Innovative Sensing Methods for the Critical Zone

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Data availability is one of the major constraints in terrestrial research, limiting our ability to analyze terrestrial processes and their interactions, and to test different model hypotheses. This is particularly true for the critical zone, which extends from the land surface, including vegetation and water bodies, through the pedosphere and the unsaturated zone to the groundwater. The critical zone is highly heterogeneous and this makes it difficult to obtain adequate representations of landscape spatial heterogeneity to inform bottom-up modeling approaches, or to design and perform integrated measurements to meaningfully constrain top-down modeling approaches. Notwithstanding these challenges, there are several data sources that are rarely used or poorly exploited in critical zone studies. These include new types of data (e.g. wireless distributed sensors and new remote sensing products) that are still under investigation, as well as traditional types of data (e.g. results of fieldwork investigations, maps of various characteristics of the landscape) that are seldomly exploited to a full degree in larger scale studies for various reasons, such as incommensurability problems and inadequate models.

This session will focus on how data obtained from new observation techniques and from innovative analysis of existing data sources can be used to inform model design and process identification at larger scales.

We solicit contributions related but not limited to:

(i) Innovative sensing techniques to advance understanding of the critical zone (e.g. wireless network, cosmic-ray probes, hydrogeophysical measurements, fiber optics, etc.)

(ii) Methods for the evaluation, visualization, and interpretation of distributed data sets from multiple sources (e.g. joint interpretation of soil moisture, micrometeorology, and groundwater data) to maximize the information gain from critical zone observatories

(iii) Analysis of spatial and temporal patterns of critical zone properties and processes at different scales using ongoing measurements from critical zone observatories

(iv) Unusual and unexpected critical zone phenomena identified by measurements that seem to defy current understanding of the critical zone