

## Gravity Anomaly over the Northern Part of Central Japan (2)

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**Abstract** The relationship between Bouguer anomaly and topographic relief in central Japan is illustrated by a series of profiles along 52 traverses. Data from observation points within 2.5' (about 5 km) on both sides of each traverse are plotted on the profile. They express various patterns in the relationship between Bouguer anomaly and topography: (1) the low negative Bouguer anomaly strongly correlates inversely with the high topography in the central part of Honshu Island and their variations comprise wavelenghtes of 70km and 300km: (2) there are many regions of a positive correlation between Bouguer anomaly and high topography in the shorter wavelength: and (3) most of alluvial plains are characterized by local negative anomaly.

### 1. Introduction.

A detailed contour map of Bouguer anomaly over the central part of Honshu Island was presented in the previous paper (KONO *et al.*, 1982). In this paper, 52 profiles of observed Bouguer anomaly and topography are illustrated. They are useful to recognize some characteristic relationship between Bouguer anomaly and topography over the surveyed area.

### 2. Profiles.

The index map showing the locations of the profiles is reproduced in Fig. 1 from the previous paper (KONO *et al.*, 1982). The code for each profile is indicated in both sides (for Fig. 2) and top and bottom (for Fig. 3) in the figure. In Fig. 2 to 5, all of the profiles are displayed. In each section, the data from observation points within 2.5' (about 5km)

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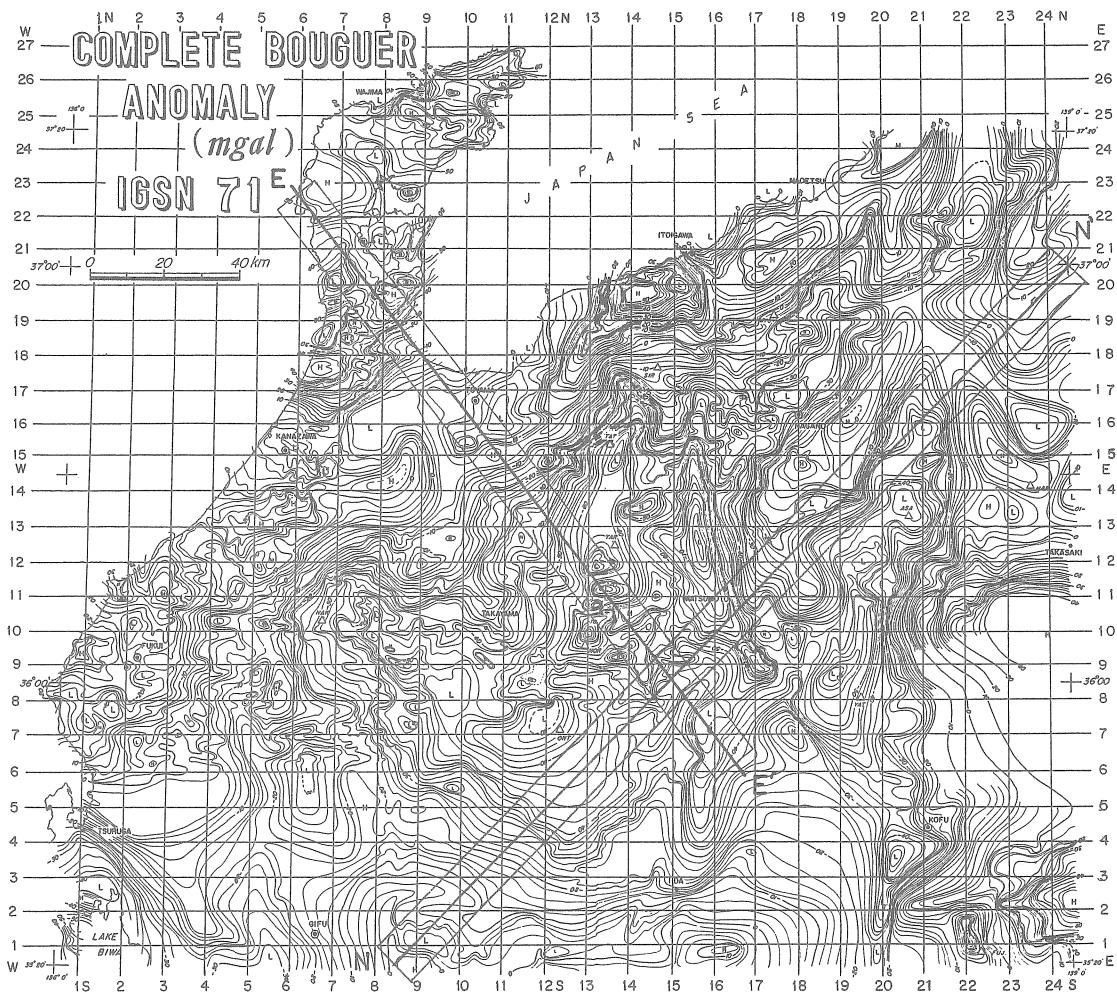
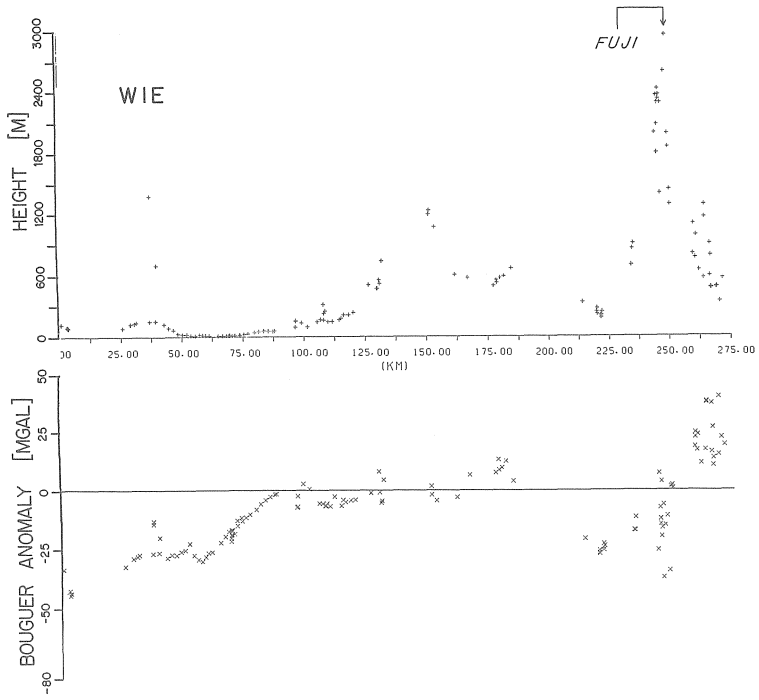
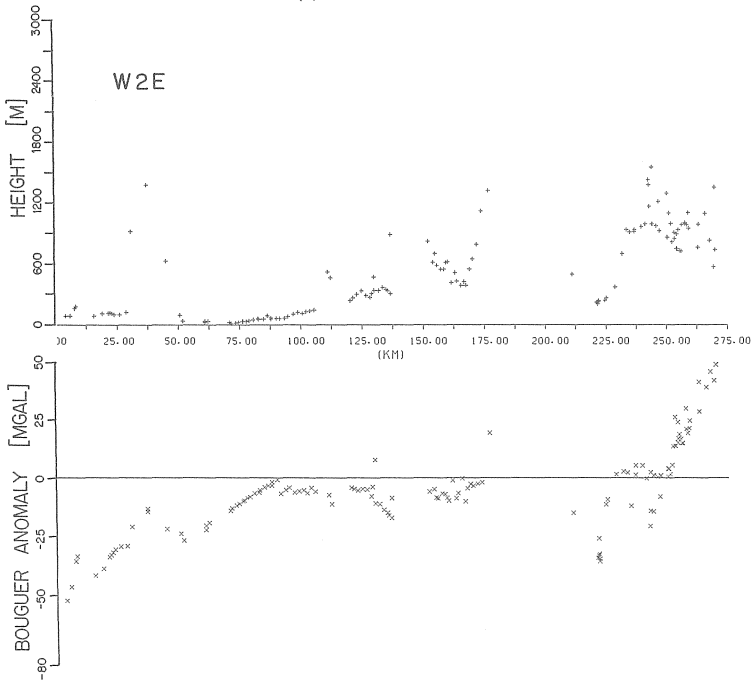


Fig. 1 Index map for Figs. 2 to 5. Codes for each profile are indicated in both sides (for Fig. 2) and top and bottom (for Fig. 3).

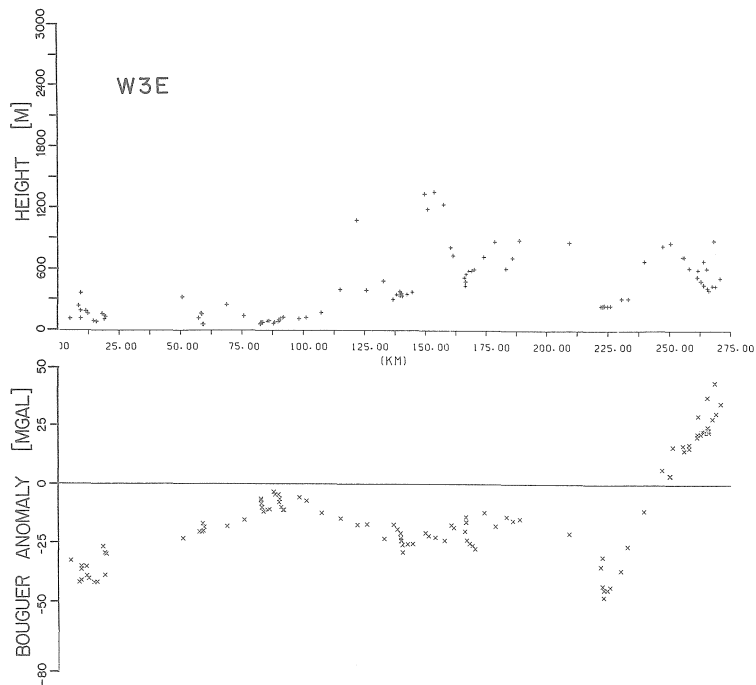
Fig. 2 Profiles of observed Bouguer anomaly and topography of the East-West traverses. *HAK*: Mt. Hakusan, *NOR*: Mt. Norikura, *ZAT*: Mt. Tateyama, *YAR*: Mt. Yariyatake, *MYO*: Mt. Myoko, *ONT*: Mt. Ontake, and *ISTL*: Itoigawa-Shizuoka Tectonic Line.



