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Analyzing the delay-effect of Digital Terrestrial Broadcasting on Earthquake Early Warning

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In October 1 2007, the Earthquake Early Warning system service started in Japan. This service is the first attempt in the world for an early earthquake prediction. Since the Hanshin Earthquake occurred in 1995, we began to concern about the earthquake and especially when Mid-Niigata Earthquake occurred in 2004. We began to realize the significance to understand about the earthquake in order to live in Japan.

This study is about, how Digital Terrestrial Broadcasting's time delay effects the reception time of Earthquake Early Warning. I drew the range that affects the delay on the map so it is easy to see. This study is related to 4 different fields: Digital Terrestrial Broadcasting, Earthquake, Diastrophism of fault, and Earthquake Early Warning.

I simulated the effects by the following procedure. At first, I measured the delay time of Digital Terrestrial Broadcasting and One-segment Broadcasting. Secondly, I simulated the Diastrophism of fault if the earthquake occurred in Tokyo Bay, Odawara, and Miura-Hantou. Thirdly, I supposition the area of diastrophism to damage area and I paste it on top of the map. Fourthly, I calculated the distance of reception time of Earthquake Early Warning on Analog Broadcasting. After that, I drew the distance on top of the map. Fifthly, I calculated the distance again of reception time of Earthquake Early Warning on Digital Terrestrial Broadcasting and One-segment Broadcasting. I drew the distance on each map again. In the end, I calculated each affected area to compare the damage.

The result came out the following. First, if the earthquake (M6.8) occurred at Tokyo Bay, the affected area of Digital Terrestrial Broadcasting's delay was 9.30 times larger than Analog Broadcasting. Moreover, the affected area of One-segment Broadcasting's delay was 18.79 times larger, comparing it to Analog Broadcasting. The next result is if the earthquake (M8.0) occurred at North side of Odawara City. The affected area of Digital Terrestrial Broadcasting's delay was 2.12 times larger than Analog Broadcasting. The affected area of One-segment Broadcasting's delay was 3.56 times larger. If the earthquake (M6.5) occurred at Miura-Hantou, the affected area of Digital Terrestrial Broadcasting's delay was 1.96 times larger, comparing it to Analog Broadcasting. For One-segment Broadcasting's delay, it was 1.96 times larger. I like to conclude that as the hypocenter of an earthquake is deeper, the affected areas of time delay increases.

For future work, I have some idea to overcome this situation. For example, by decreasing the quality of movie only if the earthquake occurs, the delay time may decreases. Another example is installing an analog radio circuit into a TV or monitor, since Analog Broadcasting has very less delay time than Digital Broadcasting.

In the end, I like to say that this study is not about earthquake prediction or seismic intensity.