

# ANALYSIS AND VALIDATION OF THE D.M.A. GRAVIMETRIC DATA OF THE MEDITERRANEAN SEA

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## 1. INTRODUCTION.

In agreement with the decisions made in Trieste in 1992, on occasion of a meeting help by the GEOMED Group, with Prof R.H.Rapp, I was charged to contact with the USA Defense Mapping Agency (DMA) in order to exchange gravity data in the Mediterranean area. The contact was made at the end of 1992 and now we dispose of new gravimetric material to include in the GEOMED Gravity Data Bank.

These DMA gravimetric data have been analyzed and the marine data corresponding to the Mediterranean Sea have been validated following the standard procedure used by the Madrid Geomed Group. In the following I present the computations made and the results obtained.

## 2. D.M.A. DATA.

The following material has been received from the DMA (Doodson, 1992):

- a) A magnetic tape containing 249511 point gravity anomaly records within the coordinates 25°N to 45°N; 12°W to 40°E.
- b) Source File listing.
- c) References Base Station Data Format.
- d) WGS 84 Ellipsoidal gravity formula and gravity anomaly conversion equations.

GEOMED people have the compromise of not disseminate the data external to GEOMED.

The observed gravity values are adjusted to the International Gravity Standardization Net of 1971. The theoretical gravity is the reference gravity value obtained from the gravity field of the World Geodetic System (WGS 84) reference ellipsoid of revolution. As the WGS 84 Earth's gravitational constant includes the mass of the atmosphere, the atmospheric gravity correction has been added to observed gravity. As the GEOMED Group works in the GRS 80 no system transformations are needed.

The DMA point gravity file data format has 80 characters by record and has been changed to the GEOMED format (Sevilla et al, 1991) with the following information: order number, latitude, longitude, depth, free air anomaly, observing error, and finally the validation flag; (the format is: I10, 2F12.6, 3F8.2, I3). Figure 1 shows the distribution of the DMA available gravity data in the whole area, Figure 2 shows the blocks of 1°x1° with DMA data in the Mediterranean Sea, and Figure 3 shows de previous GEOMED data for comparison.

D.M.A. DATA

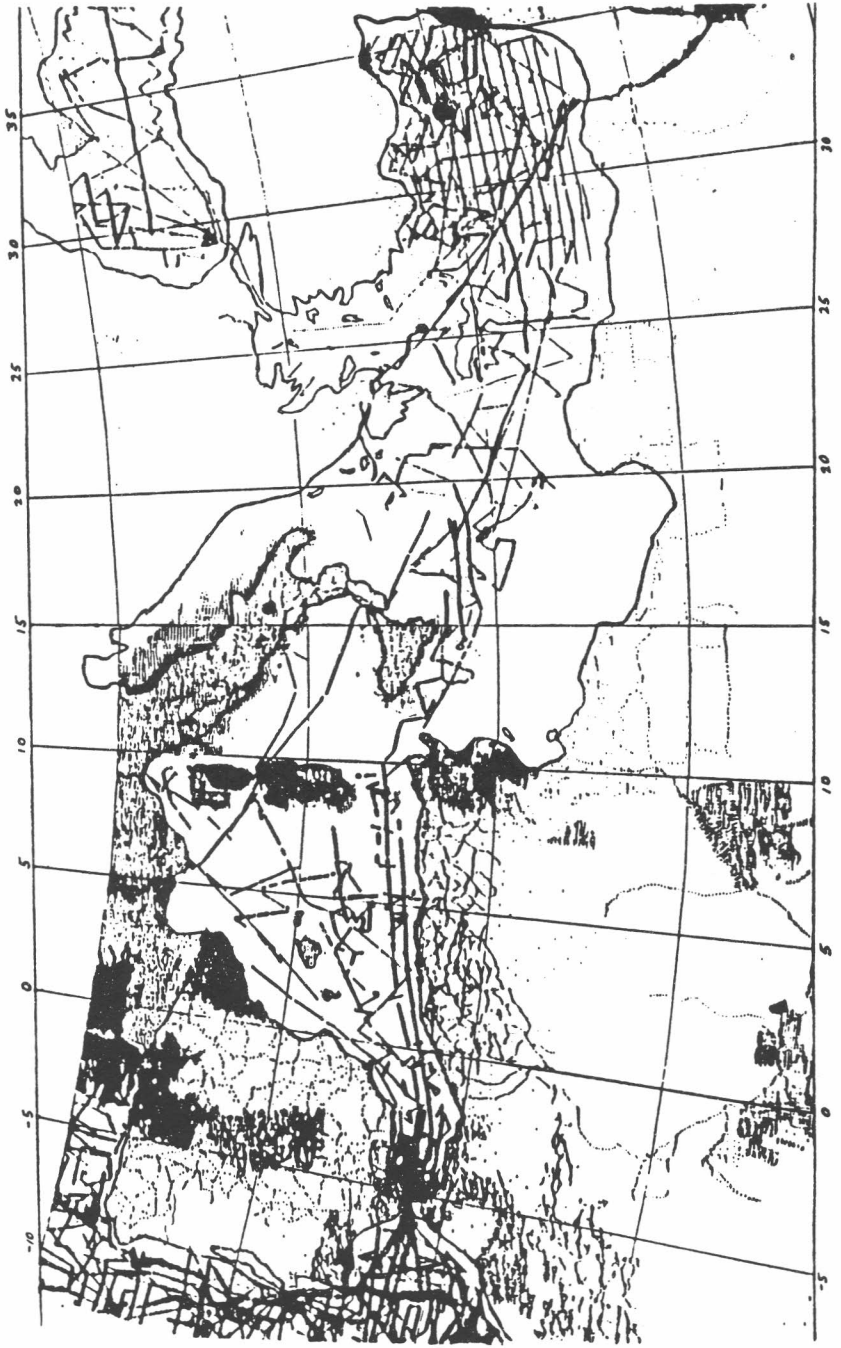


Figure 1. Distribution of the DMA gravity data

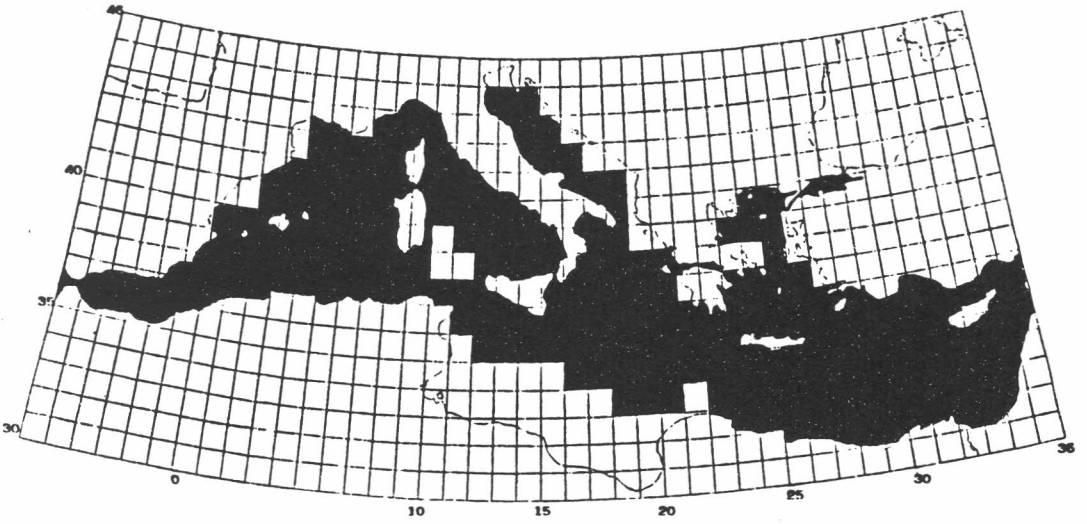


Figure 2. Blocks of  $1^{\circ} \times 1^{\circ}$  with DMA data in the Mediterranean Sea

