K042
2000/2001

LOGISTICS REPORT

K042: Styles of early glaciation near the margin of the East Antarctic Ice Sheet, South Victoria Land

ANTARCTICA NEW ZEALAND 2000/2001

Event Personnel :

Philip Holme	(Victoria University of Wellington)
Carl Bornholdt	(Victoria University of Wellington)
Dr. Stephen Hicock	(University of Western Ontario)

HEADINGS

1 Aims

This project is a detailed study of ancient glacial deposits termed the Sirius Group, focussed mainly at Allan Hills, but including Mount Feather and Table Mountain, Southern Victoria Land, Antarctica. The Sirius Group is a collection of Neogene deposits that crop out at high elevations (mostly >1500 m) throughout the Transantarctic Mountains (TAM). Allan Hills occupies a low point in the TAM, making the site more susceptible to overriding by the EAIS during minor volume fluctuations, while Mount Feather has the highest elevation deposits of the Sirius Group. Table Mountain is nearby Mount Feather and of similar elevation to Allan Hills, but the deposits there are more varied. The aim of this project is to show whether the Sirius Group was deposited by valley glacier or continental ice sheet, by wet- or dry-based glacial ice, by a single depositional event or several overriding events and to determine paleoflow direction. The expansion of the study this season to include deposits at Mount Feather and Table Mountain significantly widens the scope of the project and will permit a valid regional perspective.

The field season ran from mid-November 2000 to December 22, 2000 and included visits to three field sites: Allan Hills, Mount Feather and Table Mountain. Holme and Hicock's work at Allan Hills consisted of outcrop description and mapping (continued from the 1999/2000 field season), while work at Mount Feather and Table Mountain focussed on outcrop studies. In total, nine outcrops were studied and 24 samples were taken. Collected data include: 330 stone orientations were measured, 51 linear glacial abrasions and 79 planar deformational structures. Bornholdt's work consisted of mapping and sampling the volcanogenic and sedimentary deposits which comprise Mount Watters. Additionally, Holme aided K047a in choosing potential sites for their drilling program at Allan Hills.

2 Planning

Discuss the New Zealand pre-Antarctic planning phase of your expedition, detailing any suggestions for improvements:

i With the application process;

We have no suggestions for improvements to the application process.

ii With Antarctica New Zealand staff;

We have no suggestions for improvements to Antarctica New Zealand staff.

iii Provision of maps and aerial photographs;

Maps and aerial photographs were obtained before our first season last year and during the winter before our (second) season this year.

iv To the Pre-season Information

We have no suggestions for improvements to the pre-season information.

v To Medicals, documentation and flights to Antarctica.

Holme and Bornholdt's medical examinations were conducted by a GP at the Victoria University campus. Bornholdt was recovering from a broken clavicle and required subsequent visits to a specialist to monitor the status of his recovery. His recovery progressed very well and he was eventually deemed fit by the specialist and did not suffer any related difficulties during the field season. Hicock's medical exam was conducted by a GP in Ontario, Canada.

3 Cargo

Cargo shipped to ANZ's store for transport to Scott Base consisted of five wooden rock boxes (two with papers inside totalling <10 kg), a cardboard map tube, and a collapsible aluminium pole in a section of ABS plastic piping. These items were given to ANZ at a very late date and we are extremely grateful that the staff in Christchurch expedited their shipment to Scott Base.

4 Personnel

Philip Holme	(PhD student, principal investigator (for P. Barrett) - Victoria University of Wellington)
Carl Bornholdt	(Honours student, field assistant to Holme - Victoria University of Wellington)
Dr. Stephen Hicock	(co-supervisor for Holme - University of Western Ontario)

5 Preparations for the Field

As applicable discuss your initial period at Scott Base relating to:

i Reception, planning for your event and liaison where appropriate;

Our reception at Scott Base was fine, as was on-base planning for helo weights, etc.

ii Availability and condition of equipment received by your event. Any work required by your party to make the equipment serviceable should be noted;

Equipment received by our event was in good working condition. The ground-sheet for one of our Polar tents was an Endura floor, but that was the only mistake.

iii Field training and field party equipment 'shakedown' journey (if applicable);

Two of our event members did AFT last year and so only required a refresher course, but one of them (Hicock) did not receive this training due to a mix-up. He arrived southbound at Scott Base late in the day and it was decided that he and the other new (returning) arrivals would begin their AFT refresher the next day. At 0700h the next morning however an attempt was made to fly him into the field (Allan Hills) and he missed the AFT refresher session. Poor weather in the McKay Glacier valley forced the helo to abort its mission and to return with Hicock to Scott Base where he then spent several days at Scott Base due to ongoing weather and radio-disruption delays but did not receive the training session.

iv Delays at Scott Base, whatever the cause.

