An Analysis of French Avalanche Accidents for 2005-2006 By David George

Abstract

This independent study analyzes avalanche accidents that occurred in France during the 2005-2006 season. From the 3rd December 2006 to the 24th of April 2006 a total of 55 people died in 49 avalanche accidents. This is the highest figure since the ANENA (Association Nationale pour l'Etude de la Neige et des Avalanches) began recording such statistics in 1971.

Anyone who picked up a newspaper cannot have failed to realize that France had a pretty unusual winter in terms of avalanche deaths. Headlines ranged from the factual: "Alps see climb in avalanche fatalities", "Aspen Man Killed By Avalanche In France", "Five killed in French Alps avalanche" to the more lurid "Avalanche deaths hit new record", "Ski slopes' hidden perils take record toll" and "Skiers dicing with death off piste". The fact that a number of Americans were amongst the victims only served to heighten media interest. A visit to Chamonix by France's dynamic interior minister Nicolas Sarkozy and some media conflation of his comments led to speculation in the English language press that France was on the verge of banning off-piste skiing and cracking down on "backcountry hooligans". In fact Mr Sarkozy had largely addressed his comments to bad behavior on the ski slopes.

The autumn of 2005 was warm and dry in the Alps. In October temperatures were in the low 20s °C in the Alpine valleys with some record highs recorded: these were welcomed by engineers at la Plagne who were able to rebuild the Bellecôte cable car top station in record time following a devastating fire early in August. Only the Southern Alps had sufficient snowfall to be skied when a storm blew in from the Italian side of the mountains, bringing around 80cm of snow to the border regions at the start of October and with it the first French avalanche fatality. A policeman from Valgaudemar in the Hautes-Alpes, was killed while ski touring. The accident occurred just over the Italian side of the border of the Col d'Agnel and so does not feature in our statistics.

This storm had trouble penetrating far into the Northern Alps and left just 20cm of snow at 2500 meters. The weather turned colder from the first week of November. On the 22nd the author climbed on foot to 2500 meters altitude in the Belledonne mountains in the Northern Alps. On a north facing slope at 3pm the air temperature was -6.3 °C, the temperature on the surface of the snow was -9.3 °C and the ground temperature +0.3 °C. The 15cm of snow depth was composed entirely of facetted snow crystals with a temperature gradient of 60 °C per meter; this was a worrisome start to the winter season.

A couple of days later the first real snows of the winter arrived in the Northern Alps, Pyrenees, and on the island of Corsica. These enabled high and even mid-mountain ski resorts to open their doors and kick started the ski touring season. The Pyrenees was said to have had the best start for 15 years but wind and cold meant the conditions were unstable above 2200 meters. A number of avalanche incidents were reported in the area including a spectacular slide on a north facing, convex roll-over at the ski resort of Piau on the 28th of November, which was caught on a helmet camera by Jérôme Buc. Thanks to the "*Internet effect*" Jérôme's video was seen by people all over the planet. Jérôme's cry of "oh shit" is an understatement as he is rapidly swept away by the slab. Fortunately he suffered nothing more serious than some minor lacerations. This was not the case for a pair of Spanish ski mountaineers caught close to the border with Andorra at the start of December. One man was buried and because of the severe weather conditions the rescue services

were unable to recover his body until the following day despite his avalanche beacon. Not the last time this would happen over the winter. This would be the first fatality in France over what would become a grueling five-month period.



Figure 2 Faceted snow in November 2005

This death would be followed by that of a member of the specialist mountain police unit at Le Lioran in the Massif-Central. The officer was patrolling a closed run prior to the opening of the resort. Then on the 18th a British student was caught at the edge of the ski slopes in Tignes. The man was snowboarding with his brother when they decided to take a run which was closed due to poor snow cover. There had been 20cm of fresh snow coupled with strong westerly winds the day before. This had cross-loaded some dips with just enough snow to prove fatal. The man was not wearing an avalanche beacon and the delay of 30 minutes before rescue by members of the ski patrol was possibly fatal. His brother, who avoided the slide, was unable to believe that with so little snow the conditions were so dangerous despite the resort flying the black and yellow checkerboard flags.

