-0.016
Norway	-0.045	-0.044	0.041	0.040
Sweden	0.057	0.058	0.143	0.142
Finland	-0.042	-0.041	0.044	0.043
Poland	-0.078	-0.077	0.008	0.008
Slowenia	-0.056	-0.055	0.030	0.030
Slovakia	-0.065	-0.064	0.020	0.020
Croatia	-0.048	-0.047	0.038	0.038
all points	-0.069	-0.068	0.017	0.016

Variant with 17 datum points – mean tide

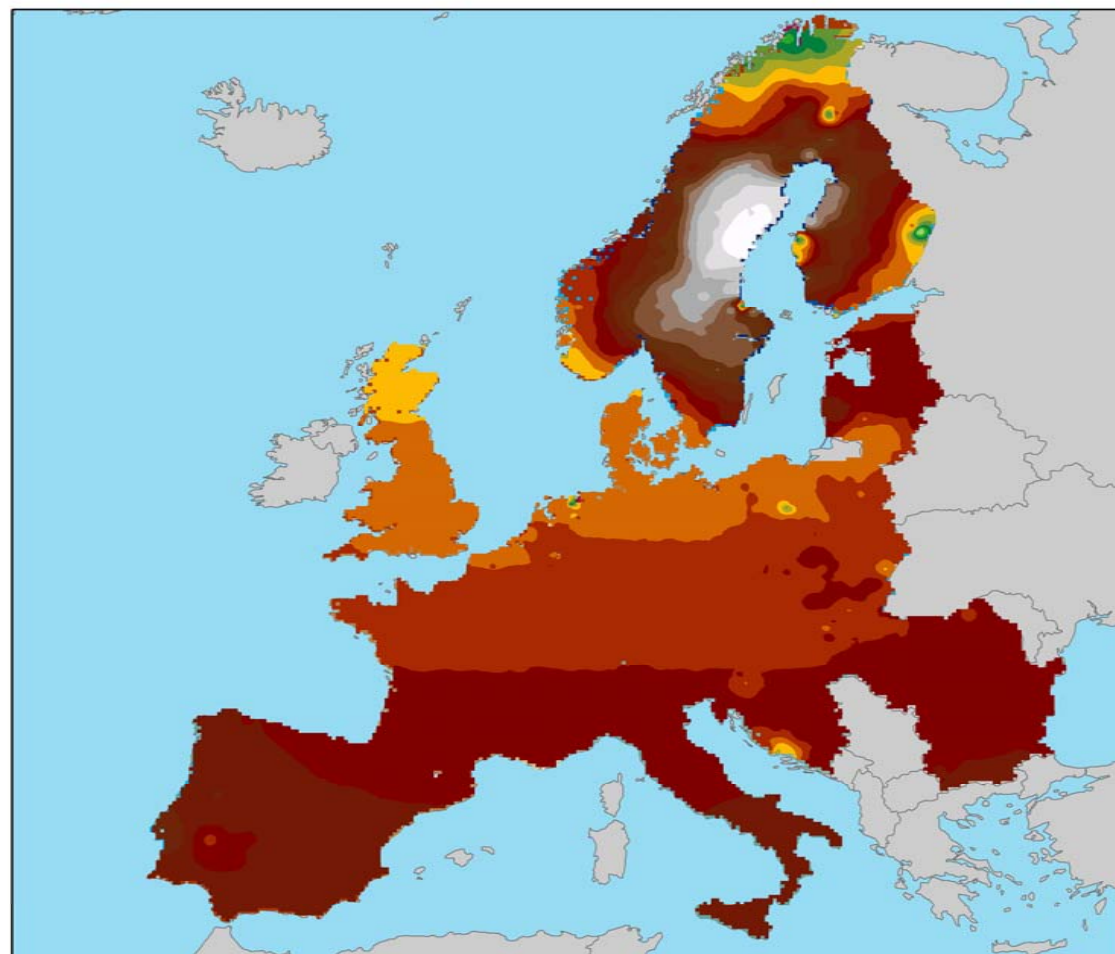


Differences to UELN-95/98
in kgal*mm

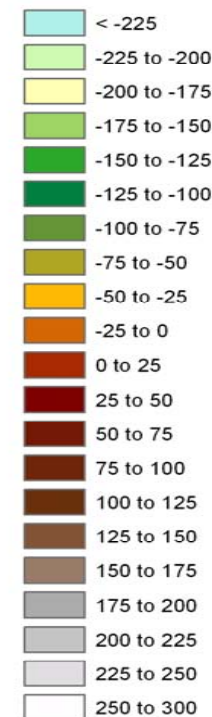
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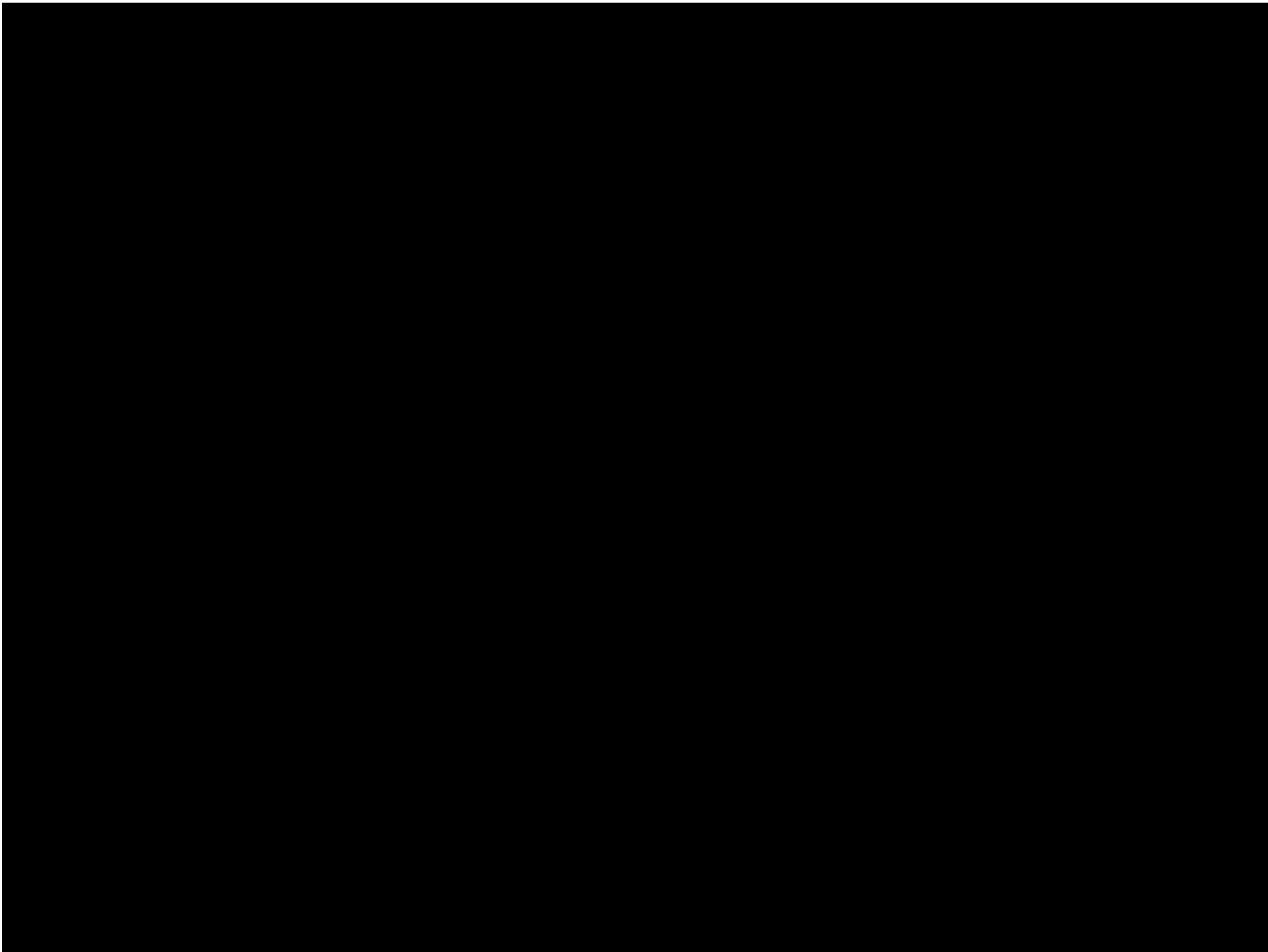