Holme and Bornholdt were delayed three days at Scott Base before going into the field because of poor weather (snowfall and poor visibility) there. Hicock was delayed several days at Scott Base due to poor weather both at Scott Base and Allan Hills when he arrived later in the season. He was delayed in Christchurch for nine days before arriving at Scott Base due to poor weather and HF radio disruptions (due to solar flare activity).

6 Field Transport

As applicable report on the following:

i Aircraft Operations

Discuss the success or otherwise of all aircraft, helicopter or other operations supporting your event.

All our helicopter operations were successful. The Helicopters New Zealand pilots, Rob and Jim, were great and we were very happy to be flying with them. We are very grateful to Jim Wilson for making a flight out to Table Mountain to pick us up at the end of the season when weather conditions were quite poor. Had he not done so we would have been forced to stay there for several days over Christmas.

Describe the containerisation of cargo, total flight weights, special handling of dangerous cargo, (eg motor toboggan, fuel tanks) and pre-planning meetings.

Our cargo was very standard for a field party and we did not have any hazardous cargo. We were transported exclusively by the HNZ 212 helo 'HNO' and for each flight our weight was 1900 lbs or slightly over. The pilots, Rob and Jim, were aware of our weights and acted accordingly, especially when we had to be dropped off and picked up at Mt. Feather (2500 m.a.s.l).

7 Event Diary

Day	Date	Location	Activity
01	19/11/00	AH - camp (Trudge Valley - TV)	insertion and camp setup (Holme, Bornholdt, Spencer - AFT instructor and temp guest)
02	20/11/00	AH - central Allan Hills	traverse to place diatom trap on ice-sheet imm. west of Allan Hills
03	21/11/00	AH - Holme at Echo Gully; Bornholdt, Spencer at Mt. Watters	Holme - revisit outcrop; Bornholdt, Spencer outcrop measurement
04	22/11/00	AH - Holme at camp for a.m. then western TV; Bornholdt, Spencer at Mt. Watters	Holme - recce; Bornholdt, Spencer outcrop measurement, description and sampling. K047A arrival and Spencer to SB
05	23/11/00	AH - camp, drillsite	Help K047A set up camp and drillrig
06	24/11/00	AH - south ridge of TV in a.m.; Holme at drillrig in p.m. while Bornholdt at Mt. Watters	mapping in a.m.; Holme help at drillrig in p.m. while Bornholdt mapping
07	25/11/00	AH - rim of gully in southeast corner of TV	recce for second drillsite location
08	26/11/00	AH - Holme walk with K047A members Dickinson, Hosie, Wayne to 'Triangle' in central Allan Hills; Bornholdt at Mt. Watters	Holme look for new drillsite; Bornholdt mapping
09	27/11/00	AH - Holme walk with entire K047A group to Triangle; Bornholdt at Mt. Watters	Holme look for new drillsite and outcrop; Bornholdt mapping
10	28/11/00	AH - eastern TV	sampling transect
11	29/11/00	AH - eastern TV	sampling transect
12	30/11/00	AH - Holme on west side of Triangle; Bornholdt at Mt. Watters	Holme outcrop work; Bornholdt mapping
13	01/12/00	AH - Holme at camp; Bornholdt at Mt. Watters	Holme assisting K047A with helos; Bornholdt mapping
14	02/12/00	AH - at camp	Holme revising field plan; Bornholdt assisting K047A with helos
15	03/12/00	AH - Holme at camp; Bornholdt at Mt. Watters	Holme ill with fever; Bornholdt mapping
16	04/12/00	AH - Hicock arrival. Holme, Hicock on west side of Triangle; Bornholdt on ridge	Holme, Hicock doing outcrop description; Bornholdt mapping

