

GROUP VIII (a).—*Local Earthquakes observed at several places.*

*Eqke No. 1.* July 14th 1898; 7h 8m 59s p.m.

Total duration =  $2\frac{1}{3}$ m.

Observations at Meteorological Observatories :—

Utsunomiya	..	7h 8m 50s p.m.	Weak.	
Maebashi	.. ..	7. 8. 58	Slight.	
Mito	.. .. .	7. 8. 33	„	Motion quick.
Kofu	.. .. .	7. 8. 35	„	
Tokyo	.. ..	7. 8. 50	„	
Yokosuka	.. ..	7. 9. 0	„	
Kumagae	.. ..	7. 9. 50	„	

The P.T. lasted for 8s.

The P.P. lasted for 20s. The max. 2a, which occurred at 4,3s from the commencement of this epoch, was 0,15 mm in each component.

The E.P. The average period was 1,9s.

*Eqke No. 7.* July 25th 1898; 0h 17m 4s p.m.

Total duration = 11m.

Observations at Meteorological Observatories :—

Yokosuka	..	0h 17m 12s p.m.	Weak.	Motion quick.
Tokyo	.. ..	0. 17. 13	„	„
Yokohama	..	0. 17. 47	„	{ Accompanied by vertical motion.
Kofu	.. ..	0. 17. 21	„	Houses shaken.
Mito	.. ..	0. 17. 22	Slight.	Motion gentle,
Numazu	.. ..	0. 17. 33	„	„
Maebashi	..	0. 17. 41	„	„

Utsunomiya	..	0h 17m 58s p.m.	Slight	Motion quick.
Fukui	..	0. 18. 5	„	
Fukushima	..	0. 19. 25	„	
Kumagae	..	0. 19. 40 (?)	„	

(EW component).

The P.T., whose duration was 11,0s, consisted of vibrations (max.  $2a = 0,2$  mm) of an average period of 1,4s, superposed with still quicker movements. The very first displacement was directed towards W. The amplitude remained nearly constant.

The P.P. lasted for 57s, the motion being especially active for the first 23s. The initial displacement was 1 mm and directed towards W, the counter movement (max.) being 1,4 mm towards E. The motion consisted essentially of waves of an average period of 1,2s, superposed with still quicker ones.

The E.P. The motion consisted of vibrations of an average period of 1,8s, superposed more or less definitely on slower ones of an average period of 4,9s. These waves were well defined and not confused by the traces of the P.O. which existed to a very slight amount.

P.O. The average period was as follows:—

4,7s (before the earthquake);

4,9 (after „ „ ).

mean.....4,8s.

The NS component diagram was unfortunately rubbed off by mistake before varnishing it.

*Eqke No. 8.* July 27th 1898; 2h 35m 2s a.m.

Total duration = 10m.

Observations at Meteorological Observatories:—

Mito	..	2h 35m 18s a.m.	Weak.	Houses shaken.
Utsunomiya	..	2. 35. 20	„	Motion gentle.

Kumagae	.. ..	2h 35m 3s a.m.	Slight.	Houses shaken.
Maebashi	.. ..	2. 35. 7	„	Motion gentle.
Choshi	.. ..	2. 35. 30	„	
Tokyo	.. ..	2. 35. 31	„	

(NS component).

The P.T., whose duration was 17s, consisted of vibrations of an average period of 0,91s.

The P.P. consisted of very small vibrations of an average period of 1,0s, superposed on others of an average period of about 2,4s. There were also traces of waves of an average period of about 12s. The max. 2a was 0,07 mm.

The E.P. The average period was 3,4s.

(EW component).

The max. 2a was 0,09 mm.

*Eqke No. 10.* August 7th 1899; 11h 2m 56s p.m.

Total duration = 3m.

Observations at Meteorological Observatories :—

Mito	.. ..	11h 3m 30s p.m.	Slight.	Motion quick.
Kumagae	.. ..	11. 3. 40	„	
Tokyo	.. ..	11. 3. 45	„	
Yokosuka	.. ..	11. 3. 57	„	

The P.T., whose duration was 14s, consisted of very quick small vibrations. The amplitude gradually increased towards the end.

The P.P., whose duration was 25s, began with a well defined motion of 0,1 mm towards E and 0,05 mm towards S, followed by the counter displacement of 0,1 mm towards W and 0,08 mm towards N. The motion consisted of quick vibrations, superposed on waves of an average period of about 1,4s, whose max. 2a was 0,2 mm in the EW and 0,15 mm in the NS component.

The E.P. The average period was about 1,2s.

*Eqke No. 13.* August 11th 1898; 5h 40m 39s p.m.

This was a small local shock.

