



# Avalanche Safety

AS 101  
Winter Field Safety Course

9-13.January 2024

Martin Indreiten

Marie Brekkhus

# Learning outcome

## Knowledge

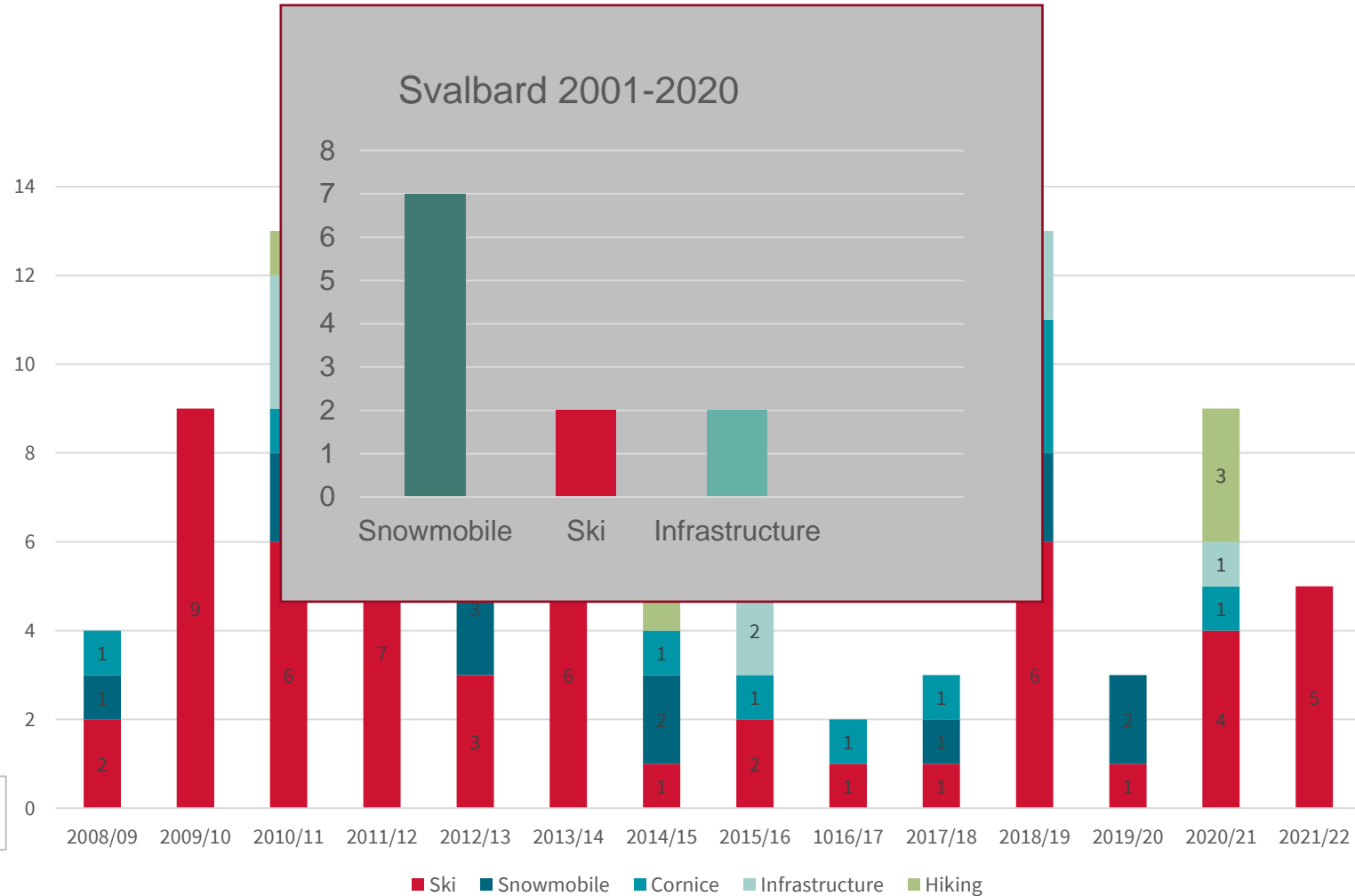
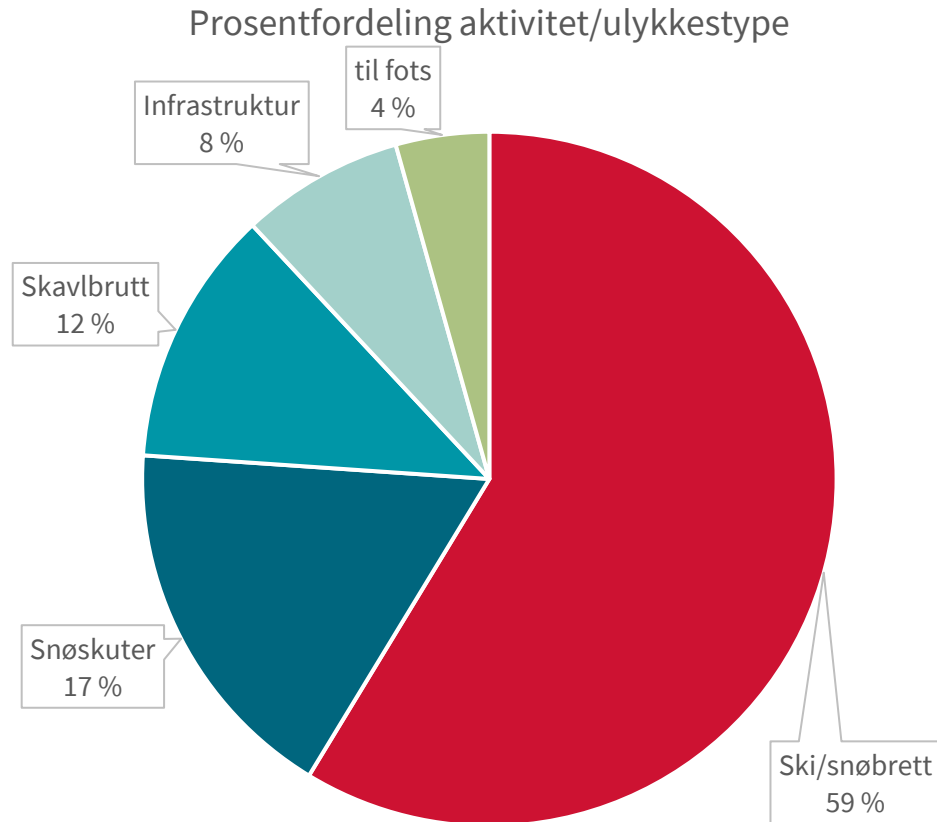
- Understand and know how to plan and travel safe in avalanche terrain by considering: snow – terrain – people – weather
- Understand and know how to identify danger signs that increase avalanche danger
- Understand and know the most effective procedures and strategies for search and rescue in an avalanche

## Skills

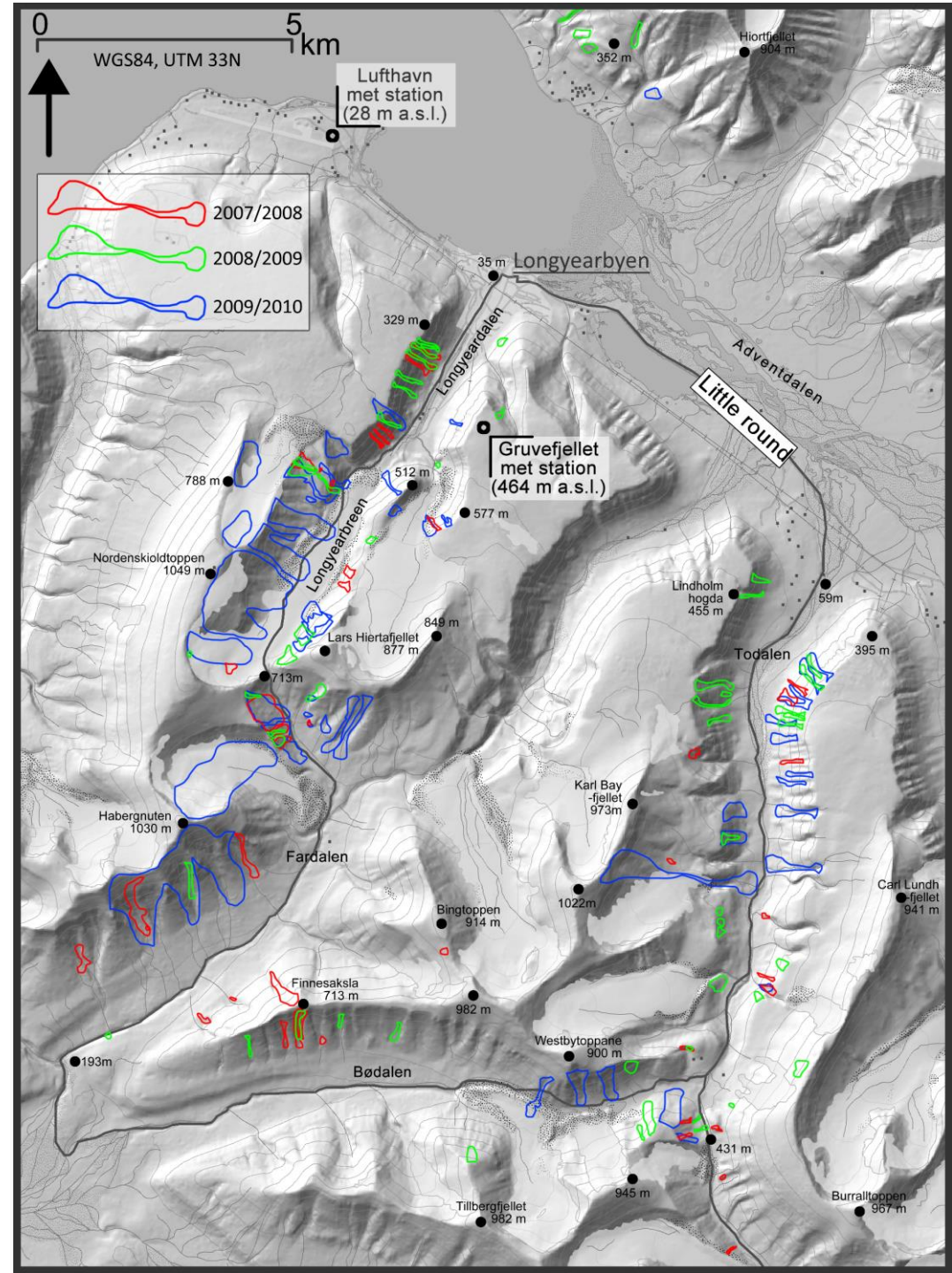
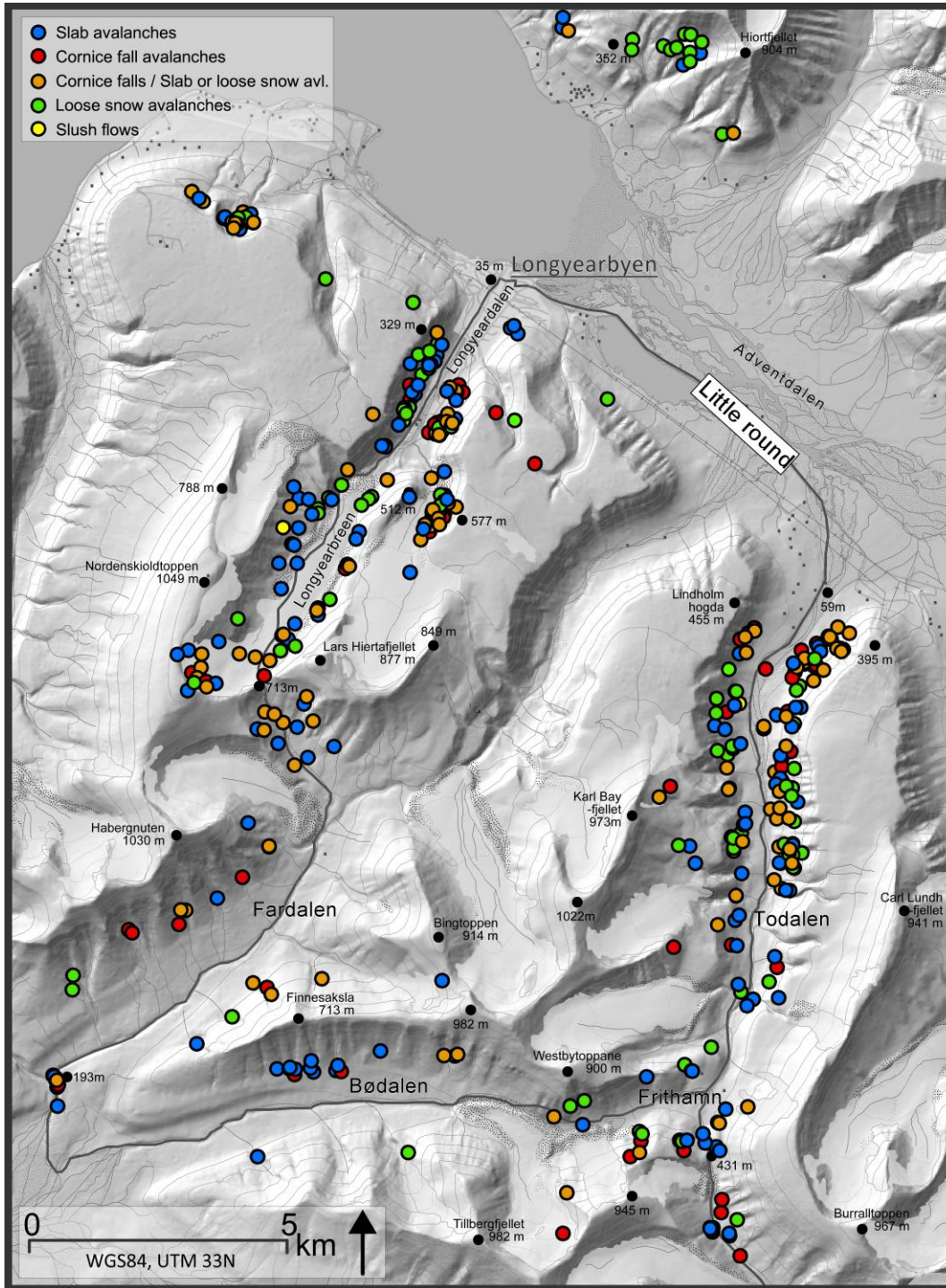
- Know how to plan and make your trip safer by following 3 steps for safe planning and travel
- Familiarization to the UNIS avalanche safety equipment
- Be able to use avalanche beacon, probe and shovel for effective search and rescue
- **General Competence**
- Be able to understand and identify avalanche danger in the terrain from a avalanche forecast
- Be able to do companion rescue; beacon search – probing - shovelling
- As a member of a group be able to take part in organized avalanche rescue



