

Anonymous Referee #2

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The manuscript discusses a very pertinent problem in Earth System Dynamics and for that reason merits consideration in principle. However, it does so without sufficient technical coherence and depth, transmitting the notion of a vague opinion paper than a thoroughly developed scientific study, which would be needed to provide solid grounds to the argumentation conducted in the manuscript.

The obstacles being already at a scientific language level, where there is no syntax unicity behind fundamental concepts. In practice, each and every term prone to cause confusion should be clearly defined in a rigorous manner, e.g. as the other reviewer pointed out "integration, incorporation, linkage of data model-usage, coupling". Otherwise this is not a scientific paper, but rather a soft-formulated style of manuscript tailored for a non-scientific audience (which has its merits but is outside the scope of ESD).

While articulate divagations with catchy phrases and buzzwords may be popular in some soft venues in environmental science (e.g. Water Resources Research, WRR) and outreach communication (EOS or general media), this sort of approach feels out of place at ESD. In fact, here a rigorous "hard-science" treatment and discussion of problems should rather be the norm. For every bold statement of opinion, a rigorous scientific argumentation is a fundamental requirement, and in many cases mathematics are actually extremely helpful for that purpose.

My recommendation is thus to restructure and strengthen the paper so that its true scientific DNA comes out and the formulation, methodologies, definitions and overall concepts are all clearly stated. To drop the fashionable WRR-style beauty without substance, and rather take a more sober, theoretical ecology or ESD style scientific construct. The ESD readers will highly appreciate your insightful rigour.

Moreover, a clearer distinction should be made between the known facts and insights, and the novel contributions brought on by this study. The strategies followed in the study should also be more explicitly and rigorously formulated and justified, alongside with their merits and caveats. At some stages, the reader is left to wonder what has actually been done in practice, and what are essentially suggestions and statements of purpose. The formal procedures belong to the main body of the manuscript, as they are fundamental to bring more substance to the eloquent argumentation.

In order to actually grasp some basic sense of the scientific work beneath the manuscript, the reader has to jump between the main body and the supporting/annex material, where hope begins to emerge that there might be something to this study beyond the vague statements typical of an opinion paper.

In conclusion, at this stage I cannot enter into specific technical recommendations because I see a profound lack of substance and consistency throughout the manuscript. I enjoyed reading it as a person, but felt utterly disappointed at the lack of substance as a scientist.

Notwithstanding my criticism, I do see potential for this paper to succeed in ESD. This is why, despite disappointed at its content after the initial excitement brought by the abstract, I do not recommend rejection at this stage. I believe in the purpose, I believe in the mission, and I hope that despite the limitations of my own review assessment, it will somehow contribute to help the authors reformulate and strengthen their message. However, for publication to happen at ESD, it is my firm understanding that it will need to be reformulated more scientifically. And at that stage, we can discuss whether the scientific and technic details will substantiate the author's eloquent argumentation.

We thank Referee #2 for his/her thoughtful and constructive review of our manuscript. The reviewer appears to have unmet expectations of reading a Research article, which was not the purpose of this manuscript. Rather, our manuscript is a Short Communication, describing and discussing results of a community survey to raise questions for future discussion and analysis. Bringing a high level of detail while at the same time a high level of abstraction, we thoroughly analyzed the survey's results, discussing the merits of the survey and the limitations of the analysis. The survey's outcome is described, synthesized and discussed in terms of information on synergies, challenges and perspectives to ESD modeling as seen by scientists of the CZO, LTER, NEON and ISMC networks. We do not understand the reviewers concerns about Water Resources Research, which is a fine journal publishing highly detailed and rigorous results from observational, theoretical, experimental and modeling studies. More fundamentally, we argue that our Short Communication falls squarely within the domain of ESD which is "dedicated to the publication and public discussion of studies that take an interdisciplinary perspective of the functioning of the whole Earth system and global change" and "accepts research articles, review articles, short communications, and commentaries."

