Contribution ID: **413** Type: **Poster (+) Presentation**

Water infiltration to sandstone outcrops at the soil-rock interface

Wednesday, 2 June 2021 09:00 (1 hour)

Water acts as a very important agent in salt and frost weathering responsible for major physical damage to both natural rocks and building stones, and compared to the idealised laboratory research, distinctly fewer field studies investigated water's role in weathering processes on natural rock exposures. Especially, there is a lack of knowledge about the critical interaction between soil and rock as one of the types of water entrance into natural rock outcrops. In Český ráj (Czechia), we studied water flow dynamics at this soil-rock interface by measuring the infiltration rate into natural sandstone surfaces (Karsten tube) and water content (TDR) in a shallow zone (cca 0.8 m) of soil [1]. The results show that, as the underlying sandstone is coarser than the soil cover, water infiltrates to the rock only when water content reaches a certain threshold (roughly 17–27 vol. %), and at lower saturations the soil cover retains all the rainwater. The most notable finding is that the infiltration rate (m/s) of the sandstone surfaces differed up to four orders of magnitude over a distance of tens of meters, mostly depending on the weathering degree of the surface. The hydraulic properties of natural rock outcrops in weathering/water flow studies should therefore be interpreted with extreme caution as these are likely to significantly differ within a study area. Our results also show that to quantify the entry of water into sandstone outcrops, one should consider not only the permeability of the surface, but also other factors such as the presence and hydraulic properties of the soil cover which can function as a water reservoir enabling rock-infiltration of otherwise run-off rainwater. A less time and resource demanding methodology to investigate hydraulic parameters of both soil and the underlying rock would be beneficial. In a follow-up study, we intend to investigate a method using non-Newtonian fluids such as xanthan solution to measure hydraulic conductivity and pore size distribution of both the soil and the underlying rock. Similar approach using a set of saturated flow experiments has been already successfully applied [2, 3], where the authors described pore size distribution of various porous media.

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Time Block Preference

Time Block A (09:00-12:00 CET)

References

[1] Sysel, O. (2020). Permeability of sandstone surfaces and water flow in shallow zone of ruiniform sandstone landscape. Diploma thesis, Charles University, Faculty of Science, Institute of Hydrogeology, Engineering Geology and Applied Geophysics, Prague (in Czech).
[2] Abou Najm, M. R., Atallah, N. M. (2016). Non-Newtonian fluids in action: revisiting hydraulic conductivity and pore size distribution of porous media. Vadose Zone Journal 15(9), 1-15.
[3] Hauswirth S.C., Abou Najm M.R., Miller C.T. (2019). Characterization of the Pore Structure of Porous Media Using non-Newtonian Fluids. Water Resources Research 55(8), 7182-7195.

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