# Norway: More than half of those killed in avalanches in the last 14 years were skiing or snowboarding



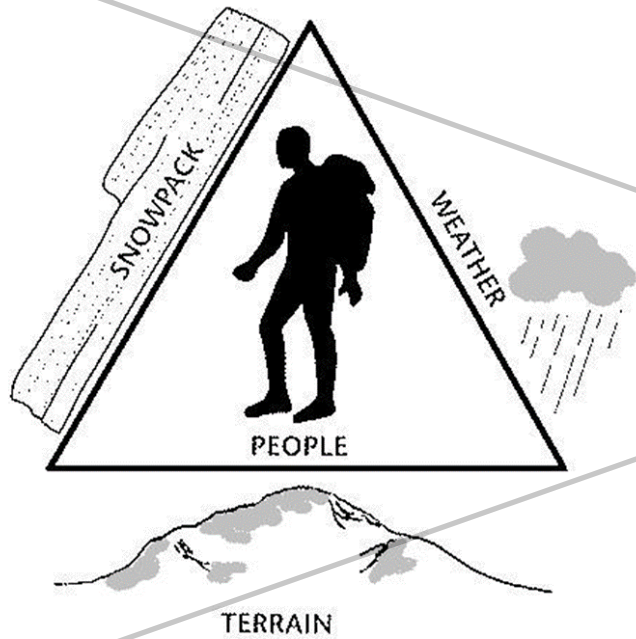






# Avalanche safety

## CAUSE

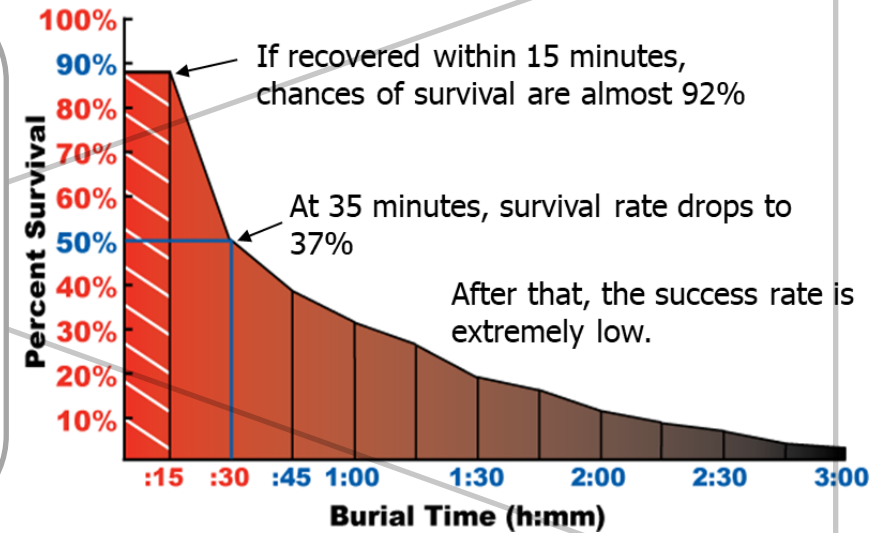


## Proactive Controls

## AVALANCHE ACCIDENT



## CONSEQUENCE



## Reactive Controls



© regobs.no, Kjetil@obskorps

## Slab avalanches “the killer”

- soft – hard
- dry - wet
- size from small to big





## Slab avalanche – Fardalen 2015







# That's why there are avalanches

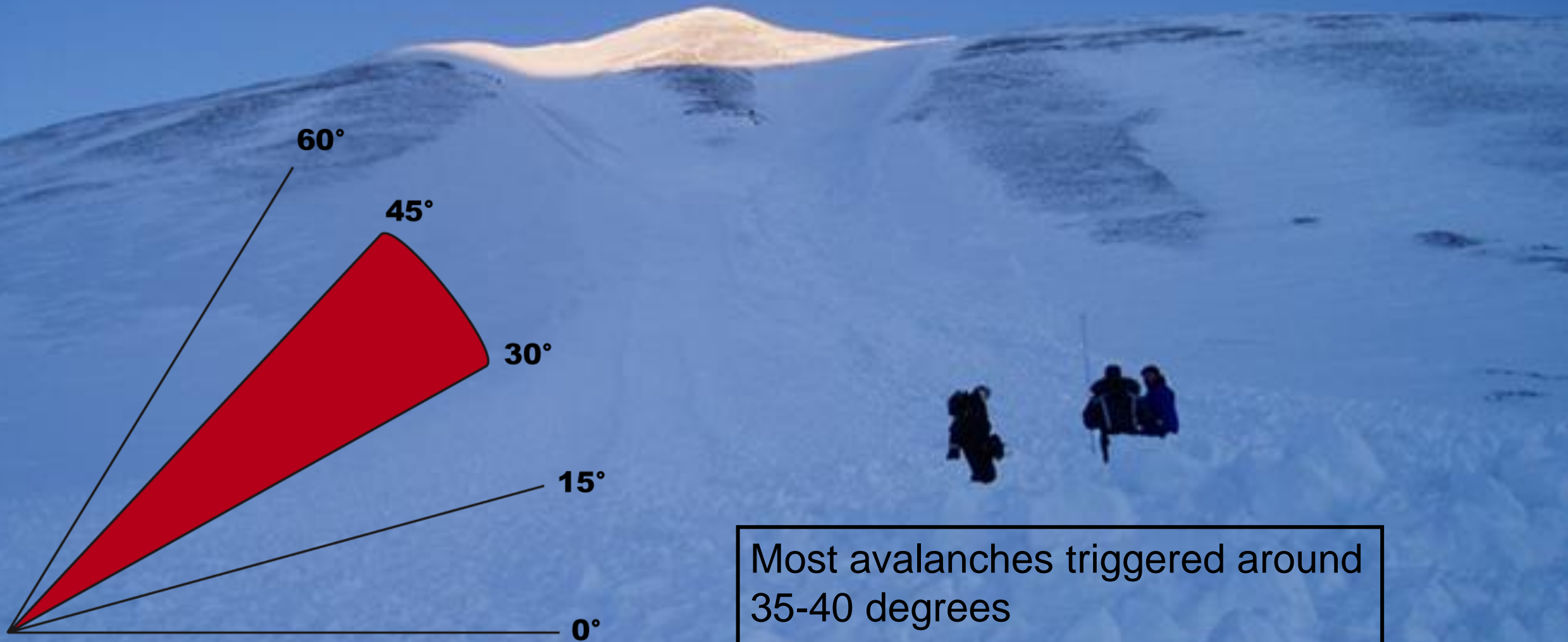


**Steep terrain**

**Avalanche trigger**

**Slab / weak layer**

Steep terrain = avalanche terrain