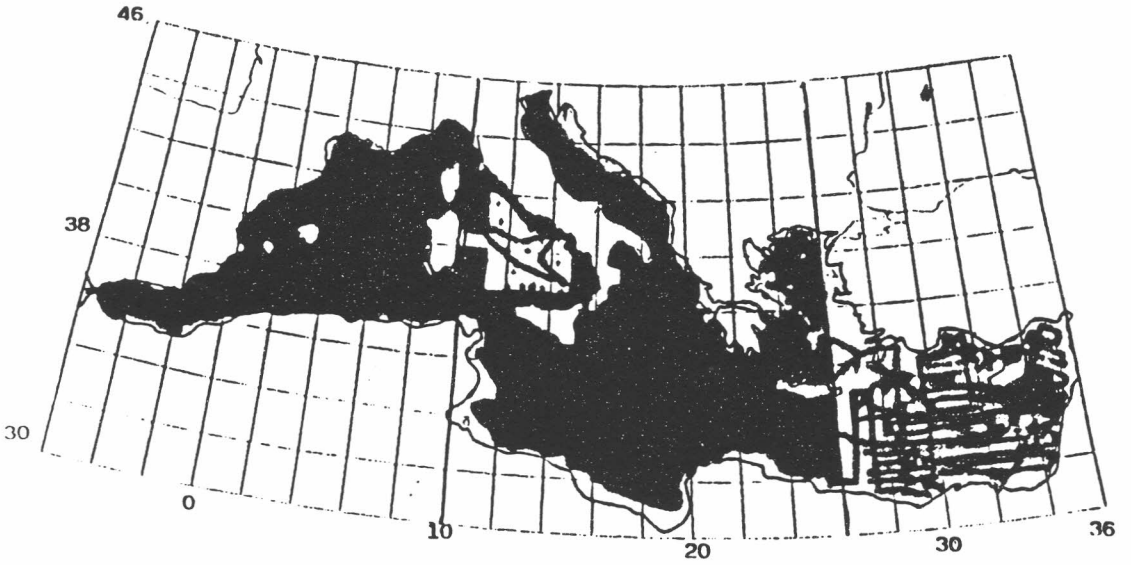


Figure 3. GEOMED data in the Mediterranean Sea

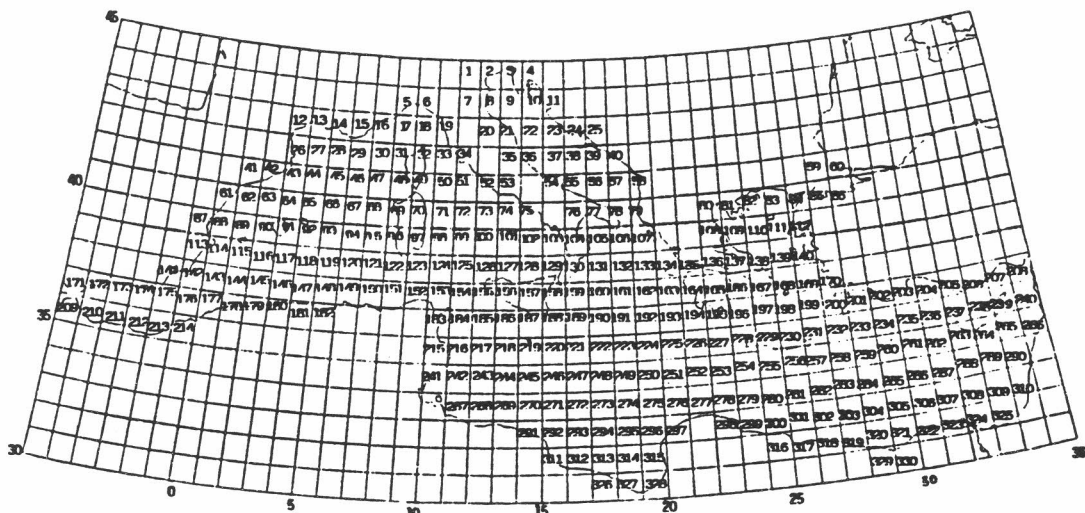


Figure 4. Distribution and numbering of the  $1^{\circ} \times 1^{\circ}$  zones in the Mediterranean

2.1 Data distribution: The DMA data are distributed as follows:

59.364 land data  
190.147 marine data (48.160 mediterranean data)

Following the initial classification of the Mediterranean Sea in three blocks, namely East, Central and West, and recalling also the GEOMED data, we have the result shown in Table 1.

Table 1. Summary of gravimetric data in the Mediterranean Sea

BLOCK	AREA	GEOMED DATA					DMA DATA		
		(1)	(2)	(3)	(4)	(5)	(1)	(4)	(5)
G1MED	(26 <math>\lambda</math> <math>36</math>)	4244	3652	2587	2583	2566	16175	16048	15761
G2MED	(10 <math>\lambda</math> <math>26</math>)	15972	15905	14995*	15688	15633	16870	16597	16125
G3MED	(-6 <math>\lambda</math> <math>10</math>)	8390	8457	8457	8392	8376	15115	15033	14642
MEDIGRA	1+2+3	28606	28014	26039*	26663	26575	48160	47678	46528

(1) = Original data, (2) = Transformed GRS80 data, (3) = Gridded data, (4) = Validated (flag 1), (5) = Validated (flag 1+2).

\* This number must be supplemented in 910 point data (BGI data added to G2MED) no gridded, having a total of 26949 points in the whole raw GEOMED data file (MEDIGRA92).



## 2.2 Data preprocessing

First of all a comparison of the DMA data with GEOMED gravity data to find repeated points is made. The result is: No common points are detected.

## 3. VALIDATION PROCEDURE

The procedure applied to validate the DMA data is the following

- 1.- The data are classified in  $1^{\circ} \times 1^{\circ}$  zones, the same zones that used in the computations of MEDIGEO92 geoid (Sevilla et al. 1992a). The distribution of these zones is shown in Figure 4 and the number of points in each zone (DMA and GEOMED) is given in Appendix A.
- 2.- Least squares predictions of gravity anomalies,  $\Delta g_{pre}$ , in the same points in which there are DMA anomalies,  $\Delta g_{DMA}$ , are made by using the covariance functions and the validated data used in the calculation of MEDIGEO92 in each zone (data of  $2^{\circ} \times 2^{\circ}$  zones with the  $1^{\circ} \times 1^{\circ}$  zones in the middle), and the prediction error is also calculated.

- 3.- Residual anomalies are calculated by the difference

$$\Delta g_{res} = \Delta g_{DMA} - \Delta g_{pre}$$

- 4.- The limit of tolerance is fixed in 20 milligals (the observing error in the DMA data run from 3 to 15 milligals).
- 5.- Criterion:

If  $\Delta g_{res} < 20$  the point is considered good,

If  $\Delta g_{res} > 20$  the point is analyzed by taking into account several circumstances:

- a) The number and the distribution of the bad points is checked in the zone. If there is a majority of bad points it is possible that the prediction is false. Then the prediction data and the covariance function are checked. This testing produces a revalidation of the GEOMED data with external sources, mainly in conflictive zones (Sevilla et al. 1992b). In some zones the validation using this procedure is not possible
- b) If the bad points are a minority, their distribution and position in the zone are studied. Normally, these points are isolated with large  $\Delta g_{res}$  and immediately a gross-error in the  $\Delta g_{DMA}$  is detected by inspection and comparison with the neighboring points (See Table 2).
- c) Sometimes, the bad points are arranged in a particular way (See Table 3). In this case the data source is the same and there can be problems with the datum definition or the datum transformation; this is not so easy to check up and these data are considered as bad data. (Really a validation procedure of marine data, as the ones published in the BGI Bulletin No 71 (Dec-92), must be applied).

Table 2. Example of accumulated bad point (DMA: Zone 019)

	num	latitude	longitude	depth	faa	ra	pe
	86694	43.137833	10.388833	0.0	39.60	-5.36	2.96
	86695	43.142834	10.478833	0.0	36.40	-8.78	6.69
	86696	43.146332	10.285000	0.0	43.10	-3.49	1.99
	86697	43.152832	10.012000	0.0	21.50	-3.23	1.27
	86698	43.182999	10.111333	0.0	48.50	0.15	1.79
	86699	43.185501	10.375000	0.0	42.50	-4.49	2.33
	86700	43.188667	10.438667	0.0	39.50	-6.60	3.66
	86701	43.211334	10.235000	0.0	46.10	-7.39	2.51
	86702	43.214500	10.497000	0.0	37.40	-6.61	9.49
	86703	43.228333	10.365500	0.0	37.90	-8.68	2.90
	86704	43.245499	10.015000	0.0	28.60	1.20	0.73
	86705	43.250832	10.421333	0.0	37.40	-6.43	7.20
	86706	43.270832	10.204500	0.0	45.30	-1.52	2.12
	86707	43.276333	10.310833	0.0	45.10	0.81	2.76
	86708	43.286335	10.113333	0.0	42.30	-0.14	2.60
	86709	43.302166	10.435000	0.0	24.90	-14.01	10.56
	86710	43.337833	10.197167	0.0	45.70	10.80	1.32
	86711	43.346333	10.388000	0.0	26.10	-9.10	10.16
	86712	43.358833	10.280333	0.0	41.30	7.05	3.30
	86713	43.364666	10.055333	0.0	44.20	-1.25	2.48
	86714	43.397499	10.134667	0.0	43.00	0.69	1.91
	86715	43.411167	10.379667	0.0	30.30	0.03	10.83
	86716	43.411335	10.310500	0.0	24.80	-6.81	5.62
	86717	43.420834	10.223333	0.0	34.10	-2.30	1.34
	86718	43.432999	10.014667	0.0	55.20	-0.64	1.68
	86719	43.445000	10.341333	0.0	32.80	2.45	9.12
	86720	43.466331	10.097500	0.0	49.10	-1.04	2.57
	86721	43.482166	10.303333	0.0	36.20	3.17	8.77
	86722	43.485001	10.225833	0.0	30.80	-9.69	4.47
	86723	43.489666	10.151667	0.0	44.90	-2.20	1.32
	86724	43.522835	10.283000	0.0	28.00	-7.26	9.78
	86725	43.533333	10.145000	0.0	44.00	-2.22	4.39
	86726	43.536167	10.065500	0.0	44.10	-4.47	3.50
	86727	43.547165	10.210333	0.0	40.80	-0.50	7.54
	86728	43.548332	10.298333	0.0	22.10	-11.55	11.55
	86729	43.588833	10.065333	0.0	39.80	-5.24	5.50
	86730	43.590832	10.256667	0.0	24.40	-11.23	12.06
	86731	43.617168	10.141667	0.0	35.90	-4.85	10.73
	86732	43.624500	10.001167	0.0	32.50	-10.62	4.36
	86733	43.653667	10.084500	0.0	34.60	-5.56	10.18
1	86734	43.664665	10.222167	0.0	12.20	-22.40	13.66
	86735	43.687168	10.143833	0.0	17.60	-18.68	12.90
	86736	43.719501	10.037833	0.0	16.80	-17.85	9.80
2	86737	43.733002	10.202500	0.0	-0.70	-34.01	14.18
1	86738	43.737499	10.099167	0.0	8.10	-25.45	12.46
1	86739	43.792999	10.034667	0.0	5.60	-21.30	9.92
1	86740	43.803333	10.204167	0.0	-7.70	-41.04	14.50
2	86741	43.804501	10.119167	0.0	-0.50	-31.66	13.27
1	86742	43.836334	10.084500	0.0	1.10	-28.07	12.44
2	86743	43.892502	10.196667	0.0	-9.50	-46.73	14.89
2	86744	43.892834	10.073333	0.0	-1.20	-32.38	12.90
	86745	43.893333	10.010333	0.0	6.80	-18.93	10.49

