Modeling Aboveground Biomass Changes using Disparate Lidar Datasets in a Managed Northern Wisconsin Forest

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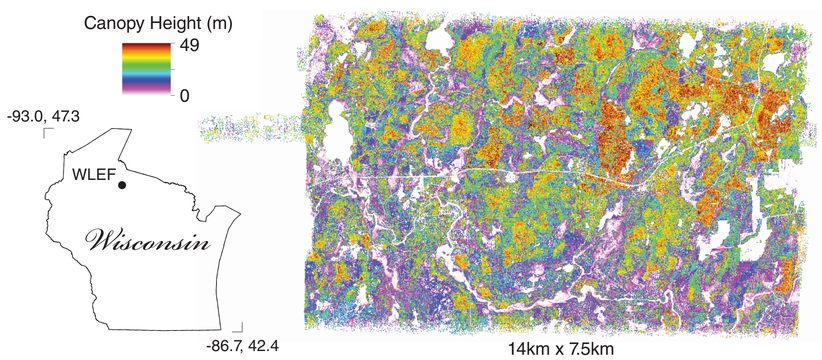
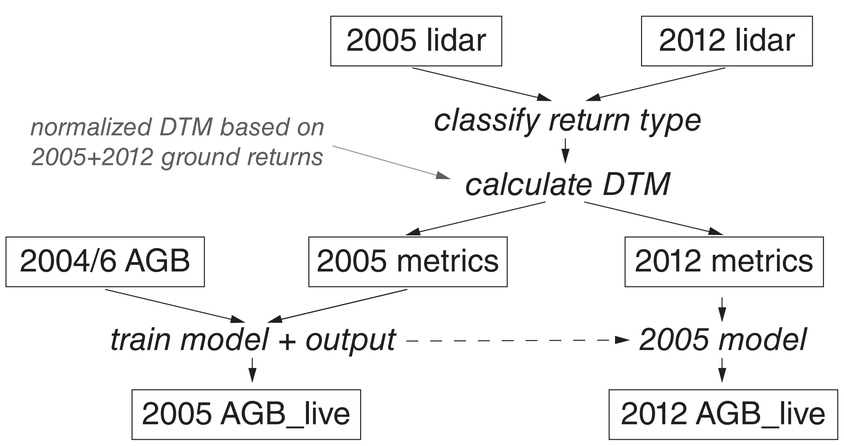
BACKGROUND

- Need to quantify changes in aboveground biomass (AGB) to better understand the influence of forest disturbance/regeneration on local carbon sequestration potential and atmospheric flux
- Increasing abundance of repeat lidar data though often with differing pulse density, IFOV, and pulse/return structure, which contribute to "false" metric changes
- Goal to assess influence of lidar data variability of (changes in) modeled AGB

STUDY AREA



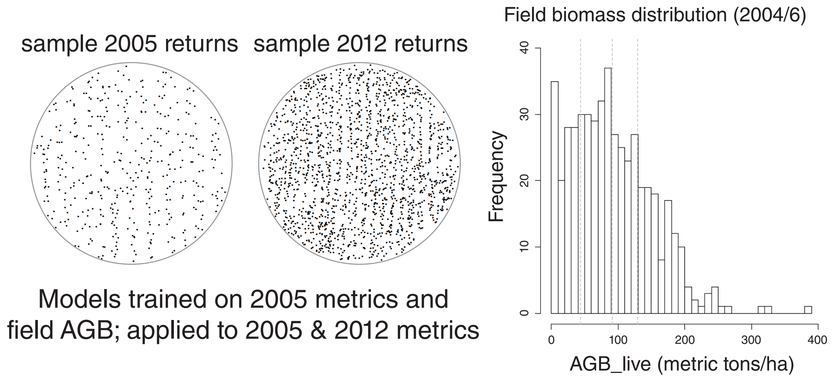
DATA + METHODS



- **Model AGB_live by relating metrics from 2005 and 2012 lidar data to field-derived AGB**
- Lidar: 2005 Optech 2025 1st return, 2 pulse/m^2
  2012 G-LiHT multi-return, 12 pulse/m^2
- ~80 metrics relating percentile height return, decile height return density, topographic metrics, etc.
- Field data: 2004/2006 allometrically-derived AGB_live
- Models: 1) Random forest, 2) Stepwise regression
- Metric~AGB model trained on 2005 metrics + 2004/6 field data
- Model output resolution: 14m pixel, equivalent area to 7.3m radial plot

