

34. Results of Precise Levellings Executed in the Epicentral Region of the Imaichi Earthquake.

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During the first two weeks after the outburst of the Imaichi Earthquake, the decrease in number of aftershocks seemed to be abnormally slow, threatening with the possibility of occurrence of another earthquake. It suggested also that the post-seismic crustal movement was going on slowly, and we thought that this was a good chance to study the relation between the aftershocks and the post-seismic crustal movements. Although after a time the decrease in number of aftershocks proved to be not so abnormal, the levelling surveys were repeated as they were planned at first.

In the vicinity of Imaichi, there are two levelling routes; one along the Nikko Highway, from Utsunomiya to Nikko via Imaichi, and the other along the Aizu Highway, from Imaichi to Wakamatsu. These levelling routes, which belong to the Geographical Survey Bureau, were not however utilized, since they are somewhat distant from the epicentre of the present earthquake as determined provisionally from the distribution of damage to houses and land-slides, and accordingly the crustal movement there was supposed to be small. Instead of these levelling routes, a new route was schemed, which starts from the BM at Imaichi towards the south, crosses the valley of Namekawa, runs through Ochiaimura, the most severely shaken village, and

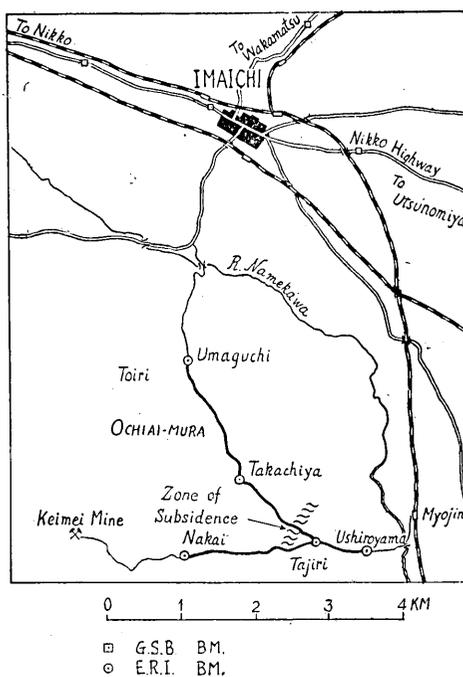


Fig. 1.

then turns to the east to reach the Myojin Station. A reconnaissance however proved that it is difficult for the precise levelling survey to cross the valley of Namekawa, owing to numerous land-slides and steep topographies. In these circumstances the present levelling was executed only in Ochiaimura along the route shown in Fig. 1 by thick lines.

Bench Marks.

Since it was necessary to execute the first levelling survey as fast as we can, iron rivets, cemented to natural rock or, in some cases, to huge boulders deeply imbedded into the ground, were used as bench marks. Their localities are given in Table I and in Fig. 1. No. N bench mark is a temporary one.

Table I Localities of Bench Marks

Bench Marks No.	Name of Locality	Note
No. 1	Ushiroyama	20 m east of Myojin Police Station.
No. 2	Nakai	Under the Jukuya stone tower.
No. 3	Takachiya	Under the fire-tower.
No. 4	Umaguchi	
No. N	Tajiri	On the handrail of a concrete bridge at the branch pt. to Takachiya.

Instruments and the method of survey.

The instruments used in the present survey were as follows:

Level: Zeiss 1st order levelling instrument
No. 5934.

Staffs: Invar tape staffs Nos. 841 and 842.

The method of survey was just the same as used by the Geographical Survey Bureau of Japan, except that two steel spikes, each 2.5 cm. in diameter and 30 cm. long, were used in place of the usual ground-plates for the staff, since the ground plates were found to sink into the frozen or muddy ground.

Results.