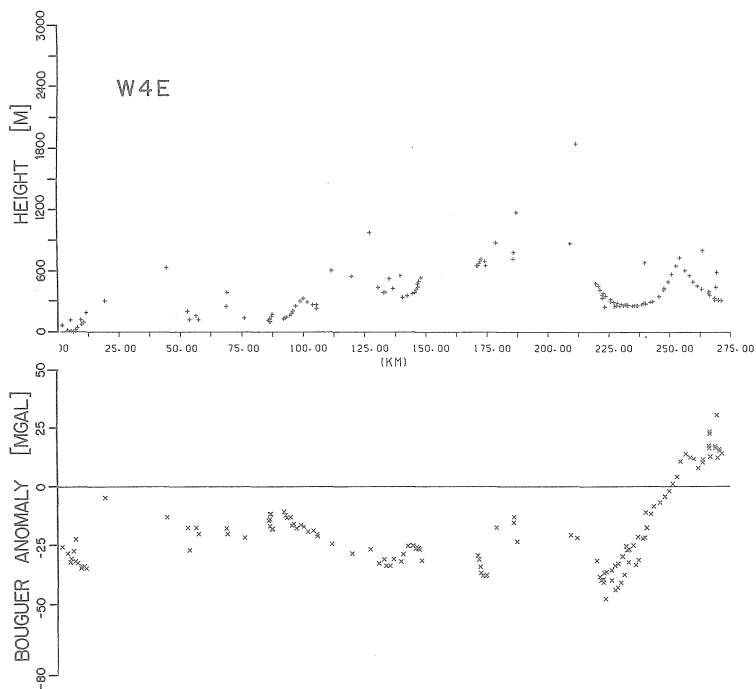
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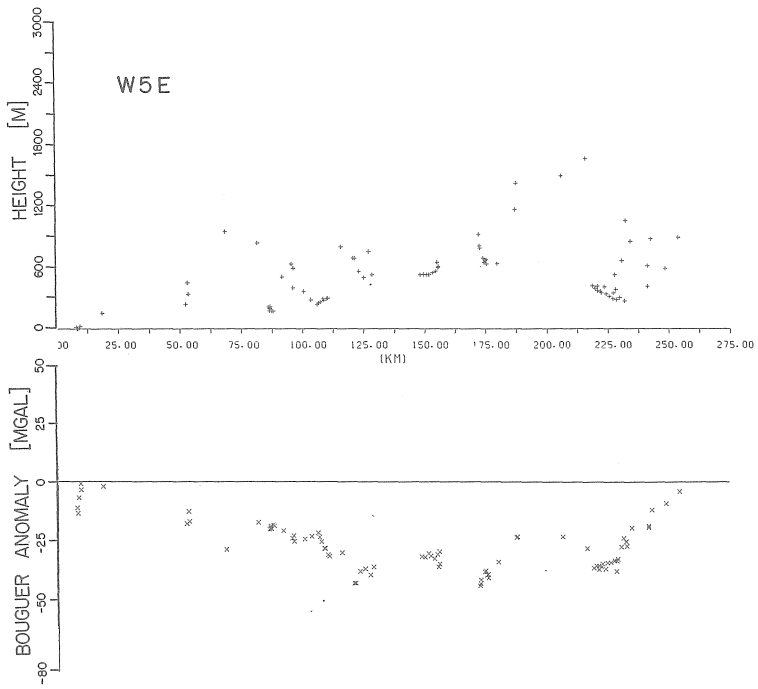
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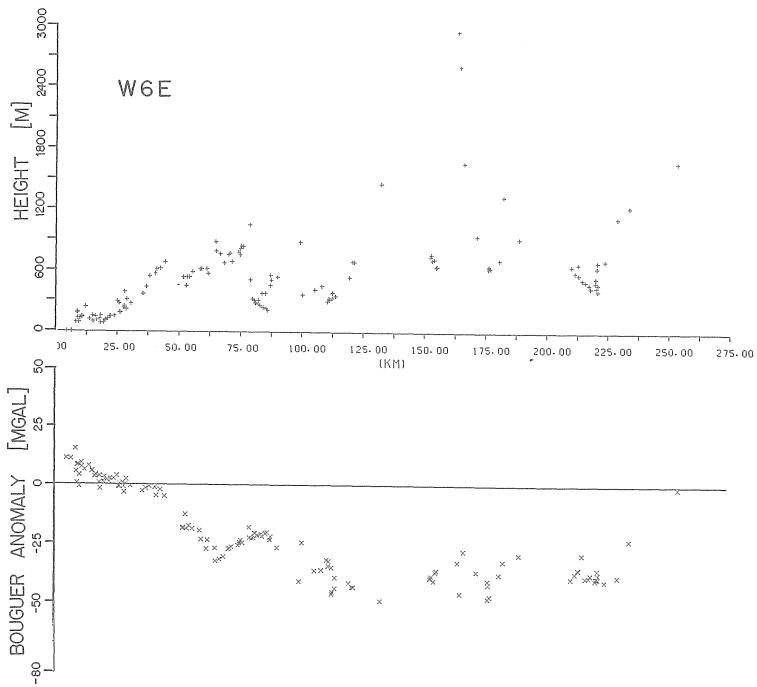
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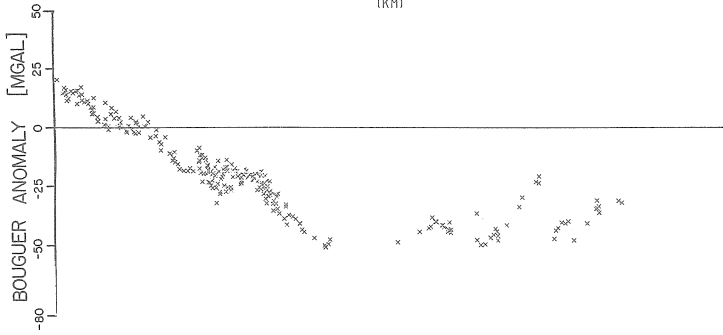
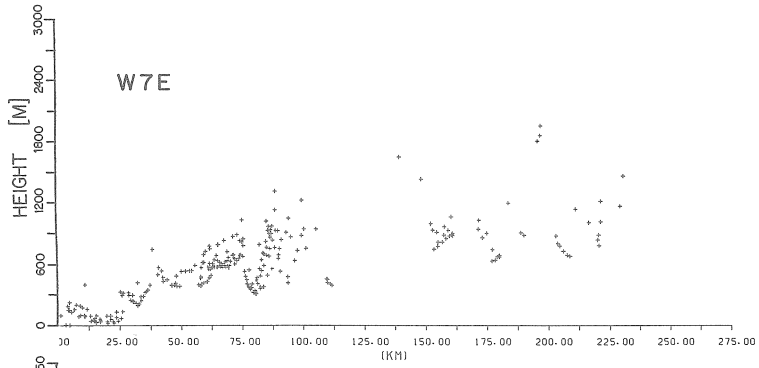
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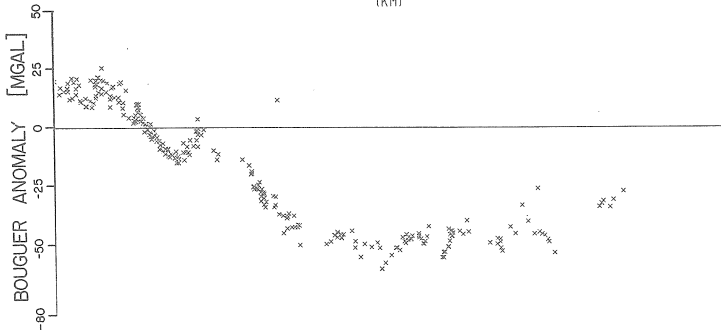
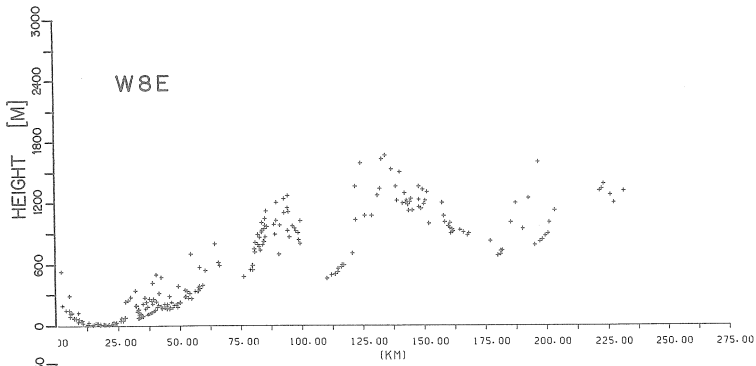
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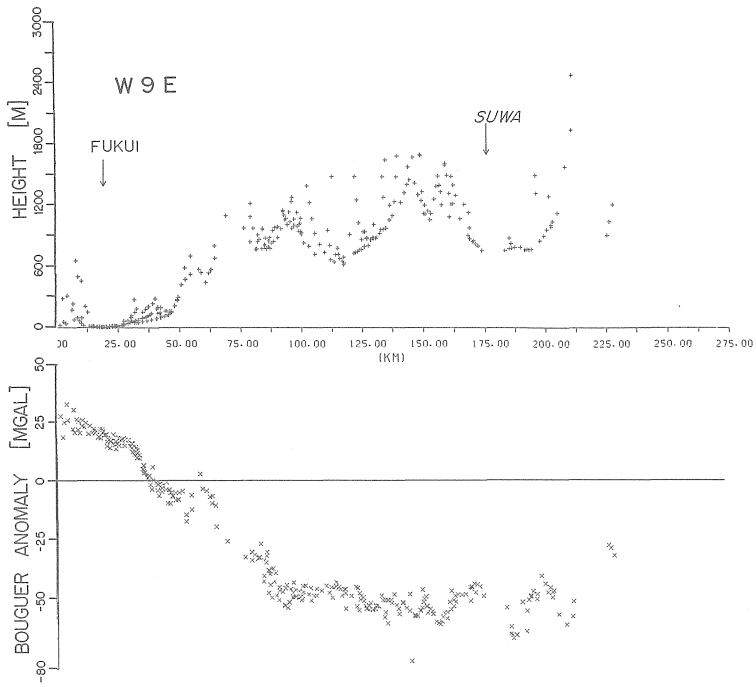
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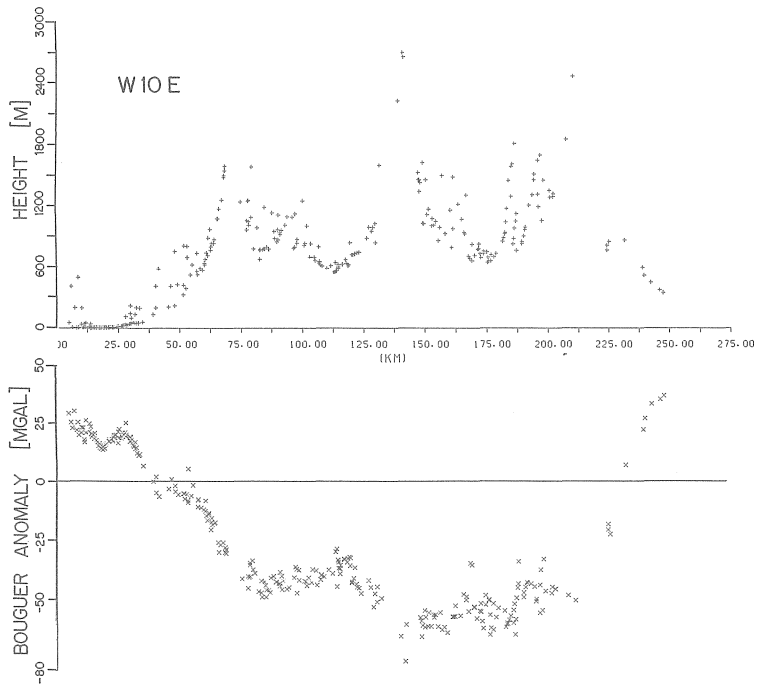
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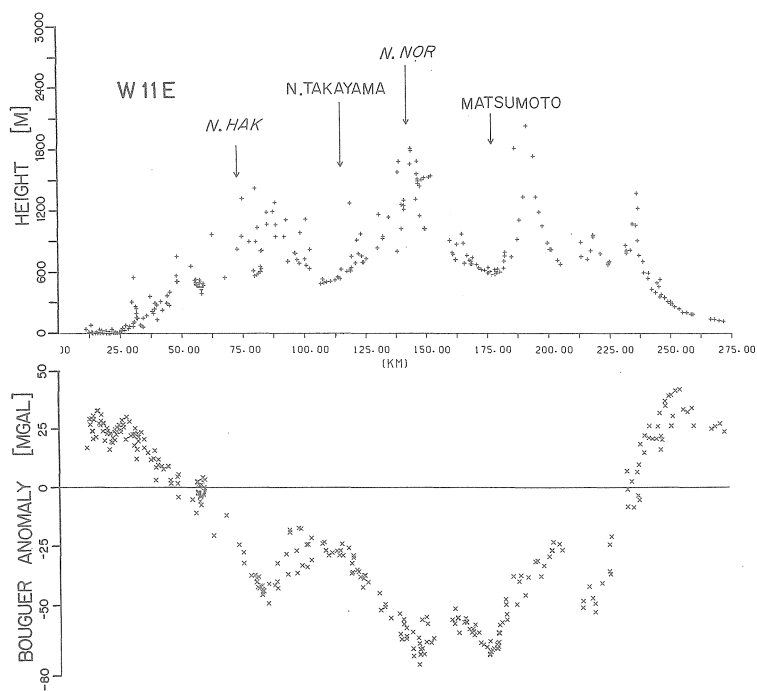
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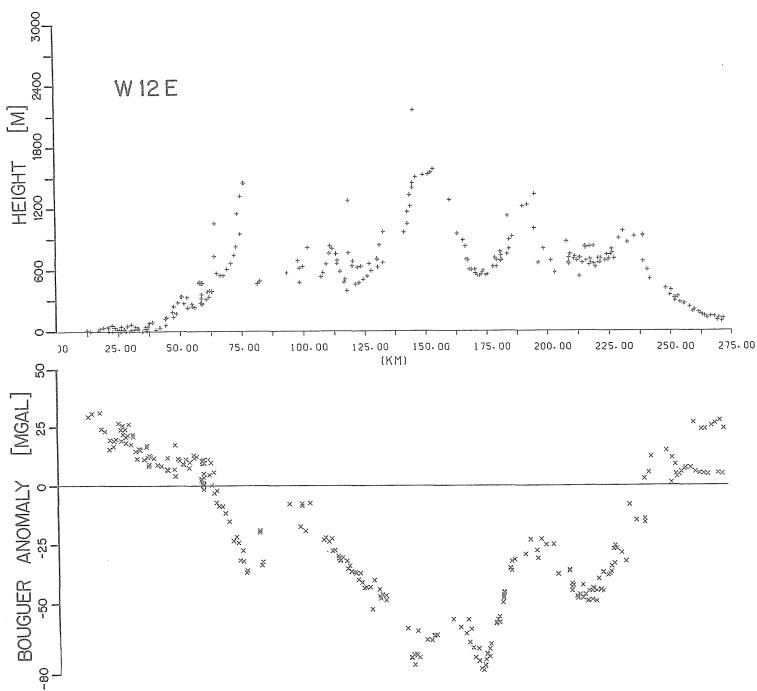
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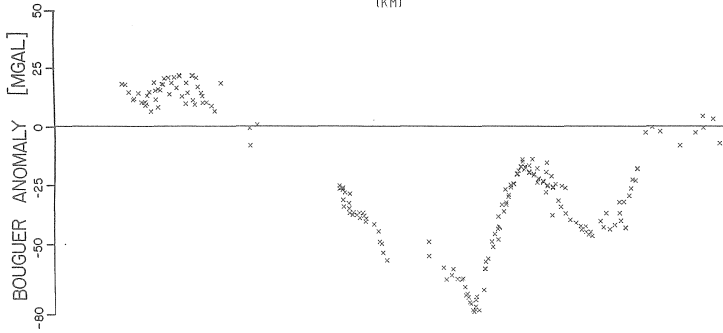
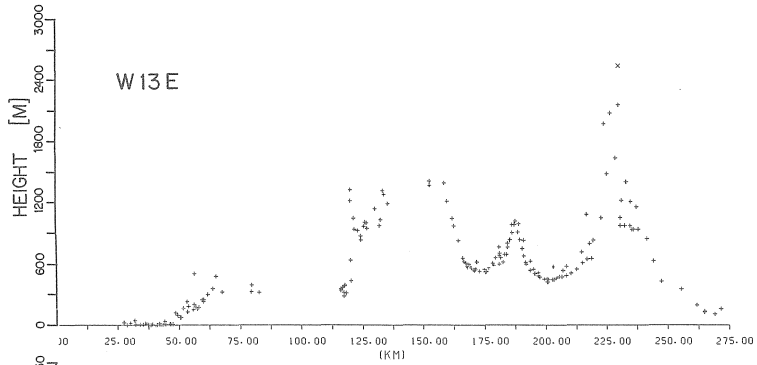