## Observations at Meteorological Observatories :—

Kumagae ..	5h 40m 46s p.m.	Weak.	{ Motion quick, accompanied by vertical vibrations.
Tokyo ..	5. 40. 47	„	Motion quick.
Yokohama ..	5. 40. 50	„	{ Accompanied by vertical motion.
Kofu .. ..	5. 40. 30	„	Houses shaken.
Mito. . . .	5. 40. 52	„	
Yokosuka ..	5. 40. 57	„	
Utsunomiya.	5. 41. 42	„	Motion quick.
Choshi ..	5. 40. 30	Slight.	
Maebashi ..	5. 40. 45	„	Motion gentle.
Fukui ..	5. 41. 0	„	
Numazu ..	5. 41. 25	„	Duration short.

*Eqke No. 25.* September 4th 1898 ; 3h 53m 21s p.m.

Total duration = 1m 45s.

## Observations at Meteorological Observatories :—

Mito .. . . .	3h 52m 50s p.m.	Slight.	Motion quick.
Tokyo .. . . .	3. 53. 5	„	
Kumagae .. ..	3. 53. 9	„	

This was a very small earthquake. The duration of the P.T. was about 4s.

*Eqke No. 26.* September 5th 1898 ; 4h 47m 35s p.m.

Total duration = 1m 30s.

## Observations at Meteorological Observatories :—

Maebashi ..	4h 51m 28s p.m.	Strong.	{ Motion quick, accompanied by vertical movements; houses shaken.
Kumagae ..	4. 47. 12	Slight.	

Mito	.. ..	4h 47m 25s p.m.	Slight.	Motion quick.
Tokyo	.. ..	4. 47. 27	„	
Kofu	.. ..	4. 47. 30	„	{ Motion quick ; followed by after-shocks.
Utsunomiya	.. ..	4. 47. 49	„	Motion quick.

The earthquake took place amidst a great storm of P.O. The commencement and the P.T. were, however, well defined.

The P.T. whose duration was 7s, consisted of very small quick vibrations.

The P.P. began with the max. 2a of 0,06 mm in the NS and 0,13 mm in the EW component. The rest of the motion was much smaller. The prevailing average period was about 0,8s.

*Eqke No. 27.* September 7th 1898; 1h 6m 38s p.m.

Total duration = 48s.

Observations at Meteorological Observatories:—

Tokyo	.. ..	1h 6m 42s p.m.	Slight.
Kumagae	.. ..	1. 7. 25	„
Kofu	.. ..	1. 7. 50	„
Yokosuka	.. ..	1. 6. 45	Weak.

This was a very small shock, the diagram showing merely traces of minute quick vibrations.

*Eqke No. 38.* September 28th 1898; 1h 40m 49s a.m.

Total duration = 10m.

Observations at Meteorological Observatories:—

Maebashi	.. ..	1h 42m 51s a.m.	Weak.	{ Accompanied by vertical motion.
Utsunomiya	.. ..	1. 43. 0	„	{ Motion quick, houses sha- ken.
Kumagae	.. ..	1. 57. 15 (?)	„	Motion quick.

Yokosuka	..	1h 42m 55s a.m.	Weak.	Duration long.
Tokyo	.. ..	1. 43. 2	„	Motion gentle.
Mito	.. ..	1. 43. 9	„	Motion quick.
Mera	.. ..	1. 44. 20	„	Doors shaken.
Kofu	.. ..	1. 44. 10	Slight.	{ Accompanied by vertical motion.
Yokohama	..	1. 52. 0 (?)	„	

The P.T., whose duration was 9,1s, consisted of small vibrations of an average period of about 2,0s, superposed with others still quicker. The initial motion was directed towards SW.—The amplitude was at first small and became full-sized from about the middle of the epoch; the max. 2a was 0,1 mm in the EW and 0,05 mm in the NS component.

The P.P. whose duration was 1m 27s, was most active during the first 47s. It began with a motion of 0,8 mm towards E and 0,6 mm towards S, followed by a counter (max.) displacement of 0,9 mm towards W and 1,1 mm towards N. The prevailing average period was 0,63s, there being also some traces of vibrations of about 2s period.

The E.P. The motion consisted essentially of vibrations of an average period of 2,8s, superposed on others of an average period of 4,5s. Towards the very end, the average period was 5,0s.

*Eqke No. 41.* October 6th 1898; 4h 52m 22s a.m.

Total duration = 1m 15s.

Observations at Meteorological Observatories :—

Utsunomiya	.. ..	4h 52m 30s a.m.	Slight.	Motion gentle.
Mito	.. ..	4. 53. 16	„	Motion quick.
Tokyo	.. ..	4. 55. 59	„	

The P.T. lasted for about 6s.

