

# ICE AVALANCHE RISK MANAGEMENT FROM THE PLANPINCIEUX GLACIER (COURMAYEUR – ITALY)

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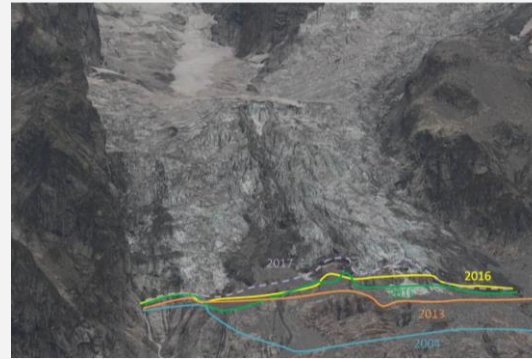
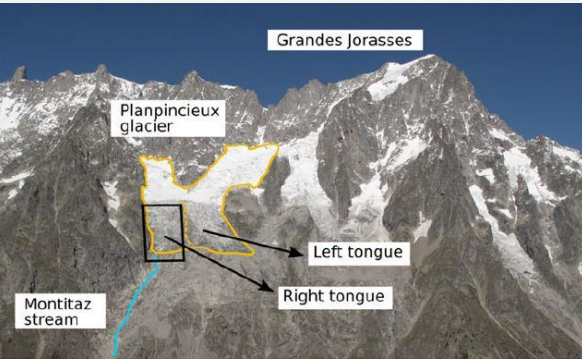


Instabilities occurring on temperate glaciers in the Alps have been the subject of several studies, which have highlighted preliminary conditions and possible precursory signs of break-off events.

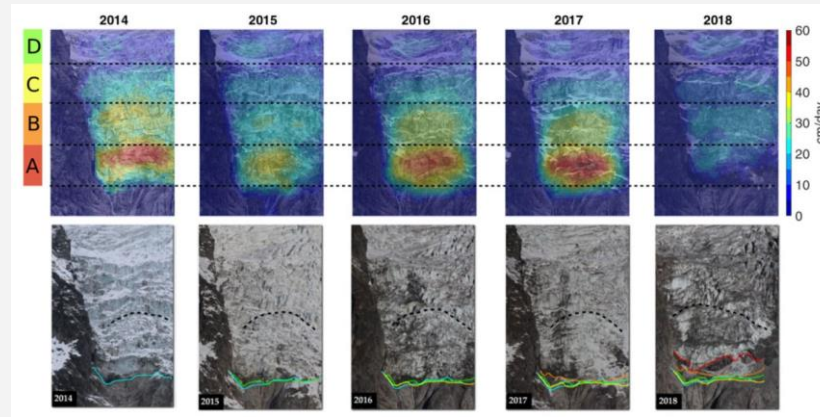
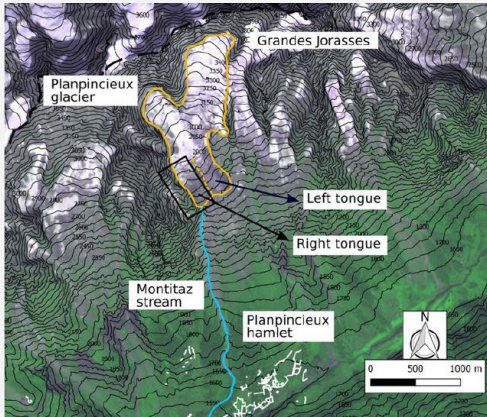




