Clim. Past Discuss., 2, S476–S479, 2006
www.clim-past-discuss.net/2/S476/2006/

Climate of the Past Discussions

Interactive comment on "Climate-human-environment interactions: resolving our past" *by* J. A. Dearing

Anonymous Referee #2

Received and published: 18 October 2006

The paper sets out an extremely valuable and powerful vision that seeks to combine knowledge from climate change, ecosystem change and human history better to understand the past, present and future trajectories of the contemporary earth system at different spatial scales. As such it draws on examples from a wide range of science and points out major deficiencies in knowledge, especially with respect to the extent of human impact on environmental processes through time on regional and global spatial sales.

Although the vision is clear, and the overall analysis is very plausible, the execution could be improved, particularly by providing more explanation in places, improving the flow of the argument and adopting a more balanced structure.

Some suggestions:

P567 lines 15 - 30. This para could be improved to provide a better link into the main body of the paper, The concept of the large “local” versus small “regional/global” scales needs defining or elaborating, but also should come at the end of this para to make a smooth link into section 2. The para could then begin with the Figure 1 description, plus associated questions (although some of these are strangely conceived/worded!), and end with a sentence that emphasises the need and difficulty of addressing such questions at the different scales considered.

P 568 title - depending on the definition adopted above, I wonder if this might be better expressed as “local/regional” scales to counterpoise with “regional/global” later. The concept of a “Region” is very fuzzy and it might be useful here to distinguish between single records (site based) and “local regions” (e.g. landscapes). Are the problems of up-scaling the same at all levels of scaling up?

P 568 line 4 - does this refer to contemporary or past “climate-human-environment” interactions? It could be argued that studies of past interactions need a thorough understanding of contemporary interactions first, or can we understand past interactions simply through inference?

P 568 line 20 - if this still refers to local scales then some archives listed here such as ice cores and marine sediments should be deleted

P 568 lines 22/23 - “properties, parameters and conditions” - vague terms that don’t match the terms in Table 1 (“conditions and processes”).

P 569 line 10 - should point out that using the past to define “rehabilitation targets” needs to take into consideration that such targets are not necessarily stationary, especially in view of prospective climate change (cf Battarbee et al. Freshwater Biology 2005).

P 569 line 20 - “long time-scales of observation” Need to be clear on definitions. I think

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this assumes that reconstructions using proxies can also be termed “observations”. I would prefer to use the term “observations” for instrumental and documentary records, as distinct from “reconstructions” using inference from palaeo-records.

P 570 line 5 - I agree that palaeo-records are good for generating hypotheses, but I would also argue from the acidification work that the palaeo record can also be used to test some of the those hypotheses (a la Deevey!) Indeed, the point could be made more strongly that only a palaeo approach can be used to test (or at least evaluate) alternative hypotheses that involve long-term processes, such as, in this case, base cation leaching.

P 570 line 7 - I’m not sure this is the best place to introduce the two case studies, In fact these case studies do not sit comfortably here. They come very abruptly after 2.1 and do not necessarily illustrate the points that have gone before. Maybe they should be integrated into 2.1 (learning from the past) and used to illustrate the use of multi-proxy studies in disentangling roles of people versus climate etc rather than “parallel histories”, a term that needs defining.

P 574 line 28-9 - “Ěa need for further testing and calibration of the model over relatively long time-scales”. Better would be “Ě a need for development of the model to include better simulation of key processes” (in this case the inclusion of a dynamic DOC component).

P 575 line 1 - “syndromes of change” a cryptic term - define/describe.

P 575 line 5/6 - I think there is and should also be a shift towards the analysis of long-term observational time series as these become longer and more useful. In my view they are as much or more likely to reveal insight into future complexity than dynamic models that often struggle to capture all relevant processes and feedbacks. Both, of course, are needed, but good time series are the only reality check we have and provide essential early warnings of future change.

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P 576 line 2 - “small-scale climate change” see above, use “regional/global scale”?

P 576 line 14 - add “generated from widely dispersed and heterogeneous archives”?? to end of sentence.

P576 section 3.1 compared with other sections this is a bit thin - I wonder if it can be beefed up by discussing the problem of top-down regionalisation i.e. the regional applicability of ice core and marine signals. Are these truly providing global/hemispherical signals or are they also biased by their location? Can the signal be distributed regionally etc? And perhaps make a linking sentence in 3.1 by pointing out difficulty of making human-climate-ecosystem comparison on common, e.g. regional, spatial scales with respect to bottom-up aggregation of records of human activity and top-down scaling from global/hemispheric records of climate change.

P 577/578 headings

3.2 Human activities - deals with population and land-cover, 3.3 Ecological/hydrological processes - deals with a mix of human activities and natural processes. It’s not clear to me what the structure of the argument is within and between these and following sections.

3.4 Ruddiman - this is a cogent discussion but, as with the case studies of Section 2, I wonder if it’s somewhat out of balance in its length given the context

Excellent and strong discussion!

Interactive comment on Clim. Past Discuss., 2, 563, 2006.