The P.P. The max. 2a, which occurred at the commencement, was very small.

The E.P. There were some traces of undulations of an average period of about 15s.

*Eqke No. 46.* October 20th 1898; 3h 15m 46s p.m.

Total duration = 1m 14s.

Observations at Meteorological Observatories:—

Kofu .. .. .	3h 15m 10s p.m.	Slight.
Tokyo .. .. .	3. 16. 2	„
Yokohama.. .. .	3. 16. 15	„
Utsunomiya .. .. .	3. 16. 24	„

The P.T., whose duration was 7,7s, consisted of very small quick vibrations of an average period of about 0,5s.

The P.P., whose duration was 15s, consisted of vibrations of an average period of 0,49s. The initial displacement was directed towards SW, and the max. 2a was 0,02 mm in each component.

The E.P. The average period was about 0,6s.

In the EW component there was, at 36s from the commencement of the earthquake, a second slight but decided increase of the amplitude.

*Eqke No. 49.* October 26th 1898; 10h 30m 14s a.m.

Total duration = 2m 44s.

Observations at Meteorological Observatories:—

Choshi .. .. .	10h 27m 6s a.m.	Slight.
Yokohama .. .. .	10. 30. 32	„
Tokyo .. .. .	10. 30. 47	„
Kofu.. .. .	10. 31. 20	„
Utsunomiya .. .. .	10. 36. 32	„
Mito.. .. .	10. 29. 50	„

The P.T. lasted for 16s.

The P.P. began with the max. 2a of 0,07 mm towards W and 0,05 mm towards S. The end was somewhat confused by P.O.

*Eqke No. 54.* November 12th 1898; 2h 42m 40s a.m.

Total duration = 2m.

## Observations at Meteorological Observatories:—

Choshi	.. .. .	2h 25m 23s a.m.	Slight.	
Ishinomaki	.. .. .	2. 37. 10	„	
Utsunomiya	.. .. .	2. 42. 20	„	
Mito	.. .. .	2. 42. 58	„	Motion gentle.
Yokosuka	.. .. .	2. 43. 10	„	
Tokyo	.. .. .	2. 46. 38	„	

The P.T. lasted for 9s.

The P.P., whose duration was 19s, consisted of small quick vibrations superposed on others of an average period of about 1,1s. The max.  $2a$  was 0,14 mm in the EW and 0,05 mm in the NS component.

The E.P. The average period was about 1,5s.

The end was confused by P.O.

*Eqke No. 55.* November 12th 1898; 9h 42m 25s a.m.

Total duration = 12m.

## Observations at Meteorological Observatories:—

Tokyo	.. .. .	9h 42m 19s a.m.	Weak.	Motion quick.
Yokosuka	.. .. .	9. 42. 22	„	Duration short.
Kofu	.. .. .	9. 42. 35	„	} Accompanied by vertical motion; houses shaken.
Maebashi	.. .. .	9. 42. 45	Slight.	
Mito	.. .. .	9. 42. 27	„	Motion quick.
Utsunomiya	.. .. .	9. 43. 8	„	Motion gentle.
Nagoya	.. .. .	9. 43. 15	„	
Fukushima	.. .. .	9. 43. 50	„	
Choshi	.. .. .	9. 44. 0	„	Motion quick.
Matsumoto	.. .. .	9. 44. 19	„	

(NS component).

The P.T., whose duration was 10s, consisted of quick small vibrations, superposed more or less distinctly on 4 slower waves (max.  $2a = 0,15$  mm) of an average period of 2,1s.



The P.P., whose duration was 34s, began with the max. 2a of 1,2 mm towards N. The motion was composed of very quick vibrations which continued till 67s after the commencement of the earthquake, and which were superposed on traces of waves of an average period of about 2,8s.

The E.P. The motion consisted essentially of vibrations of an average period of 2,3s, superposed on slower ones of an average period of 7s.

The EW component diagram was lost, as the earthquake took place while the record-receiver was being changed.

*Eqke No. 55.* November 20th 1898; 3h 42m 4s a.m.

Total duration = 1m 30s.

Observations at Meteorological Observatories:—

Tokyo	.. .. .	3h 41m 12s a.m.	Slight.	
Kumagae	.. .. .	3. 41. 24	„	
Mito	.. .. .	3. 42. 3	„	Motion quick.
Utsunomiya	.. .. .	3. 42. 40	„	
Kofu	.. .. .	3. 47. 13	„	

The P.T., whose duration was 6s, consisted of very small quick vibrations of an average period of about 0,4s.

The P.P., whose duration was 6,5s, consisted of quick vibrations. The initial displacement was directed towards SW, and the counter displacement (max.) was 0,10 mm towards E and 0,07 mm towards N.

