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Spatiotemporal moisture dynamics in a prairie pasture

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For most practical applications, soil moisture estimates are needed at field scale, integrated over the root zone. We present here results from a field study in a pasture site in Saskatchewan, Canada. We combine observations of point scale soil moisture content from an array of neutron probes with continuous, field scale, shallow soil moisture content observations from the COSMOS instrument. The neutron probe data provide insights into the spatial variability of soil moisture processes, which is highly significant at this site. In particular, we find that the field comprises non-participating profiles, where infiltration, change in storage and drainage are minimal, and dynamic profiles, where these processes are highly dynamic. This strongly affects the relationship between the spatial mean vs standard deviation of moisture content, with important implications for upscaling of point scale observations to field scale. The COSMOS performs well, but only captures changes in water content to a depth of around 20 cm, meaning that upscaling with depth is required to produce a field scale, root zone integrated estimation of soil moisture content. We compare three upscaling approaches.