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Biogeosciences Discussions

Interactive comment on "Combined biogeophysical and biogeochemical effects of large-scale forest cover changes in the MPI earth system model" *by* S. Bathiany et al.

S. Bathiany et al.

sebastian.bathiany@zmaw.de

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1. As suggested, we have merged Sect. 3.2 with Sect. 3.3. In the new Sect. 3.2, now called "Regional mechanisms and feedbacks", biogeophysical mechanisms are discussed together with their impact on the carbon cycle via climate – carbon cycle feedbacks. In order to explain beforehand how the separation of different effects on the terrestrial carbon pools was calculated, we have included this explanation in Sect. 3.1, now called "Global changes in temperature and the carbon cycle". We agree that this improves the structure of the manuscript because Fig. 5 and former Fig. 10 (now Fig. 6) can be shown and discussed together.

2. Regarding the deviations of the terrestrial carbon pools from observations see our reply to referee 1.

3. To show more spatially explicit results which document the reasons for the obtained temperature changes we have now included figures for the surface and planetary albedo (here: Fig. 1 and 2), as well as evapotranspiration (ET, Fig. 3). We have added three different figures because we think that one panel of figures alone (e.g. for the net short-wave radiation at the surface) cannot explain the observed changes for all four experiments. From the additional figures it can be seen that surface albedo changes dominate the temperature response in the boreal experiments, while in the tropics changes in cloud cover and surface albedo changes counteract each other in their effect on the planetary albedo. Here, anomalies in ET explain the temperature changes at the surface. Fig. 8 further documents that changes in ET are reversed over the oceans. In DB and AB the changes in MOC are even more apparent in ET than in temperature, therefore we show the changes in ET also for these experiments.

Interactive comment on Biogeosciences Discuss., 7, 387, 2010.

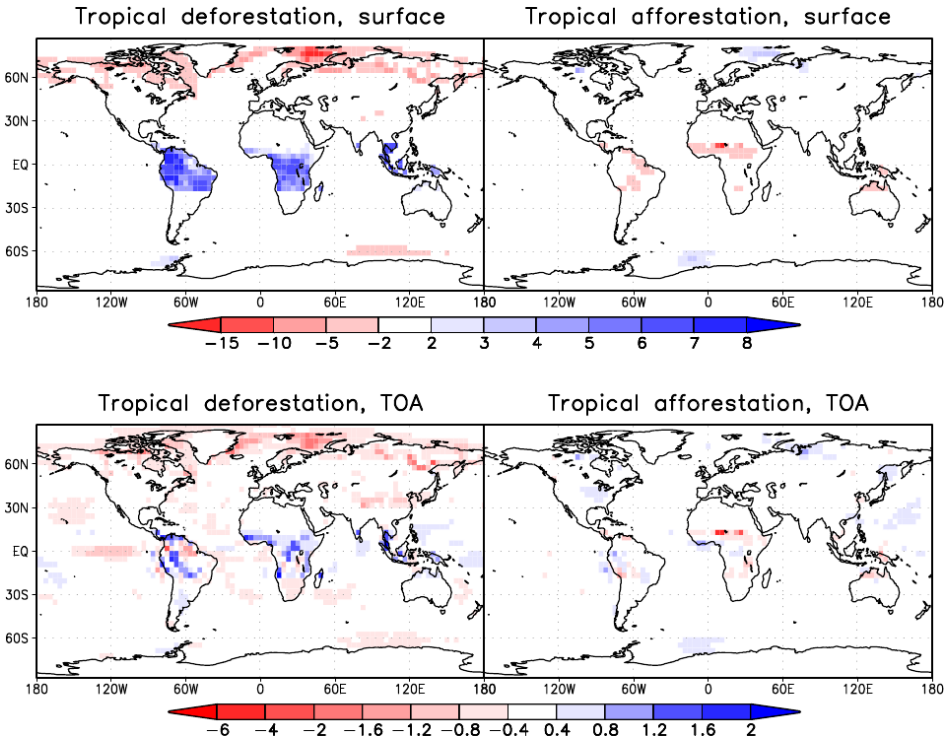

Fig. 1. Anomalies in surface albedo (top) and planetary albedo (bottom) in %, averaged over the final 200 years for tropical deforestation (left) and tropical afforestation (right).