Variant with 19 datum points compared with solution of 2003 – zero tide



Differences to UELN 2003
in kgal*mm





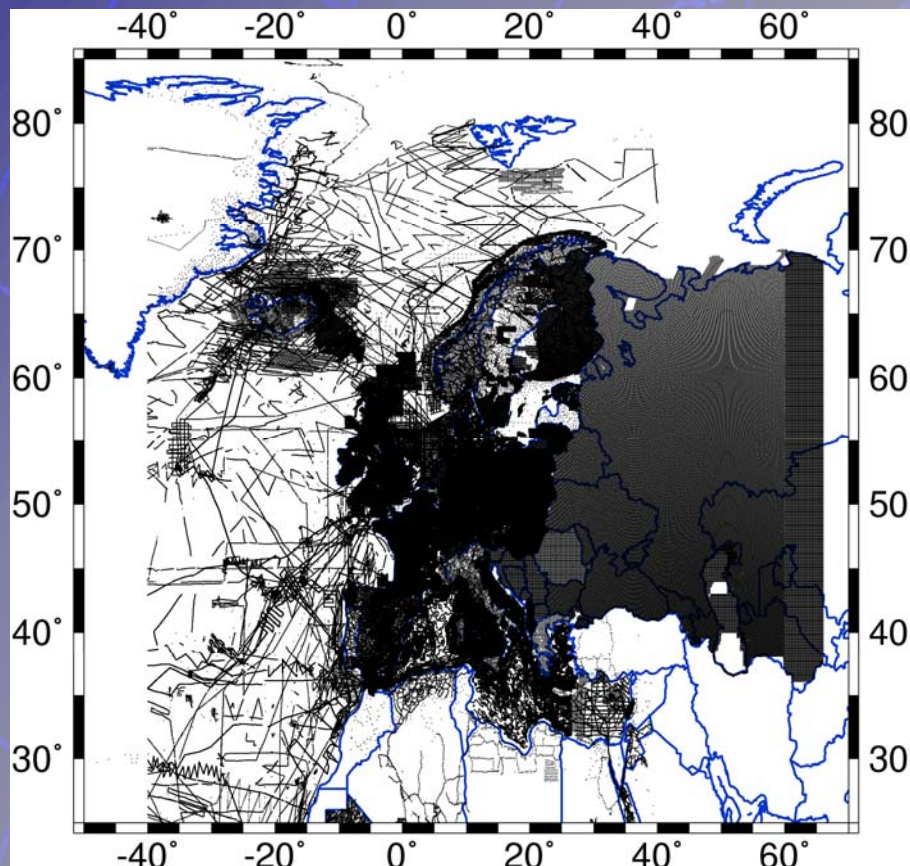
The Development of the European Gravimetric Geoid Model EGG2007

H. Denker¹, J.-P. Barriot, R. Barzaghi, D. Fairhead,
R. Forsberg, J. Ihde, A. Kenyeres, U. Marti,
M. Sarrailh, I.N. Tziavos

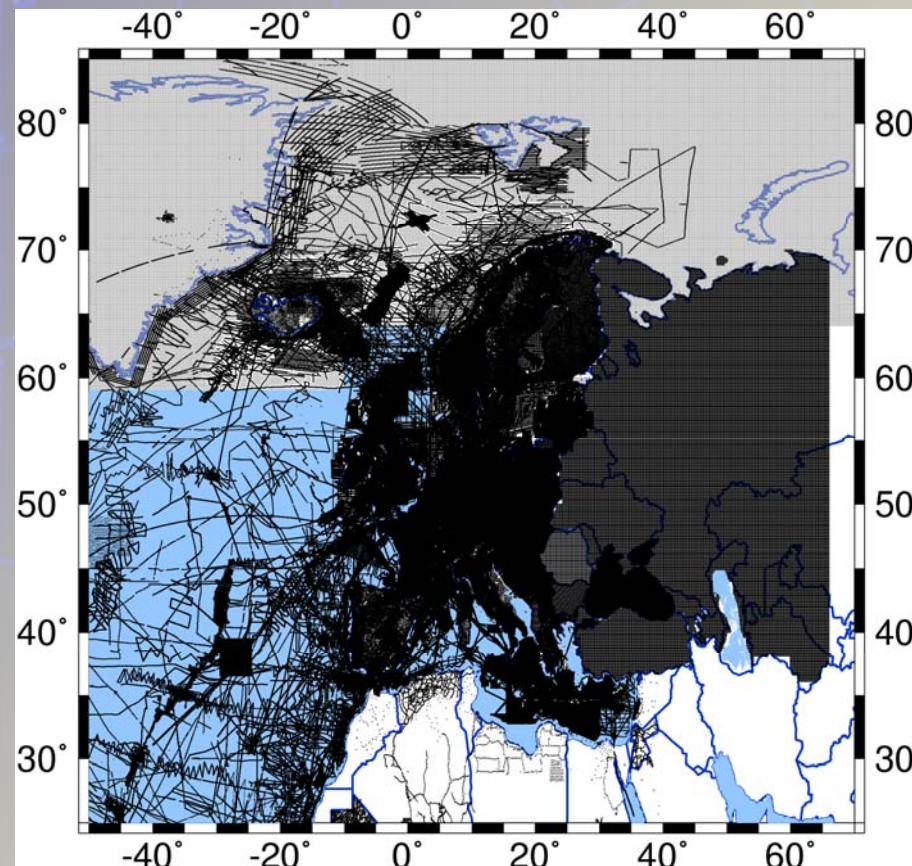
¹ Institut für Erdmessung (IfE), Leibniz Universität Hannover

