

A new European Gravimetric (Quasi)Geoid EGG2015

Table 1. Main characteristics of EGG1997/2008/2015.

EGG1997	EGG2008	EGG2015
2,684,133 (744 sources)	5,355,206 (718 sources)	6,100,190 (766 sources)
Other gravity data sources		
195,840 (ArcGP)	389,196 (ArcGP)	
335,124 (KMS1996)	13,222,260 (1' x 1' alt.)	13,222,260 (1' x 1' alt.)
-	120,747 (EGM2008 fillins)	120,807 (EGM2008 fillins)
3,019,257 (<i>Total</i>)	18,894,053 (<i>Total</i>)	19,832,453 (<i>Total</i>)
Terrain data base		
7.5" ... 5' resol.	1" ... 30" resol.	1" ... 30" resol.
700 million elev.	8.3 billion elev.	8.3 billion elev.
15' x 20' RTM	15' x 20' RTM	15' x 20' RTM
Global geopotential model		
EGM1996 ($l_{\max}=360$)	EGM2008 ($l_{\max}=360/2190$)	GOCO05S ($l_{\max}=280$)
Computation procedure		
Remove-restore technique, spectral combination (1DFFT)		
GRS80, zero-tide system, EVRS		
Computation grid		
25° - 77°N, 35°W - 67.4°E	25° - 85°N, 50°W - 70°E	25° - 85°N, 50°W - 70°E
1.0' x 1.5'	1.0' x 1.0'	1.0' x 1.0'
3,120 x 4,096 pts.	3,600 x 7,200 pts.	3,600 x 7,200 pts.

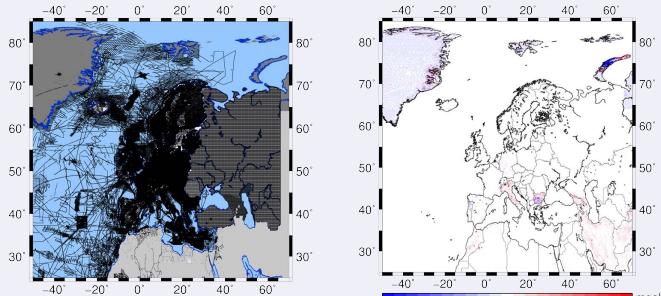


Fig. 1. Gravity data EGG2015 (left) and gravity differences EGG2015 - EGG2008 (right).

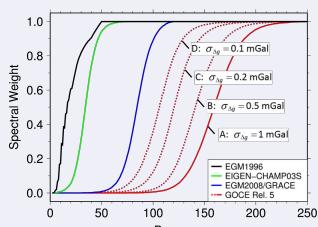


Fig. 2. Spectral weights.

- relative weighting of GOCE and terrestrial data is of vital importance
- EGG2015:** GOCO05S + terrestrial gravity data with $\sigma_{\Delta g} = 0.2 \text{ mGal}$
 \rightarrow gives overall best GPS/levelling fits
- $\zeta_0^{\text{EVRF2007}} = +0.305 \text{ m}$ (derived from EUVN_DA and other data sets)
- $W_0^{\text{EVRF2007}} = 62,636,857.86 \pm 0.02 \text{ m}^2 \text{s}^{-2}$

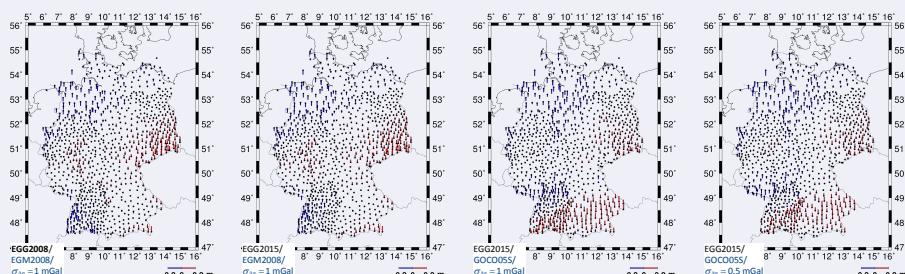


Fig. 3. Comparison of 954 GPS/levelling stations in Germany (BKG) with different EGG quasigeoid models.

