Tagungsnummer
V339

Thema
Kommission I: Bodenphysik und Bodenhydrologie

Freie Themen

Autoren
K. Dorau[1], J. Luster[2], T. Mansfeldt[1]
[1]Universität zu Köln, Geographisches Institut, Köln; [2]Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Zürich

Titel
Soil aeration - The relationship between redox potential and air-filled pores

Abstract
Soil water contents are variable with impact on oxygen diffusion rates and redox potentials (E_H). When water saturated soils become aerated, a switch from reducing to oxidizing conditions occurs. However, only limited information are available at which air-filled pore volume ([epsilon]) this dramatic shift happens. Therefore, undisturbed soil cores were taken by steel cylinders from the topsoils of a Fluvisol and a Gleysol that differed in soil structure and clay content. After submergence in the laboratory, the samples were sealed by a glass dome to exclude oxygen and to achieve strongly reducing conditions (E_H < -100 mV). We aerated the sample on demand by removal of glass plugs in the dome and consecutively measured E_H by platinum-(Pt) tipped electrodes and [epsilon] by pressure head readings on hourly basis. We propose to use the terms: i) $[epsilon]_{Pt\ reaction}$, to indicate the air-filled pore volume at which a response of the Pt-tipped electrode due to contact with oxygen occurs (i.e., E_H increase > 5 mV h^{-1}), and ii) $[epsilon]_{Pt\ aeration}$, to indicate when oxidizing soil conditions are present (i.e., E_H > 300 mV at pH 7). These characteristic $[epsilon]_{Pt\ reaction}$ values were at 0.036±0.013 $cm^3\ cm^{-3}$ for the Fluvisol and at 0.048±0.017 $cm^3\ cm^{-3}$ for the Gleysol whereas $[epsilon]_{Pt\ aeration}$values were at 0.047±0.005 and at 0.085±0.002 $cm^3\ cm^{-3}$, respectively. This study provided important information to determine the aeration status of a soil when, e.g., [epsilon] is known but E_H measurements are absent.