

Avalanche Safety

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February 9, 2010

Agenda-Week One

- Definition + Diagram
- Short Video
- Avalanche Dynamics- Weather Snowpack Terrain
- Another Short Video
- East Coast Avalanches?
- Week Two: *Avalanches and You: The Basics of Safe Travel in Avalanche Terrain*

Avalanche

- Loose Snow Slides: Small amount of cohesionless snow releases and picks up more snow as it descends
- Typically smaller, less serious than slab avalanches
- Often caused by solar warming of the snow

Types: Loose Snow



From www.avalanche.org

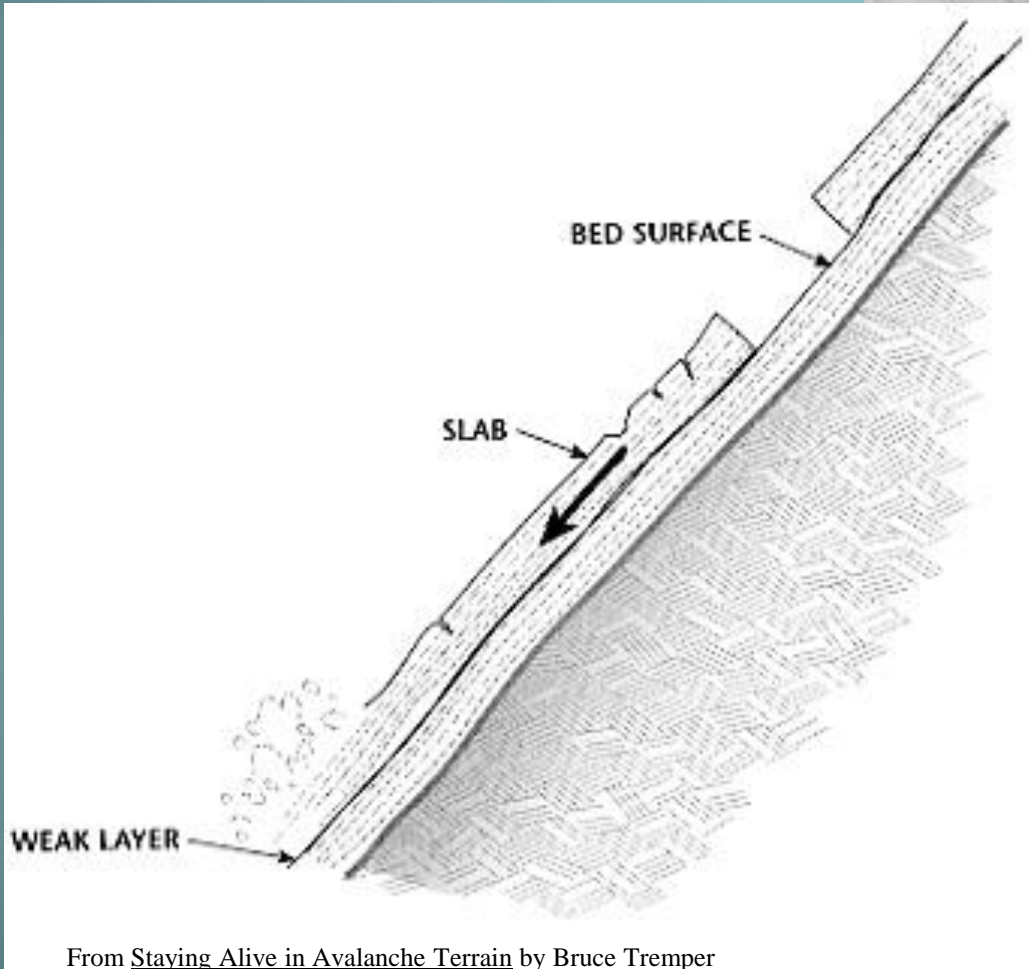
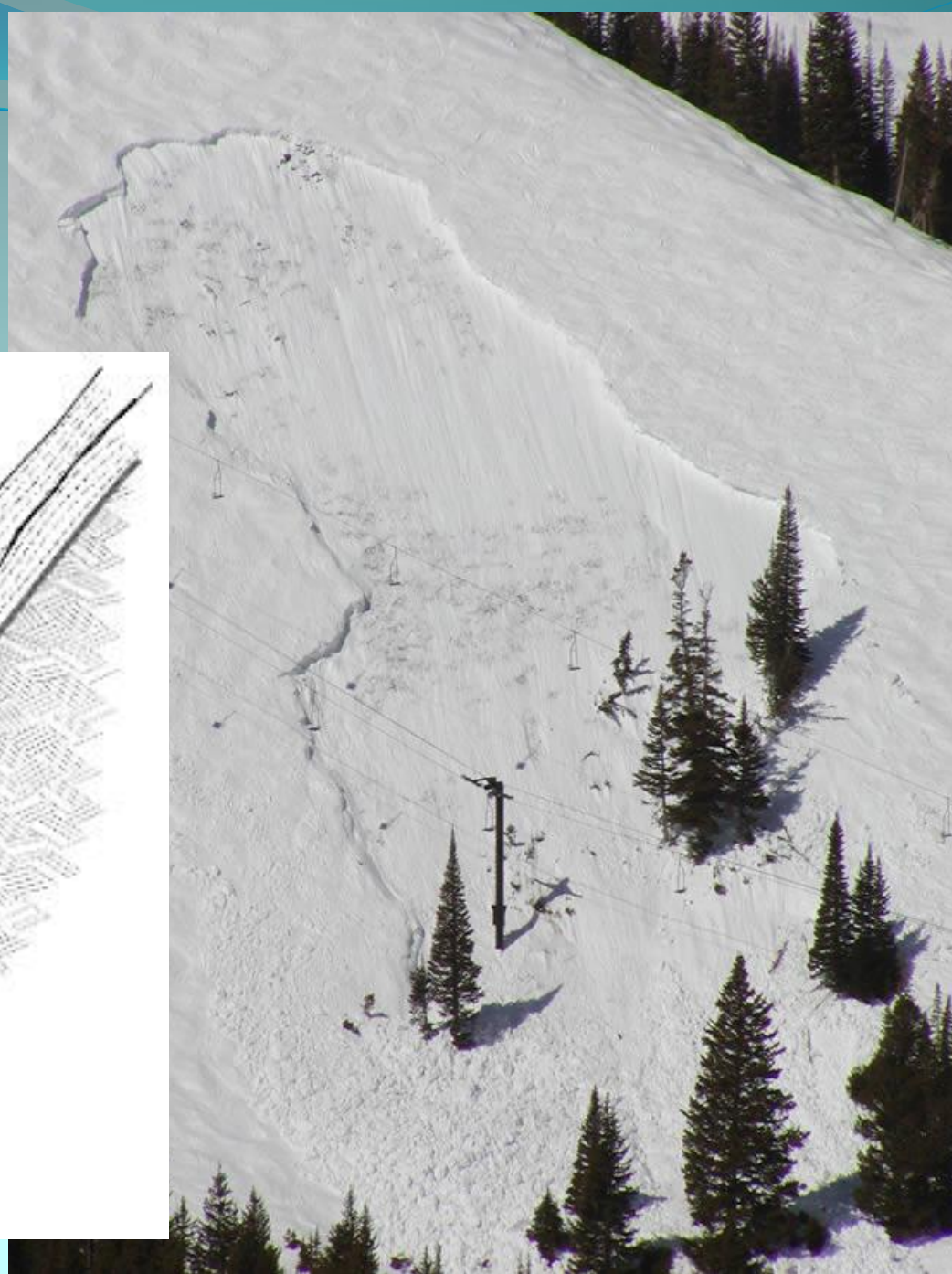
Photo by Bryan Palmintier

