Newsletter of the

New Zealand Mountain Safety Council Snow and Avalanche Committee

Issue No. 8

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Convener's Comments

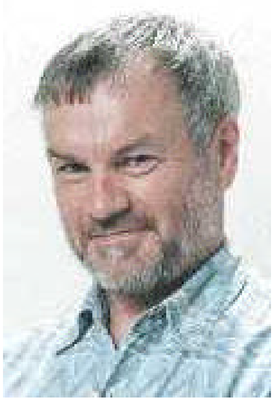
Many thanks to Dave Irwin who has done an excellent job of putting this year's issue of the Crystal Ball together. Despite the fact that we have had a couple of quite lean snow winters, interest in snow and avalanche safety remains high for a variety of reasons, good and bad. On the positive side, the 2000 winter is off to a more promising start but on the negative side, it has taken two avalanche incidents resulting in fatalities to heighten public awareness of safe practices in avalanche terrain. Hopefully, the publicity associated with these events will lead to greater participation in snow safety training programmes, the snow stability exchange programme and to the adoption of safe practices in general.
I would like to refer to two items not discussed elsewhere in this issue:

- **Milford Road developments** .
  Ian Wilkins of Southern Lakes Heliski has joined the avalanche management team this year. Avalanche forecasting procedures will be enhanced as well by a number of initiatives:
  1. a new high elevation weather station in the Cleddau valley (north west of the Homer tunnel)
  2. Howard (Twitty) Conway has successfully applied a physically based snow stability forecasting programme to hindcast past significant avalanche occurrences (as a test for future use as an aid in forecasting)
  3. systems for measuring free water percolation in the snowpack (combining a 2m x 2m collecting tray and a tipping bucket rain gauge) and continuous snow temperature variation have been installed at the Mt Belle weather station. A paper on this will be given at the ISSW this year (http://www.coe.montana.edu/ce/issw/).

  Noel Eade (Works Infrastructure Invercargill) and Wayne Carran (Te Anau) attended the International Symposium on Snow and Avalanches at Innsbruck at the end of April (http://www.spri.cam.ac.uk/igs/innsbruck.htm) as well visiting the Swiss Federal Institute for Snow and Avalanche Research. At the symposium they were impressed by the number and variability in standards of the presentations, the harshness of some of the questioning and the preponderance of after-the-event rather than hands-on forecasting presentations.

Snow and avalanche symposium 2001
Following the successful Te Anau meeting dealing with a range of avalanche issues in June of 1999, the Snow and Avalanche Committee is keen to promote another similar meeting in the May/June period next year. A location in the Canterbury high country is favoured at present. At Te Anau, we focussed on highway and explosives issues (some of which are followed up in this newsletter); we would welcome any suggestions of topics that could be the focus for a meeting next year and any comments on possible venues.

Best wishes for a stimulating and safe 2000 season



Ian(Shorty) Owens
Snow and Avalanche Convener

Contents

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The 1999 Avalanche Accident and Damage Summary

Compiled by Dave Irwin

Introduction

The 1999 Avalanche Accident and Damage Summary has been compiled for the NZMSC Avalanche Committee and other interested parties. The report summarises snow and weather information, and avalanche accidents and damage, as reported by all contributing organisations.

The summary incorporates the records of avalanche activity (including reports of no activity) as well as snow summary details that have been provided by the relevant Department of Conservation area offices, ski areas, heli-skiing and mountain guiding operations. As confidentiality has been promised to contributors regarding specific sources of information, data are presented in a general form, with specific snow summary details being held on file.

The report follows the format of previous reports prepared for 1981-98. While the Council attempts to compile as complete a report as possible, this years return rate was less than 50%, with only 20 out of 45 organisations responding with information.

As the Council's aim is to maintain an ongoing census of snow conditions and avalanche incidents each winter season, organisations are encouraged to share their experiences in this open yet confidential forum.

In 1999, there were 10 avalanche incident/accident events involving people and/or property reported. These events exposed at least 26 people to avalanche danger, caught 10 people and partially buried 5 people. One person was injured and no one was killed. This is a low level of avalanche involvement compared with previous winters over the study period.

Reported avalanche incidents and accidents involved a range of work and recreation activities. All events involved people and no damage to property was reported. Of the 10 incidents reported, transceivers were only used in 3 cases. Of note, groomer drivers involved in 2 events were not using transceivers (one in a partially buried groomer that released and was caught in class 3.5 avalanche).

Avalanche Accidents 1999

The attached table lists 10 avalanche events that were recorded during 1999 in which people or property were involved.

Please note the following points when reading this table:

1. The listed events include only those in which people were caught, property was damaged or roads were affected. These events are those reported to the Avalanche Data Centre or described in the press so are a matter of public record. One report was received from backcountry users. Only 3 reports were received from land managing agencies.
2. Information recorded is as described using the 1999 Avalanche Accident and Damage Summary reporting forms or from interviews of those involved.
3. Avalanche size is based on an estimate of destructive potential as per the NZ Guidelines to Weather, Snowpack, and Avalanche Observations where:

Size	Description	Typical Mass (tonnes)	Typical Path Length (m)	Typical Impact Pressure (kPa)
1	Relatively harmless to people	<10	10	1
2	Could bury, injure or kill a person	10^2	100	10
3	Could bury a car, destroy a small building or break a few trees	10^3	1,000	100
4	Could destroy a railway carriage, large truck, several buildings or forest of up to 4 hectares	10^4	2,000	500
5	Largest snow avalanches known. Could destroy a village or forest of 40 Hectares	10^5	3,000	1000

Source McClung & Schaerer (1993)

4. Under **Trigger**: N = Natural; A = Artificial; D = Deliberate.
5. Under **Activity** the following terms should be noted:
   - *Skiing* and *Snowboarding* implies skiing or snowboarding at a ski area;
   - *Ski-tour* and *Snowboard-tour* implies a backcountry tour (although these terms give no indication of the preparedness of participants);
   - *Mountaineering* includes climbing and tramping.

1999 AVALANCHE ACCIDENT & DAMAGE SUMMARY

Accidents by Activity

DATE	SIZE	TRIGGER	ACTIVITY	Human Involvement: Transceivers in Use?	No. in Party	No. Caught	No. Buried (Part)	No. Buried (Full)	No. Injured	No. Killed		Other Damage: Personal Equipment	Roads	Vehicles	Buildings	Ski Lifts	Other
4-Jun	?	A	Snowboard-tour	N	2	2	2	0	0	0		?	0	0	0	0	
23-Jul	3	A	Grooming	N	1	0	0	0	0	0		0	0	0	0	0	
27-Jul	1	D	Av. Control	Y	2	1	0	0	0	0		0	0	0	0	0	ski cut
3-Aug	3	D	Av. Control (road)		2	0	0	0	0	0		0	1	0	0	0	occupants of car
10-Aug	2	A	Snowboarding	N	1	1	0	0	0	0		0	0	0	0	0	
21-Aug	3	A	Heliskiing	Y	6	1	1	0	0	0		0	0	0	0	0	
21-Aug	2	A	Skiing		1	0	0	0	0	0		0	0	0	0	0	closed area
23-Aug	2.5	A	Ski Tour	N	5	1	1	0	0	0		0	0	0	0	0	left ski area
24-Aug	3	A	Heliskiing	Y	5	3	0	0	1	0		0	0	0	0	0	injured
7-Sep	3.5	A	Grooming	N	1	1	1	0	0	0		0	0	1	0	0	
TOTALS					26	10	5	0	1	0		0	1	1	0	0	
Occurrences / Incidents			10		10	7	4	0	1	0	0	0	1	1	0	0	

Key to Trigger: N - Natural
A - Accidental
D - Deliberate

report generated: 14-Jun-00

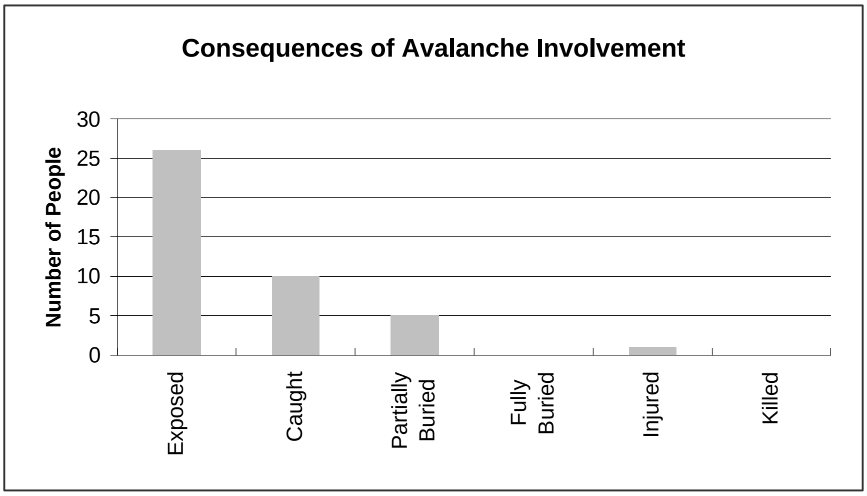
The following table lists the reported incidents in chronological order:

The following graphs present analysis of:
- the consequences of avalanche involvement; and,
- avalanche involvement by activity.

The NZMSC Avalanche Data Centre expresses its appreciation and thanks to all those who contributed in any way.

Consequences of Avalanche Involvement

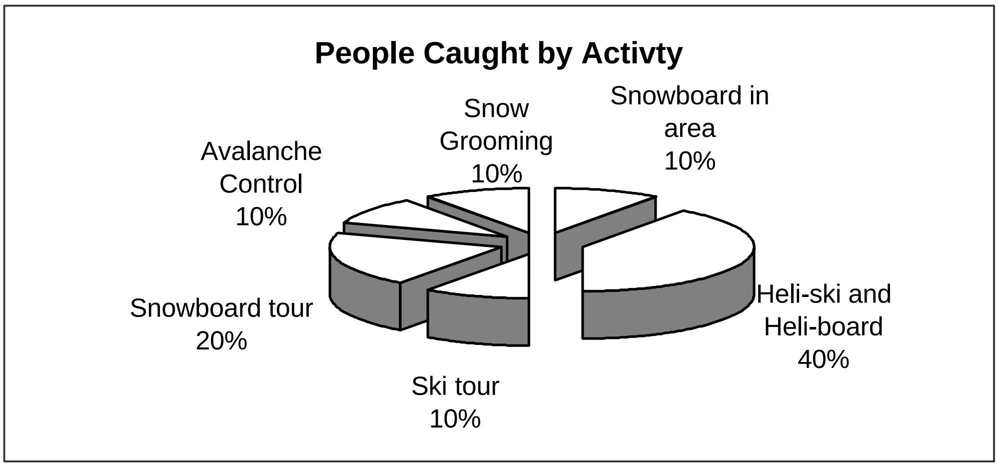
Ten people were caught in 7 of the 10 reported avalanche incidents involving people or property. The consequences of involvement are presented below:



Exposed	Caught	Partially Buried	Fully Buried	Injured	Killed
26	10	5	0	1	0

Avalanche Involvement by Activity

The activities of those caught and the number of incidents reported for each activity are presented below:



	Skiing in area	Snow board in area	Heli-ski and Heli-board	Skit-tour	Snow board tour	Avalanche Control	Snow Grooming	Climbing	Patrolling	Driving	Total
Number incidents	1	1	2	1	1	2	2	0	0	0	10
People caught	0	1	4	1	2	1	1	0	0	0	10

Brief Review of the Mountain Weather Winter 1999

Stewart Burgess (NIWA)

PRECIPITATION WAS BELOW AVERAGE IN SOUTH ISLAND ALPINE REGIONS, A WARM START AND MILD OVERALL

Winter precipitation was near average in many mountainous regions, including Ruapehu/Tongariro, and Mt Taranaki. However, the Tararua's, and areas within Able Tasman National Park alpine regions, and Southern Alps all experienced below average precipitation. June and July, like the 1998 season, were warmer than normal. August temperatures were closer to average. Overall mean winter temperatures showed the greatest anomalies in South Island alpine regions, where for most they were at least 0.5ºC above average. Significant snowfalls in alpine regions of the North Island were infrequent. Most mountainous regions were sunnier than average.

