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Using high-resolution LiDAR data for the assessment of ice-storm forest damages.

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Natural disturbances act as a driver in forest communities at different scales shaping both structure and species composition. In a climate change perspective, disturbances are meant to increase both in frequency and in severity, highlighting the necessity for forest managers of quick decision-making for adequate resource planning. Among the recent extreme events in the Alps, the ice-storm that took place during the late winter 2014 was noticeable for its extension, affecting three Countries, one of which got damaged for more than 50% of its forest cover. In the last decades, the use LiDAR technology proved the capability of providing reliable information on forest structure at a landscape scale. A procedure was developed for the assessment and quantification of ice storm damages on stands of three typical Alpine species: Norway spruce (Picea abies Karst.), silver fir (Abies alba Mill.) and European beech (Fagus sylvatica L.). The approach was tested at three different point densities in order to take advantage of the extremely high-resolution of the original point cloud (200 pts/m2) and then to assess the feasibility of a possible wider application to commonly available datasets (i.e. 5 and 10 pts/m2). A direct comparison between measured and derived stand structural parameters did not show satisfactory correlations, while analysing the differences between pre- and post- event in terms of basal area and volume showed the potential of LiDAR in correctly identifying variations of the single parameters. Furthermore, the use of the Leaf Area Density index (Bouvier et al., 2015) showed the possibility of identifying the damage across the vertical profile of the stand and describing how each species was affected. On a wider perspective, this methodology applied to multi-temporal LiDAR scans may allow for rapid assessment of damage intensity and typology over landscapes and future regeneration dynamics.