Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-67-RC2, 2018

Biogeosciences
Discussions

Interactive comment on "Elevating the biogeosciences within environmental research networks" *by* Daniel D. Richter et al.

J. Beringer (Referee)

jason.beringer@uwa.edu.au

Received and published: 21 March 2018

Globally, research networks are key to supporting regional and global science. They have not developed equally across the globe and even the progression of networks within a country can be messy. The authors have done a good job at describing the US based networks and the manuscript is generally well written. Therefore, the authors have provided a great platform for discussion and for this reason I think it is important. I am not from one of those networks and I acknowledge that my comments are partly opinion too but hope that it adds to a useful discussion. I will keep my comments general at this time as I think the paper needs major revision.

My first impression is that this is very American centric with the author list and examples

of networks used in the paper. Bringing biogeosciences to LTERs, EONs, and CZOs is necessarily an American focus due to the specific infrastructure programs but should be a global one. Is there a better framework here? Or at least better nomenclature? If, as they propose, we are "interested in addressing questions that motivate the worlds research networks" then this requires a global effort and integration across boundaries is necessary. In addition, submission to Biogeosciences is to a global audience and the paper should be relevant. To stay in Biogeosciences I would recommend that the paper should expand globally to be a real interest and engage our global community rather than assuming that the rest of the world is the same as the USA.

The objective of the paper was to "motivate more collaborators to bring the best of the biogeosciences to the LTERs, EONs, and CZOs". In my opinion this is a rather odd objective to have for the paper and I don't think it achieved it. The paper suffers from not having a clear problem statement, so it is never clear what the discussion is trying to achieve and so in the end it achieves nothing. The scope and problem need to be well developed with some specific outcomes in mind. For example, what are the pressing problems and puzzles of the world that you allude to and how can they be addressed by integrating different measurement capabilities or networks. What the important global questions that you refer to in the paper? It would be useful to determine these perhaps as an integrating framework – find synergies first.

There is also no definition of what biogeosciences is and what a is a 'biogeoscience approach'? Are we talking about Earth system Science or Critical Zone Science?

I agree that these networks are underutilised. Many networks globally struggle with minimal (or no) funding to keep the lights on and funds do not support scientific research. This is a problem particularly for investigators who spend a lot of time running things. Perhaps you could discuss this? The authors ague that "In fact, the core concepts that motivate these networks' operation clearly and substantially overlap (Figure 4), that is, ecology's ecosystem is entirely congruent with Earth science's critical zone". I find this is a cursory observation and the figure simply shows different schematics for

each network and does nothing to synthesis the information. There needs much more development of these ideas here. This would be more beneficial if it were a systematic analysis of the operational and conceptual frameworks associated with each. Maybe a table or synthetic diagram. Same with the differences, make a systematic review of the difference and/or gaps. What are the challenges they face?

"EONs are surveillance facilities" I don't truly understand the distinctions you are trying to make here. All facilities are surveillance really.

At the end of the day the networks (or what they provide) are just tools. They are constantly evolving and being reinvented to attract and maintain funding. Really what we want is a scientific framework that is capable of answering these questions BUT then utilises tools in its toolkit. These would include surface observational capability (LTER, NEON, CZO), atmospheric tools, remote sensing and modelling. Shouldn't we also include the humanities? If that is the case don't we already have this is Earth System Science (relevant programs are iLEAPS, GLP, Future Earth). How do the networks help address the big societal questions that they are posing? Are we reinventing the wheel in biogeosciences because we already have ESS? This needs discussion and thought.

Also the observational facilities you mention are very specific in the US and are quite different elsewhere in the world so there is a huge need to think about this in terms of CAPABILTIES rather than specific entities like (LTER, NEON, CZO). For example, in Australia there is a Terrestrial Ecosystem Research Network (TERN) that has only a single platform with different capabilities. It is important to document these across the globe to be truly an internationally relevant discussion. Regional questions will be answered very differently depending on capabilities, access and funding. To solve global problems we need to go beyond borders. How is this achieved? Needs discussion.

The authors note that "emphasized, discussions with international colleagues are most important" and I would agree, so much so that really that needs to be done as part of

this submission else it is completely biased. This collaboration could/should also come from breakout group or similar at major meetings to enable and capture discussion and debate. It is unclear as to how this has arisen. I suggest that the global community needs to be included now. Also the authors state that "We respond to this request by arguing that NEON can ensure much greater scientific engagement by incorporating more geophysical and biogeophysical aspects of the biogeosciences into their overall design and operations". Again this is a rather flippant statement. What greater engagement exactly? What would this look like? How would it add value to NEON? Isn't this just incorporating CZO into NEON?