Avalanche

- Slab Avalanche: One or more cohesive layers of snow break away from slope as a unit.
- More serious



Types: Slab



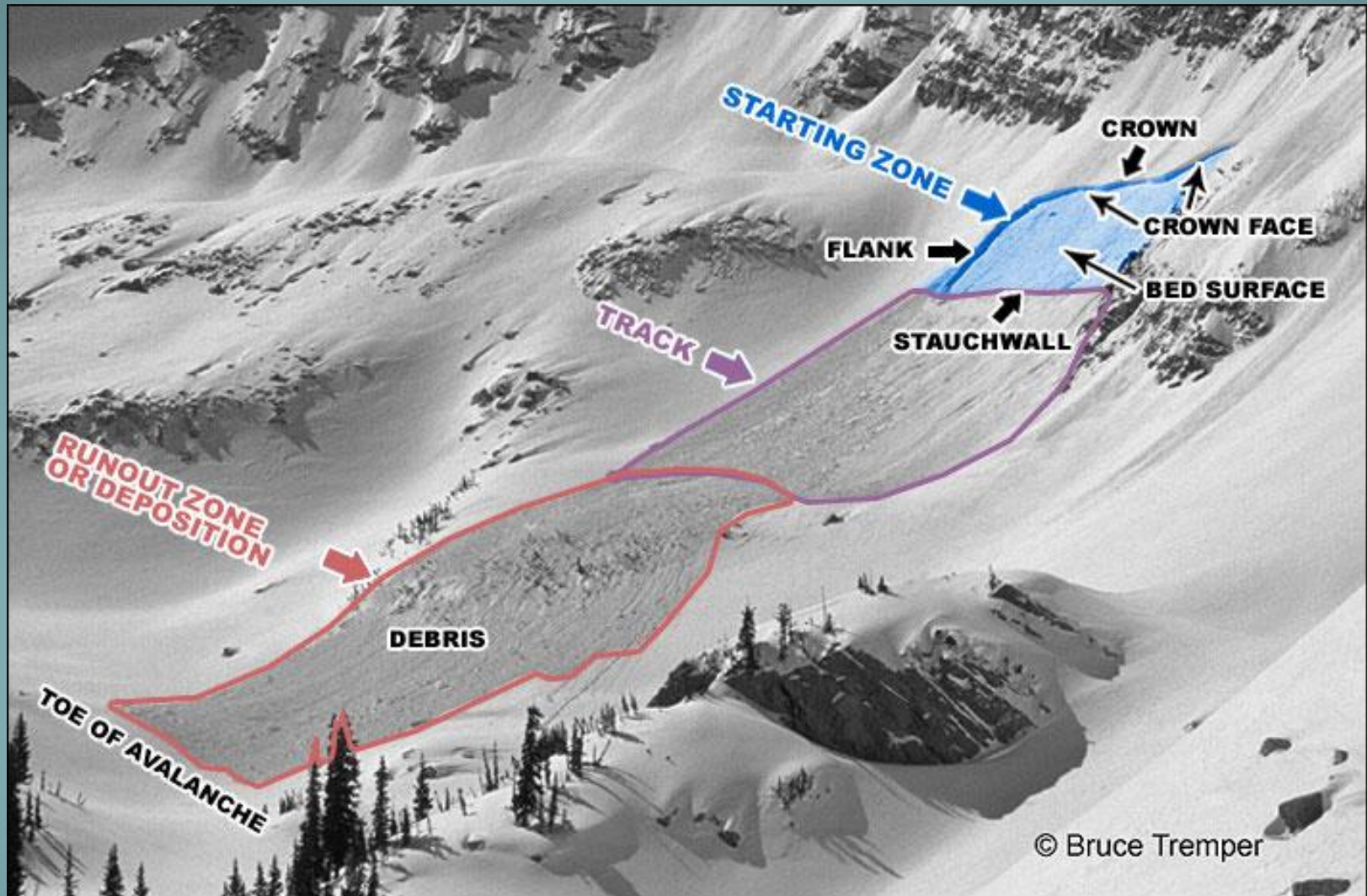
From [Staying Alive in Avalanche Terrain](#) by Bruce Tremper

In-bounds slide at Park City, From www.avalanche.org

Why do avalanches occur?

Downward force of snow on bed surface overcomes friction between bed surface and snow

