The Earthquakes are not produced by Occurrence of Fault

by

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Abstract

Many theories of the earthquake are founded upon the hypothesis that earthquakes are produced by the occurrence of a fault, but the actual phenomena go against this hypothesis. If the hypothesis were correct, the radiation pattern ought to be shown as quadrant type, but many actual patterns are not; they are conical. So the author considers that the earthquakes are not produced by the occurrence of a fault but are produced by magma explosion in a magma pocket. In this paper two earthquakes are shown for examples.

1. Mean of the radiation patterns

The P wave of an earthquake indicates the direction of its center's motion. If a part of the earthquake center expands first, the P wave radiated from the part will be a compression wave. And if another part of the earthquake center contracts first, the P wave radiated from the part will be a dilatation wave. The distribution of these P waves makes a radiation pattern. So the radiation pattern indicates the initial mechanism of the earthquake. Therefore the radiation pattern which is made by the occurrence of a fault must show a quadrant type. If the earthquake is produced on the Plate Tectonics Hypothesis, the Sea Floor Spreading Hypothesis, etc., the radiation patterns must be shown as quadrant type, because these hypotheses need the occurrence of a fault. If the actual radiation pattern is not a quadrant type, the earthquake can not be produced by the occurrence of a fault.

2. Radiation patterns of actual earthquakes

The author takes the Niigata Earthquake and the Off Echizen-Misaki Earthquake as examples. The former occurred at about 1 o'clock on the afternoon of June 16, 1964. The violent tremors shook the Niigata City area violently, and within 15 minutes after the shock, a Tsunami whose height was about 5 meters hit the area. Its magnitude was 7.5, and dead 26. Its location was $38^{\circ}21'0\text{N}$., $139^{\circ}11'0\text{E}$., and depth was 40 km. The Echizen-Misaki Earthquake occurred at about a half after 6 o'clock on the morning of March 27, 1963. The violent tremor shook Tsuruga City area, but fortunately there were no casualties. Its Magnitude was 6.9. Its location was $35^{\circ}47'0\text{N}$., $135^{\circ}46'0\text{E}$., and its depth was 0 km.

Fig. 1. Japanese Seismograph Stations.

We show the Japanese Seismograph Stations in Fig. 1, for the convenience of the reader's reference.

2.1 On the Niigata Earthquake

The radiation pattern shown in Fig. 2 is provisionally classified by M. ICHIKAWA as quadrant type. Elements of its nodal planes are Dip 70° , Az. $N220^\circ E$ and Dip 70° ,

Fig. 2. Radiation pattern for the Niigata Earthquake at about 1 o'clock on the afternoon of June 16, 1964. It is classified by M. ICHIKAWA as quadrant type, but many observations at Hachinohe (16), Miyako (17), Morioka (18), Oofunato (20), Mizusawa (19), Ishinomaki (21), Sendai (22), Fukushima (24), Nemuro (3), Niigata (27), Matsumoto (62) and Nagoya (48) belie this classification. The upper left figure shows observations the world over plotted on a stereographic net.

Fig. 3. Radiation pattern for the same earthquake as shown in Fig. 2. It is classified by T. HIRASAWA as quadrant type, but many observations at Miyako (17), Oofunato (20), Morioka (18), Mizusawa (19), Ishinomaki (21), Sendai (22), Fukushima (24), Shirakawa (26), Onahama (25), Mito (31) and Niigata (27) are against his quadrant type. The upper left figure shows observations the world over plotted on a stereographic net.

Fig. 4. Radiation pattern for the same earthquake as above two examples. It is classified by K. AKI as quadrant type. He makes this pattern with knowledge of the Mohorovicic Layer, but observations at Niigata (27), Aikawa (28), Takada (61), Matsumoto (62), Nagoya (48) and Shionomisaki (73) still go against the quadrant type.

Fig. 5. Radiation pattern for the same earthquake as above three examples. It is classified by the author as conical type, of course with knowledge of the Mohorovicic Layer shown in Fig. 6. This pattern accords with the observations without exception. Therefore the radiation patterns of earthquakes are not quadrant type but conical.

Az. N122°E. But many observations at Hachinohe (16), Miyako (17), Morioka (18), Oofunato (20), Mizusawa (19), Ishinomaki (21), Sendai (22), Fukushima (24), Nemuro (3), Niigata (27), Matsumoto (62) and Nagoya (48) belie this classification.

The upper left figure in Fig. 2 represents the distribution of the first motions observed over the world plotted on a stereographic net.

Fig. 3 shows the radiation pattern which is classified by T. HIRASAWA (1965) as quadrant type. Elements of its nodal planes are Dip 58.8°, Az. N280.8°E, and Dip 31.2°, Az. N101.7°E. But many observations at Miyako (17), Oofunato (20), Morioka (18), Mizusawa (19), Ishinomaki (21), Sendai (22), Fukushima (24), Shirakawa (26), Onahama (25), Mito (31) and Niigata (27) also run counter to the quadrant type.

