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Integrating multi-source data and model projections to address carbon cycling in central European forests

Katarina Merganicova¹, Roland Hollos², Zoltan Barcza^{1,2,5}, Jan Merganic³, Zuzana Sitkova⁴, Daniel Kurjak³, Martin Mokros¹, Peter Fleischer³, Hrvoje Marjanovic⁶, Dora Hidy⁵, Katarina Strelcova³, and Tomas Hlasny¹

¹Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Prague, Czech Republic, (merganicova@fld.czu.cz)

²Eötvös Loránd University, Department of Meteorology, Budapest, Hungary

³Technical University in Zvolen, Faculty of Forestry, Zvolen, Slovakia (merganicova@tuzvo.sk)

⁴National Forest Centre - Forest Research Institute Zvolen, Zvolen, Slovakia

⁵Eötvös Loránd University, Faculty of Science, Excellence Center, Martonvásár, Hungary

⁶Croatian Forests Research Institute, Department for Forest Management and Forestry Economics, Zagreb, Croatia

Carbon cycling in forest ecosystems is affected by a number of interacting environmental factors. Here we analyse carbon sequestration in temperate forests composed of three common Central European species: Norway spruce, European beech and oak along an extended environmental gradient across Central Europe using long-term monitoring data and process-based modelling of forest dynamics. For the analyses we used selected ICP forest monitoring plots, long-term forest research plots from thinning trials, and highly-equipped intensively monitored plots from five central European countries: Croatia, Hungary, Slovakia, Poland and the Czech Republic. Their temporal development was simulated using a process-based model Biome-BGCMuSo, which is sensitive to soil and climate conditions. Since such models of forest growth dynamics implicitly describe relationships between forest productivity and environmental conditions, their implementation can reveal the main factors affecting carbon cycling in forests along the gradients of latitude, altitude, or other environmental factors as long as they are included in the models. The study indicates that by linking long-term monitoring data and forest growth modelling we can not only test the model capacity to simulate forest dynamics, but above all we can increase our capacity to address main challenges faced by the central European forestry with respect to the global climate change.