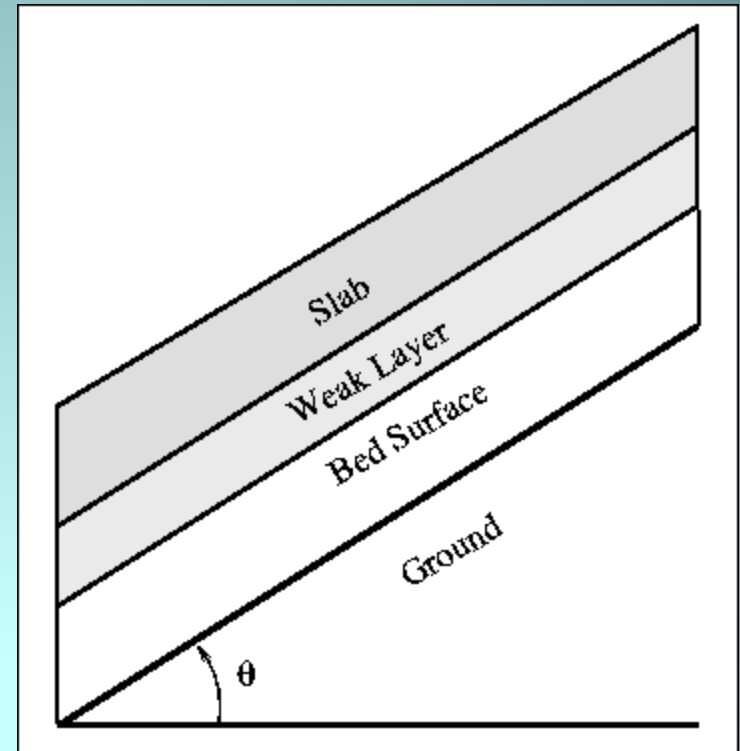




© Bruce Tremper

Avy Dynamics: Snowpack

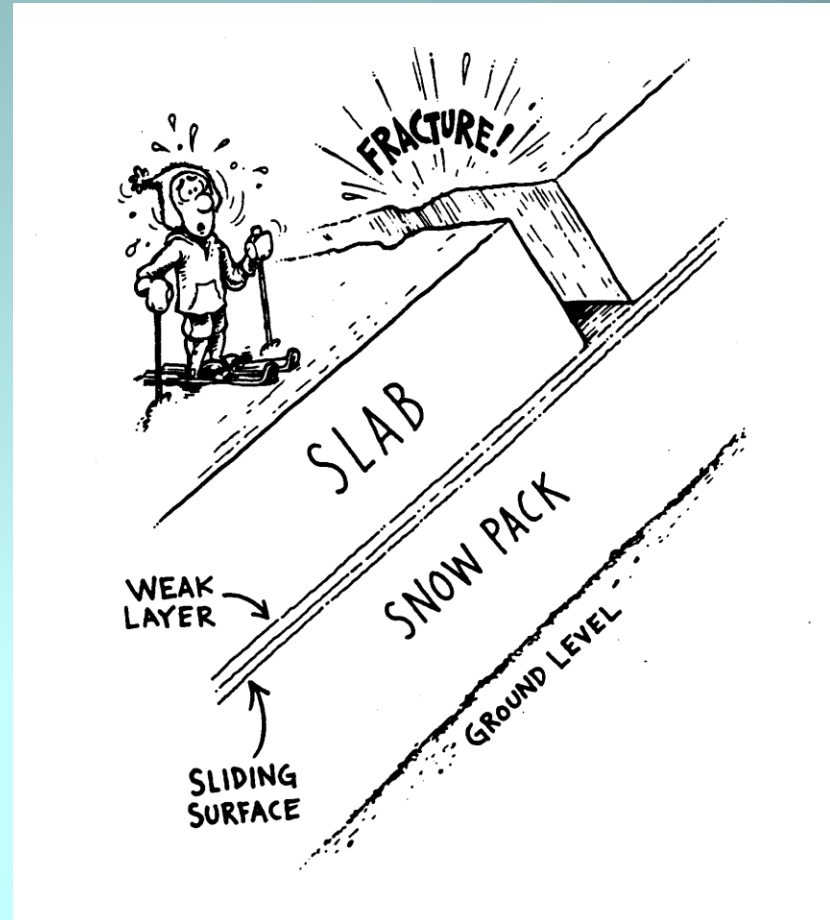
- Bed Surface: A hard smooth surface the avalanche runs on:
 - Can be the ground, or
 - Strong old slab of snow
- Weak Layer: A layer of snow that "fails" initiating avalanche motion
 - Consisting of loose poorly bonded snow
 - Weak material properties
 - Particularly weak shear strength
- Slab: The cohesive layer of snow that moves during the avalanche
 - Well bonded snow crystals
 - Strong material properties



Snowpack

Overtime a snowpack stabilizes through a process called metamorphism.

Metamorphism a process in which the relative temperature gradients within and between layers converges to an equilibrium temperature.