The E.P. The prevailing average period was 1,0s.

The motion was somewhat confused by P.O.

*Eqke No. 62.* November 28th 1898; 7h 2m 34s a.m.

Total duration = 2m 10s.

Observations at Meteorological Observatories:—

Tokyo	.. .. .	7h 2m 47s a.m.	Slight.	
Maebashi	.. .. .	7. 3. 39	„	Motion gentle.

Mito	.. .. .	7h 3m 54s a.m.	Slight.	Motion quick.
Utsunomiya	.. .. .	7. 4. 0	„	
Kumagae	.. .. .	7. 3. 20	„	

(NS component).

The P.T., whose duration was 8,8s, consisted of vibrations of an average period of 6,8s, superposed with quicker ones.

The P.P., whose duration was 30s, began with the max. 2a of 0,1 mm. The motion was superposed with quick vibrations.

The E.P. The motion consisted of small vibrations of an average period of 1,1s, superposed on others of an average period of 4,8s.

P.O. There were slight P.O. Their average period was as follows:—

4,8s (1h before the earthquake);

4,9 (1h after „ „ ).

*Eqke No. 67.* December 5th 1898; 0h 47m 53s a.m.

Total duration = 3m.

Observations at Meteorological Observatories:—

Choshi	.. .. .	0h 50m 23s a.m.	Slight.
Tokyo	.. .. .	0. 50. 33	„
Utsunomiya	.. .. .	0. 50. 30	„
Kumagae	.. .. .	0. 50. 30	„
Mito	.. .. .	0. 51. 0	„

The P.T. and the P.P. consisted of quick vibrations.

The P.T. lasted for 7s.

The P.P. lasted for 26s. The first displacement was 0,15 mm towards E and 0,1 mm towards S, and the counter motion (max.) was 0,2 mm towards W and 0,22 mm towards N.

The end was confused by P.O.

P.O. The max. 2a was 0,03 mm in each component, and the average period, measured immediately before the earthquake, was 4,2s.

*Eqke No. 73.* December 25th 1898; about 1h a.m.

Total duration = 3m.

Observations at Meteorological Observatories:—

Tokyo	..	..	..	1h 1m 46s a.m.	Slight.	
Mito	..	..	..	1. 1. 48	„	Motion gentle.
Matsumoto	..	..	..	1. 2. 40	„	
Utsunomiya	..	..	..	1. 3. 0	„	Motion gentle.
Fukushima	..	..	..	1. 5. 3	„	

(NS component).

The P.T., whose duration was 10s, consisted of very small quick vibrations of an average period of 1s.

The P.P. lasted for 35s. The max. 2a was 0,04 mm.

The end was confused by small P.O. The EW component diagram was not obtained as the writing index had been, through an accident, previously uplifted off the smoked paper.

*Eqke No. 77.* January 1st 1899; 1h 49m 45s a.m.

Total duration = 2m 30s.

Observations at Meteorological Observatories:—

Tokyo	..	..	..	1h 51m 1s a.m.	Slight.	
Yokosuka	..	..	..	1. 51. 15	„	
Mito	..	..	..	1. 51. 51	„	Motion quick.
Matsumoto	..	..	..	1. 54. 37	„	

The commencement was not clear, on account of the presence of slight P.O. The duration of the P.T. was, however, about 7s.

The P.P., whose duration was 20s, consisted of quick vibrations. It began with a well defined motion of 0,12 mm towards E and 0,07 mm towards S, followed by the counter displacement (max.) of 0,14 mm towards W and 0,07 mm towards N.

*Eqke No. 80.* January 14th 1898; 11h 30m 42s a.m.

Total duration = 30s.

## Observations at Meteorological Observatories :—

Utsunomiya	11h 30m 10s a.m.	Slight.	Motion gentle.
Tokyo	11. 30. 35	„	
Kumagae	11. 30. 38	„	

The P.T. was obscured by a very powerful storm of P.O.

The P.P. began with a well defined motion towards SE, the counter displacement (max.) being 0,1 mm towards W and 0,14 mm towards N.

P.O. The max. 2a was 0,1 mm in each component and the average period was 4,8s.

*Eqke No. 83.* January 23rd 1899; 2h 55m 38s p.m.

Total duration = 40s.

## Observations at Meteorological Observatories :—

Mito	2h 52m 40s p.m.	Weak.	Motion quick; houses shaken.
Tokyo	2. 51. 38	Slight.	
Maebashi	2. 52. 36	„	
Kumagae	2. 52. 40	„	
Utsunomiya	2. 52. 42	„	Motion quick.
Choshi	2. 52. 30	„	

The P.T. was obscure.