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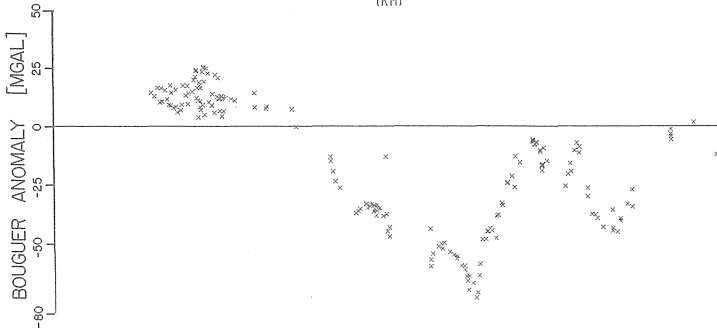
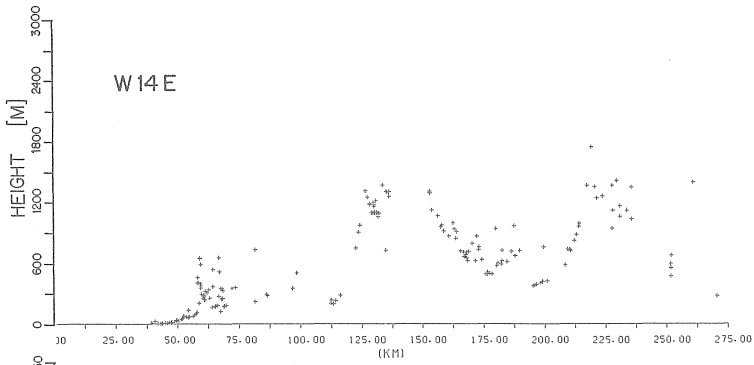


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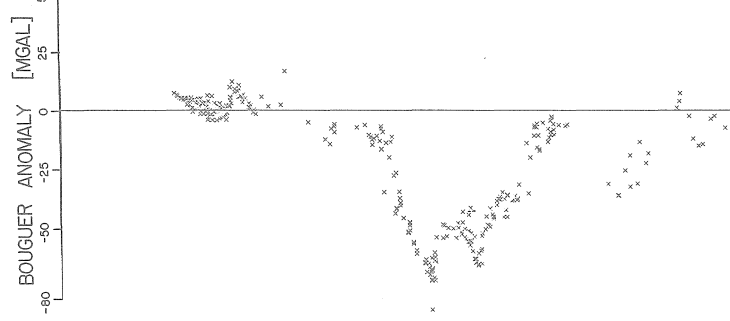
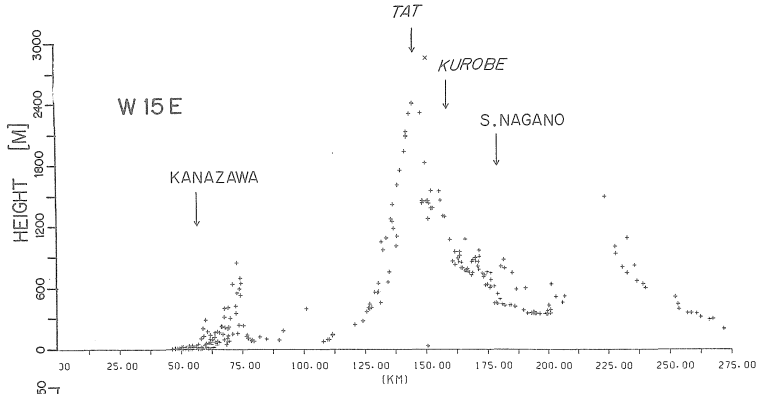




