Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MIS03-P12 会場:コンベンションホール 時間:5 月 27 日 18:15-19:30

Soil moisture variations for landscape trees under humid tropical conditions

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Compact urban development in Hong Kong has left little plantable spaces for amenity vegetation. Containers could permit tree growth in cramped sites with masses of buried utilities. This study evaluated the moisture variations in landscape tree containers in urban Hong Kong. Stratified random sampling selected 12 containers of different geometry. Soil moisture was obtained by a Time Domain Reflectometry (TDR) probe. Volumetric soil moisture content was measured at 5 cm depth intervals every two weeks for one year. Topsoil and subsoil samples were taken to analyze key physical and chemical properties. The soil mix, derived from decomposed granite amended with organic material, were highly stony with high sand content and loamy sand texture. The mean bulk density of 1.72 Mg/m^3 suggested degraded structure and compaction to about 33 per cent total porosity. Despite having more organic matter, the topsoil was more compacted and less porous than subsoil mainly due to prolonged rainsplash impact. Inadequate organic matter and excessive sand are unfavorable to soil structure formation and maintenance. The dominant coarse sand could support more air capacity pores to promote infiltration, drainage and aeration, with limited availability of medium pores for storage of plant-available water. Moisture content closely followed the rainfall regime with pronounced variations between dry and wet seasons and episodes. Moisture increased notably with depth in most containers due to less compacted subsoil. Occurrence of lithologic discontinuity in some sites retarded downward water movement and created perched water table. Waterlogging occurred periodically in subsoil due to heavy and prolonged rainfall in the wet season, compounded by blocked drain holes with impeded drainage. Sites shaded from direct sunshine had more water and less temporal fluctuations, indicating the influence of elevated temperature on evapotranspiration. The applications of the findings to container design, soil management for urban trees were explored.