

Sensitivity of backscatter intensity of ALOS/PALSAR to biophysical parameters of boreal forests in Alaska

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We investigated the sensitivity of ALOS/PALSAR backscatter intensity for estimating the above-ground biomass (AGB) and other biophysical parameters (tree height, diameter at breast height (DBH), and tree stand density) in the boreal forest of Alaska. In July 2007, forest surveys were conducted along a south-north transect (150W) to profile the ecotone from boreal forest to tundra in Alaska. In situ parameters were measured in 29 forests by a combination of the Bitterlich angle-count sampling method and the sampled-tree measuring method. These in situ values were compared with the backscatter intensity of ALOS/PALSAR. A strong positive logarithmic correlation was found between the backscatter intensity and the forest AGB, with the correlation being stronger in the HV than in the HH polarization mode. No obvious saturation was found in the sensitivity of the HV mode backscatter intensity to the forest AGB up to 120.7 Mg ha⁻¹. Similarly, a robust sensitivity was found in the HV backscatter intensity to both tree height and DBH, but weak sensitivity was observed for tree density. The regression curve of HV backscatter intensity to the forest AGB appeared to be intensified by the uneven forest floor, particularly for forests with small AGB. The geographical distribution of the forest AGB was mapped, demonstrating a generally south-rich and north-poor forest AGB gradient.

Keywords: ecotone, black spruce forest, forest above-ground biomass, synthetic aperture radar, Bitterlich method