



Digging into the Future: The transition between bedrock and soil as an underexplored frontier zone in geoscience

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Terrestrial environments and their ecosystems demand healthy, sustainable, and resilient soils. Over the past couple of decades, significant efforts have been made to safeguard global soils, yet the materials and resources responsible for soil formation have been widely overlooked. The transition from bedrock to soil – a zone often described as ‘soil parent material’ – holds an exciting yet untapped potential for helping us address some of the largest environmental challenges, including climate change and the biodiversity crisis. In this award lecture, I will present a strand of my research programme ‘Building Tomorrow’s Soils’ which seeks to establish how soil parent materials enhance the sustainability, health, and resilience of soil systems. First, with a focus on carbon sequestration, I will highlight how the bedrock–soil transition zone has the potential to be a long-term store of organic carbon. I will then present research which shows that some soil parent materials release petrogenic (i.e. rock-derived) organic carbon into soils. These understudied inputs of organic carbon to soils are currently absent from most, if not all, soil carbon models, which threatens our ability to optimize soil carbon management in the long-term. Finally, I will argue that developing a mechanistic understanding about this transition zone – this underexplored material which is neither rock nor soil in structure and function, but a blend of both – requires a similarly cross-disciplinary approach.