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Dense grain size analysis for acquiring basic statistics and its utilization for the identification of liquefied horizon

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The conventional grain size distribution analysis technique, standardized as JIS A 1204 and widely used in geotechnical engineering field, is inappropriate for the geological study of sediments. Because the technique can only provide sparse and irregularly spaced distribution data displayed as accumulation curves. Moreover, there is no insurance of traceability, due to the flushing-out of entire specimen from sieves after the analysis. Regretfully, geotechnical engineers do not aware its inaptness, and are still wasting their efforts for grasping grain size characteristics of soils by means of the technique. In contrast, Laser diffraction and scattering method, and optical measuring tools, which can provide dense grain size data, have been widely utilized by sedimentologists.

We have been adopting a Laser diffraction and scattering particle size analyzer for the fine particles smaller than 3phi, and conventional sieving method for the coarser particles but at 1/4phi intervals. Individual data are merged to form not only accumulation but also frequency distribution data from 13phi to -3phi at equal 1/4phi intervals. This dense and equally spaced data of grain size distribution enable us to simply calculate basic statistics, such as sorting, skewness and kurtosis. We applied this analytical technique to the core specimen sampled from liquefied sites. The core specimen were first cut into disks at 2.5 to 5.0 cm in thickness, and processed under the above grain size analysis procedure. As a result, liquefied horizon showed specific features in the basic statistics. Namely, sorting indices were usually below 2.0, and kurtosis indices showed usually larger than 7.4, characterized as very leptokurtic. The characteristic feature is one of the effective indicators for identifying liquefied horizon.

Keywords: Grain size analysis, Sieving, Laser diffraction and scattering, Basis statistics