		south of TV	
17	05/12/00	AH - Holme at camp; Hicock in central Allan Hills; Bornholdt on ridge south of TV	Holme working with GPS units; Hicock taking outcrops photos; Bornholdt mapping
18	06/12/00	AH - Holme, Hicock on east side of Triangle; Bornholdt in short valley south of TV	Holme, Hicock doing outcrop description; Bornholdt mapping
19	07/12/00	AH - Holme, Hicock on east side of Triangle; Bornholdt in short valley south of TV	Holme, Hicock doing outcrop description; Bornholdt mapping
20	08/12/00	AH - Holme on ridge north of TV; Hicock, Bornholdt ridge south of TV	Holme recce; Hicock, Bornholdt mapping and recce then packing up camp
21	09/12/00	MF - move to Mt. Feather	move to Mt. Feather, camp setup, recce
22	10/12/00	MF - all around study area	recce
23	11/12/00	MF - south corner of plateau	outcrop description
24	12/12/00	MF - Holme, Hicock at east and north corners of plateau, Bornholdt at camp	Holme, Hicock doing outcrop description; Bornholdt tending camp
25	13/12/00	MF - at east and north corners of plateau then Bornholdt at camp	doing outcrop description; Bornholdt then tending camp
26	14/12/00	MF - at camp waiting for helo move to Table Mtn.	at camp waiting for helo move to Table Mtn.
27	15/12/00	MF - move to Table Mtn.,	move to Table Mtn., camp setup, recce
28	16/12/00	TM - Holme, Hicock west of camp; Bornholdt at camp	Holme, Hicock doing outcrop description; Bornholdt tending camp
29	17/12/00	TM - Holme west of camp; Hicock all over Table Mtn; Bornholdt near camp	Holme doing outcrop description; Hicock doing recce; Bornholdt assisting K047A. K047A and Hicock to SB. Hosie remaining at Table Mtn.
30	18/12/00	TM - Holme, Bornholdt southwest of camp; Hosie north and east of camp	Holme, Bornholdt doing outcrop description; Hosie studying permafrost polygons
31	19/12/00	TM - Holme south of camp; Bornholdt, Hosie working in vicinity of camp	Holme doing outcrop description; Bornholdt, Hosie studying permafrost polygons
32	20/12/00	TM - Holme south of camp; Bornholdt, Hosie at Navajo Butte	Holme doing outcrop description; Bornholdt, Hosie exploring
33	21/12/00	TM - camp	waiting for helo pickup
34	22/12/00	TM - to SB	return to SB

8 Event Map

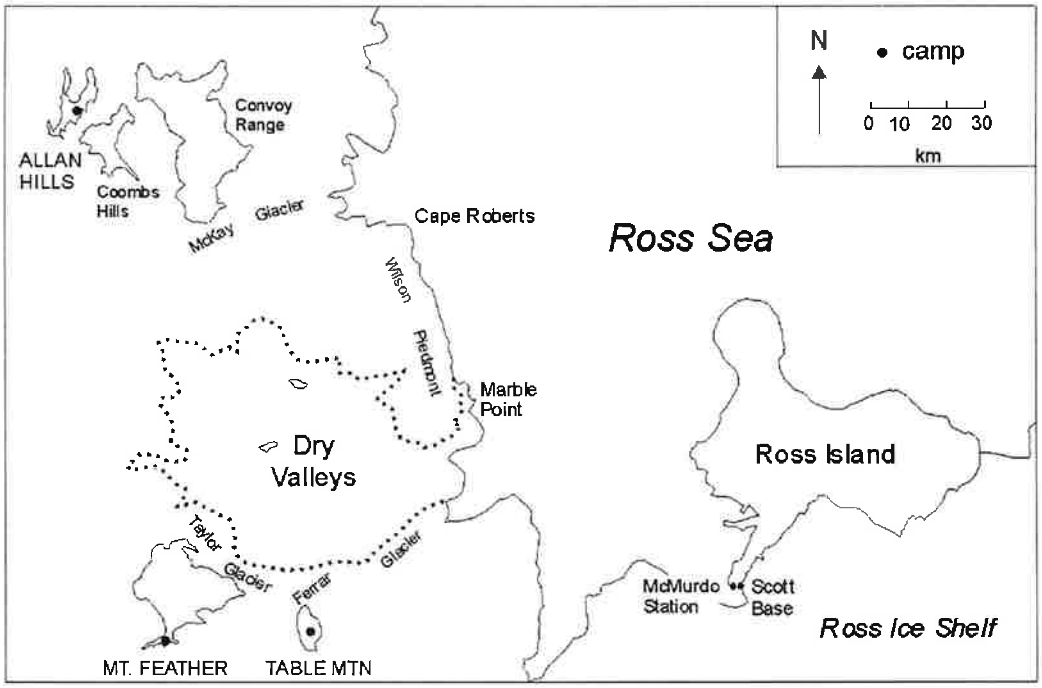


Figure 1. Map showing locations of fieldsites.

9 Weather

Provide a general overview of your local weather throughout the season and how this aided or hindered your party movements and decisions.

