

EGU26-5788, updated on 09 Jul 2026

<https://doi.org/10.5194/egusphere-egu26-5788>

EGU General Assembly 2026

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Challenges in estimating plant available water in stony forest soils

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Stony soils are very common in non-agricultural landscapes. Yet, characterizing the hydraulic properties of stony subsoil is necessary but technically complex.

In this study, we aim to improve the characterization of stony subsoils by addressing two critical aspects: (i) the estimation of coarse fragment content and (ii) the water retention of stones. Both factors potentially influence plant available water capacity - a key input for many hydrological models - and its uncertainty, yet they are rarely quantified in deep horizons.

Our methodology involved eleven forest sites in Wallonia (Belgium), where soil pits were excavated down to 2 m depth to capture the vertical variability of soil texture, stoniness, hydraulic properties. Coarse fragment content was assessed by horizon using four approaches: two in situ methods and two laboratory-based methods applied to samples of different sizes. Additionally, we carry out measurements on stones to measure available water between field capacity and wilting point.

Preliminary results underline the importance of adapting soil sampling volume and method to the degree of soil heterogeneity to quantify stone water availability at the profile scale. Our results also indicate that certain rock types can hold up to 15 % of their volume of plant available water, challenging the common assumption that their contribution is negligible.