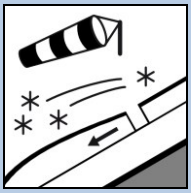
Typical avalanche problems

The five typical avalanche problems as defined by the European Avalanche Warning Services EAWS aim to describe typical situations as they occur in avalanche terrain and to support avalanche professionals and recreationists in their evaluation of the avalanche hazard. They complement the danger level and the danger locations (slope aspect and elevation) and represent the third level in the information pyramid. The following definitions include a general characterization of the problem including expected avalanche types, a description of the typical spatial distribution and of the position of the weak layer in the snowpack, a characterization of the release mechanism, a description of typical durations and time periods of the problem, and finally some travel advises for recreationists. The main focus thereby is on recreationists traveling in avalanche terrain. However, the typical avalanche problems may also be useful for avalanche safety services.

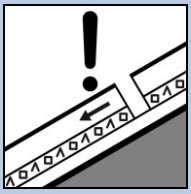

New snow

What?	Characteristics	The avalanche problem is related to current or most recent snowfall. The amount of additional loading by new snow onto the existing snowpack is the crucial factor of the new snow problem. How critical the loading is depends on various factors such as temperature or characteristics of the old snow surface.	
	Expected avalanche types	• Dry-snow slab avalanches • Dry loose snow avalanches • Natural and human triggered avalanches	
Where?	Spatial distribution	Generally widely present and often in all aspects.	
	Position of weak layers in the snowpack	Usually at the transition to the old snow surface, but sometimes in the new snow layers and sometimes also deeper in the old snowpack.	
Why?	Release characteristics	Dry-snow slab avalanches: • Additional load due to snowfall on existing or newly created weak layers	Dry loose snow avalanches: • Lack of cohesion between the new snow particles
When?	Duration	Typically during snowfall and up to a few days after.	
How to manage?	Identification of the problem in the field	The new snow problem is fairly easy to recognize. Watch out for new snow amounts and recent avalanche activity. Be aware of slight weather changes (e.g., changes in air humidity) affecting new snow conditions.	
	Travel advice	Dry-snow slab avalanches: Wait until the snowpack stabilizes.	Dry loose snow avalanches: Danger of falling is more important than danger of burial. Consider consequences in steep terrain.

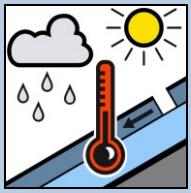
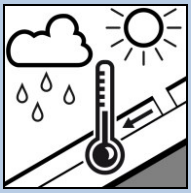
Wind-drifted snow

What?	Characteristics	The avalanche problem is related to wind-drifted snow. Snow can be transported by wind with or without a concurrent snowfall.
	Expected avalanche types	• Dry-snow slab avalanches • Natural and human triggered avalanches
Where?	Spatial distribution	Highly variable but typically on leeward sides in gullies, bowls, near distinct changes in slope angle, behind ridgelines or other wind-sheltered locations. More common above treeline.
	Position of weak layers in the snowpack	Usually at the transition to the old snow surface or within the windslab layer due to variation in wind speed and variation during storm cycle, but occasionally also deeper in the old snow cover.
Why?	Release characteristics	Wind-drifted snow is an additional load on a weak layer and builds a slab which is particularly prone to support crack propagation.
When?	Duration	Wind-drifted snow can evolve very quickly. The problem lasts typically during the snowdrift event, up to a few days at most, depending on snowpack evolution.
How to manage?	Identification of the problem in the field	If not hidden by new snow the wind-drifted snow problem can be recognized with training and good visibility. Consider wind signs and locate deposits. Typical clues: snowdrift deposits, recent avalanche activity and sometimes shooting cracks or whumps. However, it is often hard to determine the age of wind signs and wind signs do not necessarily imply an avalanche problem (e.g., in absence of a weak layer).
	Travel advice	Avoid snowdrift deposits in steep terrain, in particular in areas where the snow cover changes from thin to thick or from hard to soft.

