Estimation of aboveground biomass in North China using Sentinel-1 and 2 datasets

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Forest aboveground biomass (AGB) plays an important role in measuring forest carbon reserves. Accurate mapping AGB is important for monitoring carbon stocks and will contribute to achieve the goal of sustainable development. In this study, we explored the potential of mapping AGB in north China using a three-year monthly time series of Sentinel-1 (S1) and Sentinel-2 (S2) data. The backscattering and indices of SAR S1 combined with spectral reflectance, vegetation indices and biophysical parameters from multispectral S2 imagery were evaluated for AGB prediction in a Random Forest regression. Three scenarios were conducted with different datasets to determine: (1) the potential of using S1 and S2 to estimate AGB, (2) optimal variables selection for AGB mapping, (3) contribution of time series datasets to improving the accuracy of AGB mapping. Random forest regression was used to develop forest AGB estimation models, which was divided into three types of modeling using only S1, only S2, and a combination of S1 and S2. Compared to S1 (RMSE = 65.7 Mg/ha), S2 achieved better prediction accuracy (RMSE = 58.4 Mg/ha), although the combination of S1 and S2 time series datasets estimated the best AGB results (RMSE = 42.3 Mg/ha). The research implied that incorporation of SAR and multispectral data considerably improved AGB mapping performance when compared with the use of SAR or multispectral data alone. This proposed approach provides a new insight in improving the estimation accuracy of forest AGB in north China.