



Multi-temporal image analysis for river reach morphological changes identification

Daniele Giordan (1), Luca Franzi (2), Stefano Rinaldi (2), Furio Dutto (3), Marco Baldo (1), and Paolo Allasia (1)
(1) CNR IRPI, Torino, Italy (daniele.giordan@irpi.cnr.it), (2) Regione Piemonte, Italy, (3) Servizio di Protezione Civile, Città Metropolitana di Torino, Italy

The study of river reach evolution can be very important for the definition of the level of risk of building and infrastructures that are located nearby. Usually, these studies are based on the use of aerial photos and/or LiDAR surveys that could be analyzed for the definition of the river reach boundaries and their evolution over the time. In the past, the typical approach was the use of aerial photo for the identification of main morphological elements of the river and the definition of their changes over the time. LiDAR systems introduced an important add value related to the possibility to acquire also a DTM of the studied area and not only an orthophoto. The comparison of DTMs acquired in different periods can be useful for the identification of the changes in altimetry that can be a very important element for the comprehension of the morphological evolution of the studied area.

When a river reach is characterized by a frequent changes in time, a detailed investigation needs frequent surveys and mapping. In this frame the recourse to frequent use of LiDAR could be very expensive, and therefore other cheaper solutions can be preferable. The use of RPAS system can be considered a good means for the acquisition of orthophoto and digital surface models, especially for limited portions of river reaches and for the most active sectors. The high resolution of the orthophoto and the DSM are two important products that can be used for the identification and the measurement of main morphological changer of a river reach.

The combination of aerial photos, LiDAR surveys and RPAS acquisition has been tested on the Orco River, Piemonte region (NW Italy). Orco is a gravel multichannel river with several sectors characterized by a strong inclination to the wandering of the main channel. One of the most critical sector is located not far from the confluence with Po River, where the wandering of the main channel changed the direction of the main flux of the water that now risks to threatening the hamlet of Pratoregio.

In 2007 the public administration (Regione Piemonte) financed the LiDAR survey on the Orco river, in collaboration with the Politecnico of Turin and the CNR-IRPI. Now, a RPAS survey of the reach nearby Pratoregio has been used to map the recent altimetric and planimetric evolution of the river, where the flood control works have been damaged by strong lateral river erosion. The RPAS dataset has been very useful to map the new shape of the river's channels to measure the volumetric changes of the river lateral bars and to obtain an updated 3D model useful for hydraulic numerical simulations. The aim of the survey is the identification of the best engineering solution to manage the river and to protect the endangered areas. The availability of LiDAR and RPAS DSM has been also used to evaluate the accuracy of RPAS DSM and its limitations.