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Remote Sensing of Environment

Volume 59, Issue 1, January 1997, Pages 118-133

Forest biomass from combined ecosystem and radar backscatter modeling \hat{a}^{-}

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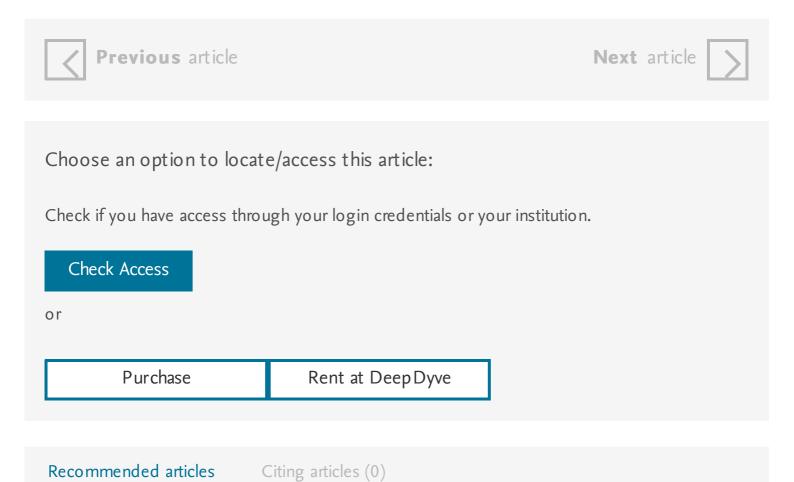
https://doi.org/10.1016/S0034-4257(96)00114-9

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Abstract

Above-ground woody biomass is an important parameter for describing the function and productivity of forested ecosystems. Recent studies have demonstrated that synthetic aperture radar (SAR) can be used to estimate above-ground standing biomass. To date, these studies have relied on extensive ground-truth measurements to construct relationships between biomass and SAR backscatter. In this article we discuss the use of models to help develop a relationship between biomass and radar backscatter and compare the predictions with measurements. A gap-type forest succession model was used to simulate growth and development of a northern hardwood-boreal transitional forest typical of central Maine, USA. Model results of species, and bole diameter at breast height (dbh) of individual trees in a 900 m² stand were used to run discontinuous canopy backscatter models to determine radar backscatter coefficients for a wide range of simulated forest stands. Using model results, relationships of copolarized backscatter

to forest biomass were developed and applied to airborne SAR (AIRSAR) image over a forested area in Maine. A relationship derived totally from model results was found to underestimate biomass. Calibrating the modeled backscatter with limited AIRSAR backscatter measurements improved the biomass estimation when compared to field measurements. The approach of using a combination of forest succession and remote sensing models to develop algorithms for inferring forest attributes produced comparable results with techniques using only measurements. Applying the model derived algorithm to SAR imagery produced reasonable results when mapped biomass was limited to 15 kg/m^2 or less.



- The work presented in this article was performed at Goddard Space Flight Center and funded by NASA Headquarters Ecosystem Processes and Modeling Program RTOP 462-43 and SIR-C / XSAR Project RTOP 665-31. Dr. Weishampel's work was supported by the National Research Council while he was a resident at GSFC.
- Thanks to Professor Alan Strahler of Boston University for making the tree crown information available. Special thanks to International Paper for the use of their Northern Experimental Forest and the University of Maine for assistance in field measurements and logistics. The constructive criticisms of three anonymous reviewers are also appreciated.

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