



EVRF07

as Realization of the European Vertical Reference System

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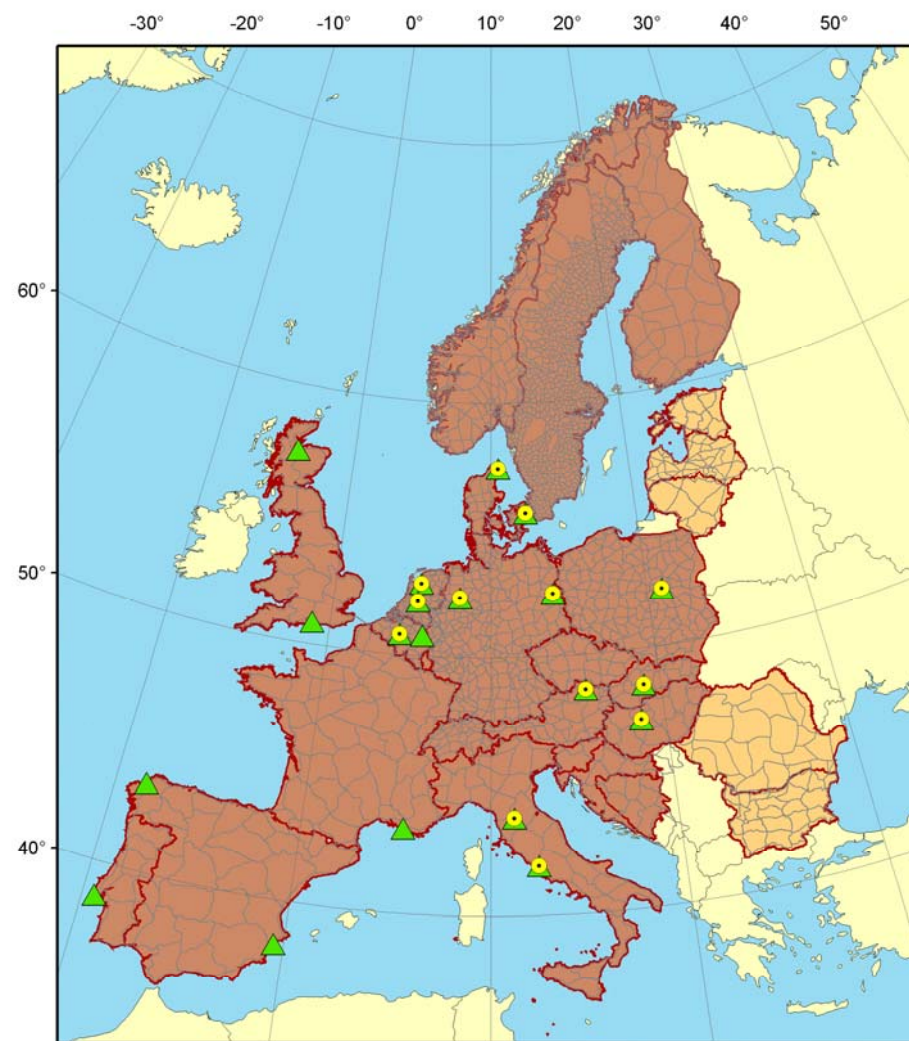
1. Data
2. Datum
3. Epoch of the measurements
4. Tidal corrections
5. Summary of the adjustment parameters
6. Delivery of the Results

New data of 14 countries since 1999:

- | | |
|--------------------------|-------------------------|
| • Latvia (1999) | new part of the network |
| • Romania (2000) | new part of the network |
| • Lithuania (2001) | new part of the network |
| • Switzerland (2002) | update |
| • Bulgaria (2003) | new part of the network |
| • the Netherlands (2005) | update |
| • Finland (2005) | update |
| • Norway (2005) | update |
| • Sweden (2005) | update |
| • Slovakia (2007) | update |
| • Lithuania (2007) | update |
| • Poland (2007) | update |
| • Portugal (2007) | update |

