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European Union
Humanitarian Aid
and Civil Protection

Understanding avalanche synoptic patterns to prevent better risk scenarios in the Pyrenees and discussing novel wildfire-avalanche multi-risk situations

SNOW AVALANCHES

Carles García, Glòria Martí, Manuel Bertrán (ICGC), Eduard Plana, Marta Serra, Chiara Sabella (CTFC), Guillem Canaleta (PCF), Núria Gasulla, David Pagès (DGPC CAT)





CIVIL PROTECTION-AVALANCHES: CURRENT SITUATION

HIGH DANGER WARNING

What?

Where?

When?



Avís de perill d'allaus

Avis emès el 13/12/2019 a les 13:00

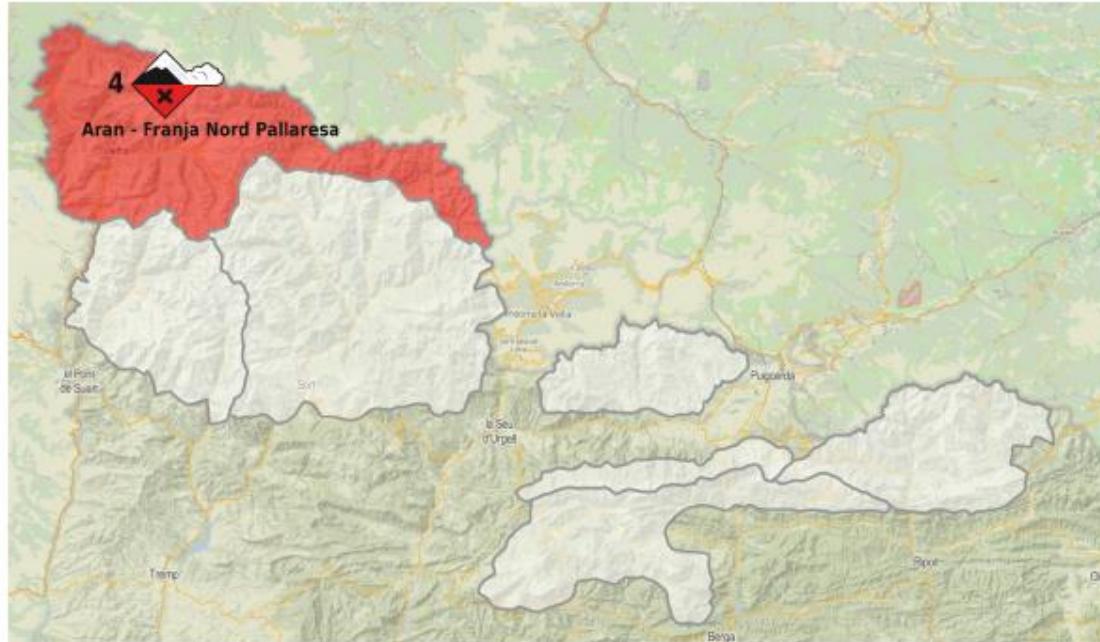
Període: Vàlid fins el 15/12/2019 a les 00:00

Situació: El perill és FORT (4) a l'Aran-Franja Nord de la Pallarsa.

Tendència: L'activitat natural d'allaus minvarà considerablement diumenge.

L'estabilitat del mantell nival ha emplorat de forma general a l'Aran-Franja Nord de la Pallarsa. El perill és FORT (4) en aquest sector per les nevades, el vent i la pluja del present episodi, i continuará en aquest grau dissabte degut a l'increment de temperatures i l'efecte del sol. Els principals problemes són de neu humida, per la neu recent i les pluges, i de neu ventada degut a les acumulacions de neu formades pel vent de nord-oest. En conseqüència, s'esperen nombroses allaus naturals de mida 3 (amb capacitat per enterrar un grup de persones) a qualsevol orientació, o fins i tot alguna de mida 4 (amb capacitat per arribar a fons de vall o sepultar un edifici petit) a orientacions est i nord a cotes elevades.

La probabilitat d'allaus accidentals és molt elevada i es recomana no accedir a terreny allavós.



HOW TO IMPROVE THIS INFORMATION

RELATIONSHIP: ATMOSPHERIC CIRCULATION - MAJOR AVALANCHES – 50 years

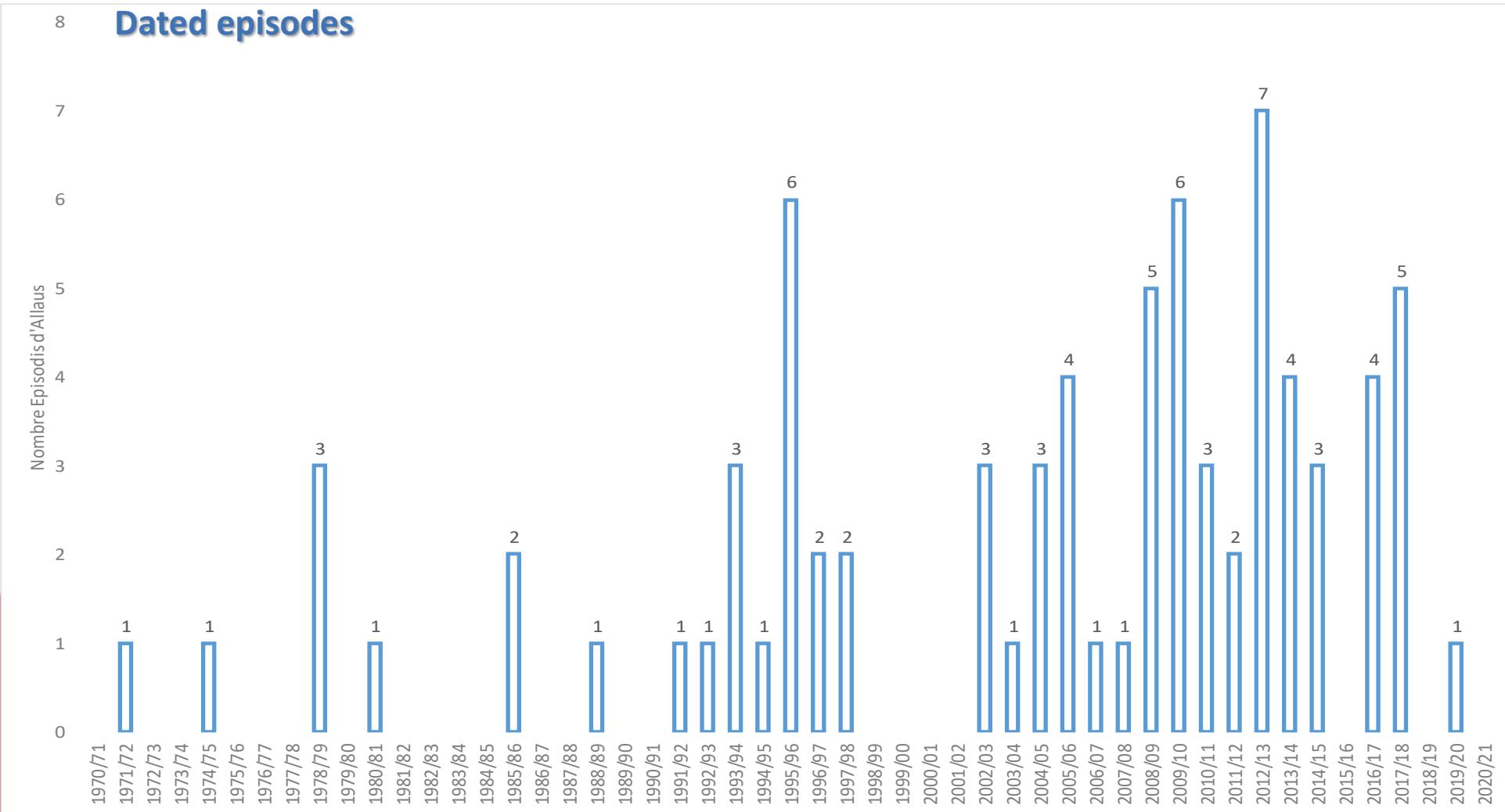
WHICH ATMOSPHERIC PATTERNS LEAD MAJOR AVALANCHES (PCA ANALYSIS).