The P.P. began with the max. 2a of 0,05 mm in the EW and 0,07 mm in the NS component. In the former component there was a second max. 2a of 0,04 mm at  $6\frac{1}{2}$ s after the first maximum.

*Eqke No. 96.* March 6th 1899; 8h 11m 40s p.m.

Total duration = 6m.

## Observations at Meteorological Observatories :—

Choshi	8h 10m 0s p.m.	Slight.	
Tokyo	8. 11. 47	„	
Mito	8. 11. 55	„	Motion quick.

Utsunomiya .. .. 8h 12m 2s p.m. Slight. Motion gentle.  
 Fukushima .. .. 8. 12. 11 .. ..

(EW component).

The P.T. lasted for 11s.

The P.P. consisted of small quick vibrations of an average period of 1,1s. The max. 2a was 0,04 mm.

The E.P. The average period was 2,2s.

The motion was confused somewhat by slight P.O.

The EW component diagram was obscured by the superposition of several lines.

*Eqke No. 104.* March 16th 1899; about 8h 54m a.m.

Observations at Meteorological Observatories:—

Kumagae .. .. 8h 54m 11s p.m. Slight.  
 Tokyo .. .. 8. 54. 25 .. ..  
 Kofu .. .. 8. 55. 45 .. ..

This was an extremely small local shock, the diagram showing merely traces of small quick vibrations confused by P.O.

P.O. There existed a strong storm of P.O., whose max. 2a was 0,06 mm in each component. The average period was as follows:—

5,3s (on the 17th, morning),

4,0 (on the 16th, after-noon).

*Eqke No. 114.* March 24th 1899; 6h 39m 40s p.m.

Total duration = 4½m.

Observations at Meteorological Observatories:—

Mito .. .. 6h 39m 20s p.m. Slight.  
 Kumagae .. .. 6. 38. 59 .. ..  
 Utsunomiya .. .. 6. 39. 26 .. ..  
 Maebashi .. .. 6. 39. 49 .. ..  
 Tokyo .. .. 6. 39. 52 .. ..

Yokohama	...	6h 39m 59s p.m.	Slight.
Fukushima	.. ..	6. 40. 0	„
Kofu	.. ..	6. 40. 26	„

The P.T. lasted for 9s.

The P.P. began with the max. 2a of 0,15 mm towards W (?) and 0,2 mm towards N. The motion consisted of vibrations of an average period of about 2,4s, superposed with quick smaller vibrations. The latter continued to appear for altogether 1m 10s.

P.O. Small P.O. began to appear from about 2 hours before the earthquake. The max. 2a was 0,07 mm in each component and the average period was 4,3s.

*Eqke No. 117.* April 2nd 1899; 11h 1m 5s p.m.

Total duration=4m.

Observations at Meteorological Observatories:—

Kofu	.. ..	11h 18m 50s p.m.	Slight.
Tokyo	.. ..	11. 19. 27	„
Mito	.. ..	11. 19. 31	„

(EW component).

The P.T. whose duration was  $5\frac{1}{2}$ s consisted of very small and quick vibrations.

The P.P., whose duration was about 9s, began with the max. 2a of 0,1 mm. 7,8s later on there occurred a second max. 2a of 0,06 mm. The motion consisted of very quick vibrations.

There existed slight traces of quick P.O.

(NS component).

The max. 2a was 0,06 mm. In this component there was no second maximum motion.

*Eqke No. 118.* April 5th 1899; 1h 0m 53s p.m.

Total duration=9m.

Observations at Meteorological Observatories:—

Kofu	..	..	0h 59m 42s	p.m.	Weak.	{ Motion quick; accompanied by vertical movements; houses shaken.
Yokohama	..	1.	0.	44	"	{ Motion quick, accompanied by vertical movements.
Mera	..	..	1.	1.	0	" Doors shaken.
Tokyo	..	..	1.	1.	18	" Motion quick.
Yagi	..	..	0.	57.	43	Slight.
Kumagae	..	1.	0.	59	"	
Utsunomiya	..	1.	1.	11	"	
Mito	..	..	1.	1.	22	" Motion quick.
Fukui	..	..	1.	1.	27	"
Numazu	..	..	1.	0.	40	Weak. { Motion quick; accompanied by vertical movements.
Yokosuka	..	1.	0.	42	"	
Matsumoto	..	0.	59.	8	Slight.	
Fukushima	..	0.	59.	20	"	
Nagano	..	..	1.	1.	29	"
Nagoya	..	..	1.	1.	38	"
Tsu	..	..	1.	1.	38	"
Gifu	..	..	1.	1.	40	"
Choshi	..	..	1.	1.	54	"
Maebashi	..	1.	4.	2	"	

The P.T. lasted 20s.

