

Development of vibration probe penetration test for liquefaction analysis

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【Outline】

We have developed a new test — the vibration probe penetration test (VPT) — for determining and evaluating liquefiable soils. VPT, unlike other tests such as CPT, directly uses the dynamic response of soils.

【Activities】

To confirm the effectiveness of the test, we conducted both laboratory experiments and field tests. We found that soil resistivity was strongly related to soil density and that VPT patterns reflect soil properties such as permeability of sand and liquefaction resistance.

Jinguuji, M. et al. (2006) Development of vibration probe penetration test (VPT) and results of laboratory and field experiments, Proceedings of First European Conference on Earthquake Engineering and Seismology, pp. 1–7.

【In future】

Our results have shown that VPT may have some additional merit in some soils such as sands with high silt content. VPT can also be used to evaluate ground improvement after liquefaction by comparing test results before and after treatment.

The bottom figures show the result of in situ testing in the field (Antalya, Turkey). Resistivity is strongly related to the density of soil. N (negative) means no density increase in the soil and indicates a high liquefaction resistance. P (positive) means that liquefaction resistance is low at the indicated depth because of a large change in soil density. Further analysis of the patterns is required to determine whether the resistivity patterns can also reveal other soil characteristics such as permeability.

