Biogeosciences Open Access
Discussions

Interactive comment on "A probabilistic risk assessment for the vulnerability of the European carbon cycle to extreme events: the ecosystem perspective" *by* S. Rolinski et al.

Anonymous Referee #2

Received and published: 3 September 2014

The ms entitled "A probabilistic risk assessment for the vulnerability of the European carbon cycle to extreme events: The ecosystem perspective" by S. Rolinski et al. introduces a quantitative and general method to estimate vulnerability and risk hazard in ecosystems. The method is rather flexible and can be modified for application to disparate specific cases (i.e. as well as ecosystem processes and response variables). The method tracks the range of environmental conditions associated with a given past impact, then it estimates future hazardous situations departing from environmental conditions. The method is interesting in the context of recent demands from IPCC and has a great potential for useful applications. Specifically it allows for quantification and standardization of concepts such as vulnerability which is desperately needed in

current Ecology. Some concerns with the ms in its present form are: 1) The ms is difficult to read with long sentences and some sections are unnecessary long. This is the case of the discussion section which is unbalanced in depth and extension with respect the introduction. Authors need to make the ms more accessible to a broader audience and potential model users. Focusing the ms around two or three main intuitive ideas and results might be helpful, chiefly for the discussion. 2) Throughout the ms authors should clarify when they refer to real data (observations) and when to simulated data. It seems method implementation implies the identification of an impact on a given ecosystem process (e.g. net carbon storage) and the range of the main driving factors (e.g. temperature) at which that impact occur. Instead of using real data from a documented impact the authors use simulated data from a DGVM (i.e. LPJmL, which simulates carbon and water cycles as well as vegetation growth dynamics). In this respect the case studies provide insight on model behavior but not on natural processes behavior. Given the complexity (e.g parameter number) of DGVM the approach is interesting as it identifies thresholds etc. Nevertheless it would be more interesting to use real data (e.. remote sensed, forest inventory, etc) to describe real system response. Given that Sys responses come from simulated LPJmL data and given that the simulation model is a function of climate, it is important to clarify that the results only inform us about model dynamics but not on system vulnerability. It would be clarifying to describe or at least to discuss how the method would work with real data and how data uncertainty would be incorporated. 3) Another concern is that the method assumes that system responses to a given extreme event are always the same. There are clear examples of the opposite. For example there are cumulative drought stress effects in plants or ecosystem responses can shift due to changes in population and community structure. Some of these limitations come from the PRA approach but others may be associated with the DGVM underlying assumptions (e.g. if the DGVM pools functional diversity or size structure). Given that data uncertainty is not considered the discussion should mention how DGVM model underlying assumption's may impact on PRA predictions, and likely biological mechanisms underlying those responses.

4) Please check typos : e.g. Page 10171- Line 5 a probility instead of probability and grammar all over the ms (some sentences are too long or unclear).