# Elements of a slab avalanche







# Elements of a slab avalanche



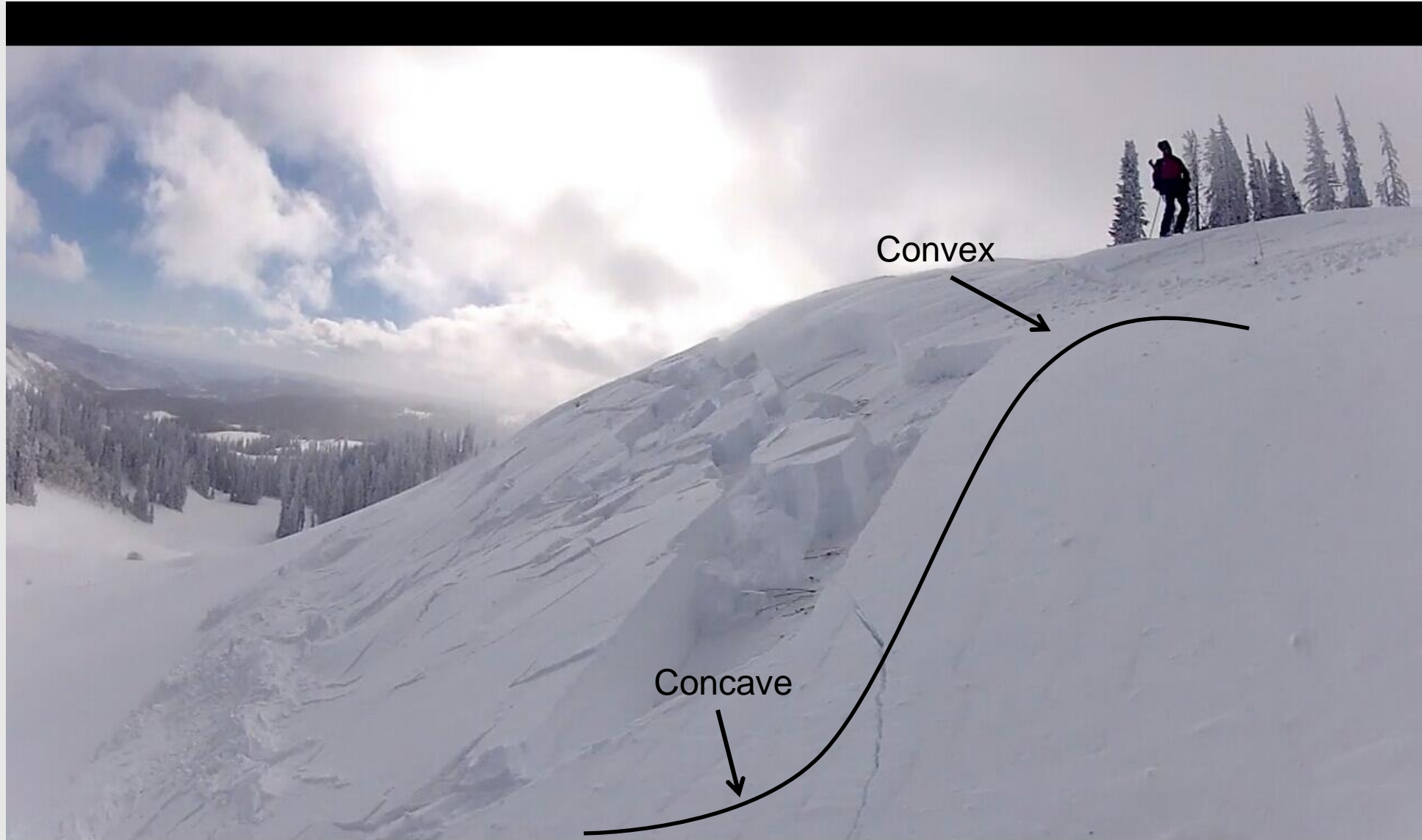




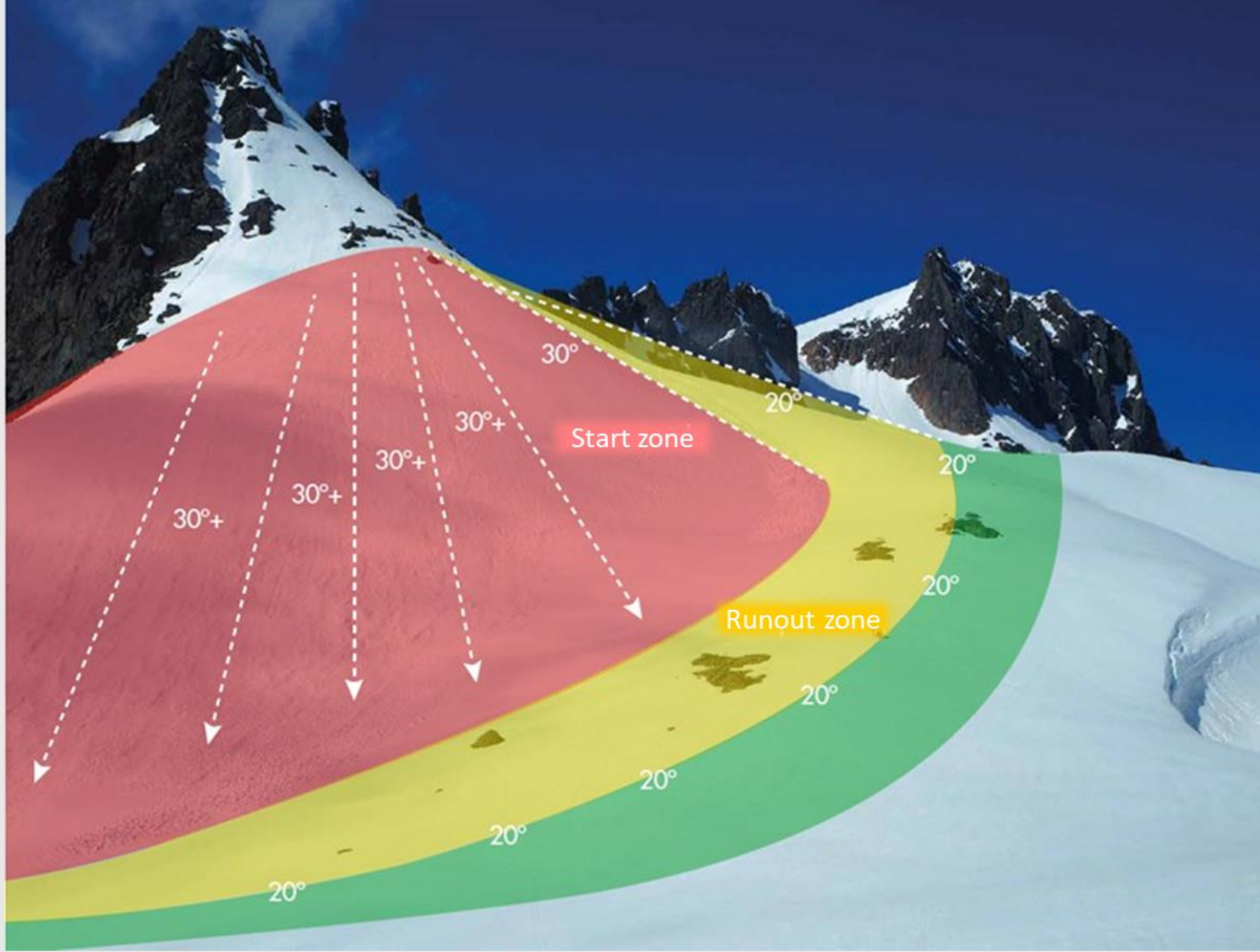
# Elements of a slab avalanche



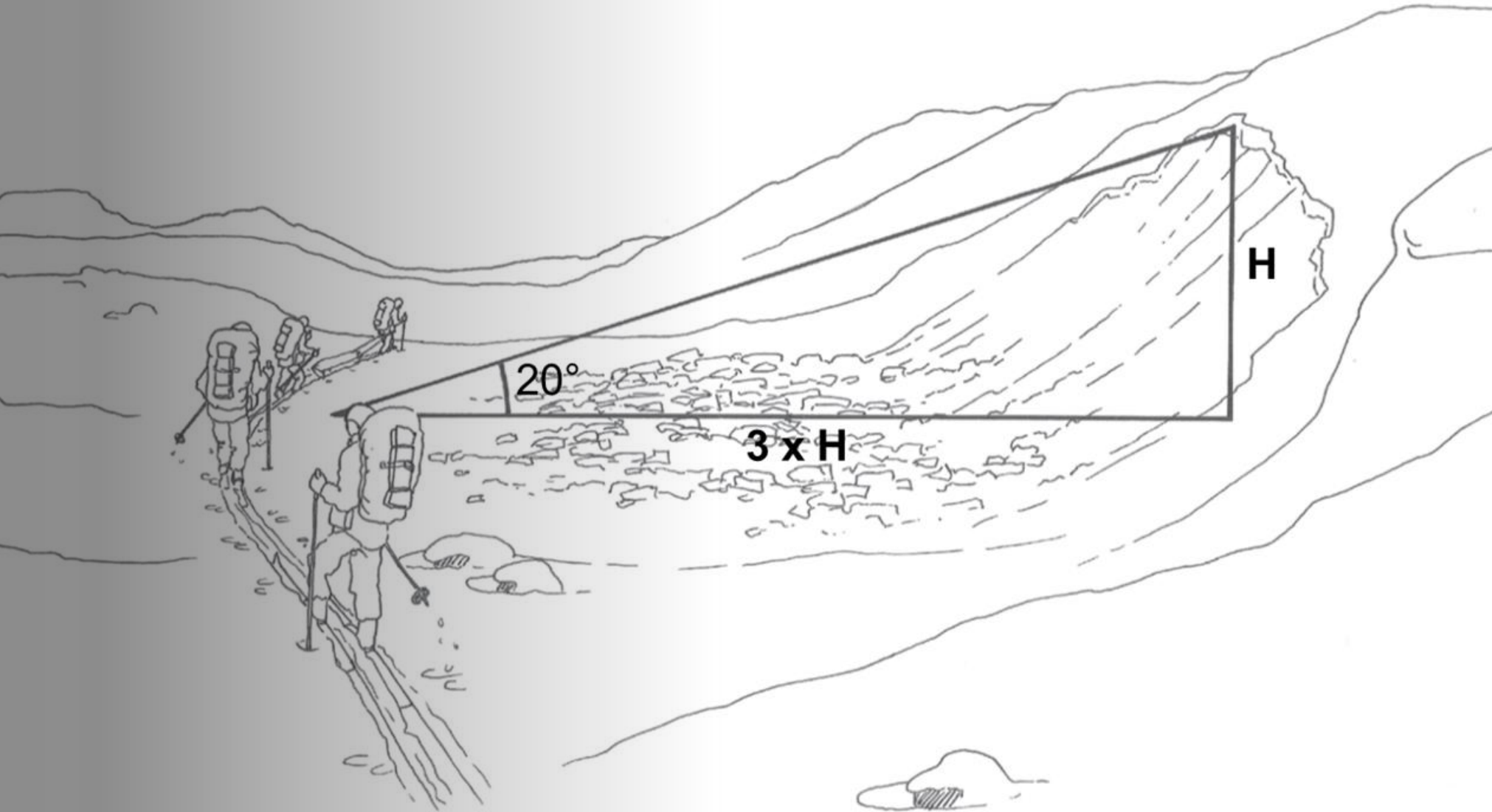
# Start zone







# Runout zone

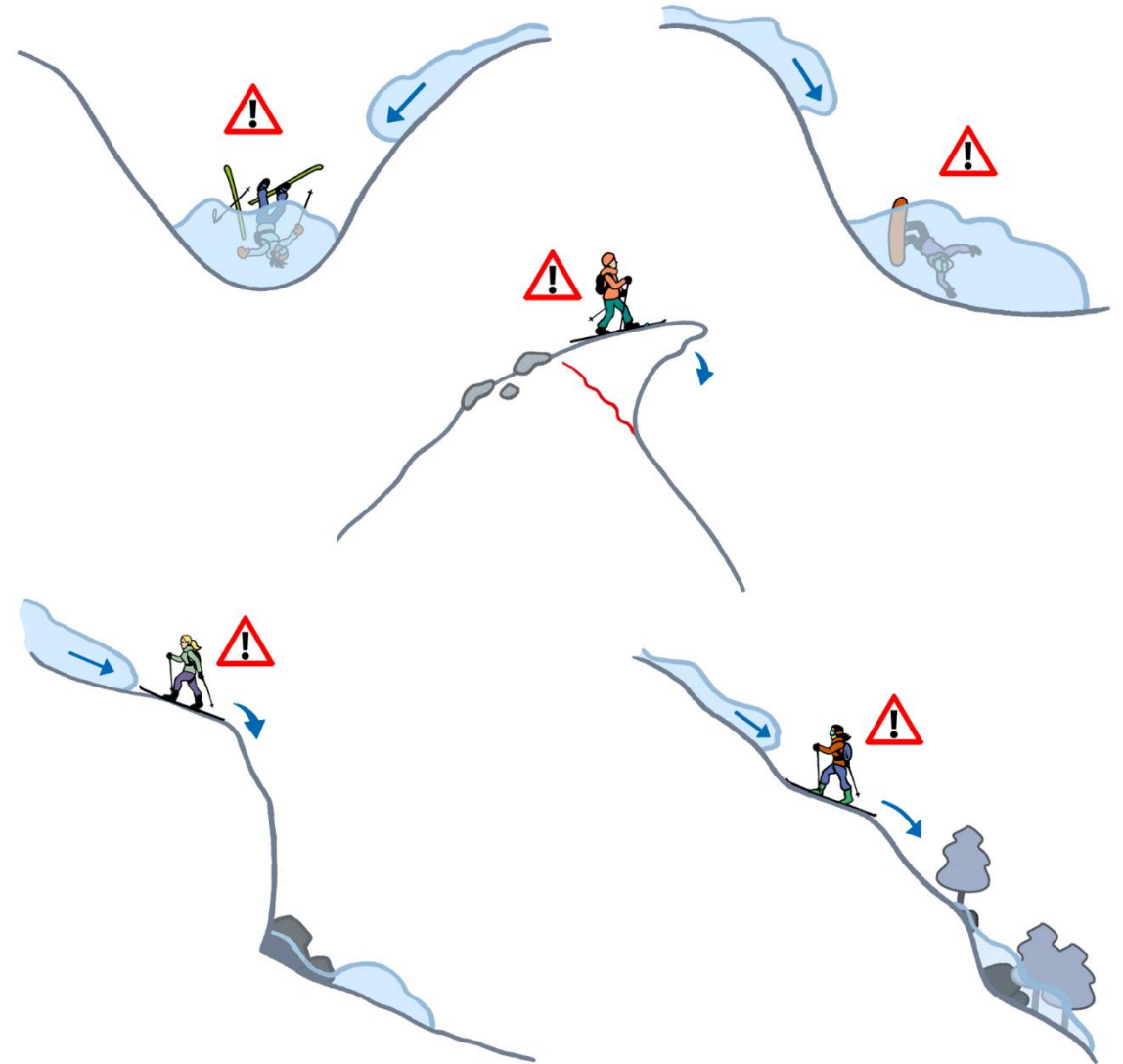




# Terrain trap

---

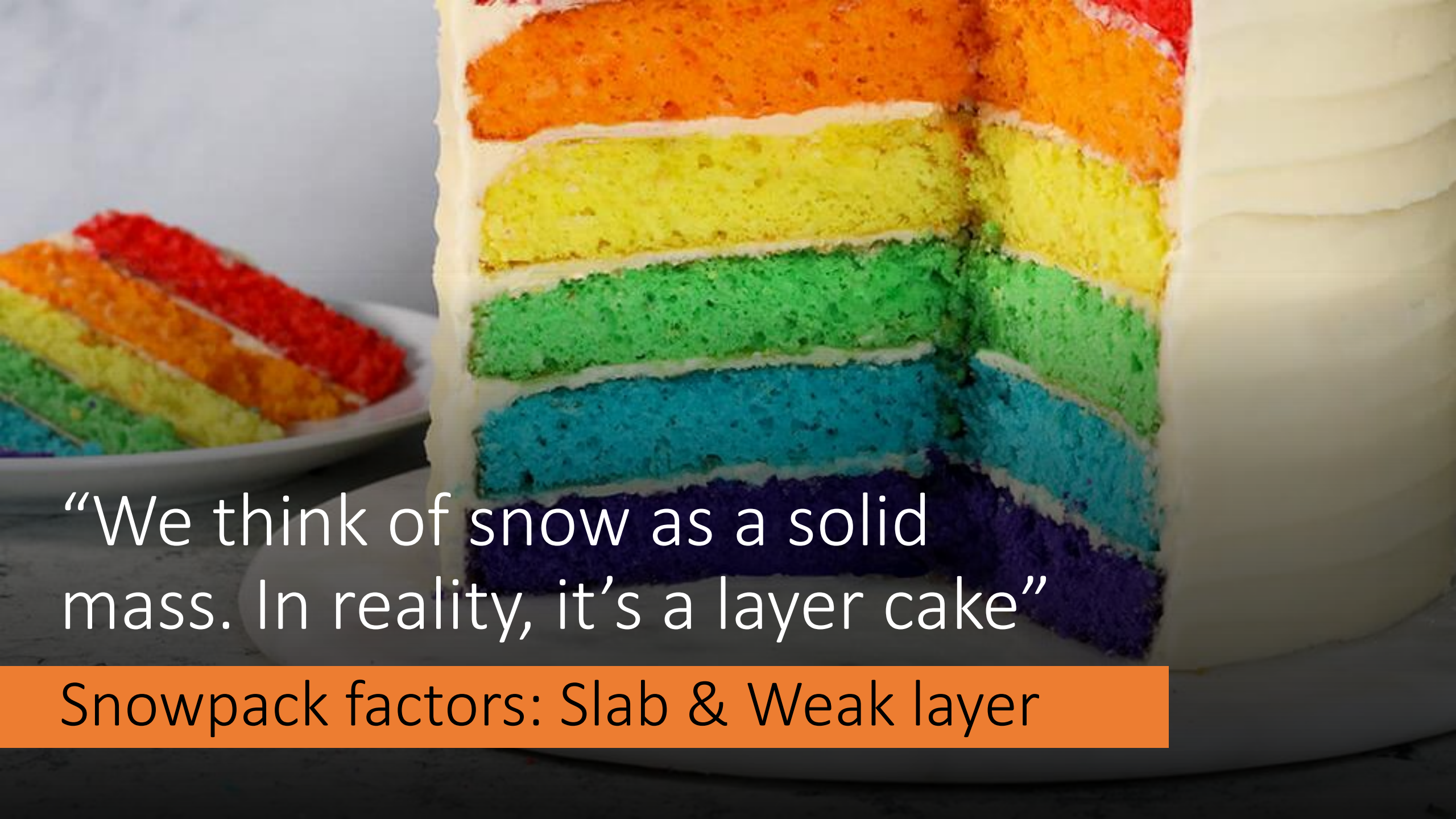
**Terrain traps** are features that increase the consequences of being caught in an **avalanche**



# Terrain trap







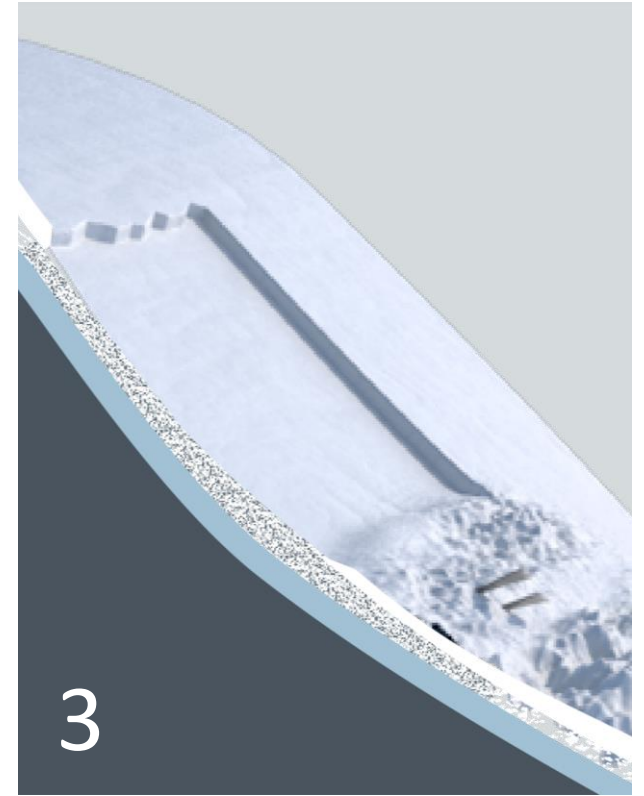
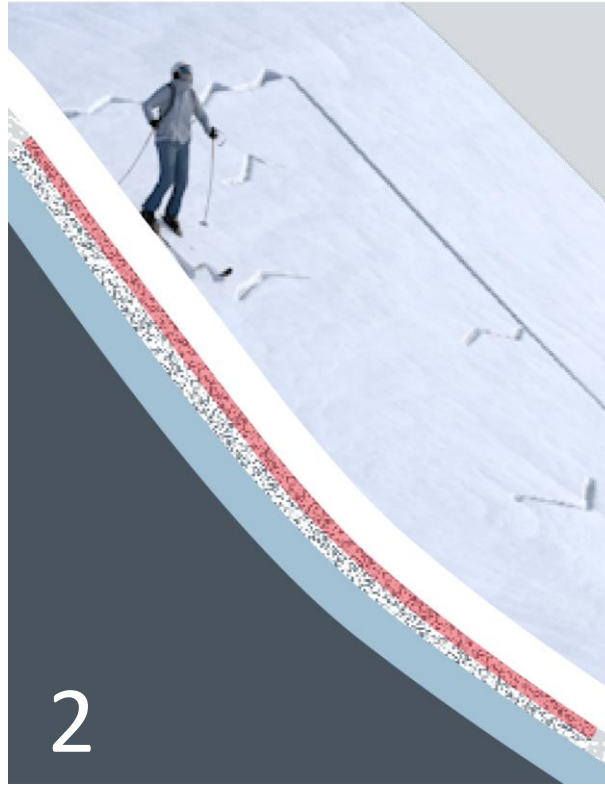
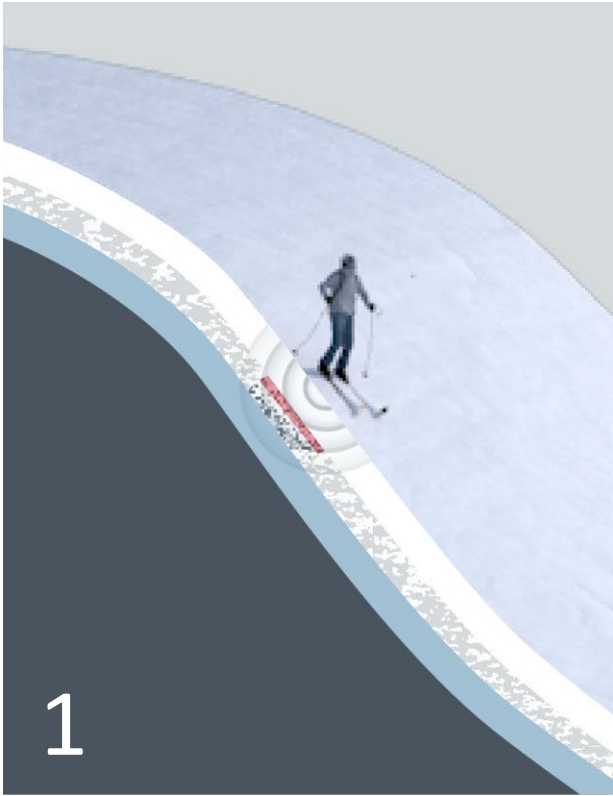
“We think of snow as a solid mass. In reality, it’s a layer cake”

