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The constructed catchment Chicken Creek as Critical Zone Observatory under transition

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The constructed catchment Chicken Creek was established in 2005 as an experimental landscape laboratory for ecosystem research. The 6 ha area with clearly defined horizontal as well as vertical boundary conditions was left for an unrestricted primary succession. All Critical Zone elements are represented at this site, which allows the study of most processes occurring at the interface of bio-, pedo-, geo- and hydrosphere. It provides outstanding opportunities for investigating interactions and feedbacks between different evolving compartments during ecosystem development. The catchment is extensively instrumented since 2005 in order to detect transition stages of the ecosystem. Data recorded with a high spatial and temporal resolution include hydrological, geomorphological, pedological, limnological as well as biological parameters.

In contrast to other Critical Zone Observatories, this site offers the unique situation of an early stage ecosystem with highly dynamic system properties. The first years of development were characterized by a fast formation of geomorphological structures due to massive erosion processes at the initially non-vegetated surface. Hydrological processes led to the establishment of a local groundwater body within 5 years. In the following years the influence of biological structures like vegetation patterns gained an increasing importance. Feedbacks between developing vegetation and e.g. hydrological features became more and more dominant. As a result, different phases of ecosystem development could be distinguished until now.

This observatory offers manifold possibilities to identify and disentangle complex interactions between Critical Zone processes in situ under natural conditions. The originally low complexity of the system is growing with time facilitating the identification of influences of newly developing structures on system functions. Thus, it is possible to study effects of small-scale processes on the whole system at the landscape scale. In addition, the highly dynamic initial system properties allow the observation of multifaceted changes of Critical Zone properties and functions within short periods of time. Chicken Creek could complement the existing network of Critical Zone Observatories which are usually established at ecosystems in a mature state.