Fig. 4 shows the radiation pattern which is classified by K. AKI (1966) as quadrant type. He makes this pattern with the knowledge of the Mohorovicic Layer. So this pattern is more excellent than the above two. Elements of its nodal planes are Dip 20°, Az. N110°E, and Dip 70°, Az. N290°E. But observations at Niigata (27), Aikawa (28), Takada (61), Matsumoto (62), Nagoya (48) and Shionomisaki (73) still go against his quadrant type.

Fig. 5 shows the radiation pattern for the same earthquake, which is classified by the author (1965) as conical type, of course with the knowledge of the Mohorovicic Layer shown in Fig. 6. This is a Push Conical Type (A type), the slope of the principal axis is 145°, Az. N95°E. On this type the reader is referred to the author's treatise (1953). This pattern accords with the observations without exception, and far more excellent than the above three that are classified as quadrant type.

Fig. 6. Underground structure (Mohorovicic Layer).

Therefore the radiation patterns of earthquakes are not quadrant type but conical. The conical pattern indicates that this earthquake was produced by magma explosion in a magma pocket as shown in the lower right figure of Fig. 5.

2.2 On the Off Echizen-Misaki Earthquake

The radiation pattern shown in Fig. 7 is classified by M. ICHIKAWA (1971) as quad-

Fig. 7. Radiation pattern for the Off Echizen-Misaki Earthquake at about a half after 6 o'clock on the morning of March 27, 1963. It is classified by M. ICHIKAWA as quadrant type, but many observations at Ishinomaki (21), Sendai (22), Fukushima (24), Maebashi (57), Nagano (60), Matsushiro (59), Koobe (76), Himezi (78), Takamatsu (88), Koochi (91) and Amamiooshima (107) do not conform to this type. And the world observations which are shown in the upper left figure do not harmonize with this type.

Fig. 8. Radiation pattern for the same earthquake as shown in Fig. 7. It is classified by K. Abe as quadrant type with the knowledge of the Mohorovicic Layer. But observations at Maebashi (57), Fukui (67), Tsuruga (68), Maizuru (69) and Koobe (76) are against this quadrant pattern. Namely, observations which exist in the conversion circle do not harmonize with this type.

Fig. 9. Radiation pattern for the same earthquake as the above two examples. It is classified by the author as conical type, of course with the knowledge of the Mohorovicic Layer shown in Fig. 6. This pattern accords with the observations without exception. Therefore the radiation patterns for earthquakes are not quadrant type but conical.

rant type. Its elements of nodal planes are Dip 90° , Az. $N323^\circ E$, and Dip 90° , Az. $N233^\circ E$. But many observations at Ishinomaki (21), Sendai (22), Fukushima (24), Maebashi (57), Nagano (60), Matsushiro (59), Koobe (76), Himezi (78), Takamatsu (88), Koochi (91) and Amamiooshima (107) do not conform to this type. And observations the world over which are shown in the upper left figure do not harmonize with this type. So this pattern is not quadrant.

Fig. 8 shows the radiation pattern which is classified by K. ABE (1973) as quadrant type. Its elements are Dip 69° , Az. $N234^\circ E$ and Dip 68° , Az. $N144^\circ E$. He makes this pattern with the knowledge of the Mohorovicic Layer. So this is more excellent than above ICHIKAWA's pattern. But observations at Maebashi (57), Fukui (67), Tsuruga (68), Maizuru (69) and Koobe (76) are against this pattern. Namely, observations which exist in the conversion circle do not harmonize with the quadrant. So this pattern is not quadrant.

Fig. 9 shows the radiation pattern which is classified by the author as conical type, of course with the knowledge of the Mohorovicic Layer shown in Fig. 6. This is Push Conical Type (A type), the slope of its principal axis is 100° , Az. $N2^\circ E$. This pattern accords with the observations almost without exception, and far more excellent than above two that are classified as quadrant type. Therefore the radiation patterns for the earthquakes are not quadrant type but conical.

The conical pattern for this earthquake indicates that it was produced by magma explosion in a magma pocket as shown in the lower right figure of Fig. 9.

3. Conclusion

In spite of many studies classifieing these radiation patterns as quadrant type, these patterns do not harmonize with quadrant but coincide with conical. This appears to be the strongest proof that earthquakes are not produced by the occurrence of a fault but are produced by magma explosion in a magma pocket.

So the Fault Theory for the earthquake (the Continental Drift Hypothesis, the Mantle Convection Hypothesis, the Sea Floor Spreading Hypothesis and the Plate Tectonics Hypothesis) might be unrealistic assumptions.