Allan Hills:

The weather at Allan Hills this season was generally very snowy compared to last season. The snow was 'real' precipitation in that it often occurred during fairly low wind conditions and therefore was unlikely to have been blown in from the plateau. When we arrived there on Nov 22 the daily temperature was around -17°C, but warmed up rapidly until it was about -8 to -10°C when we left in early December. Wind conditions were generally moderate (10-15 kts) most of the time but became quite windy on occasion (>20 kts) - wind direction was from the south. We experienced several days of low visibility which prevented helo arrivals - this was different from last year when we had mostly clear, sunny skies.

Mount Feather:

We experienced mainly poor weather conditions at Mt. Feather (ground-level, dense cloud and much blowing snow), but there is a very clear pattern to the weather there. Mornings are often clear or partly cloudy with good visibility, but by 11 am cloud builds up at ground level (2500 m), dropping visibility to 20-50 m and completely preventing any helo activity. This weather is local to Mt. Feather, however, and during brief glimpses through the cloud we could see that adjacent valleys (Ferrar, Taylor) were largely clear. Mt. Feather is so high that it produces its own weather (a summit cloud). We received several heavy snowfalls during our stay there and temperatures hovered around -18 to -20°C. Winds were often <25 kts and blew exclusively from the north/northeast - this is uncommon for Mt. Feather where the winds are often much stronger and southerly.

Table Mountain:

Weather conditions at Table Mtn. were somewhat similar to those at Allan Hills, but less windy and with lower visibility. Temperatures there were around -8 to -12°C and the wind blew from the north <10 kts. We received quite a bit of snowfall and for about half the time the weather deteriorated to conditions somewhat similar to those at Mt. Feather with low visibility due to ground-level cloud and falling snow.

K042 Weather Log for the 2000/2001 Field season

Date	Time	Loc'n	Wind Speed (kts)	Wind Dir.	Temp (°C)	Cloud Cover	Cloud Height (m)	Sfc Defn	Horizon Defn	Vis. (m)	Weather
22/11/00	0700h	AH	10g20	S	-17	3/8	2000	fair	fair	2000	
	0800h	AH	10g15	S	-15	6/8	2000	fair	fair	2000	
23/11/00	0800h	AH	10g20	S	-17	0/8	-	good	fair	2000	
24/11/00	0800h	AH	5g12	SE	-14	8/8	~2000	fair	fair	2000	
25/11/00	0900h	AH	7g10	S	-13	8/8	1000	fair	poor	2000	Much snow and poor visibility later in the day
26/11/00	0900h	AH	5	S	-12	8/8	1000	fair	poor	2000	Snow and 35 kts wind until about 1800h then cleared to 1/8
27/11/00	0900h	AH	5	S	-11	2/8	2000	good	good	2000	
28/11/00	0900h	AH	10g20	S	-14	8/8	~2000	good	fair	2000	Snow at night
29/11/00	0900h	AH	8g15	S	-10	1/8	>2000	good	good	>2000	
30/11/00	0900h	AH	20g30	S	-12	1/8	>10000	good	good	>10000	
01/12/00	0900h	AH	5g10	S	-13	2/8	1000	good	good	unlim	
02/12/00	0900h	AH	0-5	S	-13	8/8	2000	good	fair	2000	Light snow from east
	1200?	AH	5	S	-13	8/8	2500	fair	poor	10000	Snowing lightly, cloud is dense
03/12/00	0700h	AH	3	SW	-15	8/8	<2500	fair	poor	2000	
	0830h	AH	10	S	?	8/8	2200	fair	fair	15000	Cloud is diffuse
	1200h	AH	10-12	S/SE	?	8/8	7500ft	fair	poor	10000	Cloud is medium to thin
	1300h	AH	10-15	S/SE	?	8/8	?	fair	poor	?	Medium cloud, occasional snow flake
04/12/00	0700h	AH	10g20	S	-13	4/8	>3000	good	good	unlim	Mostly high cloud
05/12/00	0700h	AH	0	-	-12	8/8	2000	poor	poor	<2000	Dense cloud, snowing lightly
	1200h	AH	0	-	-12	8/8	2000	poor	poor	<2000	Dense cloud, snowing lightly
	1500h	AH	3	S	-12	8/8	3000	good	good	>15000	
06/12/00	0700h	AH	8-12	S	-12	2/8	>3500	good	good	15000	Blowing snow on the ground
	0800h	AH	10-12	S	-12	3/8	high	good	good	15000	Cloud is thin
07/12/00	0700h	AH	0-10	S	-10	1/8?	medium	good	good	?	
	0800h	AH	0-10	S	-10	1/8?	medium	good	good	?	
	0900h	AH	0-10	S	-10	1/8?	medium	good	good	?	
	1000h	AH	0-10	S	-10	1/8?	medium	good	good	?	
08/12/00	0700h	AH	5	S	-8	0/8	-	good	good	unlim	
09/12/00	0700h	AH	0-5	S	-7	0/8	-	good	good	unlim	
	1000h	AH	0-5	S	-7	0/8	-	good	good	unlim	
	1200h	AH	0-5	S	-7	0/8	-	good	good	unlim	
10/12/00	0900h	MF	2	NNW	-18	0/8	-	good	good	unlim	Weather deteriorated at 1600h to 7/8 cloud cover. The cloud appeared to be local to Mt. Feather. Wind speed incr. to 10g20
11/12/00	0930h	MF	2	NNW	-20	8/8	2500	poor	poor	60	Snowing lightly. Weather same during the day, visibility decreased and wind reached 10g20. Sun broke through and then sky began to clear at 2200h.
12/12/00	0800h	MF	0-2	N	-17	0/8	-	good	good	unlim	Two small cumulus clouds can be seen. A beautiful day. Clouded over in the evening to 40 m visibility.
13/12/00	1000h	MF	5g8	NW	-16	7/8	<2500	poor	fair	100	We are in the cloud