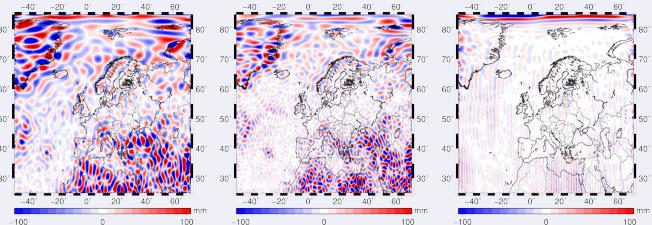


Fig. 4. EGG quasigeoid differences

- EGG2015/GOCO05S/0.2mGal - EGG2008 (left),
- EGG2015/GOCO05S/0.2mGal - EGG2015/GOCO05S/1.0mGal (middle), and
- EGG2015/GOCO05S/1.0mGal - EGG2015/GOCE-DIR/1.0mGal (right).

Table 2. Comparison of GPS/levelling data sets with different EGG quasigeoid models.

Quasigeoid	Mean	RMS	Min.	Max.
FRG2011 GPS/levelling data (BKG, 954 pts.)				
EGG1997/EGM1996/1.0mGal	+0.441	0.094	-0.197	+0.322
EGG2008/EGM2008/1.0mGal	+0.296	0.027	-0.069	+0.079
EGG2015/EGM2008/1.0mGal	+0.297	0.027	-0.068	+0.083
EGG2015/GOCO05S/1.0mGal	+0.306	0.031	-0.082	+0.091
EGG2015/GOCO05S/0.2mGal	+0.304	0.027	-0.078	+0.079
EGG2015/GOCO05S/0.1mGal	+0.302	0.025	-0.074	+0.070
Bulgarian EUVN_DA GPS/levelling data (26 pts.)				
EGG1997/EGM1996/1.0mGal	+0.453	0.093	-0.171	+0.222
EGG2008/EGM2008/1.0mGal	+0.377	0.078	-0.111	+0.166
EGG2015/EGM2008/1.0mGal	+0.366	0.073	-0.082	+0.167
EGG2015/GOCO05S/1.0mGal	+0.353	0.028	-0.057	+0.077
EGG2015/GOCO05S/0.2mGal	+0.357	0.031	-0.073	+0.059
EGG2015/GOCO05S/0.1mGal	+0.359	0.040	-0.083	+0.076
EUVN_DA GPS/levelling data (Kenyon et al. 2010, UK & Italy excl., 1139 pts.)				
EGG1997/EGM1996/1.0mGal	+0.359	0.161	-0.599	+0.636
EGG2008/EGM2008/1.0mGal	+0.302	0.076	-0.302	+0.391
EGG2015/EGM2008/1.0mGal	+0.303	0.075	-0.291	+0.399
EGG2015/GOCO05S/1.0mGal	+0.305	0.071	-0.271	+0.391
EGG2015/GOCO05S/0.2mGal	+0.305	0.072	-0.259	+0.396
EGG2015/GOCO05S/0.1mGal	+0.305	0.072	-0.254	+0.398

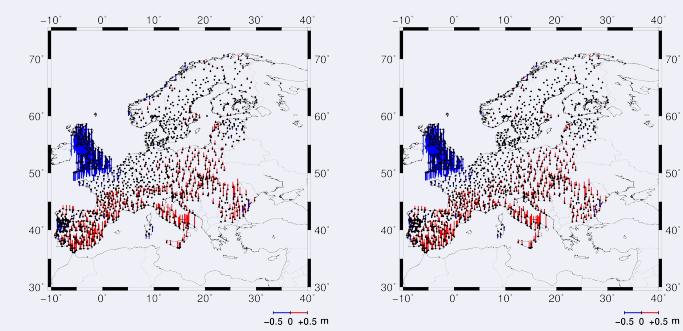


Fig. 5. Comparison of EUVN_DA GPS/levelling stations (Kenyon et al. 2010) with EGG2008 (left) and EGG2015 (right) quasigeoid models.