Results of the surveys, which were repeated three times, are given in Table II. In Table III are given the heights of each bench mark as found by the three surveys, as well as the variations in height in the intervals between each survey,

Table II

Section	Distance	First Survey		Second Survey		Third Survey	
		Jan. 10-15, 1950		Feb. 24-27, 1950		Apr. 11-13, 1950	
		Height Diff.	Closing Error	Height Diff.	Closing Error	Height Diff.	Closing Error
	km	m	mm	m	mm	m	mm
1-N	0.590	0.18784	0.27	0.19066	0.15	0.18819	1.52
N-2	1.840	44.84931	0.15	44.83741	1.05	44.83592	2.83
N-3	1.380	22.46240	0.07	22.44937	2.93	22.45127	3.13
3-4	2.080	56.18477	0.09	56.18963	1.35	56.18517	4.63

Table III

Survey BM	I	II	III	II-I	III-II	III-I
	m	m	m	mm	mm	mm
1	0.00000	0.00000	0.00000	0	0	0
2	45.03715	45.02807	45.02411	- 9.08	-3.96	-13.04
3	22.65024	22.64003	22.63946	-10.21	-0.57	-10.78
4	78.83501	78.82936	78.82463	- 5.35	-5.03	-10.38
N	0.18784	0.19066	0.18819	2.82	-2.47	0.35

Conclusion.

Variations in heights of each bench marks are graphically shown in Fig. 2. The feature of the crustal movement is very complicated, but it seems that the bench marks No. 1 and No. N belong to a land-block different from that on which the remaining bench marks lie, and each of these two blocks made a south-easterly tilt in the interval II-I, and then a north-westerly tilt in the interval III-II, making a zone of discontinuity at the boundary.

It seems that a zone of subsidence that appeared with the earthquake to the north of No. 1 bench mark in the direction NE, corresponds to this boundary of land-blocks. The surveyed area as a whole is inclining towards NW, but the absolute amounts of tilt have been gradually decreasing.

In connection with the present results, it will be interesting to mention that the Geographical Survey Bureau has found a remarkably upheaved zone to the west of Imaichi. Areal extension of this upheaved zone is not known but seeing that this is caused by the main earthquake, it can be said that the post-seismic crustal deformations surveyed by us are perhaps in the direction

of recovery from the initial crustal deformations caused by the main earthquake.

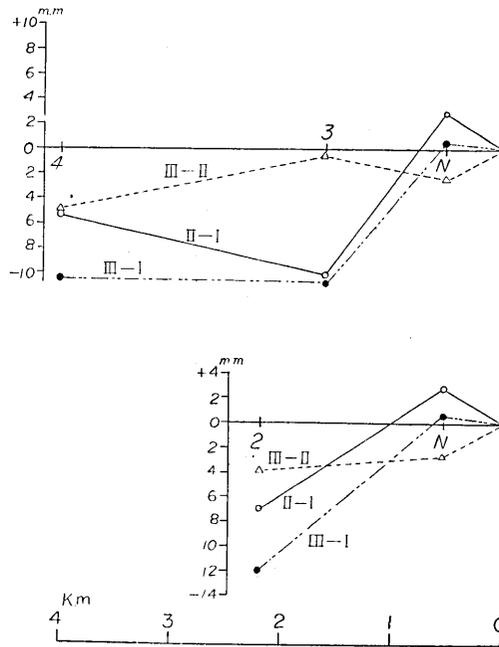


Fig. 2.

34. 今市地震の震央地域における精密水準測量結果 (概要)

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今市地震の震央地域と思はる落合村において3回の精密水準測量を施行して本文第II表及第III表に示す如き結果を得た。

初め日光街道に沿つてある地理調査所的水準線路に今市町において取附ける豫定であつたが行川の兩岸が地形急峻で山崩が多く通過困難のため落合村内のみとした。

水準點は第I表及び第1圖に示す如く設置した。急速を要するため岩盤に植附けた鐵ボルトを用ひた。

測量方法は凡て地理調査所の方式と規格とによつた。第2表の結果によれば水準點 No. 1, No. N と水準點 No. 2, No. 3, No. 4 とは別箇の地塊上にあるものの如くで、兩方の地塊は第1回、第2回の測量期間夫々南東に傾いて、兩地塊の境目に食違を生ずる様な運動をした。此の境目は宛も地震當時 No. N 水準點の直北に當つて、東北-西南の方向に沈下を生じた地帯に相当するものと思はれる。第2回、第3回の測量期の間には兩地塊は前と反対の方向に動き、全期間を通じて見ると、西乃至西北に傾いてゐる。傾斜の量は漸次に減少してゐる。

地理調査所の測量によれば今市町西方に著しい隆起地域があることと、此が本震によつて生じたものであることを考へ合せると、落合村の地塊の運動方向は本震に伴ふ地殻運動が恢復する方向に向つてゐるものと思はれる。