											here so our local visibility is poor, but through breaks in the cloud we can see Ross Island. We received a few cm of snow in the afternoon and evening and the visibility then decreased to 20 m.
14/12/00	0700	MF	0	-	-17	1/8	<2500	good	good	unlim	

Note: AH – Allan Hills, MF – Mount Feather, TM – Table Mountain

10 Accidents, incidents or hazards

No event members were injured and no hazards were experienced during the season.

11 Field Equipment

i

The field clothing issued to us by ANZ was generally of good quality and it performed well. Exceptions to this were sunglasses, and the ECW jacket and salopettes issued to one of our members (Bornholdt). His ECWs were of lightweight design, both in durability and insulation and were not adequate for the exposed conditions experienced at Allan Hills and Mt. Feather (2500 m). Since this was Bornholdt's first season in Antarctica he did not realise in Christchurch that his gear was substandard. Admittedly, this was Holme's second season and he should have checked Bornholdt's gear to ensure that it was adequate, however, a person should be able to receive gear from ANZ that performs the function for which it is issued, especially critical items like ECW's. Bornholdt was able to compensate by using other thermal gear issued by ANZ, but ECW's are supposed to be Extreme Cold Weather gear which his were clearly not. Additionally, the sunglasses issued to us were so cheap that the plastic frame cracked and broke after three days use - we appreciate that the sunglasses issued by ANZ are supplementary to those brought by individuals but they should be of sufficient quality to endure the simple act of wearing them.

ii

Our event was issued two polar tents which performed well throughout the season. Our kitchen gear was generally in good shape, except for one of the primus stoves and the sieve. We had constant difficulty with the stove as it appeared to have a partial blockage in the fuel path. The sieve we received was quite battered - half of the steel mesh was torn out from the surrounding steel ring.

iii

The 20 person-day ration box system provides adequate nutrition for persons doing physical outdoor at elevation on the edge of the polar plateau. We were pleased to note this year that the bumper bars were fresh and palatable. The Scott Base diet was excellent and we enjoyed the meals there very much - compared to our flat food in New Zealand, every meal there was a treat. The Christmas Feast was a wonderful experience that will live on in our memories.

12 Radio Communications

i Report on the suitability and effectiveness of the radio equipment issued to you at Scott Base. Comment on battery power, condition of aerials and utilisation of solar panels.

It is generally not possible to contact Scott Base from Allan Hills using VHF radios, so HF communications are used. The Codan radio assembly we were issued performed well in the field, but the radio was built into a heavy wooden box which added considerably to its weight and bulk. We appreciate that the radio is an expensive and critical piece of field equipment which has to survive many field seasons and therefore has to be protected, but the box makes it almost too cumbersome. The solar panels were sufficient for charging the batteries.

For communications amongst ourselves in the field while at Allan Hills, and with Scott Base while at Mt. Feather and Table Mtn., we were issued the new Motorola handheld VHF radios. These are great little radios but possess a shortcoming in that they cannot currently be connected to high-gain aerials. While at Allan Hills we were extremely fortunate that Alex Pyne, a member of the K047A event who were with us there, brought one of the old Tait handhelds and a high gain aerial (see point 'ii' below).

ii Report on reception/transmission conditions and suitability of radio sked timing. Note particularly any periods during your field trip, or regions you visited, where radio reception was especially bad or unexpectedly good. Comment on conditions where repeater stations were used.

