



Effects of climate change on Earth's dynamic surface (and vice versa): Challenges and opportunities in studies of the Critical Zone

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Ice core records show that greenhouse gas concentrations in Earth's atmosphere are now much higher than at any time in at least the last 400,000 years. However, global temperatures have not (yet) risen nearly as much as the correlations in the ice core records indicate that they should. These observations highlight the need to understand how the living skin of the terrestrial Earth – the so-called Critical Zone – responds to and influences climate change. Studies exploring feedbacks between the climate system and the Critical Zone are expanding rapidly, drawing on both intensive observations at dedicated observatories and comparisons across environmental gradients. Here I will illustrate how both observatory data and gradient inter-comparisons can illuminate coupled physical, chemical, and biological processes in the Critical Zone, and I will outline key challenges facing Critical Zone research.