

Interactive Discussion on 6, C1070-C1075, 2013

Reply to anonymous Referee #2

General comments

1. Biophysics/carbon cycle
 - a. CO₂ simulation

Reply: that was a misunderstanding we rephrased the paragraph:

P. 3105, L 10: The model now takes into account the influence of atmospheric CO₂ concentration to plant stomatal conductance and therefore to surface evaporation. This effect is long known (Betts et al. (1997), Avissar and Pielke (1991)) and some studies show the effects for current climate simulations (Jeong et al. (2010), Cao et al. (2010)). An important point in this respect is the ability of the new model system REMO-iMOVE to connect atmospheric forcing and vegetation response on model time-step basis.

- b. Net Primary Production:

Reply:

First to clarify: stating laziness or unfamiliarity with a scientific topic to an authorship under the protection of anonymity is not very professional, also the comments were not very constructive - we could see that in no other referees behaviour.

We will just clarify that we are dealing with a regional climate model, which was run for 11 years. We further do not include any carbon pools or carbon storage. To meet the referee's request of thoroughly comparing NEE or GPP to observation data we first would need carbon pools in the model and second we would need carbon pools in the model, which are in equilibrium as initial condition. To add these kind of functionality is our future plan, but not the scope of this paper. We guess referee 2 is so experienced in carbon cycle and biophysical studies to know, that plant productivity even locally can vary drastically from species to species and condition to condition. A RCM with a grid extent of 50 km and an interactive vegetation module is not a crop model with a local scope.

To validate a climate model, we use mean values, since climate is the statistical representation of weather – the same is true for the productivity of vegetation in that model. We compare the productivity with an appropriate metric to observed values. If we see a large spread even in the local observations we have to generalize and to compare appropriate metrics. We find it very suitable in this scope to compare mean productivity of PFTs for certain climatic regions to good observational measurements – which is undoubtedly the values of all of the many authors that are compiled in the book by Roy et al. (2001).

2. Figures

Reply: It is in the favour of the authorship on how data are analysed and we did it in the shown way. Figure 12 is split in separate figures.

3. Equations

Reply: The equations in the context of the phenology model are consistent to the LPJ models – we stated that now explicitly (P. 3093). The changes in soil albedo scheme are based on the assumptions of the stated papers, which are empirically derived. In tests we needed to adjust these findings to our model inherent parametrizations (P. 3092).

4. Vegetation type

Reply: Now we are a little confused by the comment of referee 2. We brought up something new, explained the method and used it in our model to show that it works fine – like it is done in a scientific work. Existing PFT distributions were not appropriate for our model, so we developed a new method of mapping PFTs according to high resolution vegetation and land use distribution. In addition, we combine this with Holdridge classification to further differentiate PFT compositions according to different bioclimatic zones as a function of latitude and altitude.

Specific comments:

1. Colloquialisms:

Reply: we defined and changed the stated colloquial terms

2. Spin-up:

As we did explain in the text – REMO has a simple representation of soil moisture – in our experience one year is well enough to spin up this simple bucket. The spin-up of soil temperature is explained on P3098, L2-3 and the introduced soil moisture courses show, that one year of soil moisture spin up is sufficient for a bucket soil scheme

3. GPCC vs. GPCP: see P3098 L.18

4. A climate model is validated on measures, which it is designed to model – this is climatological monthly means. You could analyse mean diurnal cycle (averaged over 30 years, f. ex.), but this is not within the scope of this paper

5. This has been done, for example in Rechid D, Hagemann S, Jacob D (2009) Sensitivity of climate models to seasonal variability of snow-free land surface albedo. *Theor Appl Climatol*, 95, 197-221.

6. We are not dealing with improvements – we are dealing with differences. We implemented new processes, which represent land-atmosphere-interactions more realistically in the model, further this system is tested and evaluated here.

7. The surface vegetation ratio (VGR) gives the vegetated fraction of each grid cell, which is covered with greened vegetation, thus this part is able to do photosynthesis.