The noticeable warmth was caused by much warmer than average sea surface temperatures surrounding New Zealand, combined with more frequent anticyclones (often centred in the Tasman Sea), with ridges of high pressure over New Zealand. These resulted in more frequent southwesterlies than usual. Windiness was, for most, below average. The main exceptions were mountainous areas in the southwest of the South Island. These were windier than normal.

Winter rainfall and temperature statistics from selected alpine recording sites are:

Location	*Rainfall (mm)*	*Percent of average*	*Comments*
Chateau Ruapehu	831	108	Near average
North Egmont	2052	104	Near average
Arthurs Pass	772	78	Below average
The Hermitage	517	59	Well below average

Location	*Temperature Mean (C)*	*Departure from average (C)*	*Comments*
Chateau Ruapehu	3.4	+0.3	Slightly above average
Arthurs Pass	3.1	+0.6	Above average
The Hermitage	3.9	+0.9	Well above average

June rainfall was below average over the Ruahine's, Tararua's, Southern Alps, and the Fiordland ranges, with totals as low as 50 percent of normal in some areas. The Ruakumara and Kaikoura ranges received above normal rainfall. Other mountainous regions experienced near normal precipitation. Snowfall (as with June 1998) was infrequent throughout the country and well below average for the time of year. The month was rather mild (also like June 1998) in all alpine regions, with mean temperatures about 1.0ºC above average. Sunny skies prevailed over much of the country. Southwesterlies prevailed, being more frequent than usual over the southern half of the South Island. General windiness was below normal over the North Island and about average over the South Island.

Significant weather events during June were:

* 4 June
A brief southerly outbreak resulted in snowfall to a depth of 9 cm at The Hermitage.

* 13-15 June
Cold easterlies brought snow to the Southern Alps, and to low levels in inland South Canterbury and Southern Lakes. Snow depths of about 5 cm were widespread in the high country basins, with depths to about 30 cm recorded at The Hermitage.

* 25-26 June
Further snowfall, from southwesterlies, to low levels in inland South Canterbury, Southern Lakes, and surrounding mountains. Snow depths of about 3-7 cm were common.

July's rainfall was above average in the Kaikoura's, and about the Queenstown mountains, with totals exceeding 150 percent of normal in places. Some Canterbury rivers were in flood on the 17th, due to high rainfall. Precipitation was below average in the Southern Alps, and near average in the Tasman mountains and most North Island alpine regions. Mean temperatures (as with July 1998) were warm, running about 1.0°C above average in most South Island alpine regions, and 0.5°C above average in the North Island. The continued warmth of July, was caused by much warmer than average sea surface temperatures surrounding the country. Depressions often occurred to the east of central New Zealand. General windiness was below average over the North Island and about average over the South Island.

Significant weather events during July were:

* 2-4 July
Severe damaging northwesterlies affected much of the lower South Island during the morning. These were violent, gusting to 150 km/h, in the Tuatapere and Middlemarch areas. The winds were followed by one of the heaviest known snowfalls in the western Otago/Southern Lakes region. More than a metre of snow was measured at Cornet Peak, with depths to 40cm reported at The Hermitage,

and in some low-lying rural areas. Depths to 15 cm were recorded at Arthur's Pass.

* 25-29 July
Cold southerlies brought further snowfall to low levels in the south and east of the South Island, with depths to 25 cm in inland parts of Southland and Otago, and about 10cm at Arthur's Pass. Heavy snowfall occurred in the Wairarapa high country (8cm in places) on the 26th, and Mt. Ruapehu received its first significant snowfall for the winter, with depths to 13 cm recorded. The Desert Road was closed until the 29th due to snow and ice.

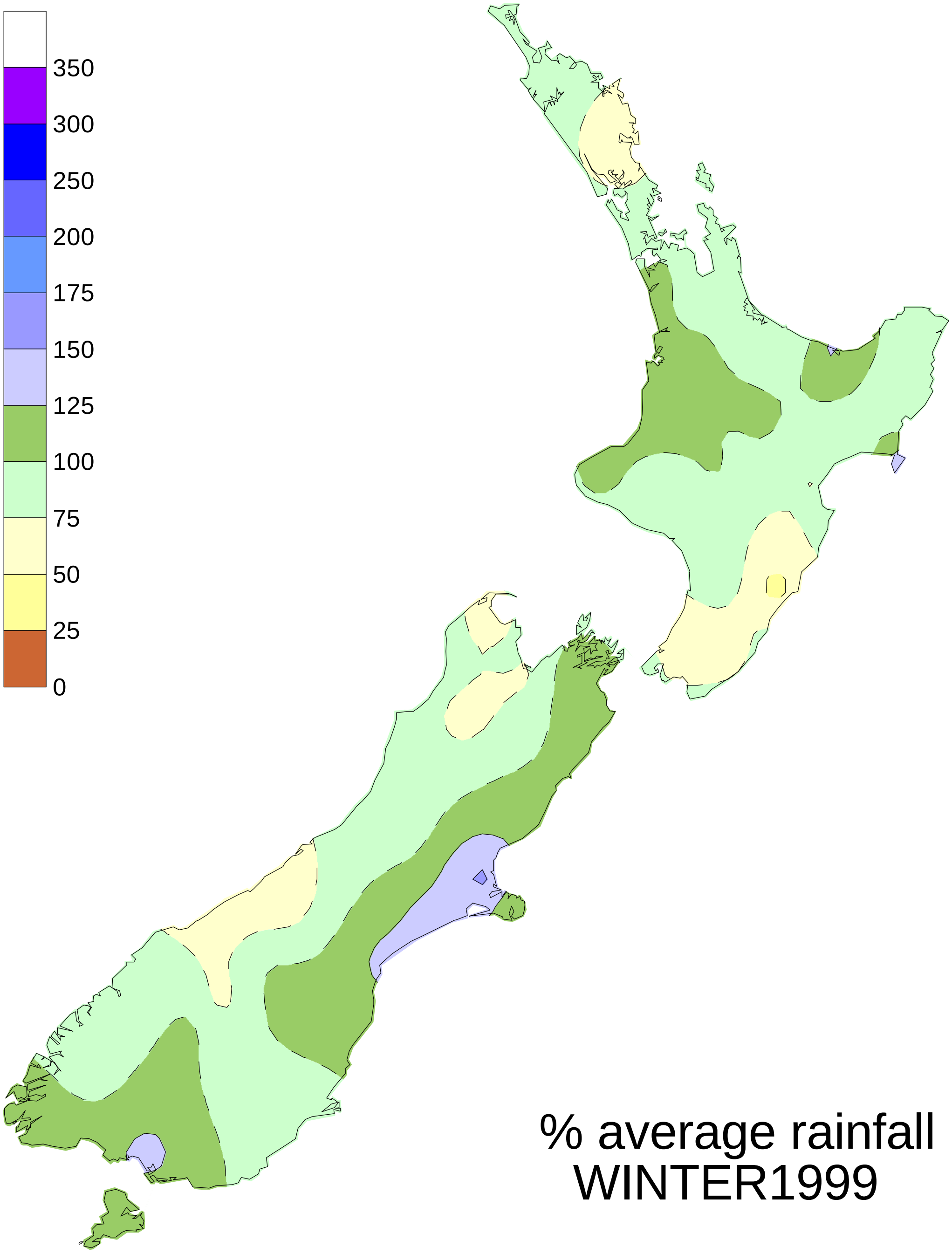
August rainfall was below average in most mountainous regions, but above average on Mt. Taranaki, and the central North Island mountains. August alpine temperatures were near average. Sunshine totals were below average over the central North Island volcanic plateau, but above average in most South Island mountains. Strong anticyclones were often centred in the Tasman Sea, with ridges extending towards New Zealand. These brought more frequent southwesterly flow to the whole of New Zealand. Mean wind strengths were near average.

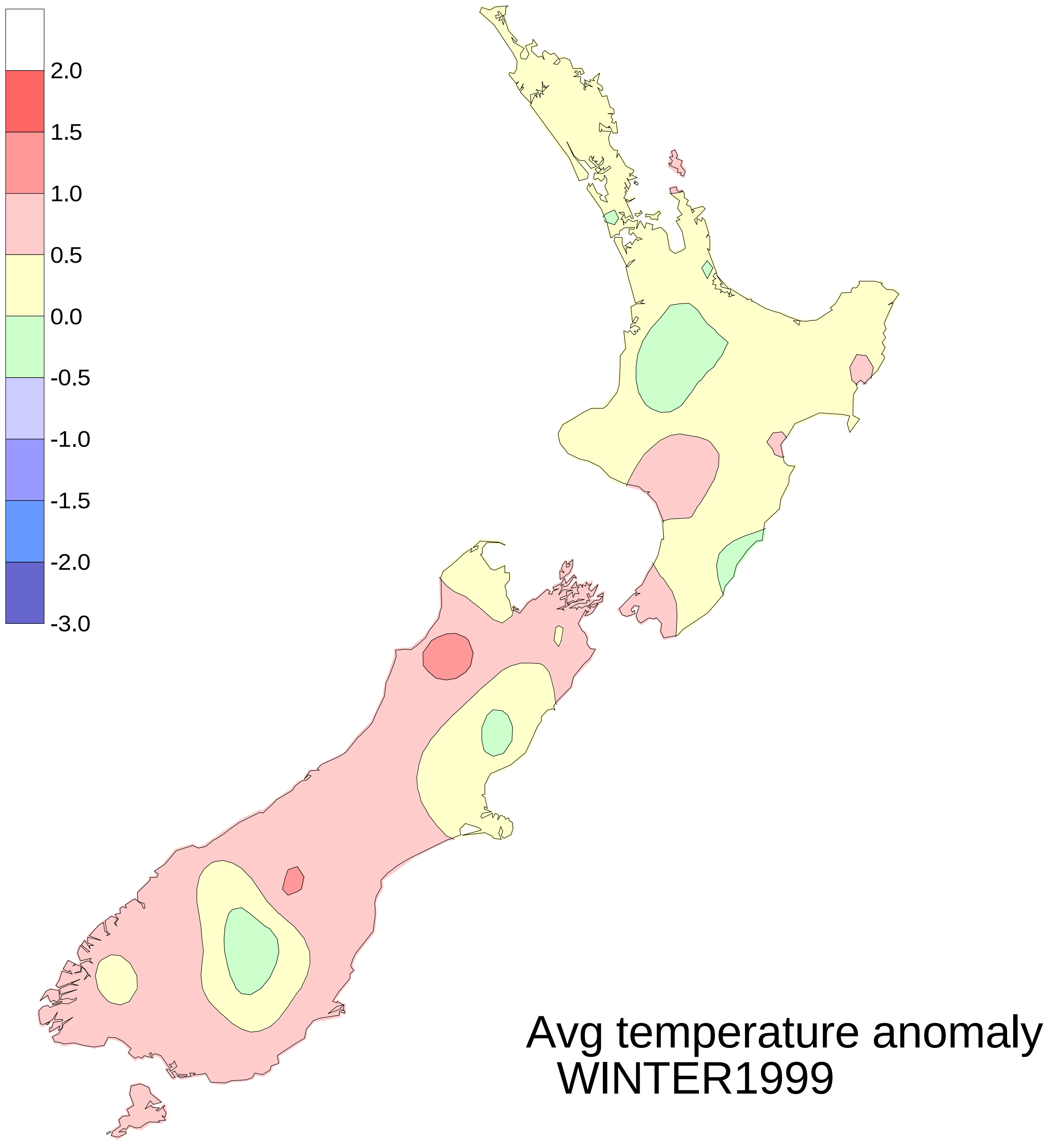
Significant weather events during August were:

