Statistics of removing EGM2008 to degree N from the JSG03 test data.

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1. Statistics of differences JSG03 data – EGM2008 to degree N.

Tr fein (mgal):

	Europe					Pacific				
N	0	36	60	120	240	0	36	60	120	240
Mean	-24.8	3.56	5.09	2.1	0.4	-5.87	-2.22	0.94	1.40	1.18
St.Dev	48.7	49.13	45.04	36.0	25.5	70.38	65.25	57.76	42.78	35.16

Tr grob (mgal):

	Europe					Pacific				
N	0	36	60	120	240	0	36	60	120	240
Mean	-21.58	0.63	0.00	0.19	0.25	-10.59	0.32	0.33	0.52	0.37
St.Dev	46.35	41.69	37.77	30.49	22.26	53.80	47.36	41.89	32.71	23.81

T_val_ (m**2/s**2)

	Europe					Pacific				
Mean	422.5	-0.11	-3.0	-0.7	0.0	82.05	4.62	0.71	-0.20	-0.13
St-Dev.	40.4	32.55	22.1	10.9	4.1	112.57	49.07	32.84	10.16	4.82

Tr_flugA (mgal)

Mean	-11.71	16.79	14.19	1.81	-0.05
St.Dev	42.57	44.30	41.25	31.64	20.77

Tr_flugC (mgal)

Mean	-26.80	0.67	-1.27	-0.20	-0.11
St.Dev	36.76	37.76	36.25	29.83	19.90

Tr_flugP (mgal)

Mean	-6.09	1.33	-0.19	-0.40	-0.47
St.Dev	59.95	57.29	49.02	32.19	24.81

2. Covariance function parameters:

EGM1998 error-degree-variances, $\sigma^2_{i,EGM98}$ used up to degree N with a scale factor "a" in the covariance model:

$$cov(r_P, r_Q, \psi) = \sum_{i=2}^{N} \sigma^2_{i,EGM98} \cdot a \cdot \left(\frac{R_B^2}{r_P r_Q}\right)^{i+1} P_i(\cos(\psi)) + \sum_{i=N+1}^{\infty} \frac{A}{(i-1)(i+1)(i+4)} \cdot \left(\frac{R_B^2}{r_P r_Q}\right)^{i+1} P_i(\cos(\psi))$$

where A is determined so that the gravity anomaly variance at height zero becomes equal to the one estimated. Ψ is the spherical distance between P and Q, P_i the Legendre polynomials. R is the mean radius of the Earth, 6371 km.

Europe				Pacific			
N	R-R_B (km)	a	$\sigma^2(\Delta g_0)$		R-R_B (km)	a	$\sigma^2(\Delta g_0)$
36	5.022	0.94	2472		8.230	0.10	4284
60	7.346	1.47	2083		8.904	0.16	3213
120	6.324	0.48	1330		1.669	0.09	1884
240	2.181	2.15	689		1.608	0.01	1303
240 new	2.283	1.26	684				

3. Prediction results.

The test values of T in the two areas were predicted using in all cases Tr (fein) and Tr (grob), denoted (1). To these two data-sets was added Tr (flug) from the specific area, denoted (2) in the table below which show the mean and standard deviations of the differences. Units m^2/s^2.

				Europe					Pacific
N	36	60	120	240		36	60	120	240
Case (1)									
Mean	0.26	-0.05	-0.01	-0.04		-1.60	-0.70	-0.10	-0.05
St.dev.	1.91	1.54	0.83	0.83		3.19	2.35	0.55	0.22
Case(2)									
Mean	0.18	-0.22	-0.02	-0.07		-1.50	-0.62	-0.11	-0.05
St.dev.	1.71	1.20	0.75	0.85		2.55	1.46	0.37	0.17

We see how the mean and standard deviation of the differences generally decrease for increasing N, and that the addition of airborne gravity disturbances also improves the results.

Error estimates have also been computed, see the main document “IAG JSG03 Contribution” http://cct.gfy.ku.dk/jsg03.htm. They also show a small decrease of the mean error when airborne data are added. The error-estimates for the European area is generally in agreement with the standard deviation of the differences. But for the Pacific area, the prediction results are in general much better that the estimated mean of the error. This may be due to the estimated value of the scale factor “a” on the error degree-variances. But a better explanation is needed.