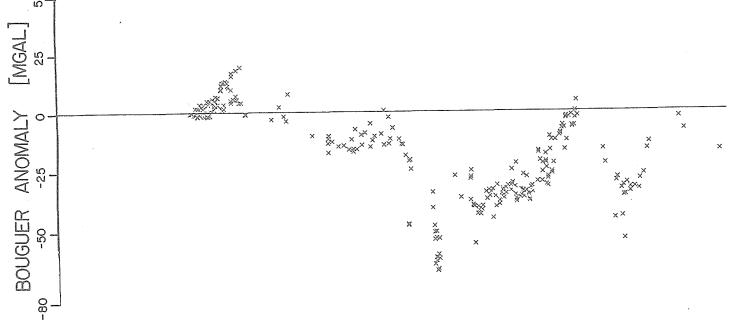
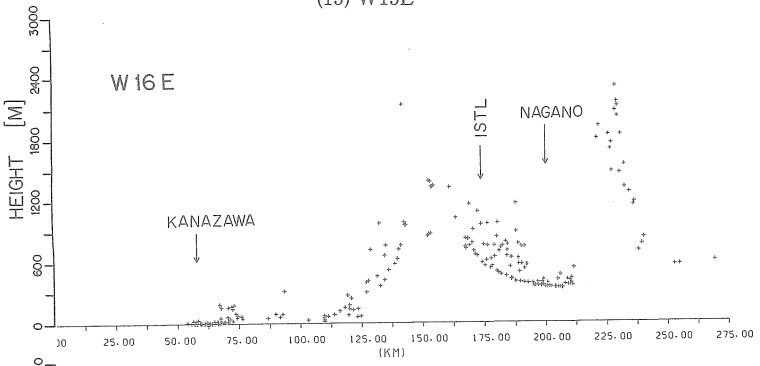
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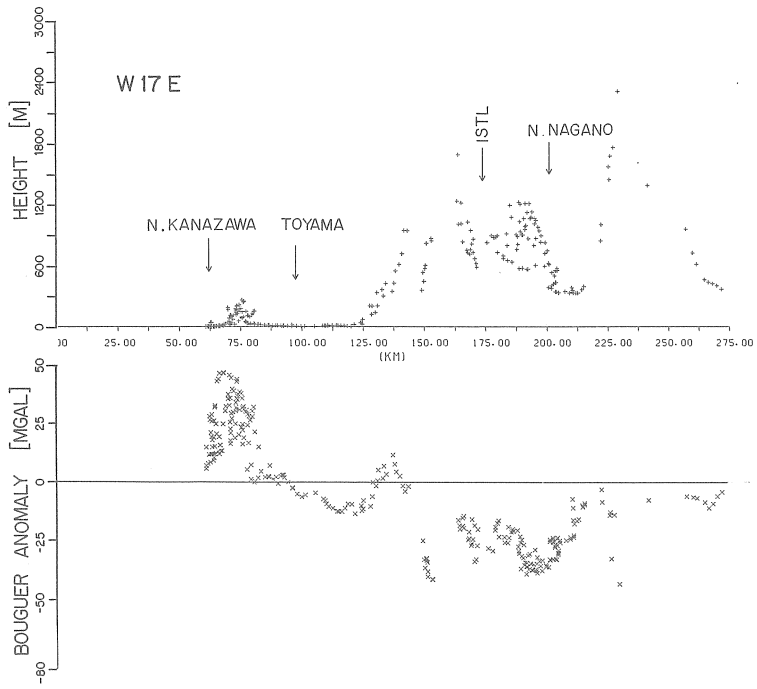
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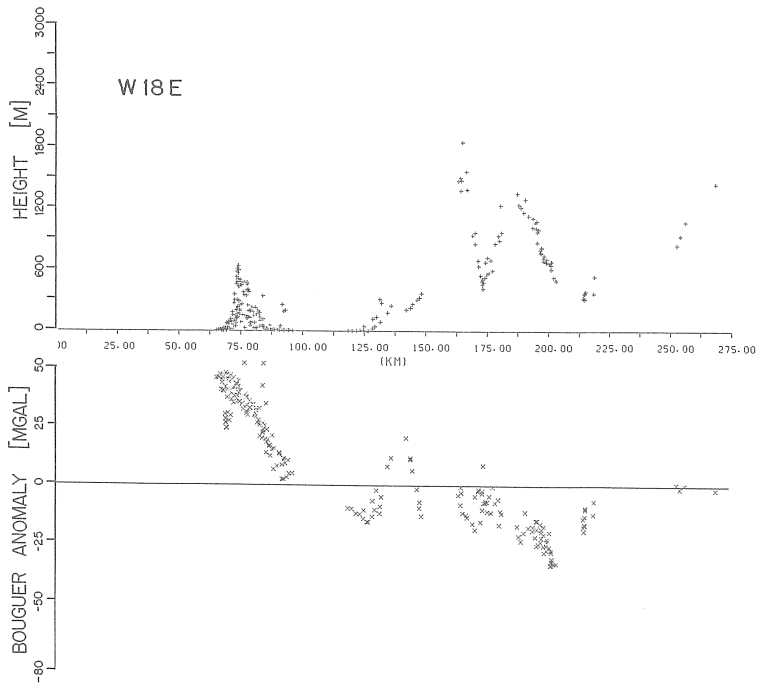
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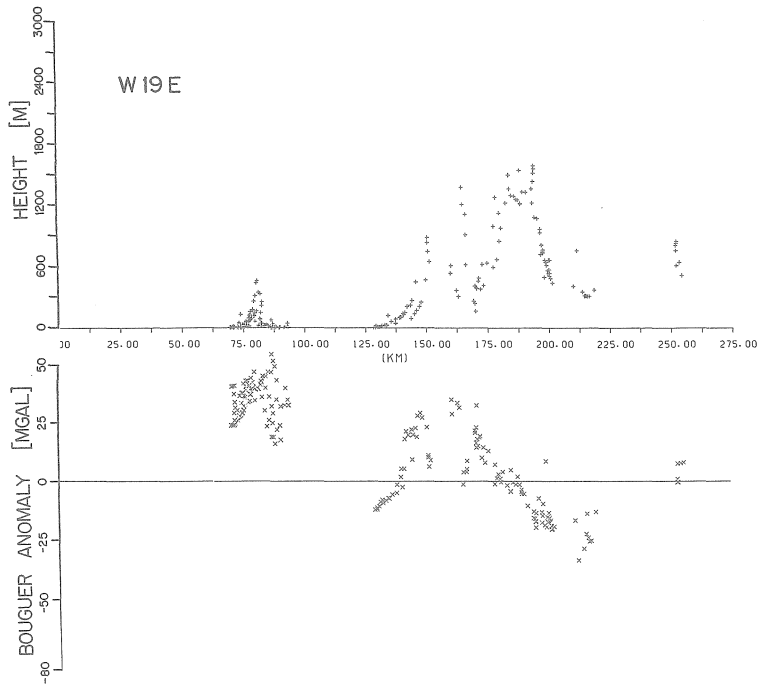
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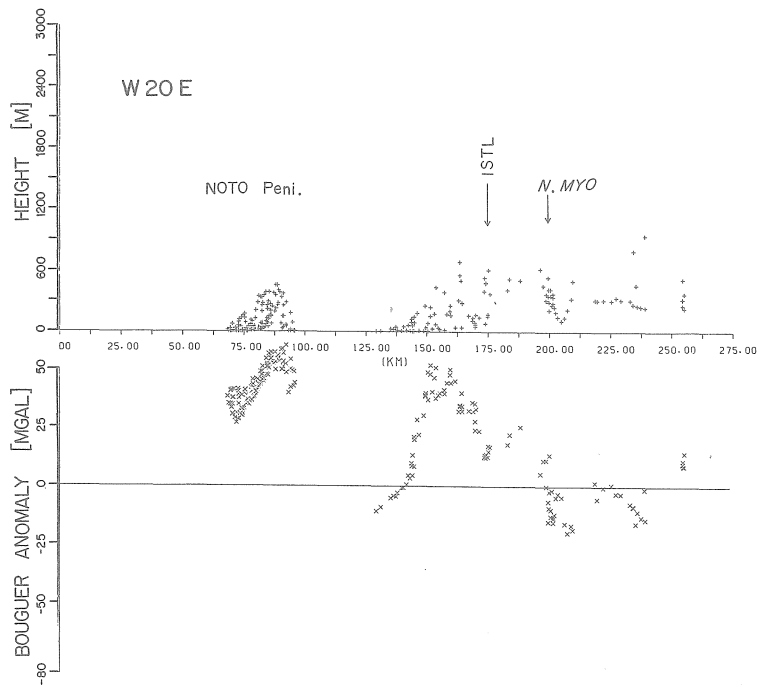
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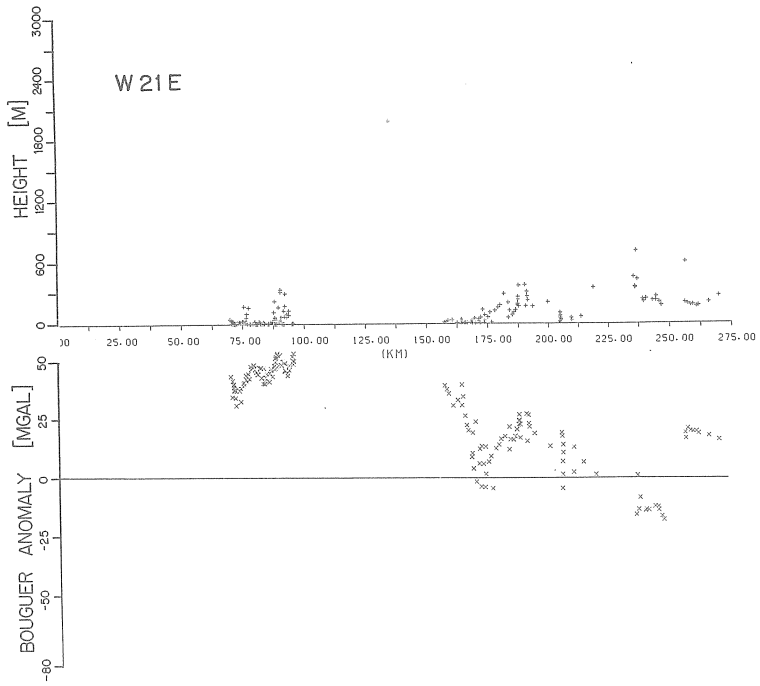
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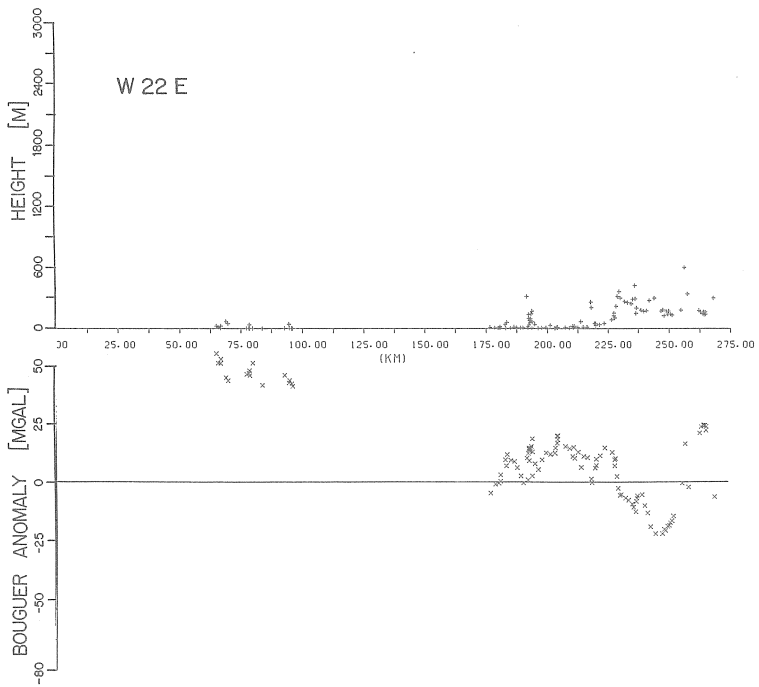
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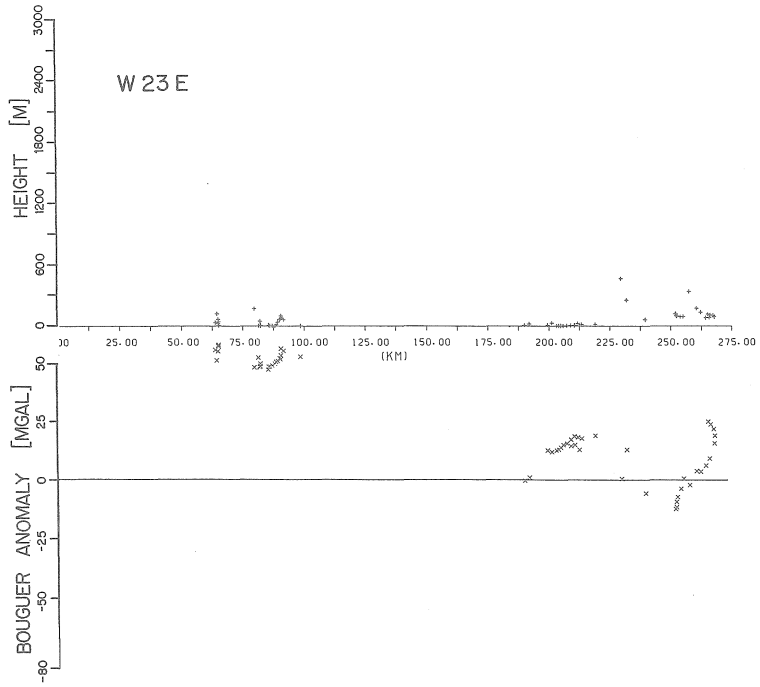
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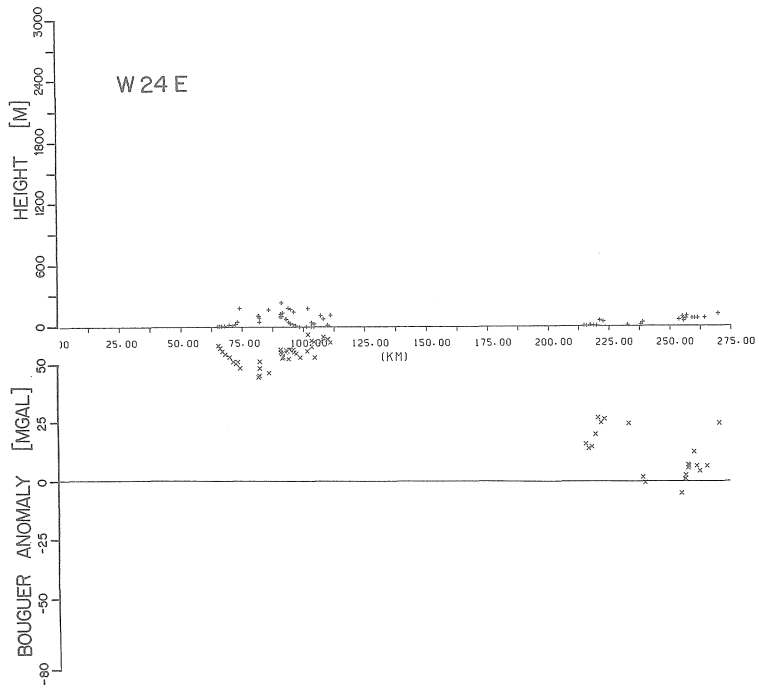
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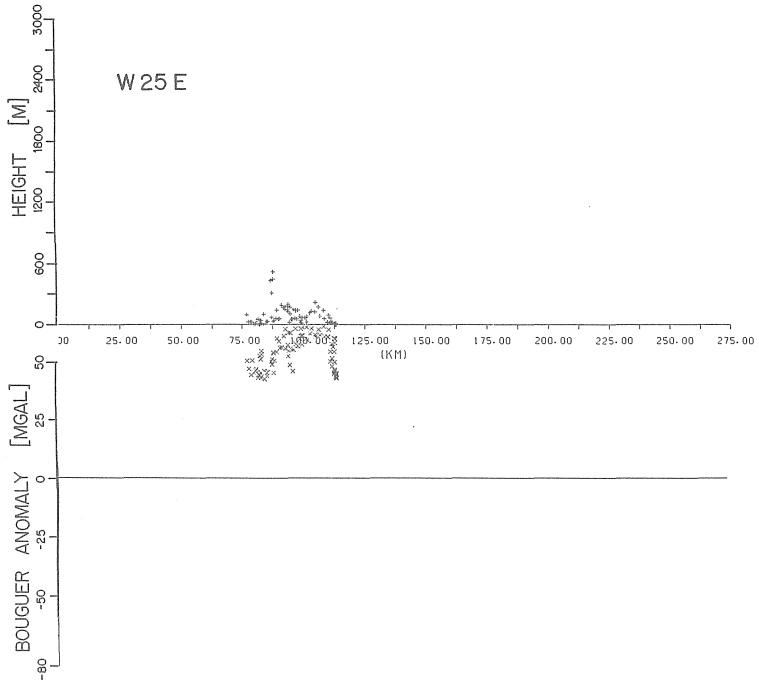
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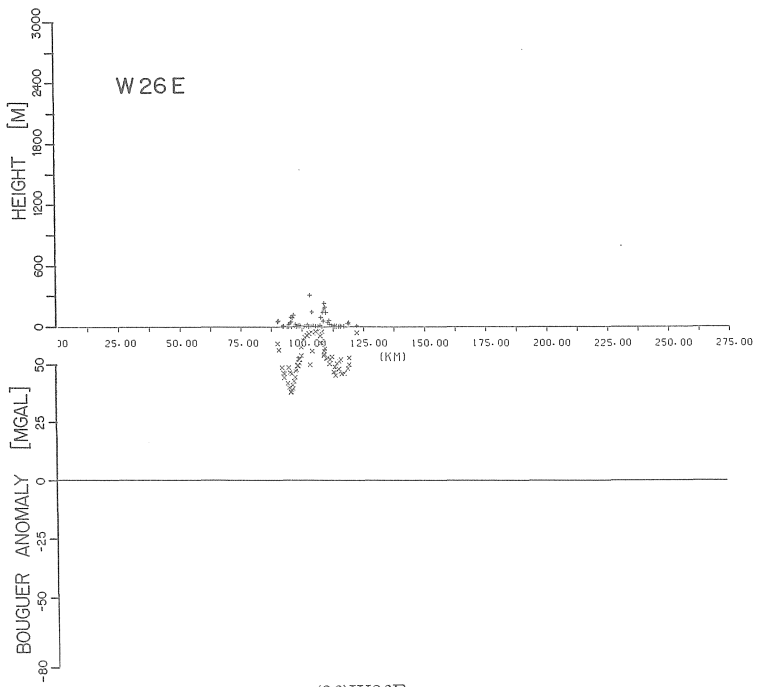
(23) W23E