faa = free-air anomaly, ra = residual anomaly, pe = prediction error

Table 3. Example of systematic distribution of bad points (DMA: Zone 005)

	num	latitude	longitude	depth	faa	ra	pe
	85791	44.009666	8.604833	0.0	-42.40	-9.28	1.74
	85792	44.014000	8.613000	0.0	-42.90	-8.64	2.22
	85793	44.015667	8.751500	0.0	-56.40	-11.12	1.99
	85794	44.019501	8.623167	0.0	-43.40	-7.72	2.68
	85795	44.022667	8.759000	0.0	-57.10	-11.89	2.64
	85796	44.024666	8.256667	0.0	29.60	-4.90	9.72
	85797	44.025002	8.633167	0.0	-44.60	-7.50	3.01
	85798	44.029335	8.641500	0.0	-45.50	-7.22	3.17
	85799	44.029999	8.766667	0.0	-57.70	-12.69	3.14
	85800	44.033669	8.649500	0.0	-46.10	-6.67	3.27
	85801	44.039165	8.659667	0.0	-47.20	-6.33	3.32
	85802	44.040501	8.778167	0.0	-59.10	-14.65	3.47
	85803	44.045834	8.672000	0.0	-48.40	-5.88	3.27
	85804	44.046001	8.784000	0.0	-59.60	-15.55	3.44
	85805	44.052502	8.684333	0.0	-49.30	-5.30	3.10
	85806	44.054668	8.793500	0.0	-60.70	-17.47	3.13
	85807	44.057999	8.694500	0.0	-51.60	-6.54	2.88
	85808	44.062000	8.801167	0.0	-61.20	-18.78	2.63
	85809	44.062500	8.702833	0.0	-53.80	-7.99	2.63
	85810	44.069000	8.808667	0.0	-61.10	-19.60	1.98
1	85811	44.075668	8.816000	0.0	-61.30	-20.81	1.27
	85812	44.076332	8.727667	0.0	-52.70	-5.22	1.37
	85813	44.082165	8.738000	0.0	-52.00	-4.04	0.77
	85814	44.083000	8.281667	0.0	20.10	-5.72	12.57
1	85815	44.084332	8.825500	0.0	-62.20	-23.08	0.66
	85816	44.089500	8.750500	0.0	-51.00	-2.61	1.01
1	85817	44.094501	8.836500	0.0	-63.30	-25.68	1.55
	85818	44.095333	8.760667	0.0	-51.00	-2.41	1.73
1	85819	44.099667	8.842167	0.0	-63.70	-26.72	2.11
	85820	44.101334	8.771167	0.0	-50.80	-2.20	2.42
	85821	44.106167	8.779500	0.0	-51.20	-2.73	2.86
1	85822	44.110001	8.853333	0.0	-64.80	-28.56	3.01
	85823	44.112167	8.790000	0.0	-51.10	-3.01	3.23
1	85824	44.116665	8.860667	0.0	-65.30	-29.07	3.35
	85825	44.116833	8.798167	0.0	-51.00	-3.34	3.39
	85826	44.122833	8.808500	0.0	-51.00	-4.00	3.43
1	85827	44.125500	8.870167	0.0	-65.80	-28.85	3.50
	85828	44.128666	8.818833	0.0	-50.50	-4.21	3.32
	85829	44.132332	8.825167	0.0	-49.70	-3.79	3.18
1	85830	44.134167	8.879500	0.0	-65.80	-27.39	3.30
	85831	44.139500	8.837500	0.0	-49.30	-3.88	2.80
	85832	44.141666	8.314667	0.0	13.80	-4.72	13.99
1	85833	44.142666	8.889000	0.0	-66.00	-25.62	2.78
	85834	44.145168	8.847667	0.0	-47.90	-2.60	2.46
1	85835	44.147999	8.894500	0.0	-65.40	-23.57	2.30
	85836	44.150002	8.856000	0.0	-46.40	-0.89	2.18
	85837	44.154667	8.864167	0.0	-45.00	0.93	1.93
1	85838	44.158501	8.906000	0.0	-65.80	-21.11	1.13
1	85839	44.158833	8.393000	0.0	20.20	20.37	9.88
	85840	44.159332	8.872167	0.0	-43.70	2.84	1.70
	85841	44.164001	8.880333	0.0	-42.90	4.35	1.50
	85842	44.167168	8.915500	0.0	-66.30	-19.61	0.53

faa = free-air anomaly, ra = residual anomaly, pe = prediction error

- 6.- When there is an island in the zone, the prediction is made with the data and the covariance on the same island side on which the DMA data are located.
- 7.- Finally, for bad points a flag is associated in the following way:
- If  $20 < \Delta g_{pre} < 30$  the flag is 1
- If  $\Delta g_{pre} > 30$  the flag is 2
- If the point has been not validated, the flag is 9
- 8.- The DMA Zones that cannot be validated with this procedure are show in Figure 5. This zones are: 82, 84, 85, 86, 97, 111, 139, 166, 167, 168, 195, 196, 197, 199, 200, 201, 203, 207, 229, 231, 232, 233, 234, 257, 258, 263, 275, 290e, 298, 324, 325, 325e.
- 9.- In all these calculations we have used the GEOCOL10 program (C.C. Tschering).

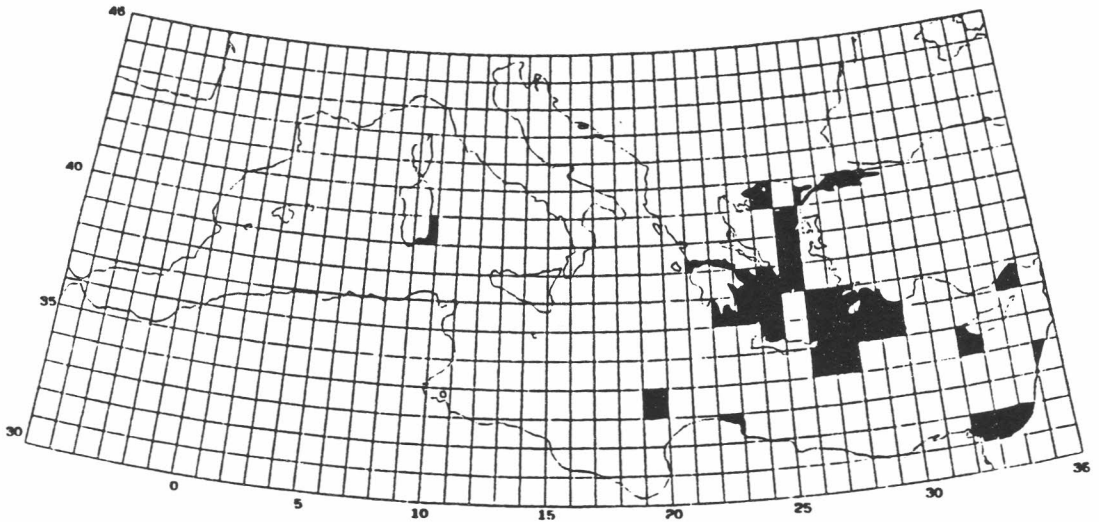


Figure 5. DMA Zones no validated

#### 4.- STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA

##### 4.1. Geopotential model comparison

The first step in the statistical analysis is the calculation of model anomalies with three geopotential models: IFE88E2, OSU89B and OSU91A1F; then a comparison with the observed anomalies is made to establish the model that better suits the gravity field in the area. In Appendix A we have the results of these calculations, considering separately each block of Table 1 and also

the sum blocks 1+2 and 1+2+3, i.e. the whole Mediterranean Sea. As sight these results we can conclude that in all the cases the model that best fits the gravity field in the Mediterranean Sea is the IFE88E2 one, and the rejected points in validation have not influence on this conclusion.

#### 4.2. Comparative analysis between GEOMED data and DMA data

From Appendix A we select the GEOMED and DMA observed anomalies and the respective IFE88E2 reduced anomalies, both without having rejected any point as Table 4 shows.

For the raw data, a systematic difference is detected, especially in BLOCKS 1 and 3. The DMA anomalies are greater than the GEOMED anomalies, the standard deviations are also greater. This seems a consequence of the smoothing. The geopotential models fits better the GEOMED data, i.e. the standard deviations are minor.