A storm coupled with strong winds traversed the Northern Alps and Pyrenees just before New Year's eve. The result was four deaths in separate incidents including a Californian, Ajay Tambe on holiday in Courchevel. This small avalanche occurred between marked runs and was a reminder that French "*in-bounds*" skiing is largely unsecured. A father and son had a lucky escape skiing a couloir above the resort of Romme-Sur-Cluses. Completely buried by an avalanche they were fortunate to be rescued ten minutes later when a passing group noticed tracks entering the slide and made a scan with their beacons.

The winter was cold at all altitudes until the end of January; snow covered the valley floors from mid-December right through to February. There was no freeze-thaw cycle to stabilize the snow pack except at New Year when temperatures saw a spectacular jump. At 1600 meters in the Haute-Savoie they rose from -17 °C to +6 °C in the course of 24 hours. However these brief warm spells were without any significant rain which might have bonded the crystals. Snowfall was enough to be dangerous but not enough depth to stop the formation of depth hoar or to bridge unstable layers. In Val d'Isère in mid-January practically the whole snowpack except on south-aspect slopes, around 80cm, was composed of facetted crystals. This "loud powder" was a pleasant

surprise to off-piste enthusiasts expecting the worst as there had not been any fresh snow since New Year.



Figure 3 Ancolie, Tignes

A storm cycle on the 17th of January brought nearly half a meter of fresh snow to the Northern Alps at altitude accompanied by strong winds from the south to southwest. This caused seven fatalities total, five deaths off-piste and two ski tourers over the next couple of days including a British ski instructor from Méribel skiing with a guide at the neighboring resort of les Menuires. The guide escaped with minor back injuries. He was wearing an ABS Airbag pack. Two young men were not so lucky in a notorious avalanche couloir at les Arcs. The group was with a local ski instructor but did not have time to operate their ABS system before being engulfed in the slide. The avalanche risk was high at the time. A ski patroller was also killed at les Deux Alpes and a second slide in the same sector killed a local man a quarter of an hour later. A large group had a lucky escape in the notorious Balme sector at la Clusaz. One member was found unhurt by avalanche rescue dogs and when interviewed by television they said they were unaware of the risks. Warning notices and avalanche flags were clearly displayed around the resort at the time.



Figure 4 Pied de Moutet, les Deux Alpes

The end of January would see thirteen people killed between the 28th and the 4th of February in ten separate incidents. This also opened the account for the Southern Alps where three soldiers

died in an avalanche close to the Pic de Bure observatory. The soldiers, part of specialist mountain units, were on a training course. Four of the soldiers were following their instructor across an open bowl at what they believed was a safe distance when they triggered a large avalanche. There had been half a meter of fresh snow in the area accompanied by strong winds. Despite avalanche beacons and a large and well-organized rescue operation only one of the soldiers was rescued alive. A homicide investigation was opened by the state prosecutor in Grenoble.