(24) W24E



(25) W25E



(26)W26E

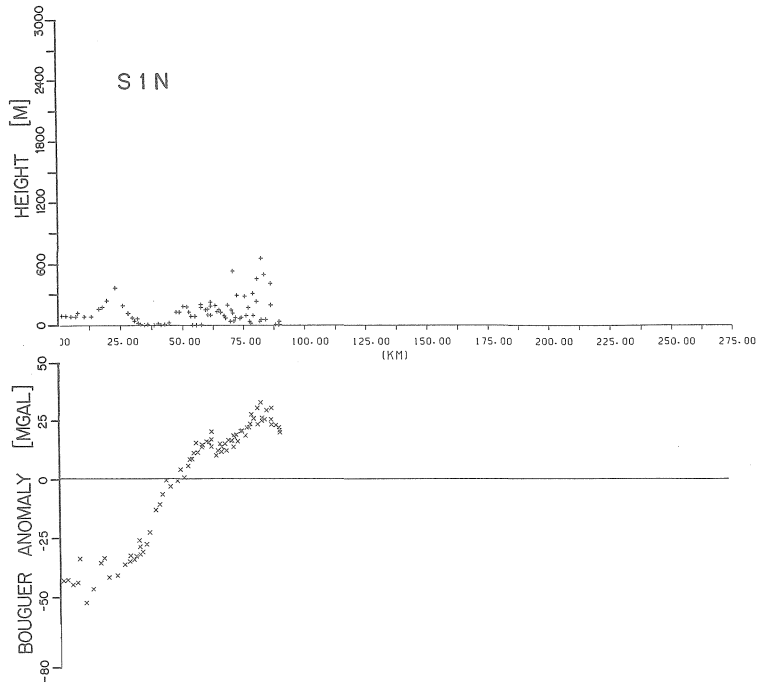
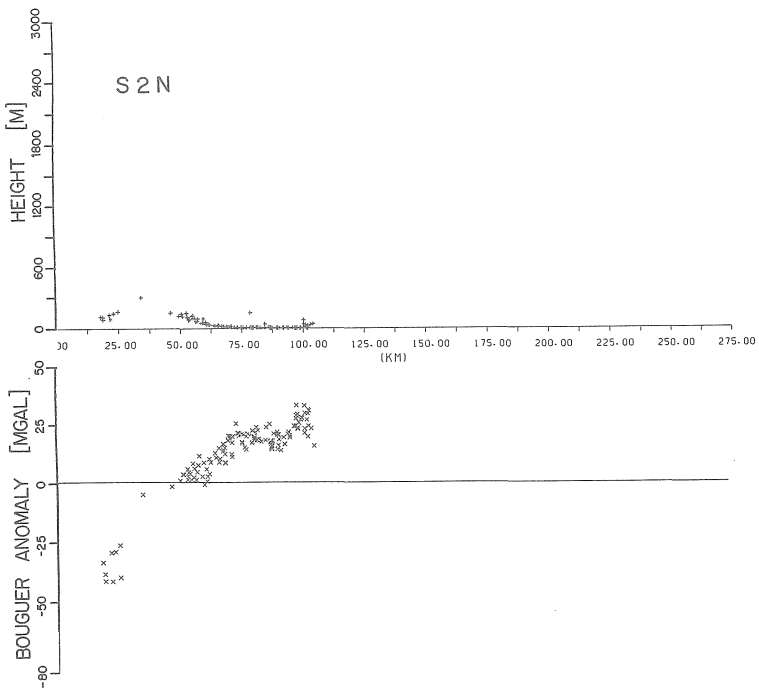


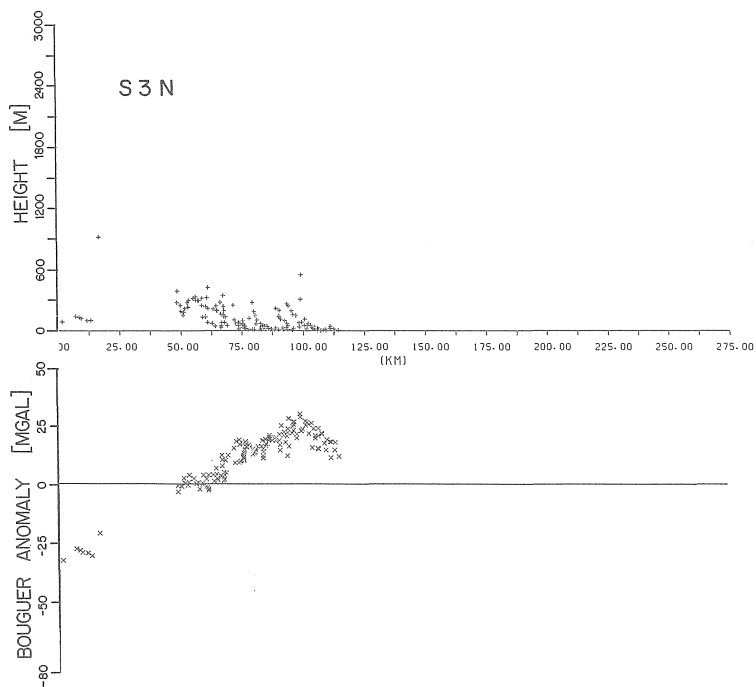
Fig. 3 Profiles of observed Bouguer anomaly and topography of the North-South traverses.

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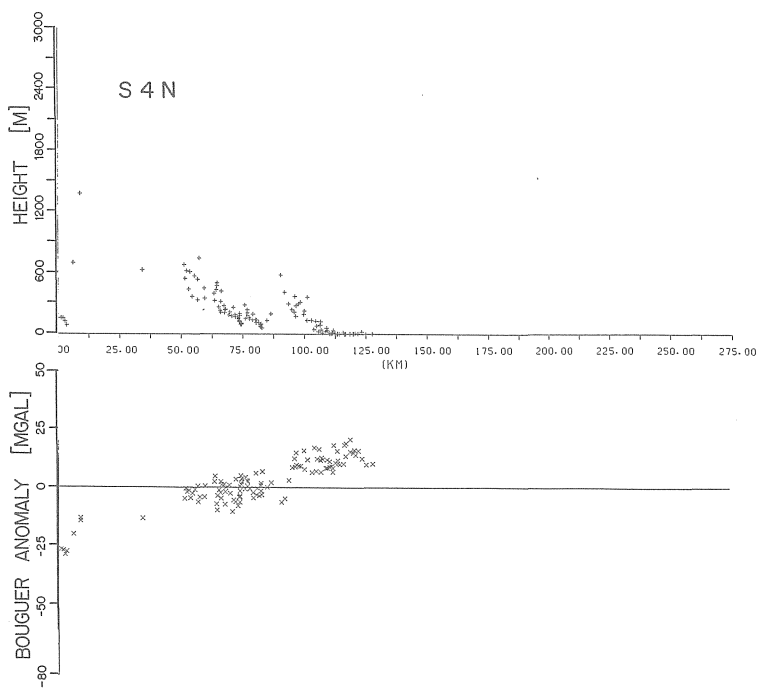


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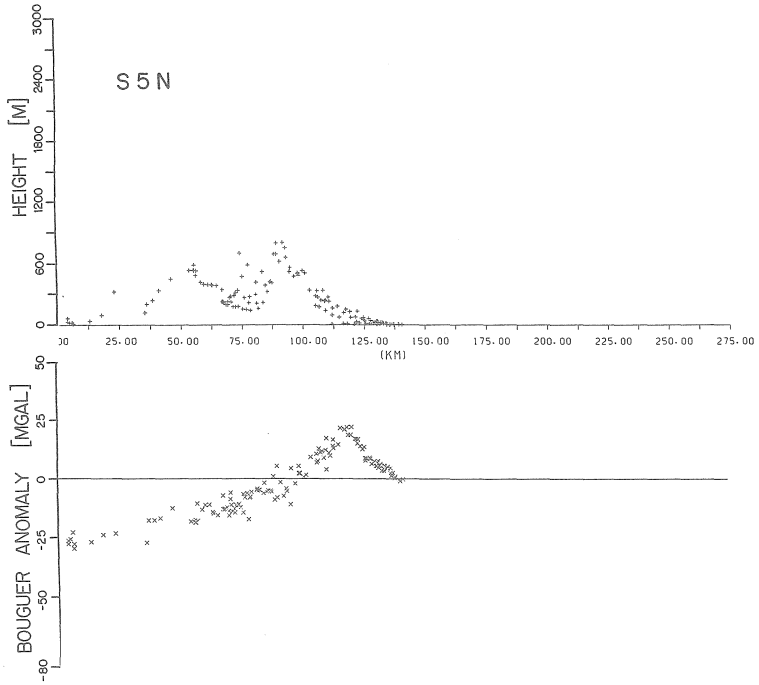