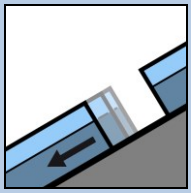
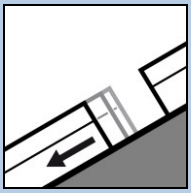
Persistent weak layers

What?	Characteristics	The avalanche problem is related to the presence of persistent weak layers in the old snowpack. These weak layers typically include buried surface hoar, depth hoar or faceted crystals.
	Expected avalanche types	• Dry-snow slab avalanches • Mostly human triggered avalanches; natural avalanches are rare, mainly in combination with other avalanche problems
Where?	Spatial distribution	The avalanche problem can be widespread or quite isolated. It can exist in all aspects, but is more frequent on shady, wind sheltered slopes.
	Position of weak layers in the snowpack	Anywhere in the old snowpack, often deep in the snowpack. However, when deeply buried triggering becomes increasingly hard.
Why?	Release characteristics	Release of avalanche when loading exceeds the strength of the weak layer.
When?	Duration	Weak layers can persist for weeks to months; possibly most of the winter season.
How to manage?	Identification of the problem in the field	Persistent weak layers are very challenging to recognize. Signs of instability such as whumps are typical but not necessarily present. Stability tests can be helpful to detect the persistent weak layers. Information on snowpack history is critical and reference to the published avalanche report is important. Crack propagation over long distances is common and remote triggering is possible.
	Travel advice	Travel conservatively and avoid large steep slopes. Consider the history of weather and snow cover processes in the area. Be extra cautious in areas with a thin snowpack and at the transition from thin to deep snowpack. This problem is a major cause of recreational avalanche fatalities.

Wet snow

What?	Characteristics	The avalanche problem is related to weakening of the snowpack due to the presence of liquid water. Water infiltrates the snowpack due to melt or rain.	
	Expected avalanche types	• Wet-snow slab avalanches • Wet loose snow avalanches • Mainly natural avalanches	
Where?	Spatial distribution	When sun is the main cause, distribution of the problem is mostly depending on aspect and elevation. All aspects are affected in the event of rain on snow.	
	Position of weak layers in the snowpack	Anywhere in the snowpack	
Why?	Release characteristics	Wet-snow slab avalanches: • Weakening of pre-existing weak layers in the snowpack or ponding at layer interfaces • If rain, there is also additional loading on weak layers	Wet loose snow avalanches: • Loss of cohesion between snow crystals
When?	Duration	• Hours to days • Rapid loss of stability possible • Especially critical as water infiltrates for the first time deeper down, once the snowpack has warmed up to 0 °C. • Natural avalanches might be more likely at certain times of the day, in particular in the afternoon (unless rain is the dominating factor).	
How to manage?	Identification of the problem in the field	The wet snow problem is usually easy to recognize. Onset of rain, snowballing, pin wheeling and small wet slabs or loose wet avalanches are often precursors of natural wet-snow slab avalanche activity. Deep foot-penetration is another sign of increased wetting.	
	Travel advice	In the presence of a sun crust the conditions after cold nights with clear skies are usually favourable in the morning due to freezing. After warm nights with overcast skies the problem often exists already in the morning. Normally rain on fresh snow creates this problem almost immediately. Good timing and trip planning are important. Consider avalanche runout zones.	

Gliding snow

What?	Characteristics	The entire snowpack is gliding on the ground, typically on smooth ground such as grassy slopes or smooth rock zones. High activity of glide-snow avalanches are typically related to a thick snowpack with no or only few layers. Glide snow avalanches can occur both with a cold dry snowpack and with a warm wet snowpack. The release of a glide-snow avalanche is difficult to predict, although glide cracks open usually before a release.
	Expected avalanche types	• Glide snow avalanches; cold dry or 0°C-isothermal wet snowpack • Any avalanche release is usually natural. Human and artificial triggering is unlikely.
Where?	Spatial distribution	Predominant on smooth ground and on every aspect, but more often on south-facing slopes.
	Position of weak layers in the snowpack	Interface between the ground and overlaying snowpack
Why?	Release mechanisms	Glide-snow avalanches are caused by a loss of friction at the snow-ground interface.
When?	Duration	Days to months; possibly entire winter-season. The release can occur at any time during the day. In the spring, gliding avalanches occur mostly in the later part of the day.
How to manage?	Identification of the problem in the field	With the presence of glide cracks the problem can often be localized, however, the presence of glide cracks does not indicate imminent avalanche release, as this is nearly impossible to predict. Avalanche release without pre-existing glide cracks is also common.
	Travel advice	Avoid areas close to glide cracks.