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地震は断層の生成によって起こっていない

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地震は断層の生成によって起こると仮定して、多くの学説が組み立てられているが、はたして、地震は断層の生成によって起こっているであろうか。地震が断層の生成によって起こっているとすれば、地震現象としては、初動分布が4象限型になっていなければならない。初動分布は、震源の最初の動きを表示しているものであるから、すべての地震学説に対して生殺与奪権を握っている。ところが、筆者が、たびたび報告しているように、初動分布は4象限型でないと考える方が、現象に忠実である。本文に、その、はっきりした例を示している。

昭和39年6月16日(1964年)の新潟地震は、多くの人命や構造物に被害を与え、地震予知 Project が始まった当初であったから、多くの人々によって調査された。市川政治は、断層説の立場から、Fig. 2 に示すような初動分布であろうと暫定的に調査していた。それによると、一つの節平面は Dip 70° で Az. $N220^\circ E$ であり、他の節平面は Dip 70° で Az. $N122^\circ E$ である。この節平面が地表に描く節線は Fig. 2 となる。しかし、多くの観測点(八戸、宮古、盛岡、大船渡、水沢、石巻、仙台、福島、根室、新潟、松本、名古屋、等)が、この4象限型区分に、はまっていない。

同様に、平沢朋郎(1965年)も、断層説の立場から、同じ地震の初動分布を区分している。それによると、一つの節平面は Dip 58.8° で Az. $N280.1^\circ E$ であり、他の節平面は Dip 31.2° で Az. $N101.7^\circ E$ となっている。これに従って区分したものが、Fig. 3 である。これも多くの観測点(宮古、大船渡、盛岡、水沢、石巻、仙台、福島、白河、小名浜、水戸、新潟、等)が、この4象限型の区分に、はまっていない。

安芸敬一(1966年)も、同様に、断層説の立場から、この初動分布を区分している。彼は Mohorovicic 層の存在を認めているので、前2者より、かなりよくなっている。それが Fig. 4 である。それによると、一つの節平面は Dip 20° で Az. $N110^\circ E$ であり、他の一つは Dip 70° で Az. $N290^\circ E$ である。しかし、かなりの観測点(新潟、相川、高田、松本、名古屋、潮岬、等)が、この4象限型の区分に、合致していない。

このように、4象限型に区分しようとする努力が払われたが、期待した結果は得られなかった。ということは、元来、この地震の初動分布は4象限型ではなかった、ということになる。すなわち、断層の生成によって起こった地震ではない、ということである。それにもかかわらず、この地震を断層生成によって起こった地震であると想定して、地震予知 Project に役立てようとしている。こんなことで、地震予知が可能になるであろうか。

Fig. 5 は、筆者(1965年)が、岩しょう爆発説の立場から、区分したものである。この地震の深さは 40 km であったから、勿論、Fig. 6 に示すような Mohorovicic 層の存在を用いている。当時は、まだ、外国の観測資料が揃っていなかったため、日本だけの資料から、節円錐の Element を算出した。それによると、

非対称押円錐型 (A型) の主軸が 145° 傾むいていて、その Az. は $N95^\circ E$ であった。最近になって I.S.C の資料が入手できても、Fig. 5 の左上の図のように、何等補正を加える必要がなかったものである。しかも、日本の全資料は、一つの例外もなく、うまく、この型にはまっている。

Fig. 7 は、昭和 38 年 3 月 27 日 (1963 年) の越前岬沖地震の初動分布を、市川政治 (1971 年) が断層説の立場から、4 象限型に区分したものである。その節平面の一つは $Dip\ 90^\circ$ で、Az. $N323^\circ E$ であり、他の一つは $Dip\ 90^\circ$ で、Az. $N233^\circ E$ となっている。これも多くの観測点 (石巻、仙台、福島、前橋、長野、松代、神戸、姫路、高山、高知、奄美大島、等) が、この 4 象限型の区分に、はまっていない。

Fig. 8 は、同じ越前岬沖地震の初動分布を、阿部勝征 (1973 年地震学会にて発表) が、4 象限型に区分したものである。これは Mohorovicic 層を認めているので、前記市川の区分よりは、よくなっている。それでも、前橋、福井、鶴賀、舞鶴、神戸、等は、この区分に合致していない。しかも、これらの観測点は全部、転向円内にある。結局、転向円外の観測資料を、4 象限型に区分しようとすると、転向円内の観測資料が、それに合致しないということである。この節平面の一つは $Dip\ 69^\circ$ で、Az. $N234^\circ E$ であり、他の一つは $Dip\ 68^\circ$ で、Az. $N144^\circ E$ である。

このように、かなり苦労して、4 象限型に区分しようとしているのであるが、4 象限型にはならないのである。

Fig. 9 は、前 2 者と同じ地震の初動分布を、岩しょう爆発説の立場から、筆者が区分したものである。地震の深さは 40 km が妥当であるので、Fig. 6 に示した Mohorovicic 層の存在を考慮に入れてある。これも、非対称押円錐型 (A型) の主軸が 100° 傾いていて、その Az. は $N2^\circ E$ となっている。これは、転向円外の資料も転向円内の資料も、矛盾なく、うまく区分している。

これらのことから、元来、初動分布は、4 象限型ではなく、円錐型と考えるべきであることが分る。そうなると、地震は、断層の生成によって起こっているものではなく、岩しょうの爆発によって起こっているものであることが分る。

* 筆者はこの論文提出中の 1974 年 8 月 3 日病気のため急逝したので、これが遺稿となった。