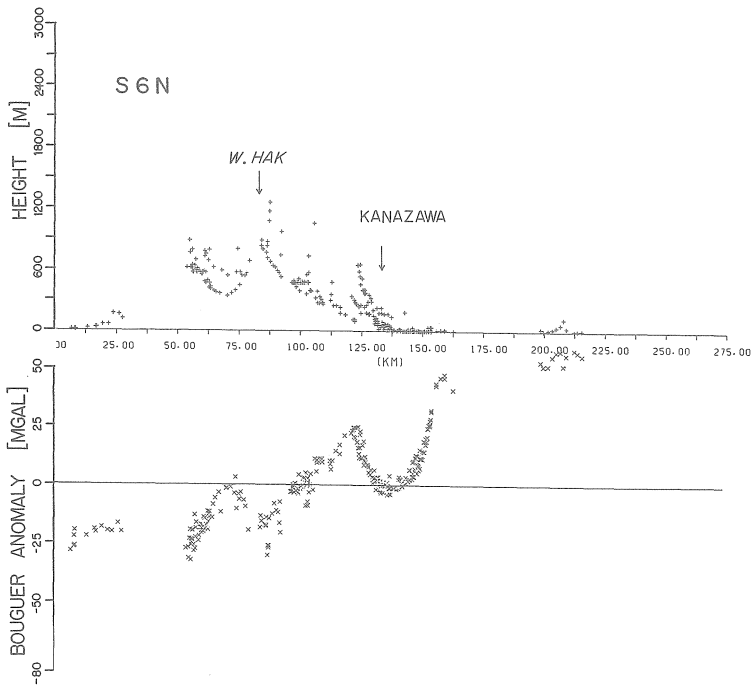
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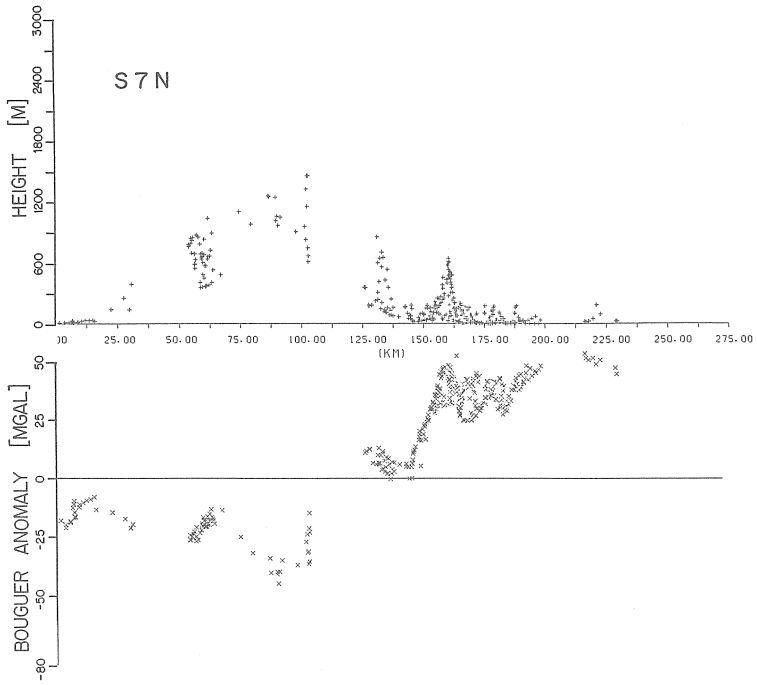
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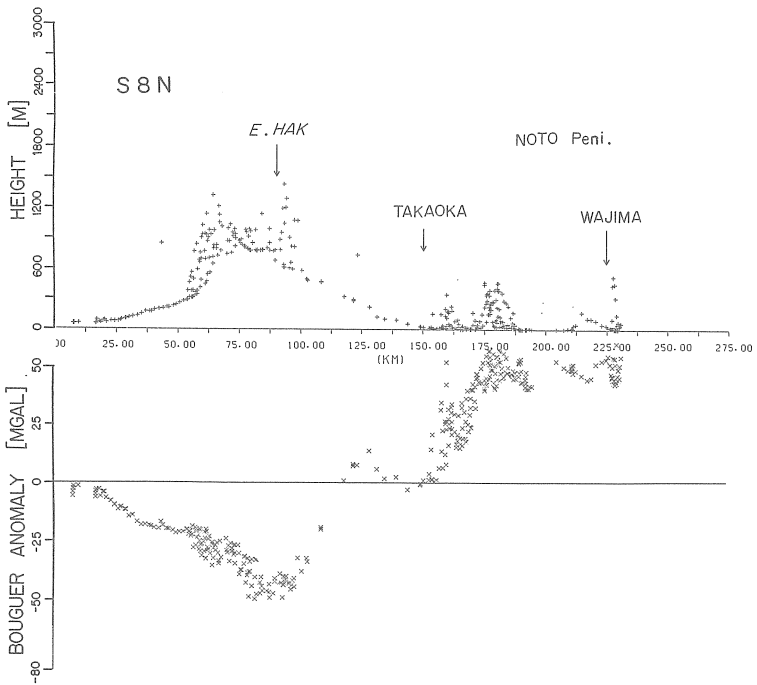
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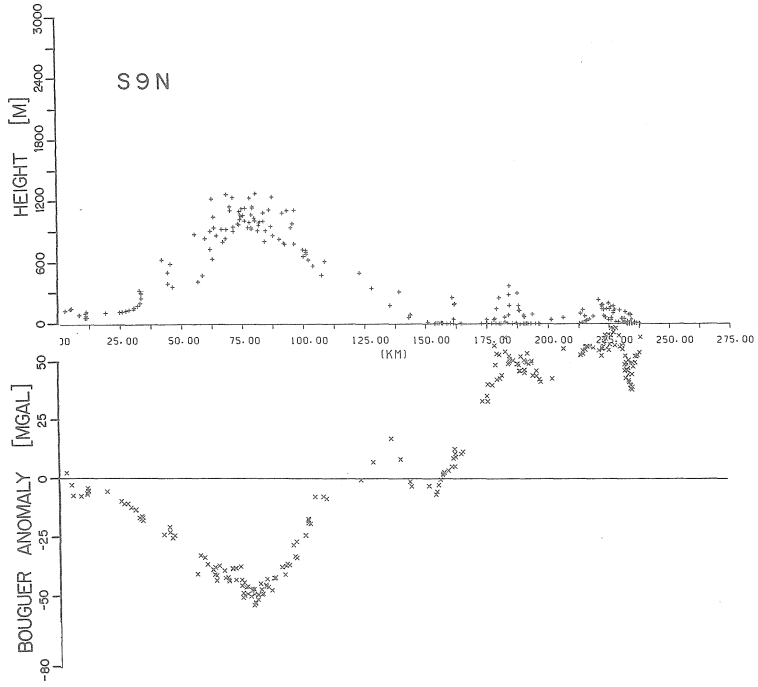
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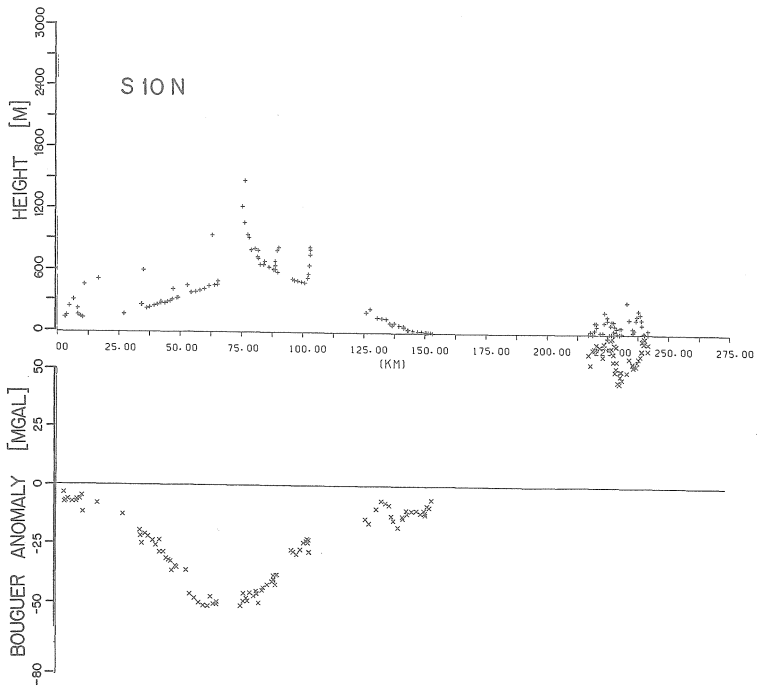
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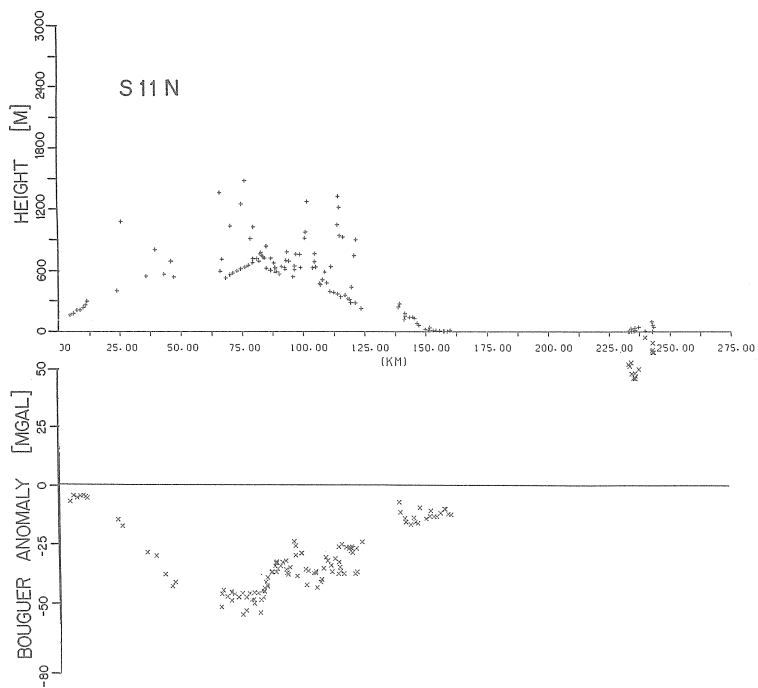
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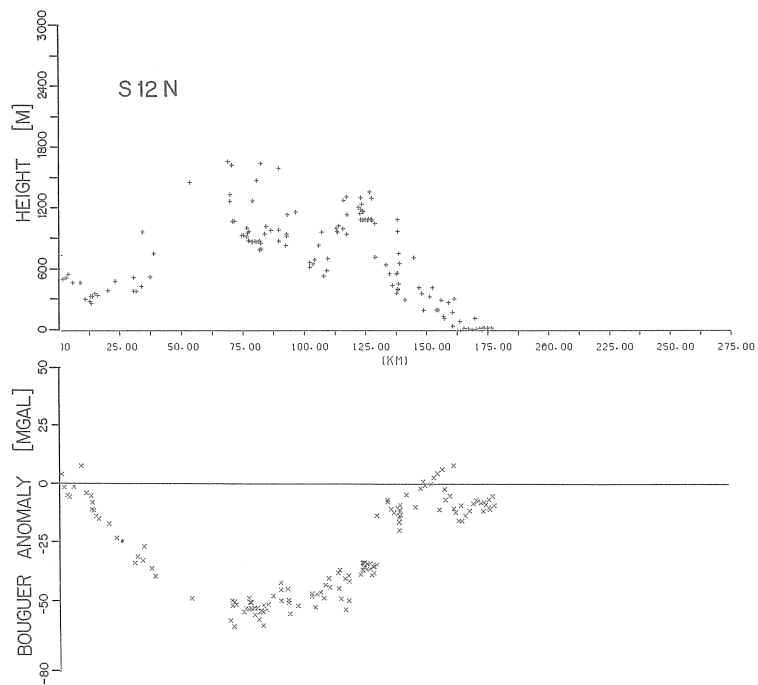
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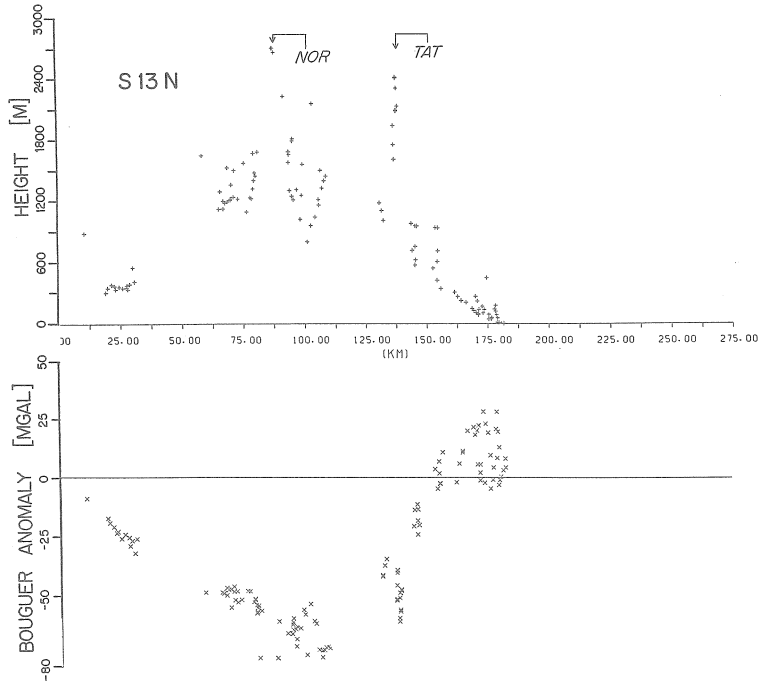
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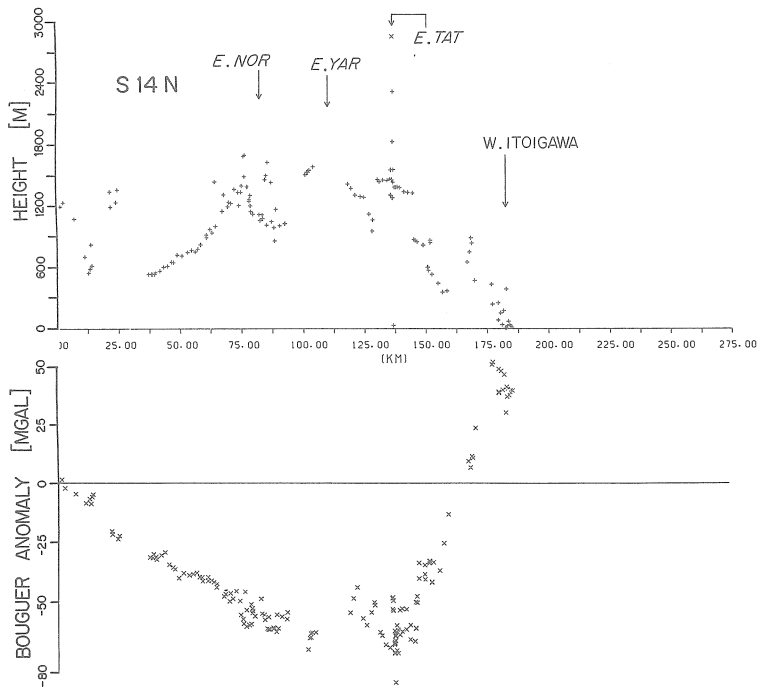
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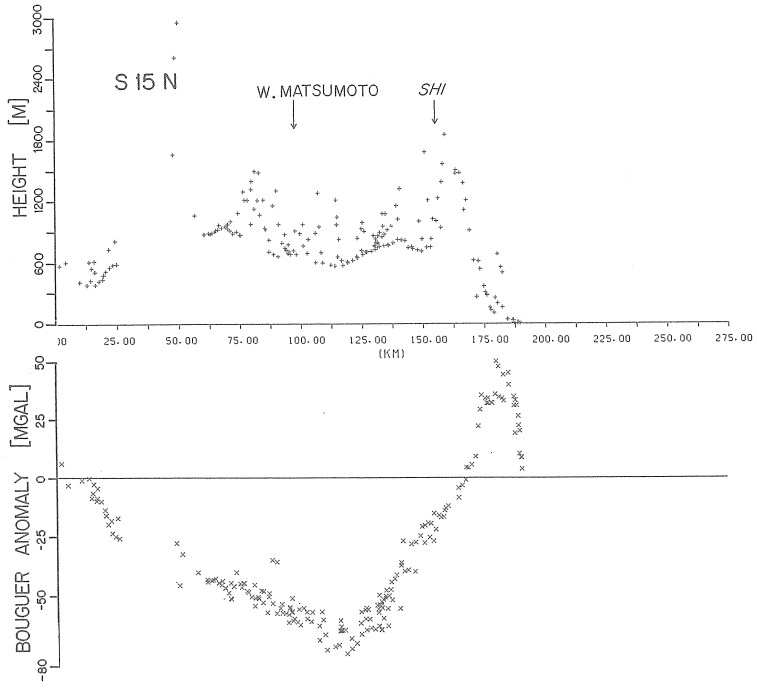
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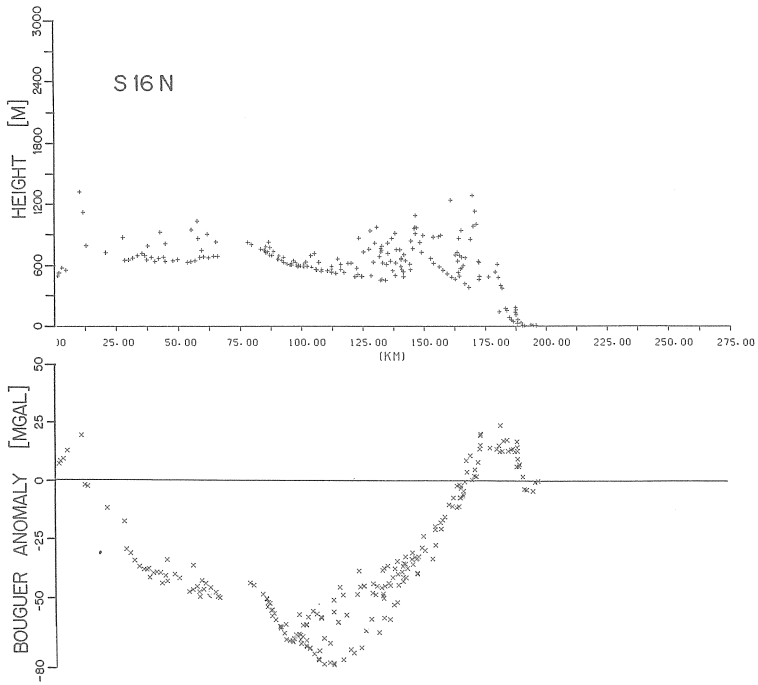
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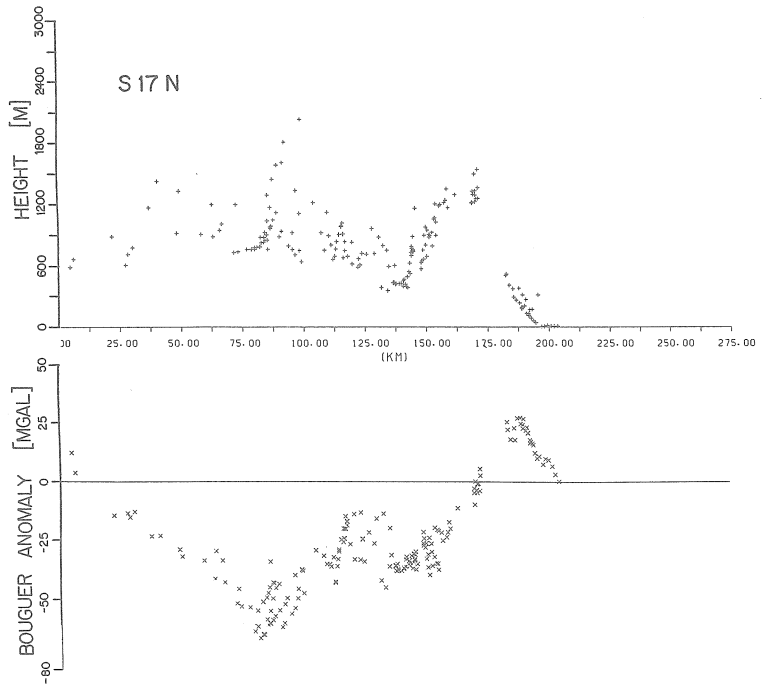
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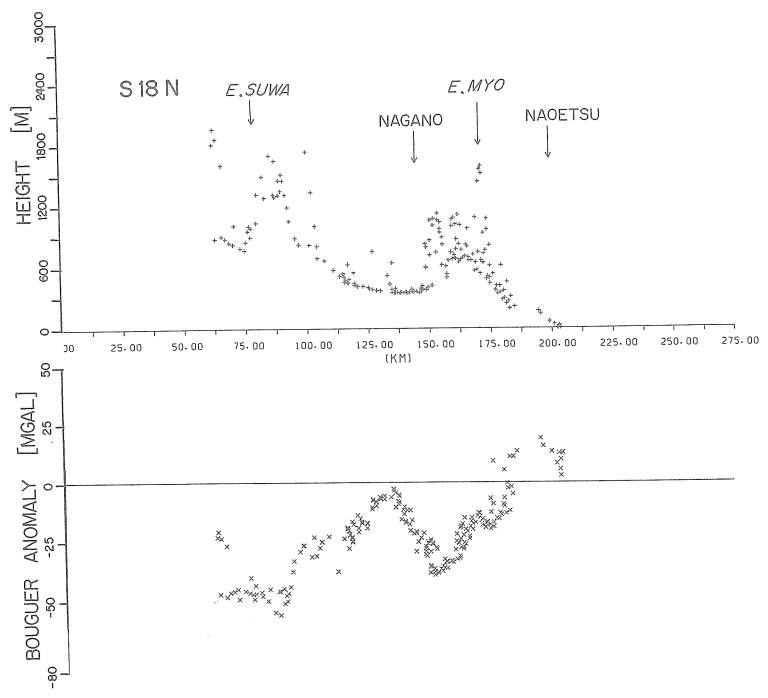
(15) S15N



