



Biogeophysical effects of afforestation on temperature and precipitation extremes – case studies for Europe

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Europe is the only continent with a significant increase of forest cover in recent times. In the last two decades the annual area of natural forestation and forest planting amounted to an average of 0.78 million hectares/year[1]. As large-scale forest cover changes influence regional atmospheric circulation, regional-scale sensitivity studies have been carried out to investigate the climatic effects of forest cover change for Europe. Applying REMO (regional climate model at the Max Planck Institute for Meteorology, Hamburg), the projected temperature and precipitation tendencies have been analyzed for summer, based on the results of the A2 IPCC-SRES emission scenario simulation. For the end of the 21st century it has been investigated, whether the potential forest cover change would reduce or enhance the effects of emission change.

The magnitude of the biogeophysical feedbacks of afforestation on temperature and precipitation means has been determined relative to the magnitude of the climate change signal. Based on the simulation results a significant climate change mitigating effects of forest cover increase can be expected in northern Germany, Poland and Ukraine, which is 15-20 % of the climate change signal for temperature and more than 50 % for precipitation.

The analysis of the impacts on temperature and precipitation extremes is focusing on regional differences within Europe, based on the following research questions:

- Does the increased forest cover induce any changes in temperature and precipitation extremes and in the climate variability?
- How big are the land cover change feedbacks compared to the projected climate change signal?
- What are the differences by bioclimatic regions, which regions show the largest effect on the simulated climate through forest cover increase?

Results may help to identify regions, where forest cover increase has the most favourable effect and should be supported to reduce the projected climate change. Data provide an important basis of the future adaptation strategies and land use policy.

Keywords: forest cover, afforestation, climatic extremes, biogeophysical feedbacks, regional climate modelling

[1]Data of FAO, 2010. (China reports also a significant statistical increase of forest cover but its real extent is questionable)