Snowpack factors: Slab & Weak layer

# Snowpack factors: Slab & Weak layer







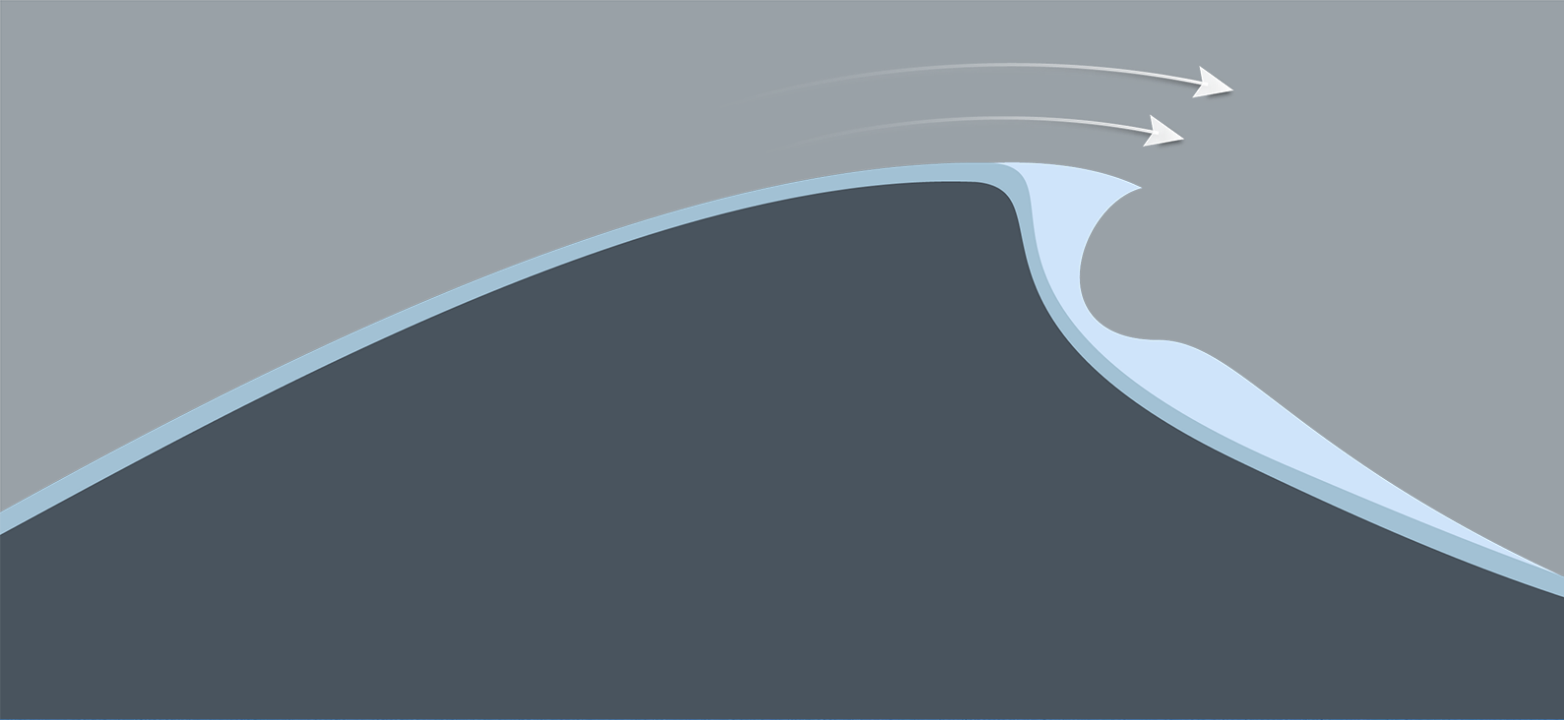
FILM

Avalanche triggers: Additional load

# Wind, the “architect of avalanches”



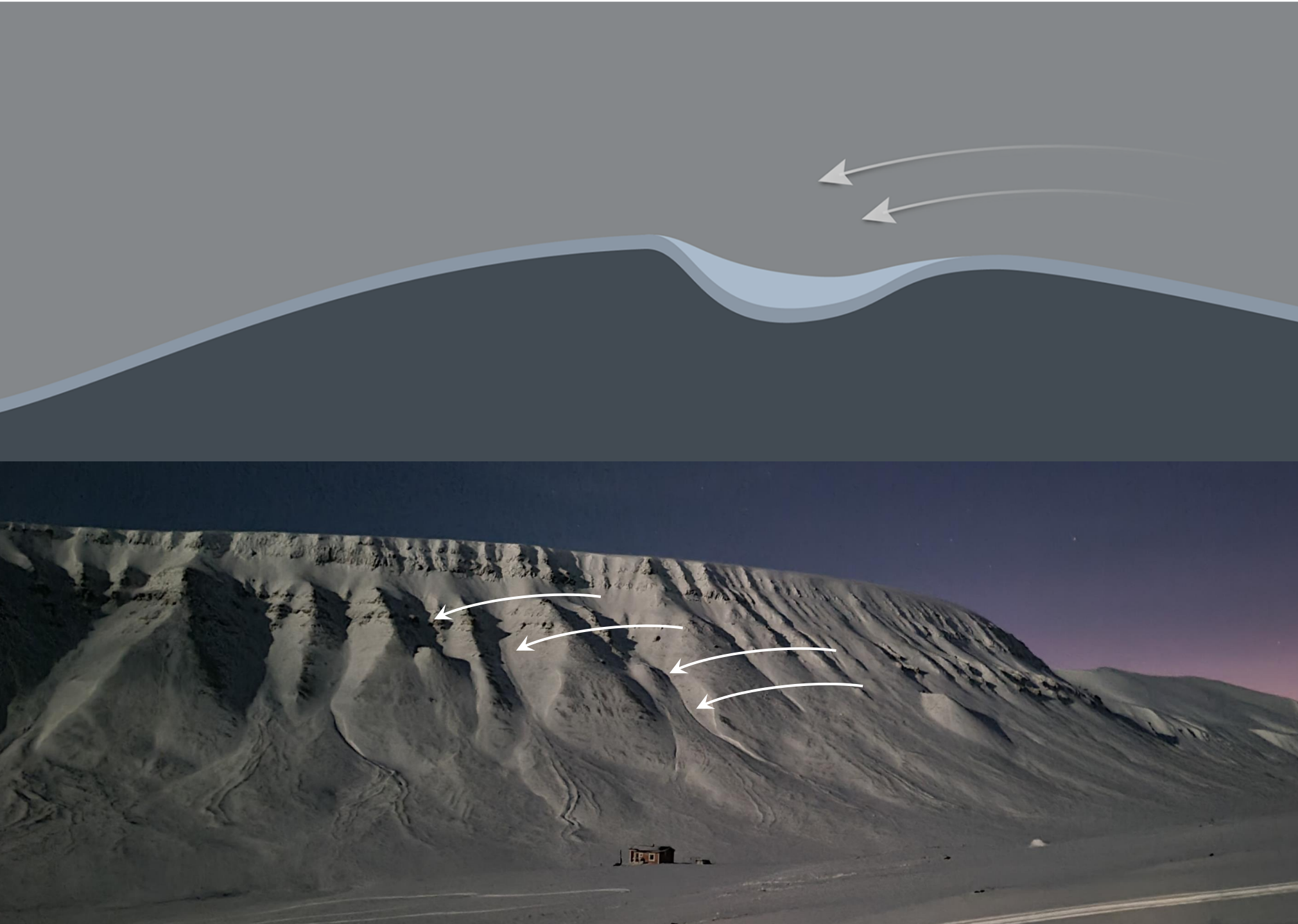




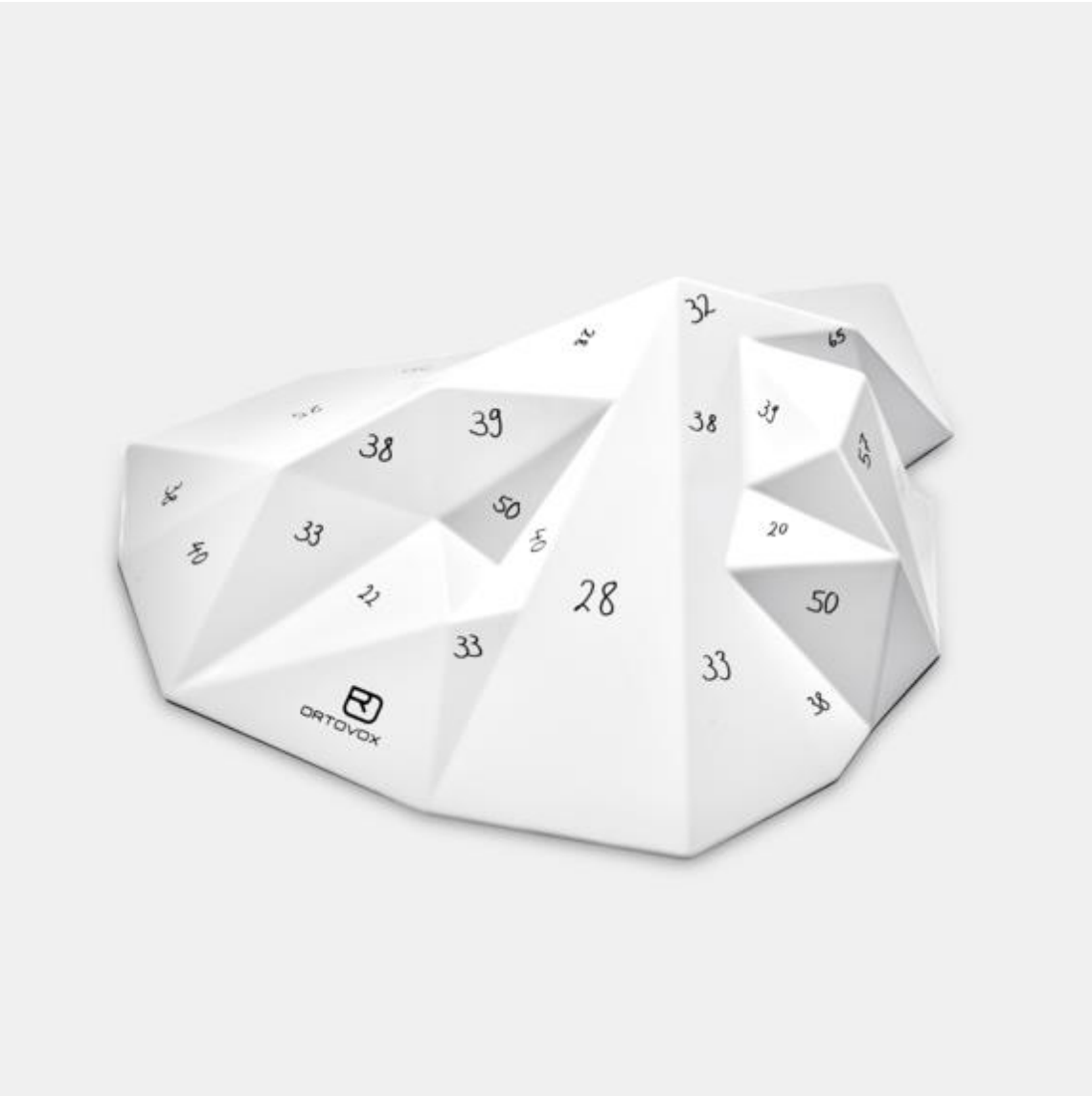
Top load



Side load








### 3D Mountain Exercise:

- Identify avalanche terrain
- Identify terrain traps
- Wind – top and side loading

## 3D Mountain Exercise:



**Danger level 3 - Considerable avalanche danger**

Published: 2023-01-13 03:42 PM


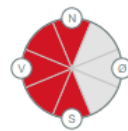

**! Natural avalanches**

Complicated situation with persistent weak layers in the snowpack, wind and fresh snow. Avalanches may be released both naturally and remotely.





