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USE OF ALS DATA TO ESTIMATE STAND-LEVEL STRUCTURAL VARIABLES IN ALEPPO PINE FOREST

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ABSTRACT:

Light Detection and Ranging (LiDAR) has been successfully used to describe a wide range of forest metrics from local to regional scales. However, little research has focused on the use of this technology to derive key stand characteristics using low point density Airborne Laser Scanner (ALS) data in *Pinus halepensis* Mill. forest. Thus, the objective of this research was to develop models of Aleppo pine mean height, basal area, timber volume, density and aboveground biomass at stand level from ALS point clouds and fieldwork information in an area located in northeastern Spain.
ALS data was acquired by the National Plan for Aerial Orthophotography (PNOA) for the entire Spanish territory with a nominal point density of 0.5 points/m^2. Thirty LAS archives (2 km x 2 km), covering the study area, were filtered with the multiscale curvature classification (MCC v.2.1 command-line tool) and processed with FUSION v. 3.30 software. Stand metrics were obtained within 44 plots, 30 m in diameter, randomly selected across the study area. A multiple regression analysis was performed for each of the dasometric variable and a leave-one-out cross-validation (LOOCV) was conducted.
The selected models for mean height, basal area, timber volume, density and aboveground biomass had R^2 values of 0.84, 0.79, 0.88, 0.46 and 0.90, respectively, and the ALS-derived variables with the greatest contribution to these models (with the partial R^2 in brackets) were the maximum elevation (0.84), skewness (-0.70), 95th height percentile (0.85), percentage of first returns above 1 m (0.47), and 60th height percentile (0.77), respectively.
The use of ALS data captured at national level on forest management involves a research challenge. In this sense, despite of the low point density of the data, with the exception of stand density, the final models were sufficiently precise to be used in forestry operations.

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