Title: Estimating urban tree carbon storage using LiDAR and field measurement – Qiuyan Yu

Abstract:
As a hotspot of human–environment interaction, urban trees are an important component of local and global carbon cycle. Accurate and efficient mapping and estimating of urban tree carbon storage can help us better understand the role of urban trees in mitigating local urban heat islands and global warming. Given the highly complex and fragmented landscapes and restricted accessibility in urban environment, studies in urban tree carbon storage mapping are limited and are greatly lagging behind similar studies in natural environments. In this context, the aim of this study is to better map urban tree aboveground carbon storage, and evaluate the impacts of different land use/ land cover (LULC) classes on mapping accuracies in the City of Tampa, Florida, USA. Our study used digital surface model (DSM) derived from aerial LiDAR (1-m spatial resolution), field inventory data (diameter at breast height (DBH), and tree species) of 111 plots (0.1 acre each), and i-Tree derived tree aboveground carbon storage. We linked a series of height-related metrics within plots (i.e., lowest top of canopy height (TCH), highest TCH, mean TCH, and standard deviation of TCH) to their basal area (BA) and found that the mean TCH could best predict BA (R^2=0.51). We then used predicted BA and other height-related metrics (besides mean TCH) to construct the optimum plot-aggregate allometric model through stepwise regression analysis. The optimum allometric model, consisting of predicted BA, lowest TCH, and standard deviation of TCH, could predict aboveground carbon storage with a R^2 of 0.60. But its predicting capacity varies with LULC background and species composition. This paper illustrates the potential of using LiDAR to accurately and reliably estimate urban tree aboveground carbon storage and the need to involve other variables such as LULC.