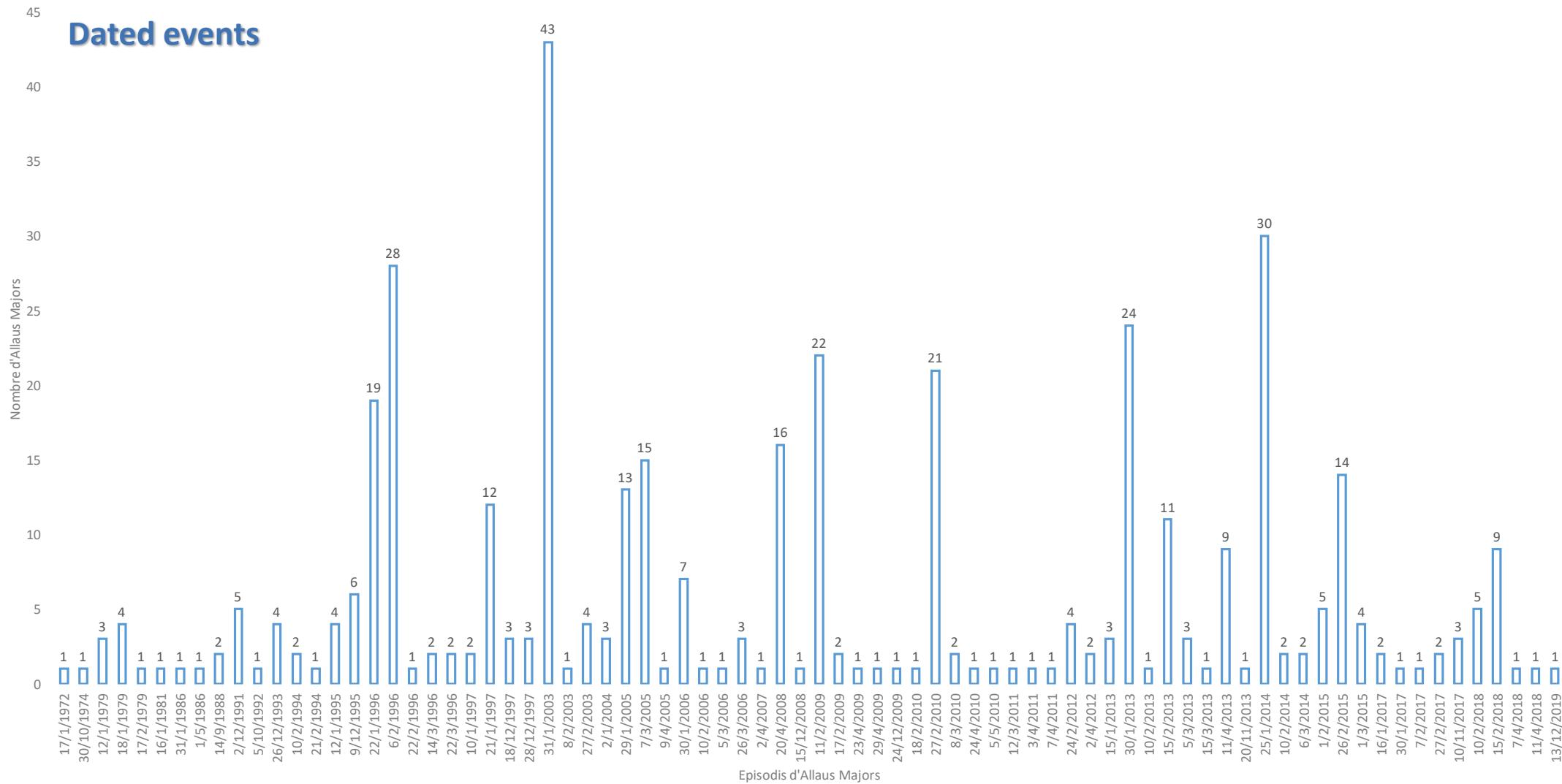
- Major avalanches: >1000 m long, affecting buildings and infrastructures.
- Atmospheric circulation: 500 hPa (medium level), controls weather on surface:
 - Storm profile: precipitation, temperature, wind

MID TERM FORECASTING: 48-72 h OF CRITICAL SITUATIONS

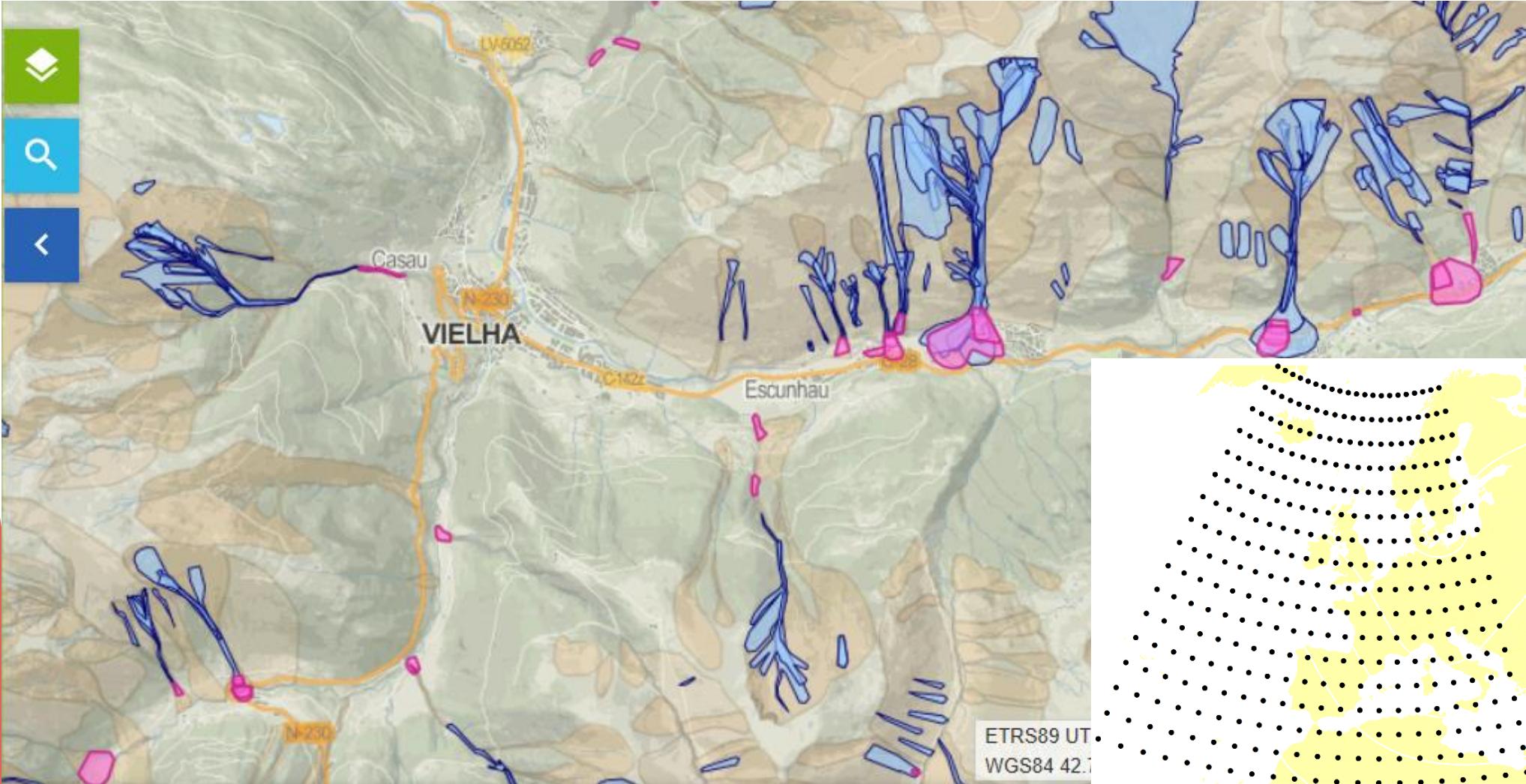
- **Civil Protection: to get ready a response to a likely emergency.**