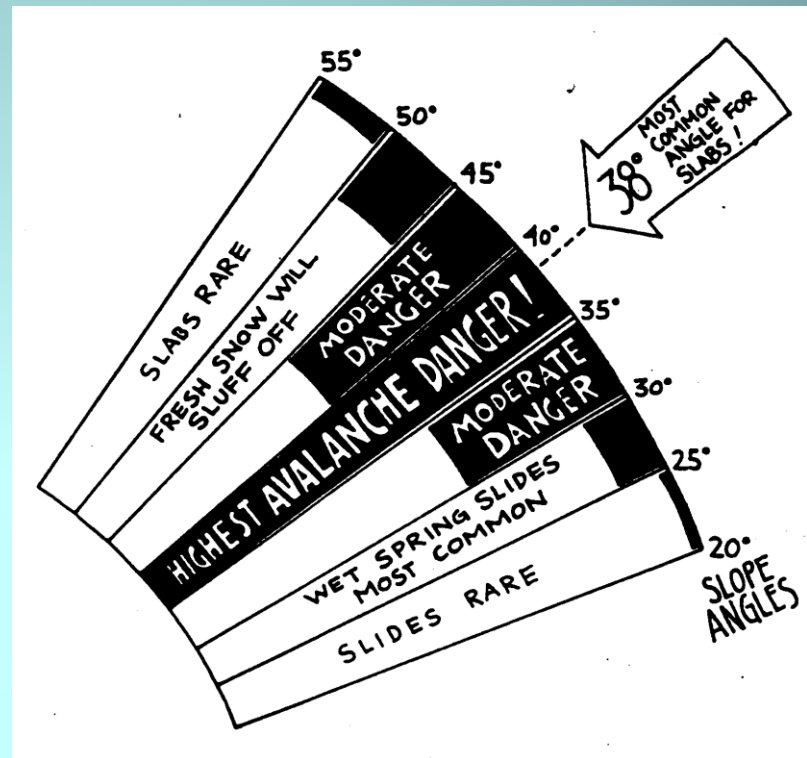


Weather

- Is it precipitating?
 - Type, amount, duration, intensity
- Is it windy?
 - Direction, Speed, Duration
- Temperature: Snow temperature affected by ground and air temperature and solar radiation.
 - Some warming can help snow layers bond, while too much warming can cause the snow pack to melt rapidly, loosening bonds between snow grains and causing sluff avalanches.