Table 4. Statistical parameters of the raw data

#### STATISTIC OF THE OBSERVED FREE-AIR ANOMALIES

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	2587	-45.95	53.24	-216.31	96.78	313.09
DMA BLOCK 1	16175	-52.50	62.11	-239.10	147.30	386.40
GMG BLOCK 2	15905	-8.70	50.14	-226.96	142.52	369.48
DMA BLOCK 2	16870	-8.38	63.73	-216.50	146.20	362.70
GMG BLOCK 3	8457	-1.72	24.93	-131.92	84.19	216.11
DMA BLOCK 3	15115	-15.49	33.81	-142.70	92.80	235.50
GMG BLOCK 1+2	18492	-13.91	52.21	-226.96	142.52	369.48
DMA BLOCK 1+2	33045	-29.98	66.70	-239.10	147.30	386.40
GMG BLOCK 1+2+3	26949	-10.09	45.79	-226.96	142.52	369.48
DMA BLOCK 1+2+3	48160	-25.43	58.79	-239.10	147.30	386.40

#### STATISTIC OF THE OBSERVED FREE-AIR MINUS IFE88E2 ANOMALIES

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	2587	-1.02	14.06	-79.83	83.86	163.69
DMA BLOCK 1	16175	-4.05	20.56	-118.00	88.90	206.90
GMG BLOCK 2	15905	-0.87	17.17	-119.51	114.30	233.81
DMA BLOCK 2	16870	-1.88	24.04	-129.11	117.23	246.34
GMG BLOCK 3	8457	-0.83	15.32	-94.88	80.20	175.08
DMA BLOCK 3	15115	-5.60	21.23	-103.05	73.27	176.32
DMA BLOCK 3	15076	-5.60	21.20	-103.05	73.27	176.32
GMG BLOCK 1+2	18492	-0.89	16.77	-119.51	114.30	233.81
DMA BLOCK 1+2	33045	-2.94	22.43	-129.11	117.23	246.34
GMG BLOCK 1+2+3	26949	-0.87	16.33	-119.51	114.30	233.81
DMA BLOCK 1+2+3	48160	-3.78	22.10	-129.11	117.23	246.34

As the rejected points in validations do not have influence in these differences, and to make a further analysis, a new calculation using the DMA data excluding the points with flag 9, (i.e. the no validated points) is made. Now we get the Appendix B and the Table 4.

In BLOCKS 1 and 2 the large differences in reduced anomalies have disappeared and the values become very similar to the GEOMED data. This is not the result for the BLOCK 3. As to get this results has been needed to reject 4836 points in BLOCK 1 and 1904 in BLOCK 2, and only 39 in BLOCK 3, a further analysis must be done. A proposition is clear: Do not work with no validated raw data.

Table 4. Statistical parameters only with DMA validated points

STATISTIC OF THE OBSERVED FREE-AIR ANOMALIES

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	2587	-45.95	53.24	-216.31	96.78	313.09
DMA BLOCK 1	16175	-52.50	62.11	-239.10	147.30	386.40
DMA BLOCK 1	11339	-40.78	52.87	-191.10	116.90	308.00
GMG BLOCK 2	15905	-8.70	50.14	-226.96	142.52	369.48
DMA BLOCK 2	16870	-8.38	63.73	-216.50	146.20	362.70
DMA BLOCK 2	14966	-15.20	61.07	-216.50	143.30	359.80
GMG BLOCK 3	8457	-1.72	24.93	-131.92	84.19	216.11
DMA BLOCK 3	15115	-15.49	33.81	-142.70	92.80	235.50
DMA BLOCK 3	15076	-15.63	33.72	-142.70	80.50	223.20

STATISTIC OF THE OBSERVED FREE-AIR MINUS IFE88E2 ANOMALIES

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	2587	-1.02	14.06	-79.83	83.86	163.69
DMA BLOCK 1	16175	-4.05	20.56	-118.00	88.90	206.90
DMA BLOCK 1	11339	-0.80	13.10	-65.15	65.43	130.58
GMG BLOCK 2	15905	-0.87	17.17	-119.51	114.30	233.81
DMA BLOCK 2	16870	-1.88	24.04	-129.11	117.23	246.34
DMA BLOCK 2	14966	-0.99	22.15	-104.11	111.06	215.17
GMG BLOCK 3	8457	-0.83	15.32	-94.88	80.20	175.08
DMA BLOCK 3	15115	-5.60	21.23	-103.05	73.27	176.32
DMA BLOCK 3	15076	-5.60	21.20	-103.05	73.27	176.32

4.3. Gridding effect in the GIMED block.

The original GIMED block consists on 4244 gravity points irregularly distributed in the interval  $31.1 \leq \phi < 37.6$ ,  $16.6 \leq \lambda < 35.6$ . These points have been classified in two blocks with the actual limits of GIMED and G2MED; The result is 3652 gravity points in the interval  $26 \leq \lambda < 36$  (GIMED INI) and 592 in the interval  $16 \leq \lambda < 26$  (G2MED SUP).

The statistical analysis of these blocks is shown in Appendix C and Table 3. We can see the variations of the statistical parameters: the block GIMED(3652 points) fits the IFE88E2 model better than the block G2MED(592 points). These 592 points have been rejected from the MEDIGRA92 FILE.

If we compare the GIMED(3652 points) with the GIMED(2587 gridded points) we see the effect of gridding that reduce the mean and the standard deviations of the free air gravity anomalies due to the missing of extreme values. Therefore, a smoothing has been produced in the data bank and it is possible that some high frequency of the gravity field has been lost.

Table 5. Gridding effects on the free-air anomalies in the GIMED block

**STATISTIC OF THE OBSERVED FREE-AIR ANOMALIES**

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	4244	-50.31	56.02	-220.48	113.79	334.27
GMG BLOCK 1	3652	-47.83	53.35	-220.48	113.79	334.27
GMG BLOCK 1	2587	-45.95	53.24	-216.31	96.78	313.09

**STATISTIC OF THE OBSERVED FREE-AIR MINUS IFE88E2 ANOMALIES**

	NUMBER	MEAN	SD	MINIMUM	MAXIMUM	RANGE
GMG BLOCK 1	4244	-1.84	16.52	-87.91	87.00	174.91
GMG BLOCK 1	3652	-0.82	15.22	-87.91	87.00	174.91
GMG BLOCK 1	2587	-1.02	14.06	-79.83	83.86	163.69

**5. ANALYSIS OF THE MEDIGE092 THROUGH EXTERNAL GRAVIMETRIC CONTROL**

In Section 3 we have mentioned that using the DMA data it is possible to revalidate the GEOMED data through external control. The GEOMED and the DMA data are completely independent, the former are taken by digitization of appropriate cartography (or by gridding) and the later are directly points of measurements. The correct prediction of DMA anomalies with GEOMED data and covariances is an indicative of a correct prediction of geoid undulations, therefore, having made these predictions in all the zones, when a prediction is not correct we change the data and covariance till getting success in the task or to mark the zone as no valuable. After this, we have the conclusions shown in Table 4 (Compare with the conflictive zones in Sevilla et al. 1992b).

**6. ACKNOWLEDGEMENTS**

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Table 4. Revalidation of MEDIGE092

Zone	008	will be predicted with	009
"	017	"	" 005
"	070	"	" 070 y 071
"	072	"	" 072 y 071
"	082	No match with any prediction	
"	097	"	" " " " " "
"	101	will be predicted with Alt.1	
"	111	No match with any prediction	
"	116	will be predicted with 117	
"	123	"	" " 122
"	129	"	" " Alt.2
"	139	No match with any prediction	
"	159	will be predicted with Alt.2	
"	166	No match with any prediction	
"	167	"	" " " " "
"	168	"	" " " " "
"	187	will be predicted with Alt.2	
"	195	No match with any prediction	
"	196	"	" " " " "
"	197	"	" " " " "
"	199	"	" " " " "
"	200	"	" " " " "
"	201	"	" " " " "
"	202	"	" " " " "
"	207	"	" " " " "
"	229	"	" " " " "
"	230	will be predicted with 198	
"	231	No match with any prediction	
"	232	"	" " " " "
"	233	"	" " " " "
"	234	"	" " " " "
"	235	will be predicted with 235 y 261	
"	257	No match with any prediction	
"	258	"	" " " " "
"	263	"	" " " " "
"	275	"	" " " " "
"	290e	"	" " " " "
"	298	"	" " " " "
"	324	"	" " " " "
"	325	"	" " " " "
"	325e	"	" " " " "



# A P E N D I X A

## MEDITERRANEAN SEA: BLOCK 1 (GEOMED)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (2587 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	33.9401	1.37	31.1667	36.8333	5.6667	0
LONGITUDES	31.0325	2.51	26.0833	35.5833	9.5000	0
DEPTHS	-1933.44	842.62	-4376.84	-0.20	4376.64	0
FREE AIR ANOMALIES	-45.95	53.24	-216.31	96.78	313.09	0
IFE882E ANOMALIES	-44.93	53.34	-220.43	102.64	323.07	0
OSU89B ANOMALIES	-39.42	50.72	-171.12	110.17	281.29	0
OSU91A ANOMALIES	-39.37	51.33	-171.75	107.01	278.76	0
FREE AIR-IFE88E2	-1.02	14.06	-79.83	83.86	163.69	2
FREE AIR-OSU89B	-6.53	16.65	-90.75	71.16	161.91	4
FREE AIR-OSU91A	-6.58	16.86	-88.81	73.41	162.22	1
OSU91A-OSU89B	-0.06	1.82	-3.95	5.14	9.09	4