RESULTS

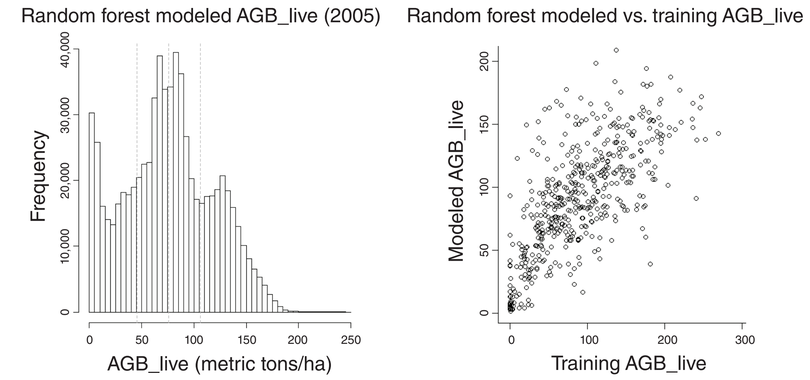
Model Training



Models trained on 2005 metrics and field AGB; applied to 2005 & 2012 metrics

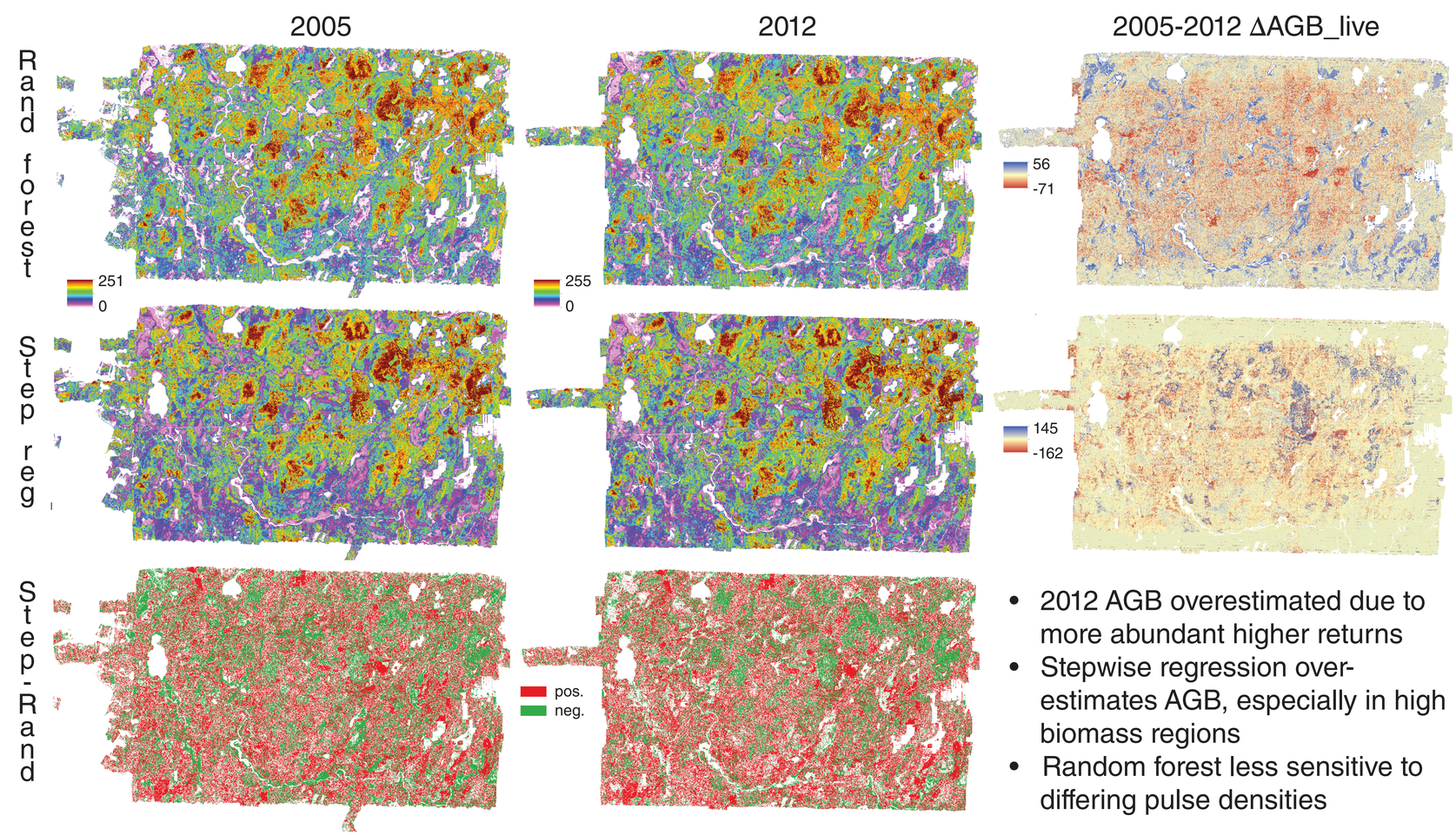
- Random forest: 48% explained variance
- Stepwise regression: 57% explained variance

Model Output



- Significant predictors: 70th percentile, mean percentile, 80th perceile return heights

Modeled Aboveground Biomass



- 2012 AGB overestimated due to more abundant higher returns
- Stepwise regression over-estimates AGB, especially in high biomass regions
- Random forest less sensitive to differing pulse densities

FUTURE WORK

- Decimate 2012 lidar data to constant pulse density at 15th percentile of 2005 pulse density
- Evaluate influence of pulse density variability on metrics

ACKNOWLEDGEMENTS

- This research carried out under the NASA Postdoctoral Program, administered by Oak Ridge Associated Universities.