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DOES A POST-STRATIFICATINO OF GROUND UNITS IMPROVE THE FOREST BIOMASS ESTIMATION BY REMOTE SENSING DATA?

Hooman Latifi[a*], Fabian E. Fassnacht[b,c], Florian Hartig[d], Christian Berger[e], Jaime Hernández[f], Patricio Corvalán[f], Barbara Koch[c]

a- University of Wuerzburg, Department of Remote Sensing in cooperation with German Aerospace Center, Oswald-Kuelpe-Weg 86, D-97074 Wuerzburg, Germany – hooman.latifi@uni-wuerzburg.de

b- Institute for Geography and Geoecology, Karlsruhe Institute of Technology, Kaiserstraße 12, D-76131 Karlsruhe, Germany, fabian.fassnacht@kit.edu

c- University of Freiburg, Chair of Remote Sensing and Landscape Information Systems, Tennenbacherstrasse 4, D-79106 Freiburg, Germany – barbara.koch@felis.uni-freiburg.de

d- University of Freiburg, Department of Biometry and Environmental System Analysis, Tennenbacherstrasse 4, D-79106 Freiburg, Germany – florian.hartig@biom.uni-freiburg.de

e- University of Jena, Department of Earth Observation, Loebdergraben 32, D-07743 Jena, Germany – christian.berger@uni-jena.de

f- Laboratorio de Geomática y Ecología del Paisaje, Universidad de Chile, Av. Santa Rosa 11315, Santiago de Chile - jhernand@uchile.cl, pcorvala@uchile.cl

[*] Presenting author.

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ABSTRACT:

Remote sensing-assisted estimates of aboveground forest biomass are essential for modeling carbon budget on various scales. For these estimates, multiple factors such as sensor type, statistical prediction method, sampling design for the reference inventory data or the splitting of prediction models into species- strata-specific submodels affect the quality and robustness of the resulting predictions. Yet, few studies have attempted a systematic analysis of how these factors (and their interactions) contribute to the yielded predictive quality. We addressed this topic by conducting two tests based on performance of small scale, remote sensing-assisted biomass models under post-stratification of sampling units. We used arbitrarily-selected predictors from airborne LiDAR and hyperspectral data obtained in a managed mixed forest site in southwestern Germany. They were evaluated in terms of their predictive power by means of 5 commonly in-use spatial models. The bootstrap cross validated RMSE and r2 diagnostics were additionally analyzed in a factorial design by an Analysis of Variance (ANOVA) to rank the factor effects. Selected models were used for wall-to-wall mapping of biomass estimates and their associated uncertainty. The results revealed marginal advantages for the strata-specific prediction models over the unstratified ones, which were more accentuated on area-based prediction maps. Yet, these findings are concluded to be partially site-specific. Input data type and statistical prediction method are concluded to remain the two most crucial factors for the quality of remote sensing-assisted biomass models.