|  |
| --- |
| **The influence of reference source on tree canopy cover mapping and post-stratified estimation of forest structure in Colorado** |
| Remotely sensed fractional tree canopy cover has proven useful in a wide range of environmental applications, including carbon monitoring. For example, the US Forest Inventory and Analysis (FIA) program uses the Tree Canopy Cover product from the National Land Cover Database for post-stratified estimation of aboveground biomass and other forest structure attributes at county, state, and national levels. However, generation and validation of canopy cover maps across broad spatiotemporal extents is challenging due to the limited availability of consistent reference measurements. Using new canopy cover references sources and combining different reference sources could provide greater spatiotemporal coverage to support map generation, but the disparate measurement approaches between reference sources may affect their suitability for combination and their individual effectiveness in particular applications. We tested the use of multiple reference sources alone and in select combinations for generating annual wall-to-wall canopy cover maps using temporally fitted Landsat time series processed with the LandTrendr algorithm. These reference sources include aerial photo-interpretation with a dot-grid, field line transects, estimates based on stem-to-crown allometry, and spaceborne and airborne lidar. The maps derived from each data source or combination were compared by their Landsat model accuracy and their accuracy according to airborne lidar maps of canopy cover. Each of the canopy cover maps were then used for stratifying FIA plots in post-stratified estimation of county- and state-level forest aboveground biomass. Initial results show that Landsat-based models of the canopy cover sources have similar accuracy when considering the full range of canopy cover (airborne lidar RMSE=9.2% to spaceborne lidar RMSE=13.3%), which is in part because of zero-inflation across all datasets. When considering only forest areas (i.e., canopy cover ≥10%), the range in Landsat model accuracy was much wider (stem-allometry method RMSE = 12.8%; spaceborne lidar RMSE=23%). Airborne lidar and stem-mapped estimates were similar where coincident (r=0.86), and combining these datasets slightly improved Landsat model accuracy (overall RMSE=9.0%; forest RMSE= 12.3%). All analyses were conducted in Colorado forests, where we further explored accuracy and biases across forest types and cover levels. Understanding which reference sources could be complimentary and which have the strongest relationship with Landsat imagery provides insights for improving broad-scale mapping of tree canopy cover and its influence on subsequent forest structure estimation and carbon monitoring. |