MAJOR AVALANCHES (1970-2020): N=78 episodes, N=418 events





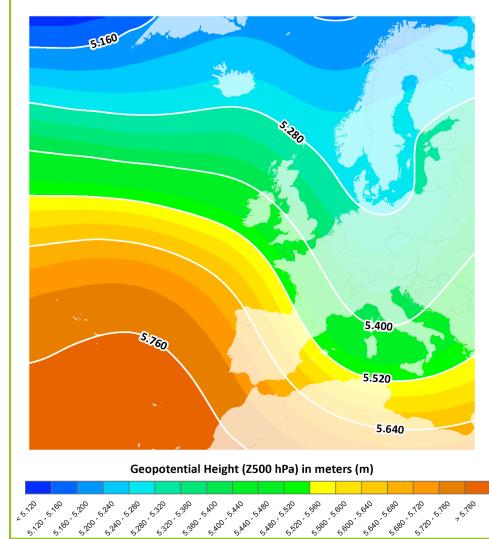
MAJOR AVALANCHE EVENTS – capture of the atmospheric situation (grid 500 hPa)



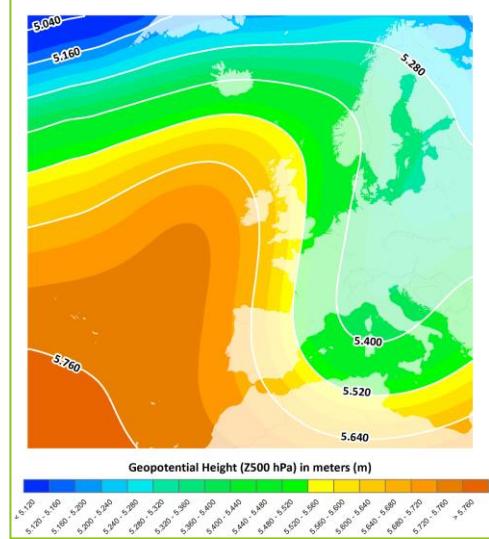


RECIPE

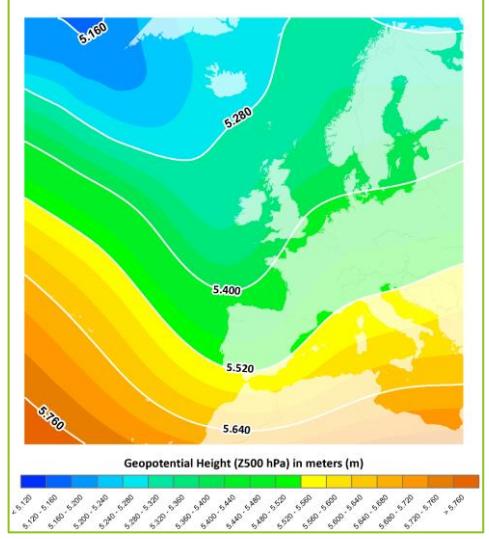
PATTERN 1: NW



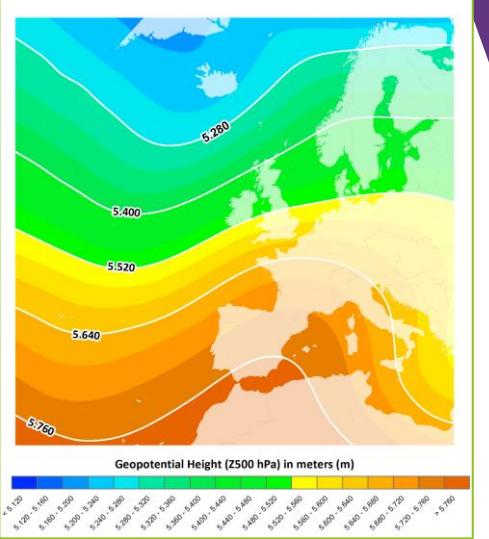
P2: N



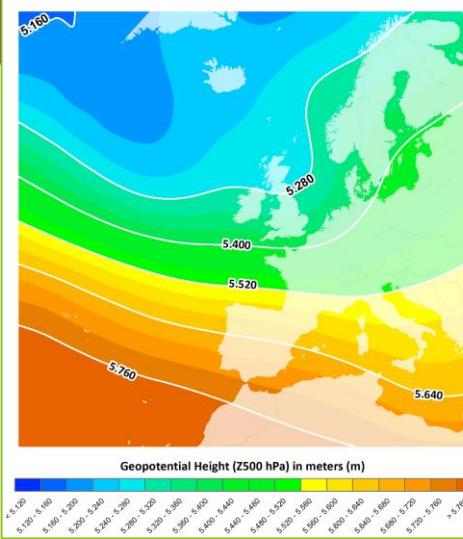
P3: TROUGH



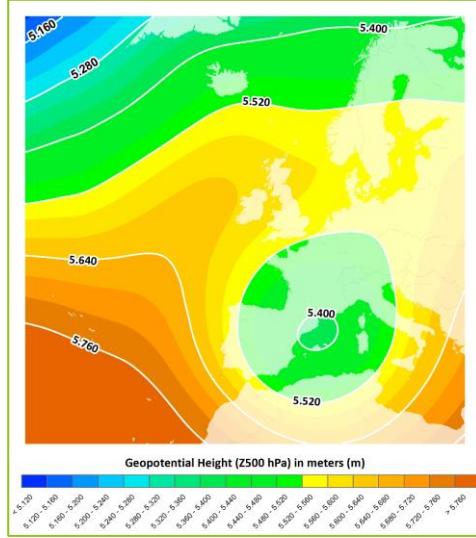
P4: MEDIT. HIGH PRESS.



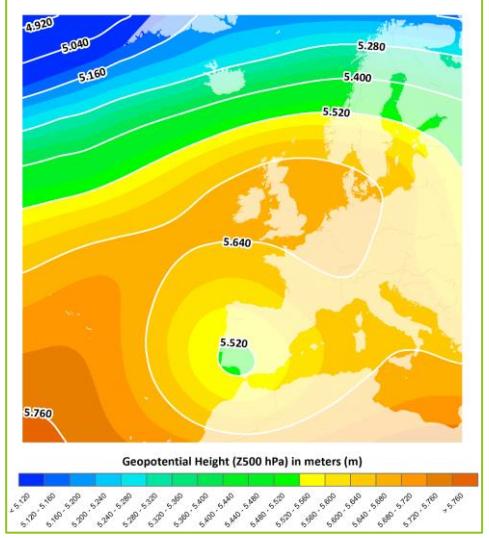
P5: W



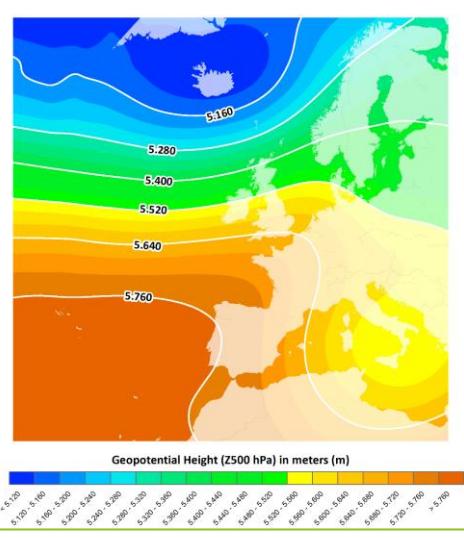
P6: COLD LOW



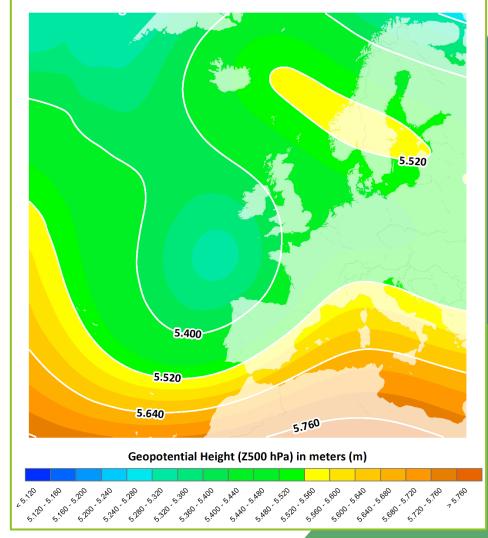
P7: E



P8: ATLANT. HIGH PRESS.



