

## VAL VIOLA BORMINA

We are in Val Viola, where the landscape is very reminiscent of Iceland, both for the glaciers and pastures that dominate the landscape and for the frequent and more abundant precipitation compared to the average conditions of the upper valley!

The glacierized sector of Val Viola is located at the head of Val Viola Bormina and is better known as Val Dosdè and Val Cantone di Dosdè.

In this area, extending between 2000 and 3300 m of altitude, lie the glaciers of Piazzi group (with the exception of Cima de Piazzi glacier), which feed with their melt water the dense network of streams crossing the pasture and forest areas below.

The glaciers of the Val Viola Bormina are all mountain glaciers, i.e. they do not flow into a tongue (except for eastern Dosdè, the largest, which still has one) and are currently in an intense phase of regression following the current climate warming. These glaciers retreated by 50% from 1954 to 2007 and their volume decreased by 30% from 1981 to 2007. This areal and volumetric loss is also testified by the recent moraine amphitheatres perfectly preserved in the proglacial areas of many of the glaciers of the group.

Although the average size of the glaciers is limited (only the eastern Dosdè glacier reaches an area of almost 1 km<sup>2</sup>), the glacial and especially supraglacial morphologies are well expressed and exemplary of forms otherwise present only on larger glaciers. In fact, we can observe glacier tables, epiglacial streams, ice cones, median moraines, and cryoconite deposits.

Val Viola is not only an area of great interest thanks to glaciers and the landscape that they have shaped over time, but it is also a real open-air scientific laboratory!

The first Italian experiments were conducted on Eastern Dosdè in 2008 to evaluate the effectiveness and applicability of artificial cover (called geotextiles) to reduce the summer melting of snow and ice. This study showed that the melting of snow when protected with a geotextile is up to 60% lower, an interesting result for all those situations in which snow and ice must be preserved (such as on glaciers used for summer skiing). Further still, eastern Dosdè was monitored with an automatic supraglacial weather station for ten years (from 2007 to 2017) and since 2009 a second automatic weather station has been running in the area in front of the Federico Valgoi Refuge, in Val Dosdè. By means of these two stations, it was possible to investigate high altitude and supraglacial meteorological conditions, fundamental information to evaluate the effects of the present climate change and to model the melting of snow and ice.

If you pay attention, along the path in Val Dosdè it is also possible to observe, under the bridge crossing from the right to the left side of the valley, an hydrometer, an instrument for measuring the quantity of water carried by the stream fed by the meltwater of Val Dosdè and Val Cantone di Dosdè glaciers. The hydrometer has been in operation since summer 2009 and together with the weather stations makes the valley a real open air laboratory. The data collected are essential to better understand and quantify the impacts of climate change on Lombardy and the Italian Alps.