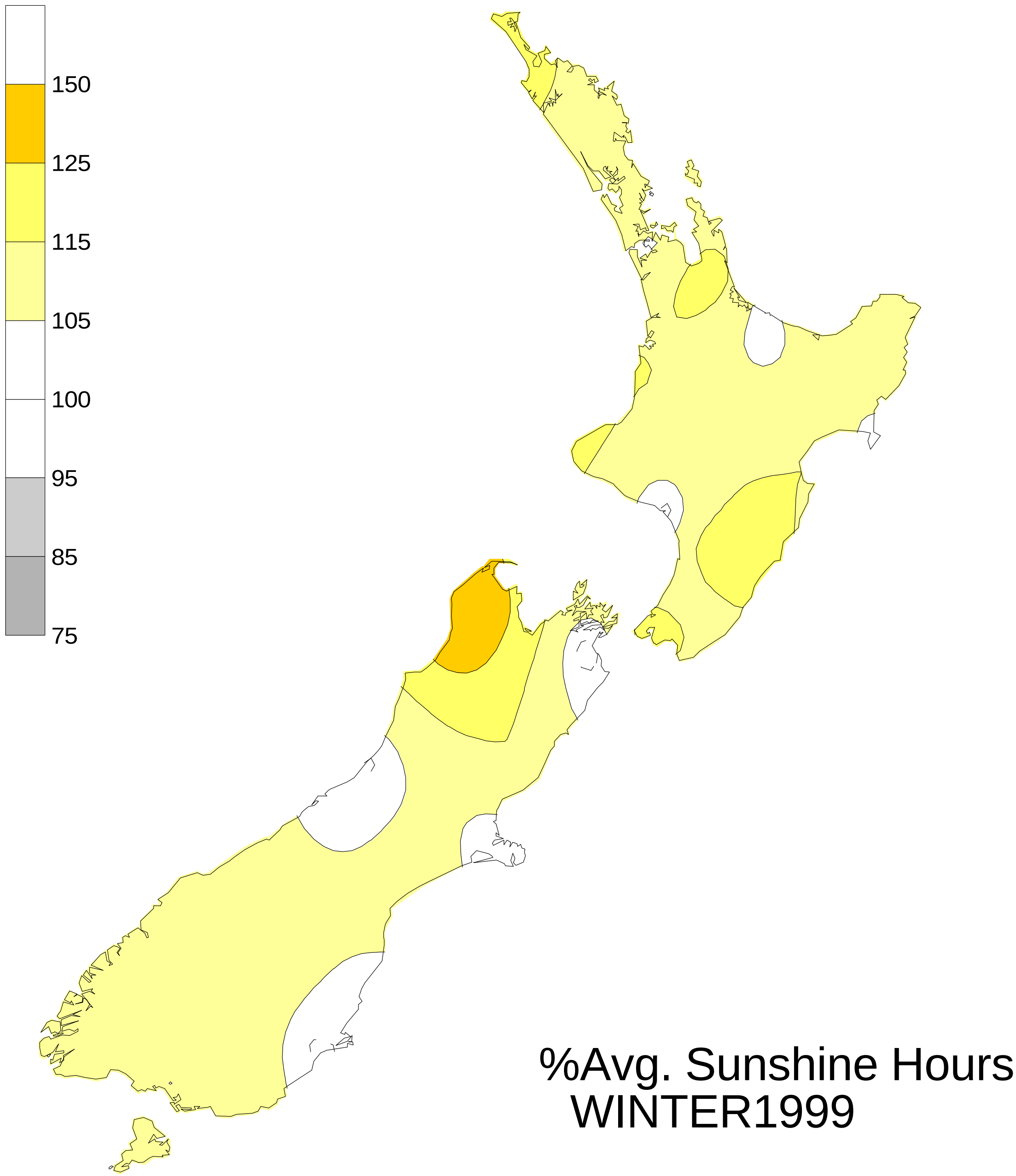
* 1-5 August
A shallow depression tracked across the South Island, with snow depths to about 30cm recorded at Arthur's Pass, 20 cm at The Hermitage, and 10cm in the hills around Queenstown.

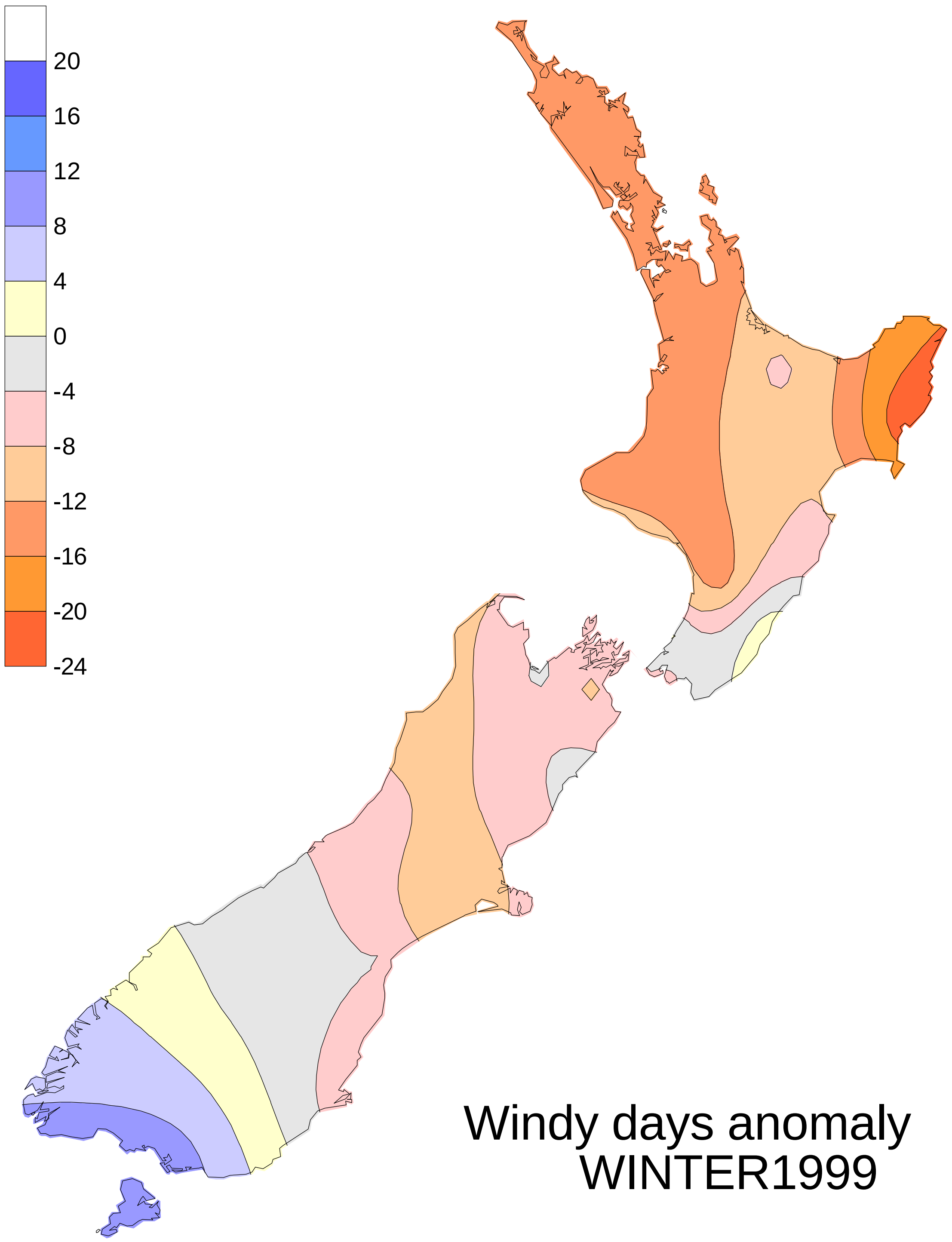
* 16-18 August
Bitterly cold southerlies, with snow lying in high country areas of the South Island, as well as to low levels in Banks Peninsula. Significant falls in most North Island ski areas.

* 21-22 August
Cold southwesterlies with snow to 10 cm depth in the Roxburgh hills. Further snow fell on Banks Peninsula, with depths to 7cm in hilly areas.


350
300
250
200
175
150
125
100
75
50
25
0
% average rainfall
WINTER1999


2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-3.0
Avg temperature anomaly
WINTER1999


150
125
115
105
100
95
85
75
%Avg. Sunshine Hours
WINTER1999

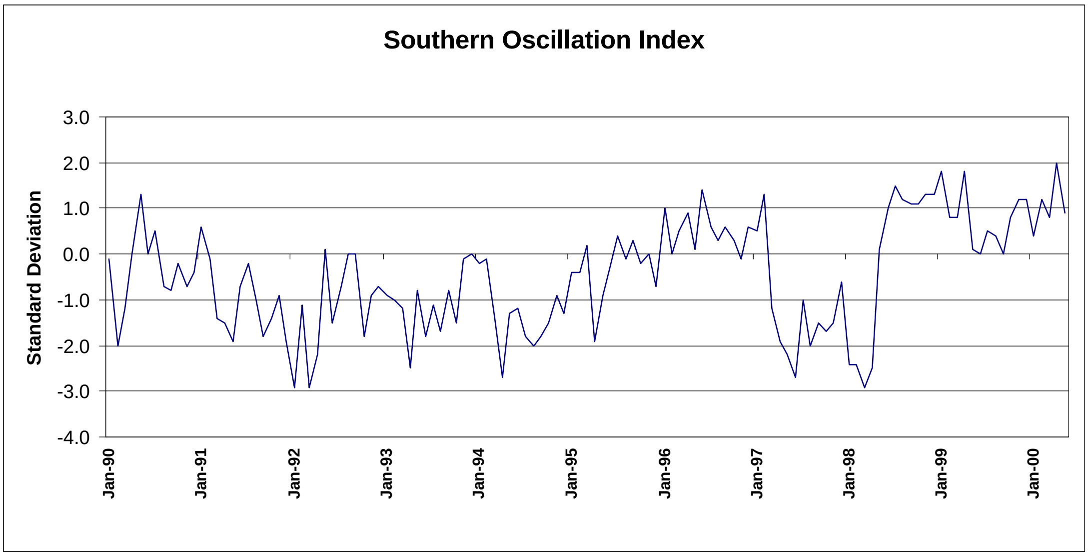

20
16
12
8
4
0
-4
-8
-12
-16
-20
-24
Windy days anomaly
WINTER1999

New Zealand Climate Outlook Winter-Spring 2000: Warm in Most Areas

Stewart Burgess (NIWA)

The mean value of the Southern Oscillation Index (SOI) for the 30-days to 19 May was +0.9, a moderate fall from +1.8 in April. However, the 90-day average (+1.2) is still relatively high. Sea surface temperatures continue below average throughout the western and central equatorial Pacific (which is typical of La Niña in the Southern Hemisphere). However, eastern tropical Pacific waters off the west coast of South America have been warming, and are at least 1.0ºC above average between 80ºW and 100ºW. This may be associated with the early stages of the development of an El Niño event, but this is not expected this year. These conditions, along with global model predications tend to signal a gradual decay of the present La Niña episode through winter, with near neutral conditions likely by spring.