P9: SW

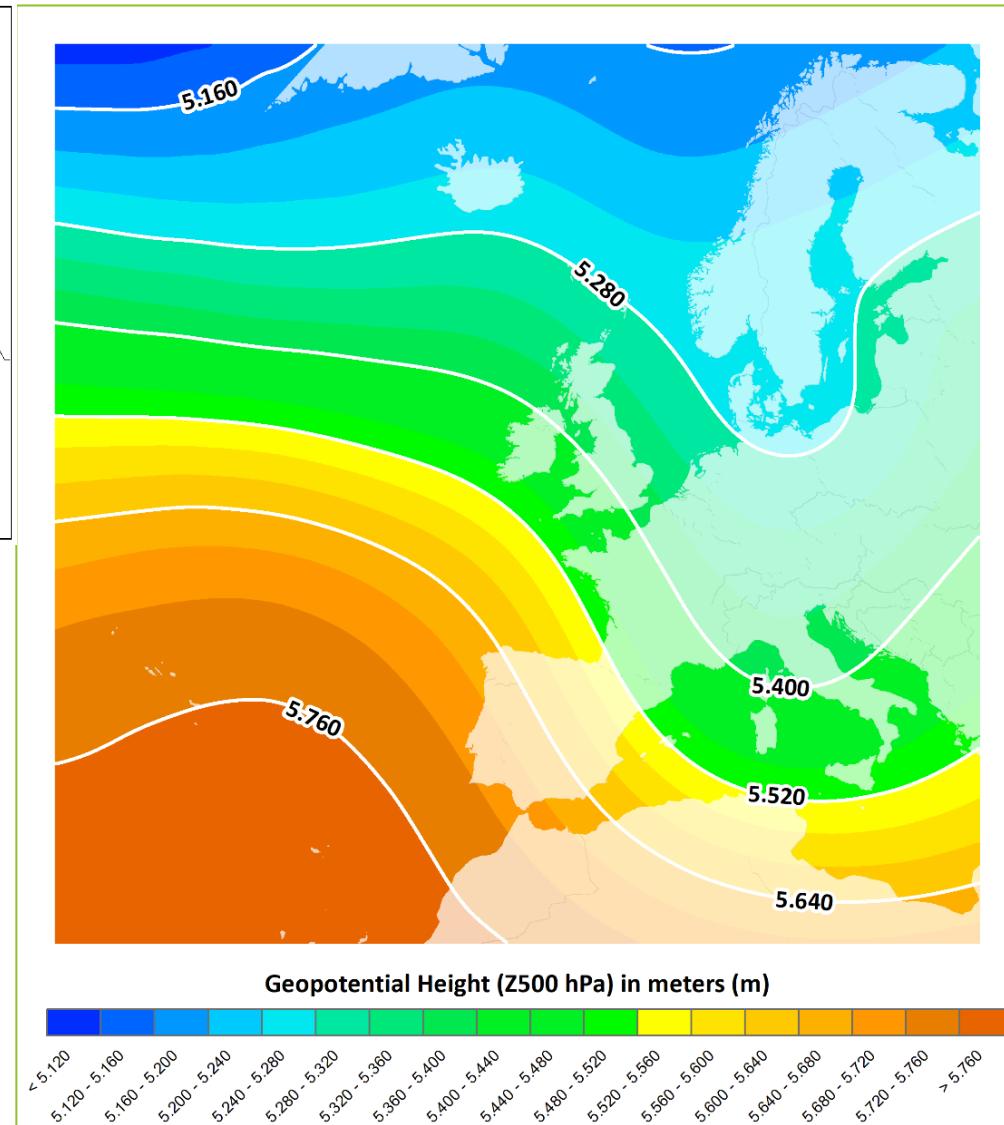
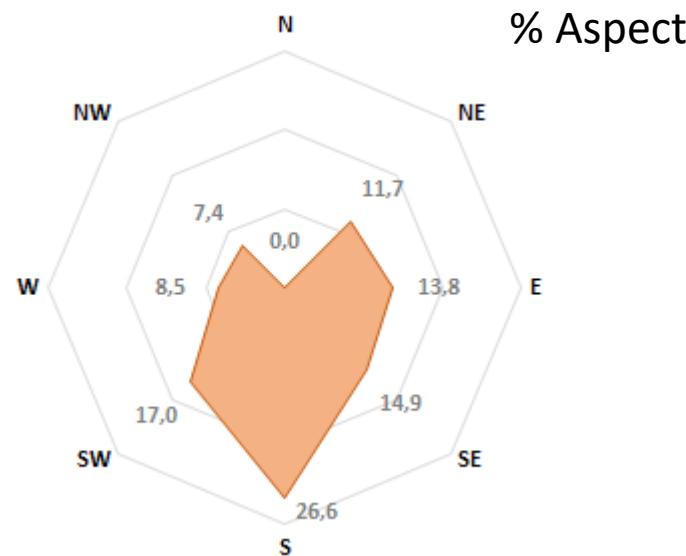
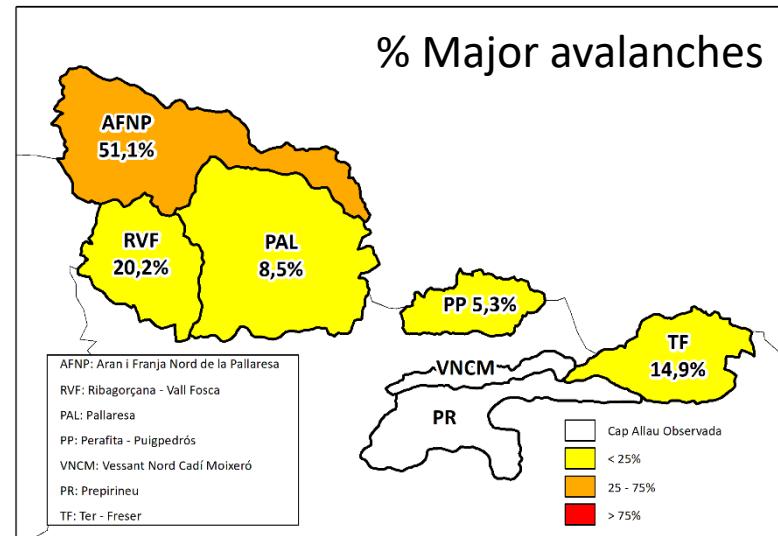


Reinforcing civil protection capabilities into multi-hazard risk assessment under climate change