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (2583 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	33.9388	1.37	31.1667	36.8333	5.6667	0
LONGITUDES	31.0361	2.51	26.0833	35.5833	9.5000	0
DEPTHS	-1933.73	843.16	-4376.84	-0.20	4376.64	0
FREE AIR ANOMALIES	-45.94	53.25	-216.31	96.78	313.09	0
IFE882E ANOMALIES	-44.87	53.28	-220.43	102.64	323.07	0
OSU89B ANOMALIES	-39.36	50.68	-171.12	110.17	281.29	0
OSU91A ANOMALIES	-39.31	51.28	-171.75	107.01	278.76	0
FREE AIR-IFE88E2	-1.07	13.95	-79.83	82.16	161.99	2
FREE AIR-OSU89B	-6.58	16.57	-90.75	71.16	161.91	4
FREE AIR-OSU91A	-6.63	16.78	-88.81	73.41	162.22	1
OSU91A-OSU89B	-0.06	1.82	-3.95	5.14	9.09	4

GROSS ERRORS: 4 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (2566 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	33.9310	1.37	31.1667	36.8333	5.6667	0
LONGITUDES	31.0446	2.51	26.0833	35.5833	9.5000	0
DEPTHS	-1934.22	844.04	-4376.84	-0.20	4376.64	0
FREE AIR ANOMALIES	-45.80	53.16	-216.31	96.78	313.09	0
IFE882E ANOMALIES	-44.70	53.18	-220.43	102.64	323.07	0
OSU89B ANOMALIES	-39.20	50.61	-171.12	110.17	281.29	0
OSU91A ANOMALIES	-39.14	51.20	-171.75	107.01	278.76	0
FREE AIR-IFE88E2	-1.11	13.79	-79.83	82.16	161.99	2
FREE AIR-OSU89B	-6.60	16.36	-90.75	71.16	161.91	4
FREE AIR-OSU91A	-6.67	16.57	-88.81	73.41	162.22	1
OSU91A-OSU89B	-0.06	1.82	-3.95	5.14	9.09	4

GROSS ERRORS: 21 (Flag 1+2)

## MEDITERRANEAN SEA: BLOCK 2 (GEOMED)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15905 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.7591	3.09	31.0822	45.5824	14.5002	0
LONGITUDES	17.8328	4.27	10.0823	25.9161	15.8338	0
DEPTHS	-1477.14	1261.39	-4700.00	0.00	4700.00	615
FREE AIR ANOMALIES	-8.70	50.14	-226.96	142.52	369.48	1
IFE882E ANOMALIES	-7.84	48.94	-192.60	137.13	329.73	3
OSU89B ANOMALIES	-9.10	46.29	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-8.67	46.40	-179.57	118.53	298.10	0
FREE AIR-IFE882E	-0.87	17.17	-119.51	114.30	233.81	4
FREE AIR-OSU89B	0.40	18.62	-110.37	124.48	234.85	1
FREE AIR-OSU91A	-0.03	18.43	-106.92	121.48	228.40	3
OSU91A-OSU89B	-0.43	1.92	-6.05	6.51	12.56	40

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15688 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.7414	3.10	31.0822	45.5824	14.5002	0
LONGITUDES	17.8422	4.25	10.0823	25.9161	15.8338	0
DEPTHS	-1483.55	1264.61	-4700.00	0.00	4700.00	606
FREE AIR ANOMALIES	-9.23	49.86	-226.96	124.00	350.96	1
IFE882E ANOMALIES	-8.21	48.87	-192.60	137.13	329.73	3
OSU89B ANOMALIES	-9.46	46.17	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-9.02	46.29	-179.57	118.53	298.10	0
FREE AIR-IFE882E	-1.03	16.55	-119.51	101.15	220.66	4
FREE AIR-OSU89B	0.22	17.98	-110.37	104.22	214.59	1
FREE AIR-OSU91A	-0.21	17.80	-106.92	103.78	210.70	3
OSU91A-OSU89B	-0.43	1.92	-6.05	6.51	12.56	39

GROSS ERRORS: 217 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15633 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.7426	3.10	31.0822	45.5824	14.5002	0
LONGITUDES	17.8326	4.26	10.0823	25.9161	15.8338	0
DEPTHS	-1482.86	1265.25	-4700.00	0.00	4700.00	602
FREE AIR ANOMALIES	-9.13	49.78	-226.96	124.00	350.96	1
IFE882E ANOMALIES	-8.11	48.81	-192.60	137.13	329.73	3
OSU89B ANOMALIES	-9.36	46.10	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-8.93	46.22	-179.57	118.53	298.10	0
FREE AIR-IFE882E	-1.02	16.46	-119.51	101.15	220.66	4
FREE AIR-OSU89B	0.23	17.88	-110.37	104.22	214.59	1
FREE AIR-OSU91A	-0.20	17.70	-106.92	103.78	210.70	3
OSU91A-OSU89B	-0.44	1.92	-6.05	6.51	12.56	39

GROSS ERRORS: 272 (Flag 1+2)

# MEDITERRANEAN SEA: BLOCK 3 (GEOMED)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (8457 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	39.4266	2.19	35.2487	44.3324	9.0836	0
LONGITUDES	4.2767	3.60	-5.7512	9.9991	15.7503	0
DEPTHS	-1853.86	938.70	-2857.00	0.00	2857.00	2
FREE AIR ANOMALIES	-1.72	24.93	-131.92	84.19	216.11	1
IFE882E ANOMALIES	-0.89	21.38	-94.76	71.96	166.72	2
OSU89B ANOMALIES	-0.77	17.85	-73.78	65.56	139.34	2
OSU91A ANOMALIES	-1.36	17.55	-69.75	63.94	133.69	3
FREE AIR-IFE882E	-0.83	15.32	-94.88	80.20	175.08	2
FREE AIR-OSU89B	-0.96	16.16	-73.22	82.67	155.89	2
FREE AIR-OSU91A	-0.36	16.24	-76.05	84.24	160.29	3
OSU91A-OSU89B	0.60	1.40	-4.56	2.44	7.00	17

GROSS ERRORS: 0

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (8392 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	39.4204	2.19	35.2487	44.3324	9.0836	0
LONGITUDES	4.2560	3.59	-5.7512	9.9991	15.7503	0
DEPTHS	-1861.95	936.75	-2857.00	0.00	2857.00	2
FREE AIR ANOMALIES	-1.94	24.71	-131.92	79.79	211.71	1
IFE882E ANOMALIES	-0.95	21.37	-94.76	71.96	166.72	2
OSU89B ANOMALIES	-0.85	17.83	-73.78	65.56	139.34	2
OSU91A ANOMALIES	-1.45	17.52	-69.75	63.94	133.69	3
FREE AIR-IFE882E	-1.00	14.98	-94.88	76.25	171.13	2
FREE AIR-OSU89B	-1.10	15.87	-73.22	82.67	155.89	2
FREE AIR-OSU91A	-0.50	15.95	-76.05	84.24	160.29	3
OSU91A-OSU89B	0.60	1.40	-4.56	2.44	7.00	17

GROSS ERRORS: 65 (Flag 1)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (8376 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	39.4220	2.18	35.2487	44.3324	9.0836	0
LONGITUDES	4.2581	3.59	-5.7512	9.9991	15.7503	0
DEPTHS	-1863.54	936.59	-2857.00	0.00	2857.00	2
FREE AIR ANOMALIES	-1.98	24.66	-131.92	79.79	211.71	1
IFE882E ANOMALIES	-0.97	21.37	-94.76	71.96	166.72	2
OSU89B ANOMALIES	-0.85	17.83	-73.78	65.56	139.34	2
OSU91A ANOMALIES	-1.45	17.52	-69.75	63.94	133.69	3
FREE AIR-IFE882E	-1.01	14.92	-94.88	76.25	171.13	2
FREE AIR-OSU89B	-1.13	15.77	-73.22	73.80	147.02	2
FREE AIR-OSU91A	-0.54	15.86	-76.05	72.27	148.32	3
OSU91A-OSU89B	0.60	1.40	-4.56	2.44	7.00	17

GROSS ERRORS: 81 (Flag 1+2)

# MEDITERRANEAN SEA: BLOCK 1+2 (GEOMED)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (18492 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.3647	3.07	31.0822	45.5824	14.5002	0
LONGITUDES	19.6794	6.13	10.0823	35.5833	25.5010	0
DEPTHS	-1540.98	1221.82	-4700.00	0.00	4700.00	615
FREE AIR ANOMALIES	-13.91	52.21	-226.96	142.52	369.48	1
IFE882E ANOMALIES	-13.03	51.22	-220.43	137.13	357.56	3
OSU89B ANOMALIES	-13.34	48.10	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-12.97	48.31	-179.57	118.53	298.10	0
FREE AIR-IFE88E2	-0.89	16.77	-119.51	114.30	233.81	6
FREE AIR-OSU89B	-0.57	18.51	-110.37	124.48	234.85	5
FREE AIR-OSU91A	-0.95	18.36	-106.92	121.48	228.40	4
OSU91A-OSU89B	-0.37	1.91	-6.05	6.51	12.56	44