The following graph shows monthly values of the SOI, and highlights the present La Niña episode.



The overall influence of La Niña throughout winter combined with continued above average New Zealand area sea surface temperatures likely will still have an influence on New Zealand's climate, although it may be weak.

Although research supports warmer than average early to mid-winter conditions over much of New Zealand, the period is not expected to be as warm as those of 1998 and 1999. We expect more airflow from the north-east, than is usual for the time of year, over the North Island. Temperatures may be near average in some inland eastern South Island areas. Reduced westerly winds mean that the frequency of strong windy conditions may be below average. Rainfall is likely to be near normal in most ski areas.

Snowfall projections are very tentative. If there are warmer than normal temperatures over much of the country, then extensive long-lying snow at low altitudes may be less frequent than average in affected areas. Near average temperatures with average rainfall in southern South Island ski areas would indicate average snow accumulations, although further research is required to quantify this.

No clear temperature or rainfall guidance exists for the late winter to early spring period.

South Island Snow Stability Exchange: Update 2000

Steve Schreiber

The 1999 winter was a very successful season for the South Island Snow Stability Exchange. The beginning of the season saw the second year of the trial with about the same number of participants as the first season. This made it possible to move forward with the project and develop an Internet based method of daily communication.

This database development was a joint venture between the "SISSEX", John Gray and Martyn Davies at NZSki, Ltd. and a design company based in Christchurch: Alchemy, Ltd. The goal of development was to provide a means for professional and recreational snow observers to share their data on a daily basis, record the data in a uniform structure, and then be able to interpret the data to predict trends in avalanche stability more easily. The database was up and running by mid September and was 90% successful in its operation.

Positive results of the database included immediate use of graphs and archived data, standardization of recording (accomplished with draft of new "guidelines"), and improved communication between avalanche forecasters. Other positives include direct links to weather data at no charge and direct links to www.snow.co.nz for ski area reports and on site cameras. Another positive was the publication of a semi-weekly "Hazard" forecast for the recreational mountain traveller. Issues to be resolved include E-commerce, improved user management, and increased public awareness.

As the project moves into a third season, a review of the project has been undertaken. What limitations are keeping the project from being as useful as possible? What do we do well?

Firstly, I believe, there are not enough participants. Non participants include most of the Canterbury and North Canterbury ski fields, the Southern Lakes ski fields and the North Island ski areas. Data from the far South (Milford) and the Coast is

missing. Moreover, in my opinion, more complete field observations are required to have a complete awareness of what is happening in the snowpack.
In addition, consistency of observations is quite variable. This is because most guiding operations and ski areas do not take recordings on bad weather days. In my opinion, this is a significant problem as most of the significant event cycles occur during storms.

To address these issues, the SISSEX needs to change from a personal project owned by one person, we need to spend more time training participants and we need to embrace new technologies as they become cost effective. The first change will be timely and appropriate for many. The NZMSC is going to be taking over the project. This is beneficial for the programme, both financially and politically and it benefits the annual data collection programme, published in the Crystal Ball. It also legitimises the project making it easier for wider participation. I will continue as Programme Manager to support continuity.

Moreover, to upgrade the quality and consistency of the data, a training programme for ski patrollers and guides to support developing computer skills as well as transferring field observations to the computer is being developed. In addition, I will be visiting as many operations as possible to support that training process. Furthermore, the Otago Polytech will now include information about the project in its avalanche courses.

New technologies are on the horizon. Fairly soon, we will be able to deliver an Avalanche Hazard Advisory by digital pager, digital mobile phone, and possibly wireless email. If there is a demand for this information, we need to be prepared to provide it.

This is a new season and a new beginning for the SISSEX. Many thanks to all of you who support the project. Special thanks go out to the organizations that have financially supported the trial phase. These include the New Zealand Mountain Guides Association, the Canterbury Mountaineering Club, NZSki, Ltd., Ortovox & Recco, and the New Zealand Mountain Safety Council.

Steve Schreiber, Programme Manager
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Power Gel Alpine – A new product for Snow

Hamish McCrostie

In the last Crystal ball I wrote about developments with Orica Explosives and the background to the problems experienced with Power Gel. With the assistance and commitment of Yogesh Narula from Orica Explosives (formally ICI) a new low temperature power gel has been formulated and tested by a limited number of ski areas during the latter part of the 1999 season.

The reason for the small number of participants was that the production of a run of the new product had to be underwritten by those areas (a factory run is 32 cases). Four ski areas entered into the spirit of the proposal and paid up front for the product. The process of changing the factory over to the new formulation is quite involved and the commitment to doing this by Orica was appreciated.

During testing Yogesh visited the areas and became familiar with the product applications and the people involved at the coal face.

Some initial hitches such as use of old dets were ironed out quickly and the testing was a success. Product was stored at up to –20^{o}C for 2 weeks and taken out and detonated without problem. The composition is easy to work with, projectile manufacture has been improved, and the de-sensitising problems have been reduced with the use of a new gas replacing oxygen in the formulation.

Another improvement is the velocity of detonation increase from 4000-4500 m/sec to 4500-5000 m/sec. This increases the blast effect without being too sharp a crack on detonation.

On the strength of the testing the product appears to solve the many problems that beset normal Power Gel. Orica will now make this product available on a regular basis to all licenced snow blasting operations.

Currently there is a small amount of test product left at the test areas. Orica will require some indication on an annual basis whether to produce a run or 2 each season. The process requires at least 3 weeks notice for the factory to plan the run.

Please contact Yogesh Narula at Orica and discuss your requirements with him for the 2000 season. His contact is (09) 292 1009. Yogi, as he is known, is keen to hear from the industry users so he is able to develop a better understanding of usage patterns and volumes which will allow the factory to produce PG Alpine efficiently.

While it is obvious the snow explosives usage is a minuscule part of the explosives consumption in New Zealand, Orica have recognised that the Snow Industry is an important part of our tourism business and are very keen to foster a good working relationship with the industry. The development of Power Gel Alpine and the production of special Amex bags for use on the Milford Road avalanche programme have shown they are committed to this new relationship.

This is a worthwhile relationship to foster as many advantages will stem from it. Happy hunting and stay safe.

New Explosive Training Developments

Hamish McCrostie

In the past 8 months, representatives of the snow blasting industry have been working with the Extractive Industry Training Organisation (EXITO) to develop a training standards process for snow blasting certification and associated strands in avalauncher and heli-bombing.

This came about as changing legislation may mean that EXITO may become responsible for all civilian explosives certification. This is still being worked through with Dept of Labour. This also coincides with DOL pulling back from explosives training, a role it previously carried out.

The NZ Mountain Safety Council has assisted in putting forward the appropriate people with the appropriate expertise allowing the process to move forward smoothly. That expert panel is as follows:

Tom Reece	EXITO
Wayne Carren	Works Civil (Milford Road)
Mark Woods	Whakapapa
Brian Heward	Cardrona
Hamish McCrostie	nzski.com

EXITO is now working through issues with SFRITO to finalise a certificate of competency for snow blasting. Don’t panic though, in the mean time it is business as usual and you will all be kept up to date with developments when they happen. At this stage the new certification process is looking like this:

Limited Snow Control Licence:

Unit 6400	First aid
New unit draft	Demonstrate knowledge of explosives and properties
Unit 8890	Store explosives
Unit 4562	Assist avalanche control using hand charges
New unit draft	Plan layout, assemble, place and fire shots for snow control

This will allow licence holders to assist with hand charge operations while they complete:
Unit 4563 Control avalanches using hand charges.

The following endorsements will then be available:
Heli-bombing
Unit 4565 Control avalanches using helicopter bombing

Avalauncher
Unit 4564 Control avalanches using avalaunchers.

This will provide a clear streamlined process for getting personnel trained appropriately and certified for snow control while maintaining required standards for working with explosives.

The training and assessment criteria are being worked through. However it is envisaged that this will be strictly controlled due to the specialised nature of the training and assessment requirements.

Development of Avalanche Transceiver Technology

Martin Schnelle

In 1986, the IKAR (International Committee for Alpine Rescue) decided to adopt the 457 kHz as the future sole frequency for avalanche transceivers. In 1989, the DIN standards were changed to allow single high frequency and dual frequency to comply to the recognised standard of avalanche transceivers. This standard has now evolved into EN 282 being the European Norm equivalent valid in all states of the European Community States. In many states, the sale of non-EN compliant devices can cause serious problems to all parties in the supply chain should a device not comply and a legal liability challenge is raised.

By now, if anyone is still using low frequency avalanche transceiver (eg Pieps 1, Pieps 2, Pieps SF, Skadi, etc), they pose a great risk to themselves and other parties (ie fellow excursion members, rescue teams). It should no longer be even considered as an option to use these old ones as being better then using none at all.

Even the dual frequency devices are now so old already that they have to be considered suspect in their reliability of performance. Even reasonably young dual frequency units due to their limited reach should no longer be used. The public en large though appears to have heard and accepted this message as no incidents appear to have occurred (correct me if I am wrong) with people having been caught using old unreliable transceivers in the recent past. The use of dual frequency transceivers today is also not advisable as the new technologies have significant advantages.

Both, old single low frequency avalanche transceivers and old dual frequency avalanche transceivers commonly only had a reach of about 20 something meters.

Most modern avalanche transceivers lay claims of up to 80 meters (in an ideal line up) with a reliable common use minimum reach of at least 50 meters or more. Surprisingly though that one of the newest digital brands on the market only has a practical use of about 25 meters or so.

Modern single high frequency avalanche transceivers mostly feature far greater reach and most have incorporated a variety of improvements over the last few years with the addition of visual search aids such as LED lights, basic numeric displays, and now even detailed LCD screens. The cost of development of new technical approaches of avalanche transceivers has escalated in the last few years with new brands appearing, others disappearing or changing hands to avoid collapse etc.

One of the elements of innovation is the attempt of digitising the transceiver technology. As with any technological development, big changes in the basic technological approach generally always come with new problems yet to be resolved. Since avalanche transceivers are a safety device, such developments need to be conducted in careful steps ensuring full compatibility with the existing technology and ensuring continued reliability of the operation. All developments aim in making the devices more user friendly, but how is this defined and best achieved?

Claims of being able to find faster with a certain brand are always made in tests that always fail to include one critical element - the aspect of real danger of life and death and how a human being (searcher) reacts under such pressure. What about a multiple search under life and death pressure? Are a large number or a small number of user adjustment options more helpful in search situations?

What may appear logical in an exercise or fancy marketing may be difficult to follow through in an emergency. The bottom line therefore remains unchanged that only after extensive and frequent training will any searcher be able to achieve a high level of confidence to accurately handle an emergency with a good chance of success. On this note, *Keep it Simple* is a more sure recipe to achieve a highly user friendly device.

Is digital technology better then analogue? Both technologies have their advantages and this cannot be answered either way with total confidence. Analogue technology comprises of the passive processing of a radio signal. There is no calculative program in place that has to make a decision as to what to do and when and in which circumstances. It is therefore a valid argument that reliability is most important in a life saving device. Analogue is well proven to work well and is very advanced in its own right. The restriction of analogue technology is to overcome the direction of a search that always is some sort of a curve following the radio field line. To overcome that, a Doppler Antenna is required which does not yet exist small enough to be incorporated into an avalanche transceiver. All analogue devices certainly are simple to operate which is a distinct advantage and that may save a lot of time in a search even if the actual search process itself may commonly take longer. Analogue devices are normally a lot cheaper compared to digital devices.

