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Airborne Laser Scanning as an effective tool for disaster mapping over mountainous forested landscapes

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The emergence of airborne laser scanning (ALS), initially as a research tool and in the last decade as a commercial capability has provided a powerful means to characterize the natural features and man-made structures within mountainous forested landscapes. ALS is capable of delivering very dense point clouds of a landscape in a relatively short time. Furthermore, ALS is able to operate during the night and highly accurate because of laser ranging accuracy and precise sensor platform supported by an integrated position and orientation system. The capability of ALS to obtain both ground and non-ground points leads to produce a high-quality digital terrain model and to retrieve detailed information from non-ground points (e.g. vegetation, building).

Rapid mapping over spatial scales is one of the essential aspects for emergency response in dealing with hazard and risk assessment in mountainous environment. To date, many national agencies, private industries and research institutes utilize products derived from ALS data for disaster management. In order for the data to be effectively use by the end-users or decision-makers, a number of consideration at pre, during and post ALS data acquisition stages are required.

This paper provides recommendations at planning stages, measurement phases, point cloud processing and products derivation throughout ALS data acquisition over rugged forested terrain based on Bois Noir catchment dataset in Barcelonnette, France. This catchment is highly affected by landslide hazards and located within climatic, lithological and geomorphological condition of the Southern French Alps. Airborne laser scanning data over the 100-years old forest in Bois Noir catchment was captured in July 2009 using a RIEGL laser scanner mounted on a helicopter.

Airborne laser scanning differs in terms of typical project size, measurement techniques, scanning mechanism, positional accuracy and resolution of derived-products. Selection of laser sensor, number of satellite positioning systems and specification of inertial measurement unit plays important role in generating high-quality data and significantly influence the cost of data acquisition. A considerable amount of semi (automatic) processing is required to extract semantically meaningful information from the ALS point cloud. Besides that, management of ALS data, with respect to ALS data format and data delivery was employed during this project. Visualization techniques for both original point clouds and images-derived over mountainous forested landscapes are presented here.

Our aims are to stress important aspects related to ALS data acquisition and processing stages, with emphasis on utilizing rapid high-resolution topographic data at reasonable cost in context of disaster management. In addition, they can provide a guideline to a larger number of users from multi-disciplinary fields, in which we believe, should be part of risk management and prevention policies.