### Avalanche problems

**Wind drifted snow (slab avalanches)**

Avalanches may release spontaneously on some steep slopes. Avalanches can get large enough to bury a car or destroy a small house (size 3).



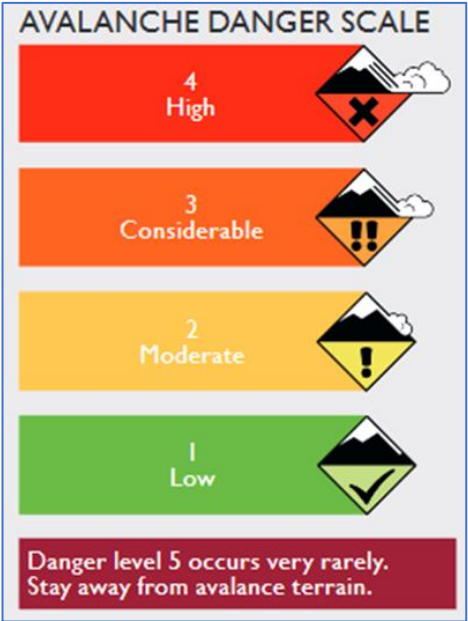
### AVALANCHE DANGER SCALE

4 High	
3 Considerable	
2 Moderate	
1 Low	

**Danger level 5 occurs very rarely.  
Stay away from avalanche terrain.**



# Possible distribution of avalanche prone locations, remote triggering and size





# Varsom. no

- **Map**
  - Slope angel map
  - Avlaanche runout zones
  - off line map (possible)
- **List**
  - Observations in map view
- **Warnings** (Avalanche forecast)
  - In map centre
  - In map view

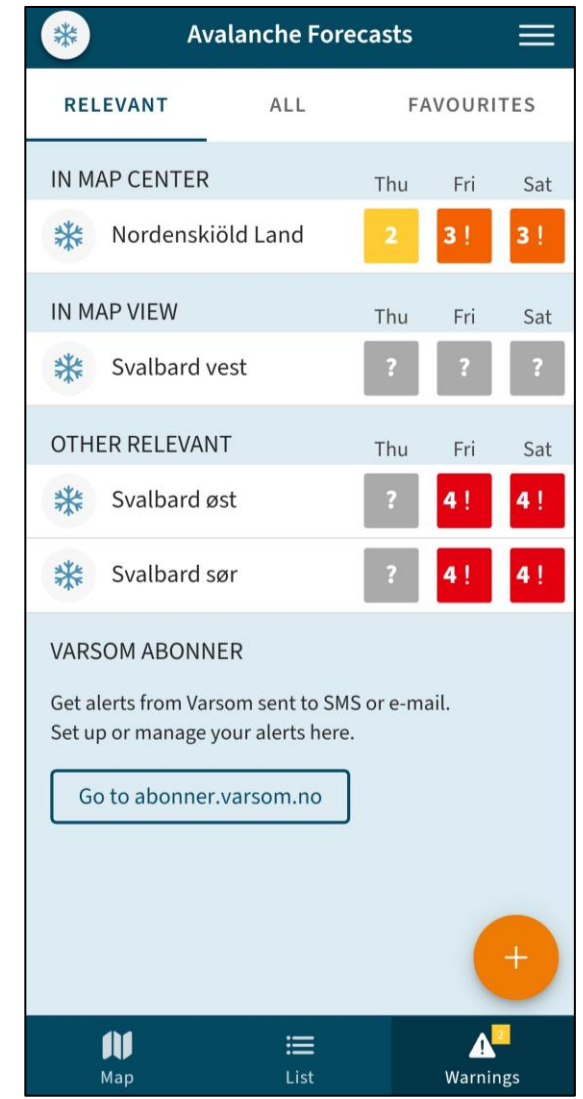
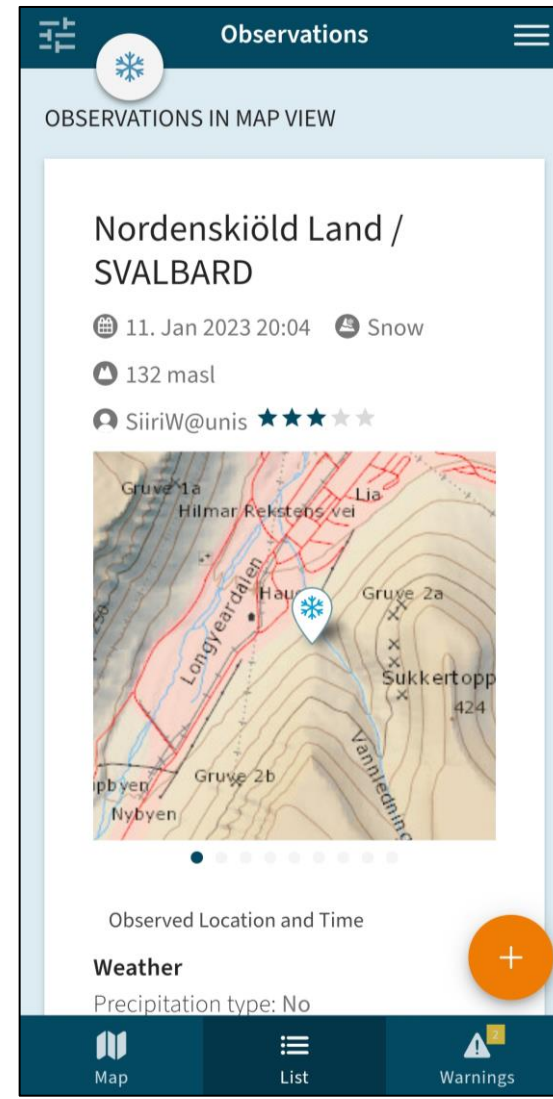
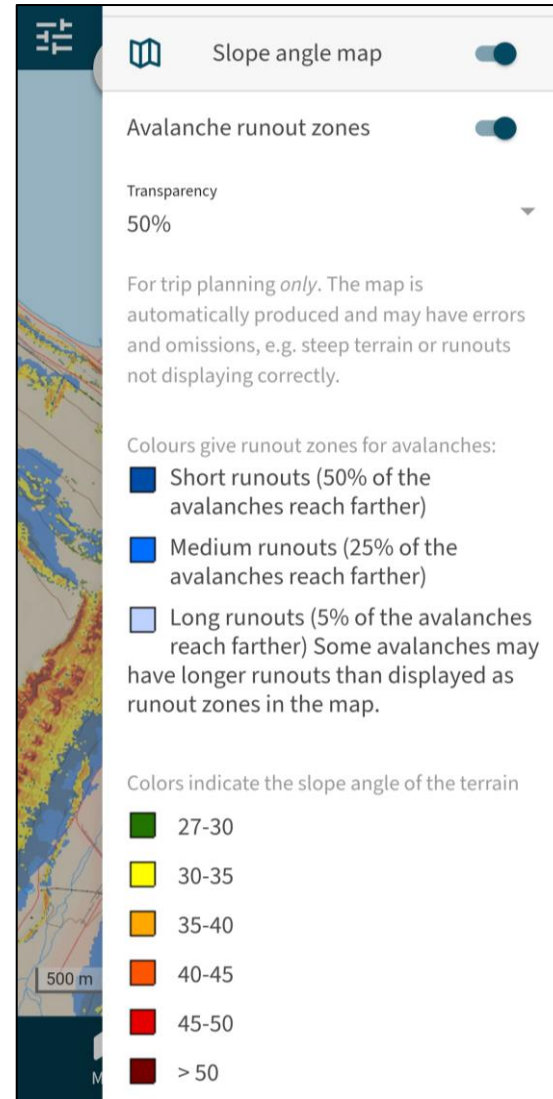
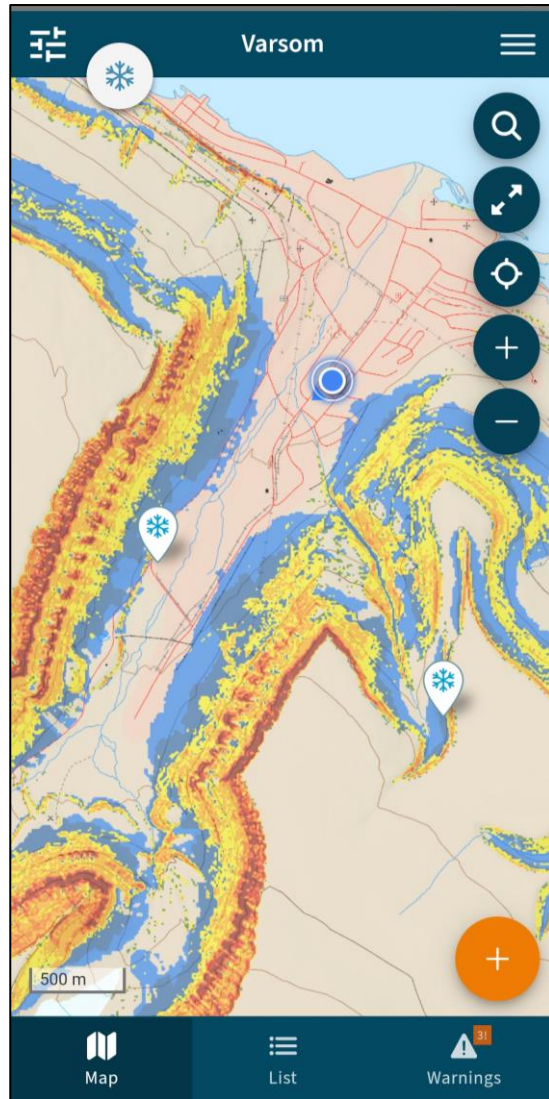
Possible to get alerts from Varsom sent to SMS or e-mail