Digital technology is trying to overcome the limitation of analogue technology by using 2 or more real and/or virtual antennas and to digitise and process this signal into a user friendly form. The first generations of such avalanche transceivers are showing promising options for the foreseeable future but have not yet convinced many senior professionals. Also, digital technology as such has some of its own inherent problems, eg a programmed microchip is required to analyse and calculate signals received, and display that result. Some arguments say that microprocessors are not reliable performers and state that digital microchips may fail from time to time (eg freezes like a computer crash, or calculate a signal with a result that it has no answer for and subsequently stops working). Such failures only need simple re-booting which in most cases of life is no problem but considered doubtful if in a safety device when such a failure occurs during a life and death search. Although a search commonly may appear faster with a digital device, the presence of possible technical problems or the fact of a series of consumer adjustable search options or confusions due to multiple burials may result in a lot of time being lost.

Another question far from being answered is if the digital technology avalanche transceivers actually comply sufficiently with the EN standards. A number of manufacturers all claim full compliance but argue bitterly over the validity of any such claims of others. Unfortunately, no authority has stepped into this argument to test and rule on the compliance issue arguing that this must come from the public. The expense to challenge and test EN compliance is prohibitively high even for the manufacturers of avalanche transceivers. This situation is not good for anyone and may only be resolved after a death and liability challenges being raised. We in New Zealand have no position to get engaged or influential in the furthering of this debate to a conclusion.

All manufacturers appear to recognise that digital technology has advantages worth incorporating and most manufactures have already come up with some form of digital devices these days. Some devices are 100% digital, some are still 100% analogue, and a third group of devices are a hybrid incorporating the best of both worlds (the reliability of analogue with the benefit of calculating valuable information in a user friendly display).

So how should a user decide from here? Since some of the claims made by the manufacturers are still inconclusive, and the benefits of the one technology verses the other is also not yet conclusive, the user has a real dilemma in his/her choice. Best advice therefore could be as follows:

If budget is important, choose an analogue unit from a reputable and well-established brand. Price alone should not be the choice but the history of reliability and reputation. Always make sure it is easy and simple to use. You may be very good with complex units yourself but this can be to your disadvantage if someone else has to find you.

If you prefer the latest technology (maybe even a gear freak) and budget is less of a concern, choose a digital unit from reputable brand but again, look for a unit with a minimum of user adjustable options. Simple and easy to use is always an important criteria.

What is a reputable brand? How long has the brand been around, what is their history of reliability. Ask your local professionals, mountain + heliski guides, ski patrollers, police, etc, all those who use avalanche transceivers all the time. Most are likely to have tried them all.

Whatever you do, even if you do not buy an avalanche transceiver, borrow or hire one when going out. Never head for the snowy mountains without an avalanche transceiver - and most important of all, PRACTISE, PRACTISE, PRACTISE regularly, repetitively, and extensively. Remember that an avalanche transceiver is NOT a licence to venture and risk more dangerous slopes.

Do the European, Canadian, and US differ in their opinion and development? Not at all. Since the DIN / EN standard is the only one around, this effectively is also recognised in the US and Canada. Since all brands (no matter if made in Europe or on the American continent) target both continents equally, the results of opinion and opinion variances are the same. Still want to know more? Check out the following web sites:

www.avalanche.net.nz (in particular during the snow season).
www.snow-forecast.com (which features NZ mountains well).

New Avalanche Guidelines are Available

The new, revised edition of the **New Zealand Guidelines and Recording Standards for Weather, Snowpack and Avalanche Observations** has now been published, ready for use in the 2000 winter. The New Zealand Mountain Safety Council is recommending its immediate implementation. Though much of the content follows previous editions, there are significant changes which pick up current trends in New Zealand and else where in the world.

COPIES NOW AVAILABLE
From the
NZ Mountain Safety Council

Price $10-00 including GST

Research Work now Available

Over the last year the Council has undertaken two research projects relating to aspects of the avalanche industry in New Zealand. These projects are now completed. Copies of the research projects are available from the Council for $10:00 per copy. The executive summaries/recommendations of the studies are as follows:

Project 1: The New Zealand Mountain Safety Council Report on Avalanche Incidents and Accidents 1981-1998

(Will MacQueen and Dave Irwin)

The New Zealand Mountain Safety Council has collected details of avalanche incidents and accidents since 1981. This report presents the second analysis of this amassed data (the first taking place in 1986).

The report has drawn the following conclusions:
The data collected through the *Avalanche Accident and Damage Summary* reports is incomplete, and some activity groups are under represented. As a result, few conclusions can be drawn from this data set.

Between 1981 and 1998, there have been 37 fatalities that can be directly attributed to avalanche involvement. There were approximately 4 times more avalanche fatalities as a result of recreation activity than as a result of work activity. A total of 6 deaths or 16% of avalanche fatalities were related to work activities. A total of 24 deaths or 65% of avalanche fatalities were related to recreation activities. Mountaineers appear most at risk, and it is likely that on average at least one climber will die each year in an avalanche.

Mountain/avalanche training accounts for 19% of fatalities, and events that involve mountain/avalanche training are likely to involve multiple fatalities. All fatalities related to mountain/avalanche training occurred on Mt Ruapehu, and all fatalities on Mt Ruapehu over the study period involved mountain/avalanche training.

The snow sport "club" areas account for approximately 5% of visitor days. However, almost 60% of avalanche fatalities occurring on snow sport areas are related to "club" operation.

The report makes the following recommendations:
Currently, avalanche resources maintained by the NZMSC are very difficult to access (given the current format of data and the storage system). An archival storage system should be considered for paper resources, and the formation of a computer database considered for all suitable data.

It is suggested the current collection of data through the *Avalanche Accident and Damage Summary* reports is not providing the information it was intended to provide. It is suggested this approach be:

1. Discontinued; or
2. Attempts are made to improve return rates, particularly in recreation sectors (However, given that incomplete returns have been observed since 1981, this may not be realistic); or
3. Only used to gather information on those who work in the avalanche industry (i.e. not assuming to represent recreation activity).

It is recommended more detailed information be collected on avalanche fatalities, and that this resource become the focus of data collection.

The high number of fatalities related to mountain/avalanche training may suggest that not all instructors have adequate training and experience to evaluate and manage avalanche hazard for groups in the locations selected. It is recommended that the mountain/avalanche instruction industry review the current standards and qualifications accepted for alpine instructors since it appears there may be a range of standards that apply.

The high numbers of fatalities linked to recreation activities suggests there remains a need for continued (or increased) avalanche education and advocacy. Since 2 geographic locations account for around 60% of the fatalities, advocacy might be targeted in these areas through (continued) public avalanche forecasting programs.

Further Research Identified:
The number of avalanche fatalities related to recreation activities, particularly mountaineering, remains high, yet reliable information on this user group is limited. Although beyond the scope of this study, it would be useful to investigate the following factors:

- How widely are transceivers, shovels and probes used?
- What is the level of knowledge and education (i.e. snow craft, avalanche courses etc.) and experience factors?
- Is there a propensity for risk taking?
- What is the nature of terrain involved (i.e. is trauma a major contributing factor related to avalanche fatalities)?

There remain a disparate number of avalanche fatalities that occur on smaller (club and company) snow sport areas. Although beyond the scope of this study, it would be useful to investigate the degree to which the minimum criteria for an effective snow safety program (including the employment of staff with Otago Polytechnic Level 2 Professional Avalanche Training or equivalent) has been implemented by all snow sport areas.

Project 2: The Effectiveness of Avalanche Hazard Zoning in New Zealand. *(Alistair Smith)*

Since LaChapelle's short visit in 1979, the level of avalanche science, recognition, monitoring and control has increased dramatically in New Zealand. The formal identification of avalanche hazard zones has occurred on the Milford Road, almost all ski areas, and on some of the highly used walking tracks of the South Island. Spearheaded by the production of the avalanche atlas for the Milford Road in 1980, the techniques used there have filtered on to the production of similar atlases for other areas. Much of this work has been performed by a small group of alpine experts, many of whom have gained experience while working in the Northern Hemisphere.

In contrast to Europe, where large-scale private development has occurred in alpine regions, in New Zealand alpine development in a general sense is very minor. With the vast majority of the alpine environment under the public administration of DoC, private development is restricted, and for this reason there has been no real need for land-use planning regulations in relation to avalanche hazard. No formal avalanche hazard zoning, where building and activity restrictions are put in place, such as those adopted in the European alpine nations, Canada, and the United States at local government level have been adopted in new Zealand.

Inevitably the level of avalanche hazard in New Zealand will grow with increasing population; pressure for development; people engaging in alpine recreational pursuits; and, numbers of tourist visiting our spectacular alpine environments. The annual death toll from avalanches has generally increased over time as a result of increased recreational use of the mountains (Breese *et al.* 1986, Prowse *et al.* 1981, and Dingwall 1990).

In management of a growing avalanche hazard, no major shifts are likely to come in statutory responsibility or current policy for alpine hazard management. With DoC the principal agency in the management of the alpine environment, the onus for public safety falls on the individual. The following should however be considered:

- Hazard assessment be performed on some of the other 'high-use' walking tracks that are without formal avalanche identification (e.g. Kepler track).

- Old lease agreements with concession holders be re-addressed to ensure the requirements for avalanche safety are being met.

Although few private developments have occurred in the alpine environment and are largely restricted, local authorities should at least acknowledge the avalanche hazard, if present in their region. District councils could develop clear criteria for assessing applications for developments in alpine areas. If further ski fields are to be developed, a comprehensive avalanche management plan and terrain analysis should be carried out prior to siting of buildings/structures to avoid property destruction and potential fatalities as is illustrated by the Remarkables lodge damage in 1987.

The greatest potential benefits for avalanche hazard management and increasing the effectiveness of avalanche hazard zoning come through advances in technology and the following measures are advocated.

- The network of automated weather stations should continue to be expanded.
- Acquiring a radar weather station in Southland would greatly increase the degree of accuracy in predicting weather conditions and implementing control measures on the Milford Road.
- Geographic Information Systems (GIS) would provide huge benefits in the quantity of data that could be stored, transferred, recalled, and used in modelling and prediction. Meteorological conditions, snow pack characteristics, terrain analysis, and other stability factors can be combined into one system increasing the ability to predict when a slope will fail. A programme could be instigated to introduce GIS into ski field management.

The dissemination of information is clearly a key factor in avalanche hazard identification and management. Management decisions are only as good as the information on which they are based and the transfer of knowledge and best practices can provide for greater understanding of avalanche hazard. Avalanche atlases play key role in the identification and awareness of avalanche hazard. In addition they fulfil the role of educating new staff in the locations of, and the potential for avalanche.

- Avalanche atlases should continue to be produced (although GIS may eliminate many of their functions) and regularly updated. There is a concern that much of the knowledge and experience in management and monitoring of avalanche hazard is held in human capital. An atlas provides some means of passing this knowledge on.
- The re-calculation of Hazard Indexes should be an ongoing process, and people made aware of the risk and increasing numbers of people and assets exposed to hazard.
- In some instances a greater degree of information should be incorporated into atlases, such as, common snow-loading conditions and the potential areas where control should be targeted in these conditions. Some atlas provided poor quality photographs with little definition of avalanche paths, and often no estimation of run-out zones. In this form they provide few management benefits.
- The Internet provides a medium through which information can be exchanged rapidly. It should be used to source information about advanced avalanche management practices from the Northern Hemisphere and to exchange information locally.

Unlike many nations, in New Zealand we still have the choice of where, and how, to develop. We also have the social and physical infrastructure in place to give us the capability to make informed decisions. With high quality human resources in science, engineering, planning, management and education, provided there is a policy focus and financial commitment, successful long-term management of New Zealand's avalanche hazard can be achieved.

