IIS UNIVERSITY OF TOKYO
GDM

Quality assessment and undrained cyclic resistance of Gel-Push samples collected at liquefaction site

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Gel-Push sampling method

To investigate liquefaction properties of sandy soils, laboratory tests on undisturbed samples are necessary. However, this is not an easy task since sandy samples can be easily disturbed during the sampling process.

To address this issue, "Gel-Push sampling (GP)" technique (Fig. 1) has been progressively developed. The GP sampler allows collecting samples with high sampling quality through the use of a lubricant gel (Fig. 2) that reduces the friction between the tube wall and soil sample.

In this study, samples were collected from reclaimed and alluvial sandy layers in Chiba (Fig.3) by conventional triple tube (TP) sampler and GP sampler. Then, sampling quality was assessed by comparing the results of laboratory and field investigations. This study is collaborated with Kiso-Jiban consultants Co. Ltd.

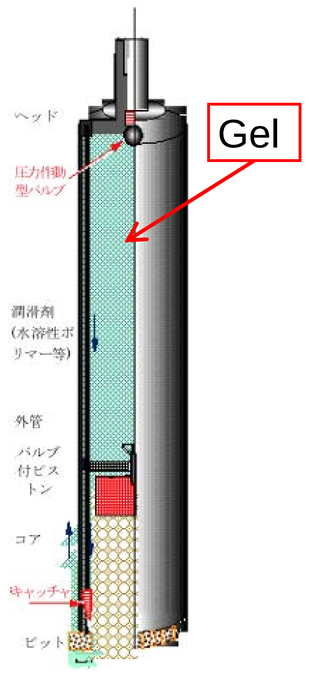


Fig.1 GP sampler*1

Fig.2 GP sampler cutting shoe

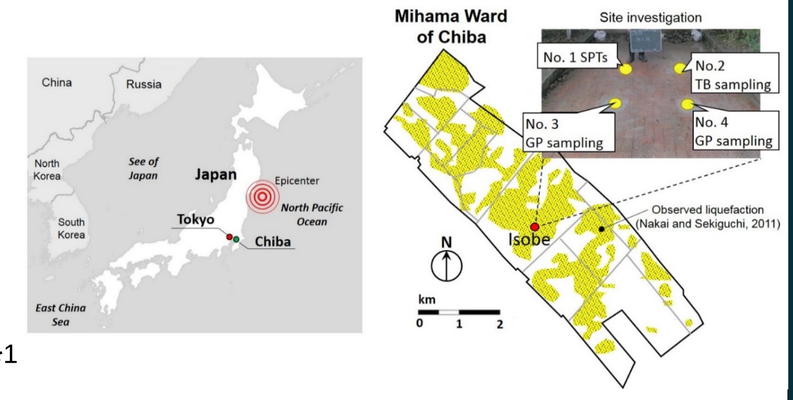


Fig.3 Sampling site

V_s measurement and triaxial apparatus

To evaluate the liquefaction strength of each specimen, undrained cyclic triaxial tests were conducted using the apparatus shown in Fig.4, which is equipped with dynamic measurement devices (Fig. 5).

By comparing the change in soil properties between in-situ and laboratory measurements, sample quality was evaluated considering two important factors: (i) Change in void ratio (e), which reflects the change in density; and (ii) change in S wave velocity (V_s), which captures the change in soil fabric.

Fig.4 Triaxial apparatus

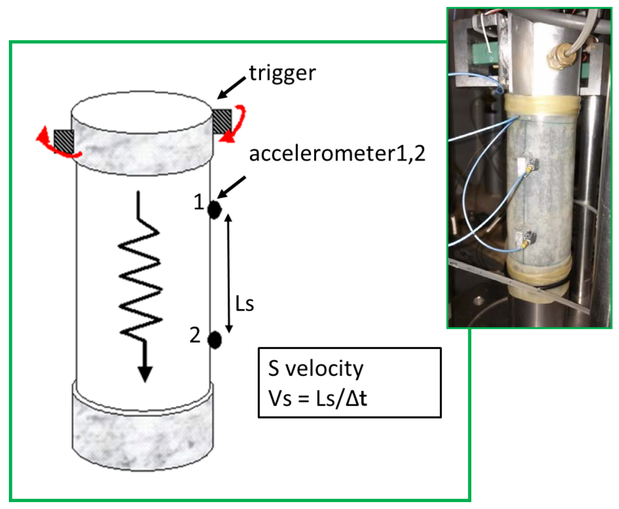
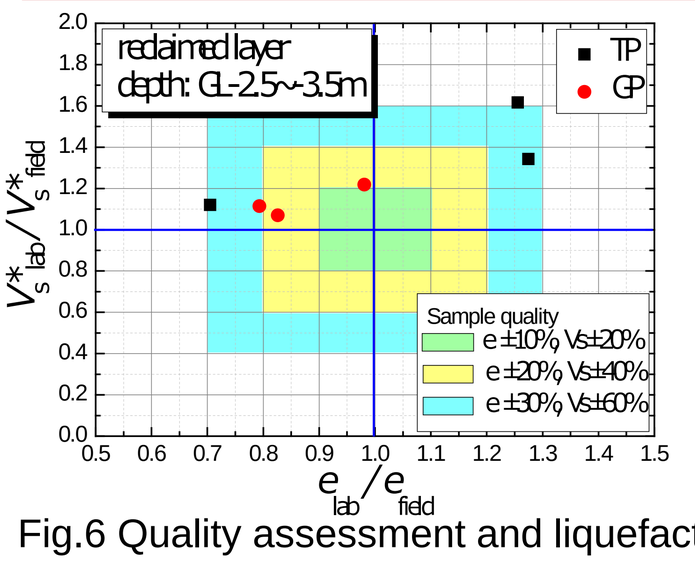