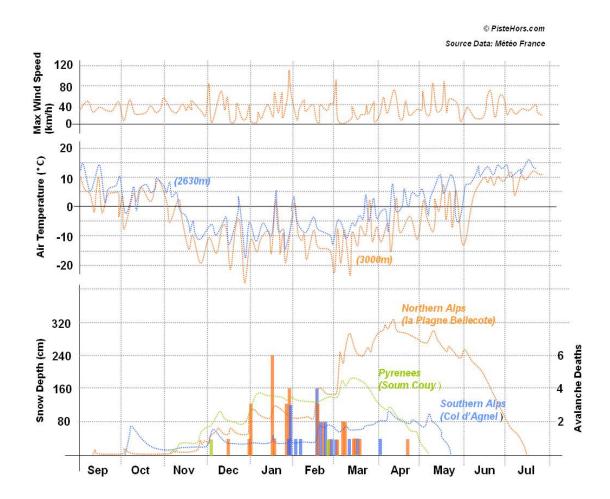


Figure 5: Avalanches plotted against snowfall / wind

While the fresh snow and wind at the Pic de Bure were an obvious ingredient the cluster of incidents in the Northern Alps seemed to come out of the blue. At Tignes a Polish skier was killed crossing between two ski runs on a frequently used link. A shocked piste director, Jean-Louis Tuaillon, former head of the ANENA said that the link "was neither marked nor pisted but was widely used to avoid the bottom of a run that is frequently icy". As such the ski patrol had blasted the slope above that morning but without result. At neighboring Val d'Isère a local skier accompanied by a professional was killed on the popular Grand Vallon route despite being located quickly using his avalanche beacon; another skier was killed in Les Arc's Combe des Lanchettes¹,

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¹ In local patois "lanche" is connected with avalanches, thus Avalanche Bowl

scene of a drama just nine days previously. This is just a selection of incidents. There had been no fresh snowfall in the interior mountain ranges of the Savoie since the middle of the month. Instead a powerful "Chinook" wind had raged in the area where it transported snow onto north sector slopes.

A storm moved across the Pyrenees, Southern and Northern Alps over the weekend of the 18th February bringing significant fresh snowfall. Météo France raised the avalanche risk to Extreme (5) for only the second time this winter. In the week that followed there were fifteen fatalities in fourteen incidents with over half the deaths in the Southern Alps. Among the dead was American Jon Seigle from Aspen. Mr Seigle was said to be risk averse and was equipped with an AvaLungTM and helmet as well as the standard backcountry gear of probe, shovel, and beacon. He was skiing with friend Gary Sawyer of Basalt and they were accompanied by high mountain guide Gary Ashurst who ran a guiding business with his wife at the off-piste mecca of La Grave. The group had headed over to Montgenèvre because La Grave was closed due to the avalanche conditions. The avalanche occurred around 1pm on a roughly north west facing 35° slope which rolled over into a series of gulleys with sparse tree cover. The slope had been skied during the morning with no signs of instability. Mr Seigle was fatally injured after colliding with a tree and Mr Ashurst was badly injured.



Figure 6 Montgèvre, 18th February

Further snow followed in the first fortnight of March, which was also the end of the French school holiday period. Showing rare black humor the avalanche forecaster for the Western Pyrenees commented that "the most stupid will be able to ski down to 1000 meters altitude on all slope aspects". There were 11 deaths in ten incidents over this period, the majority of them in the Savoie. Perhaps the forecaster's warning had been heeded? Warming temperatures also brought a ray of hope with rain to 2000 meters and the start of a stabilization of the snow pack. Amongst the incidents was a member of the high mountain police during a rescue exercise in the Southern Alps resort of Auron. One of the rescue helicopters was unavailable due to a visit to the area by French President Jacques Chirac which led to claims of delays in the rescue operation by a union representative. An experienced member of the piste patrol was also killed at the small resort of Bernex in the Northern Alps; this became the second fatality there that winter. Boston resident Michael Paul Gordon was also killed when he was swept into a lake at Tignes after becoming separated from his partner. He was using a snowboard with non-releasable bindings which, according to one rescuer, contributed to the gravity of the accident. The rescue operation was ham-

pered due to the absence of avalanche beacons and delays by his companion in giving the alert. The incident was almost a carbon copy of an accident in January 2004 when two snowboarders were swept into the lake by a slide.



Figure 7 Avalanche, Tignes le Lac

In April a good freeze-thaw cycle and rain at altitude stabilized the snowpack, just a couple of incidents were logged. The last fatality was that of an Italian ski tourer in an incident at 3pm in the Mont Blanc range when the zero isotherm was at 2800 meters and the group seemed to be following the more dangerous "summer route" to the Leschaux refuge.

An Exceptional Winter?