GROSS ERRORS: 0

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (18271 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.3452	3.07	31.0822	45.5824	14.5002	0
LONGITUDES	19.7075	6.13	10.0823	35.5833	25.5010	0
DEPTHS	-1547.19	1224.02	-4700.00	0.00	4700.00	606
FREE AIR ANOMALIES	-14.42	51.95	-226.96	124.00	350.96	1
IFE882E ANOMALIES	-13.39	51.14	-220.43	137.13	357.56	3
OSU89B ANOMALIES	-13.68	47.98	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-13.30	48.19	-179.57	118.53	298.10	0
FREE AIR-IFE88E2	-1.03	16.20	-119.51	101.15	220.66	6
FREE AIR-OSU89B	-0.74	17.94	-110.37	104.22	214.59	5
FREE AIR-OSU91A	-1.12	17.80	-106.92	103.78	210.70	4
OSU91A-OSU89B	-0.38	1.91	-6.05	6.51	12.56	43

GROSS ERRORS: 221 (Flag 1)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (18199 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.3462	3.08	31.0822	45.5824	14.5002	0
LONGITUDES	19.6955	6.13	10.0823	35.5833	25.5010	0
DEPTHS	-1546.50	1224.84	-4700.00	0.00	4700.00	602
FREE AIR ANOMALIES	-14.30	51.86	-226.96	124.00	350.96	1
IFE882E ANOMALIES	-13.27	51.06	-220.43	137.13	357.56	3
OSU89B ANOMALIES	-13.57	47.90	-177.36	121.07	298.43	0
OSU91A ANOMALIES	-13.19	48.12	-179.57	118.53	298.10	0
FREE AIR-IFE88E2	-1.03	16.11	-119.51	101.15	220.66	6
FREE AIR-OSU89B	-0.73	17.83	-110.37	104.22	214.59	5
FREE AIR-OSU91A	-1.11	17.69	-106.92	103.78	210.70	4
OSU91A-OSU89B	-0.38	1.91	-6.05	6.51	12.56	43

GROSS ERRORS: 293 (Flag 1+2)

# MEDITERRANEAN SEA: BLOCK 1+2+3 (GEOMED)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (26949 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.3256	3.16	31.0822	45.5824	14.5002	0
LONGITUDES	14.8458	9.00	-5.7512	35.5833	41.3345	0
DEPTHS	-1639.16	1149.76	-4700.00	0.00	4700.00	617
FREE AIR ANOMALIES	-10.09	45.79	-226.96	142.52	369.48	2
IFE882E ANOMALIES	-9.22	44.44	-220.43	137.13	357.56	5
OSU89B ANOMALIES	-9.39	41.49	-177.36	121.07	298.43	2
OSU91A ANOMALIES	-9.33	41.55	-179.57	118.53	298.10	3
FREE AIR-IFE88E2	-0.87	16.33	-119.51	114.30	233.81	8
FREE AIR-OSU89B	-0.69	17.81	-110.37	124.48	234.85	7
FREE AIR-OSU91A	-0.76	17.73	-106.92	121.48	228.40	7
OSU91A-OSU89B	-0.07	1.82	-6.05	6.51	12.56	61

GROSS ERRORS: 0

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (26663 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.3131	3.16	31.0822	45.5824	14.5002	0
LONGITUDES	14.8442	9.02	-5.7512	35.5833	41.3345	0
DEPTHS	-1646.26	1150.73	-4700.00	0.00	4700.00	608
FREE AIR ANOMALIES	-10.50	45.56	-226.96	124.00	350.96	2
IFE882E ANOMALIES	-9.47	44.38	-220.43	137.13	357.56	5
OSU89B ANOMALIES	-9.64	41.39	-177.36	121.07	298.43	2
OSU91A ANOMALIES	-9.57	41.45	-179.57	118.53	298.10	3
FREE AIR-IFE88E2	-1.02	15.83	-119.51	101.15	220.66	8
FREE AIR-OSU89B	-0.85	17.32	-110.37	104.22	214.59	7
FREE AIR-OSU91A	-0.92	17.24	-106.92	103.78	210.70	7
OSU91A-OSU89B	-0.07	1.82	-6.05	6.51	12.56	60

GROSS ERRORS: 286 (Flag 1)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (26575 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.3156	3.17	31.0822	45.5824	14.5002	0
LONGITUDES	14.8299	9.01	-5.7512	35.5833	41.3345	0
DEPTHS	-1646.42	1151.31	-4700.00	0.00	4700.00	604
FREE AIR ANOMALIES	-10.42	45.46	-226.96	124.00	350.96	2
IFE882E ANOMALIES	-9.39	44.30	-220.43	137.13	357.56	5
OSU89B ANOMALIES	-9.56	41.31	-177.36	121.07	298.43	2
OSU91A ANOMALIES	-9.49	41.37	-179.57	118.53	298.10	3
FREE AIR-IFE88E2	-1.02	15.74	-119.51	101.15	220.66	8
FREE AIR-OSU89B	-0.86	17.21	-110.37	104.22	214.59	7
FREE AIR-OSU91A	-0.93	17.13	-106.92	103.78	210.70	7
OSU91A-OSU89B	-0.07	1.82	-6.05	6.51	12.56	60

GROSS ERRORS: 374 (Flag 1+2)

## MEDITERRANEAN SEA: BLOCK 1 (DMA)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (16175 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	34.0386	1.39	31.0027	40.9912	9.9885	0
LONGITUDES	30.5401	2.62	26.0017	35.5687	9.5670	0
DEPTHS	-1515.93	1191.02	-4442.00	0.00	4442.00	3848
FREE AIR ANOMALIES	-52.50	62.11	-239.10	147.30	386.40	5
IFE882E ANOMALIES	-48.45	58.89	-220.62	112.65	333.27	1
OSU89B ANOMALIES	-42.94	54.91	-171.26	107.11	278.37	1
OSU91A ANOMALIES	-43.16	55.83	-171.55	109.16	280.71	0
FREE AIR-IFE88E2	-4.05	20.56	-118.00	88.90	206.90	4
FREE AIR-OSU89B	-9.56	23.00	-113.80	80.47	194.27	6
FREE AIR-OSU91A	-9.34	22.65	-115.69	80.02	195.71	4
OSU91A-OSU89B	0.23	1.90	-4.47	5.70	10.17	45

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (16048 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	34.0368	1.39	31.0027	40.9912	9.9885	0
LONGITUDES	30.5372	2.63	26.0017	35.5613	9.5597	0
DEPTHS	-1522.09	1190.55	-4442.00	0.00	4442.00	3770
FREE AIR ANOMALIES	-52.69	62.10	-239.10	147.30	386.40	5
IFE882E ANOMALIES	-48.42	58.96	-220.62	112.65	333.27	1
OSU89B ANOMALIES	-42.92	54.96	-171.26	107.11	278.37	1
OSU91A ANOMALIES	-43.14	55.88	-171.55	109.16	280.71	0
FREE AIR-IFE88E2	-4.27	20.29	-118.00	88.90	206.90	4
FREE AIR-OSU89B	-9.77	22.75	-113.80	80.47	194.27	6
FREE AIR-OSU91A	-9.54	22.39	-115.69	80.02	195.71	4
OSU91A-OSU89B	0.23	1.90	-4.47	5.70	10.17	45

GROSS ERRORS: 127 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15761 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	34.0280	1.40	31.0027	40.9912	9.9885	0
LONGITUDES	30.5106	2.62	26.0017	35.5613	9.5597	0
DEPTHS	-1521.78	1195.25	-4442.00	0.00	4442.00	3748
FREE AIR ANOMALIES	-52.82	61.83	-239.10	147.30	386.40	5
IFE882E ANOMALIES	-48.33	58.81	-220.62	107.67	328.29	1
OSU89B ANOMALIES	-42.82	54.84	-171.26	105.39	276.65	1
OSU91A ANOMALIES	-43.06	55.76	-171.55	105.41	276.96	0
FREE AIR-IFE88E2	-4.48	20.13	-118.00	88.90	206.90	4
FREE AIR-OSU89B	-9.99	22.53	-113.80	80.47	194.27	6
FREE AIR-OSU91A	-9.76	22.18	-115.69	80.02	195.71	4
OSU91A-OSU89B	0.24	1.90	-4.47	5.70	10.17	45

GROSS ERRORS: 414 (Flag 1+2)

## MEDITERRANEAN SEA: BLOCK 2 (DMA)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (16870 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.0821	2.88	31.7732	44.9972	13.2240	0
LONGITUDES	18.8949	4.62	10.0010	26.0000	15.9990	0
DEPTHS	-1464.81	1466.24	-5027.00	0.00	5027.00	3273
FREE AIR ANOMALIES	-8.38	63.73	-216.50	146.20	362.70	11
IFE882E ANOMALIES	-6.50	63.66	-191.40	136.72	328.12	0
OSU89B ANOMALIES	-6.04	61.67	-173.96	119.90	293.86	1
OSU91A ANOMALIES	-5.83	61.70	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-1.88	24.04	-129.11	117.23	246.34	5
FREE AIR-OSU89B	-2.34	25.48	-106.13	128.48	234.61	1
FREE AIR-OSU91A	-2.55	24.88	-105.25	125.50	230.75	6
OSU91A-OSU89B	-0.21	2.14	-4.24	6.00	10.24	22

