EGU2020-13716
https://doi.org/10.5194/egusphere-egu2020-13716
EGU General Assembly 2020

Peatland hydrological behavior with global warming

Stefano Ferraris[1], Davide Canone[1], Davide Gisolo[1], Mario Putti[2], Pietro Teatini[3], and Maurizio Previati

[1]Università and Politecnico of Torino - Department of Regional Studies, Torino, Italy (stefano.ferraris@unito.it)
[2]Università of Padova - Department of Mathematics, Padova, Italy
[3]Università of Padova - Department of Civil, Environmental and Architectural Engineering, Padova, Italy

A peat deposit close to Venice was monitored both in the field and in the lab (1) to investigate the hydrological response of peat soil to changing meteorological conditions in the frame of land subsidence assessment. The whole area is about 3 meters lower than the sea level and therefore subsidence is a major issue. Predictions highlighted the risk of an almost complete disappearance of the peat layer in this area during the next 50 years, due to the increased frequency of warmer periods. Unfortunately, despite the considerable impacts that are expected to affect peatland worldwide, only a few measured datasets are currently available to assess the response of a peat deposit to enhanced drying due to global warming.

The lab measurements were performed both at the pedon and at the core scale. An undisturbed peat monolith of approximately 0.7 m^3 was collected, transferred to the lab, and instrumented to monitor matric potential, water content, and total weight. This undisturbed peat lysimeter allows to monitor water content variations (both through the weight monitoring and time domain reflectometry sensors), and matric potential, with drier conditions with respect to the field campaign. A complete cycle of wetting and drainage was performed, raising the water table from the bottom to the top of the sample and down again. Additional measurements of matric potential and water content were collected by testing peat cores on a suction table.

A set of water retention curves was experimentally determined. They were derived for a range of matric potential much broader than that experienced in situ . Variations were found, with respect to the field natural conditions, in the relations between the matric potential and the volumetric water content of different horizons as a result of the initial prolonged drying. Also, the hysteresis behaviours in the lab and in the field were different, with much wider loops in the lab conditions because of extended range of potential. Hydraulic non-equilibrium between the water content and water potential could also be a possible cause, but further modelling work is necessary to assess it. The van Genuchten parameters were obtained for both wetting and drying, for modelling purposes.

(1) Previati et al. (2019), Hydrological Processes.