

## ***Interactive comment on “A call for international soil experiment networks for studying, predicting, and managing global change impacts” by M. S. Torn et al.***

**B. Jason (Referee)**

jason.beringer@uwa.edu.au

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The authors present a paper that is a call to the community to establish an international soil experiment network for studying, predicting, and managing global change impacts. The paper is generally well written and should be attractive to the Journal audience. The authors argue well that there is a need to establish soil experiments with broad global coverage in order to understand the soil responses to global change such as soil warming, soil water and nitrogen deposition. The benefits of establishing such a network include the ability for cross site syntheses, development and validation, conceptual models and education. The paper argues strongly and concisely for the need

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for deep soil manipulation experiments within a global soil experimental network. The authors outline the benefits and outline the potential framework for such a network.

Despite the need for such a network I generally found the focus of the paper to be rather narrow concentrating in particular on soil organic carbon and the impact of warming and nutrient additions. I wondered how and why this paper had developed as it appears to be much in isolation with little connection to existing soil networks or larger networks like the critical zone observatories (CZO). Also there is no discussion in the paper about the next steps which is important.

In addition, they made a solid argument for the importance of networking in science in general but none of this is particularly new and I would have liked to see more discussion about the particular challenges with network faces and the role of this network in the larger programs/networks. I also felt the paper did not give adequate previous recognition of effort in this area in terms of current networks and previous literature. For example, how may a program like this fit into the International Soil Carbon Network or CZO? There were several references relating to previous work that could have been cited, for example, Paustian (1995) who proposed the long term network of long-term experiments for analysis of soil carbon dynamics and global change. Jandl (2014) who discussed the current status, uncertainty and future needs in soil organic carbon monitoring, Banwart (2012) design of global environmental gradient experiments using international networks of CZOs. Smith (1996) establishing a European GCTE soil organic matter network (SOMNE).

The authors place an emphasis on manipulative experiments as being a saving grace. Although I certainly would agree that manipulations are important, they have their place in a suite of approaches that can be used to tackle some of Earth's wicked problems around feeding the world population for example. The paper could have benefited by a discussion on the limitations of such an approach because by definition these manipulation experiments are artificial. Also how they may inform/compliment other methods such as long term studies. Discuss.

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In section 7 the authors give a rather offhand remark about other teams also examining nutrient dynamics and other questions related to ecosystem services that soils provide. I found this comment a bit naïve that by developing a narrowly focused soil experimental network that you would guide additional studies of nutrient dynamics and other aspects of soil ecosystem services. I would argue that large systems thinking and systems frameworks needs to come first (such as critical zone observatories, international soil carbon network, EU soils, international geosphere biosphere program, global change and terrestrial ecosystems program, long-term ecological research program and NEON). These are required to tackle these problems under which such networks as this would be an important component.

I think the paper currently does not connect to existing networks adequately and I would argue that success will come by embedding the within larger programs. The paper currently appears to be 'starting from scratch' with respect to building an experimental network. Engaging the community through larger networks and meetings of scientific unions for example AGU and EGU (for example) is a must and piggybacking off developed networks will be important to access the relevant communities and have their engagement. This is particularly true of the critical zone Observatory network, which is mentioned in the paper in passing. The critical zone Observatory has a focus that is synergistic with this proposed network and provides a larger framework. The most value to be gained by a soil experimental network will be gained by linking disciplines as part of a larger picture [for example the CZOs].

Another consideration for a network such as this is to consider a hierarchical approach, where some manipulation experiments are performed at a number of key intensive sites, but then there may be opportunities for some additional simple measurements that can be made across a large network (i.e. ISCN, CZO) that can be undertaken by all members of the larger network to provide observations spanning spatial and temporal scales. I would like to see a discussion on the consideration of linking with larger scale networks. In the first sentence of the conclusions the authors talk about fluxes of soil

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carbon to the atmosphere and therefore there is a perfect link to the Fluxnet community as well in terms of describing the processes controlling soil respiration.

There was no discussion about how such a network will contribute to managing global change as indicated in the title. The title should read " A call for an international. . .network. . ."

Although the authors discuss the role on modelling a little they underestimate the importance of obtaining buy in from modellers at a very early stage in the design process to ensure that you are targeting the processing that are least well understood and measuring what they can model?

Lastly, the figure 2 is not really relevant to the aims of the paper and I would prefer to see a synthesis or framework style graphics illustrating the linkages between the network and other aspects of earth system science.

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