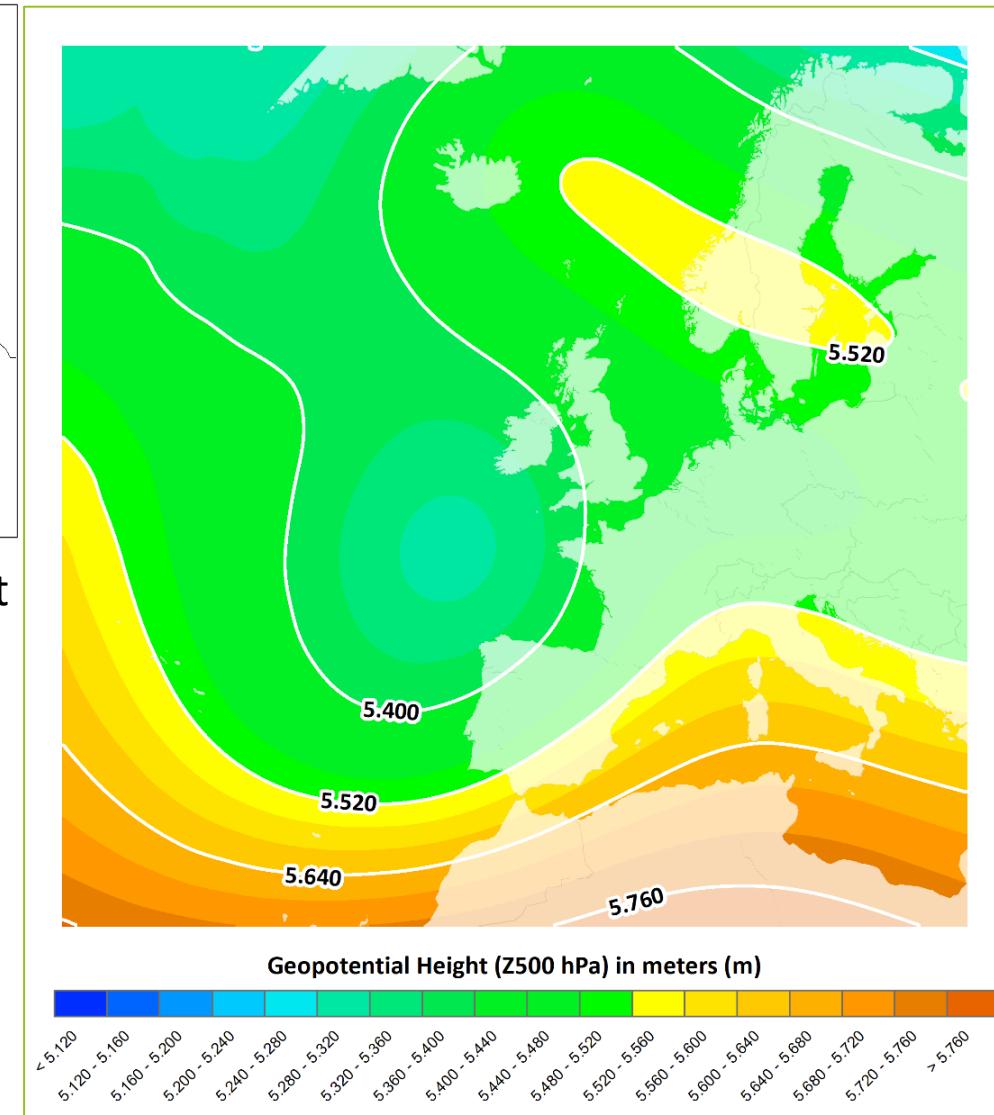
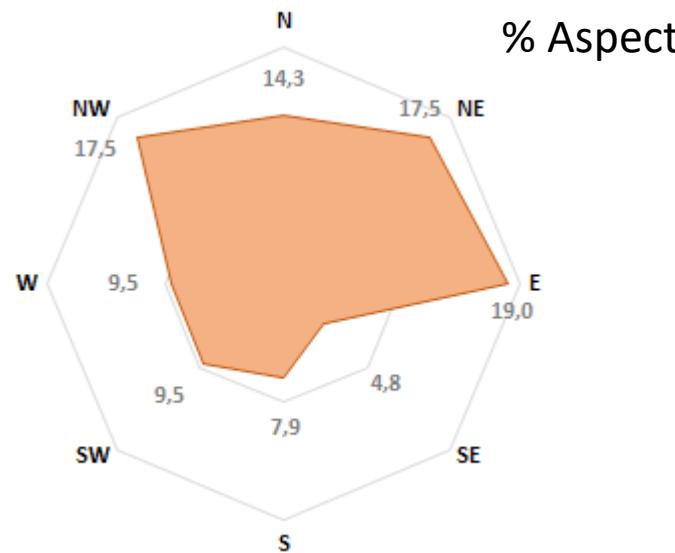
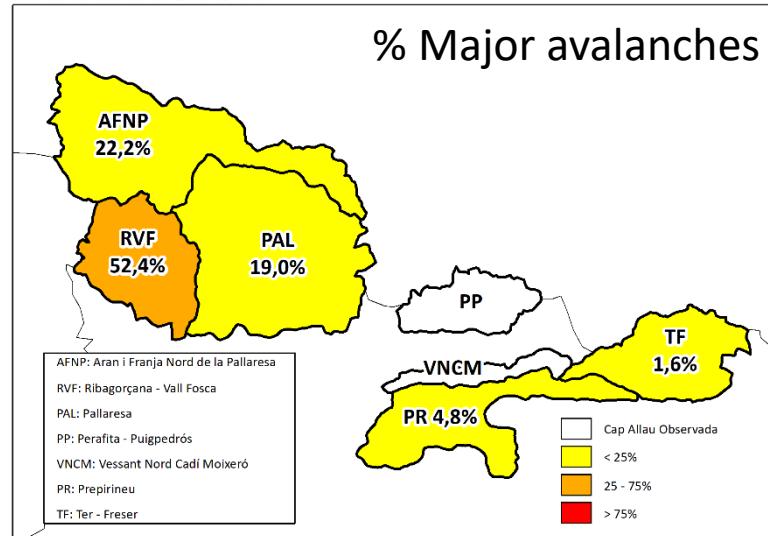


led by

PATTERN 1: NW



PATTERN 9: SW



VISUALIZER TOOL FOR MANAGING AVALANCHE EMERGENCIES

AVY SYNOPTIC PATTERNS (9)