The P.P., whose duration was 1m 33s, consisted of sharp quick vibrations, superposed with traces of slower waves of an average period of about 2,1s. The max. 2a was 0,8 mm in the EW and 0,9 mm in the NS component. The small quick vibrations disappeared at about 1m 22s from the commencement of the earthquake, and then waves of an average period of 3,2s became prominent.

*Eqke No. 124.* April 15th 1899; 7h 25m 30s p.m.

Total duration = 33m,

## Observations at Meteorological Observatories :—

Kumagae	..	7h 25m 56s p.m.	Strong.	Houses shaken.
Maebashi	..	7. 25. 53	..	{ Accompanied by sound; houses shaken.
Mito	.. ..	7. 24. 35	Weak.	{ Motion quick; accompanied by vertical movements; houses shaken.
Kofu	.. ..	7. 25. 15	..	..
Utsunomiya	..	7. 25. 52	..	{ Motion quick; accompanied by vertical movements.
Tokyo	.. ..	7. 25. 54	..	Duration long.
Yokosuka	..	7. 26. 3	..	..
Yokohama	..	7. 26. 4	..	..
Fukushima	..	7. 26. 51	..	{ Motion quick; houses sha- ken.
Matsumoto	..	7. 29. 0	..	Motion gentle.
Choshi	.. ..	7. 25. 22	Slight.	{ Accompanied by vertical movements.
Yagi	.. ..	7. 25. 45	..	..
Osaka	.. ..	7. 26. 5	..	Motion gentle.
Numazu	..	7. 26. 13	..	..
Miyako	.. ..	7. 26. 15	..	..
Tsu	.. ..	7. 26. 19	..	Duration long.
Nagoya	.. ..	7. 26. 39	..	Motion gentle.
Iida	.. ..	7. 26. 45	..	..
Ishinomaki	..	7. 26. 50	..	Duration long.
Nagano	..	7. 26. 58	..	..
Sakai	.. ..	7. 30. 18	..	..

The P.T., whose duration was 12.8s, consisted of small quick vibrations, superposed on traces of waves of an average period of about 2s.

The P.P., whose duration was 7½m, began with an abrupt vibration (period=2.3s), consisting of the following two displacements:



$$\begin{array}{l}
 \text{(1st motion)} \left\{ \begin{array}{l} 1,25 \text{ mm towards E;} \\ 0,45 \text{ mm } \quad \text{,, S.} \end{array} \right. \\
 \text{(2nd motion)} \left\{ \begin{array}{l} 1,3 \text{ mm } \quad \text{,, W;} \\ 1,05 \text{ mm } \quad \text{,, N.} \end{array} \right.
 \end{array}$$

Then followed a number of well defined waves of an average period of 5,5s, whose amplitude remained nearly constant for 2m 39s; the first vibration having the max. (abs.) 2a of 1,7 mm in the EW and 1,6 mm in the NS component. The six vibrations of the above group, which occurred from about 2m 12s after the commencement were especially well defined and had an average period of 5,0s. Towards the end there were well defined vibrations of an average period of 2,9s, their max. 2a being 1,0 mm in the EW and 0,4 mm in the NS component. The max. 2a of the superposed quick vibrations, which were continued till 2m 34s after the commencement of the earthquake, was about 0,6 mm in each component.

The E.P. At first, the motion consisted of vibrations of an average period of 7,2s, superposed on others of an average period of 3,9s. Towards the end, the average period was 7,4s.

*Eqke No. 131.* April 24th 1899; 6h 36m 59s a.m.

Total duration=5m.

Observations at Meteorological Observatories :—

Yokosuka	.. ..	6h 38m 11s a.m.	Weak.
Kofu	.. ..	6. 36. 2	Slight.
Fukushima	.. ..	6. 37. 40	„
Kumagae	.. ..	6. 38. 17	„
Tokyo	.. ..	6. 38. 20	„
Mito	.. ..	6. 38. 46	„ Motion quick.

The 1st P.T., whose duration was 3,6s, consisted of very small quick vibrations of an average period of about 0,51s.

The 2nd P.T., whose duration was 6,7s, consisted also of quick vibrations; the max. 2a being 0,05 mm in each component.

The P.P., whose duration was 40s, began with the max. 2a of 0,2 mm in the EW and 0,05 mm in the NS component.

The E.P. Towards the end the average period was 1,4s. There existed probably vibrations of longer period, but these were obscured by small P.O.

P.O. The average period, measured 1h before the earthquake, was 3,6s.

*Eqke No. 132.* May 2nd 1899; 1h 2m 22s a.m.

Total duration = 6m.