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (16597 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.0826	2.88	31.7732	44.9972	13.2240	0
LONGITUDES	18.8757	4.61	10.0010	26.0000	15.9990	0
DEPTHS	-1469.79	1469.42	-5027.00	0.00	5027.00	3246
FREE AIR ANOMALIES	-8.62	63.37	-216.50	146.20	362.70	11
IFE882E ANOMALIES	-6.77	63.46	-191.40	136.72	328.12	0
OSU89B ANOMALIES	-6.42	61.49	-173.96	119.90	293.86	1
OSU91A ANOMALIES	-6.18	61.52	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-1.85	23.57	-129.11	117.23	246.34	5
FREE AIR-OSU89B	-2.20	24.92	-106.13	128.48	234.61	1
FREE AIR-OSU91A	-2.43	24.34	-105.25	125.50	230.75	6
OSU91A-OSU89B	-0.24	2.14	-4.24	6.00	10.24	22

GROSS ERRORS: 273 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (16125 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.0938	2.89	31.7732	44.9972	13.2240	0
LONGITUDES	18.8701	4.59	10.0010	26.0000	15.9990	0
DEPTHS	-1462.15	1474.20	-5027.00	0.00	5027.00	3209
FREE AIR ANOMALIES	-8.37	63.13	-216.50	146.20	362.70	11
IFE882E ANOMALIES	-6.35	63.17	-190.85	136.72	327.57	0
OSU89B ANOMALIES	-6.02	61.29	-173.96	119.90	293.86	1
OSU91A ANOMALIES	-5.76	61.30	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-2.02	23.04	-129.11	117.23	246.34	5
FREE AIR-OSU89B	-2.35	24.55	-106.13	128.48	234.61	1
FREE AIR-OSU91A	-2.61	23.96	-105.25	125.50	230.75	6
OSU91A-OSU89B	-0.26	2.14	-4.24	6.00	10.24	20

GROSS ERRORS: 745 (Flag 1+2)

## MEDITERRANEAN SEA: BLOCK 3 (DMA)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15115 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	38.5882	2.52	35.2250	44.4112	9.1862	0
LONGITUDES	2.2680	4.81	-5.9967	9.9942	15.9908	0
DEPTHS	-844.11	1003.49	-2888.00	0.00	2888.00	5643
FREE AIR ANOMALIES	-15.49	33.81	-142.70	92.80	235.50	41
IFE882E ANOMALIES	-9.88	27.45	-94.71	68.69	163.40	4
OSU89B ANOMALIES	-8.78	23.33	-73.89	60.15	134.04	5
OSU91A ANOMALIES	-8.40	22.44	-69.86	59.34	129.20	10
FREE AIR-IFE88E2	-5.60	21.23	-103.05	73.27	176.32	3
FREE AIR-OSU89B	-6.71	21.10	-82.10	72.17	154.27	3
FREE AIR-OSU91A	-7.09	21.46	-84.90	73.52	158.42	4
OSU91A-OSU89B	-0.38	2.14	-4.57	2.43	7.00	24

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (15033 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	38.5892	2.52	35.2250	44.4112	9.1862	0
LONGITUDES	2.2675	4.81	-5.9967	9.9942	15.9908	0
DEPTHS	-845.70	1005.25	-2888.00	0.00	2888.00	5620
FREE AIR ANOMALIES	-15.62	33.74	-142.70	92.80	235.50	41
IFE882E ANOMALIES	-9.96	27.40	-94.71	68.69	163.40	4
OSU89B ANOMALIES	-8.85	23.30	-73.89	60.15	134.04	5
OSU91A ANOMALIES	-8.47	22.40	-69.86	59.34	129.20	10
FREE AIR-IFE88E2	-5.66	21.04	-103.05	73.27	176.32	3
FREE AIR-OSU89B	-6.78	20.99	-82.10	72.17	154.27	3
FREE AIR-OSU91A	-7.16	21.35	-84.90	73.52	158.42	4
OSU91A-OSU89B	-0.38	2.14	-4.57	2.43	7.00	24

GROSS ERRORS: 82 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (14642 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	38.6040	2.51	35.2250	44.4112	9.1862	0
LONGITUDES	2.3227	4.79	-5.9967	9.9942	15.9908	0
DEPTHS	-848.98	1012.62	-2888.00	0.00	2888.00	5530
FREE AIR ANOMALIES	-15.43	33.23	-139.80	92.80	232.60	41
IFE882E ANOMALIES	-10.01	27.34	-94.71	67.81	162.52	4
OSU89B ANOMALIES	-8.87	23.20	-73.89	60.15	134.04	5
OSU91A ANOMALIES	-8.51	22.31	-69.86	59.34	129.20	10
FREE AIR-IFE88E2	-5.42	20.42	-98.48	73.27	171.75	3
FREE AIR-OSU89B	-6.56	20.55	-79.80	72.17	151.97	3
FREE AIR-OSU91A	-6.92	20.91	-82.66	73.52	156.18	4
OSU91A-OSU89B	-0.36	2.13	-4.57	2.43	7.00	24

GROSS ERRORS: 473 (Flag 1+2)



## MEDITERRANEAN SEA: BLOCK 1+2 (DMA)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (33045 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	35.5924	2.74	31.0027	44.9972	13.9945	0
LONGITUDES	24.5951	6.94	10.0010	35.5687	25.5677	0
DEPTHS	-1489.83	1338.84	-5027.00	0.00	5027.00	7121
FREE AIR ANOMALIES	-29.98	66.70	-239.10	147.30	386.40	16
IFE882E ANOMALIES	-27.03	64.85	-220.62	136.72	357.34	1
OSU89B ANOMALIES	-24.10	61.30	-173.96	119.90	293.86	2
OSU91A ANOMALIES	-24.10	61.78	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-2.94	22.43	-129.11	117.23	246.34	9
FREE AIR-OSU89B	-5.87	24.56	-113.80	128.48	242.28	7
FREE AIR-OSU91A	-5.87	24.05	-115.69	125.50	241.19	10
OSU91A-OSU89B	0.00	2.04	-4.47	6.00	10.47	67

GROSS ERRORS: 0

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (32645 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	35.5853	2.74	31.0027	44.9972	13.9945	0
LONGITUDES	24.6084	6.94	10.0010	35.5613	25.5603	0
DEPTHS	-1495.50	1339.84	-5027.00	0.00	5027.00	7016
FREE AIR ANOMALIES	-30.28	66.50	-239.10	147.30	386.40	16
IFE882E ANOMALIES	-27.25	64.73	-220.62	136.72	357.34	1
OSU89B ANOMALIES	-24.36	61.15	-173.96	119.90	293.86	2
OSU91A ANOMALIES	-24.35	61.65	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-3.04	22.05	-129.11	117.23	246.34	9
FREE AIR-OSU89B	-5.92	24.18	-113.80	128.48	242.28	7
FREE AIR-OSU91A	-5.93	23.67	-115.69	125.50	241.19	10
OSU91A-OSU89B	-0.01	2.04	-4.47	6.00	10.47	67

GROSS ERRORS: 400 (Flag 1)

### STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (31886 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	35.5784	2.75	31.0027	44.9972	13.9945	0
LONGITUDES	24.6239	6.92	10.0010	35.5613	25.5603	0
DEPTHS	-1491.63	1343.89	-5027.00	0.00	5027.00	6957
FREE AIR ANOMALIES	-30.34	66.33	-239.10	147.30	386.40	16
IFE882E ANOMALIES	-27.10	64.56	-220.62	136.72	357.34	1
OSU89B ANOMALIES	-24.21	61.03	-173.96	119.90	293.86	2
OSU91A ANOMALIES	-24.20	61.52	-176.48	117.55	294.03	3
FREE AIR-IFE88E2	-3.24	21.68	-129.11	117.23	246.34	9
FREE AIR-OSU89B	-6.13	23.88	-113.80	128.48	242.28	7
FREE AIR-OSU91A	-6.14	23.37	-115.69	125.50	241.19	10
OSU91A-OSU89B	-0.01	2.04	-4.47	6.00	10.47	65

GROSS ERRORS: 1159 (Flag 1+2)

# MEDITERRANEAN SEA: BLOCK 1+2+3 (DMA)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (48160 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.5326	3.01	31.0027	44.9972	13.9945	0
LONGITUDES	17.5877	12.15	-5.9967	35.5687	41.5653	0
DEPTHS	-1287.17	1278.96	-5027.00	0.00	5027.00	12764
FREE AIR ANOMALIES	-25.43	58.79	-239.10	147.30	386.40	57
IFE882E ANOMALIES	-21.65	56.44	-220.62	136.72	357.34	5
OSU89B ANOMALIES	-19.29	52.91	-173.96	119.90	293.86	7
OSU91A ANOMALIES	-19.17	53.20	-176.48	117.55	294.03	13
FREE AIR-IFE88E2	-3.78	22.10	-129.11	117.23	246.34	12
FREE AIR-OSU89B	-6.14	23.54	-113.80	128.48	242.28	10
FREE AIR-OSU91A	-6.26	23.28	-115.69	125.50	241.19	14
OSU91A-OSU89B	-0.12	2.08	-4.57	6.00	10.57	91

