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Interactive comment on "Critical impacts of global warming on land ecosystems" *by* S. Ostberg et al.

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We thank Anonymous Referee 2 for his or her supportive comments.

The referee asks how the Γ metric connects with other indexes like the Köppen-Geiger climate classification system and the Holdridge life zones system. Both of these are classifications that map the current state of land areas (and their biomes) based on climatic indicators. The Γ metric goes beyond these indexes in that it particularly plots changes in the biogeochemical as well as structural state of the land surface. Our metric can have values even without a change of either Köppen or Holdrige class (i.e. without changing climate zone or biome) if climate change shifts the biogeochemical state of the vegetation in that climate zone and biome (e.g. more biomass or more evapotranspiration).

LPJmL as the only model used: Running multiple DGVMs on the PanClim climate

dataset is at current not feasible for technical and operational reasons. In the discussion of our paper we give an indication of the range of responses other DGVMs produce in comparison to LPJmL based on the ongoing ISI-MIP intercomparison project which uses the Γ metric to compare results from 7 global vegetation models (Warszawski et al. submitted, Piontek et al. 2013), however with a different model setup and different climate scenarios. We find that there is quite a large spread of results between models which is caused by two factors: (1) differences in the response of vegetation models to climate change; (2) differences in output variables provided by the models. While Heyder et al. (2011) designed the Γ metric to be a generic indicator that is not model-specific (although first used with LPJmL) ISI-MIP revealed obstacles to applying it to other vegetation models. For example, several vegetation models use a prescribed, constant vegetation composition, and some parameters (from Table 1 in our paper) are not computed by other models, which compromises the comparability of Γ values between models. In general terms, LPJmL results are found to be representative of the typical response of other models on a global scale, which deviate to both sides of LPJmL results.

The referee also suggests releasing the program code to the community to allow others to test it. All code that contributed to this analysis will be made available upon request from the authors. However, the metric computation is implemented as a chain of small tailor-made tools using several different scripting and programming languages and targeted at the specific output format and simulation setup of LPJmL rather than a single uniform processing programme. Apart from those technical obstacles there are also the methodological problems mentioned above.

The climate scenarios used are currently being published (peer-reviewed documentation as well as full dataset download, Heinke et al. 2012 and follow-up paper). We also plan to release our grid cell-based Γ metric results from all 152 simulations – we will add a note in the revision where these data and metadata will be made available.

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