**Mapping canopy heights by fusing optical, radar, and GEDI data in the Kruger National Park, South Africa**

Accurately mapping the canopy heights of savanna ecosystems is crucial for global biomass estimation, carbon cycling, and biodiversity. The emergence of spaceborne light detection and ranging (lidar) has shown great potential in wall-to-wall mapping the canopy height for sparse savanna ecosystems with its implicitly contained 3-D structural information. This research presents a successful development of a random-forest-based mapping method for savanna canopy heights. The method is based on various features, such as vegetation indices, texture information, and time-series features obtained from both passive (i.e., Sentinel-2 and Planet) and active (i.e., Sentinel-1, PALSAR, and GEDI) remotely sensed data in the Kruger National Park, South Africa. In addition, we distinguished between tree canopies and grass or shrubs using a tree-grass separation index. We also examined how topography, canopy cover, and land cover affect the predicted canopy heights in our study area. The study demonstrated that GEDI-based canopy heights can accurately capture the heterogeneous spatial distribution pattern in the horizontal dimension and effectively predict variations in canopy height model-based results in the vertical dimension (Pearson's r=0.682, RMSE=3.573m). The predicted canopy heights are significantly affected by topographic variations, while canopy cover variations have limited effects on the predictions. This work showcases the mapping of savanna canopy heights using GEDI and lays a foundation for future research on estimating aboveground biomass and characterizing biodiversity in regional or global scales.