- Realization of the datum of EVRF2000
 - reference point *000A2530 in the Netherlands*
- Realization of the datum of EVRF07
 - several datum points distributed over the stable part of Europe
 - participating countries were asked to propose stable points
 - 19 points were proposed
 - 14 points have been used
 - points of Great Britain, France, Spain and Portugal weren't used because of expected height changes in the area after the planned including of new measurements of France and the connection between F and UK
 - only 2 of 3 proposed points of NL was used (for the reason see the report)

Proposed datum points



Datum points

- proposal supported by the UELN data centre
- ▲ proposed by the countries

3. Epoch of the measurements

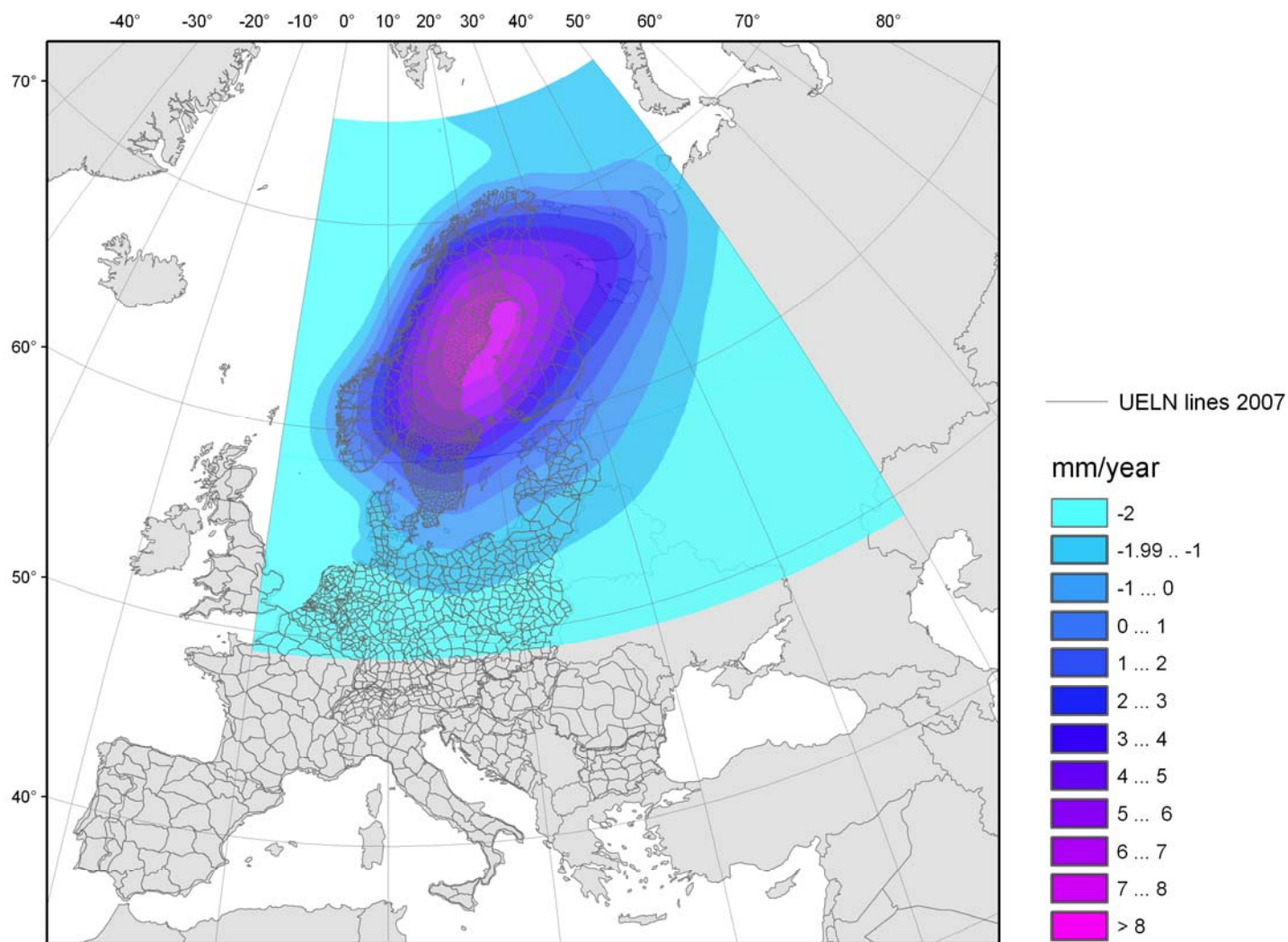
EVRF2000:

- measurements of Finland, Norway and Sweden had been reduced to the epoch 1960
- all other data had not been reduced to a common epoch

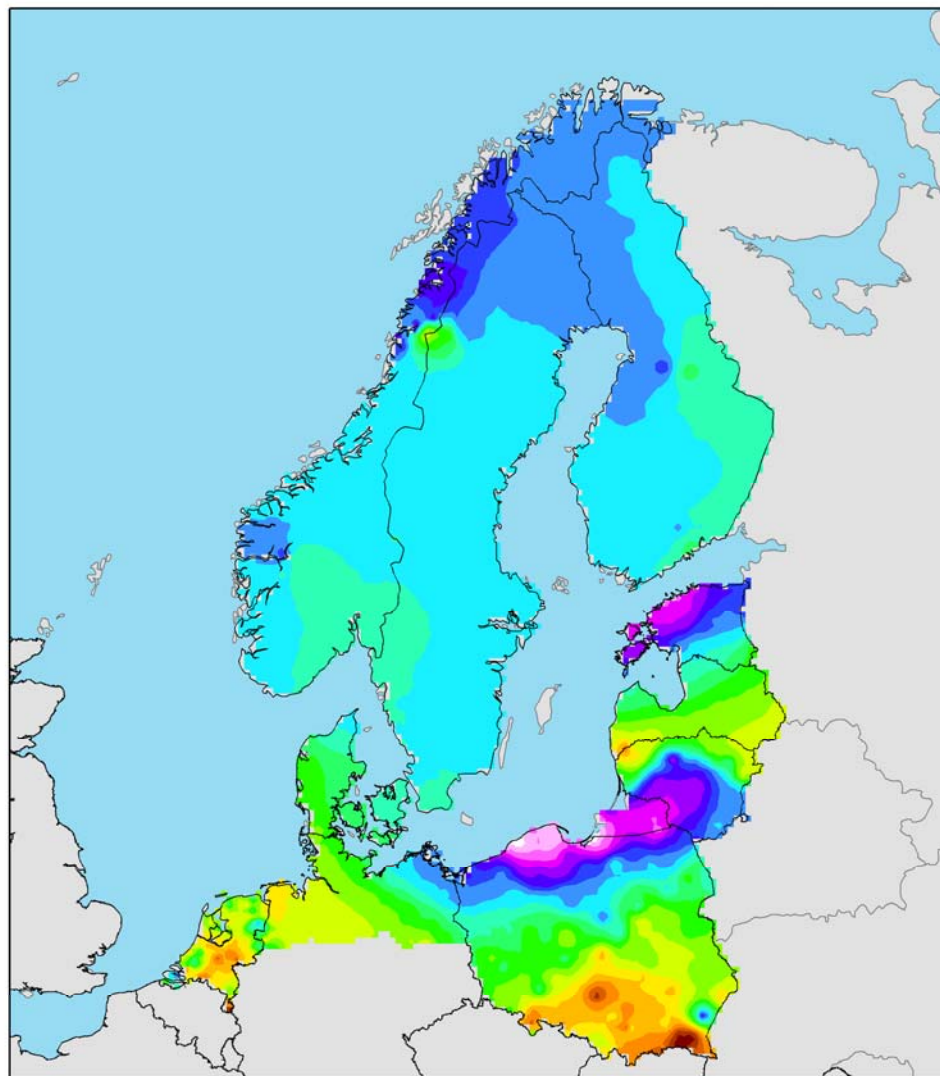
EVRF07

- Reduction to the epoch 2000 by the land uplift model [NKG2005LU](#) (Ågren and Svensson)
- 3 modalities of reduction:
 - a) [only the data of Finland, Norway and Sweden](#)
 - b) [Finland, Norway, Sweden and additional Denmark](#)
 - c) [all data located in the area of the NKG2005LU model](#)
(just as in the BLR2000 adjustment) **preferred variant**

