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A newly-developed liquefaction hazard map in Urayasu city, Chiba Prefecture

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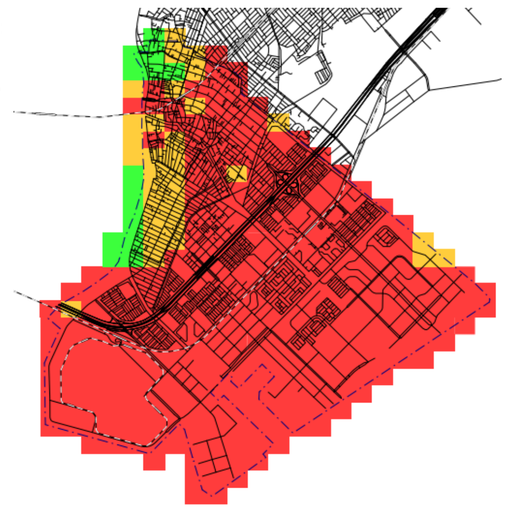
Research outline

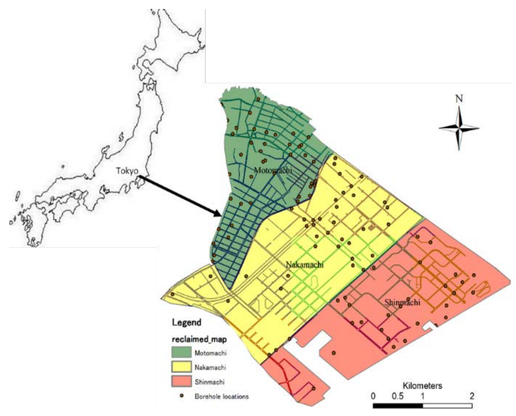
The major problems associated with liquefaction-induced ground subsidence are tilting of houses, buckling of roads, lifelines cut off, etc. For the mitigation and preparedness over the liquefaction-induced damage, development of a useful hazard map is essential.
The aim of this study is to investigate a relationship between liquefaction potential and liquefaction-induced road subsidence that occurred in Urayasu city by the 2011 the Pacific Coast of Tohoku Earthquake, and to apply this relationship to a new hazard map showing expected liquefaction-induced road subsidence for different types of roads.

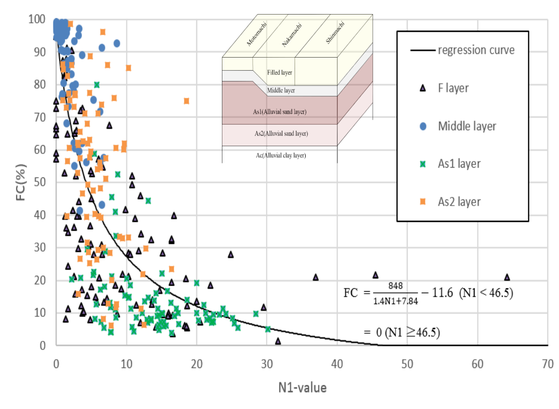


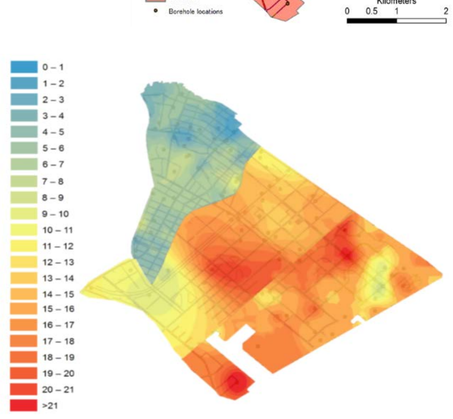
Current hazard map in Urayasu city
(http://www.bousai.pref.chiba.lg.jp/portal/)

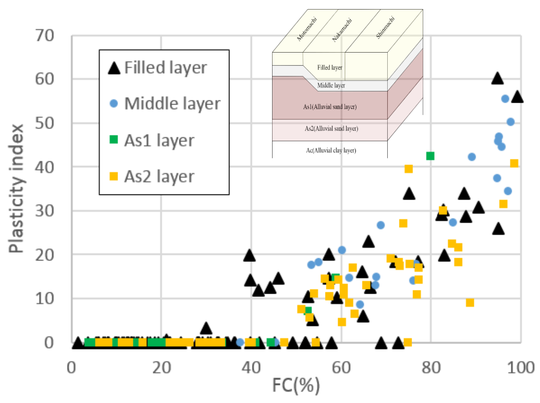
Liquefaction risk assessment

For the liquefaction assessment, soil parameters such as plasticity index, mean particles size, fines content, unit weight of soil and ground water level are necessary. In this study, although all the 109 boreholes contains soil logs, only 23 boreholes provides the needed laboratory test results. Thus, the required soil parameters for the remaining 86 boreholes were estimated by using empirical relationships developed from the available 23 borehole data.
It seems that the liquefaction potential in the old deposit area is smaller than that of the recent reclaimed areas. This result is consistent with the liquefaction-induced damages observed in the 2011 earthquake.