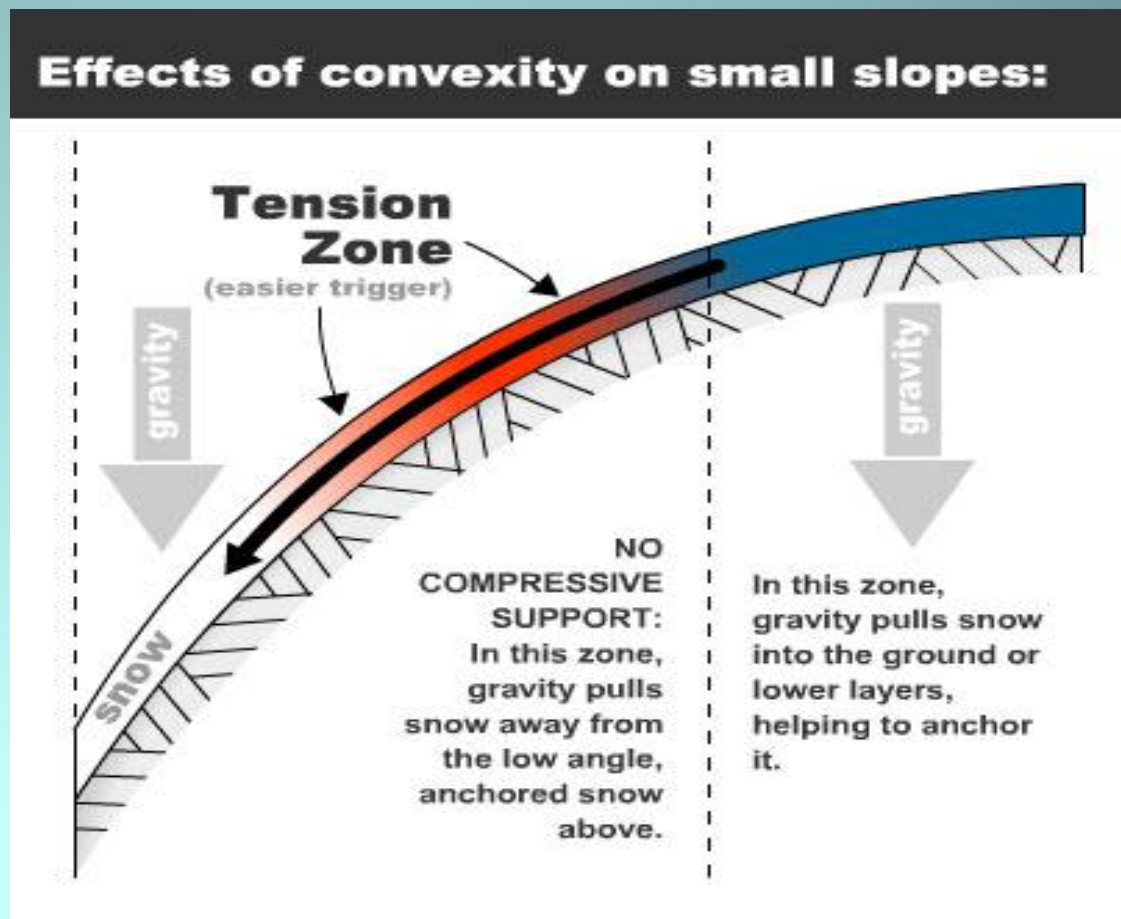
Avalanches- Terrain

- Slope Angle: Occur most often between 35° and 45° , (the perfect pitch for skiing!)
- Slope Aspect: Which direction is the slope facing relative to both recent wind events and the sun?
- Slope shape



Avalanches- Terrain

- Slope Shape



- Sensational Video #2

New England Avalanches?

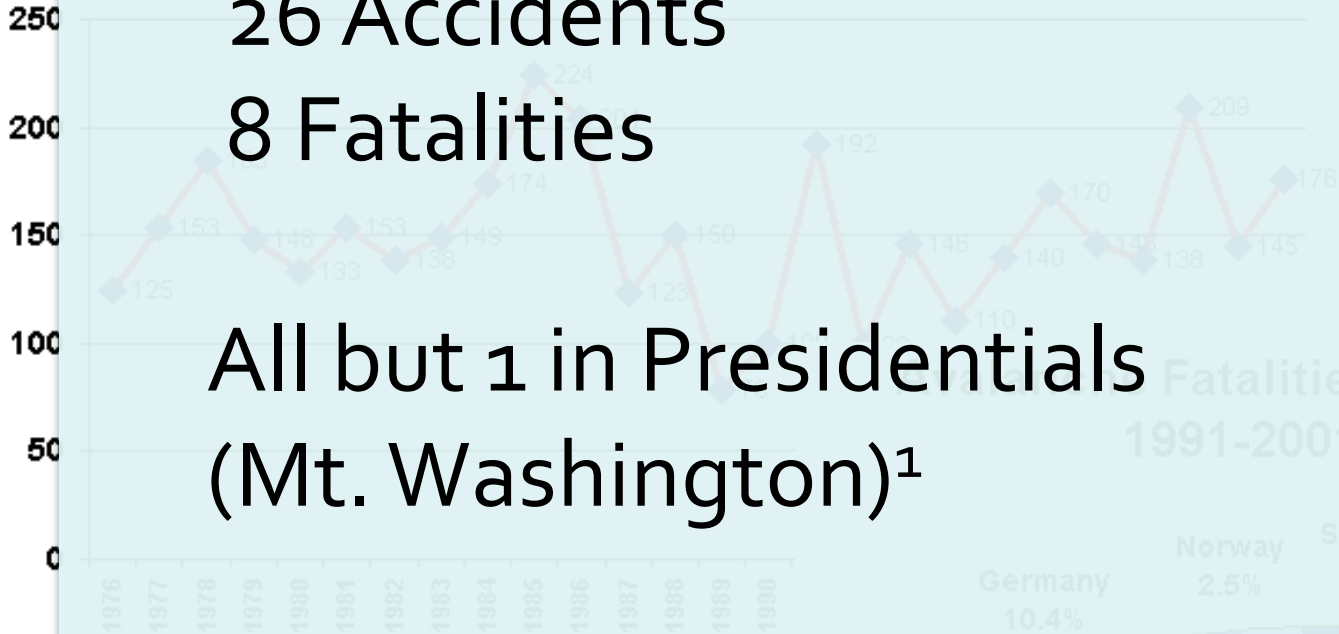
Avalanche Fatalities in IKAR Countries 1976-2001