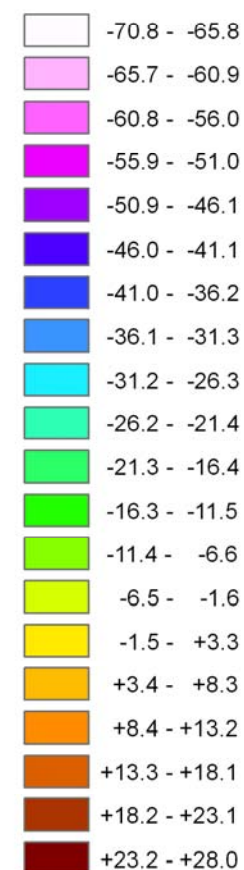
NKG2005LU and UELN lines



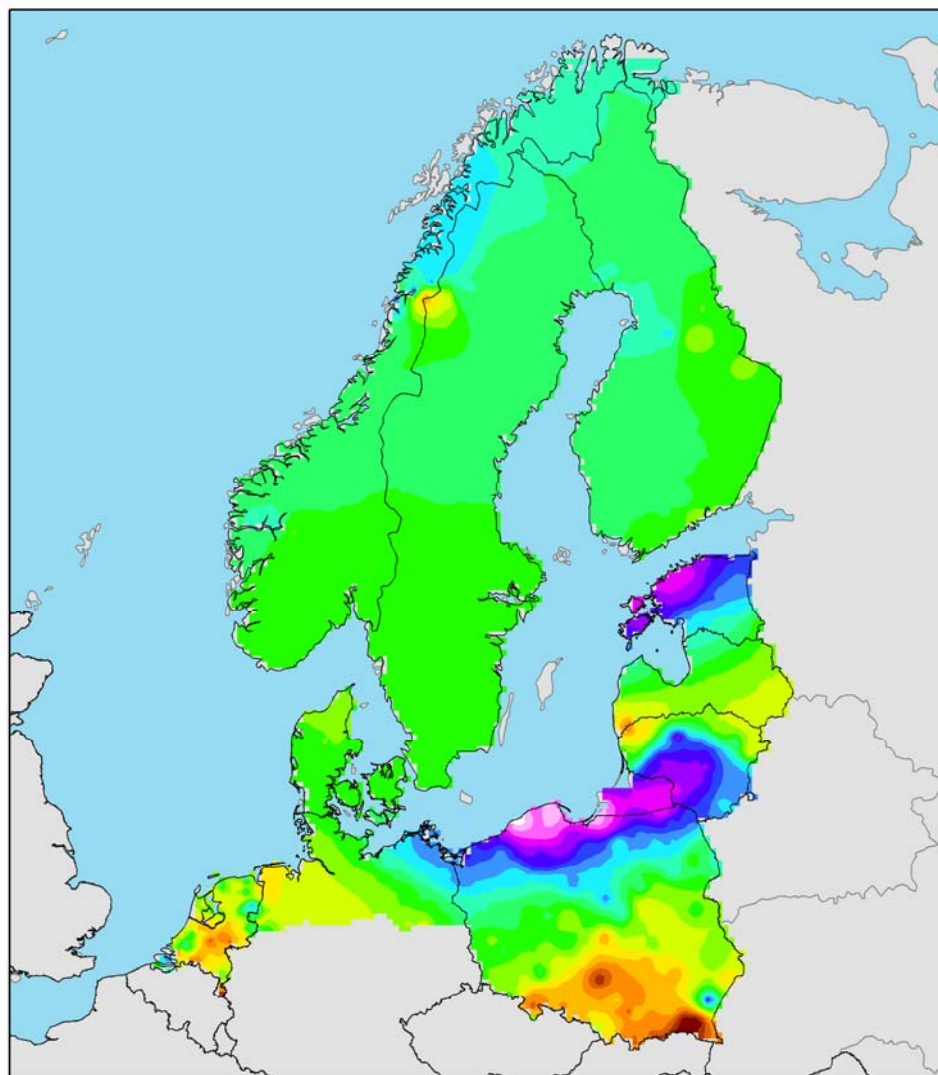
Variant a) - Differences to the BLR2000



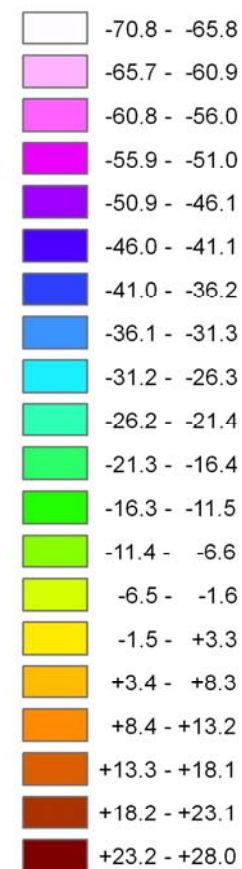
Differences UELN - NKG in kgal*mm
 FIN, NO, SE
 reduced to epoch 2000



