Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS036-P163 Room:Convention Hall Time:May 27 14:15-16:15

Ground Damage on Man-made Land caused by Mega Earthquake -Characteristics of Ground Disaster due to the Quake-

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Objective of the survey is how the ground damage caused by the Mega-earthquake was happened, especially on man-made land. In this case both source and site characteristics of the earthquake should be noticed as follows: its magnitude was 9.0 (JMA); fault plane size was calculated as 510kn(length) by 210km(width) (Natl. Res. Inst. for Earth Sci. and Disaster Prevention, 2011); this tele-seismic earthquake was long-period component rich, and had very long duration time, i.e. more than 10 minutes (Natl. Res. Inst. for Earth Sci. and Disaster Prevention, 2011). Problem is how the man-made ground responded under these conditions.

Survey was held at (1) Kaihin-makuhari Mihama-ku in Chiba city, Chiba prefecture (next two cities also belonged in the same prefecture), (2) Horie, Fujimi, and Higashino area in Urayasu city, (3) Hinode, Akemi, and Takasu area in Urayasu city.

As a result (above-mentioned number(1),(2), and(3) corresponds here and next), (1) the distribution of liquefaction phenomena etc. was revealed. On the other hand almost no distribution was found in limited area. One fault of 120m in length was distributed at Kaihin-makuhari park at 1 Hibino Mihama-ku Chiba city, and the other fault of 190m in length was distributed at Hanamigawa-ryokuchi at 3 Utase Mihama-ku Chiba city. These faults (open sense) was happened at gradual slope between 3.4m-3.6m high at street and 6m-6.4m high at park area (mound-top). And these accompanied with flow-out of big amount of sand, and heaving of manhole etc. was observed, and was 100-200m, 50m far from each fault respectively. (2) The ground damage was rare on land consisted from natural Holocene sediments, whereas the damage was very severe on land reclaimed after 1962. (3) The phenomena of liquefaction was distributed complicated and random on the most newly (after 1971) reclaimed land. The way of 'discrete sampling of ground damage' (Higuchi, 2011) was used here. Approximately 300 manholes of drainage system were observed, described, and measured. Damage was observed at approximately 40% of these locations. But its distribution pattern shows irregular.

Consequently, inexperienced ground damage due to the Mega-earthquake was observed and described. (1) Two cases of fault on gradual slope area, where is park area, were supposed one kind of phenomena in liquefied zone. No liquefied zone was observed. It is concerned with soil improvements (Kamura, 2000). (2) Relatively simple distribution was investigated. (3) Why complicated distribution was shown? Because one of the reason was the way of reclamation by hydraulic filling work, with this work silty sand of sea floor was deposited randomly. Moreover it constructed with soil improvements in any case.(Kamura, 2000). Above-mentioned methodology was tried in this survey. It was effective. Also now many scientific and social support is expected these disaster area.

References

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Photo: Fault (approximately 190m in length and approximately 70cm in throw; open sense) in liquefied zone at Hanmigawa-ryokuchi, 3 Utase Mihama-ku Chiba city, Chiba pref.

Keywords: the 2011 off the Pacific Coast of Tohoku Earthquake, Ground Disaster, Liquefaction, Reclaimed land, Chiba city, Urayasu city