- Add your obsrvations (from map view): «New snow observations»  
use: simple observation

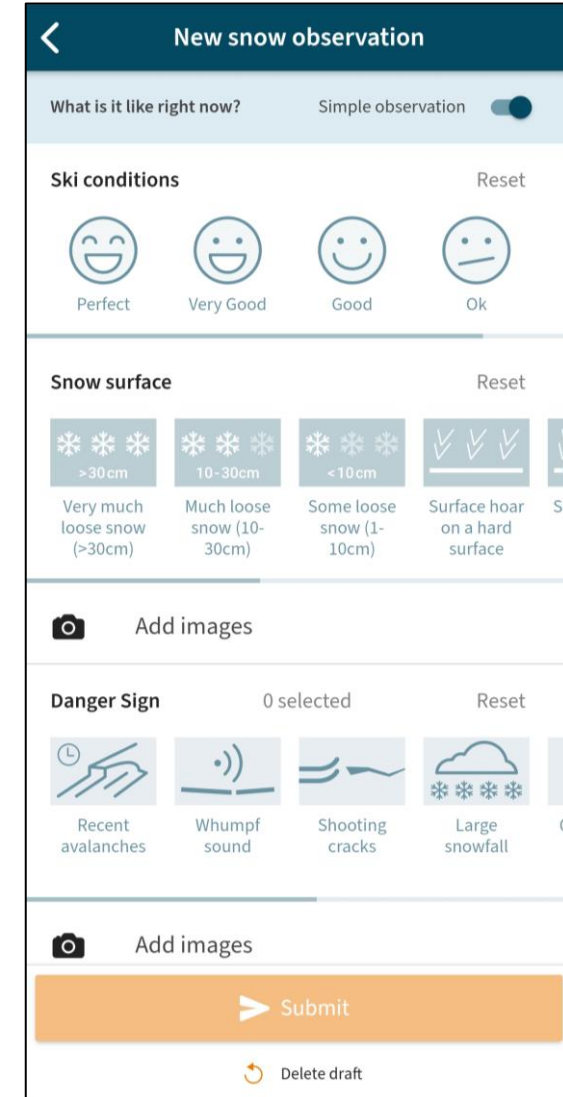
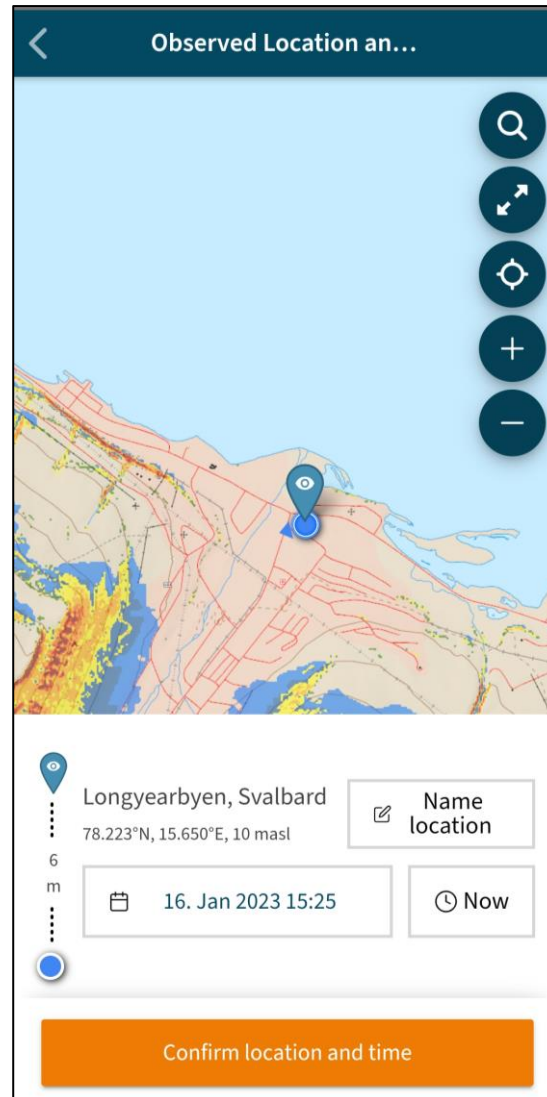
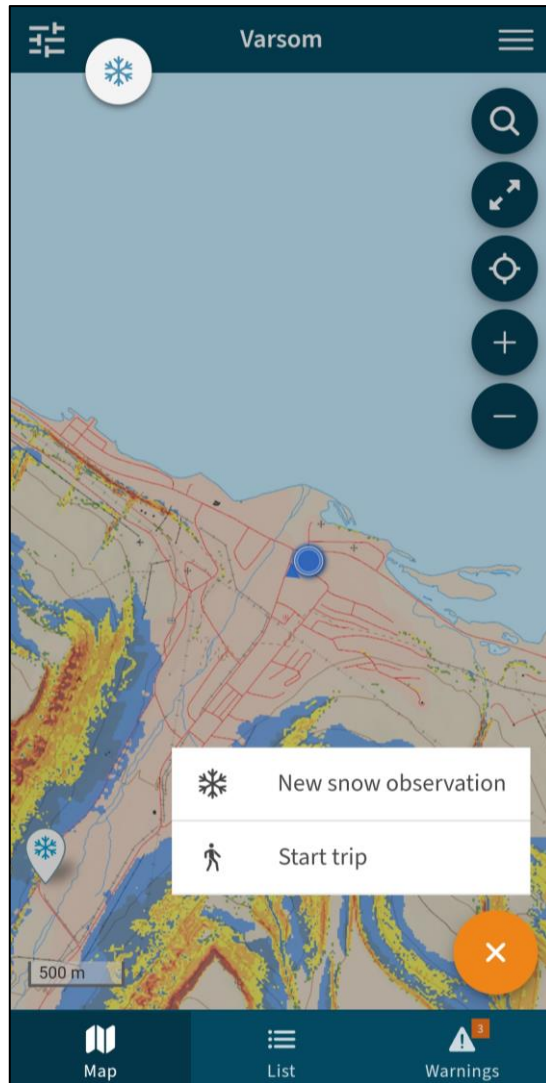




