

## Seismotectonics of the Tokyo Metropolitan area and possible type of disastrous earthquakes

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### Seismotectonics of Tokyo Metropolitan area

Both of Pacific (PAC) and Philippine Sea (PHS) plates are subducting beneath the Tokyo Metropolitan area, interacting each other. Moreover, Izu Peninsula is colliding to Honshu arc. These circumstances make Tokyo Metropolitan area seismically quite active and the earthquakes of various types are generated. Simply speaking, the earthquakes which occur in the Tokyo Metropolitan area can be classified to the following 5 categories.

(1) Shallow earthquake caused by active faults : An example of this type is 1931 West-Saitama earthquake of M6.9. Although several active faults are known around Tokyo Metropolis, their density is fairly low compared to the other areas in Japan.

(2) Inter-plate earthquake along upper surface of PHS : A typical example of this type is 1923 Kanto earthquake of M7.9. Mid-Saitama earthquake of 1968 (M6.1) and cluster at the depth of around 50km in SW-Ibaraki also belong to this type.

(3) Intra-plate earthquake in PHS : A typical example is East-off-Chiba earthquake of 1987 (M6.7). The other examples include 1978 Izu-Oshima-kinkai earthquake (M7.0) and 1980 East-off-Izu earthquake (M6.7).

(4) Inter-plate earthquake along upper surface of PAC : Typical examples are 1982 Off-Ibaraki earthquake (M7.0), 1983 SW-Ibaraki earthquake (M6.0), and clusters at the depth of 70-90km in central-Chiba to SW-Ibaraki regions.

(5) Intra-plate earthquakes in PAC : The examples include 1985 Chiba-Ibaraki-border earthquake (M6.1) and 1992 Uraga-Channel earthquake (M5.9), both of which gave shaking of intensity 5 at central Tokyo. Dip-slip, strike-slip, and normal-fault types are mixed associating to the shape of PAC.

### How imminent is M7 earthquake beneath the Tokyo Metropolis

Most dreadful earthquake in the Tokyo Metropolitan area is inter-plate earthquake of M8-class like 1923 Kanto earthquake. The recurrence interval of this type is assumed to be around 200 years, in which the former 100 years is considered as quiescent period while the latter 100 years is considered to be active period. Actually two disastrous earthquakes of M7-class were preceded to 1923 Kanto earthquake. They are 1855 Ansei-Edo earthquake (M6.9) and 1894 Meiji-Tokyo earthquake (M7.0).

Following to this scheme, the next M8-class earthquake like 1923 Kanto is considered to attack Tokyo more than 100 years later. However now is the time we should prepare against the M7-class earthquake like 1855 Ansei-Edo. Under such a concept, the Central Disaster Management Council of Japan judged the imminence of M7-class earthquake beneath Tokyo Metropolis and issued the Guideline to prepare earthquake disasters in August, 1992.

On the other hand, the Headquarters of Earthquake Research Promotion recently announced the occurrence probability of M7-class earthquake beneath the southern Kanto district. Applying Poisson model to five earthquakes which were generated at 30-80km depth in and around Tokyo since 1885, it was concluded that the occurrence probability within next 30 years is estimated to be around 70%.

### Estimated loss by M7 earthquake beneath the Tokyo Metropolis

Recently, the Central Disaster Management Council of Japan has estimated the loss by the M7-class earthquake beneath the Tokyo Metropolis. As to the scenario earthquakes, 3 models of M7.3 inter-plate events, 5 models of active-fault type events, and 10 models of M6.9 shallow events which may occur at any place around Tokyo were picked up. Various cases were investigated with different seasons and different meteorological conditions.

The worst case was observed for inter-plate earthquake at northern Tokyo Bay which was supposed to occur at 18 18 O'clock in winter time with the wind velocity of 15m/s. The number of total collapse of the houses amounts to 0.85 million and the number of death reaches to 11 thousands, while direct and indirect economic losses amount to 1.12 trillion US dollars.