- Gravity only solution – global (WHS transformation)
- Fitting to EVRS/ETRS 89 by one shift parameter (EVRS transformation)
- Zero tidal system problem: EGG - zero, EVRS - zero, ETRS - non

Locations of gravity data stored in IfE data base:



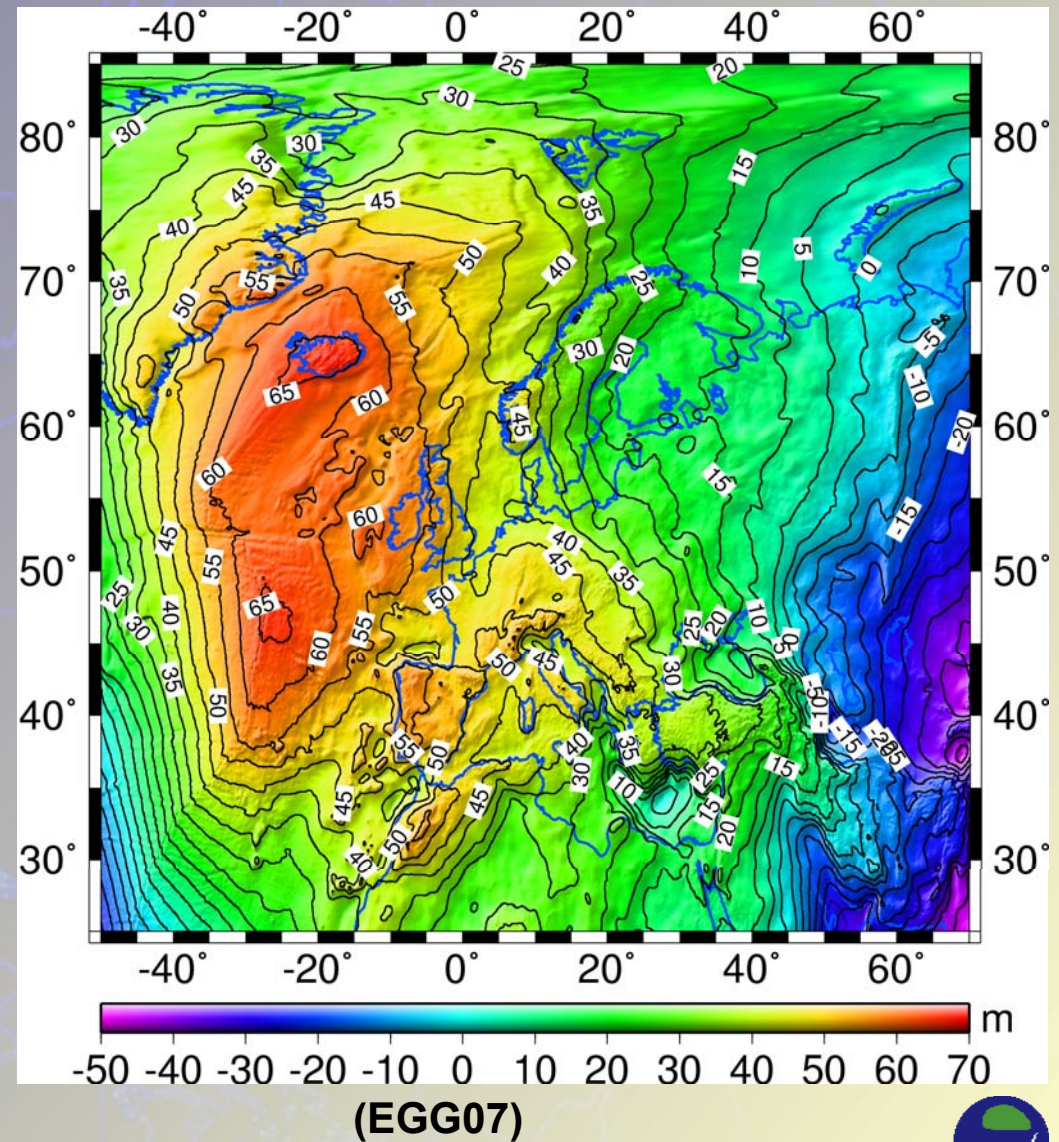
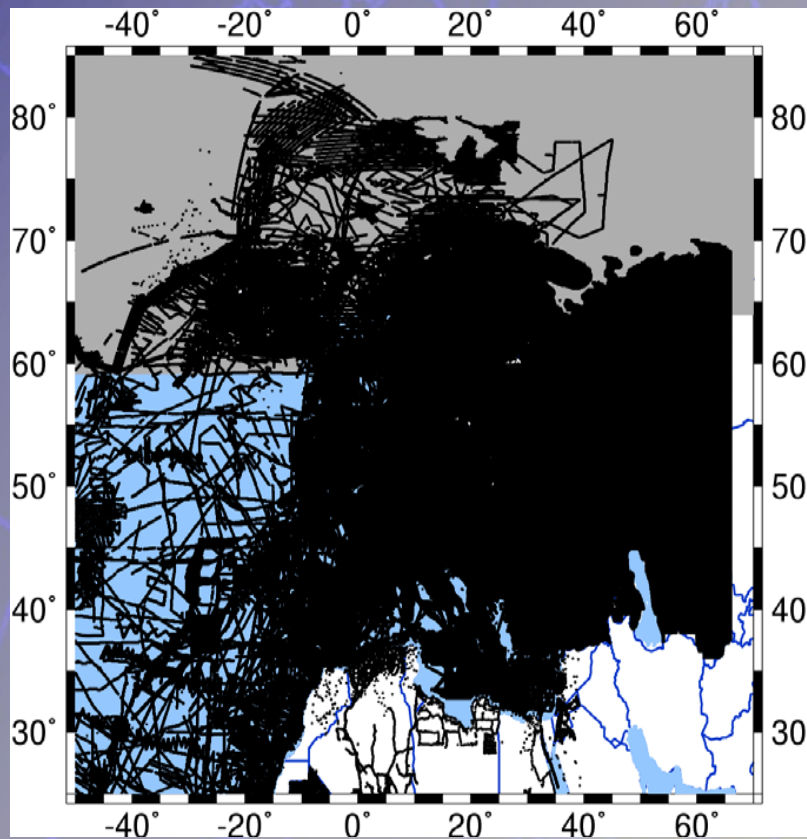
Status: EGG1997
(2,684,133 pts.)