Avalanche Accident (Mt Strauchon 27/4/00 - Draft Report)

Dave Crow
MECNZ

Introduction

On the 27th April 2000 at approximately 12pm four climbers were ascending a snow gully on the South East face of Mt Strauchon (Fig 1) when they released a slab avalanche of size 1.5.

All 4 climbers were caught and carried into the runout.

The 2 climbers lowest in the gully were carried into a crevasse and buried to a depth of 1.5 metres and 2 metres. The other two climbers were partially buried, one climber sustained moderate leg injuries.. They dug themselves out and searched for their companions using their ice axes as probes.

After approximately 1 hour they abandoned the search and retreated to Brodrick Hut from were they had made the ascent. The uninjured climber then made his way out to the road end were he used a cell phone to raise the alarm (9:30pm).

A search party arrived on the site at 9am on the 28th and the bodies of the 2 buried climbers were recovered at 12pm, 24 hours after burial.

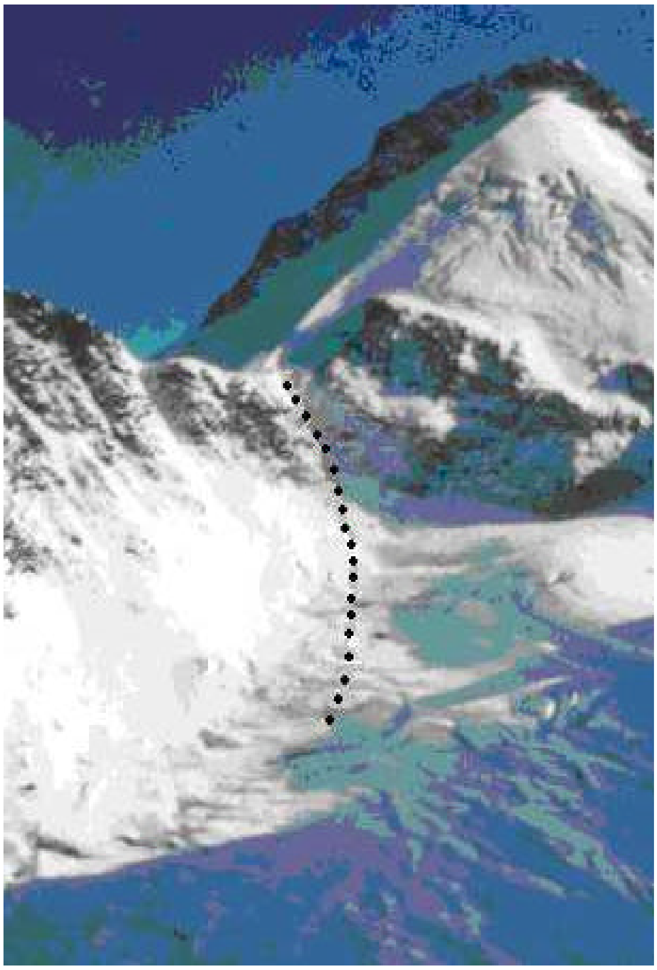

figure 1. South East Face of Mt Strauchon with route of ascent Photo D. Garlick

The gully is south east in aspect with an incline of 30°. The runout was on to a glacier with terrain traps consisting of open crevasses. The runout was at an altitude of 2000m whilst the start zone was at an altitude of 2160 metres. The track was confined.

The resulting deposit of snow had an average depth 30cm at the top and 40cm near the toe with a width of 35-40 metres and length of 40-50 metres.

Location

Mt Strauchon lies immediately west of Brodrick Pass and is generally accessed from Brodrick Hut at the head of the Huxley river in the Waitaki catchment (Fig 2).

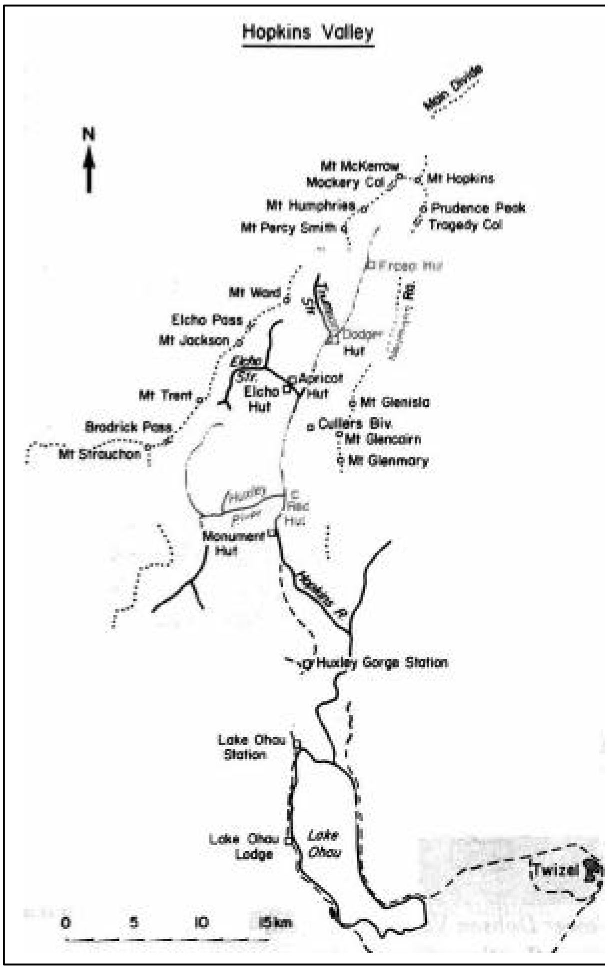

Figure 2. Location Map,
Source; NZAC
Barron Saddle-
Mt Brewster
climbing Guide

The avalanche initiated at an altitude of 2160 metres in a gully leading off the glacier at the bottom of the South East Face of Mt Strauchon (Fig 3).

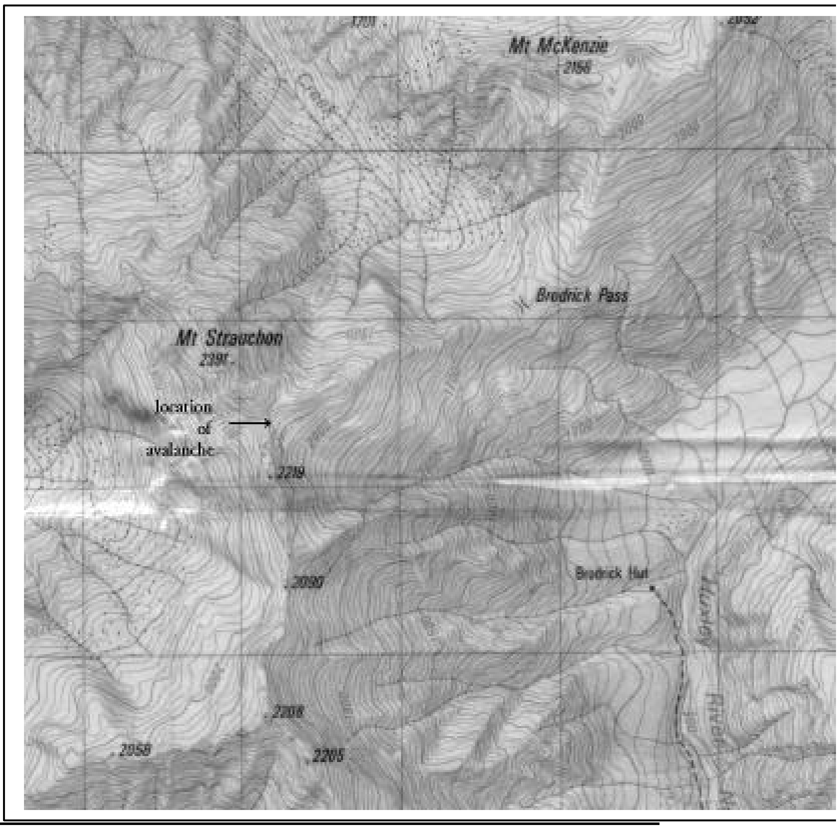

Figure 3. Site of avalanche
260 series, grid reference G37
453885

Weather prior to the event

The weather over the 6 days prior to the accident was dominated by a moderate south west flow with a series of embedded cold fronts. Recorded maximum mean daily wind speeds in the region ranged from 7 to 29 km/hr. Winds of 40 km/hr were recorded for the 3 hrs 7-9pm on the 26th April (Fig 4).

Temperatures were cool from the 21st to 25th , the coldest period being the evening of the 24th and morning of the 25th when the temperature fell to -1.0°C at 1400 metres. The 26th and 27th were significantly warmer with 24hr means of 9°C and 10°C respectively. Temperatures peaked on the morning and early afternoon of the 27th with the highest temperature of 16°C being recorded over the hours between 11am and 1 pm.

Recorded rainfall in the Hopkins Valley for the period 21st – 27th April was 25mm. The majority of rain falling from the afternoon of the 22nd and morning of the 23rd. This coincides with the passage over the South Island of a depression and associated cold front (Fig 5). Wind direction over this period was more to the NW and wind speed averaged 36km/hr.