MD.1: LIKELY AVALANCHES

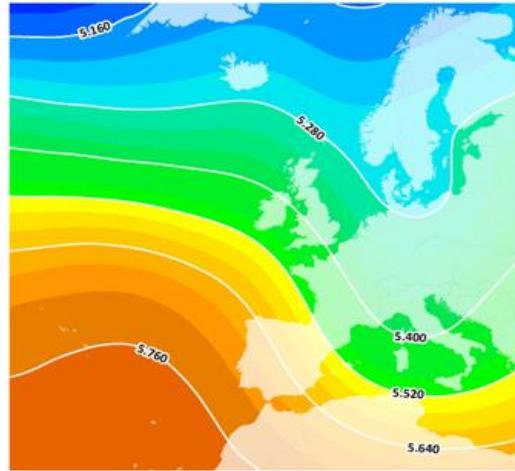
MD.2: POSSIBLE AVALANCHES

Output 1: Major avalanches

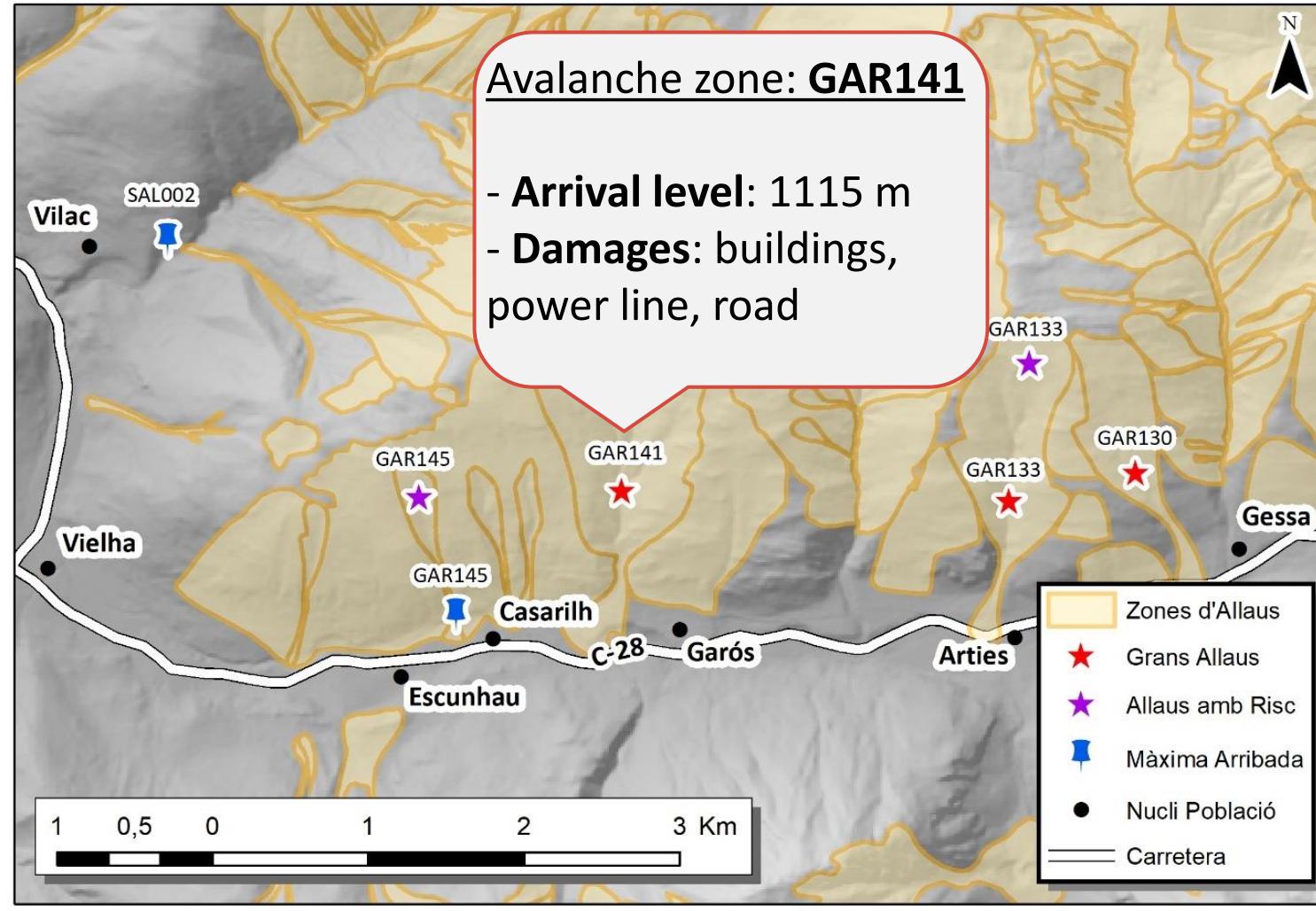
Output 2: Risk avalanches

Output 3: Maximum observed event for each avalanche zone

22/Dec/2020, Pattern NW



- ★ Major avalanche
- ★ Risk avalanche
- Maximum arrival observed



Acces to Avalanche Data Base (BDAC): code, date, region, size, afectations, ...

Situació Sinòptica del Nord-oest							
Zona Nivo-climàtica	Data d'Episodi	Codi d'allau	Zona d'Allau	Topònim	Cota inferior	Abast màxim (m)	Afectacions
Aran - Franja Nord de la Pallarsa	16/1/1981	GAR0501	GAR050	Bosost	740	Fins a 10m del poble	Edificacions (Bossost), Vila de comunicació (Carrerada Saca d'Estiuera), Bosc
Aran - Franja Nord de la Pallarsa	10/2/1994	GAR14119901	GAR141	Gardís	1050		Infraestructura (Presa, Torre), Vila de comunicació (carretera), Bosc
Aran - Franja Nord de la Pallarsa	15/2/2013	GAR150201201	GAR150	Montcorbau	1160		Vila de comunicació (Carretera de Montcorbau), Sender
Aran - Franja Nord de la Pallarsa	1/2/2015	GA R169201401	GAR169	Canaus d'Arres	1535		Vila de comunicació (Carretera deth Lac Rossac), Bosc
Aran - Franja Nord de la Pallarsa	11/2/2008	JO E004200801	JOE004	Lauet de Simona	1015		Vila de comunicació (Pista dera Artiga de Lin), Bosc
Pallarsa	1/2/2015	BNG058201401	BNG058	Lo Pletiu	1645		Vila de comunicació (C 28), Sender (del Pont).
Pallarsa	6/2/1996	ESN004199502	ESN004	Pala d'Eixe	1880		Infraestructura (Pista d'Erqui d'Esport), Vila de comunicació (Camí de Campmajor)
Perafita - Pujgpedrós	6/2/1996	DRN051199501	DRN051	Sallent/Camí Engorgs	2100		Bosc, Sender
Ribagorçana - Vall Fosca	6/2/1996	FLM006199501	FLM006	Tossal de la Costa	1460		Vila de comunicació (Camí de la Mare de Déu del Far)
Ribagorçana - Vall Fosca	5/3/2006	FLM006200501	FLM006	Barranc de Verdins	1760		Persones, Vila de comunicació (Camí de la Serra d'Avall)
Ribagorçana - Vall Fosca	12/1/1979	FLM08901	FLM089		1770		Infraestructura (Torre elèctrica), Vila de comunicació (Carretera de Capdella), Bosc
Ter - Freser	6/2/1996	NUR124199501	NUR124	Coma de les Perdius	1885		Infraestructura (Creuallera de Núria, Túnel del Pal Tort), Bosc, Sender (Camí Vell de Queralbs a Núria)
Ter - Freser	6/2/1996	NUR127199501	NUR127	Pla de Sallents	1760		Infraestructura (Creuallera de Núria, Pont), Bosc, Sender
Ter - Freser	6/2/1996	TER066199501	TER066	Coma Brinada			Vila de comunicació (C 771), Bosc
Ter - Freser	6/2/1996	TER067199501	TER067	Pasturra	1980		Edificacions (Hostal, Vivers), Equipaments (Parc del Pista esportiva), Vila de comunicació (C 771), Bosc
Ter - Freser	6/2/1996	TER147199501	TER147	Canal de la Mort del Godall	1820		Vila de comunicació (Camí del Pla de la Molina a Valter), Bosc

Situació Sinòptica Dorsal Mediterrània							
Zona Nivo-climàtica	Data d'Episodi	Codi d'allau	Zona d'Allau	Topònim	Cota inferior	Abast màxim (m)	Afectacions
Aran - Franja Nord de la Pallarsa	30/1/2013	GA R133201204	GAR133	Pales de Corilha	1265		Infraestructura (Presa), Sender
Aran - Franja Nord de la Pallarsa	30/1/2013	JO E004201201	JOE004	Lauet de Simona	1020		Vila de comunicació (Pista dera Artiga de Lin), Bosc
Aran - Franja Nord de la Pallarsa	26/3/2006	NER015200501	NER015	Barranc dera Madalena	1350		Vila de comunicació (Pista de Sarrahéra), Bosc
Aran - Franja Nord de la Pallarsa	15/2/2018	PAL356201701	PAL356	Coma de Vinyals	1525		Vila de comunicació (Pista de Vinyals), Sender
Aran - Franja Nord de la Pallarsa	30/1/2013	SAL114201201	SAL114	Arriu de Bords	1330		Vila de comunicació (Camin Vilell), Bosc
Aran - Franja Nord de la Pallarsa	30/1/2013	SAL121201201	SAL121	Arriu de Sallent	1195		Vila de comunicació (Camin deth Bosc de Mont), Sender
Ter - Freser	22/3/1996	EST002199501	EST002	Clot de l'Aiou	1360		Vila de comunicació (Camí dels Plaús)



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Thanks for your attention



RECIPE



protecció civil



Forest Research Institute
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3rd Workshop Reinforcing civil protection capabilities to cope with natural hazards in a climate change context. Findings from RECIPE project and challenging issues
October 20-21th 2021



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Understanding avalanche synoptic patterns to prevent better risk scenarios in the Pyrenees and **discussing novel wildfire-avalanche multi-risk situations**

WILDFIRES & SNOW AVALANCHES

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Forest Research Institute
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FOUNDA
TION



Prescribed burnt in Val d'Aran, Catalan Pyrenees

FOTO: E.PLANA



Wildfires in Cerdanya, C. Pyrenees (August 2012)

FOTO: E.PLANA



Fire vs. Wildfire in mountain areas: Expanding sever and large wildfires hazard in a climate (+ land use) change context ...



