Geophysical Research Abstracts
Vol. 12, EGU2010-8282, 2010
EGU General Assembly 2010

Rooting the Rubble - Nutrient Storage of Bricks in Urban Soils

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Bricks are regularly found in urban soils. We believe they could serve as primary markers for the anthropogenic impact on soils. Bricks may also fulfill functions in urban soils: Blume & Runge (1978) quantified brick contents in coarse fractions of Rendzinas from rubble in Berlin and found that up to 56 %(m/m) of the subsoil material is brick. Trinks et al. (2007) showed that bricks from coarse fractions have high porosities of up to 45 %(v/v) which might enhance the water availability of a soil depending on the fine earth texture. Blume & Runge as well as Trinks hypothesized that due to the discontinuous pore system the exchange of water between coarse bricks and fine earth may be hindered. Apart from that nothing is published about functions of bricks in urban soils.

There is no information available on the brick contents in the fine earth fraction, nor on their chemical features like cation exchange capacity (CEC) or exchangeable cations. It was hypothesized, that because of the porosity of the bricks their CEC is not depending on their particle size. Rooting of bricks, similar to rooting of Granites (Jongmans et al., 1997) has not been observed so far but can be expected.

In this study, we hand sorted urban soil samples for their bricks in the fraction 0.63-2 mm, 2-6.3 mm and 6.3-20 mm. For the fractions 0.2-0.63 mm, 0.063-0.2 mm, 0.002-0.063 mm and <0.002 mm bricks have been crushed and sieved and separated using Atterberg's sedimentation method. The CEC, the exchangeable cations (DIN ISO 13536) as well as the surface area (BET-method) have been measured for different particle size fractions. Corse bricks have been examined under microscope and scanning electron microscope for roots.

The CEC of the bricks was found to be size depending in the following way: CEC = -0.82 Ln (d) + 3.5, $r^2 = 0.95$, for CEC given in cmol(+)kg^{-1} and particle size, d in mm. The dependency of CEC and surface area shows a similar behavior and proposes a surface charge density of 1.4 mmol(+)m^{-2} for the analyzed brick materials. Bricks may not enhance the bulk soil CEC dramatically, but in sandy soils, low in cation exchange sites brick may be hotspots of water and nutrient supply which leads to rooting of bricks like it will be shown in the paper.

References:
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