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LIDAR Data Acquisition and Processing for assessing critical fuel parameters: the case study of Bosco dell'Incoronata in the Puglia Region

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In the last decades, the abandonment of rural areas has caused an increasing accumulation of fuels (the organic matter available for ignition and combustion) which is considered very critical for the whole Mediterranean Basin because fire ignition and propagation depend strongly on the availability and structure of wild land fuels. Detailed information on fuel properties (e.g. fuel load, spatial arrangement, structure, status etc.) and fuel distribution are essential for supporting (i) fuel management, (ii) fire behaviour prediction (iii) real-time fire suppression tactics and (iv) logistics decisions.

Airborne full-waveform laser scanning (ALS) is a potential tool for accurately and effectively assessing critical fuel parameters (including canopy bulk density, canopy height, canopy fuel weight, and canopy base height) over forest areas. The LIDAR is an active high resolution technology capable to provide accurate three dimensional forest structure measurements.

The aim of this paper is to develop the use of lidar (LIght Detection and Ranging) remote sensing for accurately and effectively assessing fuel critical parameters in a natural protected area (Bosco dell'Incoronata) located in the Apulia Region (Southern Italy). Lidar data acquisition was carried out on April 2008 for both Bosco dell'Incoronata and surrounding areas. An integrated approach was used to identify and characterize critical fuel parameters using a combination of lidar height bins and ortophotos. Estimates of fuel properties were compared with in-situ data collected at the same time (more or less) as the LIDAR data acquisition.

Specific goals of our analysis include: (1) developing lidar derived products and the methodology to use them for assessing critical fuel parameters, and (2) producing spatially explicit digital fuel maps.

The obtained results pointed out that LIDAR-based fuel properties and prediction models can be fruitfully used for mapping critical fuel parameters (including canopy bulk density, canopy height, canopy fuel weight, and canopy base height) over extensive forest areas.