Modeling forest biomass and growth: Coupling long-term inventory and LiDAR data

Challenge: Two common data characteristics that if ignored can result in misleading model-based inference about above ground biomass (AGB):

(1)temporal misalignment, i.e., mismatch, between LiDAR data acquisition and AGB training data measurement dates,
(2)space-time independence among model residuals—a key assumption of regression models.

New methods: We propose a Bayesian spatial process model to couple temporally misaligned AGB observations and LiDAR (or similar remotely sensed) data. The methods are specifically for forest inventories with repeated measures (e.g., FIA, NEON, LTER).

The proposed model borrows inventory information over space and time to deliver improved AGB and growth prediction accuracy and precision, over traditional methods, and full uncertainty quantification.

Significance: Given repeated or temporally staggered inventory measurements, the proposed model can rectify bias and other errors that result from modeling temporally misaligned field training data and remotely sensed covariates. This allows for more inventory data to be used in calibration and prediction initiatives (i.e., past and future relative to LiDAR collection date). Leveraging these additional data are shown to improve AGB and growth prediction.

CMS publication from: Hurtt-03, Dubayah-04, Morton-02, Cook-B-01

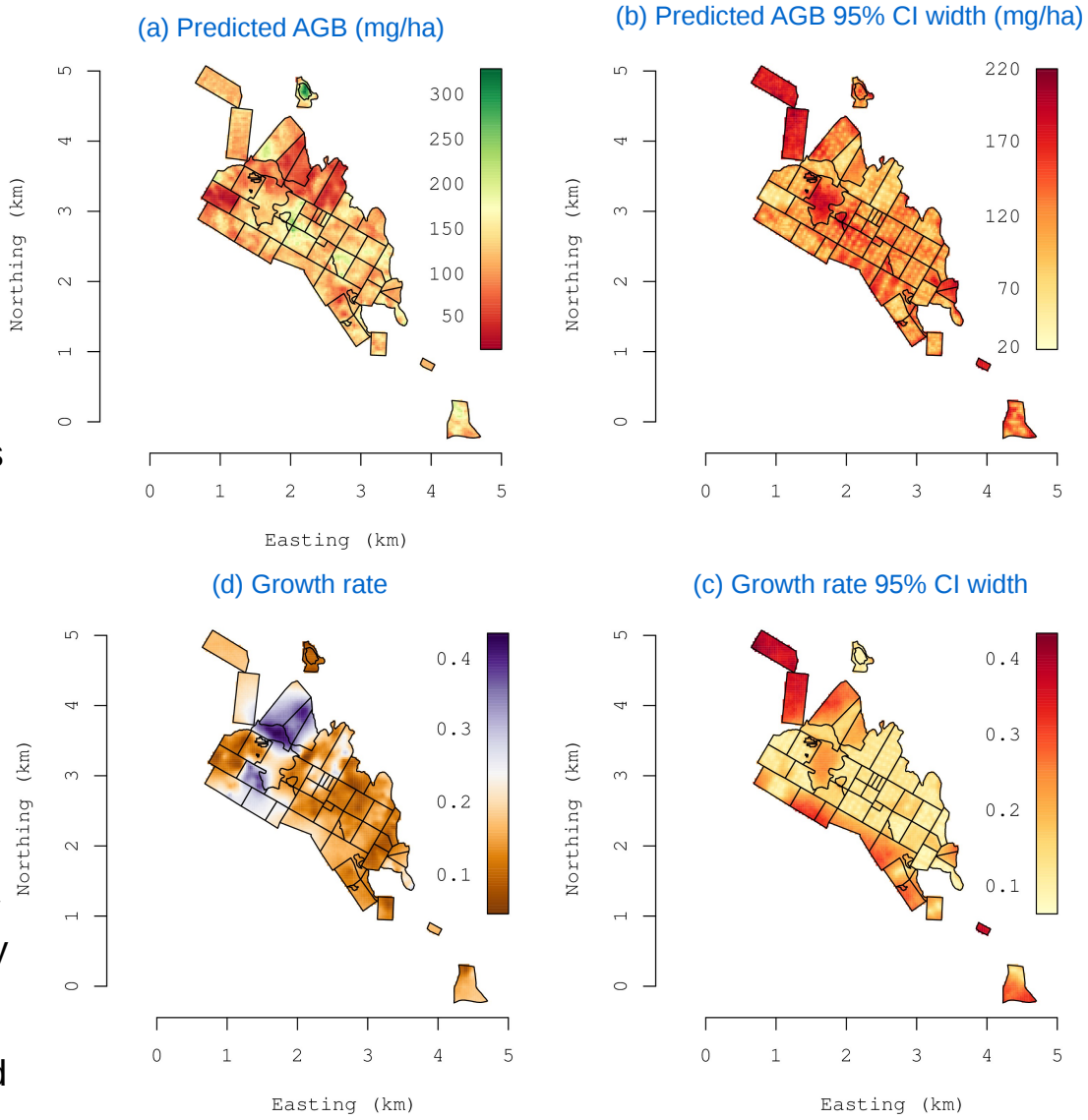

Illustration: The proposed model was assessed using LiDAR data acquired from NASA G-LiHT and field inventory data from the Penobscot Experimental Forest in Bradley, Maine.

Babcock, C., A.O. Finley, B.C. Cook, A. Weiskittel, and C.W. Woodall. (2016) Modeling forest biomass and productivity: Coupling long-term inventory and LiDAR data. *Remote Sensing of Environment*. 182:1-12.