(16) S16N

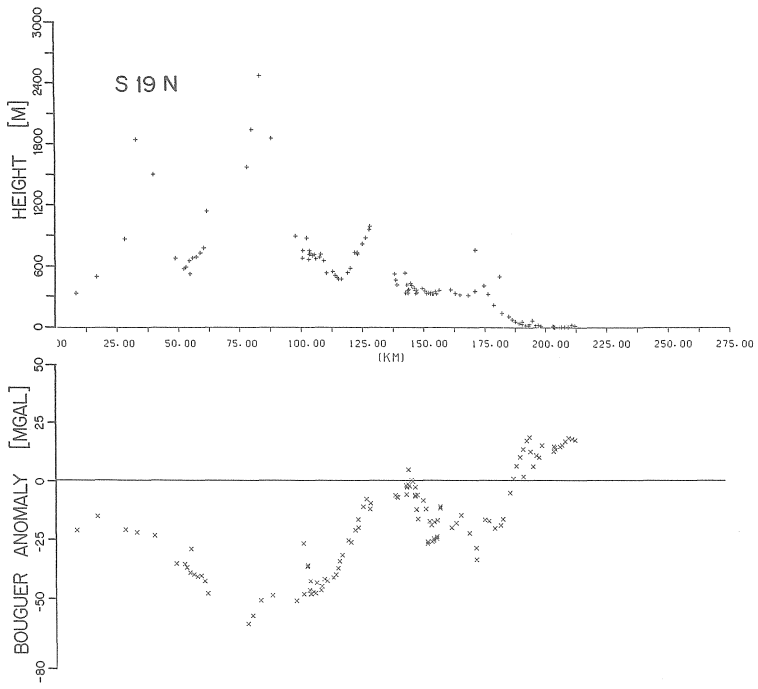


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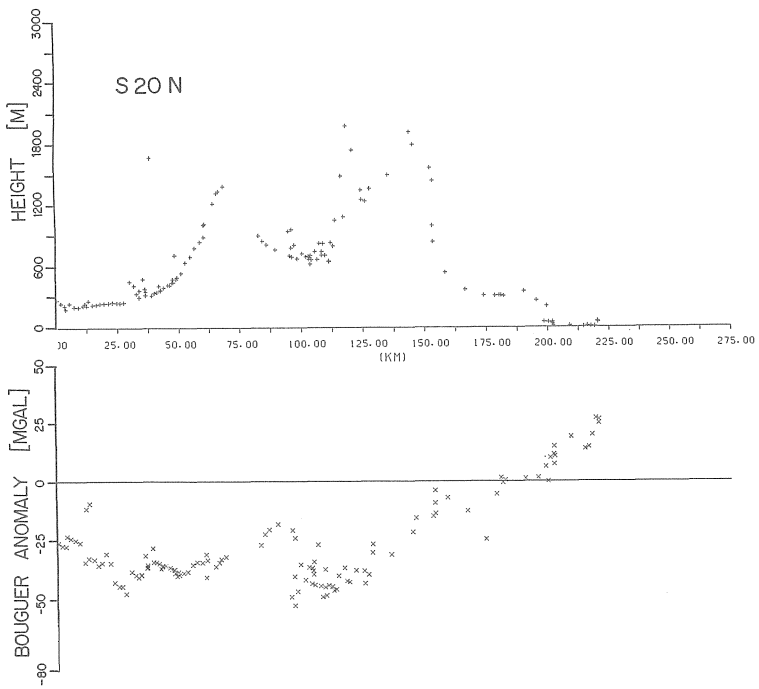


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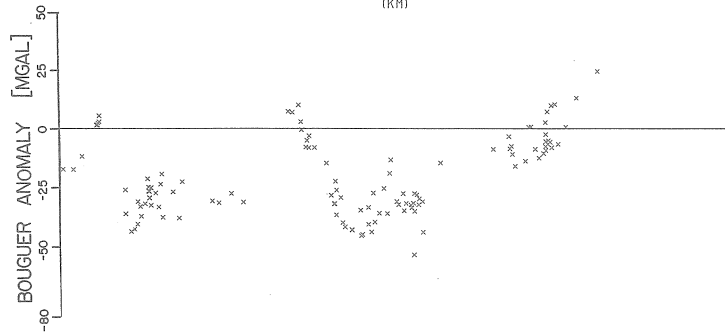
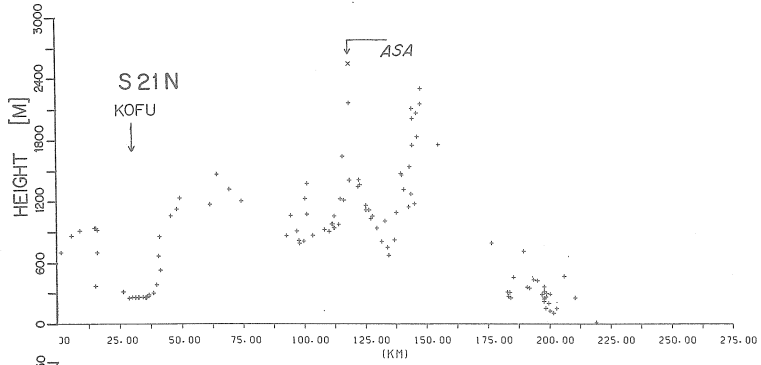




