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Climatic role of temperate forests at the forest/steppe limit

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In the NEESPI Regional Focus Research Centre for Non-boreal Eastern Europe, Sopron, researches are focusing on the climatic tolerance and distribution of zonal tree species at the xeric forest limits. These limits at the planar border zone between closed forest and woodlands (forest steppe) are determined primarily by climatic aridity and are especially vulnerable. In the last decade a direct link has been shown between recurrent summer droughts and health status of beech at their lower limit of distribution.
For the 21st century probability and severity of extreme dry events has been analyzed using the regional climate model REMO developed at the Max Planck Institute for Meteorology Hamburg. For the two investigated future time periods (2021-2050 and 2071-2100) summers are projected to be significant warmer and dryer compared to 1961-90, especially at the lower limit of beech distribution. The predicted increase in frequency of severe droughts may result in growth decline and mortality of zonal tree species over this area.
Reduction of forested area can lead to a positive feedback in warming at the forest/steppe limit in the East-Central- and Southeast-European countries. But afforestation may mitigate climate change through evaporative cooling. Therefore forest cover change studies have been carried out to investigate the climate benefits of temperate forests under enhanced greenhouse gas forcing. For the IPCC scenario A1B a complete deforestation and a complete afforestation experiment has been performed with the same climate model (REMO).
For 2021-2050 and 2071-2100 the possible effects of forest cover change on the regional climate have been analyzed, whether deforestation/afforestation can enhance or reduce the predicted tendency of drying, with special focus on the most climate change affected areas at the xeric forest limit. Results can be also useful for adaptation and mitigation strategies.

Keywords: xeric forest limit, drought frequency, forest cover change – climate feedbacks