DETECTION OF DISLOCATION LINE BY BAROMETRIC GRADIENT.

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On the barometric gradient as a secondary cause of the earthquake, Prof. Terada⁽¹⁾ and Mr. Hasegawa⁽²⁾ already discussed thoroughly.⁽³⁾ The latter proved that at Gihu the direction of the gradient is always perpendicular to the dislocation line.

If this close relation of them exists at anywhere, by the gradient at the epoch, the direction of dislocation line and also its character in any region may be found approximately, from the direction of the barometric gradient whenever an earthquake occurs. This method is more accurate, if it holds anywhere, than to determine the seismic zone merely statistically by locating a large number of epicentres, and sufficient to secure the existence of seismic zone. For the seismic zone determined by the locating epicentres is quite uncertain and arbitrary, but our method is more accurate ; and in favourable case may determine the approximate direction of the Zone by a few of earthquakes.

I examined 50 earthquakes at Tukuba during the year 1904. The results are given in Table I, II and Figure.

The pressures at the epoch when the earthquake occurs are determined graphically from 4 observations at each stations using the six-daily observations at Mito and Utunomiya and hourly obser-

- (1) Terada. Proc. Tôkyô Mathematics-Physical Soc. Ser. II Vol. IV. (1909), P. 454.
- (2) Hasegawa. „ „ „ „ „ VII. (1913), P. 181.
- (3) Prof. Nagaoka Treated This Problem Mathematically in Proc. Tôkyô Mathematics-Physical Soc. Ser. II. Vol. VI. (1912), P. 208.

stations at the Base station at Tukuba. The elevations of these stations are 31.1 meter, 125.0 meter and 30.0 meter respectively. And Mito is apart from Tukuba about 38 km. and Utunomiya about 44 km.

The barometric gradients at Tukuba are found by Prof. Okada's method as Mr. Hasegawa did, and taken positively when the pressure at Tukuba is higher than at Mito or Utunomiya. The component gradients T.—M. and T.—U. are given in Table I.

From the result we can easily find that

1) The direction of the gradient at the earthquake epoch is perpendicular to the seismic zone which suggested by Prof. Omori (Pub. of Eqk. Inv. Com. No. 11). Prof. Omori suggested this Zone from some theoretical consideration and proved statistically by the distribution of the epicentres. Existence of this Zone may be secured by our agreement, with quite different kind of method. And this is at other hand agrees with the results of Mr. Hasegawa.

2) The second fact is a great fault of my paper. It is the fact that the direction of the gradient coincides to that of annual and monthly mean pressures (Table I and II). But we must remark that the earthquake occurs more frequent in this region, than at the surrounding regions. For example at Mito the number of earthquakes during this year is 14 and at Tôkyô 8 while it amounts to 50 at this region. Hence we may consider that the above coincidence of the directions will be the cause of frequent occurrence of small earthquakes at this region. I have this opportunity to express my heartfelt thanks to Prof. Terada, Prof. Okada, Mr. Hasegawa, and Mr. Fudiwhara for their kind guidance and suggestions.

Table I.

