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Liquefaction-Fluidization phenomena in Chiba on Kanto Basin at the 2011 Earthquake off the Pacific Coast of Tohoku

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Outline of liquefaction-fluidization phenomena on the Boso peninsula in the Quaternary Kanto Basin and characteristics of liquefaction-fluidization disaster on Tokyo bay reclaimed land by the 2011 Earthquake off the Pacific Coast of Tohoku are reported in this paper.

OUTLINE OF LIQUEFACTION-FLUIDIZATION PHENOMENA ON BOSO PENINSULA: 1) Liquefaction-fluidization disaster distribute on reclaimed land by Man-made strata. 2) Liquefaction-fluidization phenomena distribute mainly on JMA intensity 5+. 3) Liquefaction-fluidization phenomena distribute mainly on northern Boso peninsula. Because the strength of shaking increase to north of Boso peninsula. 4) Liquefaction-fluidization phenomena are more serious and widely at this earthquake than at 1987 east off Chiba prefecture earthquake. 5) Seriousness of damage by liquefaction-fluidization are different in reclaimed land. The seriousness may depend on facies and thickness of Man-made strata and Holocene formation.

CHARACTERISTICS OF LIQUEFACTION-FLUIDIZATION DISASTER ON SOUTHERN CHIBA CITY IN TOKYO BAY RECLAIMED LAND: 1) Liquefaction-fluidization damage zones with few hundred meters wide distribute on this reclaimed land. Large part of the damage zones distribute on the thick part of the Holocene formation. 2) Liquefaction disaster distribute on sandy strata of Man-made strata, but the disaster distribute little on muddy strata of it (Kazaoka et al.,2000;2003). Liquefaction-fluidization part with one hundred meters wide may depend on the litho-facies lateral change of Man-made strata. 3) Intensity of liquefaction-fluidization phenomena is recognized by deformation of ground surface and amount of subsidence. 4) Jetted sand distribute under 2 meter height, from road surface, in artificial hill. This shows the groundwater table to rise to 2 meters height from road surface. 5) Strong shaking might decrease on liquefaction-fluidization part, because tall furniture toppled little in there. Same phenomena happened at the 1995 Hanshin-Awaji Earthquake (Nirei et al.,1996).

SURVEY POINT FROM NOW: It is very important the next surveys for urban planning against liquefaction-fluidization disaster. 1) Recognition of lateral change of seriousness of damage and ground deformation by liquefaction-fluidization. 2) Recognition of lateral change and vertical change of litho-facies in the Holocene formation and Man-made strata. 3) Recognition of correlation between amplification characteristic of shaking and geological structure. 4) Recognition of groundwater flow and table in each aquifer.

FOR FUTURE RESTORATION AND RECOVERY: 1) Against liquefaction-fluidization damage: It is very important to recognize the geological diversity and sustainable use on each site. It is necessary to consider as follows on damage control, damage situation of this earthquake, land use, geological environment, decrease effect of sheer wave by liquefaction. 2) Importance of groundwater: It is necessary to use daily the disaster prevention well and to monitor groundwater table and quality of the well. 3) Continuous landsubsidence after jetted sand. 4) Disaster education: Most of disaster is earth science field of the science. It is necessary to teach Man-made strata, the Holocene formation and the Neogene strata which disaster occur often on, and to teach geological disaster, Earthquake, Tunami, Landsubsidence, Slope failure and Geo-pollution. Further it is necessary to teach sustainable use of Geo-resources, such as Land and Groundwater.

Keywords: Liquefaction-Fluidization, The 2011 Earthquake off the Pacific Coast of Tohoku, Boso peninsula, Man-made strata, Tokyo bay reclaimed land, Urban Geology