Fig.5 V_s measurement method

Quality assessment and undrained cyclic resistance



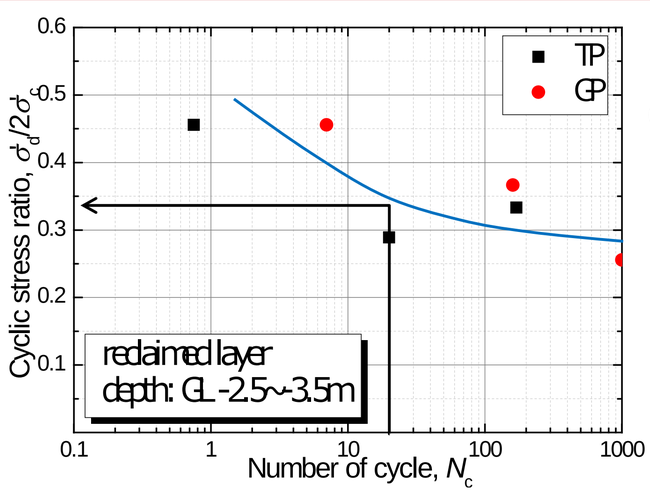
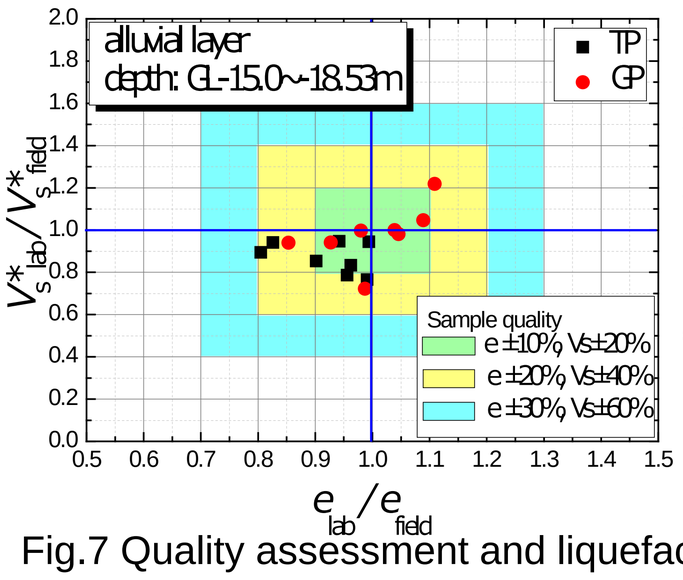


Fig.6 Quality assessment and liquefaction curve of reclaimed layer



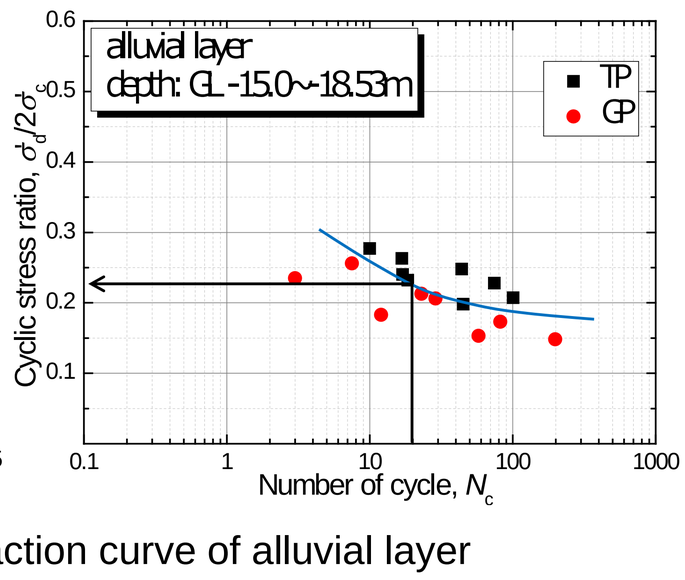


Fig.7 Quality assessment and liquefaction curve of alluvial layer

The results of quality assessment and undrained cyclic tests are shown in Fig.6 and Fig.7.

Reclaimed layer (Fig.6)

TP sampler produced both higher soil structure disturbance and larger density disturbance compared to the GP sampler. However, both sampling methods had about 2.5 times larger strength for liquefied soil with SPT-N value of 4.

Alluvial layer (Fig.7)

GP sampler produced smaller soil structure disturbance compared to the GP sampler. However, the difference of sample quality between the GP and TP did not affect the evaluation of liquefaction resistance for examined alluvial layer with SPT-N value of 8-11. It seemed both methods can be used for this soil type.

*1:島田ら, 全国地質調査業協会,「技術フォーラム 2013」長野, No.100, 2013.