Status: EGG2007
(5,354,653 pts.)

Europe

- 6.5 million gravity observations
- digital terrain model (1" ... 30" resolution)
- EIGEN-GL04C global model



- **Accuracy of combined geoid (global model + terrestrial gravity):**

GRACE + Δg (1 mgal): 0.026 m

(contribution from degrees $l = 91 - 360$: 0.023 m!)

- **Computation area:**

25°N – 85°N, 50°W – 70°E, 1.0' x 1.0' grid

3,600 x 7,200 = 25,920,000 grid points

- **GRS80 constants**, zero-tide system, EVRS

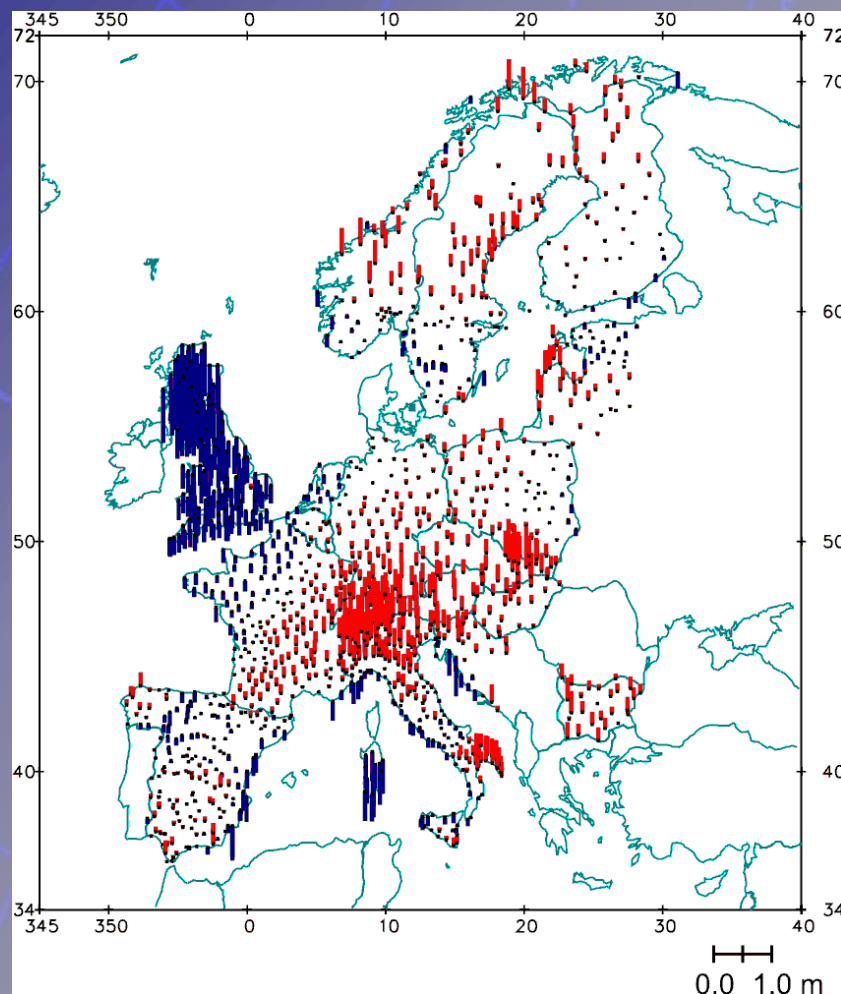
- **Solutions:**

EGG97/EGM96: EGG97 Δg , EGM96 geopotential model

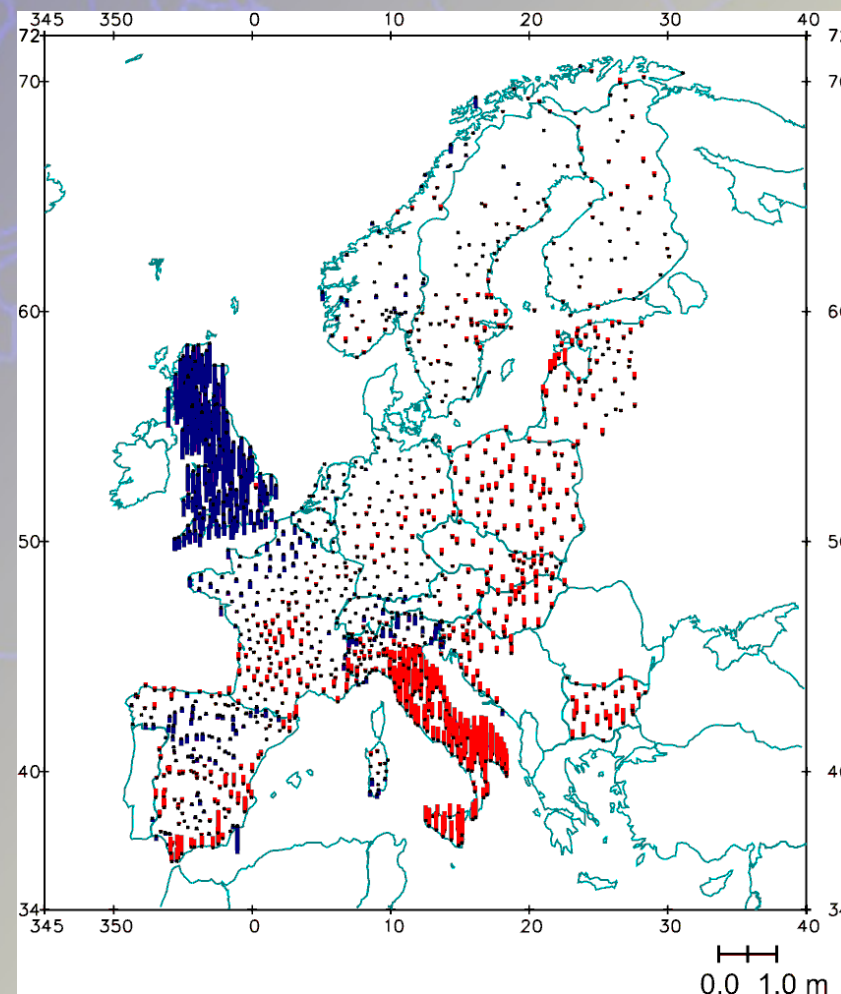
EGG97/GRACE: EGG97 Δg , EIGEN-CG03C geopotential model

