

The extraordinary 2017-2018 winter season in Aosta Valley – AO (IT)

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rique 33, 11020 Quart (AO), Italy.*

ABSTRACT: In this work we will focus in particular on the exceptional avalanche events that occurred in January. The start of the winter season was not promising, still no snow in November. Finally a strong storm brought one meter of fresh snow on the whole Region on the 10th of December. The rising spontaneous avalanche activity forced the local avalanche commissions to take the first preventive closure measures for the valley's road systems. But it's in January that winter got exceptional for snowfalls and avalanches events. A series of storms brought much snow in the first part of the month. Then other two meters of fresh snow fell from 7th to 9th of January with strong SE winds, mild temperatures and groupel snow for storm effects in some valleys. The avalanche danger degree rose to 5-very high in the Gran Paradiso valleys, Lys valley, Ayas and the upper Valtournenche. The valleys most affected by the strong avalanche activity after the great snowfalls were the Gran Paradiso valleys, in particular the valley of Cogne and Valsavarenche that were closed for several days. The avalanches reached exceptional sizes much larger than the historical limits, never seen by old people. In Cogne valley many avalanches reached the valley floor and the main road, the same happened in Valsavarenche where the events damaged the high voltage cables, brought boulders of hundreds of cubic meters on the regional road and damaged some infrastructures. The upper part of Valsavarenche was affected by a large avalanche that covered the regional road for several hundred meters with a 8 meters thick deposit leaving the last part of the road closed for about twenty days. In other valleys, avalanches also affected the road network and some had to be closed to traffic for several days. Other snowfalls affected the Region from the 17th of January after a short clear period characterized by a lot of surface hoar which caused many avalanches, either spontaneous or triggered. New heavy snowfalls occurred in the north part of the Region, in Valpelline, from the 21st to 23rd of January. Again many large avalanches reached the valley floor and the road network, closed in advance. Some events exceeded the known historical limits, some were not known at all and destroyed the electricity and telephone lines, one chalet and lapped some house.

KEYWORDS: danger avalanches, avalanches bulletin, surface hoar, spontaneous and triggered avalanche, avalanche cadastre.

1. INTRODUCTION

This article is a summary of the avalanche events that occurred in Aosta Valley (IT) during January 2018. Heavy snowfalls together with a particular layering of the snowpack brought to big and very big avalanches of historical importance, which seriously affected and damaged the road systems, several pastures and many infrastructures.

The 2017-2018 winter season was above the historical seasonal average for the amounts of fresh snow, the thickness of snow-cover and for the avalanches occurred. We'll focus on the the dynamics that led to very high danger and risks for several days and to an high instability of the snowpack.

2. THE AOSTA VALLEY

The Aosta Valley Region (Fig. 1) is located in the north-western part of Italy and borders with Switzerland and France. More than 60% of its territory is above 2000 m a.s.l. Several large and very large avalanches take place in the region, some of them represent new events never occurred before. The 17% of the regional territory is affected by avalanches as reported in the Regional Avalanche Cadastre.

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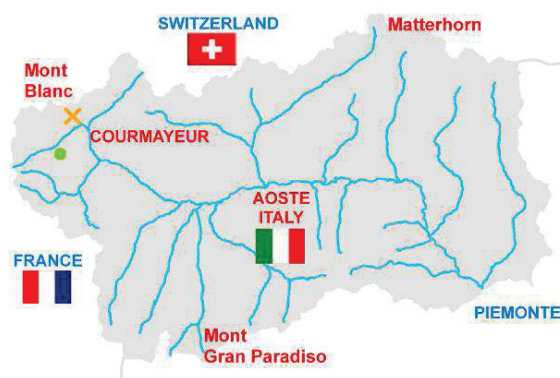


Figure 1. Map of The Aosta Valley – Italy.

3. THE EVENTS OF DECEMBER AND JANUARY 2017/18

The beginning of the 2017/8 winter season was bad in terms of snow: a very thin and patchy snowpack made of depth hoar and facets. Bad bottom layers that will give instability during the whole season.