During 'normal' operating conditions at Allan Hills we are able to contact Scott Base without difficulty using HF, however, this summer was a period of intense solar flare activity which severely disrupted our HF communications. We were fully briefed on this by the Operations Manager (Peter Cleary) when we first arrived at Scott Base and were advised that we would likely experience extended periods when we could not contact Scott Base. He showed us the contingency plan he had developed which involved using non-standard channels, including the American aviation channel (8998 kHz), if we were out of contact with Scott Base for 48 hours or had an emergency. As the season progressed we experienced many times when we could not contact Scott Base (or any other station) using HF despite following the contingency plan - the disruptions tended to completely block communications rather than simply degrading the signal until it was weak and broken. The longest period without communications was more than 48 hours and we grew anxious to contact Scott Base so two members took a Tait handheld VHF radio and high-gain aerial and climbed a high ridge (thereafter informally dubbed 'Radio Ridge') (see Figure 2). After many attempts, they were able to get through to Scott Base by hitting the Erebus Repeater. The skill of the Comms Op (Katie) was greatly appreciated because the signal was so weak and broken that we would not have understood her without her constantly repeating simple and clear messages.

At Mt. Feather we communicated with Scott Base using VHF and the Mt. Erebus Repeater. We did not experience any communications difficulties. We were also able to communicate with K047A at Table Mtn. using handheld Ch. 6 simplex line-of-sight.

At Table Mtn. we communicated with Scott Base using VHF and the Dry Valleys Repeater. We did not experience any communications difficulties.

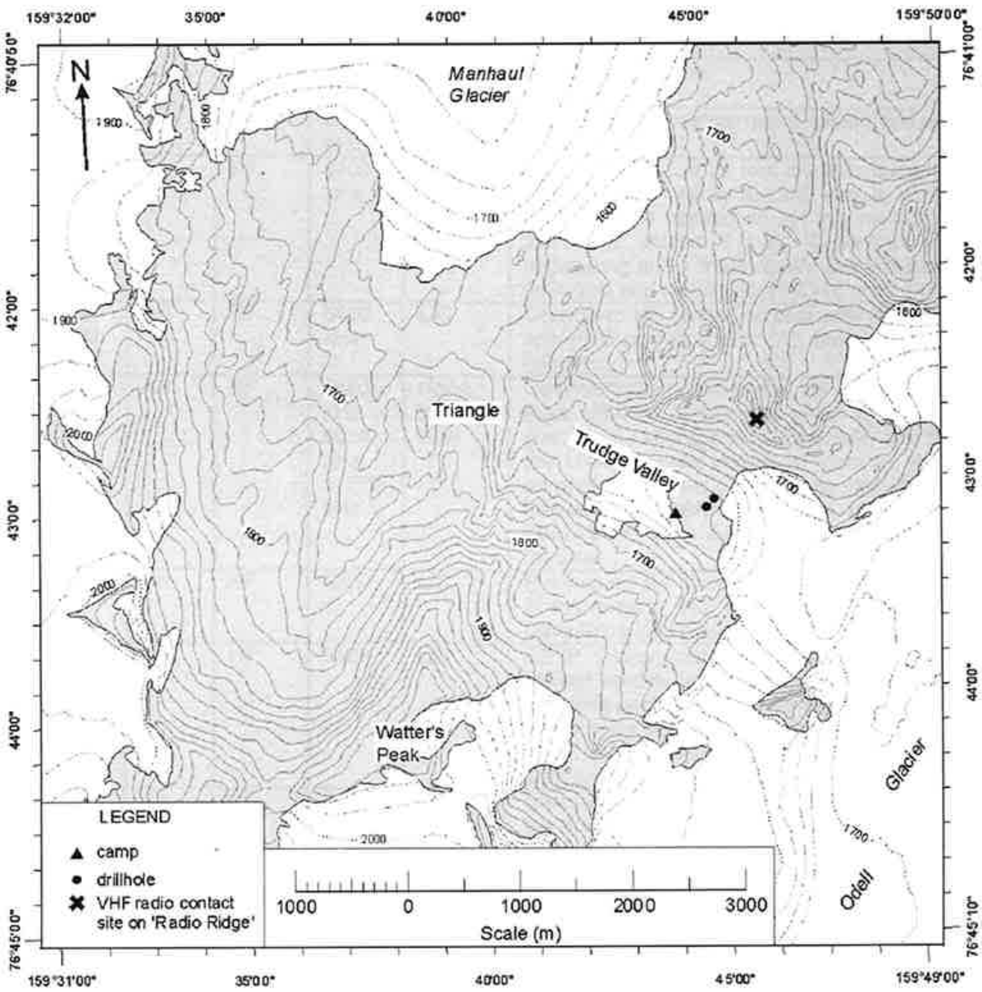


Figure 2. Location map of fieldsite at Allan Hills.

iii Comment on Scott Base's general efficiency during radio skeds in providing details of forthcoming field movements (eg helicopters), weather forecasts, resupply, or news service.