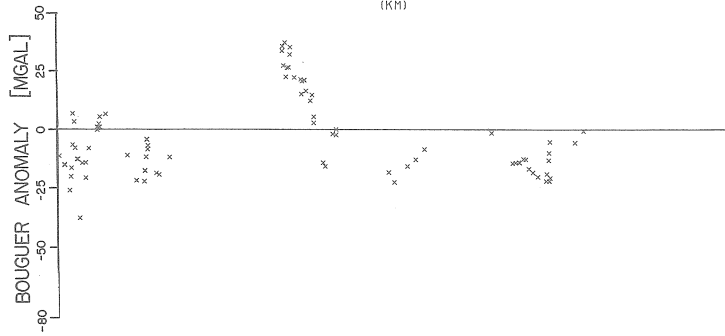
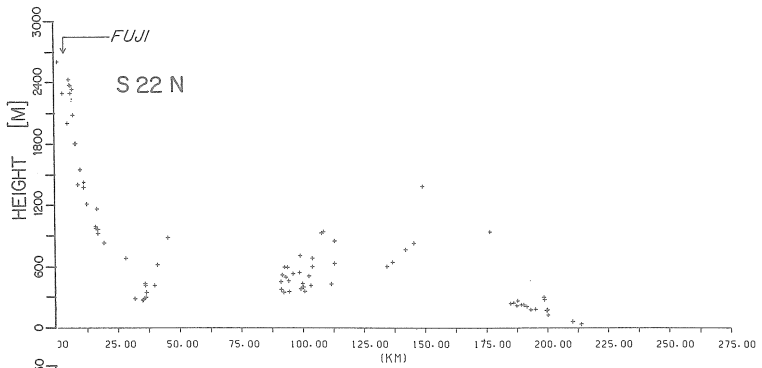
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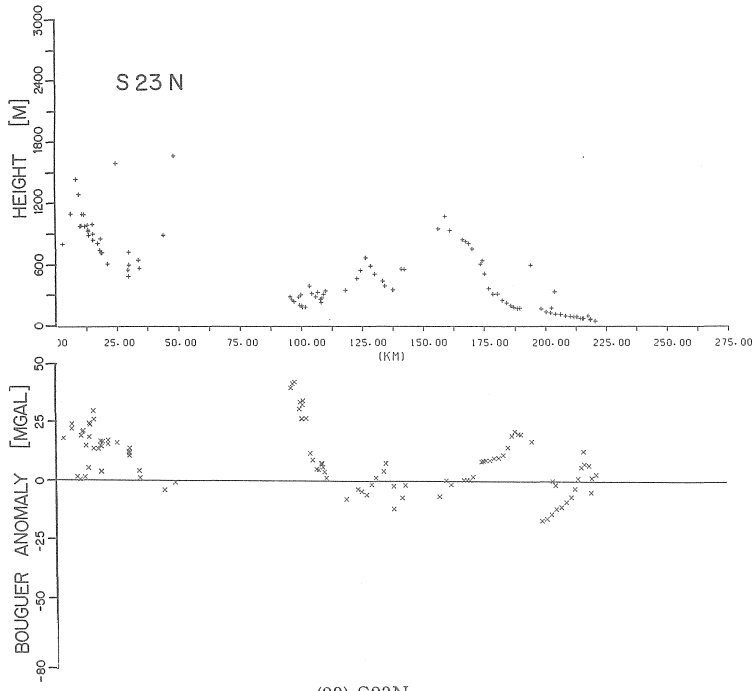
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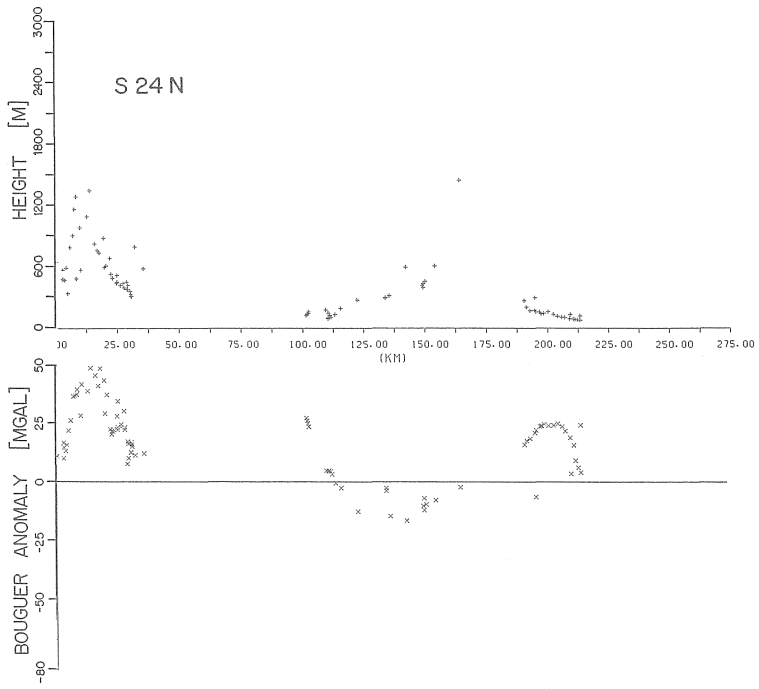
(21) S21N



(22) S22N



(23) S23N



(24) S24N

E

E'

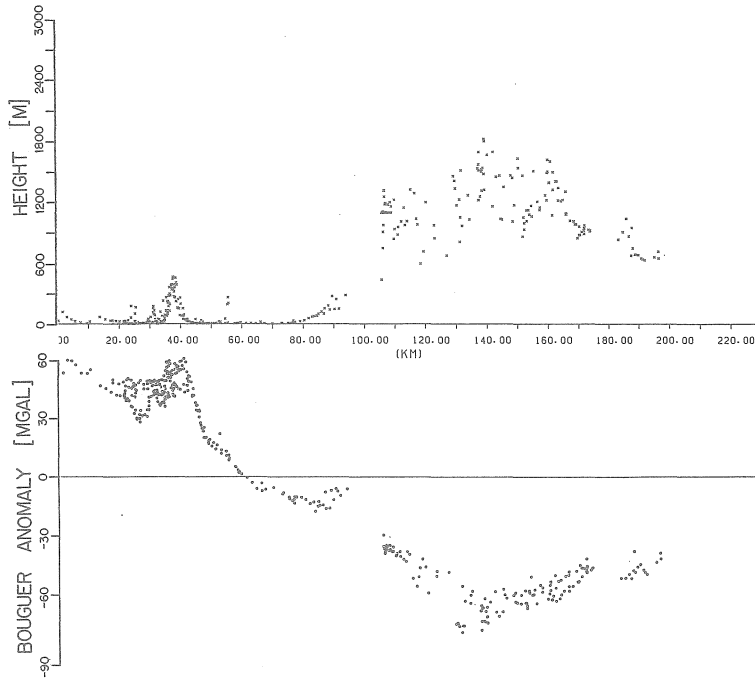


Fig. 4 Profile (EE') of observed Bouguer anomaly and topography from the Noto Peninsula (near Togi) to Ina crossing the central part of mountainous area (near Mt. Norikura)

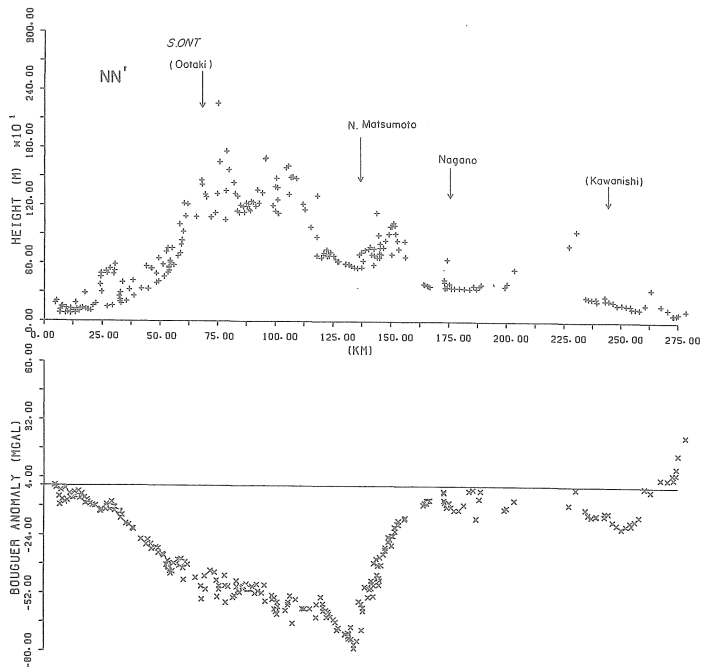


Fig. 5 Profile (NN') of observed Bouguer anomaly and topography along the observation line of seismic explosion which was carried out in Nov. 1981 by the Reach Group of Explosion Seismology.

on both sides of each traverse are plotted on the profile. Figures are drawn based on the data available at the end of 1981.

### 3. Some Remarkable Features.

Some examples of the remarkable relationship between Bouguer anomaly and topography in the surveyed area are pointed out.

The section W11E (Fig. 2(11)) is a typical example of a strong inverse correlation between Bouguer anomaly and topography. This implies the establishment of isostasy in this area. Dominant wavelengths of their variations are about 70 and 300km. Preliminary analysis clarifies that the variation of the shorter wavelength is caused by undulation of an upper crustal layer of mean depth of 5km instead of that of the Moho, while the variation of the longer wavelength is resulted by undulation of the Moho.

The Hodatsu mountains, in the southern part of the Noto Peninsula, are bounded by the Ochi lowland on the north and Tonami plain on the south. The highest peak is Mt. Hodatsu (637m) and Bouguer anomaly is about 40 mgal. This area typically shows the positive correlation between positive Bouguer anomaly and high topography (e. g., EE', Fig. 4).

W20E (Fig. 2(20)) and S15N (Fig. 3(15)) illustrate profiles of a remarkable pattern of positive Bouguer anomaly to the west of Itoigawa. The steep gradient of anomaly on the eastern (the Itoigawa-Shizuoka Tectonic Line), western (the Kurobishiyama Fault), northern (the Oyashirazu Coast) and southern boundaries suggests that a block of very high density rocks is hidden below this region. Positive Bouguer anomaly to the south of Nagano (W16E, Fig. 2(16)) and regions of positive Bouguer anomaly along the Japan Sea coast also demonstrate the positive correlation.

Most of alluvial plains and basins show another type of the positive correlation between Bouguer anomaly and topography, that is, local negative Bouguer anomaly and low topography. The examples are the plains of Fukui, Kanazawa (S6N, Fig. 3(6)), Tonami, and Toyama (W17E, Fig. 2 (17)), and the basins of Matsumoto (W11E, Fig. 2(11) and S16N, Fig. 3(16)), Suwa (W9E, Fig. 2(9)), Kofu (W4E, Fig. 2 (4)), and Ina. The Takada plain (W22E, Fig. 2(22)) and the Nagano basin (W16E, Fig. 2 (16) and S18N, Fig. 3 (18)) are exceptions, suggesting their complex geological situations. A region of Lake Biwa, a kind of water-filled basin, shows strong regional negative Bouguer anomaly, the horizontal scale of which is comparable to that of the Hida mountains, implying non-isostatic state of this region.

An example of inverse correlation between Bouguer anomaly and topography is seen in Takayama and adjacent areas where Bouguer anomaly is locally positive whereas the topography is relatively low.

EE' (Fig. 4) is a profile traversing the surveyed area from the Noto Peninsula to the central part of the highest mountain area in the Japanese Islands, demonstrating a complex relationship between Bouguer anomaly and topography.

NN' (Fig. 5) corresponds to the observation line of the seismic explosion which was

carried out by the Research Group for Explosion Seismology (1982) in Nov. 1981 between Kawanishi-machi (Niigata Prefecture) and Otaki (Nagano Prefecture) crossing the Itoigawa-Shizuoka Tectonic Line. Preliminary analysis of the observation implies that the surface layers of the western block underthrust into the eastern block around the Itoigawa-Shizuoka Tectonic Line.

In summary, Fig. 6 illustrates the four typical patterns and examples as showing the relationship between Bouguer anomaly and topography in the surveyed area.

Type	I	II	III	IV
Topography				
Bouguer Anomaly				
Correlation	Inverse		Positive	
Examples	Central Japan Hida Mountains Ryohaku Mountains Asama-Yatsugatake	NW. Takayama	Hodatsu Mountains W. Itoigawa E. Nagano Mikabu Mountains E. Fuji	Kanazawa Plain Toyama Plain Matsumoto Basin Lake Biwa
Wavelength	~ 70 km Central Japan ~ 300 km		~ 30 km Lake Biwa ~ 70 km	

Fig. 6 Schematic illustration of the relationship between Bouguer anomaly and topography over the surveyed area.

#### Acknowledgement

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#### References

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- THE RESEARCH GROUP FOR EXPLOSION SEISMOLOGY, 1982, Explosion Seismology along the Kawanishi-Otaki Observation Line. Prog. Abst. Seismol. Soc. Japan, No. 2, 110