



The use of Remotely Piloted Aircraft System (RPAS) for geological monitoring and mapping in mountain area: test and results

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Geological mapping is an interpretive process involving multiple types of information, from analytical data to subjective observations, collected and synthesized by a researcher. With field experience, geologists generally develop effective personal styles of relatively efficient mapping. Each geologic map, regardless of scale, requires a certain level of field mapping, where data are recorded on a topographic map and on aerial images, with notes in a field book. Traditionally, geological elements are hand-transferred to a cartography, on which the final map is prepared for publication using known cartographic techniques.

Cartography and topographic support are traditionally produced with aerial photogrammetry method, but nowadays, the coming of the Remotely Piloted Aircraft System (RPAS) or so called UAV (Unmanned Aerial Vehicle) can help the geologist to produce similar support, but reducing cost, increasing the productivity, to have a more flexible system and more.

In this case, the commercial fixed-wing system EBEE has been tested by producing a dense digital surface model (DDSM) of the bedrock, Quaternary sediments and landforms in a sector of the alpine Rodoretto Valley, a tributary of the Germanasca Valley (northwestern Italy).

The Germanasca Valley is located along the north-south tectonic thrust between the Dora Maira Massif, which outcrops on the valley's right side and the Greenstone and Schist Complex visible on the left side.

These nappe systems include the Penninic Domain (Lower, Medium and Upper Penninic units) and the Piedmont Zone. The landforms and surficial sediments in this valley have resulted from the combine effects of the Quaternary alpine glacial phases and deep-seated gravitative slope deformations.

In the area of investigation only monotonous calcshists of the Greenstone and Schist Complex (GS) occur, with a regional foliation dipping 20-30° to N30E and the examined area is located between 2500 m and 1760 m. The area appears elongated in a WNW-ESE direction which is almost normal to the axis of the Rodoretto Valley. It includes the extension about 10 Km².

The EBEE system allows to acquire RGB digital images following a pre-defined flight plan, as a traditional aerial photogrammetric acquisition. After the data acquisition, it is possible to generate several photogrammetric products as DSM, orthophotos and the solid image. This last is an innovative product created by the Politecnico di Torino, which allows to realize in a friendly way to plotting and to produce a map.

The Authors have used the photogrammetric products generated by the RPAS acquisition, in order to generate the geological mapping and that allows a better knowledge of the geodynamic significance about the investigated area but also to facilitating the geologist work.

In this paper will be described the procedure and methodology used in the case study to produce the DSM and orthophoto adopted to realize the geological analysis, which have been compared to the numerous already existing structural geological investigation realized with traditional approach.

Advantages and disadvantages of the use of RPAS will be described, in particular the possible applications in geological field will be analyzed.