EGG07/GRACE: EGG07 Δg , EIGEN-GL04C geopotential model

EUVN_DA (1285 stations):



$$\zeta_{GPS} - \zeta_{grav.} \text{ (after bias fit)}$$



EGG97/EGM96

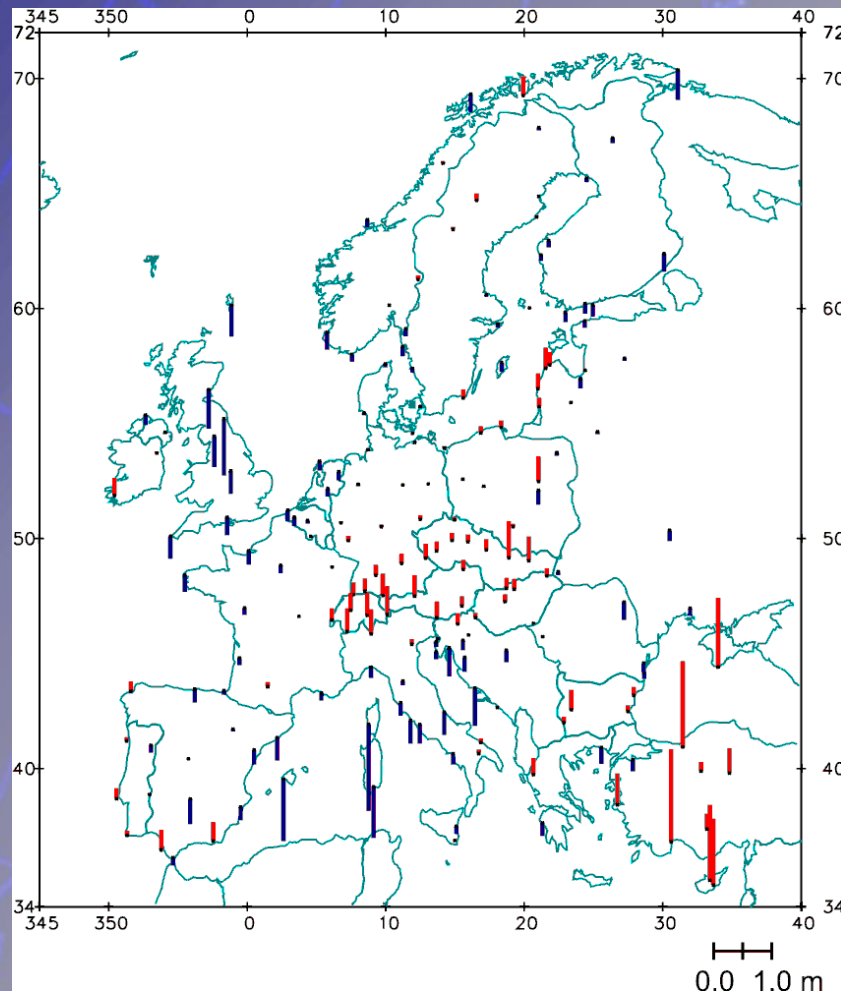
(* without IT & GB)

EGG07/GRACE

*Rms: ± 0.158 m; Min: -0.669 m; Max: +0.641 m *Rms: ± 0.079 m; Min: -0.518 m; Max: +0.549 m



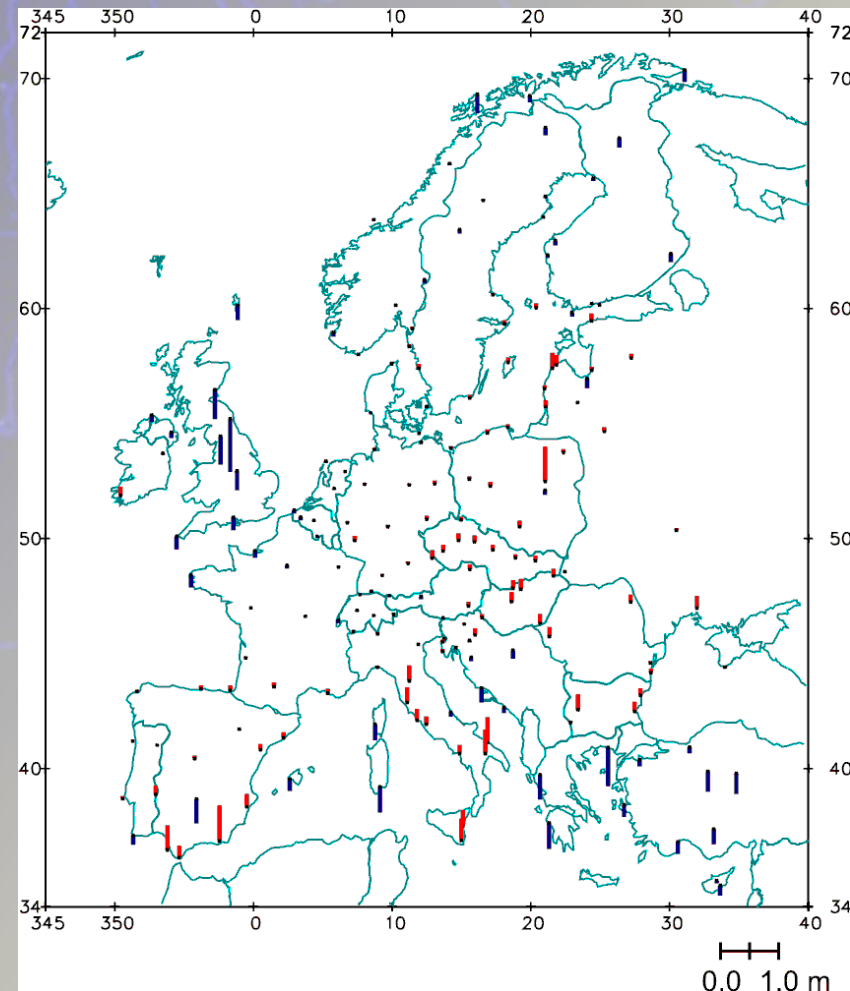
EUVN (186 stations):