New Hampshire (1990-2008)

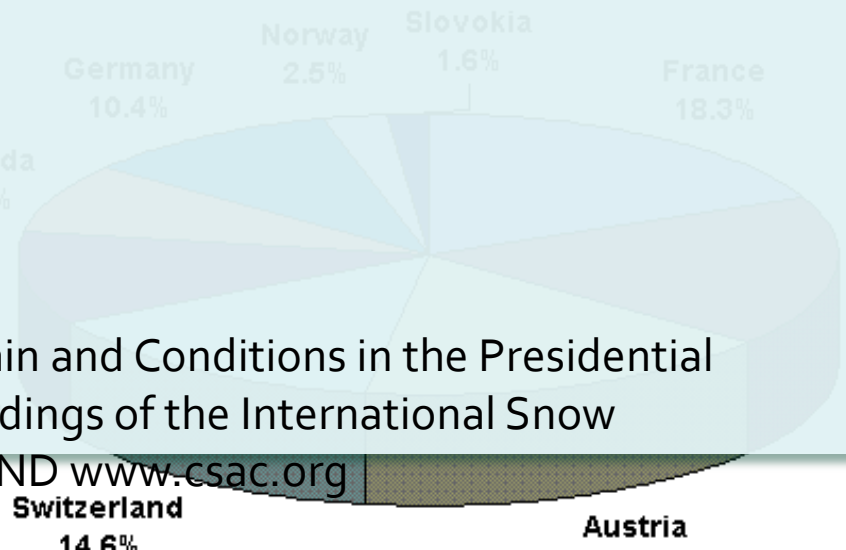
26 Accidents

8 Fatalities

All but 1 in Presidentials
(Mt. Washington)¹



Fatalities by IKAR Country - 1991-2001 (N=1477)



¹Allen, K. U. (2000). Avalanche Terrain and Conditions in the Presidential Range, New Hampshire, US. Proceedings of the International Snow Science Workshop, October 2000. AND www.csac.org

- **Avalanche Advisory for Tuckerman and Huntington Ravines**
Posted: 7:59 a.m., Sunday, January 3, 2010

- **Tuckerman and Huntington Ravines have HIGH avalanche danger today. Natural and human triggered avalanches are likely. Unstable slabs are likely on a variety of slope angles and aspects. Travel in avalanche terrain is not recommended. Natural avalanches are unlikely and human triggered avalanches are possible.** Over the past 24 hours Hermit Lake recorded 8.7" (22 cm) of new snow with a density of 7.3%. The Harvard Cabin snow plot rang in at 12.2" (26 cm) with a density of 8.4%. The summit recorded 5.5" (14 cm) with an average density around 10% but the snow that fell since midnight has been lighter than what was recorded during the day yesterday. **Snow that had fallen over the week saw its first gusts of winds yesterday and the avalanche danger rose with the winds. Overnight steady and strong NW winds blew snow into the Ravines and I'm confident that we have already had a decent avalanche cycle. While most areas are obscured this morning, I was able to see that Hillman's Highway made its longest push of the season and that some small avalanches had taken place in the Lower Snowfields.** Today we can expect 1 to 3" (2.5 to 7.6 cm) of additional snow, on-going wind loading and avalanche activity. Winds are not going to reach the impressive velocities that were predicted yesterday and I see this as a good thing. Winds well over 100 mph are good for moving snow out of the Ravines and I am not in favor of this. **Today's forecasted speeds are ideal for moving snow into the Ravines at speeds between 60 and 80 mph (97 and 129 kph) early in the day and then decreasing to 50 to 70 mph (80 to 113 kph).** Winds have shifted from the NW to the N which means south facing aspects will be directly loaded through the day and east facing aspects will get plenty of cross-loading. While north winds aren't ideal for loading north aspects, terrain will often create localized wind direction and we are not ruling out the potential for wind loading to continue on these aspects. (A north aspect is a slope that faces north, a south aspect is one that faces south.) Overall, it is not a good day to be venturing into avalanche terrain including the floor of either Ravine.





Next Week(!)

- Avalanches and *You*: A frank conversation about the risk of an avalanche in your life.