We generally did not have a problem with the performance of the Comms Ops, but felt that the operators in the second group were inferior to those in the first group. Katie (an operator from the first group) stood out as the best by far of both groups. Operators in the second group (in particular the two males) were often vague with information we had requested and ignorant of flight operations despite repeated requests for schedules. We became used to the precise and unambiguous manner of the better operators and found these two males to be less effective. Additionally, there were times when one of these two operators was working when we were unable to contact Scott Base at all despite continued attempts for more than 30 minutes. We realise that the operator can become very busy at their post, but a brief acknowledgement of our call and request to have us wait can be done in an instant.

iv Remember that you are strongly encouraged to keep a detailed radio log while in the field, in particular if you are a deep field party. The log is to be given to the Operations Manager when returning your radio at Scott Base. Such a log can become a **vital** and **lifesaving** source of information in the event of a Search & Rescue operation and can become an important **LEGAL** document.

K042 Radio Log for 2000/2001 Field season (excluding Table Mtn.)

Date	Time	Locn	Radio Type	Freq TX/RX	Signal	Comms / Comment
23/11/00	0800h	AH	HF	5400 kHz	G/R	SB requested weather report (given) and requested recontact at 0900h.
	0900h	AH	HF	5400 kHz	-	SB (P.Cleary) told us that the helo schedule changed and that the helo 'HNO' will fly to Lake Vida to shuttle all K047a gear (2 underslung, 1 internal) to AH this morning. The American helo '08H' will shuttle 2 pax (Dickinson and Pollard) plus 1 underslung and 1 internal. We are to maintain open comms on 5400 kHz and speak with HNO on VHF 142.2 MHz.
	0900-1955h	AH	HF	5400 kHz	L/C	Comment: No further contact with SB re: helos. VHF contact with HNO on 142.4 MHz L/C, but could not contact 08H on that frequency.
	2000h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None, then W/R	Comment: Carl did comms. He could not contact SB using the three different frequencies given to us by P.Cleary. This is a year of very strong solar flare activity and Cleary warned us that this could severely disrupt HF comms. He gave us instructions on what to do if we could not contact SB on 5400 kHz and Carl followed them with no success. He then contacted them with K047a's HF radio and our aerial but his signal was weak and readable.
24/11/00	0800h	AH	HF	5400	L/C	Reinformed SB of our missing short guylines and notified them of the missing floor for the polarhaven. They said Cleary and Dave Brice (FSO) were discussing it.
	2000h	AH	HF	5400	L/C	SB (P. Cleary) told us that Steve Hicock is in Christchurch. His earliest southbound is 26/11/00. We are tentatively scheduled for drillrig and possible camp move on 28/11/00 but the timing of this is open to discussion. Hicock will come in on one of these helos and our cache will be flown out then too. Briefly discussed work progress.
25/11/00	0800h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Could not contact SB using all three frequencies on the K042 HF radio and then the K047a radio. All batteries used (2 for each radio) were in the lower to mid part of the green zone on the voltmeter.
	2015h	AH	HF	5400	W/R	P.Cleary requested confirmation of our desire to move 28/11/00 or tomorrow at noon.
26/11/00	0800h	AH	HF	5400 kHz, 8010 kHz	None to V/U	Comment: Could receive a weak and broken signal from SB, but they could not receive our signal. Attempted secondary frequency with no luck. Battery was well-charged and in the green.
	1200h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Attempted to contact SB on all three frequencies but failed.
	2000h	AH	HF	5400 kHz	W/R	Carl did comms. Arranged a meeting on radio with P.Cleary for 2100h.
	2100h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Attempted comms with SB but failed.
	2230h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Attempted comms with SB but failed.
27/11/00	0800h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Attempted comms with SB on all three freq's but failed. This is now 12 hours without contacting SB. Since the comms are poor due to solar flares P.Cleary said he would not panic if we went 24 hours without contact, but that we can't go more than 48 hours.
	2000h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz,	None	Comment: Attempted comms with SB on four frequencies but failed.