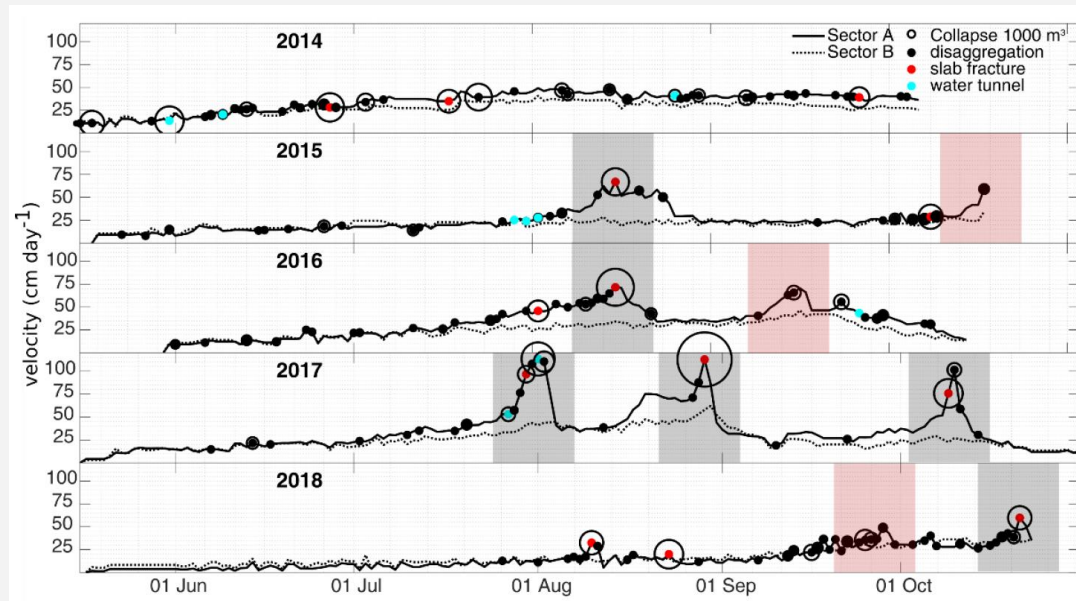
Since 2013, the Planpincieux Glacier, located on the Italian side of Mont Blanc massif (Aosta Valley), has been studied to analyse the dynamics of ice collapses in a temperate glacier.

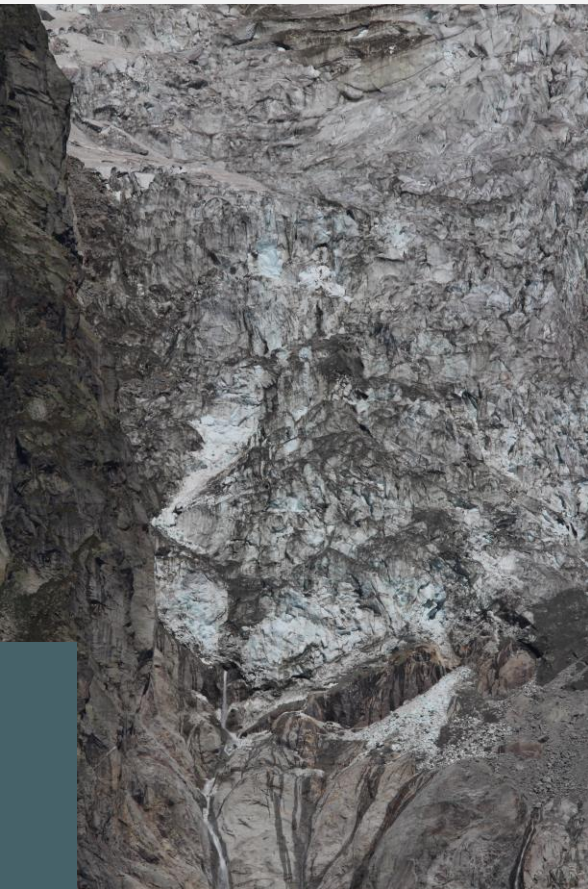


These analyses have been conducted for several years, enabling the assessment of surface kinematics on the lower glacier portion and the different instability processes at the glacier terminus.



During the period of the study, especially in the summer seasons, increases in velocities of the whole right side of the glacier tongue have been recorded. This fast sliding movement is mainly induced by water flow at the bottom of the glacier.