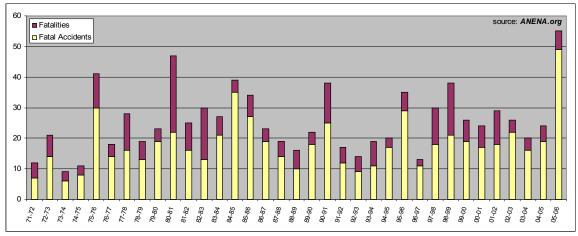


Figure 8: Avalanche fatalities and accidents during the winter

Just how exceptional was last winter? What characterizes '05-'06 was the sheer volume of fatal accidents. The closest winter in terms of fatalities was '80-'81. That year forty-seven people were killed in avalanches but over just twenty-two accidents. That winter was marked by a serious of snowfalls at low temperature with a monster fall of around 2 meters between the 13th and 20th of January. In total around 100 buildings were hit in the Savoie and Isère departments.

The dividing line between a fatal and a serious accident is often a fine one. There were a number of incidents, such as the father and son found by passing skiers, that could easily have had a different outcome. Whichever way you look at' 05-'06 the number of fatalities was double the long term average and the number of fatal accidents was nearly three times the average. This is more than just normal variance around a mean value.

Some commentators, especially in the press, blamed a change in attitudes of backcountry travelers towards more risk taking citing "youth", "adrenaline" and "lack of mountain knowledge" as key factors. Others say there is an increase in skiers "thrill seeking off piste", no doubt encouraged by resort marketing and extreme ski videos. The deaths of teenage"freeriders" in separate incidents at Pra-Loup and Saint-Gervais on the 22nd of February correspond with this picture but seem to be the exception rather than the norm. On a number of measures these accusations fail to stack up. While there has undoubtedly been an increase in the number of skiers and snowboarders leaving marked ski runs, aided by the technology, there is no reason to believe that there would be a sudden change from one season to the next. The relatively stable figure for avalanche fatalities in the Pyrenees which represents around 13.5% of French ski/days, almost the same as the Southern Alps, confirms this assumption.



Figure 9 Avalanches at Pra Loup

A similar proportion of professionals and experienced skiers also feature in last season's statistics compared to previous winters. During the winter two members of the mountain police and two ski patrollers were killed by avalanches. They were experienced professionals who have to make judgment calls about snow conditions every day of the season. Such accidents are rare; the ANE-NA records ten such fatal accidents over the previous sixteen seasons. Last winter's accidents indicate that the conditions were quite simply more dangerous over a wider geographical area.

Apart from snow professionals there were also a number of groups that were with guides, ski instructors, local or experienced (club groups etc.). At least eleven of the groups were accompanied by guides or instructors and the same number were either living locally near where they were killed and/or said to be experienced backcountry travelers. Amongst this group a couple of accidents stand out. Pierre Chapoutot, a highly experienced ski mountaineer and climber and Eric Michel, a guide from the Maurienne were on routes with reputations of being "reasonably safe" in the Lauzière area. Mr Chapoutot had forgotten to turn his avalanche beacon on leading to a significant delay in rescue. Mr. Michel was skiing steeper slopes away from the normal route. These

are reminders that there is never zero risk in the mountains and that unusual weather conditions or variations in the normal route can render it more dangerous.

This brings us back to weather as our prime suspect. The cold autumn and early winter, with thin snow cover and many clear sunny days were ideal for the formation of a weak layer of depth hoar and facetted crystals. Unlike most previous winters these conditions were generalized across the Southern and Northern Alps. The Southern Alps added nineteen to the overall number of fatalities, 35% of the total, compared to the long term average of 19%. While avalanches in the Hautes-Alpes, including the ski area of la Grave, are not unusual the figure of nine fatalities for the two most southerly areas (Alpes-de-Haute-Provence and Alpes-Maritimes) is. Influenced by the Mediterranean Sea the maritime climate helps stabilize the snow pack.

