Monitoring the climate change in the critical zone, Monte Rosa massif (Western Alps, Italy)

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INTRODUCTION

Ongoing climate change is accelerating especially in high-elevation areas, which are showing the fastest warming rates on Earth. High-mountain territories, like the European Alps, are thus experiencing important environmental changes. In turn, these control complex abiotic and biotic interactions exerting a dynamic control on the alpine landscape. Finally, these changes can have strong impacts on the critical zone processes, functions, and ecosystem services.

STUDY AREA

The study area is located in the high elevated areas of the Monte Rosa Massif (above 3000 m a.s.l.) within the municipalities of Alagna Valsesia and Gressoney-la-Trinitè. The territory is of high value from environmental, cultural, scientific and touristic point of view.

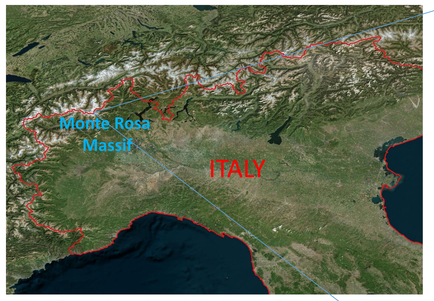

Fig. 1. Location of the Monte Rosa Massif with respect to the Alps and Italy

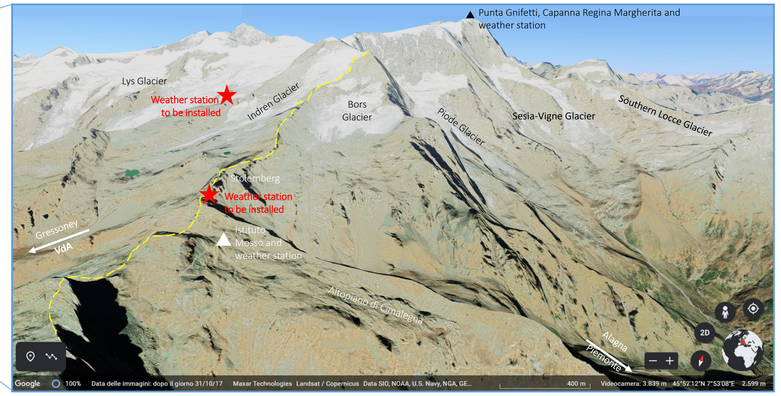

Fig. 2. 3D view of the Monte Rosa Massif

OBJECTIVES

- Installing new weather stations to fill the elevation gap of the present network in the area;
- better monitoring the climate change within the Monte Rosa massif, in particular the variation in air temperature and solid/liquid precipitation;
- making freely available the obtained data.

LABORATORY OF ALPINE CLIMATOLOGY – LCA

By accessing the website https://www.labclimaalpino.it/ it is possible to see real time data and to request the data acquired by the weather stations for specific time period at daily resolution.

Laboratorio Climatologia Alpina

Fig. 6. The LCA website with real time data of the weather stations.

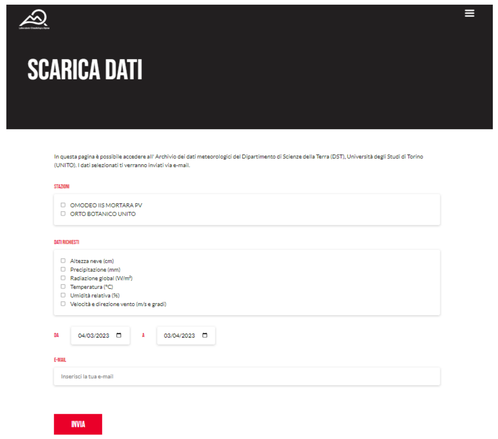

Fig. 7. Online form for data request (English version will be implemented soon).

ONGOING CLIMATE CHANGE AND ENVIRONMENTAL EFFECTS

Climate change is impacting in the area by an increase in air temperature and implications in the amount, spatial and temporal distribution of solid precipitation.
Glaciers are showing high shrinkage rates with major impacts on water supply for adjacent lowlands, hydropower production and tourism.

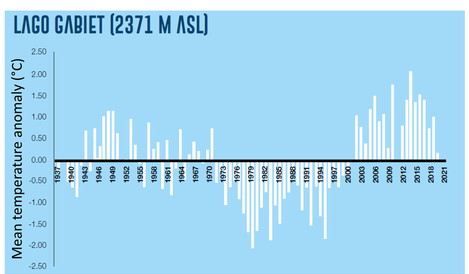

Fig. 3. Mean temperature anomaly as recorde by the existing weather station located near the study area from 1971 to 2021 (Report Legambiente and CGI. Carovana dei Ghiacciai 2022).

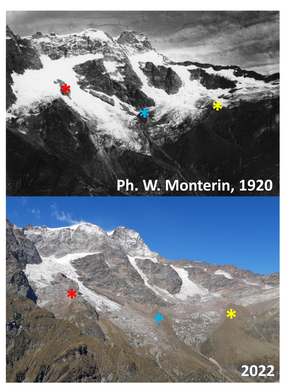

Fig 4. Photographic comparison of glaciers of Sesia Valley.

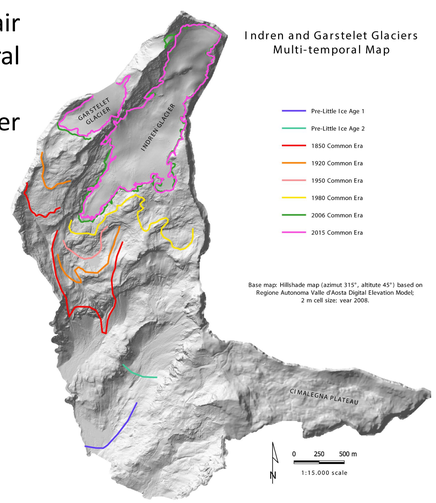

Fig 5. Multitemporal map of Indren and Garstelet glaciers (Tognetto et al., 2021. https://doi.org/10.1080/17445647.2021.1898484)

WEATHER STATION TO BE INSTALLED

Instruments:
- thermohygrometer;
- barometer;
- wind anemometer;
- heated tipping bucket rain gauge;
- nivometer.

Fig. 8. Location and scheme of the weather station

EXPECTED RESULTS AND FUTURE PERSPECTIVE

The research is expected to contribute to the knowledge of the dynamics taking place in the critical zone. The team is involved in the PNRR NODES (Nord Ovest Digitale E Sostenibile) Project and will implement the network by additional weather stations equipped with innovative sensors for Snow Water Equivalent evaluation.