



Who is in control? Competing influences of geology, land use and topography on soil moisture and soil temperature dynamics

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Can we identify distinct signatures of landscape elements in the event response of soil moisture and soil temperature? Moisture and temperature dynamics in soils are largely controlled by the climatic boundary conditions of rainfall, evapotranspiration and radiation. However, certain landscape features also leave characteristic finger prints on soil moisture and soil temperature time series. The extent of these influences and their time variable relative importance are important in a number of contexts, such as landscape scale prediction of soil moisture patterns or runoff generation, process predictions in ungauged basins or the improvement of hydrological model structures for the mesoscale.

The competing influences of geology, land use and topography on temperature and moisture characteristics in the vadose zone are explored at the CAOS hydrological observatory in Luxemburg (<http://www.caos-project.de/>) with a unique experimental setup of 45 sensor clusters. These sensor clusters cover three different geologies (schist, sandstone, marls), two land use classes (forest and grassland), five different landscape positions (plateau, top-, mid- and lower hillslope as well as near stream/floodplain locations), and contrasting expositions. At each of these sensor clusters three soil moisture profiles with sensors at depths from 10 to 70 cm, four soil temperature profiles as well as air temperature, relative humidity, global radiation, rainfall/throughfall, sapflow and shallow groundwater and stream water levels were measured continuously. Time series of up to 2 years for the schist region and up to 6 months for the complete set of sites allow for a first intercomparison of characteristic event response behavior.