GROSS ERRORS: 0

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (47678 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.5324	3.01	31.0027	44.9972	13.9945	0
LONGITUDES	17.5642	12.17	-5.9967	35.5613	41.5580	0
DEPTHS	-1290.62	1280.20	-5027.00	0.00	5027.00	12636
FREE AIR ANOMALIES	-25.66	58.60	-239.10	147.30	386.40	57
IFE882E ANOMALIES	-21.80	56.30	-220.62	136.72	357.34	5
OSU89B ANOMALIES	-19.47	52.76	-173.96	119.90	293.86	7
OSU91A ANOMALIES	-19.34	53.06	-176.48	117.55	294.03	13
FREE AIR-IFE88E2	-3.86	21.77	-129.11	117.23	246.34	12
FREE AIR-OSU89B	-6.19	23.22	-113.80	128.48	242.28	10
FREE AIR-OSU91A	-6.32	22.97	-115.69	125.50	241.19	14
OSU91A-OSU89B	-0.12	2.08	-4.57	6.00	10.57	91

GROSS ERRORS: 482 (Flag 1)

## STATISTICAL ANALYSIS OF THE GRAVIMETRIC DATA (46528 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	36.5306	3.02	31.0027	44.9972	13.9945	0
LONGITUDES	17.6059	12.14	-5.9967	35.5613	41.5580	0
DEPTHS	-1289.39	1284.29	-5027.00	0.00	5027.00	12487
FREE AIR ANOMALIES	-25.65	58.40	-239.10	147.30	386.40	57
IFE882E ANOMALIES	-21.72	56.17	-220.62	136.72	357.34	5
OSU89B ANOMALIES	-19.38	52.66	-173.96	119.90	293.86	7
OSU91A ANOMALIES	-19.26	52.95	-176.48	117.55	294.03	13
FREE AIR-IFE88E2	-3.93	21.32	-129.11	117.23	246.34	12
FREE AIR-OSU89B	-6.27	22.88	-113.80	128.48	242.28	10
FREE AIR-OSU91A	-6.39	22.63	-115.69	125.50	241.19	14
OSU91A-OSU89B	-0.12	2.08	-4.57	6.00	10.57	89

GROSS ERRORS: 1632 (Flag 1+2)

## APPENDIX B

### MEDITERRANEAN SEA: BLOCK 1 (DMA WITHOUT FLAG 9) (11339 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	33.7115	1.18	31.1500	36.7600	5.6100	0
LONGITUDES	30.9902	2.32	26.0060	35.5687	9.5627	0
DEPTHS	-1481.60	1130.79	-3221.00	0.00	3221.00	3014
FREE AIR ANOMALIES	-40.78	52.87	-191.10	116.90	308.00	5
IFE88E2 ANOMALIES	-39.98	51.40	-163.62	112.65	276.27	1
OSU89B ANOMALIES	-36.54	49.51	-153.26	107.11	260.37	0
OSU91A ANOMALIES	-36.48	50.29	-157.98	109.16	267.14	0
FREE AIR-IFE88E2	-0.80	13.10	-65.15	65.43	130.58	3
FREE AIR-OSU89B	-4.24	15.14	-88.55	65.77	154.32	5
FREE AIR-OSU91A	-4.31	15.13	-88.58	64.83	153.41	4
OSU91A-OSU89B	-0.07	1.67	-3.93	5.70	9.63	41

GROSS ERRORS: 8436

### MEDITERRANEAN SEA: BLOCK 2 (DMA WITHOUT FLAG 9) (14966 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	37.1379	3.01	31.7732	44.9972	13.2240	0
LONGITUDES	18.3159	4.56	10.0010	26.0000	15.9990	0
DEPTHS	-1576.20	1479.51	-5027.00	0.00	5027.00	2399
FREE AIR ANOMALIES	-15.20	61.07	-216.50	143.30	359.80	11
IFE88E2 ANOMALIES	-14.22	60.99	-191.40	136.72	328.12	0
OSU89B ANOMALIES	-14.67	57.18	-173.96	116.13	290.09	1
OSU91A ANOMALIES	-14.30	57.52	-176.48	114.79	291.27	3
FREE AIR-IFE88E2	-0.99	22.15	-104.11	111.06	215.17	5
FREE AIR-OSU89B	-0.54	23.01	-106.13	124.46	230.59	1
FREE AIR-OSU91A	-0.91	22.53	-105.25	122.02	227.27	5
OSU91A-OSU89B	-0.37	2.12	-4.24	6.00	10.24	22

GROSS ERRORS: 1904

### MEDITERRANEAN SEA: BLOCK 3 (DMA WITHOUT FLAG 9) (15076 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	38.5863	2.52	35.2250	44.4112	9.1862	0
LONGITUDES	2.2494	4.80	-5.9967	9.9942	15.9908	0
DEPTHS	-846.19	1003.96	-2888.00	0.00	2888.00	5643
FREE AIR ANOMALIES	-15.63	33.72	-142.70	80.50	223.20	41
IFE88E2 ANOMALIES	-10.03	27.34	-94.71	68.69	163.40	4
OSU89B ANOMALIES	-8.91	23.21	-73.89	60.15	134.04	5
OSU91A ANOMALIES	-8.53	22.31	-69.86	59.34	129.20	10
FREE AIR-IFE88E2	-5.60	21.20	-103.05	73.27	176.32	3
FREE AIR-OSU89B	-6.71	21.06	-82.10	72.17	154.27	3
FREE AIR-OSU91A	-7.10	21.43	-84.90	73.52	158.42	4
OSU91A-OSU89B	-0.38	2.14	-4.57	2.43	7.00	24

GROSS ERRORS: 39

## A P E N D I X C

### MEDITERRANEAN SEA: BLOCK 1 (G1MED ORIGINAL) (4244 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	34.0681	1.38	31.1939	37.5490	6.3550	0
LONGITUDES	29.9255	3.74	16.6825	35.5324	18.8499	0
DEPTHS	-2028.63	882.62	-4450.00	0.00	4450.00	59
FREE AIR ANOMALIES	-50.31	56.02	-220.48	113.79	334.27	0
IFE88E2 ANOMALIES	-48.48	55.35	-220.49	107.91	328.40	0
OSU89B ANOMALIES	-43.05	52.90	-176.20	118.89	295.09	1
OSU91A ANOMALIES	-43.22	53.43	-178.86	116.26	295.12	0
FREE AIR-IFE88E2	-1.84	16.59	-87.91	87.00	174.91	1
FREE AIR-OSU89B	-7.27	19.29	-107.99	75.72	183.71	0
FREE AIR-OSU91A	-7.10	19.39	-104.46	77.95	182.41	2
OSU91A-OSU89B	0.17	1.95	-3.93	5.14	9.07	5

GROSS ERRORS: 0

### MEDITERRANEAN SEA: BLOCK 1 (G1MED INITIAL) (3652 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	33.9544	1.34	31.1939	36.8523	5.6584	0
LONGITUDES	31.0504	2.49	26.0120	35.5324	9.5205	0
DEPTHS	-1965.77	835.59	-4450.00	0.00	4450.00	59
FREE AIR ANOMALIES	-47.83	53.35	-220.48	113.79	334.27	0
IFE88E2 ANOMALIES	-47.01	52.48	-220.49	107.91	328.40	0
OSU89B ANOMALIES	-41.46	49.70	-171.64	110.51	282.15	1
OSU91A ANOMALIES	-41.41	50.27	-172.01	107.17	279.18	0
FREE AIR-IFE88E2	-0.82	15.22	-87.91	87.00	174.91	1
FREE AIR-OSU89B	-6.37	17.89	-100.30	75.72	176.02	0
FREE AIR-OSU91A	-6.42	18.10	-98.19	77.95	176.14	2
OSU91A-OSU89B	-0.05	1.81	-3.93	5.14	9.07	4

GROSS ERRORS: 0

### MEDITERRANEAN SEA: BLOCK 2SUP (G2MED SUP) (592 POINTS)

	MEAN	SD	MINIMUM	MAXIMUM	RANGE	ZEROS
LATITUDES	34.7695	1.44	31.7189	37.5490	5.8300	0
LONGITUDES	22.9862	2.42	16.6825	25.9994	9.3169	0
DEPTHS	-2416.38	1051.00	-4400.00	-73.00	4327.00	0
FREE AIR ANOMALIES	-65.65	68.33	-196.24	74.60	270.84	0
IFE88E2 ANOMALIES	-57.52	69.90	-186.40	103.13	289.53	0
OSU89B ANOMALIES	-52.85	68.70	-176.20	118.89	295.09	0
OSU91A ANOMALIES	-54.40	68.83	-178.86	116.26	295.12	0
FREE AIR-IFE88E2	-8.13	22.33	-82.12	75.21	157.33	0
FREE AIR-OSU89B	-12.80	25.65	-107.99	49.08	157.07	0
FREE AIR-OSU91A	-11.25	25.59	-104.46	53.00	157.46	0
OSU91A-OSU89B	1.55	2.18	-2.60	5.04	7.64	1

GROSS ERRORS: 0