# Varsom.no



# New snow observation





# Danger signs



Before  
trip



Large  
snowfall



Quick tem-  
perature  
change



Recent  
snowdrift



Much water in  
the snow

During  
trip



Recent  
avalanches



Shooting  
cracks



Whumpf  
sound



Large  
snowfall



Recent  
snowdrift







Shooting  
cracks



Whumpf  
sound





Recent  
avalanches



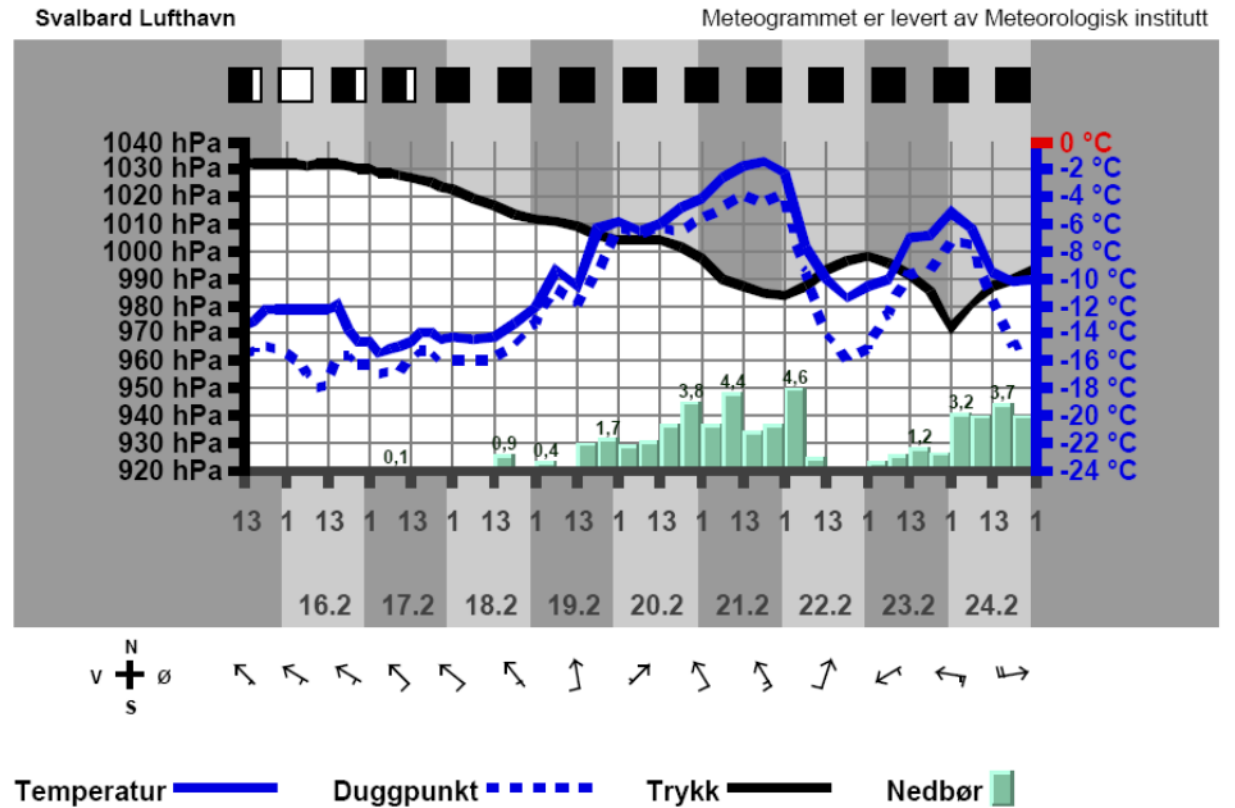


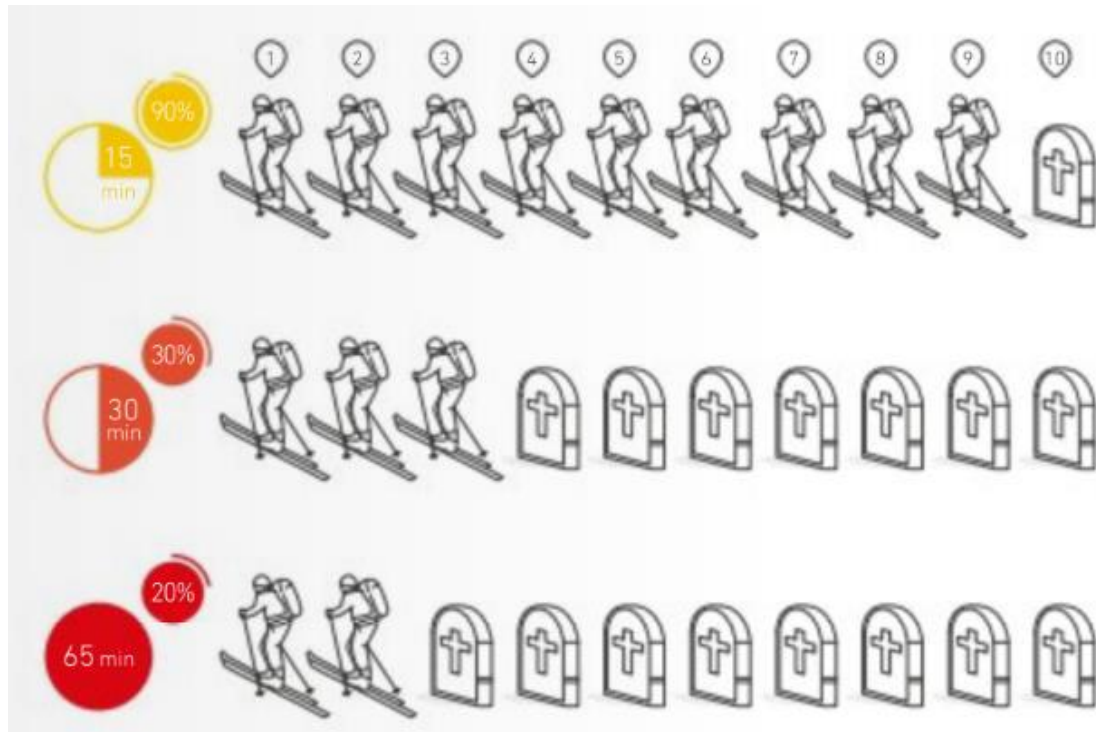


Quick temperature change

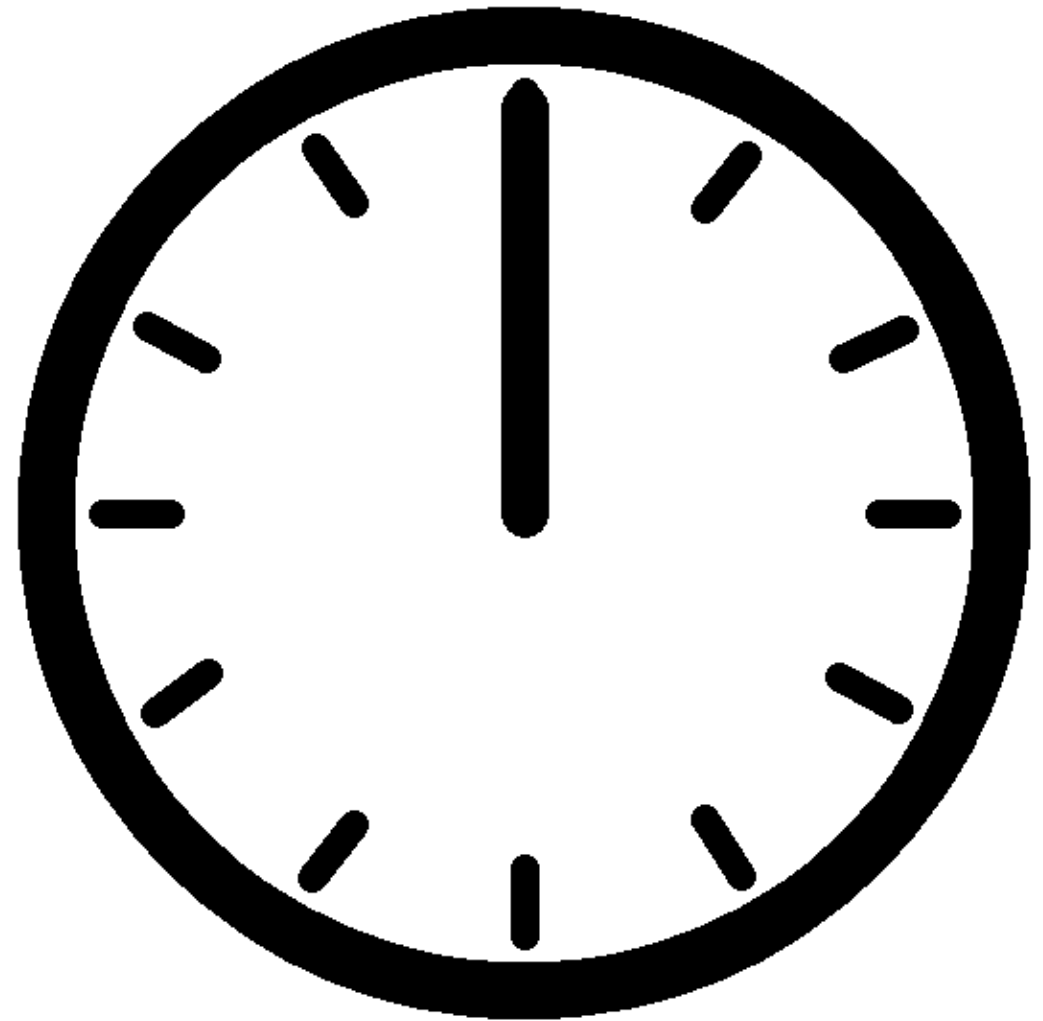


Much water in the snow





In 90 percent of avalanche accidents,  
**the victim or someone in the victim's party triggers the avalanche!**





# What do you need for a rescue?

**Avalanche Beacon**



Follows an electronic signal  
to the buried victim  
**Always make sure your beacon is  
functioning properly before  
heading out for the day.**

**Avalanche Probe**



Verifies the depth and  
location of a buried victim

**Avalanche Shovel**



Used to dig out the victim

Keep your  
distance!  
20-50

## TRANSCIVER INTERFERENCE KEEP YOUR DISTANCE!

Electronic devices, metal objects, and magnets of any kind will interfere with your transceiver's signal if they are too close.

### TRANSMITTING

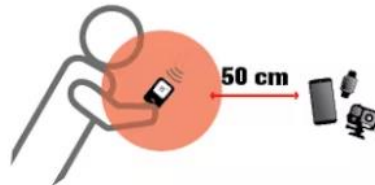


Always wear your transceiver at least **20 cm** away from anything electronic, metallic, or magnetic.

#### NO:

- Heated jackets
- Foil-lined jackets
- Magnetic jacket closures
- Chest-mounted cameras

### SEARCHING



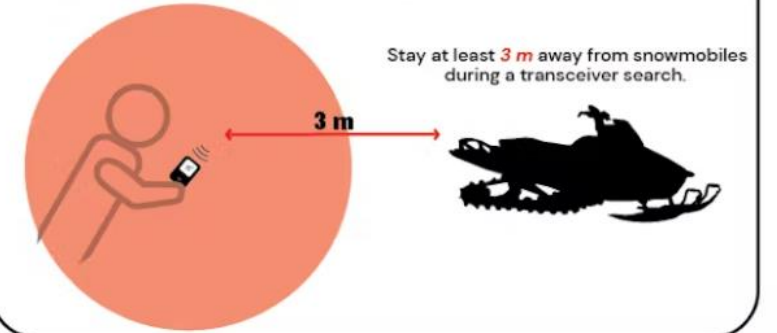
Increase the distance when searching.

Always hold your transceiver at least **50 cm** away from all electronics, metals, and magnets.

#### CAUTION

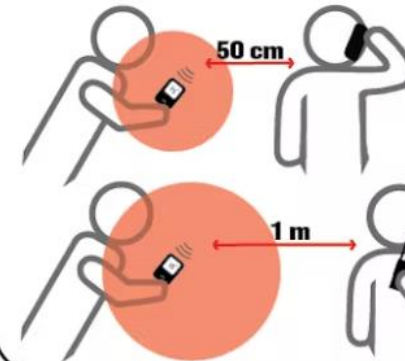
- Heated gloves and electronic watches *must* be taken off and stored away before a transceiver search
- Heated socks can interfere with your fine search when you're holding your transceiver close to the snow surface

### SEARCHING WITH SNOWMOBILES



Stay at least **3 m** away from snowmobiles during a transceiver search.

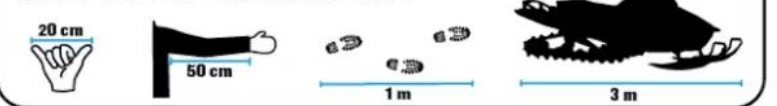
### CALLING FOR HELP



When using most communication devices, including analogue and FRS-band VHF radios, stay at least **50 cm** away from a searching transceiver.

When using a digital VHF radio, stay at least **1 m** away from a searching transceiver.

### HELPFUL MEASUREMENTS



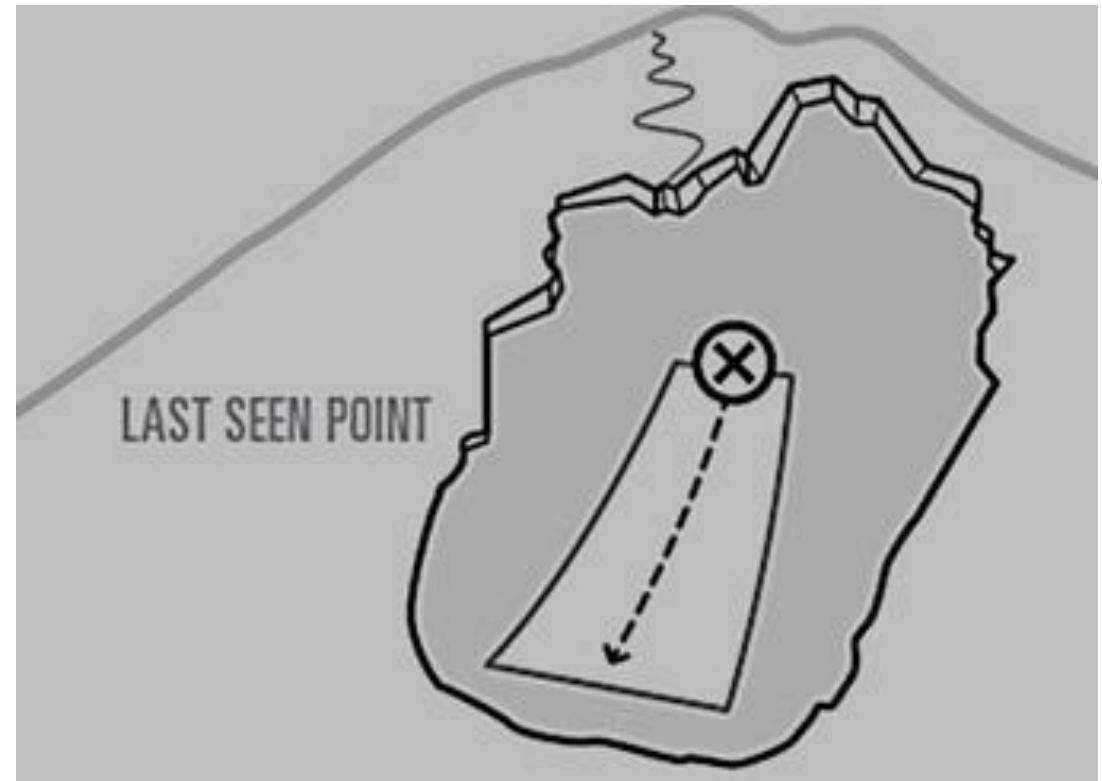
Avalanche Canada, February 2023

Avalanche transceiver manufacturers: Arva, BCA, Black Diamond/PIEPS, Marmot and Ortovox