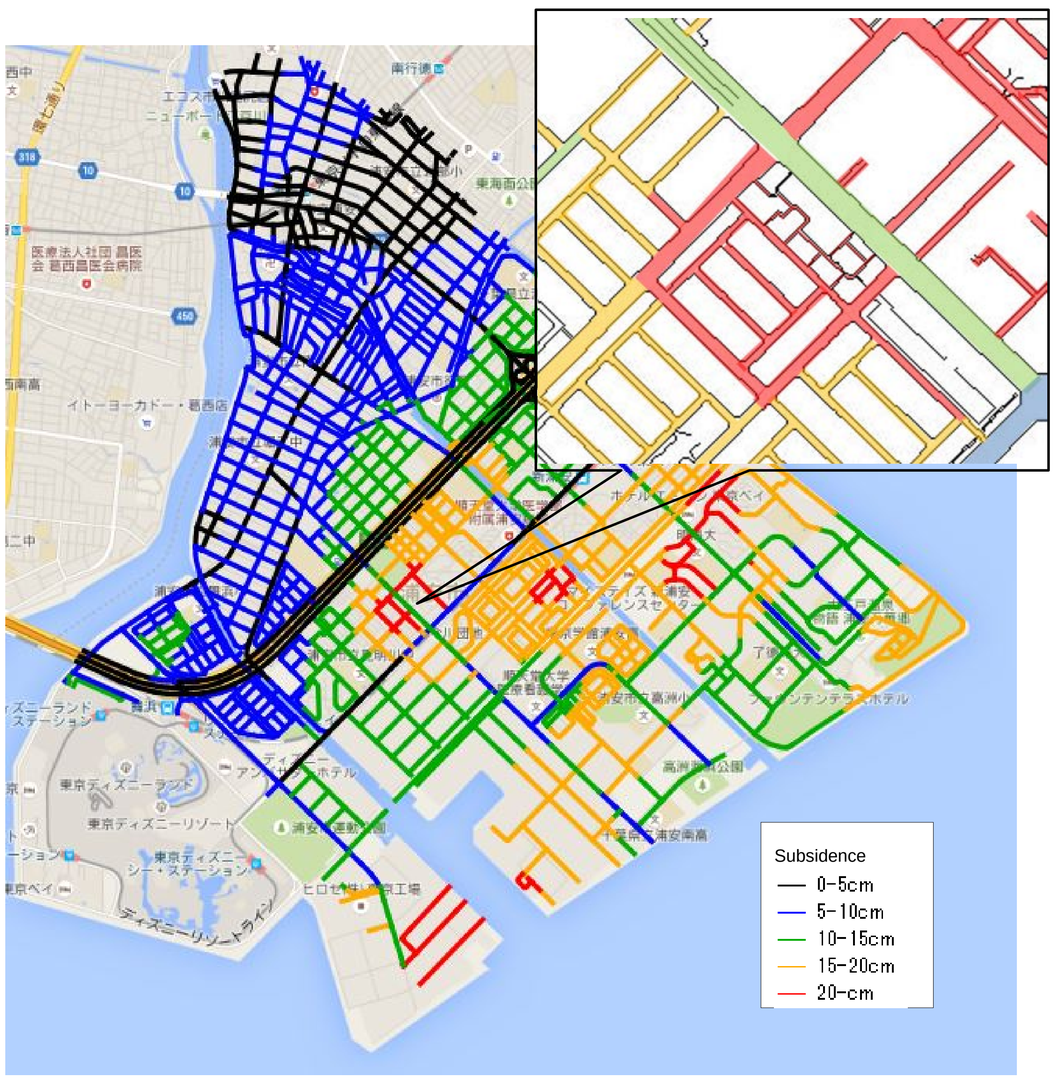








Construction of road hazard map



Road subsidence was extracted from the liquefaction subsidence map (Konagai et al., 2013). The relationship between P_L value and the road subsidence shows that the thicker the roadbed and pavement, the smaller the road subsidence.
By using the above relation, a new hazard map which shows liquefaction-induced road subsidence for different types of roads has been developed. The map would be useful not only for liquefaction assessment, but also for a risk management of a local government (e.g., the best routes for emergency vehicles to take after the earthquake).