No.	Date	Time	Barometric Pressure			Barometric Gradient		Direction of Gradient	
			Mito	Utano-miya	Tukuba	T.-M.	T.-U.		
1	I 3	4 ^h 58 ^m	p	751.9	750.9	752.5	+0.016	+0.036	N 4° W
2	8	3 25	a	65.3	65.0	65.5	+0.003	+0.011	N 15° W
3	16	2	p	61.2	60.4	61.5	+0.008	+0.025	N 11° W
4	16	10 39	p	61.2	60.5	61.5	+0.008	+0.023	N 9° W
5	17	11 29	a	59.4	58.8	59.5	+0.003	+0.016	N 18° W
6	24	5 22	a	66.3	65.2	65.6	-0.018	-0.018	S 17° W
7	29	2 32	a	69.9	70.4	69.7	-0.005	-0.016	S 10° E
8	31	10 50	a	61.6	61.8	61.7	+0.003	-0.002	S 76° E
9	II 7	5 17	a	69.1	69.6	69.7	+0.016	+0.002	N 51° E
10	9	7 55	p	62.1	62.2	62.3	-0.005	+0.002	N 87° W
11	10	0 19	a	63.6	63.9	63.9	-0.008	0.000	S 62° W
12	11	9 32	p	59.7	60.2	61.0	+0.034	+0.018	N 34° E
13	12	3 19	p	60.9	60.4	60.6	-0.008	+0.005	N 87° W
14	16	8 13	p	63.3	63.6	63.5	+0.005	-0.002	N 85° E
15	17	3 50	p	57.5	56.8	56.9	-0.016	+0.002	S 70° W
16	III 3	9 13	p	66.5	67.0	66.4	-0.003	-0.014	S 18° E
17	4	8 23	p	69.0	69.8	69.0	0.000	-0.018	S 28° E
18	8	3 42	a	71.7	71.9	70.9	-0.021	-0.023	S 14° W
19	12	8 49	p	65.4	65.4	64.9	-0.013	-0.011	S 21° W
20	14	9 43	a	66.7	67.2	66.2	-0.013	-0.023	S 2° W
21	25	3 35	p	53.7	52.5	52.4	-0.034	-0.002	S 56° W
22	26	3 30	a	56.1	56.4	56.3	+0.005	-0.002	N 85° E
23	30	1 46	p	64.7	64.4	64.5	-0.005	+0.002	S 85° W
24	IV 19	8 20	a	58.7	58.4	59.1	+0.011	+0.016	N 5° E
25	20	9 47	p	61.5	61.3	61.5	0.000	+0.005	N 28° W
26	24	8 24	p	65.2	65.0	65.2	0.000	+0.005	N 28° W
27	27	3 12	a	59.1	59.5	58.6	-0.013	-0.020	S 5° W
28	V 14	5 58	p	62.6	62.6	62.4	-0.005	-0.005	S 20° W
29	27	8 17	p	64.1	64.3	64.2	+0.003	-0.002	S 76° E
30	30	4 13	p	57.5	57.0	56.6	-0.024	-0.009	S 41° W
31	VI 7	6 14	a	52.4	52.1	52.1	0.000	+0.007	N 28° W
32	VII 5	10 54	a	59.0	59.2	58.2	-0.021	-0.023	S 14° W

No.	Date	Time			Barometric Pressure			Barometric Gradient		Direction of Gradient
					Mito	Utunomiya	Takuba	T.-M.	T.-U.	
33	8	7 ^h	21 ^m	a	759.5	759.3	759.0	-0.013	-0.007	S 35° W
34	VIII 20	10	51	p	61.9	62.2	61.9	0.000	-0.007	S 28° E
35	IX 23	8	12	p	59.4	59.6	59.4	0.000	-0.005	S 28° E
36	X 4	8	42	a	58.1	58.3	58.7	+0.016	+0.009	N 32° E
37	4	9	18	a	58.1	58.2	58.5	+0.011	+0.007	N 30° E
38	6	9	40	a	52.7	52.6	52.4	-0.008	-0.005	S 34° W
39	6	10	21	a	53.2	52.9	52.5	-0.018	-0.009	S 36° W
40	6	10	39	a	53.4	53.0	52.5	-0.024	-0.011	S 37° W
41	6	11	57	a	53.9	53.5	52.5	-0.037	-0.023	S 30° W
42	16	8	26	p	63.5	64.2	62.7	-0.021	-0.034	S 3° W
43	XI 8	11	47	a	58.6	57.9	59.3	+0.018	+0.032	N 2° E
44	10	6	49	p	65.9	66.1	65.5	-0.011	-0.014	S 10° W
45	18	6	16	p	71.7	71.8	71.8	+0.003	0.000	N 62° E
46	20	4	14	p	66.0	66.1	66.0	0.000	-0.002	S 28° E
47	22	6	56	a	60.1	60.6	60.6	+0.013	0.000	N 62° E
48	22	10	40	p	54.5	55.2	54.3	-0.005	-0.020	S 14° E
49	27	3	4	a	61.3	61.9	62.1	+0.021	+0.005	N 50° E
50	27	11	7	p	66.3	66.5	66.2	-0.003	-0.007	S 7° E
mean					60.9	61.1	60.7	-0.005	-0.009	S 1° W

Table II.

January	62.9	63.1	62.9	0.000	-0.005
February	64.2	64.3	64.2	0.000	-0.002
March	62.8	63.1	62.6	-0.005	-0.011
April	63.7	63.7	63.5	-0.005	-0.005
May	59.5	69.6	59.3	-0.005	-0.007
June	57.6	57.6	57.3	-0.008	-0.007
July	57.5	57.5	57.0	-0.013	-0.011
August	58.5	58.6	58.3	-0.005	-0.007
September	58.6	58.6	57.9	-0.018	-0.016
October	62.0	62.3	61.6	-0.011	-0.016
November	91.4	61.7	61.4	0.000	-0.007
December	62.3	62.7	62.6	+0.008	-0.002