

# Critical Zone Science at The Convergence of Disciplines, People, Place, and Scales

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The Critical Zone (CZ) is defined as Earth's thin living skin, spanning from the top of the canopy to the bottom of the groundwater. Brantley et al. (2007) envisioned CZ science as a field crossing discipline, people, places, and scales [1]. Over the past decades, we have seen significant advances, particularly in the orchestrated collection of myriad types of data, including subsurface data within the CZ Observatory network and beyond. These measurements, arduous and expensive by nature, have begun to shed light on processes in the "invisible" subsurface landscape [2]. We have additionally witnessed parallel model development designed to deepen our understanding of the CZ, ranging from traditional process-based models to emerging machine learning approaches. Together, these data and models have underscored the critical importance of the subsurface CZ in storing, processing, and releasing water and mass. They illuminate interconnected processes on land and in rivers and the general functioning of the Critical Zone in a rapidly changing world [3]. This presentation will highlight some of the key concepts emerging from the CZ science, and underscore the essential role of continued, long-term CZ monitoring to observe the evolving earth systems in a rapidly changing world. We intend to stimulate discussions on knowledge gaps and future research needs, including the expansion of spatial and "human reach" of Critical Zone science by diversifying the people who perform vs. who benefit from such science [4,5].

#### References:

1. Brantley, S. L. et al. Crossing Disciplines and Scales to Understand the Critical Zone. *Elements* 3, 307-314 (2007).

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