Reliability of biomass estimation at regional scale, BEFs for Czech Republic

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National forest biomass change estimates are needed for understanding the role of biosphere in climate change and also for the GHG reporting purposes for UNFCCC. The basis for national GHG reporting are the national forest inventory (NFI) programs, which are either based on systematic sample of forests or on stand-wise surveys. Since these programs were mostly established to estimate volume stock, one of the current challenges for NFIs is the development of the methodology for biomass estimation, like BEFs. According to IPCC GPG reporting of carbon stock changes should be transparent and verifiable, but this demand is not currently met due to the fact that the origin and uncertainty of BEFs are not known. This study focussed on the uncertainty estimation and analysis of BEFs applicable for stand-wise inventory of Norway spruce forests in the Czech Republic. Here BEFs were constructed on the basis on data from permanent research plots and by applying biomass- and volume models to tree-level data. The uncertainty of BEFs was estimated with Monte Carlo simulations. Various error sources were propagated, including measurement errors of tree diameter, height and age and in addition to those also model errors of volume and biomass were included. Due to fact that trees from same plot correlate, also the intra-plot error correlation structure was implemented into simulations to study its effects to overall uncertainty of BEF.

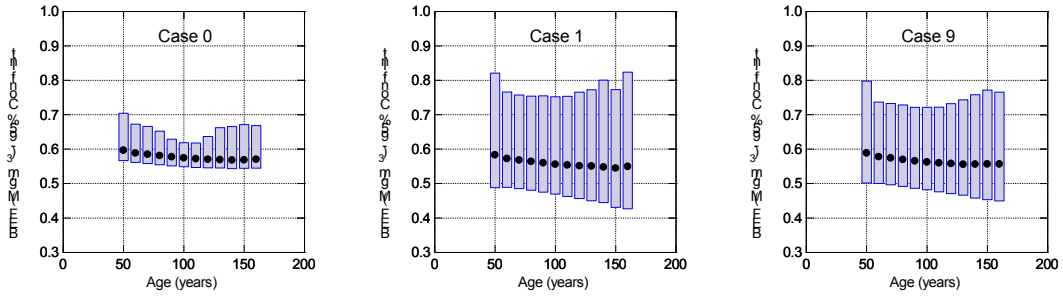

Figure 1. Uncertainty (95% of probability density) of BEF values by age-classes, with varying intra-plot error correlation cases. Where case 0 is with independent errors, while in case 1 error of biomass and volume models have full intra-plot correlation. In case 9, 36% of variance of biomass and volume model errors is fixed between trees from same plot.

These BEFs were found to be age-dependent and their uncertainty was highly dependent on the dependencies among errors (Fig. 1). Results indicate the importance of error correlations when estimating the uncertainty of BEFs that are formulated by using biomass models. It was also found that the major part of the uncertainty of BEF was due to uncertainty of biomass models applied, while the contributions of measurement errors to overall uncertainty was marginal.