One possibility for the increased figure for the Southern Alps is that the cold winter in the North and the relatively good conditions in the South meant more skiers in the region. The good conditions at the start of the season brought a small influx of backcountry skiers from the north. Figures for ski resorts from January to March show that the number of skier/days in the Southern Alps was 13.8% of the French total with a progression of just +3.5% compared to a very poor '04-'05 season and just +0.9% over the 2002-2005 average. Compare this to the Northern Alps with a +1.3% progression although the high altitude resorts suffered at the expense of mid-mountain areas which had a good start to the season. The Jura, Vosges and Massif-Cental, which all had an exceptional winter, showed progressions between +22% and 34% but with no corresponding increase in avalanche fatalities. It is possible that skiers in the Southern Alps, home to the large resorts of Serre Chevalier and Isola 2000, were unused to and unaware of the unstable conditions. They certainly seem to be over-represented in terms of avalanche fatalities compared to skiers/days.

There were nine deaths in the region while skiing or snowboarding off-piste and eight while ski touring, although this includes the major avalanche at the Pic-du-Bure. If one counts fatal avalanche incidents then 50% were off-piste and 38% due to ski touring. The figure for ski touring is slightly more than the average for France as a whole and perhaps an indication of an increased amount of such activity in the region. The SkiRando database show a 53% increase in ski tours logged for the region for the period 1st December 2005 to 30th April 2005 compared to the previous season and normalized against ski outings for the French Alps as a whole. Another indication that ski tourers stayed local and had more opportunity to tour.

The previous winters that resemble 2006 closest are '95-'96 with 35 deaths in 29 accidents and '84-'85 with 39 deaths in 35 incidents. Volume 36 of the ANENA's house publication *Neige et Avalanches* says of '84-'85 that the winter "had thin snow cover and was chilly... in particular an intense cold spell in January transformed the snowpack into a fragile layer". Similarly in '95-'96 Météo France blamed the increased number of accidents on "snow conditions" rather than a change in skier behavior, in particular a "slow stabilization of a fragile snow pack" which lasted until March. In both cases conditions were very similar to last winter.

The distribution of fatalities by month also confirms the weather as the major culprit as an unstable layer established during November and December led to a peak of incidents in January with the first major storm cycles, followed by a drop-off as conditions slowly stabilized. This is even more significant when one takes into account that February and early March are the main French winter holiday periods.

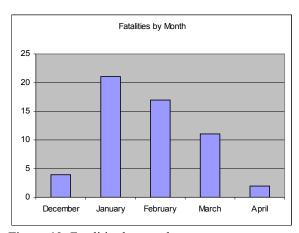


Figure 10: Fatalities by month

The statistics over recent years have shown a rising trend in the number of fatalities skiing and snowboarding off marked and secured runs (off-piste) as opposed to ski touring. Last season 36% of the fatalities were while ski touring and 53% off-piste skiing and snowboarding (this figure includes patrollers and police), which continues the trend. Consequently many educational efforts have been reoriented to target this group. For example the SPOT (Skiing the Powder of Tignes) initiative, a secured area of off-piste skiing at Tignes was coupled with an avalanche education hut and beacon training basin. However, just as snowboarding has reached a high-water mark at around 16% of French winter sports enthusiasts it is the authors belief that ski and snowboard touring will play an increasing role in future statistics. There is currently an influx of young and relatively inexperienced skiers to the sport seeking to get away from lift-served skiing. Just as wide skis and snowboards proved to be a revolution for accessing powder there is a similar revolution under way in ski touring with performant "freerando" boots, bindings, and lightweight but wide skis suitable for long tours. Whereas many routes were jealously guarded secrets in the past the preponderance of guidebooks and websites has increased communication amongst enthusiasts. As an example the extreme and long Couloir d'Infernet² in the Isère department, which would sometimes go whole winters without visitation, was skied by four groups within a week last winter as up-to-date conditions were posted to websites. Of course these conditions are only as good as the skier's ability to judge and can change from hour to hour. Around the hotspot of Grenoble, base of the ANENA and a town with a student population of about 100,000, some of the difficult routes are becoming overcrowded.