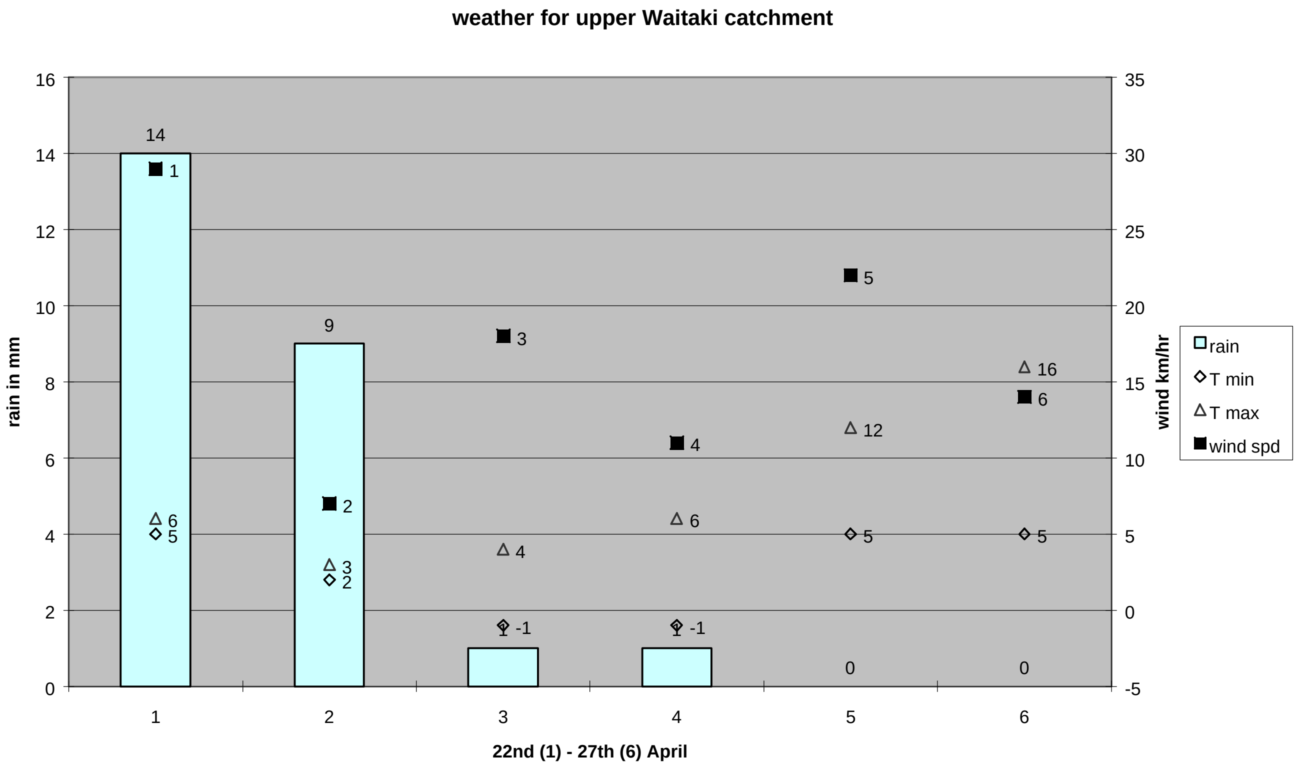

Figure 4 Graphical representation of weather data

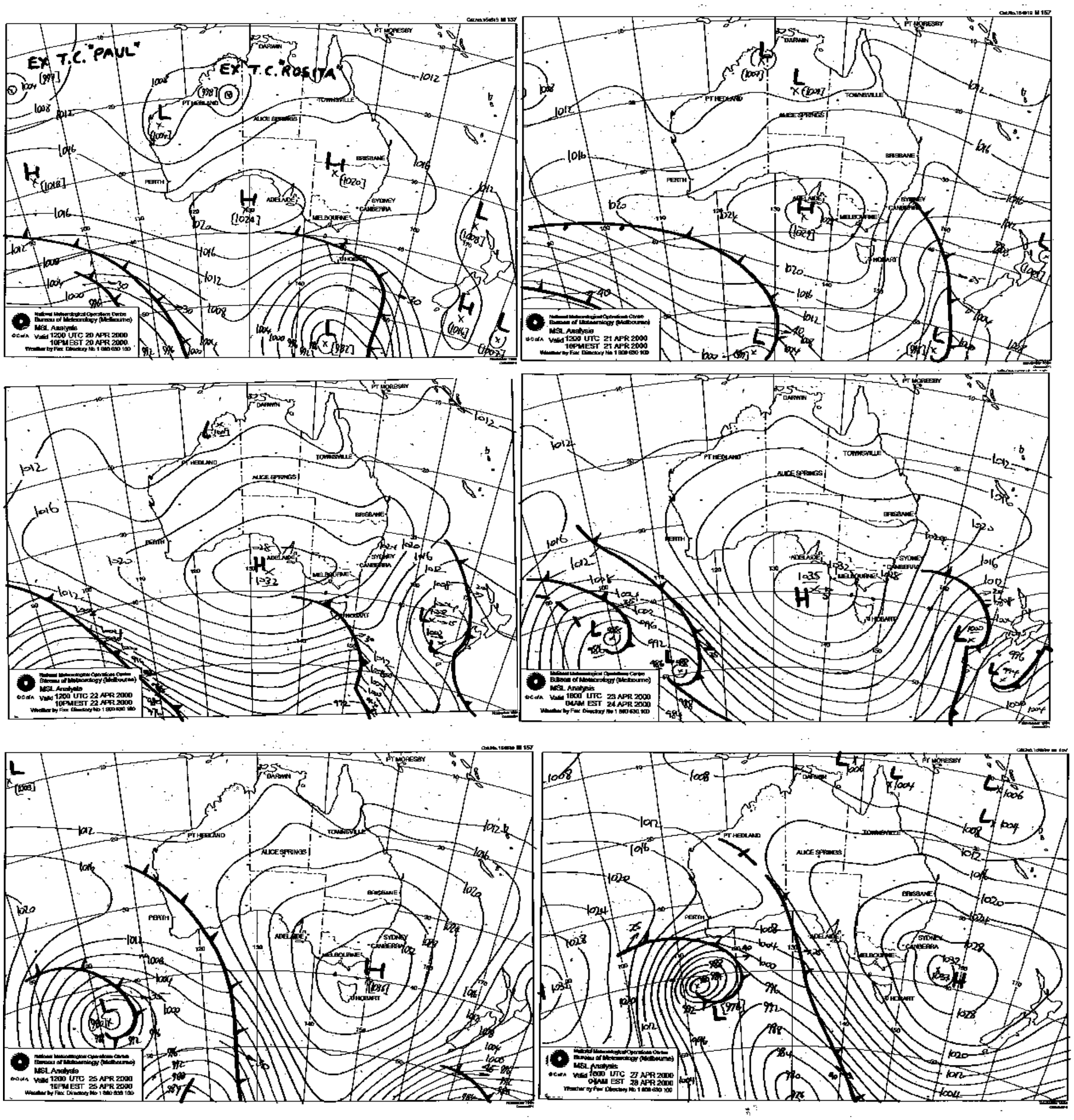

Figure 5. Synoptic maps 20 April 2000- 28 April 2000

Instability allowing the release

There is no detailed data available from the site on snowpack structure however, the following information was observed;

The snow in the glacier basin below the south east face was observed to be wind effected and had an average depth of 20 – 50cm. It contained a 2-5cm surface layer that was identified by an easy shear as well as additional layering which was overlying glacial ice.

The snow "quality" has been described as loose, dry and granular.

The foot penetration was approximately 5-10cm.

There had been some previous class 0.5-1.0 loose snow avalanche activity on northern aspects

Higher in the gully the snow surface condition changed to moderate hard slab (the climbers described kicking toes in to a depth of 4-6cm whilst ascending the gully).

Figure 6. Path of avalanche
Photo; G. Brehaut

The trigger was most likely the weight of the climber/s on the slab (the lead climber observed the snow fracture a few metres above his position to a depth of 10-15cm).

The bed surface had an average angle of 30°, the avalanche path was largely confined with lower track and runout opening onto the glacier (Fig 6) which contained terrain traps in the form of open crevasses.

The 4 climbers, who were in line about 1 to 2 metres apart and nearing the top of the gully were carried down the path with the avalanche (Fig 7). The two climbers lowest in the gully at the time of the release were carried into a crevasse on the true left of the path and buried at a depth of 1.5 metres (C) and 2 metres (D). The climber second from top cleared the terrain traps and came to rest below the crevasse (B) before being partially buried, also on the true left. The lead climber was deposited and partially buried a few metres from the toe of the debris (A), in the centre.

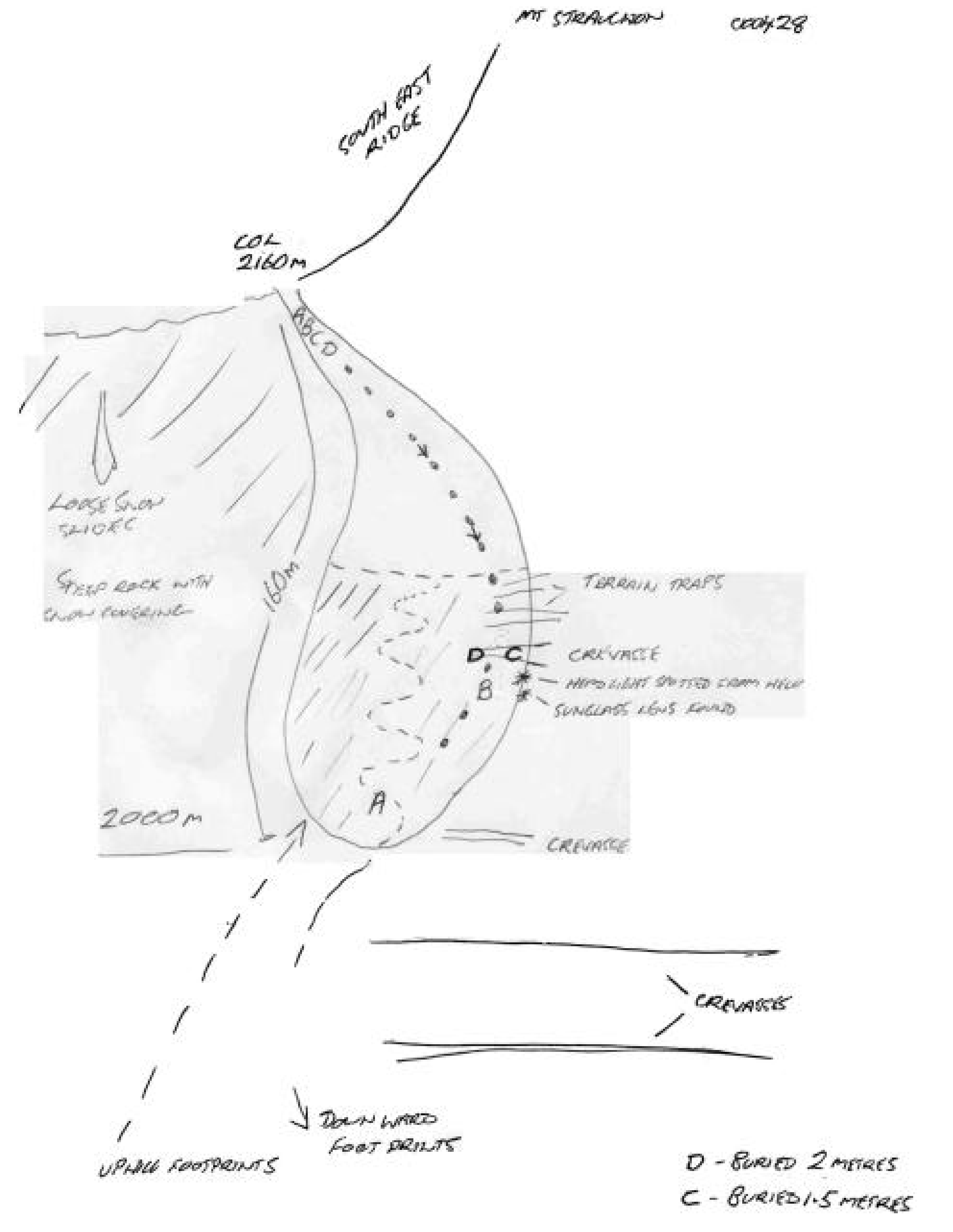

Figure 7. drawing of avalanche site
Source; G. Brehaut

Acknowledgements

1. Meridian Energy for allowing access to climate data from their main divide stations. (note all climate data taken from stations at 1400-1500 metres)
2. Gary Brehaut for photos and site descriptions
3. Gary Dickson for site descriptions
4. David Mckinley for site descriptions
5. Dave Garlick for photos

Avalanche Accident (Hakuba, Japan; 19/2/00)

Ian Owens and Dave Irwin

(The following brief summary was compiled from newspaper articles describing the avalanche accident. Although not a complete account of the incident, it does highlight a number of key issues).

On Saturday the 19th February, six friends (including three Kiwis aged between 18 and 25) met at Happo-one ski area near Hakuba (about 180 km north west of Tokyo) and purchased afternoon passes. They had planned to use the ski area's lift facilities to access backcountry terrain. The friends, living in Hakuba for the winter had met the night before to plan a snowboard tour.

They rode a gondola and two chair lifts to the top of the mountain and left the area, passing by signs warning they were leaving the area boundary. It then took somewhere between 20 and 45 minutes to walk to the valley system they were intending to ride. They had all been to the valley before and it appears to have been a popular backcountry route; one of the survivors suggesting he had been there 30 or 40 times. However police later maintained that not many people visited the area since there was a known risk of avalanches there.

It was a sunny day with no wind and it had not snowed for 48 hours. By the time they got to the valley it was about 2pm and they found a number of fresh tracks (apparently 18 in total) where others had skied or boarded the same terrain before them.

Once they got to the top of the valley the three kiwis rode out to a ridge on the left while another in the party, an Australian made his way to a central ridge running through the valley. The remaining two in the party appear to have ridden on down the valley ahead of the others.

