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Modelli di stima del volume e delle fitomasse del soprassuolo arboreo delle principali formazioni forestali della Calabria mediante dati LiDAR

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Abstract: *Models of stand volume and biomass estimation based on LiDAR data for the main forest types in Calabria (southern Italy).* The AlForLab project is part of the Cluster MEA (Materials Energy Environment) addressed to the Calabria Region. Estimating the main dendrometric variables of Calabrian forests using models based on publicly available remote sensed data is one of the main purposes of the project. This paper describes the procedures used to develop several thematic maps (raster and vector) of timber volume and phytomass to be used in planning and management activities at both regional and forest property scale, as well as for felling plans, logging projects etc. We used public LiDAR data at medium-low resolution (1.6 pts m^{-2}), acquired on about 90% of Calabrian territory in the frame of a national remote sensing programme of the Italian Ministry of the Environment. Field data from the second National Forest Inventory (INFC 2005) on 311 sample points were used for model calibration, as well as new field data acquired specifically for AlForLab project on 143 angle count samples. A series of regression models to predict volume and its corresponding aboveground biomass (dry and fresh weight) were developed and digital maps at different spatial resolutions were produced, as well as their estimate uncertainties. These models and their mapping products are also an important part of the new-establishing forest Decision Support System CFOR. The adopted models, though based on the same mathematical equation, have specific coefficients for different species and groups of species, according to a forest type classification system compatible with the fourth level of Corine Land Cover. In this way it is possible to apply the models without accessing more detailed forest type maps. All estimation methods and procedures are consistent with national forest inventory models, and with the other new tools proposed by AlForLab project to estimate timber volume, such as the regional tariffs and the field sampling inventory procedures. R^2 adjusted values (for models at the highest typological detail) are between 60% and 85%, whereas uncertainties of timber volume estimate (ESS%) range from 25% (for main forest species) up to 50% (for less spread forest types). All processing steps to produce digital maps were performed on open-source environment (R and QGIS).

Keywords: ALS, LiDAR, Timber Volume, Forest Biomass, Estimation Models, CHM, AlForLab