

Interactive comment on “Designing a network of critical zone observatories to explore the living skin of the terrestrial Earth” by Susan L. Brantley et al.

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The CZ conceptual framework has advanced our understanding of Earth surface processes with more rigour than traditional pedogenesis and landscape ecology studies and more detail than current land surface exchange models can accommodate. Thanks to CZ science we have a better understanding of weathering and landscape evolution, and interactions between tectonics and Earth surface processes. Perhaps the most valuable contribution the NSF-funded CZOs have made is the training of students who are able to think about Earth surface systems and their components beyond a single disciplinary viewpoint—hopefully they can all find satisfying jobs. CZ science

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is transdisciplinary and transformative. To build on its success the NSF should emphasize CZ science that: 1) can address current ‘wicked’ societal problems and help formulate better land development and environmental management policies. That means more studies in intensively managed landscapes, urban landscapes, landscapes exploited for their mineral, oil, and/or gas resources—and more explicit linkage with social sciences. 2) facilitates extrapolation from CZO-based science and put the results in broader regional and continental context. This means working with researchers like me who build predictive spatial models of soil and geochemistry over large regions. Spatially distributed reactive transport models would be the ultimate objective here and would enable the next. 3) aims to predict the change trajectory that Earth systems might take under global warming (as proposed in the paper). This will require working with land surface modellers to refine the scale of their models.

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