FOTO: E.PLANA

Managing natural fires (lightning). Guingueta d'Àneu, C. Pyrenees
(2016)



bombers

Restoring forest protection after a wildfire
(Trin, Switzerland)



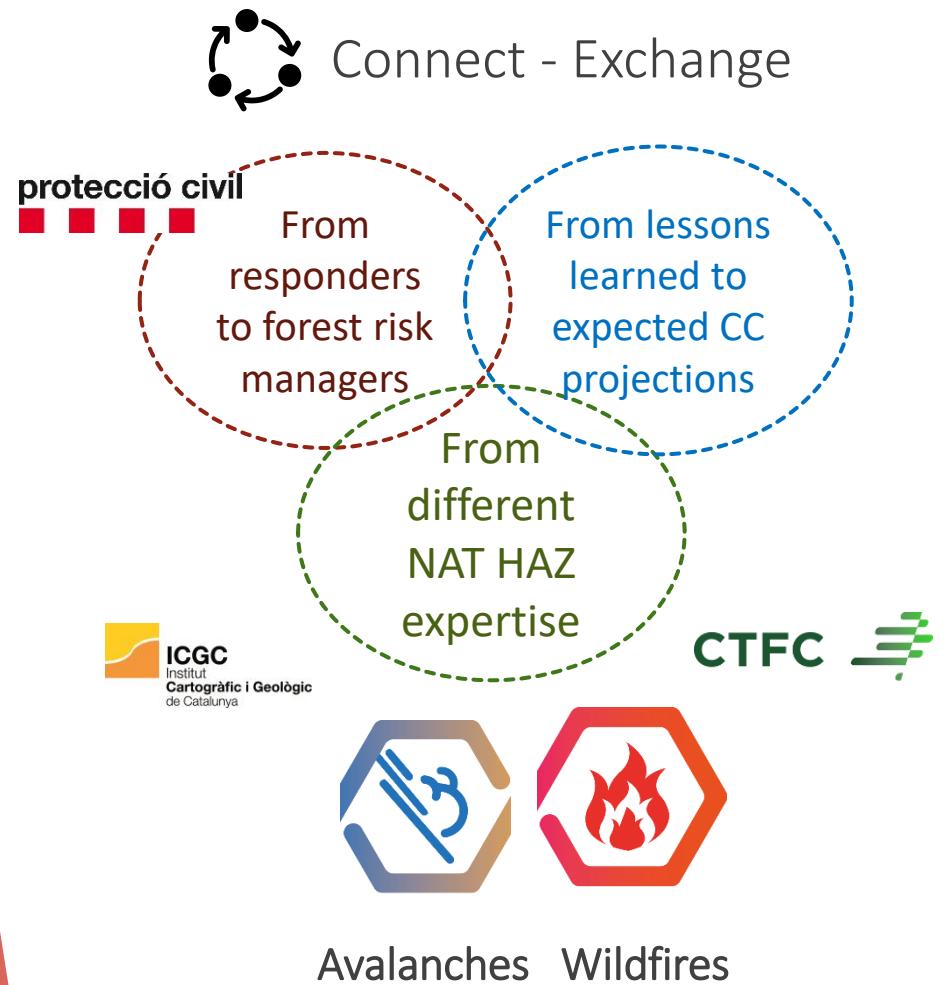
... jeopardizing forest protection function (multi-risk cascading effect)



Wildfire-avalanche multi-risk cross links based on:

- Tabletop exercise simulating a late summer large wildfire event followed by an early fresh snowfall to all attitudes (DGPC CAT, ICGC, CTFC)
- Forest management prescriptions towards common wildfire-avalanche risk mitigation approach at forest stand level (ICGC, CTFC)
- Case study exercise assessing potential wildfire-avalanche risk situation in Núria Valley (Catalan Pyrenees) (CTFC, ICGC, PCF)

- Tabletop exercise simulating a late summer large wildfire event followed by an early fresh snowfall to all attitudes



Multi-risk scenarios – Civil Protection procedure

1. Risk analysis. Expert Working Group.
2. Identify preventive measures to eliminate or mitigate the chain effect. Creation of an executive committee.
3. Emergency Planning. For unresolved situations (scenarios) through prevention mechanisms, assessment of the new scenario in the derived plan (e.g. floods due to forest fires)
4. Implementation of new procedures - operational information (to operatives)
5. Assessment of citizen collaboration and information measures
6. For scenarios of simultaneity or assessment of triggering in the very short term.

➤ Forest management prescriptions towards common wildfire-avalanche risk mitigation approach at forest stand level