# Avalanche rescue

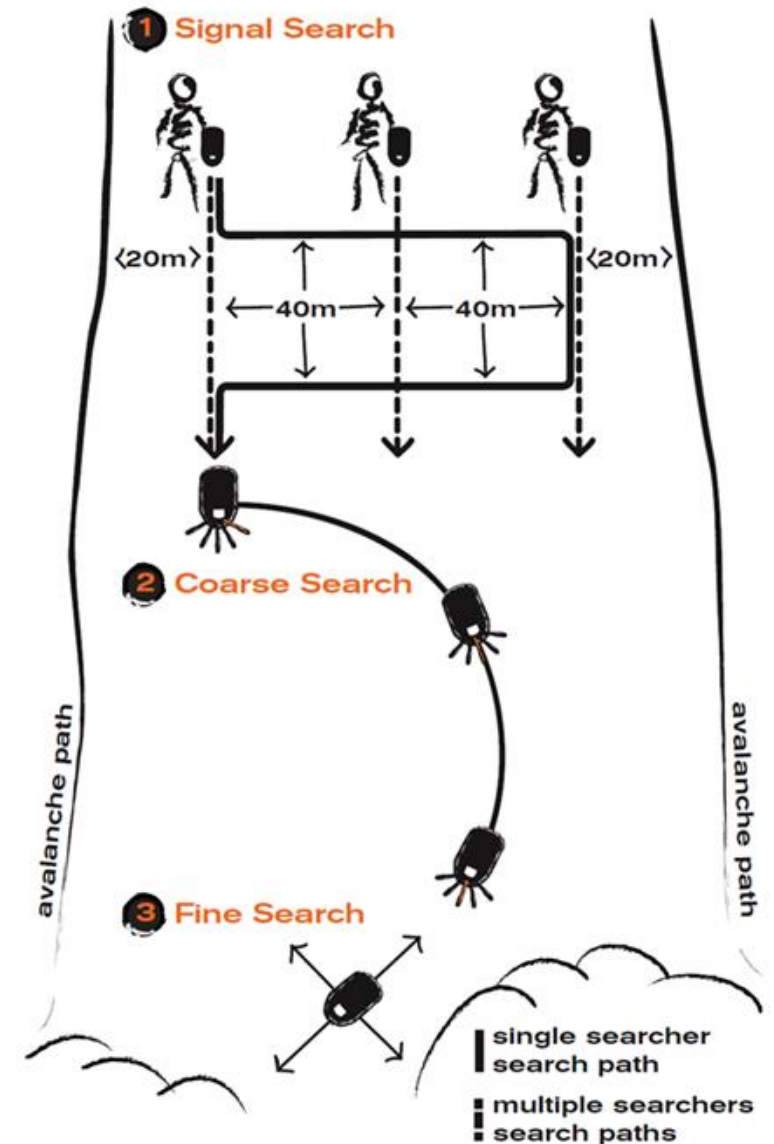
- Safety first!
  - Stop – Observe – Think – Evaluate
- Search
  - surface and beacon search
- Probing
- When to call for help?



# Avalanche beacon - search

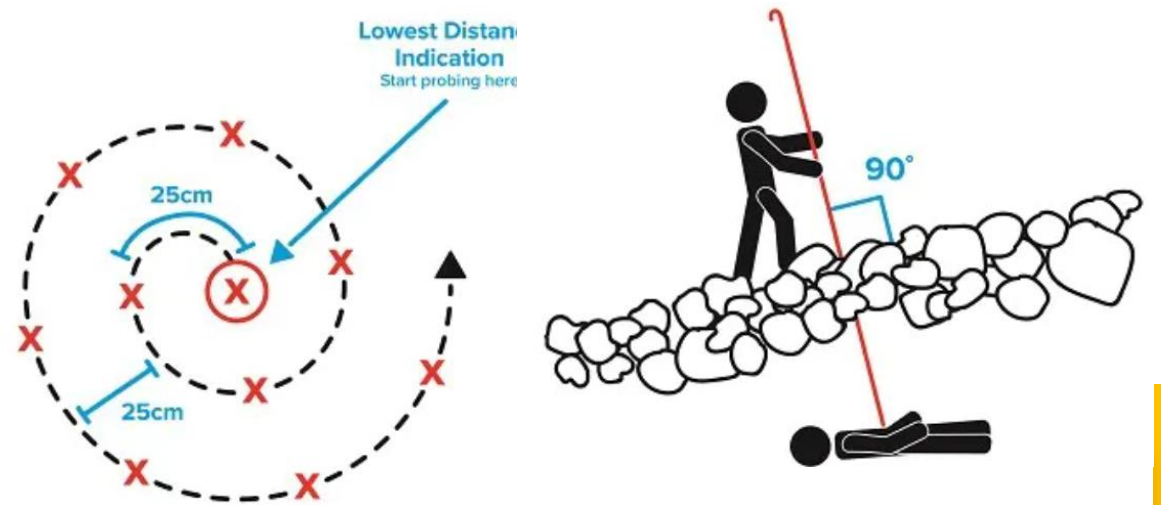
- Fast!

1. Signal search
2. Coarse search (slow down and close to surface from 10 m)
3. Fine search (from 3 m on the snow)
4. Pinpoint search – probe (25 cm)

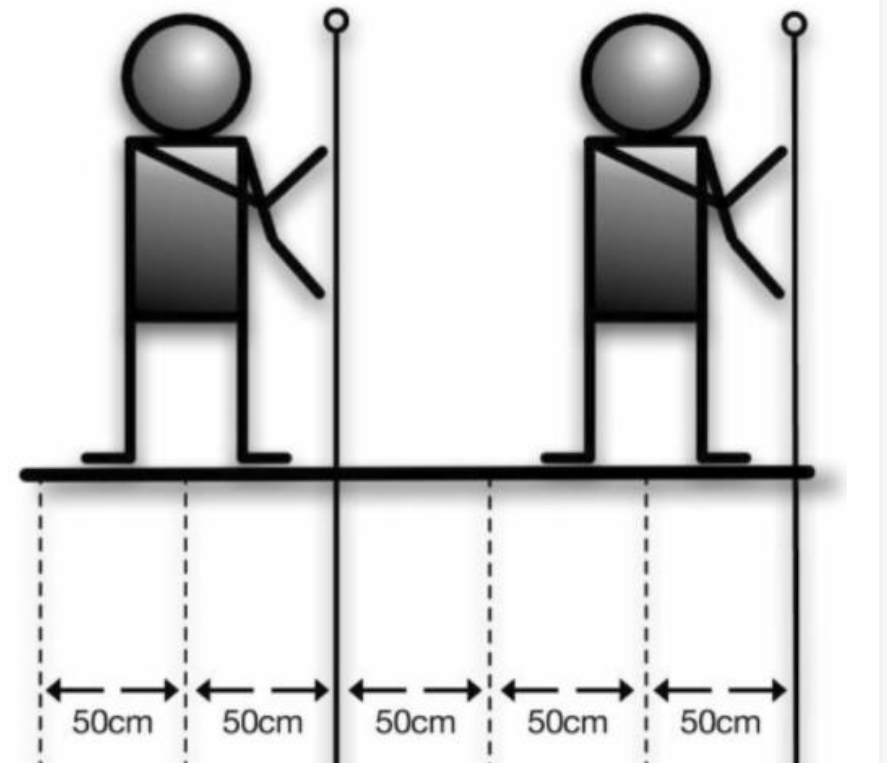




# Probing

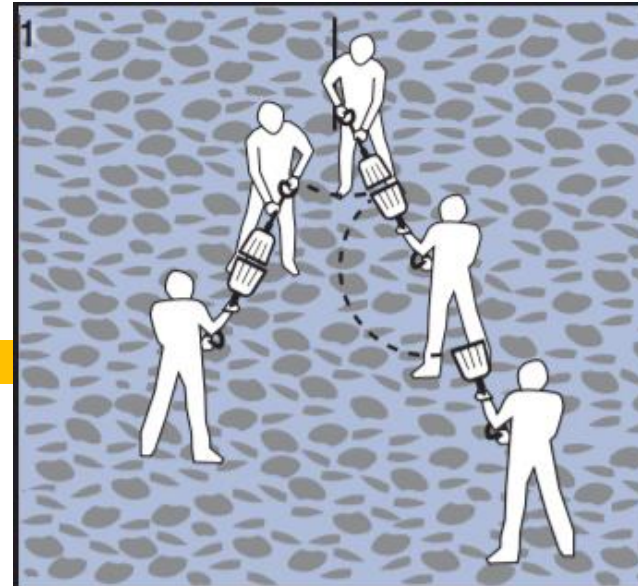


- Pinpoint probing (Avalanche beacon)
- Spot probing (likely burial area, around objects)
- Organized probe lines (3 point) (up to 6 people in one line)

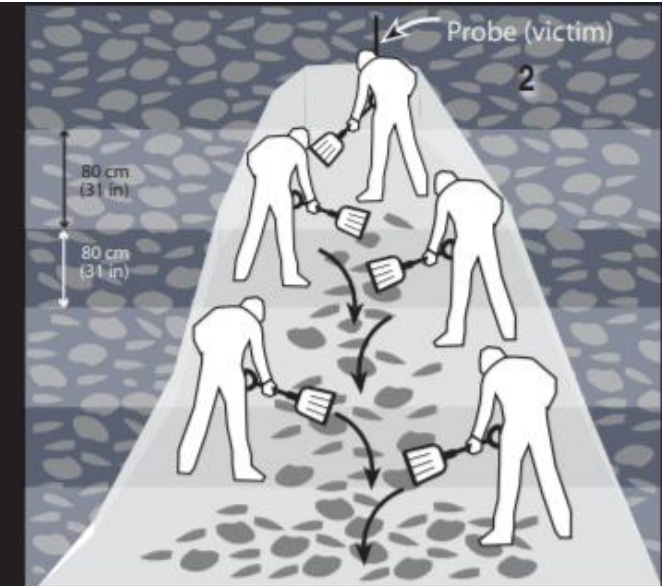


# Shovelling V-Shaped Conveyor Belt Method

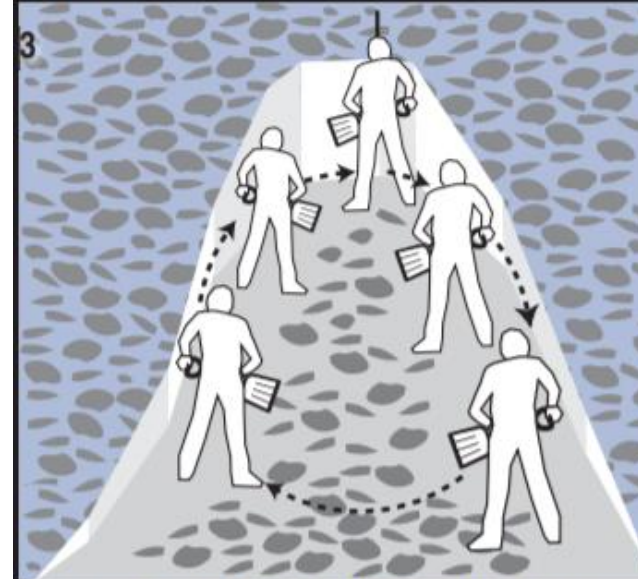
- 1) Start position
  - 2) Conveyor belt
  - 3) Clock wise rotation
  - 4) Victim first seen, more rescuers in the front
- Speed! Speed! Speed!



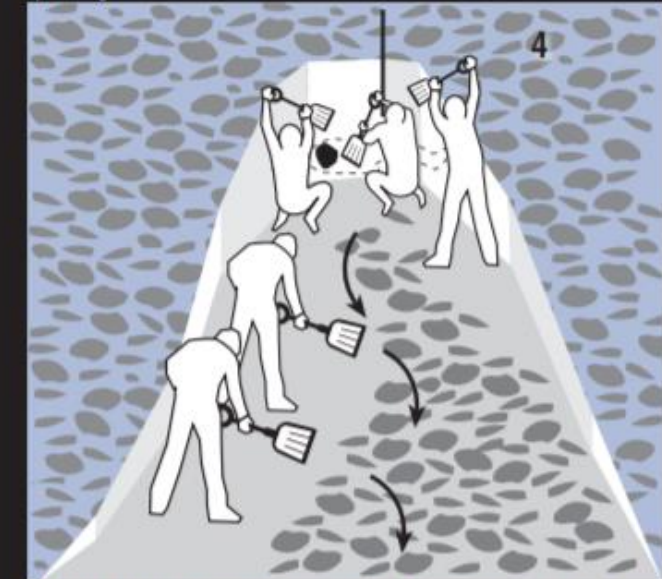
Positioning of rescuers: quick measurement of distance between shovelers



Working in sectors on the 'snow conveyor belt': Snow is transported with paddling motions



Clock wise rotation is initiated by the front person: 'Job Rotation' maintains a high level of motivation and minimizes early fatigue



Buried victim is first seen: More rescuers are needed at the front, the snow conveyor belt only need to be partly kept running.

# SUMMARY Avalanche Safety

## Don't Go if You Don't Know!

- Avalanche forecast?
- Weather forecast?
- How to avoid avalanche terrain?
- How to use safety equipment?

## Think Terrain, Not Snow

- Recognize avalanche terrain
- Recognize terrain traps and runouts
- Be able to plan a trip avoiding avalanche terrain

Get the forecast:



## Human Factor

- Number of people
- Safety equipment
- Experience, knowledge and skills
- Decision-making



# Where to find information

- Varsom.no
- Yr.no
- Unis.no  
(weather stations)





Learn more

Internett:

- [Varsom.no](http://Varsom.no) - snøskredskolen
- [backcountryaccess.com](http://backcountryaccess.com)

Bøker:

- Staying Alive in Avalanche Terrain (Bruce Tremper)
- Den lille snøskredboka (Kjetil Brattlien)
- Skikompis (Christer L. Nes)