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Effects of tree species and season on boreal forest biomass estimates from TanDEM-X

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The bistatic interferometric mode of TanDEM-X has the ability to provide near-simultaneous, cross-track interferometric measurements with high temporal correlation. In this paper, we investigate tree species and seasonal effects on biomass estimation from TanDEM-X. The digital canopy models (DCM) are generated by subtraction of the interferometric height with a high-resolution ground digital elevation model obtained from helicopter LiDAR. The models are evaluated using reference biomass data obtained from in-situ measurements of 32 circular plots with 40-m radius in the test site Remningstorp in southern Sweden. As expected, the interferometric baseline has a significant impact on the results but it is also observed that tree species and season affect the estimation results. Example results are illustrated in Figure 1. Norway spruce gives the most consistent results compared to Scots pine and deciduous species. The largest difference is observed for deciduous species, which most likely is related to the absence of leaves during winter. The canopy closure is also found to have an important effect, and has been observed to significantly reduce coherence in some particular cases. Biomass estimation has been evaluated using linear regression and leave-one-out cross-validation analysis which show that the root mean squared error (RMSE) varies in the range 19-23% for studied cases.