**Integration of different remote sensing techniques for detecting, mapping and monitoring glacier lakes in the Western Italian Alps**

*Paper 1438 - Session title: Cryosphere Posters*

**Integration of different remote sensing techniques for detecting, mapping and monitoring glacier lakes in the Western Italian Alps**

Viani, Cristina (1); Giardino, Marco (1); Huggel, Christian (2); Perotti, Luigi (1) *1: University of Torino, Italy; 2: University of Zurich, Switzerland*

The progressive retreat of glaciers causes important environmental changes in high mountain regions. The appearance of new glacier lakes is one of the most evident effects in recently deglaciated areas: their formation and evolution is strongly dependent on dynamics of glacial masses.
The Italian Alps, as other mountain regions of the world, are deeply experiencing these changes. It is important to improve the knowledge on the phenomenon and to monitor the present-day situation in such a densely populated region where glaciers and lakes are fundamental both for human and natural systems.
At the present-day, having an updated overview of the presence of glacier lakes at the regional scale has become a need for several reasons. In fact, glacier lakes represent important elements for mountain landscape and ecosystem; they are an economic resource (as water reservoir, for tourism and for the production of hydroelectricity); moreover, they can play as risk factors for enabling Glacier Lake Outburst Flood (GLOF).
The present study aims to produce an updated inventory of glacier lakes in the Western Italian Alps (Piemonte and Aosta Valley) and to reconstruct the evolutionary stages of some selected case studies starting from the end of the Little Ice Age (mid-XIX century) until now.
A first large scale overview and a preliminary inventory have been carried out by manual detection and on screen digitizing in a GIS environment using the most recent aerial orthophotos (2012): about 260 lakes and water ponds were identified within the Little Ice Age glaciers extent boundaries.
In order to get fast updates of the inventory (present-day situation) we are applying different semi-automatic methods for discriminating between water and other surface types (e.g. combination of simple bands ratio, NDWI) on multispectral satellite images (Landsat 8, Sentinel-2 and ASTER). The validation will be done comparing results obtained by the semi-automatic classification of satellite imagery taken in 2012 with those obtained by the orthophotos analysis.
The later stage of the research is devoted to detailed mapping of glaciers and related glacier lakes and to their characterization in term of geographical and geomorphological properties.
Multitemporal analysis is in progress on some selected case studies (e.g. Rutor lakes in Aosta Valley and Northern Locce Lake in Piemonte). The purpose is to reconstruct the evolutionary stages of glacier-glacier lake systems (such as glacier maximum extent, appearance of the lake, further enlargement and/or disappearance of the lake), starting from the end of the Little Ice Age until now.
For covering the entire period, an integration of different data is required: historical maps published since the mid-XIX century, aerial photographs available since the 1954 (first Italian national flight) and optical satellite images.
Furthermore, the future evolution of these glacier-glacier lake systems will be monitored using high-resolution satellite images from the Sentinel-2. In-situ GPS measurements (proglacial lake boundary) taken during summer 2015 at the Rutor Glacier will be used to validate the results obtained by the analysis of satellite imagery.
Interpretation of whole data complex will offer better understanding of the dynamics between glaciers and related glacier lakes. Results of considerable significance for the assessment of future development of dynamic mountain environment.