Many of the Referee #2's comments were consistent with those of Referee #1. We have made our use of terms more consistent and clear and have moved the materials and methods from the appendix to the main text. We point out the difference between integrating models and coupling models, e.g. here:

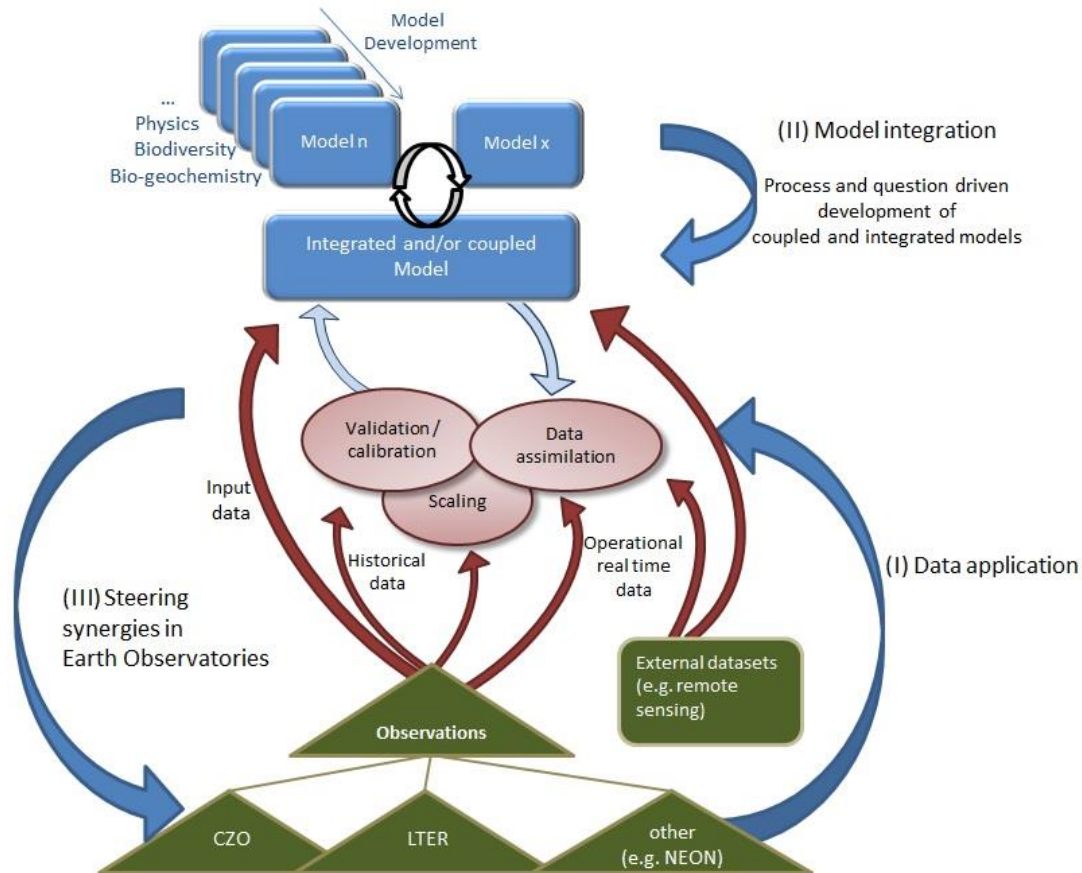
'For this reason, developing integrated models dealing with different processes, such as Land Surface Models, or coupling existing process models in suites (e.g. Peckham et al., 2013; Duffy et al., 2014) are options to expand our current modelling capability to incorporate cross-disciplinary processes for improved prediction of whole ESD system-level understanding.'

Where appropriate, we reformulated and strengthened statements and argumentation, adding e.g.: 'This result stresses the relevance of both observational networks to ESD processes in terms of the spatial and temporal scales in CZO/LTER modelling activities.'

or:

'LTER sites answer specific ecological questions, for which specific data are gathered, e.g., Black poplar population persistence under climate change.'

With a conceptual graphical presentation of the flow between observation network data and model development, indicating the different aspects of data application, model integration, and steering synergies of observational networks, we believe the paper will grow to the strength and scientific DNA the reviewer refers to. We inserted:



‘Figure: Flowchart of concepts, pathways and processes of applying terrestrial earth observatory network data to earth system dynamics models; identifying the three challenges of (I) data application, (II) model integration, and (III) steering synergies in observation networks.’