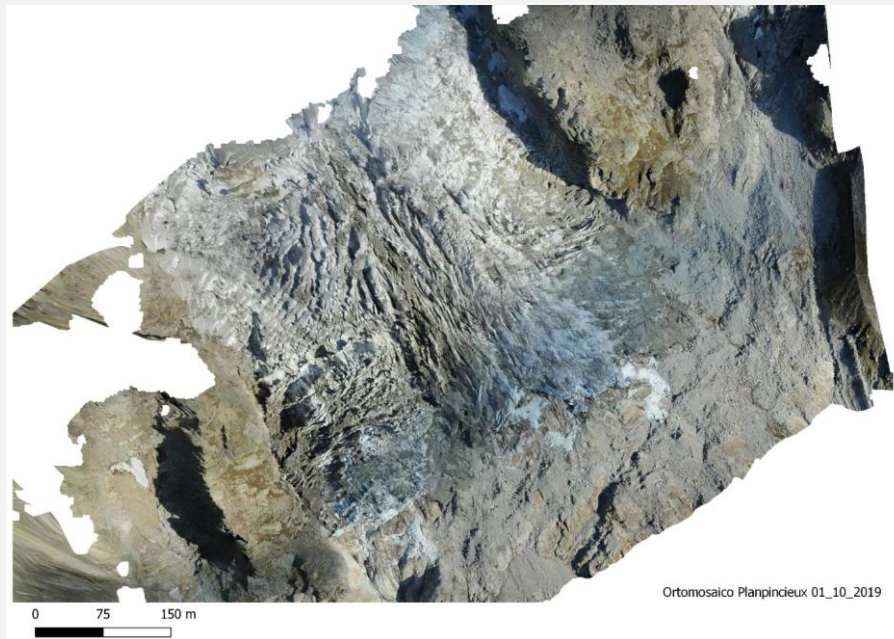
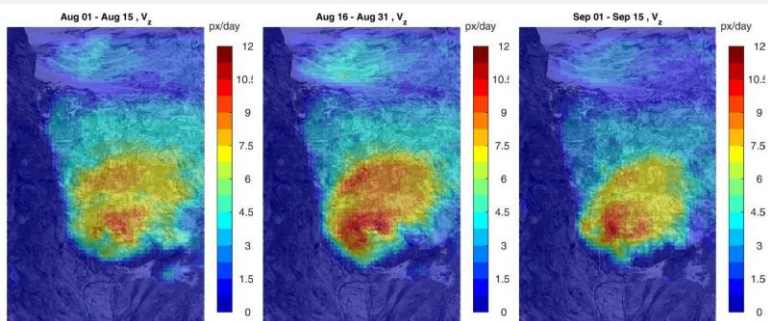


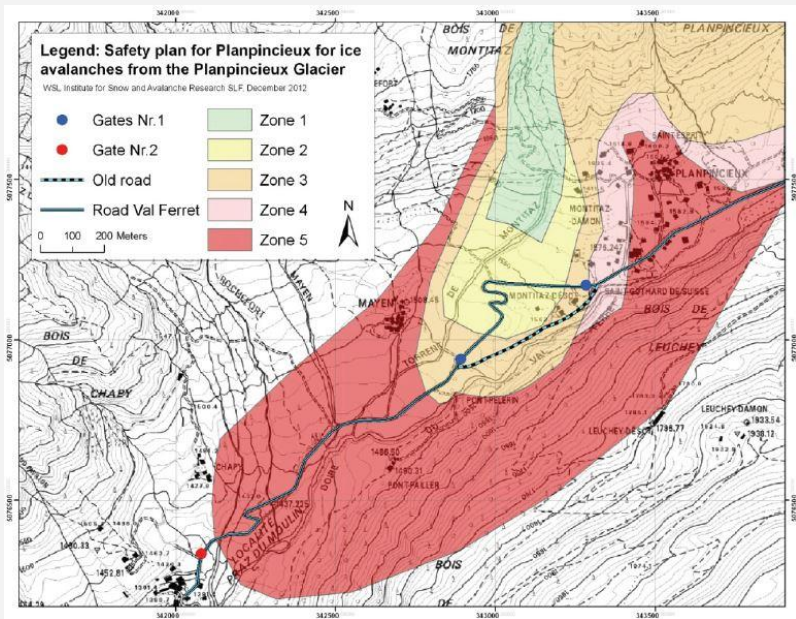
During the summer 2019, several conditions necessary for instability occurred:

- The geometrical configuration of the terminal tongue of the glacier is critical (steep slope)
- Active phases of the glacier - marked accelerations and decelerations
- The subglacial drainage network distributed under most of the glacier tongue
- Isolation of large volumes of ice - pervasive fracturing status

These conditions have existed in all known cases of destabilization (Le Tour 1949 (Glaister, 1951), Allalin 1965, Fee glacier 2009, Allalin 2000) (Faillettaz et al., 2015).