Observations at Meteorological Observatories :—

Mera	.. ..	1h 1m 5s a.m.	Weak.	{ Motion quick; houses shaken.
Yokosuka	..	1. 1. 40	„	
Hikone	.. ..	1. 0. 30	Slight.	Motion gentle.
Matsumoto	..	1. 0. 51	„	
Tokyo	.. ..	1. 1. 50	„	Motion quick.
Kofu	.. ..	1. 2. 5	„	Motion gentle.
Mito	.. ..	1. 2. 12	„	Motion quick.
Utsunomiya	..	1. 3. 8	„	
Yokohama	..	1. 54. 29 (?)	„	Motion quick.

The P.T., whose duration was 13s, consisted of small quick vibrations.

The P.P. lasted for 14s. The max. 2a, which occurred at the commencement, was 0,15 mm in each component.

The E.P. The waves had an average period of 1,9s, superposed on others of an average period of 3,7s.

*Eqke No. 134.* May 4th 1899; 10h 27m 28s a.m.

Total duration = about 1m.

Observations at Meteorological Observatories :—

Fukushima .. .. .	10h 27m 9s a.m.	Slight.	Houses shaken.
Mito .. .. .	10. 28. 17	„	Motion quick.
Tokyo .. .. .	10. 28. 42	„	

The P.T. and the P.P. consisted of very small quick vibrations.

The P.T. lasted for 5,8s.

The P.P. The max. 2a was 0,04 mm in the EW and 0,02 mm in the NS component.

The end was obscured by slight P.O.

P.O. The average period, measured immediately before the earthquake, was 3,6s.

*Eqke No. 135.* May 6th 1899; 2h 8m 34s p.m.

Total duration=2m.

Observations at Meteorological Observatories :—

Tokyo .. .. .	2h 9m 24s p.m.	Weak.	Motion quick.
Yokosuka .. .. .	2. 9. 33	„	„
Utsunomiya .. .. .	2. 9. 0	Slight..	
Kofu .. .. .	2. 9. 5	„	
Kumagae .. .. .	2. 9. 15	„	
Yokohama .. .. .	2. 9. 16	„	Motion quick.
Mito .. .. .	2. 9. 20	„	„
Fukushima .. .. .	2. 9. 30	„	

The P.T. lasted for 6s.

The P.P., whose duration was 20s, began with a motion of 0,35 mm towards E and 0,4 mm towards S, followed by the counter displacement (max.) of 0,45 mm towards W and 0,55 mm towards N. The rest of the motion was much smaller. The period of vibration was very short.

The E.P. The average period was 1,2s.

*Eqke No. 157.* July 7th 1899; 5h 12m 49s a.m.

Total duration=5m.

## Observations at Meteorological Observatories :—

Mito .. .. .	5h 12m 25s a.m.	Slight.	
Tokyo .. .. .	5. 12. 41	„	Motion quick.
Yokohama .. .. .	5. 12. 49	„	

The P.T., whose duration was 9s, consisted of small vibrations of an average period of about 1,1s.

The P.P., whose duration was 20s, consisted of quick vibrations. The initial motion was 0,32 mm towards W and 0,25 mm towards S, followed by the counter displacement (max.) of 0,42 mm towards E and 0,4 mm towards N.

The E.P. Towards the end the average period was 2,2s. The motion was somewhat confused by P.O.

*Eqke No. 159.* July 7th 1899; 6h 53m 17s a.m.

Total duration = 8m.

## Observations at Meteorological Observatories :—

Choshi .. .. .	6h 49m 57s a.m.	Slight.	
Mito .. .. .	6. 51. 48	Weak.	Motion quick; accompanied by vertical movements; houses shaken.
Tokyo .. .. .	6. 53. 5	„	
Yokohama .. .. .	6. 53. 20	„	Motion quick; accompanied by vertical motion.
Utsunomiya .. .. .	6. 54. 0	„	Motion quick; doors shaken.
Yokosuka .. .. .	6. 51. 10	Slight.	Motion gentle.
Fukushima .. .. .	6. 51. 50	„	
Mera .. .. .	6. 51. 50	„	
Kofu .. .. .	6. 52. 40	„	
Matsumoto .. .. .	6. 53. 13	„	
Kumagae .. .. .	6. 53. 15	„	
Maebashi .. .. .	6. 53. 17	„	Motion gentle.

The 1st P.T. lasted for about 3s. The motion was very small.

The 2nd P.T., whose duration was 7,5s, began with a well defined displacement of 0,05 mm towards W and 0,04 mm towards S. The max. 2a was 0,15 mm in each component.

The P.P., whose duration was 1m 14s, consisted of quick vibrations. It began with a well defined displacement of 0.65 mm towards E and 0,35 mm towards N, the counter motion (max.) being 0,95 mm towards W and 0,7 mm towards S.

