Active Fault Mapping for
Earthquake Disaster Reduction

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Basic countermeasures against earthquake disaster are given as follows: 1) Keep away from the dangerous zone! 2)
Construct safe! 3)
Prepared for the moment!, while 1) is supported be the most effective measure.

One of the most important characters of earthquakes to take essential countermeasures against their disasters is "greater earthquakes more likely occur from pre-existing active fault". While small earthquakes may occur in broad areas, disastrous earthquakes may occur in limited areas. Moreover it is assumed that same size earthquakes from the same active faults in same areas.

The potential areas that might be affected by great earthquakes are limited. Ground motions by earthquakes quickly attenuate due to the distance from active faults. From the distribution of active faults along the Japanese archipelago, the total potential area that might be affected by great ground motions will be one third of all Japanese land area even the effect of great earthquakes from plate boundaries along the Japanese archipelago is taken into account. Here it can be roughly estimated that 10% earthquakes of the world occur in Japan. The land area of Japan is 0.28% of world land area. Then it is inferred than less than 1% area of the world might be affected by earthquake disasters, and lest of world would be safe enough.

Photo 1. A destroyed school building by an earthquake 1999 in Taiwan. Fortunately earthquake occurred in a night and no children were killed in the building.
(Photo by Prof. Y. Suzuki of Aichi Prefectural University)

When important infrastructures or houses are constructed in "the limited zone", terrible disasters may occur. **Photo 1** shows a totally destroyed school building due to the Taiwan earthquake 1999. The building was exactly on the active fault line. **Photo 2** also shows a totally destroyed bridge due to the same earthquake 1999. This important infrastructure was also on the active fault line. **Photo 3** shows a totally destroyed town of Nefchegolsk due to the Sakhalin earthquake 1995. 2000 of people died where the population was 3000. This town was established 30 year before the earthquake to develop an oil field. The town was abandoned after the event. **Figure 1** shows the distribution of active fault from which the earthquake occurred 1995 and the location of the totally destroyed town of Neftegorsk. The town of Sabo located only 20 km away from

Photo 2. A destroyed bridge structure by an earthquake 1999 in Taiwan.
How much was lost ? and How much do we need to for mapping of active fault distribution.?
(Photo by Prof. Y. Suzuki of Aichi Prefectural University)

Photo 3. A destroyed town of Neftegorsk by an earthquake 1995 in Sakhalin: 2000 of people died where the population was 3000. This town was established 30 year before the earthquake to develop an oil field. The town was abandoned after the event.
(Photo by Prof. Y. Suzuki of Aichi Prefectural University)

Sabo was sound at the event. However, an earthquake from the neighboring active fault in the figure may damage Sabo at next time. Active fault distributionsarekey information for earthquake disaster mitigations.

Consequently the first priority to take actions for the most important countermeasures against earthquake disasters should be given to mappings of active fault distributions. Many great earthquake disasters repeatedly occurred just because the mappings of the active fault distribution were not available and many infrastructures and buildings had been constructed exactly on and around some active fault distribution. A school, a bridge and a dam in Taiwan, the town of Nefchegolsk in Sakhalin are few of the representative examples of such earthquake disasters. The maps can be utilized in many ways such as land use planning, traffic network planning, design proved against proper earthquake motions and so on.

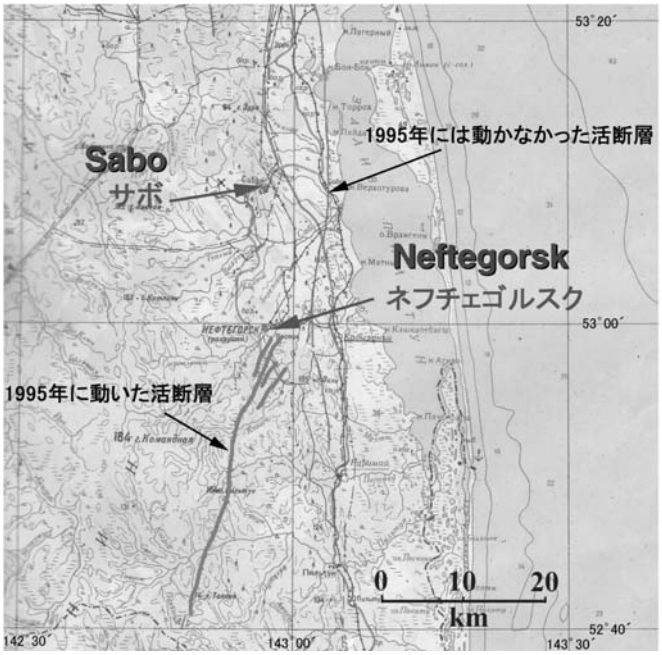

Figure 1. Distribution of active fault from which an earthquake occurred in Sakhalin 1995:
The town of Neftegorsk was totally destroyed though Sabo was sound

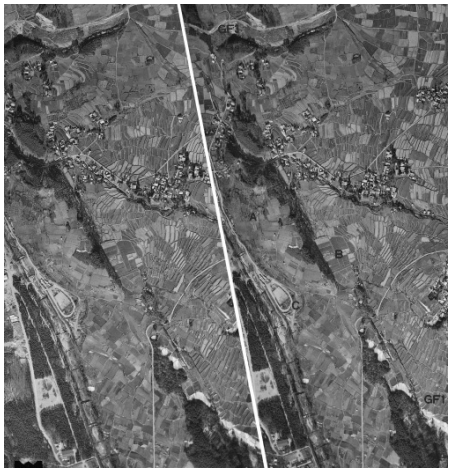

Figure 2. A example of 3-D photos. Photos of same area taken from different angles

Active fault can be mapping by using 3-D aerial photos or satellite photos. Mapping of active fault distribution are available mainly by sets of aerial (or satellite) photos (same area taken from different angles). **Figure 2** shows an example of the 3-D photo. Aerial Photos like those of each country were generally taken and archived by the each country government.

Questions and discussions

1. Active fault distribution maps can be utilized in two ways. 1) They can be used to find how many cities are dangerous and how. 2) They can be used to find which areas should be avoid to constructing and how strongly constructed according to the distance from the active fault in the dangerous zones.
2. Active fault distribution maps can be utilized also in other ways. Land use planning, translation network planning urban planning, proved-design of houses against earthquake disasters and so on.
3. Visible active faults are much more important than invisible ones as visible ones causes greater disasters. Earthquakes from deeper active faults are less affective than those from shallower active faults.
4. Most of the active faults beneath the surfaces are visible. Based on a rough statistical inference from number of visible active faults systems and from the distribution of their mean recurrence intervals, the frequency of earthquake occurrences from the visible active faults are estimated. The estimated frequency is in good accordance with that of earthquake occurrences in the history record of Japan. If the estimated frequencies were lower than that from the record in the history, there would have been many invisible active fault systems.
5. Though there might be few invisible active faults by 3-D photos, aerial photo are the cheesiest material to find their distributions. (so why do not try and use them first?)