



Comparison of soil moisture dynamics across different land covers

Heidi Mittelbach, Florian Henschel, and Sonia I. Seneviratne

ETH Zurich, Institute for Atmospheric and Climate Science, USYS, Switzerland (heidi.mittelbach@env.ethz.ch)

The spatial and temporal variability of soil moisture and its dependency on local or regional scale characteristics, such as soil texture, land cover and topography as well as weather and climate anomalies, is a fundamental feature for environmental applications. In a recent study based on a network of grassland stations in Switzerland (Mittelbach and Seneviratne 2012), it was shown that the spatio-temporal variability of absolute soil moisture is clearly distinct from the spatio-temporal variability of temporal soil moisture anomalies, and that regional-scale patterns of soil moisture dynamics could clearly be identified at the scale of Switzerland. However, it has not yet been investigated whether these conclusions apply across land cover types.

In the current study, we investigate differences in soil moisture dynamics at paired grassland-forest sites and their dependency either on dynamic or static site properties. The analysis is based on three-year continuous soil moisture measurements at three paired grassland and nearby forest sites of the SwissSMEX (<http://www.iac.ethz.ch/url/research/SwissSMEX>) soil moisture network. The three paired sites are located in different climatic regions of Switzerland. They are characterized by similar meteorological conditions but within the pairs differences in topography (elevation, slope, aspect) and soil properties are found. At all sites continuous measurements of soil moisture are available in four different depths, from 5 cm to 50 cm. The analyses of daily mean soil moisture at the single depths and integrated over the 50 cm soil column reveal different behaviour with respect to absolute soil moisture levels and temporal soil moisture dynamics between grassland and forest sites during the whole three-year period. Focusing on the recession of soil moisture during precipitation-free periods, a seasonal dependency is observed with strongest recession in summer for both land covers. However, a different behaviour is found in spring and autumn. While stronger recession is found over grassland in spring, the forest sites indicate stronger recession in autumn, with most pronounced differences at deeper depths. This investigation thus suggests that differences in soil moisture dynamics across land cover types depend on the dynamics of the vegetation cover and less on static site properties.

Reference:

Mittelbach, H., and S.I. Seneviratne, 2012: A new perspective on the spatio-temporal variability of soil moisture: temporal dynamics versus time invariant contributions. *Hydrol. Earth Syst. Sci.*, 16, 2169–2179.