A strong storm brought one meter of fresh snow on the whole Region on the 10th of December. Then other snowfalls occurred in December led to high spontaneous avalanche activity that in several cases reached the valley floor and the roads network forcing, in some cases, the Local Avalanche Commissions to close it for some days (fig.2).



Figure 2. A powder avalanche near Rhêmes Saint George on the 14th of December.

Many snowfalls, rise in temperature, rainfalls up to 1800 m, very strong winds and many big avalanches characterized the end of December and the beginning of January.

During the morning of January 4th, after the snowfalls intensity peak many avalanches, some big, reached the valley floor and in some cases affected roads and infrastructures (fig.3), either the powder cloud and the dense flow.



Figure 3. The Ayas valley on the 4th of January: the slab avalanche that damaged the Vascoccia cowshed (Photo: Jean Nicco).

From the 7th to the 9th of January the territory is still affected by a mild, wet and intense disturbance: 2 meters of fresh snow strongly reworked from south-east winds.

Below 1800 m the snow got rain and during the night of January 8th a thunderstorm with lightnings in the central part of the Region occurred. The avalanche bulletin reported the degree 5-very high in the valleys of the Gran Paradiso, Lys, Ayas and high Valtournenche, which were closed for several days. The magnitude of the avalanches events was so exceptional that locals could not remember.

On the 8th and 9th of January most of the large and medium-sized avalanches reported reached the infrastructures and the road network on the valley floor.

There were two different types of avalanches: wet snow slab avalanches that released below 2500 m a.s.l. and dry slab avalanches above 2500-2600 m a.s.l. mainly from the west and northwest slopes, the most overloaded by south-east strong winds.



Figure 4. The avalanche that reached the regional road before the village of Dejoz in Valsavarenche on January 9th.

It is very likely that the avalanche that damaged the northern side of the Frassati mountain hut (2556 m a.s.l. - Saint-Rhemy-en-Bosses, G.S.Bernardo Pass) occurred those days. But the avalanche that really got an exceptional magnitude released from the wide south-eastern slopes of Crête-de-l'Aouille (3100 m - Valsavaranche). The avalanche destroyed two high voltage pylons and damaged others (fig.4 e 5).



Figure 5. Exceptional avalanche that reached the regional road before the village of Pont in the upper Valsavarenche on January 8th. Great damages to high voltage power line and to the woods

The area affected by the powder cloud was 350 m long and 500 m wide.

The new snow consolidated pretty fast but the good weather and high percentage of humidity helped the formation of surface hoar (fig.6) in all the Region. Only over 2800 m a.s.l. it was swept away from the wind.

A very beautiful top layer to ski but very dangerous as the new widespread instability for the incoming snowfalls.



Figure 6. Very thick surface hoar.

From the 17th to 22nd of January several snowfalls and strong winds occurred in the whole Region, though the north-western area was the most affected.

The peaks of snowfall were reported along the border with France and Switzerland. The new snow, reworked from the wind, settled on the very thick buried surface hoar (fig.7) which brought to a great instability. The avalanche danger degree rose to 4-high for avalanche triggering and reported 'persistent weak layer' as typical avalanche situation.

Many triggered slabs (fig.8) reported in the "comfort zones", considered safe by off-piste skiers, such as lee slopes, the forest clearings and slopes not so steep: the ones where the surface hoar were not swept away from the wind. The instability was so high and the weak layer so thick and prone to triggering that the fracture propagations were really wide.



Figure 7. The buried surface hoar.

Conditions got worse from the 20th to 22nd of January: new great snowfalls especially in Valpelline (north center part of the Region) where 1 meter of new snow settled on the big amount of recent one and on the buried surface hoar.



Figure 8. Triggered slab. The slab releases on the buried surface hoar hidden by new wind drifted snow.

Several big avalanches occurred in Valpelline between the 22nd and the 23rd that largely exceeded the historical boundaries ever known. Those great events reached the road network, left some inhabited villages isolated, razed the electric and telephone lines, some chalets and touched some houses. The forests had the greatest damages. The avalanches release thickness, 70-150 cm, and fracture lines were incredibly big and wide as the Mont Riond avalanche (fig.9 and 10), whose release zone was 1300 m wide and 1100 m the total length of the slab (fig.11). The Mont Riond (2567 m) is in the north-middle part of the Region on the border with Suisse.

