

Interactive comment on “Emergence of multiple ocean ecosystem drivers in a large ensemble suite with an earth system model” by K. B. Rodgers et al.

Anonymous Referee #2

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The paper is dedicated to the statistical analysis of ensemble simulations of an ESM. The focus is on a topic of emergence of climate stressors (or drivers) of ocean ecosystems. The approach and results are well written, with some interesting results, but I find the paper to be too narrow in the discussion of its conclusions. The authors describe statistical properties without any attempt to link them to the mechanisms underlying variability of ocean ecosystems. For instance, there is an interesting conclusion about early emergence of SST in the tropics as opposed to oxygen which first manifests itself in the Southern Ocean. There is no attempt to explain or link this conclusion to the main features of the ocean dynamics of these areas. The same can be said about multiple driver emergences. Why are they low in the tropics? What drives the differ-

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ence? Such a narrow focus on statistical characteristics is especially surprising when the authors aim to make their results useful for the optimisation of the observational strategies. Further, in the Discussion and conclusion section the authors state that “the temporal and special characteristics of emergence should be model-dependent”. If this is true, trying to explain or at least discuss emergent statistical properties in a view of the features of underlying dynamics is especially important. Otherwise what is the value of conclusions which would change in the next model? I suggest a thorough reworking and expanding the discussion section in respect to the criticism above.

Other major points:

“Observing system” first mentioned in the abstract and further throughout the text: it looks like an afterthought dropped into the text at a later stage. It might be an important goal, but it is not explained properly. What is this observational strategy/system supposed to observe/achieve/demonstrate? Globally? Regionally? Selectively in some hotspots? I can guess it should relate to the emergence, but how and why is left to the reader to deduce. I suggest either removing all references to it or explaining properly and then dedicating some discussion to more clear recommendations for such a system following conclusions of the study.

Similarly to the first reviewer I was not satisfied by the discussion of the choice of 30 years.

(Relatively) minor points

Abstract (last sentence): Risk assessment of what? Mitigation strategies of what?

p.18191 l.15 remove “possibly”

p.18191 l.17 loss of oxygen is also caused by other factors (e.g. increased remineralisation of the organic matter at a shallower depth in response to increased T) which need to be mentioned here to give a proper explanation oxygen as a climate change-induced driver.

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p. 18192 l.19 – what is “comprehensive”?

p. 18193 l.1-2 I am afraid I don't understand this sentence.

p.18194 Statement that ENSO is the most pronounced driver of decadal physical variability in this model needs evidence. Is there a ref to a previous analysis showing this?

p.18194 l.26 Just to clarify that “trend” refers to linear trend?

p.18195 l.3 30 years choice is getting even more confusing here. Now the authors state that it is motivated by the length of continuous observations. Tail wagging the dog?

p.18200 from line 13 to the end of 3.3: I find the authors here are getting into more and more details which progressively lose their importance because of the lack of proper interpretation and wider outlook as explained at the beginning of the review.

Figure 6. (same for FigA5) A very poor choice of the colour scheme. It shows only three gradations, one of which is not even shown on the colour bar.

p.18203. I would disagree with the statement. The trend will become evident to the observer, not to the ecosystem. To state that it would become evident to the ecosystem needs demonstration that the ecosystem is sensitive to the driver. For example most of the organisms are not sensitive to the oxygen concentration until it falls below a certain threshold no matter what the variability and the trend are. Please also define “perceptible”.

p.18203 l.9 again ref to the observing system and now also to the community of researchers evaluating the network design. The authors really need to explain this properly.

Interactive comment on Biogeosciences Discuss., 11, 18189, 2014.