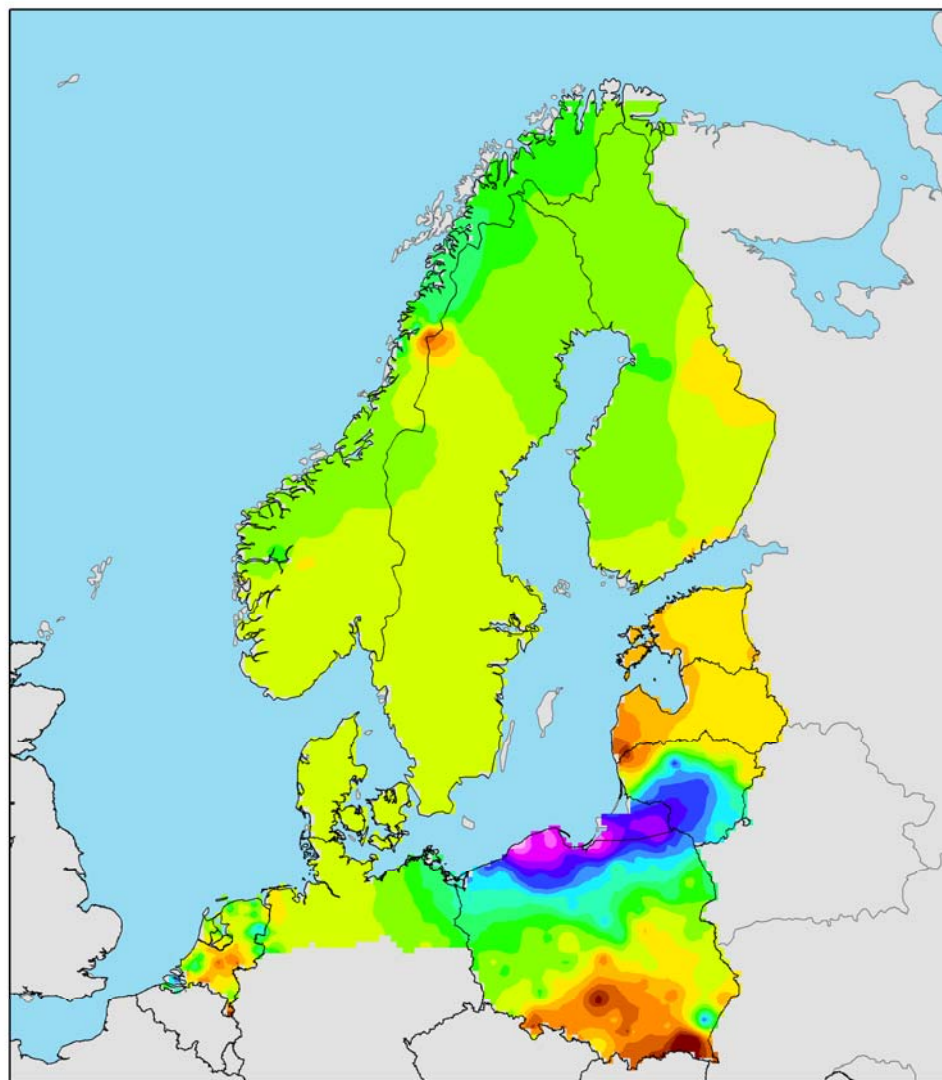
Variant b) - Differences to the BLR2000



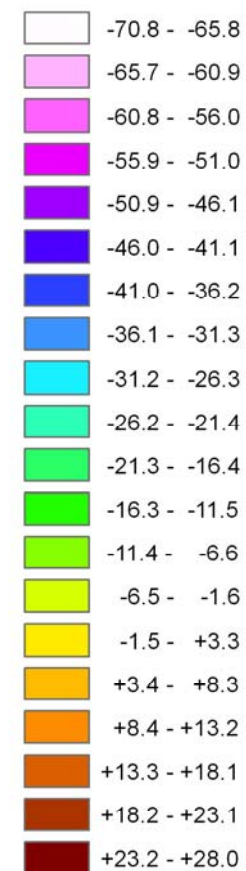
Differences UELN - NKG in kgal*mm
 FIN, NO, SE, DK
 reduced to epoch 2000



Variant c) - Differences to the BLR2000



Differences UELN - NKG in kgal*mm
 FIN, NO, SE, DK, D, PL, LT, EST, LV
 reduced to epoch 2000



EVRF2000:

- EVRS defined as zero tidal system
- no corrections were applied - in practice mean tidal system

EVRF07

- correction of the geopotential differences by