P.O. The average period, measured in the morning of the 6th, was 6,2s.

*Eqke No 170.* July 27th 1899; 2h 1m 5s p.m.

Total duration=8m.

Observations at Meteorological Observatories :—

Utsunomiya	.. .. .	2h 1m 3s p.m.	Weak.	Motion quick.
Mito	.. .. .	2. 1. 5	„	Houses shaken.
Tokyo	.. .. .	2. 1. 5	Slight.	
Yokohama	.. .. .	2. 1. 6	„	Motion quick.
Kumagae	.. .. .	2. 1. 12	„	
Maebashi	.. .. .	2. 1. 15	„	Motion gentle.
Choshi	.. .. .	2. 2. 39	„	

The P.T. lasted for 9s. The motion was small.

The P.P., whose duration was 15s, consisted of quick vibrations. It began with the max. 2a of 0,24 mm in each component.

*Eqke No. 179.* August 7th 1899; 6h 11m 22s p.m.

Total duration=5m.

Observations at Meteorological Observatories :—

Matsumoto	... .. .	6h 0m 15s p.m.	Slight.	
Mito	.. .. .	6. 1. 21	„	Motion quick.
Tokyo	.. .. .	6. 1. 37	„	

Kumagae	..	6h 1m 39s p.m.	Slight.	} Motion quick; accompanied by sound.
Yokohama	..	6. 1. 45	„	
Utsunomiya	..	6. 3. 30	„	Motion gentle.

The P.T., whose duration was 7s, consisted of small quick vibrations.

The P.P., whose duration was 30s, consisted of quick vibrations. The max. 2a of 0,22 mm in the EW and 0,2 mm in the NS component occurred at 4s after the commencement. In the NS component there were the second and third maximums which occurred respectively 5 and 10s after the first.

P.O. There existed slight traces of P.O., whose average period, measured immediately before the earthquake, was 5,1s.

*Eqke No. 180.* August 8th 1899; 9h 53m 41s p.m.

Total duration = 5m.

Observations at Meteorological Observatories:—

Mito	..	..	9h 53m 44s p.m.	Slight.	
Tokyo	..	..	9. 54. 3	„	
Maebashi	..	..	9. 54. 3	„	Motion quick.
Kumagae	..	..	9. 55. 0	„	

The P.T., whose duration was 9s, consisted of small quick vibrations.

The P.P., whose duration was 20s, consisted of quick vibrations. The initial displacement was 0,1 mm towards E and 0,05 mm towards S, the counter motion (max.) being 0,15 mm towards W and 0,05 mm towards N.

P.O. There existed very slight traces of P.O.

*Eqke No. 192.* September 3rd 1899; 10h 7m 54s p.m.

Total duration = 5m.

Observations at Meteorological Observatories:—

Utsunomiya	..	..	10h 11m 30s p.m.	Weak.	Motion quick.
Mito	..	..	10. 9. 0	Slight.	Motion gentle.

Tokyo .. .. .	10h 9m 3s p.m.	Slight.
Kumagae .. .. .	10. 9. 27	„
Fukushima .. .. .	10. 9. 40	„
Nagatsuro .. .. .	10. 25. 51 (?)	„

The P.T., whose duration was 9,4s, consisted of very small quick vibrations.

The P.P., whose duration was 16s, consisted of quick vibrations. The amplitude remained nearly constant; the max. 2a being 0,12 mm in the EW and 0,07 mm in the NS component.

The end was confused by slight P.O.

P.O. The average period, measured immediately before the earthquake, was 4,4s.

*Eqke No. 214.* October 10th 1899; 6h 17m 54s a.m.

Total duration=5m.

Observations at Meteorological Observatories:—

Yokosuka .. .. .	6h 18m 0s a.m.	Weak.	Motion quick.
Utsunomiya .. .. .	6. 18. 0	„	Motion gentle.
Yokohama .. .. .	6. 17. 53	Slight.	
Kumagae .. .. .	6. 18. 0	„	
Tokyo .. .. .	6. 18. 2	„	
Mito .. .. .	6. 18. 2	„	Liquids shaken.
Numazu .. .. .	6. 18. 44	„	Motion quick.
Nagoya .. .. .	6. 18. 45	„	
Choshi .. .. .	6. 20. 0	„	
Matsumoto .. .. .	6. 20. 13	„	

The P.T., whose duration was 10s, consisted of very quick vibrations. The max. 2a was 0,1 mm in the EW and 0,06 mm in the NS component.

The P.P., whose duration was 17s, began with the max. 2a of 0,22 mm in the EW and 0,16 mm in the NS component.

The E.P. was confused by P.O. In the earlier portion, however, there were some traces of vibrations of an average period of 1,8s.