It is difficult to estimate the number of off-piste skiers as compared to ski tourers. There is obviously some crossover in the disciplines. France sees around seven million skiers during the winter, two million are non-French. They rack-up around fifty million skier/days. Estimates of how many go off marked ski trails vary. In the Tignes area surveys show this to be close to 50%. Aerial photography by the mountain police suggests the figure is closer to 10-12%. The figures may not be as incompatible as they seem. Tignes is a very popular destination for freeriders and would expect a higher percentage of off-piste skiers. One expert, Pierre Pelcener, who leads the CRS police mountain rescue team in Grenoble, believes that off-piste skiing is in part a "commercial strategy developed by ski resorts targeting British, American, and Scandinavian guests and that ski touring is a hundred-fold more dangerous than traditional off-piste skiing although one has to take into account the relative number of skiers". Avalanche forecaster Thierry Arnou comments that "off piste skiers have the ease of ski lifts which enables them to ski

² A rough translation is somewhat aptly "the couloir to Hell"

all slope aspects at various altitudes in a single day" and thinks they take risks that can be easily avoided when ski touring with a single climb and descent.

Pelcener's point is important. The Tignes figures do not say how much time the skiers spend off marked and secured runs and the nature of the terrain they tackle: low angled between the piste skiing while, strictly speaking unsecured in France and the subject of many accidents, does get some collateral security due to avalanche control work and well traveled "itinerary routes" like the popular Vallons de la Sache at Tignes, skied by up to 3000 skiers in a day, will be somewhat stabilized by their passage. A survey by Montagnes Magazine of a number of ski resorts suggest that up to 40% of off-piste areas in French ski domains are secured by avalanche control work. Ski touring on the other hand is largely practiced far away from secured ski domains. Although popular routes may be partly stabilized by the number of skiers this effect is still a minor factor. There may be far fewer participants but in a single day they will log up more hours in avalanche territory. Industry surveys suggest that there are 1 million ski tourers in the whole of the Alps, including France, Switzerland, Germany, Austria, and former eastern-bloc countries. This figure is based on the number of bindings sold in a year and an average renewal cycle of eight years. Given the relative importance of each country's mountain regions perhaps 100,000 are based in France. Other estimates put the number of ski tours logged in France at around 200,000 to 300,000 over a season with the average skier making six to eight tours of 1200 meters meaning an average of 6 hours traveling³. This gives an estimate of 30 to 50 thousand ski tourers compared to 1 to 3 million occasional off-piste skiers. These are highly speculative figures but Pelcener's estimate that a day ski touring is hundred times more dangerous than a bit of between the piste skiing looks close to the mark.

Snow professionals have noted a change in attitude in resort skiers leaving marked runs over recent years. Last winter Val d'Isère-based ski guide Wayne Watson said that skiers in his resort "were attacking the mountain like there was no tomorrow". Jean-Louis Tuaillon, the director of piste security at Tignes, said that skiers and snowboarders have a tendency to nibble away at the off-piste areas in the resort "but when they go too far, it is far too late". He put some of the blame for this on a "consumer attitude which views the mountains as a theme park" and "a lack of mountain culture". Tuaillon believes that education rather than restriction is the only way of creating responsible and knowledgeable skiers and thinks any move to restrict access to the mountains is unworkable. Claude Defreney, piste director at Corbier, makes a similar point "we can say no and put barriers but they can go around them down the slope". Tuaillon's thoughts are also echoed by Jean-François Lamour, the French government minister responsible for winter sports, who said that many off piste skiers and boarders, while technically proficient, "often lack sufficient mountain knowledge". Following a meeting with members of the rescue services at the end of March he said that there was no question of banning or further regulating off-piste skiing. Instead he launched a multi-language information campaign.