EGG97/EGM96

Rms: ± 0.355 m; Min: -1.487 m; Max: +1.590 m

$$\zeta_{GPS} - \zeta_{grav.} \text{ (after bias fit)}$$

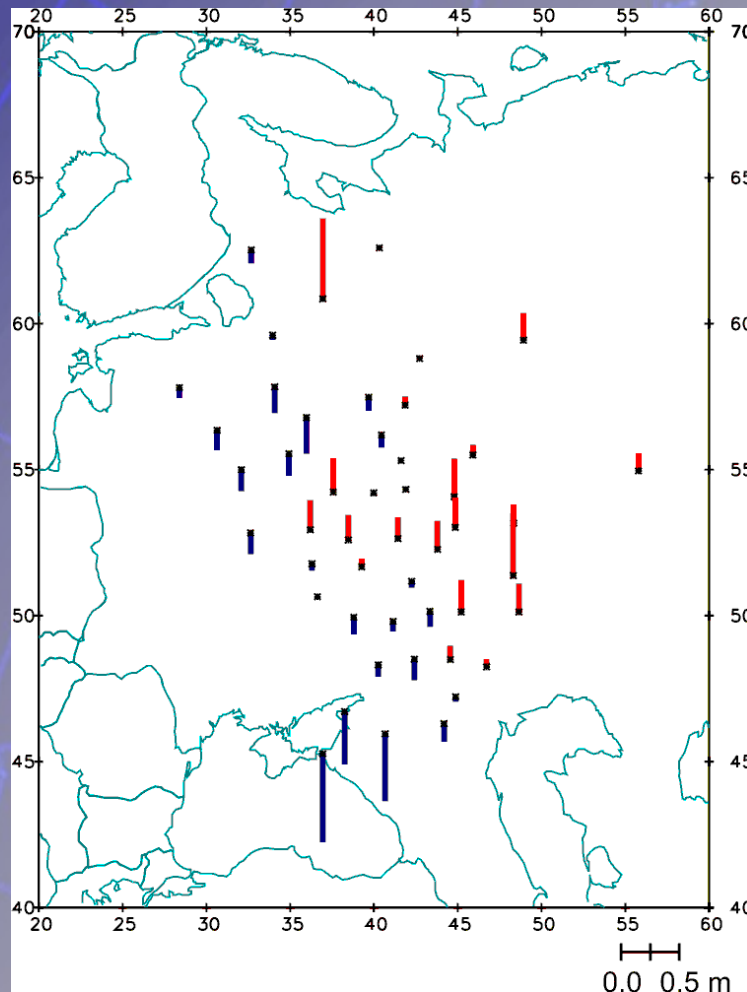


EGG07/GRACE

Rms: ± 0.188 m; Min: -0.915 m; Max: +0.614 m



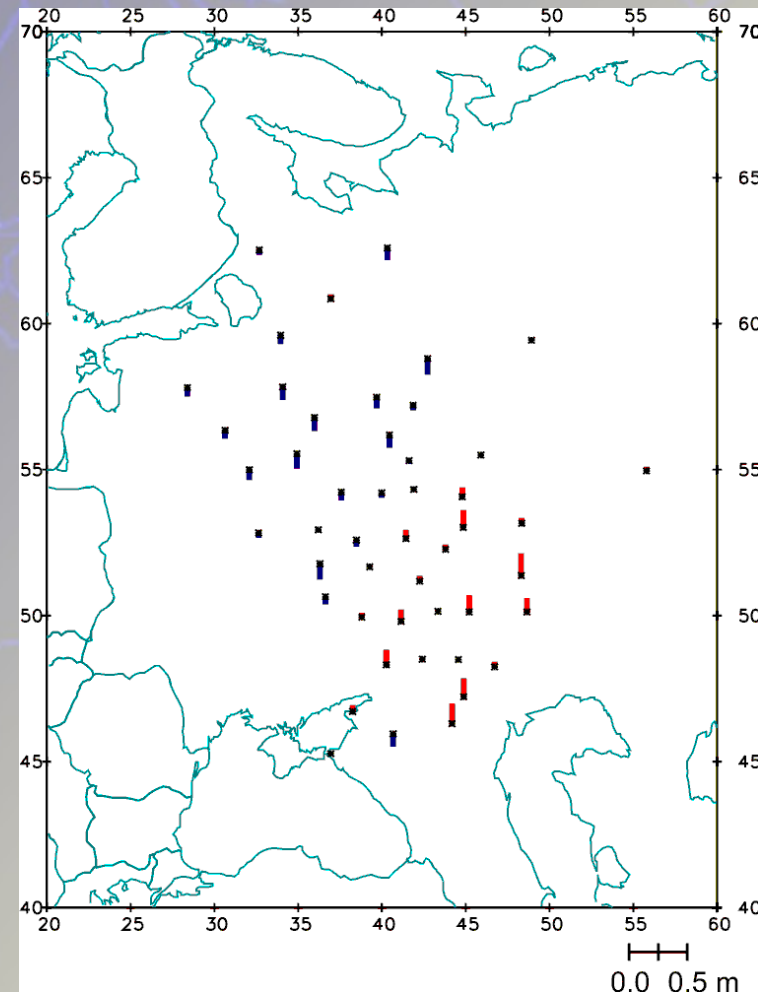
Russia (48 stations):



EGG97/EGM96

Rms: ± 0.253 m; Min: -0.760 m; Max: +0.693 m

$\zeta_{GPS} - \zeta_{grav.}$ (after bias fit)