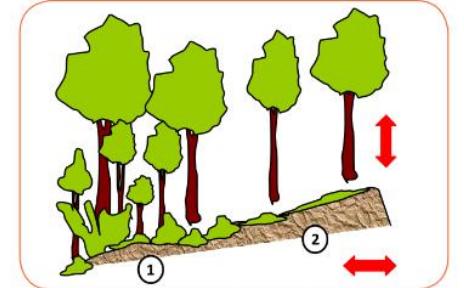
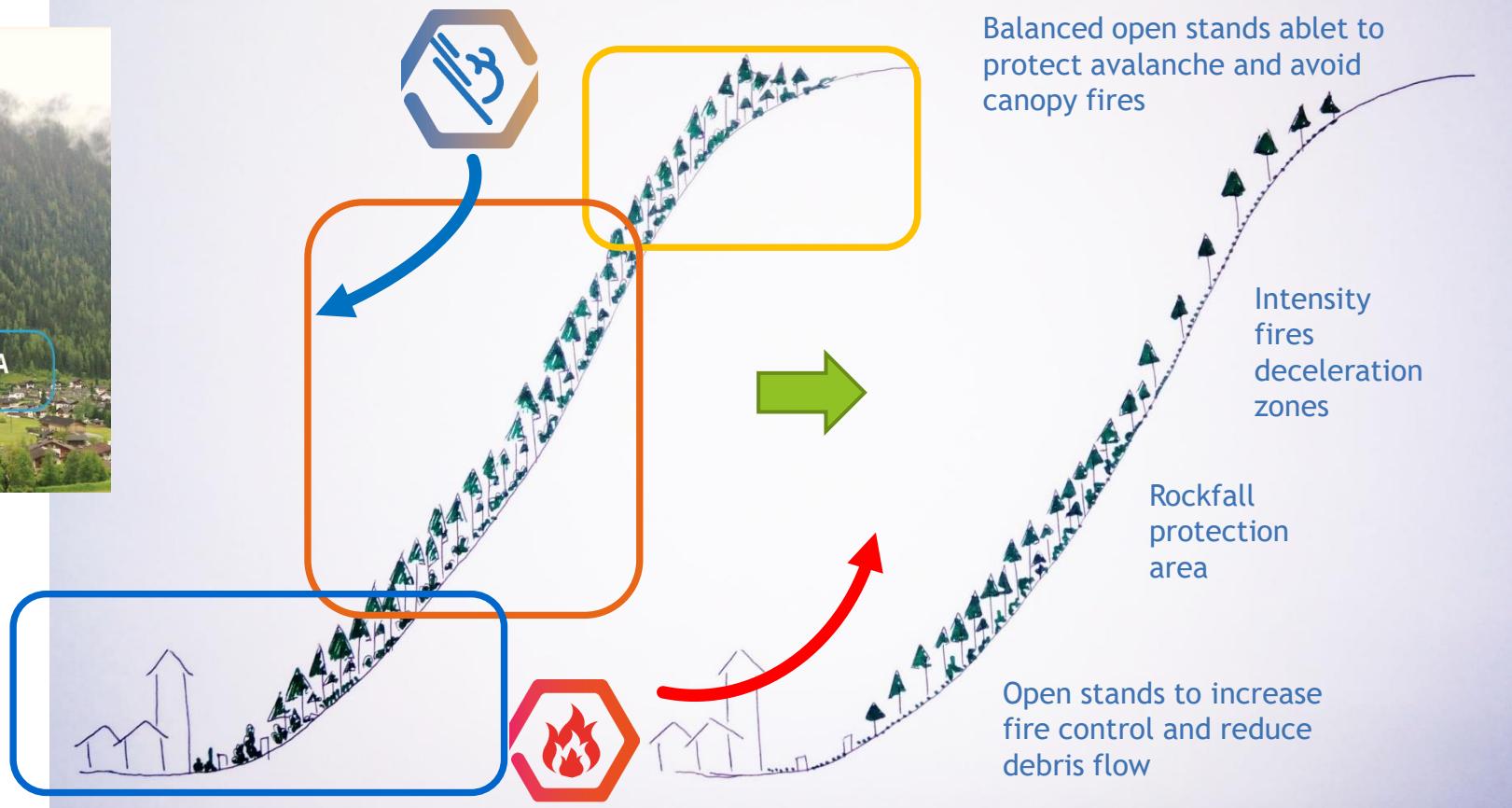
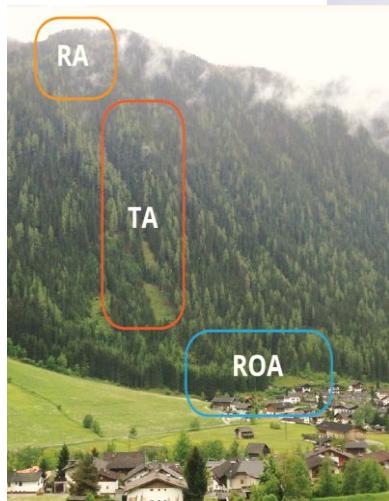
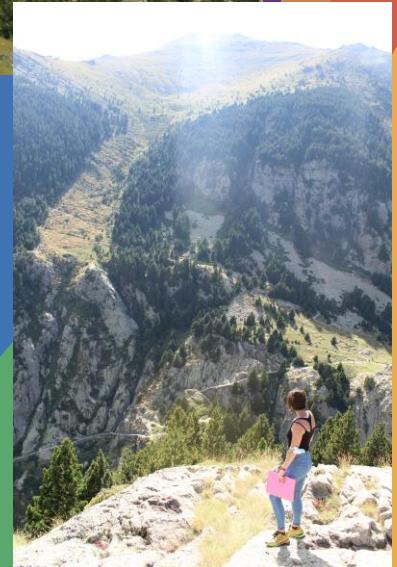
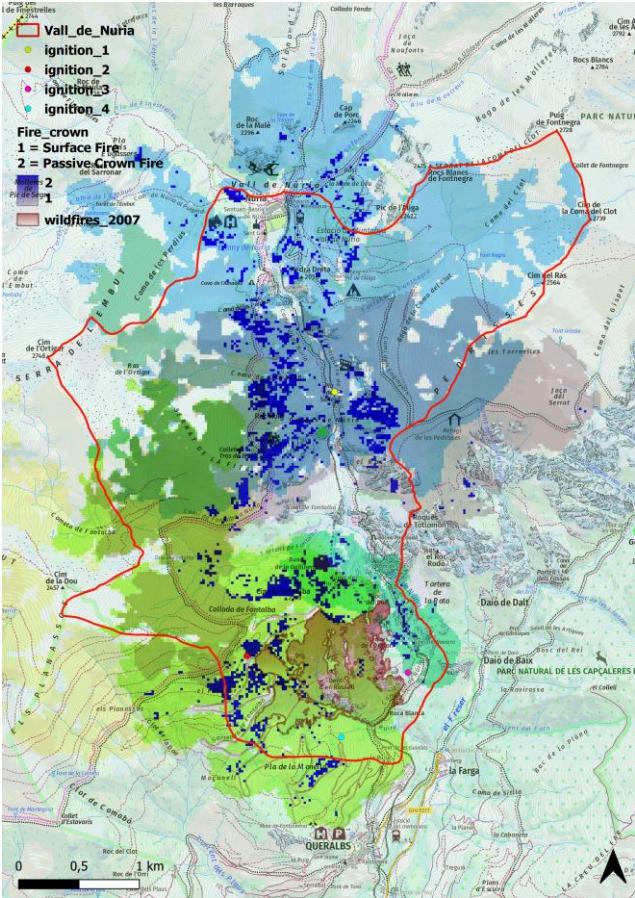
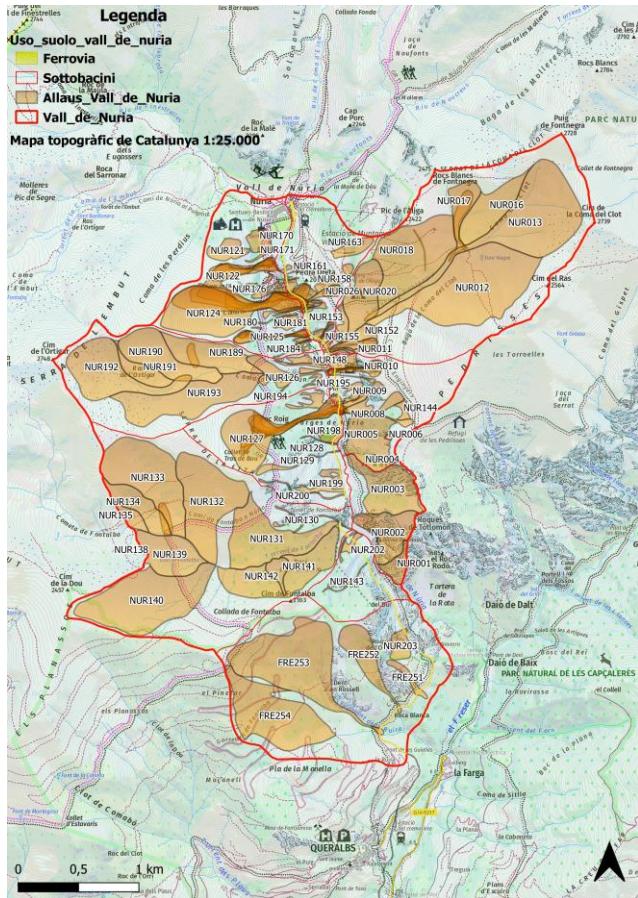


Foto superior: foc d'alta intensitat afectant tots els estrats de vegetació, fora de la capacitat d'extinció. Foto inferior: crema controlada de baixa intensitat per eliminar sobabosc i mantenir estructures de bosc resistentes al foc i dins la capacitat d'extinció. Autor: Bombers de la Generalitat de Catalunya

- Case study exercise assessing potential wildfire-avalanche risk situation in Núria Valley (Catalan Pyrenees) (CTFC, ICGC, PCF)



Some key findings

At landscape scale level

- ✓ Improve data availability to cross-analyse:
Forest protection function (mapped?) ↗ Potential high intensity fire areas
(affecting canopy) ↗ Exposed elements of the territory
- ✓ In case of multi-cascade (rare) event: Multi-agency protocol to manage the temporal loss of protection function (short time for restoring it before snow season) ✖ Reinforce Preparation/Response (EWS)
meanwhile Prevention is restored

At forest stand level

- ✓ Improve knowledge about forest stand prescriptions meeting requirements for avalanche protection and low intensity fires (fire ecology of dominant spp.)

At individual/
societal/expert
level

- ✓ Make aware local communities (farmers, tourist sector) about increasing wildfire risk in mountain areas (reinforce prevention function of prescribed burns)
- ✓ Proactive expert knowledge exchange among WF-A risks managers
- ✓ Reinforce common multi-agency prevention and civil protection plans



RECIPE

REINFORCING CIVIL PROTECTION
CAPABILITIES INTO MULTI-HAZARD
RISK ASSESSMENT UNDER
CLIMATE CHANGE



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and Civil Protection

✓ All detailed info in Deliverable 4.6

<https://recipe.ctfc.cat/>

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recipe@ctfc.cat

Thanks for your attention