The snowboarder on the central ridge took out a video camera and was filming one of the kiwis riding down the slope towards him - a distance of only about 20 metres away (the photographer later presumed that the other two kiwis were following behind the first). Then the party heard a sound “like two cars colliding" and the snowboarder being filmed yelled, "avalanche”.

The avalanche occurred at about 3:30pm. It appears to have been a slab avalanche about 60 metres wide and must have run for some distance (the debris was reported as 60 metres wide, 1 kilometre long and up to 15 metres deep in places). The slab caught the three snowboarders being filmed, but the photographer, dropping his camera and scrambling back up the ridge, managed to avoid the moving mass.

From his place on the ridge, the snowboarder who had been taking the video looked for signs of his friends in the debris and used his cell phone to call for help. Then, after about 10 minutes, he saw three figures about 1 kilometre down the valley that he assumed were the New Zealanders. However, as he made his way towards the figures he realised he had been mistaken.

When he reached the people at the bottom of the valley, he briefed them on what had happened and together they began to search for the buried victims (it does not appear that the snowboarders were equipped with shovels or probes, and did not have transceivers). They moved up the debris for about 400 metres but decided it was too risky to go any higher because of further avalanche risk. They then returned to the ski area to raise the alarm.

About 1-1/2 hours after the avalanche occurred, a helicopter and initial rescue team arrived at the avalanche site. Volunteers (friends of the buried victims) later searched through the night. However, the existing hazard appears to have thwarted efforts to search the likely burial areas at the upper end of the deposit.

The search was resumed at 6am on Sunday morning with 37 searchers (volunteers and police) taking part. However poor weather conditions (5crn new snow –13^{o}C temperatures and 2OO-metre visibility) hampered efforts.

One week after the avalanche occurred and after consultation with the victims' families, the Japanese Police called off the search. Further snow and warming weather had increased the risk of other avalanches occurring in the area of the search. It was not until 19th June that all three bodies were recovered.

Friends and family of one of the deceased have established a trust to help fund Taranaki SAR and to purchase a number of transceivers that would be available on a hire basis to ski and snowboard tourers. The mother of another of the boarders has launched a national campaign to encourage outdoor enthusiasts to use transceivers and to learn survival techniques.

The following issues are of interest:

- That all three of the deceased were caught in a slab avalanche only 60 metres wide suggests all three were riding in close proximity.
- The snowboarders were not prepared or equipped for a self-supported backcountry rescue.
- It was necessary for the funding of the organised rescue effort ($20,000 per day*)* to be underwritten by families of the victims before the Japanese authorities would undertake extensive backcountry SAR activity. Some

reports suggested this process of confirmation contributed to delays in initiating formal SAR efforts.

- Conventional travel insurance policies do not cover accidents (and SAR activity related to accidents) incurred while undertaking activities defined by the insurers as hazardous (e.g. rock climbing and mountaineering).
- In New Zealand, the volunteer and club roots of SAR are apparent in the continued community responsibility exhibited by agencies (such as DOC) and private organisations (such as ski areas and guiding companies) to initiate and extensively support SAR activity. This may lead outdoor users to entertain a false belief that there exist commensurate services in other countries.
- Awareness of avalanche hazards and appropriate safety measures is poorly developed among outdoor users who are otherwise skilled in snow based activities. The Mountain Safety Council supports the initiatives mentioned earlier aimed at overcoming this and has produced three posters (with a snowboarder, a climber and a skier as background respectively) with brief messages encouraging safe practices in avalanche terrain.

Assessing the Potential for Snow Avalanche Hazard at DOC Backcountry Huts

Dave Irwin

As part of the visitor asset management programme, the Department of Conservation is in the process of conducting avalanche hazard inspections of backcountry huts. In order to preclude visiting the one thousand odd huts and shelters in existence, the DOC has had to develop an approach to narrow the scope of the exercise.

In the context of this process, DOC has defined snow avalanche hazard as *"the potential for snow avalanches to cause distortion or destruction of an asset, or failure of one of its major elements, or injury to visitors to the asset site".*

The initial phase of the process has been to amass information on a relational data-base, the Visitor Asset Management System (VAMS). Information has been collected by the relevant Area Offices over time and entered onto the VAMS database. Information amassed relates to many aspects of visitor site management including base data relating to avalanche (eg elevation, physical location, ground cover, aerial photographs, age of hut, history of avalanche involvement/damage etc).

The first part of the process has been a desktop exercise using existing information loaded on VAMS. Any hut sites that the desktop exercise identifies as having a snow avalanche hazard may then be subjected to a site inspection to determine the true extent of the hazard and what remedial action might be required to mitigate it.

To undertake the desktop exercise, a query form has been developed that draws the relevant information from the VAMS into a format that can indicate (when considered with other sources of information including maps, photographs, and DOC Area Office staff) whether a hut may be at risk from avalanche. Query forms created a profile of avalanche related factors for each of the sixty odd huts considered to have avalanche hazard potential as identified by Area Office staff. Once a profile was established it was possible to determine whether:

a. An on ground inspection of the visitor site was required; or
b. An on ground inspection of the visitor site was not required; or
c. More information was required.

The desktop exercise was not conclusive in all cases. Where uncertainty of avalanche hazard potential has remained after the exercise, an inspection by air may be required to gather more information in order confirm or negate the necessity of an on ground inspection.

Avalanche Management Training

The Avalanche Management Training programme is jointly administered by Otago Polytechnic and NZMSC and is nationally recognised as the core-training programme for professionals working in the field. Based on the Canadian Avalanche Association professional training programme, courses are offered in -

- Recreational Back Country Avalanche Safety
- Avalanche Safety Management Stage 1
- Avalanche Safety Management Stage 2

New this year is an Advanced Avalanche Training Course pitched between the Stage 1 and 2 qualifications. This course is 4 days long, including 2 field days as well as presentations, lectures and seminars.

More info is available from Barbara Emmitt at Otago Polytechnic's Cromwell Campus (email: bemmitt@tekotago.ac.nz or phone 0800 765 9276)

The course schedule for 2000 is as follows:

Back Country Training Course

Queenstown	22nd -25th September

Stage 1 Certificate Courses

Public Courses

Queenstown	16th-22nd July
Temple Basin	23rd-29th July
Queenstown	13th-19th August
Whakapapa	27th August - 2nd September
Temple Basin	3rd-9th September

Polytechnic Courses for Enrolled Students

Christchurch Polytechnic	7th - 14th August
Otago Polytechnic (Adventure Tourism)	26th - 29th September
Otago Polytechnic (Mountain Recreation)	to be arranged

Advanced Avalanche Training

Wanaka	3rd-6th August

The next **Stage 2 Certificate Course** is scheduled for winter 2001.

Avalanche Awareness Programmes

NZMSC Avalanche Awareness Programme

The Avalanche Awareness programme run by the Mountain Safety Council in July/August each year provides essential information for skiers and climbers who need the basic knowledge required to help them make decisions about their personal safety when in avalanche terrain. The programme consists of an evening lecture and field day. An information leaflet is available from the Council. The programme for this winter can be found on the following pages.

Information and schedules for courses can also be found on the Councils web site at **http://www.mountainsafety.org.nz**

2000 AVALANCHE AWARENESS TRAINING PROGRAMME

Location	Course	Date	Venue	Contact
AUCKLAND	Evening Lecture	t.b.a.		Vern Meyer Ph: 07 333-7099 Fax: 07 333-8635 Mob: 025 985-431
WELLINGTON	Evening Lecture	t.b.a.		"
NAPIER	Evening Lecture	t.b.a.		"
WHAKAPAPA	Evening Lecture	t.b.a.		"
	Field Day	Sat 12 Aug	Whakapapa	"
	Field Day	Sun 3 Sept	"	"
	Field Day	Wed 13 Sept	"	"
	Field Day	Sat 16 Sept	"	"
OHAKUNE	Evening Lecture	Thurs 27 July	Ohakune	Mark Sedon Ph/Fax: 06 385-8290 025-909-003 Email: Mark.Sedon@xtra.co.nz www.offpiste.co.nz
	Field Day	Fri 28 July	Turoa	
	Evening Lecture	Fri 25 Aug	Ohakune	"
	Field Day	Sat 26 Aug	Turoa	"
	Evening Lecture	Thurs 21 Sept	Ohakune	"
	Field Day	Fri 22 Sept	Turoa	"
	Evening Lecture	Fri 6 Oct	Ohakune	"
	Field Day	Sat 7 Oct	Turoa	"
Taranaki	Evening Lecture	Thurs 3 Aug	Red Cross Rooms	Ross Eden Ph/Fax: 06 753-7937 Email: rosse@clear.net.nz 021-838-513
	Evening Lecture	Fri 4 August	Mt Eg. AC Club Rooms	"
	Field Day	Sat 5 Aug	Manganui Ski Area	"
	Field Day	Sat 19 Aug	Manganui Ski Area	"
MARLBOROUGH	EVENING LECTURE	WED 9 AUG	BLENHEIM	AMANDA HARVEY 03-572-8608 EMAIL: ANDREW.COLE@NZDS.MIL.NZ
	Field Day	Sun 13 Aug	Rainbow	
CHRISTCHURCH	Evening Lecture	Tues 18 July	ChCh C of Educ'n	Michelle Metherell Ph/Fax: 03 351-0942
	Field Day	Sat 22 July	Craigieburn area	
	Field Day	Sun 30 July	"	
	Field Day	Sat 19 Aug	"	
	Avalanche Awareness for Snowboarders	Sat 24 June Sun 25 June (or 30 Sept-1 Oct)	Temple Basin	NZ Snow Safety Institute (c/o Temple Basin Ski Club) Ph: 03-377-7798 Fax: 03-377-7798 Email: ski@temple.org.nz
	Weekend Winter Survival for Snowboarders	Sat 1 July Sun 2 July	Temple Basin	"
	Avalanche Awareness	Sat 22 July Sun 23 July (or 16-17 Sept)	Temple Basin	"
	5-Day Avalanche Survival for Snowboarders	Mon 14 Aug Fri 18 Aug	Temple Basin	"

TWIZEL	Evening Lecture	Sat 8 July	Lake Ohau Lodge	Mountain Education Centre Ph: 03-435-0336 Fax: 03-435-0080 Email: alpine@voyager.co.nz
	Field Day	Sun 9 July	Ohau Snow Field	"
	Evening Lecture	Sat 12 Aug	Lake Ohau Lodge	"
	Field Day	Sun 13 Aug	Ohau Snow Field	"
	Evening Lecture (Snowboarders only)	Sat 26 Aug	Lake Ohau Lodge	"
	Field Day (Snowboarders only)	Sun 27 Aug	Ohau Snow Field	"
	Evening Lecture (Snowboarders only)	Sat 2 Sept	Lake Ohau Lodge	"
	Field Day (Snowboarders only)	Sun 3 Sept	Ohau Snow Field	"
West Coast	Evening Lecture	Wed 2 Aug	Hokitika or Greymouth	The Big Raft Outdoor Activities Centre Ph/Fax: 03 755-6717 Email: revellstranch@hotmail.com
	Field Day	Sat 5 Aug	Temple Basin	"
Dunedin	Evening Lecture	Wed 19 July	Dunedin	Ph: 03 477-6644 Fax: 03-477-6648
	Field Day	Sat 22 July	Remarkables	Russell Tilsley Ph: 03-442-6664
Southland	Evening Lecture	Thurs 20 July	Invercargill	Ph/Fax: 03-221-7212
Queenstown	Evening Lecture	Fri 21 July	Queenstown	Ph: 03-442-6664