$$\Delta C_Z = \Delta C_M - 0.28841 \cdot (\sin^2 \varphi_2 - \sin^2 \varphi_1) - 0.00195 (\sin^4 \varphi_2 - \sin^4 \varphi_1)$$

in kgal·m

Treatment of the datum points:

a) $-0.28841 \cdot \sin^2 \varphi - 0.00195 \cdot \sin^4 \varphi + 0.09722$ [kgal·m]

Corrections range between −0.014 (E) and −0.108 (DK) kgal·m.

- b) Additionally transformation by +0.08432 kgal·m, the tidal correction of the datum point of EVRF2000:

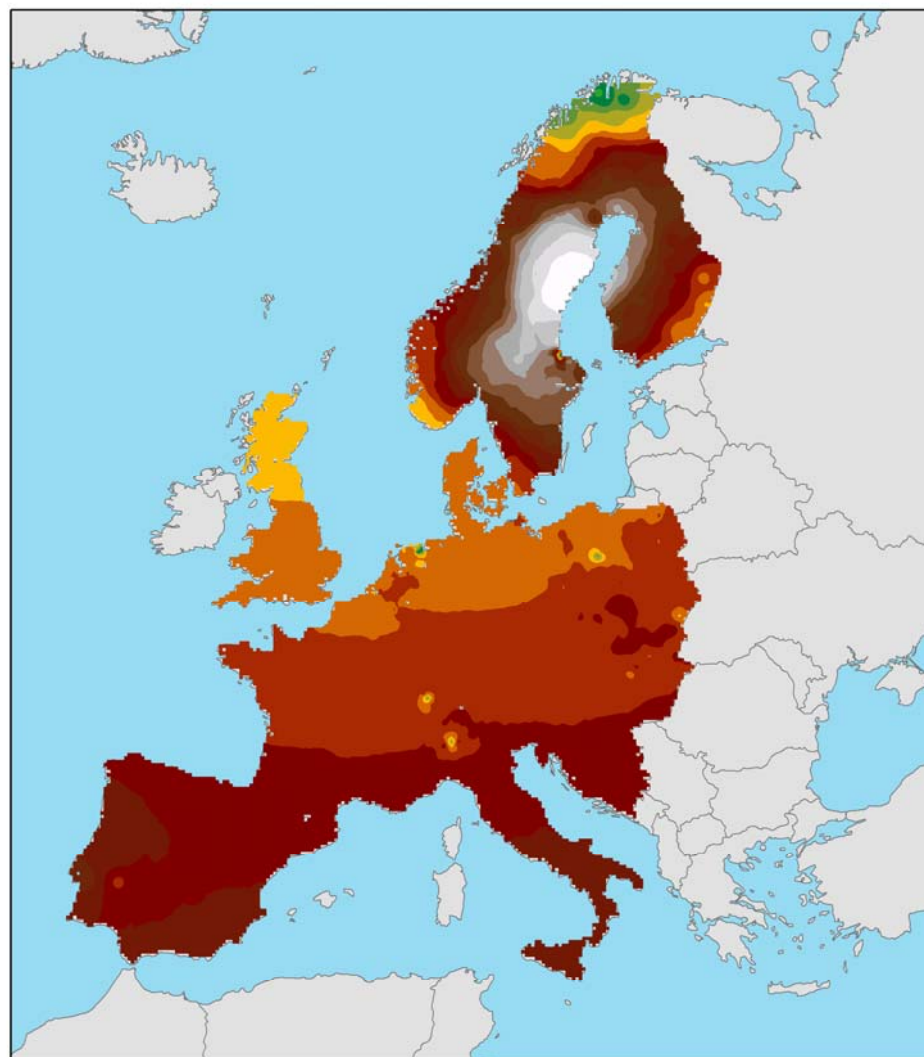
$$C_{dp2007} = C_{p95/98} - 0.28841 \cdot \sin^2 \varphi - 0.00195 \cdot \sin^4 \varphi + 0.09722 + 0.08432$$