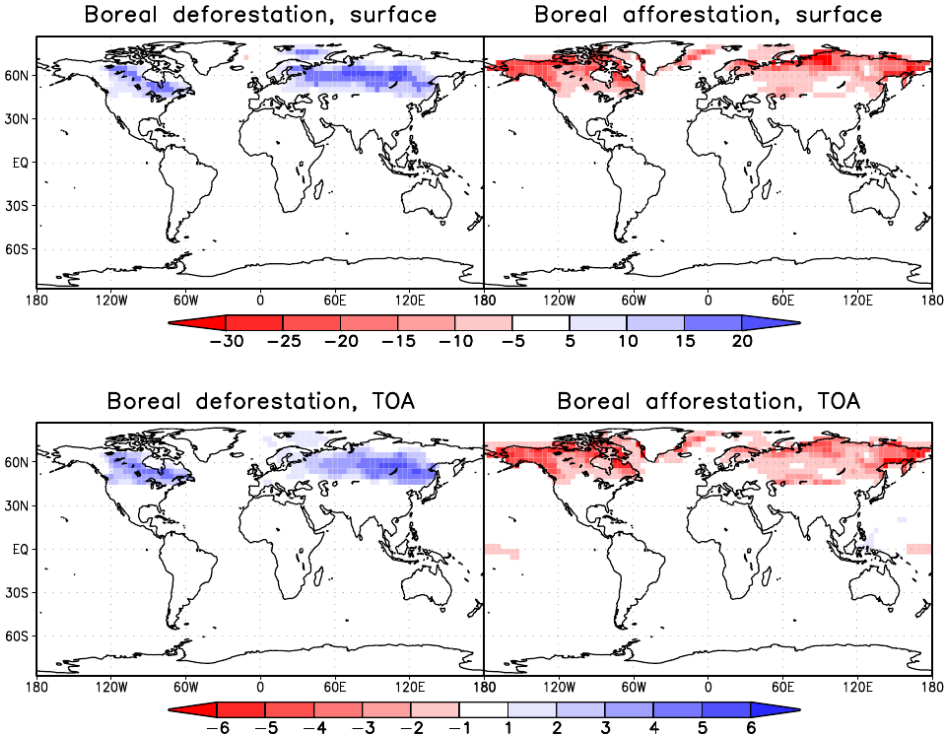

Fig. 2. Anomalies in surface albedo (top) and planetary albedo (bottom) in %, averaged over the final 200 years for boreal deforestation (left) and boreal afforestation (right).

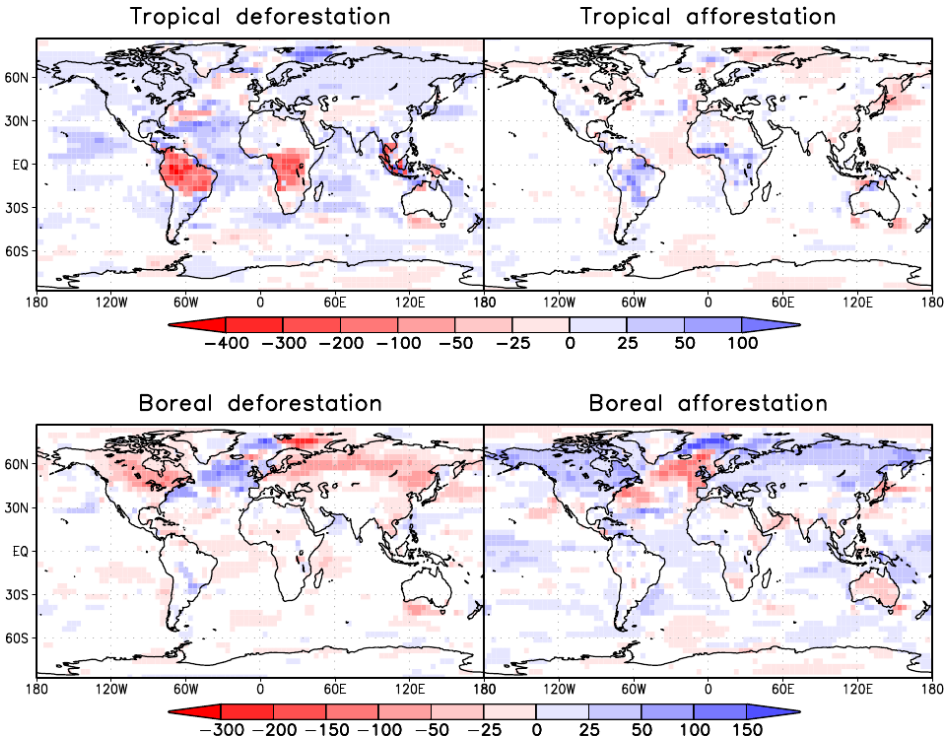

Fig. 3. ET anomalies in mm/year averaged over the final 200 years for each experiment. White areas show no significant changes according to a t-test with 95% significance.