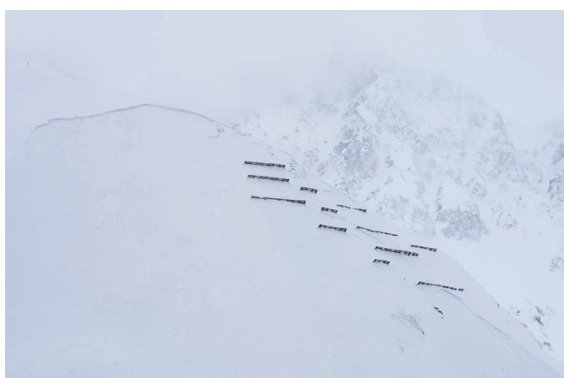


Figure 9. A part of the wide release zone of Mont Riond big slab (Municipality of Ollomont).



Figure 10. The big and dirty avalanche deposit of Mont Riond (Ollomont).

Fortunately only the forest was involved in this avalanche.

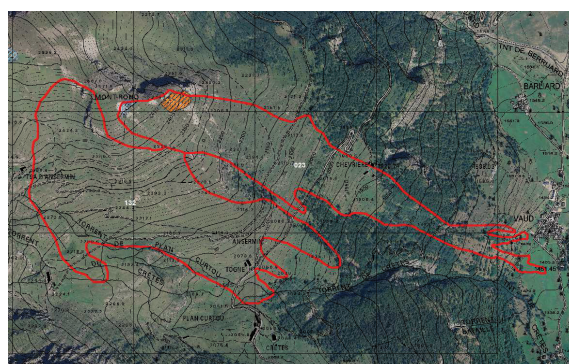


Figure 11. The avalanche area drawn in cartography with GIS.

The snowpack profiles and the stability tests done in the release area showed that the sliding plan was the buried surface hoar and, in the run-out zone, yellow melt and freeze crusts with saharian sand included.

Other big avalanches occurred in Valpelline (fig.12) in those days, with magnitude never seen in the last decades. Many of them overflowed on the regional road. Very big avalanches interested 12 km of the upper Valpelline and neither snow fences could prevent them: 1,5 to 2 m thick slabs released among snow fences.



Figure 12. The avalanche deposit is very close to the house. Oyace, Valpelline.

In the Mont Blanc area the situation is not so different, the snowpack is unstable either below 2500 m a.s.l. and above 3500 m a.s.l.

The avalanches that released above 3200 m a.s.l. were really impressive: the "Tronchey" (fig.13) and the "Torrent de Frebougé" avalanches descended on 22nd of January and left snow deposits so huge that are still not completely melted.



Figure 13. The Tronchey large avalanche in Val Ferret (Courmayeur).

9. CONCLUSION

The article presents a summary of the first part of the 2017-2018 avalanche season. A season that has been really intense and problematic since December, both for a correct assessment of the avalanche danger level, and for the management and reduction of the avalanche risk, a task carried out mainly by

the Local Avalanche Commissions in agreement with the Snow and Avalanches Office. Many factors such as heavy snowfall, mild and then rigid temperatures, southern wet perturbations with strong winds at high altitude, made the snowpack unstable and caused the release of many big avalanches with exceptional magnitude and centenary return times.

While the villages of the valley floor did not have serious damages, the alpine pastures over 1800-2000 m had great damages. At least 16 buildings were destroyed or just damaged from the avalanches of January. Although the mountain pastures or mountain huts are built in the safest sites, they cannot always be totally safe, since they are often located on wide open slopes or near gullies. The snowpack and avalanche dynamics of the past season were particular: lots of persistent weak layers and many avalanche events in the same sites. The overlap of many avalanches in the same site brought to an avalanche different behavior, speed and bigger dimension unusual to reach by the avalanche phenomenon.

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