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Remote sensing application for deadwood identification and characterisation.

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Only in the last decades deadwood has been recognised as a key factor for many processes occurring within forest ecosystems. Among these, it is worth to remember functions such as providing habitat for many taxa of forest dwelling species, the facilitation of seedlings' establishment and soil carbon sequestration and nutrient cycling. However, deadwood can play also the opposite role, mainly when favouring the spread of fire or pests within the forest stand or simply as an obstacle to silvicultural operations. From a forest management perspective, it is important to balance these different aspects in order to guarantee the sustainability of the ecosystem and its correct exploitation in the long period.
Large scale monitoring programs that can provide reliable information on the amount and spatial arrangement of deadwood in forest stands, are thus essential for an adequate resource planning.
New technologies are currently available and start to be widely used in forest inventorying and planning.
Several Aerial Laser Scanning (ALS) and Terrestrial Laser Scanning (TLS) techniques in contrast to the traditional aerial imagery, recently supported on smaller scales by the one coming from Unmanned Aerial Vehicles (UAV), have been applied with different purposes in forestry (e.g. growing stock estimation, habitat assessment, forest fuel maps). Nevertheless, a single technology cannot fit all the purposes and, for this reason, the data fusion has become more and more used.
In this contribution we reviewed the state of the art of research dealing with remote sensing application on deadwood assessment in forests, presenting three case studies using different sensors and platforms in order to define different deadwood attributes. The specific goals were: 1) to identify and characterise standing dead trees within managed stands (high density ALS data + aerial imagery); 2) to evaluate the presence and role of lying deadwood on natural regeneration after a high intensity fire event (low density ALS data + UAV imagery); 3) to evaluate the three-dimensional distribution of forest fuels for fire prevention (TLS). All these experiments have been carried out in montane conifer dominated stands.