[kgal·m]

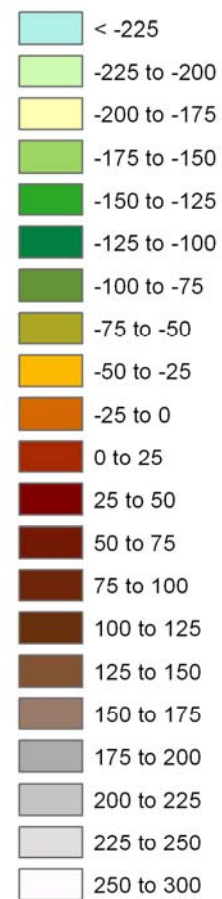
Points with the same latitude as the former datum point 000A2530 have the tidal correction 0.0.

Corrections range between +0.070 (E) and −0.024 (DK) kgal·m. *preferred variant*

Comparison of the adjusted heights of EVRF2000 and EVRF07



Differences to UELN 95/98
in kgal*mm



Differences of EVRF2007 to EVRF2000

Country	difference in kgal-mm
Austria	19.3
Belgium	-4.1
Switzerland	-7.2
Germany	0.1
Denmark	-10.7
Spain	46.0
France	17.1
Italy	43.8
the Netherlands	-9.8

Country	difference in kgal-mm
Portugal	72.3
Hungary	22.6
Czech Republic	14.3
Great Britain	-21.2
Norway	54.7
Sweden	157.1
Finland	53.7
Poland	7.5
Slowenia	26.5
Slovakia	18.3
total	14.9

5. Summary of the adjustment parameters

- datum realization by 13 datum points
- correction to the zero tidal system
- reduction of the measurements to the epoch 2000 using the whole NKG2005LU model

Parameter	UELN 95/98	EVRF07
Number of datum points:	1	13
Number of unknowns:	3063	7939
Number of measurements:	4263	10347
Number of condition equations:	0	1
Degrees of freedom:	1200	2409
A-posteriori standard deviation referred to 1 km levelling distance in kgal·mm:	1.10	1.11
Mean value of the standard deviation of the adjusted geopotential numbers ($\hat{=}$ heights), in kgal·mm:	19.64	16.05
Average redundancy:	0.281	0.233

6. Delivery of the Results

Handing over:

- a) Three reports**
- b) General adjustment parameters**

Till now no agreement on the exchange of leveling data exists. Therefore only the national part of the results will be handed over to the respective country.

- c) point related data**
- d) measurement related data (a priori and a posteriori)**