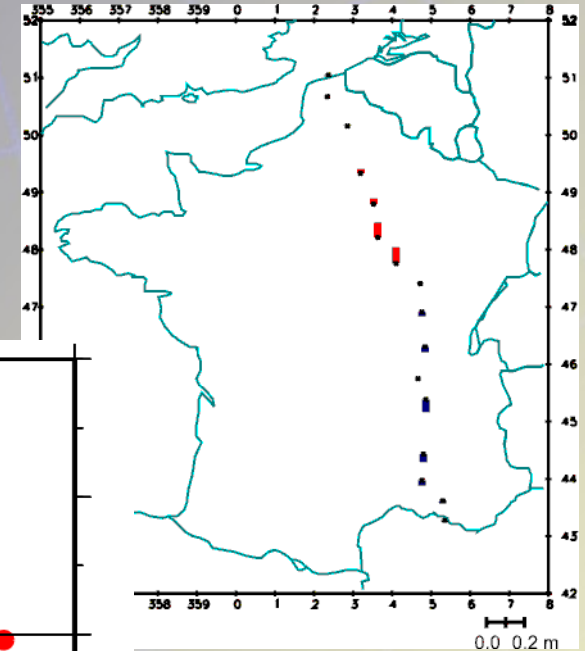
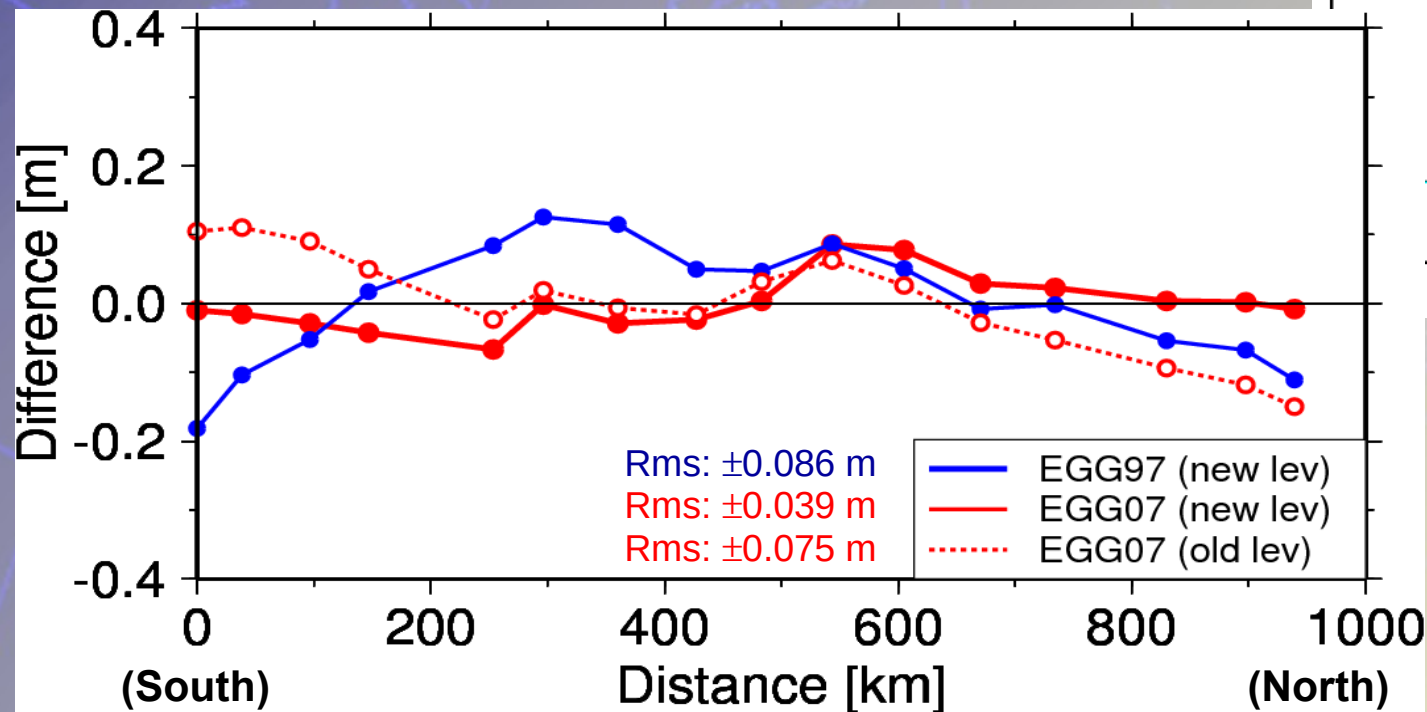


EGG07/GRACE

Rms: ± 0.089 m; Min: -0.139 m; Max: +0.192 m

French traverse (16 stations):

$$\zeta_{GPS} - \zeta_{grav.} \text{ (after bias fit)}$$

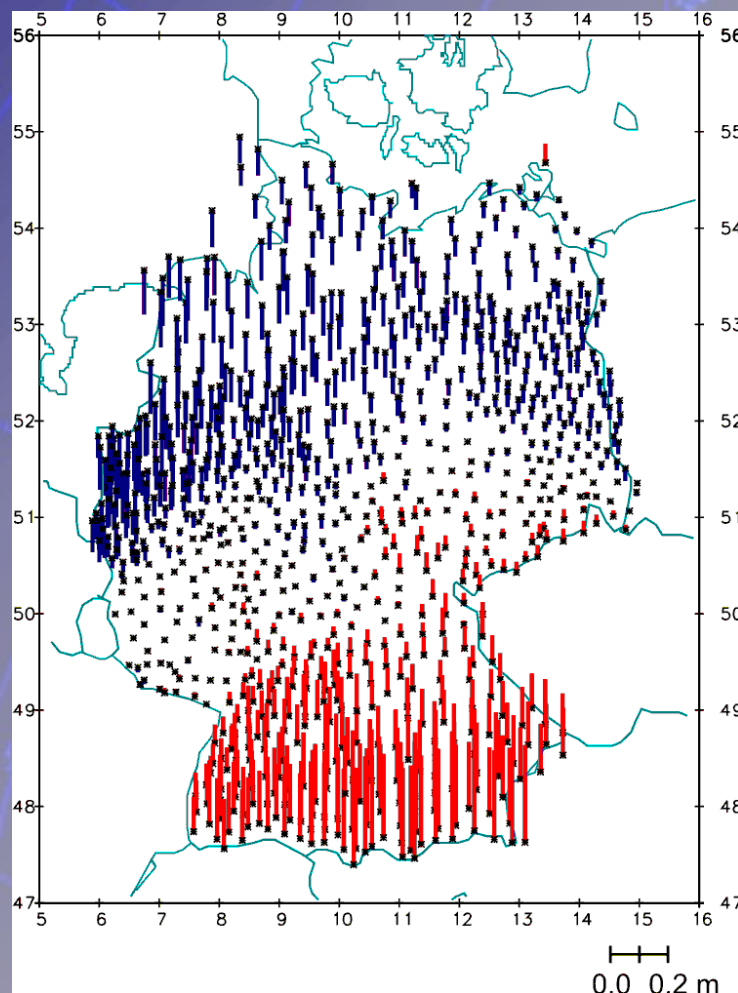


EGG07 (new lev)



