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Glacial Outburst flood risk assessment on the Chérillon Glacier (Valtournenche, Aosta Valley, Italy)

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An anomaly in the regular hydrology of the Chérillon Glacier (Aosta Valley –Italy) was reported to local authorities on the 24th of July 2017, describing the sudden disappearing of a glacial stream on the 23rd of July 2017. Investigation about the phenomena was needed to detect individuate the water retention inside or under the glacier that originated the glacial stream (Torrente Fossu), now dried. An eventual sudden increase in water run-off would flow, via the Torrente Fossu, through the densely populated area of Breuil-Cervinia: a first field survey was immediately carried out in order to observe in-situ conditions and eventual morphological evidences. No surface evidence of glacial collapse or water pocket formation was reported, but further investigations had to be planned to assess the presence of water pockets beneath the glacier surface.
A first field survey was performed by collecting Ground Penetrating Radar (GPR) data along several profiles that covered all the North-East part of the glacier; this is the part of the glacier from which water would potentially flow towards the stream. The resulting radargrams detected a subglacial cavity with an estimated volume of some thousands of cubic meters; an accurate analysis of the cavity volume was not possible. The low temperatures of the period, well below the July average, made it impossible to carry out a dye tracing experiment that had been planned.
A second field survey took place later in the season and consisted of a second GPR survey restricted to the area where the cavity was detected. The latter radargrams better defined the area and volume occupied by the subglacial cavity, which was subsequently better estimated in about 6,000 – 8,000 cubic meters. A first airborne GPR survey has been carried out using an experimental set–up mounted on a gyro-copter, in order to easily survey the area in case of water pocket volume increase.
Interesting features were observed in the radargrams that highlighted different structures of the accumulation area of the glacier: firn layers, buried by recent snowfall were clearly visible and could be georeferenced with good agreement with Sentinel Satellite imagery that evidenced the limits of the firn accumulation before the snowfall. Furthermore, gravitational accumulation could be located in the higher part of the basin.
Futher surveys will take place in 2018 to verify water level in the sub-glacial lake during the snow melt season, together with dye tracing experiments and repeated geophysical survey to asses an eventual volume increase of the sub-glacial cavity.