



## A new drone laser scanning benchmark dataset for characterization of single-tree and forest biophysical properties

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Survey-grade drone laser scanners suitable for unmanned aerial vehicles (UAV-LS) allow the efficient collection of finely detailed three-dimensional information of tree structures. This data type allows forests to be resolved into discrete individual trees and has shown promising results in providing accurate in-situ observations of key forestry variables. New and improved approaches for analyzing UAV-LS point clouds have to be developed to transform the vast amounts of data from UAV-LS into actionable insights and decision support. Many different studies have explored various methods for automating single tree detection, segmentation, parsing into different tree components, and measurement of biophysical variables (e.g., diameter at breast height). Despite the considerable efforts dedicated to developing automated ways to process UAV-LS data into useful data, current methods tend to be tailored to small datasets, and it remains challenging to evaluate the performance of different algorithms based on a consistent validation dataset. To fill this knowledge gap and to further advance our ability to measure forests from UAV-LS data, we present a new benchmarking dataset. This data is composed of manually labelled UAV-LS data acquired a number of continents and biomes which span tropical to boreal forests. The UAV-LS data was collected exclusively used survey-grade sensors such as the Riegl VUX and mini-VUX series which are characterized by a point density in the range 1 – 10 k points m<sup>2</sup>. Currently, such data represent the state-of-the-art in aerial laser scanning data. The benchmark data consists of a library of single-tree point clouds, aggregated to sample plots, with each point classified as either stem, branch, or leaves. With the objective of releasing such a benchmark dataset as a public asset, in the future, researchers will be able to leverage such pre-existing labelled trees for developing new methods to measure forests from UAV-LS data. The availability of benchmarking datasets represents an important driver for enabling the development of robust and accurate methods. Such a benchmarking dataset will also be important for a consistent comparison of

existing or future algorithms which will guide future method development.