

Recent Geological Interpretation of A Liquefied Area: A Case Study in Urayasu City, Japan (1)

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At Urayasu High School (Urayasu City, Chiba Prefecture), where one of authors worked, the 2011 Great East Japan Earthquake caused the formation of two large open cracks from which large amounts of sand and water erupted as a result of soil liquefaction (Kusunoki et al., 2011). The objectives of this study were to investigate both the cause and the mechanism of this phenomenon. The site is located on reclaimed land, and a survey of the site's subsurface geology was carried out by hand auger boring and simple dynamic cone penetration testing to observe the stratigraphy of the reclaimed bed. Aerial photographs of the different stages of the reclamation were also used for analysis.

The survey area was the school grounds, which are located several hundred meters from the former seashore. Holocene deposits were situated at a depth of approximately 3-4 m. Two large open cracks formed in the ground: crack '1' in the NNE-SSW direction and crack '2' in the WNW-ESE direction. Beneath the cracks, we found row of piles from the original ground reclamation work. These rows of piles had been laid underground, and the reclaimed bed consisted of sand and silt. The cracks appeared to be due to the difference in vibrational characteristics between the opposite sides of each crack. Also, the facies of the reclaimed bed were notably different on the opposite sides of each crack. In the cross section of crack '2', the Nd-value* was very large on the northeast side (Nekozane River side) but relatively smaller on the southwest side. In the cross section of crack '1', the facies of the reclaimed bed from approximately 2 m above to the top of the Holocene deposits were sandy on the western side relatively large Nd-value, but on eastern side mainly formed of silty material recorded almost 0.

Analysis was conducted using aerial photographs and revealed that both cracks '1' and crack '2' were located on the same discontinuity in the reclamation work history, both spatially and temporally. Therefore, the survey area contained three sections of reclaimed land demarcated by the two cracks. Moreover, a fourth section consisted of Holocene deposits. Chronologically, the survey area contained (a) 'Kaimenka-tochi' *(Urayasu City, 1985), (b) reclaimed land composed of sand and silt dredged from the seabed, and (c) the surrounding embankment. The reclamation process differed between areas (a) and (b). Area (b) was the widest and was typical of reclaimed land. Area (c), in contrast, was not constructed by dredging sand and silt from the seabed. Crack '1' was located between areas (b) and (c), and crack '2' was located between areas (a) and (b).

Therefore, the occurrence of these cracks seems attributable to discontinuities in the reclamation history. This case shows that recognizing the geological and historical processes of both the Holocene deposits and the reclaimed land is an important aspect of disaster prevention.

*Nd-value is brought by Dynamic Cone Penetration Test, which has the following conditions: a slide hammer with a weight of 5kg falling through a distance of 50cm, and diameter of 2.5cm cone. The number (i.e. Nd-value) of blows needed for the cone to penetrate each 10cm is recorded.

**'Kaimenka-tochi' means land below sea level literally. Before reclamation, it was located in front of seashore, and it was in the possession of the private owner. and was used to reed cultivation etc.

References

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