Is the regression to the mean in remote sensing inventories a problem for forest planning?

T5.34 The new age of forest monitoring: A common European forest monitoring system in a global perspective

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Abstract: Information about the forest resource is needed to make decisions about future forest management. Traditionally, this information has mainly been gathered in the field. However, as improved sensors have emerged, remote sensing has become a commonly used technique for forest inventory. One of the most important changes this has meant for forestry is the availability of spatially detailed wall-to-wall maps of forest attributes. For example, wide-scale airborne laser scanning campaigns have been performed in some countries, and satellite-based systems like the Sentinel-2 continuously produce multispectral images on the continental scale. Estimates from these remote sensing inventories are of varying quality. However, they have the strengths that they are objective by nature, produce similar data for large areas, and provide a clearer error structure compared to traditional forest inventories in operational use. On the other hand, a profound weakness with model-based inventories is the regression to the mean, i.e., estimates for small attributes are overestimated while estimates for large attributes are underestimated. For example, small trees will be estimated to be taller than they are in reality and vice-versa. Such errors could lead to problems in making implementable forest management plans. In this study, we will address this topic by quantifying the risk of suboptimality in both economic and ecological terms from basing decisions about forest management on remotely sensed information. We evaluate forest planning performance for two inventory methods (airborne laser scanning and satellite imagery) in a business-as-usual scenario extended with concerns towards biodiversity values and carbon sinks. The results will provide insights into the effect of the regression to the mean for the benefit of the development of new remote sensing techniques and planning models. The results may also provide knowledge for the upcoming European Union processes regarding large-scale forest monitoring with remote sensing.