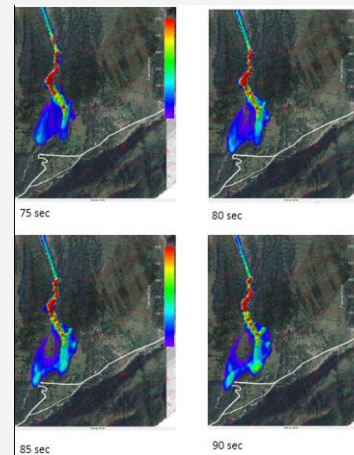
The increase of speed coincided with the opening of a large crevasse, which outlined a fast moving ice volume, assessed by photogrammetric techniques as 250.000 m<sup>3</sup>.





	Local avalanche danger level Val Ferret:	Ice avalanche volume Planpincieux Glacier:		
		20'000 m <sup>3</sup>	200'000 m <sup>3</sup>	1 million m <sup>3</sup>
Sommer	None (track free of snow)	Exclusion of zone 1	Exclusion of zones 1 and 2. Curfew zone 3 <sup>(1)</sup> .	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.
	1 Low	Exclusion of zone 1	Exclusion of zones 1, 2 and 3. Curfew zone 4.	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.
	2 Moderate	Exclusion of zone 1	Exclusion of zones 1, 2 and 3. Curfew zone 4.	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.
	3 Considerable	Exclusion of zones 1 and 2 <sup>(b)</sup>	Exclusion of zones 1, 2, 3 and 4. Curfew zone 5.	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.
	4 High	Exclusion of zones 1, 2 and 3. Curfew zone 4	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.
5 Very high	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.	Exclusion of zones 1, 2, 3, 4 and 5.	Exclusion <sup>(3)</sup> of zones 1, 2, 3, 4 and 5.	

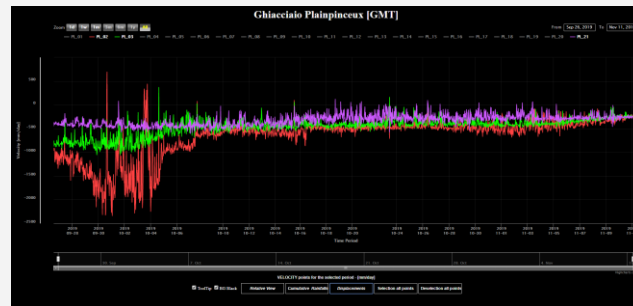
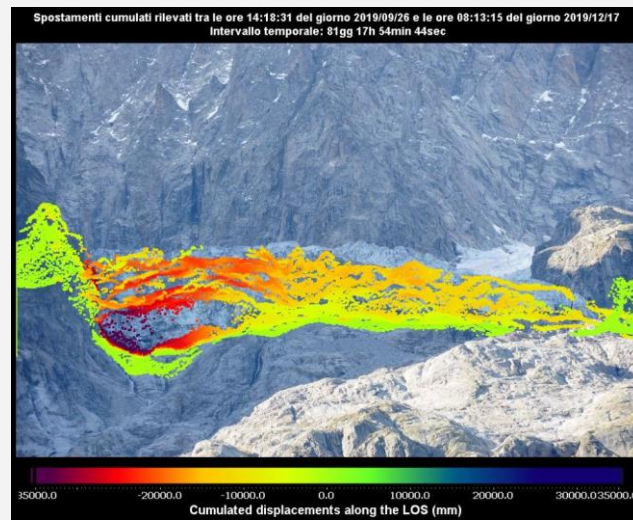
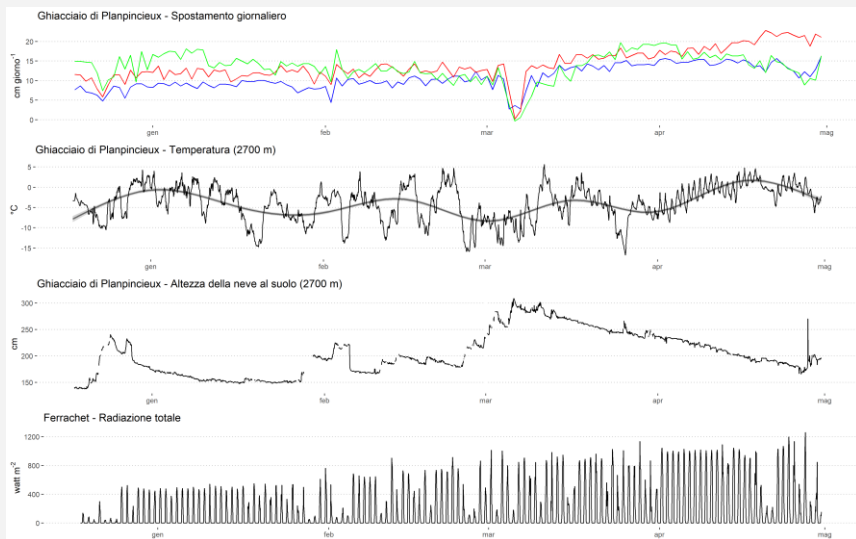
According to the risk scenarios, the collapse of this ice volume from the glacial body would have reached the valley floor, potentially affecting the access road to the Val Ferret valley.





