

Interactive Discussion on 6, C1070-C1075, 2013

Reply to anonymous Referee #4

1. We don't want to discuss, whether RCMs are needed or not. There are sufficient studies showing that RCMs have an added value over GCM climate projections e.g.

Feser F, Rockel B, von Storch H, Winterfeldt J, Zahn M (2011) Regional climate models add value to global model data: a review and selected examples. Bull Am Meteorol Soc. doi:

10.1175/2011BAMS3061.1

Rummukainen, M., 2010: State-of-the-art with regional climate models. WIREs Climate Change, 1, 82–96

Lorenz, R., E.L. Davin and S.I. Seneviratne (2012), Modeling land-climate coupling in Europe: Impact of land surface representation on climate variability and extremes, J. Geophys. Res., 117, D20109, doi:10.1029/2012JD017755.

General remark: with higher temporal and spatial resolution of RCMs finer scale processes can be captured; with the more detailed land surface representation (orography, land cover), they have a large potential to better represent regional land - atmosphere interactions than GCMs. and further with the two way coupling, better representation of regional land-atmosphere feedbacks.

2. In “Introduction”, the authors mentioned that “Long climate simulations with GCMs are limited in their horizontal resolution to values in the order of 200 km.”, this is not the case now. As more GCMs are being improved to run at much finer resolutions, i.e. 50km coupled runs from CESM (the Community Earth System Model).

Reply: We changed it to:

P. 3087 L.3: The spatial resolutions of GCM simulations within the frame of the Coupled Model Intercomparison Project Phase 5 (CMIP5) are in the range of 4° to 0.5° (Taylor et al.2012), but the standard resolution for longterm climate projections is in most cases coarser than 1°.

3. The paper says “One of the most distinct advancement of REMO-iMOVE is the introduction of the concept of plant functional types (PFTs)”. This is new, the PFT concept has been used in other land surface models, i.e. NCAR's community land model. Some discussion on the benefits of using PFTs is needed.

Reply: Here the introduction of PFTs to REMO is meant of course.

We introduced the following statements:

P3090, L8: The concept of PFTs consists in the aggregation of various species in use of comparable biophysical characterization and functional traits. Due to this aggregation we are able to handle a small but representative selection of comparable functionality, coexisting in one model grid cell.

4. It is not clear to me that if the authors are using a dynamic vegetation model or just a vegetation phenology model. On line 22 Page 3094, it says “Grass PFTs die back”. If it is a dynamic vegetation model, how did they treat with vegetation mortality when considering different stresses, i.e. heat, moisture, and carbon

Reply: The model does not include dynamic vegetation. The sentence just refers to the decrease in LAI, if the temperature or the moisture thresholds are not longer met.

Changes in the text:

P. 3094 L.22: The LAI of grass PFTs is reduced if either water or temperature are below the mentioned threshold.

5. Line 3 Page 3098: is “three years” enough to spin up the soil moisture in the regional climate model? Again, if it is a dynamic vegetation model, it needs longer time to spin up the model.

Reply: Land cover types and land use changes are prescribed, only land cover type characteristics (LAI, VGR , Albedo...) change with time. REMO has a very simple representation of soil moisture – our experience shows, that one year is well enough to spin up this simple bucket. The spin-up of soil temperature did last three years, which is also a sufficiently long period in our experience.

6. Minor comments: Line 3 on Page 3092: Change “were” to “where”. English in some places needs to be improved.

Reply: Many thanks, we changed that.