Maybe we should embrace the differences you describe between the networks? I think through the paper you have highlighted the differences between the capabilities but perhaps are the strengths. Rather than trying to make them work "much more closely", perhaps again view these as different tools that have their strengths and weaknesses. It will be through our interdisciplinary science approaches (like ESS or CZO etc.) that becomes the enabling factor.

There is a strong focus on 'ecological' and 'earth' sciences but there is more to biogeosciences or ESS. Would be useful to have a more wholistic picture of the interdisciplinary nature of the 'biogeosciences' (which by the way is never defined or scope given).

What are you really asking people to do?? You state that "We call on scientists to accelerate their production of ideas, papers, and proposals for biogeoscience research and education, and to support such research at place-based research sites and across environmental networks." Why in an acceleration needed? Don't we already do this? Not clear on what you are asking from the community and to what end?

The authors talk about scientists and students will provide "The information that will reveal the coverage of data and the data gaps in the three networks". This is a big letdown as I was rather hoping that this paper would tell me this and provide a mechanism

to achieve this. What cross-networks hypotheses are needed? What mechanisms can be used to achieve this USA and globally? Very much left wanting more here and there was a lot of description of the networks to reach a one paragraph statement that does nothing. It certainly doesn't motivate me (which was the aim of the paper). The objective of this paper is to motivate more collaborators to bring the best of the biogeosciences to the LTERs, EONs, and CZOs"

With respect to NEON the authors say that "expanding the scope to include the biogeosciences would involve additional implementation". I question whether that is what is really needed. What is the evidence that there is a lack of biogeoscience in EON's. I would argue that most EON's are lead and driven by biogeoscientists and the community. Again, really what we need here is not biogeosciences injected into everything but rather to utilise the scientific frameworks developed by interdisciplinary science (i.e. ESS and CZS) with appropriate tools to address global problems or answer hypothesis. I can see the attraction of combining CZO's and NEON but I understand that they come from different program areas (and hence funding streams) and serve different core communities. It would have been nice from a design point of view to integrate these right at the start, however, having two capabilities allows independence and the research funds to be distributed not to the usual suspects. There is a danger in having all capabilities rolled into one because then the are operated centrally and you loose buy in from the scientists that need to have a vested interest. Maybe discuss some of these challenges and more systematically?

I found the discussion rather adhoc and biased. 3.1 talks about "biogeosciences and EON/NEON" and 3.2 "The biogeosciences and LTERs and CZOs". Why have one section for EON and another with LTER and CZO combined? Rather get rid of those sections (which are silos to start with) and come up with an integrative framework to look across biogeosciences and the tools and platforms that support them. In all of the discussion there was a push to get CZO into NEON or CZO into LTER. In 3.1 the discussion was a bit of a wish list of CZO measurements that should be made at NEON

sites. In section 3.2 the push was for CZO and drilling at LTER sites. I thought it was an unbalanced discussion and needs to be rewritten. These are all very well and good but why are you asking for all these items for each capability? What specific problem or hypothesis is currently being limited because of the current arrangement? I'd like to see a more systematic review of the measurements required for the biogeosciences and from that the additional tools and measurements that may be needed and where they would be best placed.

Also, in section 3.2 the authors say that "Ways in which we can promote enhancement of the biogeosciences in the research question-driven LTERs and CZOs can be found in the LTER and CZO literature itself." and proceed to describe some examples. These examples showed the conceptual link of the link of geosciences to LTER but the section did not demonstrate any ways to promote the enhancement of biogeosciences in LTERs.

If we added all the missing pieces from each (as you have identified) then don't we end up with three identical capabilities? Is that what we want? Again, maybe the diversity is important.

The last paragraph is really the first and only specific recommendation from the paper. I would like to see a more comprehensive plan for engaging biogeoscientists. Overall paper could have outlined the challenges better and what the opportunities are?

There are some throw away statements about societal issues such as "Such a biogeoscience initiative could help better address a variety of pressing human needs as well. There are growing numbers of biologists and geologists working together on societally important issues." What are these? Cant just say this and leave it you must demonstrate this. These issues can perhaps be a uniting umbrella for biogeoscientists but these need to be articulated.

Last paragraph in the conclusion "good reasons to bring an explicitly biogeosciences initiative to the world's LTERs, EONs, and CZOs". Despite this sounding like a good

thing I don't think the authors have outlined what a 'biogeosciences initiative' is? Again I would argue that 'biogeosciences' is just a name for multidisciplinary research and the principles and frameworks for LTERs, EONs, and CZOs have been developed by communities that have been multidisciplinary. The development of ecosystem ecology, earth system science over the past 2-3 decades have driven these networks so again at the end not sure what the real purpose of this paper was.

Do the Geophysical Unions play a key role in biogeosciences? Discuss?

I found the figures not so relevant, particularly figures 1, 2 and 5 do not add value to the text and I suggest you remove.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-67, 2018.