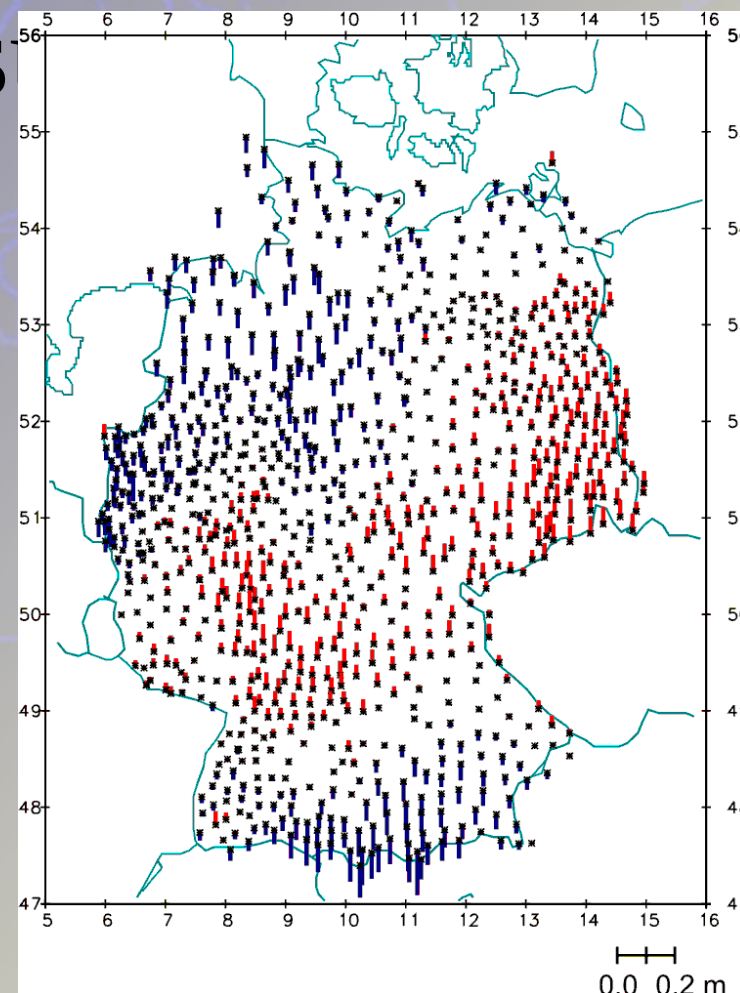
FRG (907 stations from BKG): $\zeta_{GPS} - \zeta_{grav.}$ (after bias fit)

Res



EGG97/EGM96

Rms: ± 0.099 m; Min: -0.192 m; Max: +0.338 m

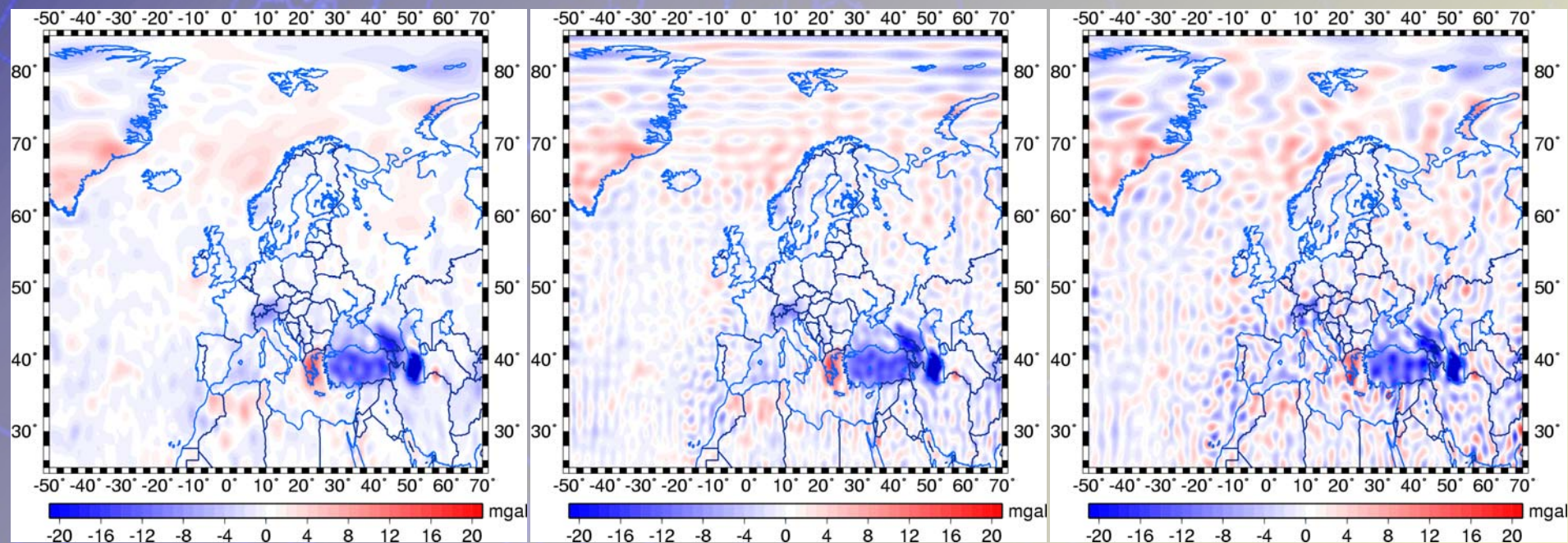


EGG07/GRACE

Rms: ± 0.036 m; Min: -0.152 m; Max: +0.075 m

Data filtering

Differences between terrestrial 5' x 5' Δg and
GRACE based geopotential models
(after Gaussian filtering with $r = 100$ km)



EIGEN-GL04C

EIGEN-GL04S1

EIGEN-GRACE01S