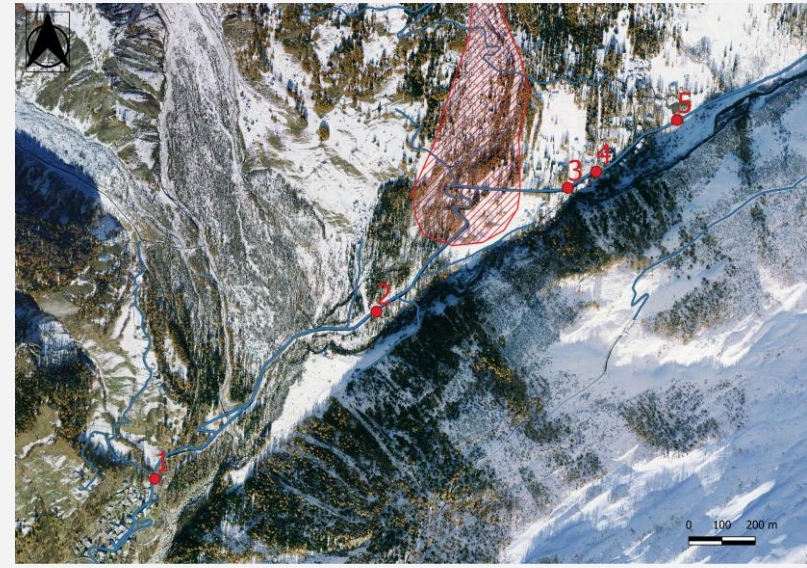
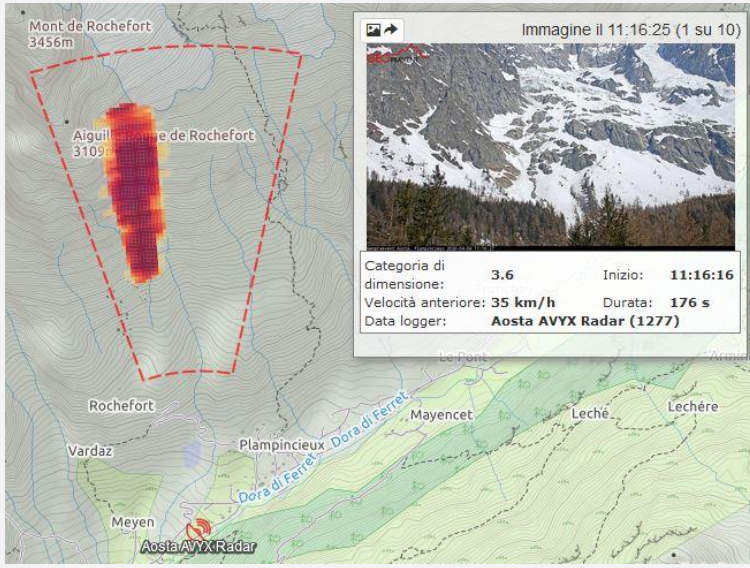
Considering the potential risk, a civil protection plan has been deployed by the monitoring team of the Aosta Valley Autonomous Region, Fondazione Montagna sicura and CNR-IRPI.

Glacier displacements from both GBInSAR and image cross-correlation, variations in the glacier morphology and environmental variables, such as air temperature, rain and snowfall, have all been taken into account to implement the monitoring plan.



RESULTS

A long-range and wide-angle Doppler radar for detection of avalanches has been installed, as a part of an early warning system which includes a traffic light system for the closure of vehicular traffic of Val Ferret valley in case of a significant event.