A recurring theme amongst survivors of avalanches, especially off-piste incidents, was a lack of knowledge of the avalanche conditions. This looks like failure to note or understand the avalanche warning flags, to read the avalanche bulletin, and even ignoring written warnings posted at lift stations. Tuaillon says that 50% of visitors to Tignes don't even realize there are avalanche warning flags and thinks skiers may actually be suffering from general information overload while in resort. Thierry Arnou, the avalanche forecaster for the Savoie department, has said "avalanche bulletins are already in my opinion out of reach to the majority of the skiers" and is open to ideas on how to improve the bulletin. One suggestion would be a move to graphical information to complement the text bulletin. These have been introduced by the Utah Avalanche Center and have been broadly welcomed by the backcountry community. They are easy to adapt

³ Industry estimates and data from SkiTour.fr database for 05-06

to different languages and provide an easy-to-understand symbolic representation of the dangers in terms of avalanche types, slope aspects, and trends. Currently the Avalanche Bulletin is only published in French and only a few resorts produce an English translation.

High mountain guide Dominique Boyer, Ortovox's representative in France, also believes that further restrictions in off-piste skiing are unlikely saying that thanks to ski resorts heavily marketing the activity "the genie is already out of the bottle". He also thinks that the focus should be on education; marketing off-piste activities should be counterbalanced with information about the risks. Ortovox works with Henry Schniewind with his popular "Henry's Avalanche Talks" and beeper training and has partnered a number of avalanche basins. At least eight were in operation in the French Alps last winter. Henry took his show on the road this year, expanding out of his home of Val d'Isère to Méribel in the Three Valleys and Sainte Foy. His inventive multimedia presentation has drawn praise from the French authorities concerned with avalanche safety. The ANENA also expanded its "Avalanche Days" conference to seven French cities and these were attended by 1300 backcountry enthusiasts.

The Vallorcine resort in the Chamonix valley has tried to clamp down on off-piste skiers. Town halls can pass local legislation restricting movement but this must be limited in scope and time. In 1999 the Haute-Savoie préfet (governor) banned off-piste skiing between the 13th and 17th February in a number of communities following the Montroc avalanche. Individual communities have also experimented with bans when the avalanche risk is above a certain level, typically Moderate (2). These moves are unpopular with guides and other professionals and also opens the legal question of responsibility when the ban is lifted.

The council in Vallorcine wanted to restrict skiing in one sector of the Aiguillette des Posettes, scene of a number of serious and fatal avalanches. The area can be accessed by the Posettes chairlift from the neighboring village of Le Tour. Patrick Ancey, the mayor and himself a mountain guide, utilized the ruse of declaring the zone at risk a "nature reserve" with restricted access. There are sensitive species in the sector but it remains to be seen whether this legal loophole will work. Some commentators have seen these moves as symbolic, a way for communities to absolve responsibility and expensive court action as the result of an accident. Others have accused ski resorts of wanting their "bread buttered on both sides", saying they want to profit from the image of freeriding without actually offering the service.

France and other European countries use the five-level scale to indicate avalanche danger. There seems to be some differences emerging in how this is interpreted between Switzerland and France. In Switzerland the majority of avalanche deaths occur at risks 2 and 3; in France they are primarily at risks 3 and 4. Unless French skiers habitually take more risk then their Swiss counterparts this would indicate a difference in interpretation of the levels. Gilles Brunot, forecaster for the Haute-Savoie, which includes Chamonix, says that just over the border with Switzerland the risk level may be 3, whereas it will often be 4 in France. He thinks this may be due to a less precise definition of the various levels in terms of the number of slopes, aspects, angles at risk in France; the Swiss are more careful about a move to level 4 due to civil security measures that must be taken.

Finally a quick note that avalanches are not the only danger facing backcountry travelers. Over a single week at the start of June seven people slid and fell to their deaths in the icy conditions. Over an average season falls into crevasses and due to icy conditions probably rival avalanche fatalities as a cause of death. The greatest risk is in the spring when strong freeze-thaw cycles can render slopes glass-hard, a tragic example of this phenomenon was the death of Doug Coombs and Chad Vanderham at La Grave early in April when they fell in the couloir de Polichinelle in icy conditions.

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Figure 2: Henry Schniewind (www.henrysavalanchetalk.com), Figure 5: Bart05, Figure 6: Dan