The scientific knowledge on the recent evolution of the glacier and the development of different civil protection procedures has therefore allowed the implementation of a closure plan for the Val Ferret in case of danger of ice avalanches from the Planpincieux glacier.

**Bollettino di aggiornamento sintetico giornaliero del monitoraggio del Ghiacciaio di Planpincieux, Val Ferret – Comune di Courmayeur**  
Bollettino n. 12 del 11/10/2019

SETTORE A	SETTORE B	SETTORE C	
			Andamento degli spostamenti medi dei vari settori misurati nelle ultime 24 ore rispetto al bollettino precedente
30 / 25	25 / 25	15 / 10	[omigono] spostamento medio verticale registrato nelle ultime 24 ore dal sistema fotografico
70 / 60	60 / 60	40 / 25	[omigono] spostamento medio sul pendio registrato nelle ultime 24 ore dal sistema fotografico
60 / 50	35 / 40	35 / 35	[omigono] spostamento medio sul pendio registrato nelle ultime 24 ore dal sistema radar
DATE 24 ORE PRECEDENTI	DATE 24 ORE DI RIFERIMENTO		

Il presente bollettino è redatto da Fondazione Montagna Sicura e dal Geohazard Monitoring Group del CNR 1971 di Torino per conto del Dipartimento Programmazione, Difesa del Suolo e Risorse Idriche - Struttura Organizzativa Assetto Idrogeologico dei Bacini Montani della Regione Autonoma Valle d'Aosta.

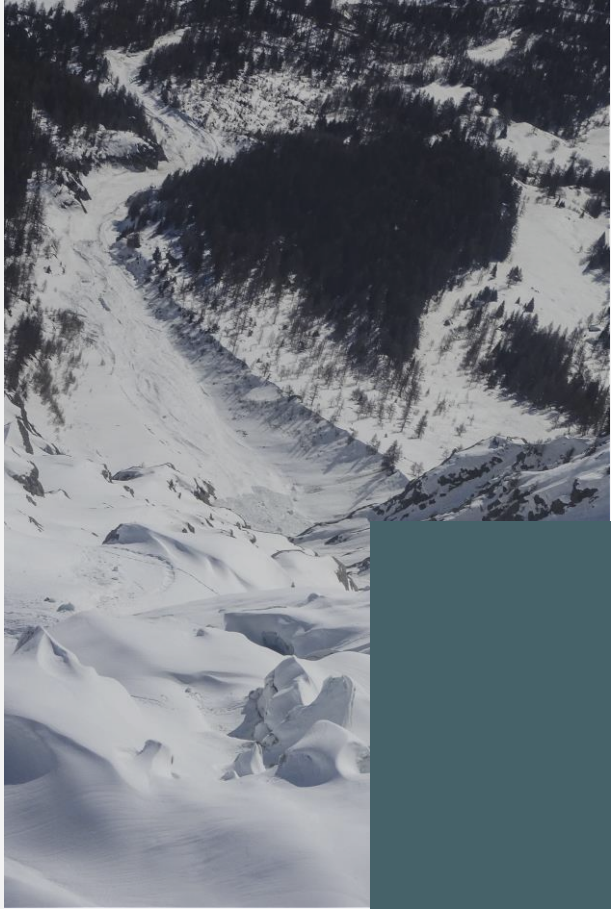
**Scheda di allertamento sintetico del Ghiacciaio di Planpincieux**

**Bollettino n.121 del 27/04/2020**

CONDIZIONI NON VINCOLANTI	
Assenza variazioni morfologiche e di deflusso idrico	Non rilevabile
Assenza crolli > 2000m3 sui settori A e B	Non rilevabile
CONDIZIONE VINCOLANTE SE PRESENTE MA SE N.P. → NON VINCOLANTE	
Assenza Variazioni anomale velocità stimate dal CNR	Non rilevabile
CONDIZIONI VINCOLANTI	
Valutazione positiva dello zero termico	SI'
Valutazione positiva precipitazioni 2300m	SI'
Assenza Variazioni di trend su Velocità Radar settore B/settore C	SI'
Vradar media sui 05 giorni Vb<Vc<10%	SI'
PERICOLO VALANGHE	
SCENARIO INVERNALE	
Grado di pericolo locale valanghe	-----

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CONCLUSIONS



# THANKS FOR THE ATTENTION

Does anyone have any questions?

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