				2773 kHz		
28/11/00	0800h	AH	HF	5400 kHz, 8010 kHz, 11570 kHz	None	Comment: Attempted comms with SB but failed. This is 36 hours with no contact.
	1900h	AH	VHF	142.8/ 138.8, 143.1/ 140.0	W/R	Comment: No comms with SB for almost 48 hours so Carl and I walked up to the top of the dyke that runs east from Roscalyn Tor. We used a Tait Handheld VHF and high-gain aerial and on our last attempt, at the very end of the ridge, got through on Ch.5 (143.1/140.0 MHz). SB were very glad to hear us - apparently there has been a total radio blackout for the last few days because of the intense sunspot activity, even all aircraft have been grounded. Comms: Comms were very weak and very broken from SB but our signal to them was strong and readable. As we talked for a bit their signal became clearer. At the end of the comm we tried them on 142.8/138.8 MHz and the signal was L/C We passed along the following messages from Alex Pyne and W. Dickinson: 1) We do not require a local drill site move by helo, 2) We still want Hicock and K042 resupply (change to 2 food boxes). Close support for cache put-in at AH. We will also use this helo to retro to SB. 3) K047a move to Marble Pt./Table Mtn 01/12/00 a) 4 pax + camp to MP via Battleship Promontory (2 hrs close helo support). Alternatively task Battle Prom. from and return to MP. b) 2 pax + camp to MP. 4) People and camp into Table – MP to Table Mtn – 2 flights. 5) 3 underslungs from AH to Table Mtn. Possible one additional underslung from MP to Table. We set an 0800h sked on HF for tomorrow or failing that an 0900h sked on VHF 142.8/138.8 MHz then 143.1/140.0 MHz from Radio Ridge.
29/11/00	0800h	AH	HF	5400 kHz	G/R	Successful comms with SB. The floor of the polarhaven was found at Marble Pt. They can move K047a people from here to MP 01/12/00, but can't move the underslungs until 02/12/00 because they can't task the helos for that long. Hicock is still in Chch and the RNZAF Herc is on standby – hopefully they fly this afternoon. Apparently there has been more snow this Nov at SB than ever before.
30/11/00	0800h	AH	HF	5400	W/B	Hicock is hopefully coming down on the Herc today. K047a internal helo weights cannot exceed 1800 lbs.
01/12/0	0800h	AH	HF	5400	L/C	Gave weather to SB. Told to come back on air at 0900h.
	0815h	AH	HF	5400	L/C	Contacted SB again to pass along messages: 1) K042 need only one food box in the resupply, 2) K042 will not need 10 minutes of helo close-support because we will not be putting in the cache.
	0900h	AH	HF	5400	L/C	SB told us they could not find foam sausages for W. Dickinson.
	1000h	AH	HF	5400	None	Comment: Unable to contact SB.
04/12/00	0700h	AH	HF	5400	L/C	Gave weather report to SB. They told us to contact them at 0800h with another report.
	0800h	AH	HF	5400	L/C	Gave weather report to SB. They told us to contact them at 0900h with another report.
	0900h	AH	HF	5400	L/C	Gave weather report to SB. They told us that the helo had lifted off at 0800h and would be arriving at AH in 30 minutes.
	2000h	AH	HF	5400	L/C	
05/12/00	0700h	AH	HF	5400	L/C	Gave weather report to SB. They told us to call back at 1200h with another report.
	1200	AH	HF	5400	L/C	Gave weather report to SB. They told us the weather at SB was poor and to call back at 1500h with another report.
	1500h	AH	HF	5400	L/C	Gave weather report to SB. They told us that there would be no flying today and said to call in for our regular sked at 2000h.
	2000h	AH	HF	5400	L/C	Comms ops switched over to a new crew.
	2100h	AH	HF	5400	L/C	Relayed message through SB to Alex Pyne at Marble Point re: how to get the GPS to work. They relayed his answer and also passed along Carl's grades.
06/12/00	0700h	AH	HF	5400	L/C	Gave weather report to SB. They asked for another one again at 0800h.
	0800h	AH	HF	5400	L/C	Gave weather report to SB. They told us to contact them again at 0830h to speak with P.Cleary.
	0830h	AH	HF	5400	L/C	P.Cleary told us that we had a flight(s?) scheduled for just after midday for K047a and to contact him at noon or before if our weather deteriorated. The K042 move to Feather is tentatively booked for 08/12/00. The weather at SB is currently poor.
07/12/00	0700h	AH	HF	5400	L/C	Gave weather report to SB. They requested us to come back on at 0800h to give weather again.

	0800h	AH	HF	5400	L/C	Gave weather report to SB. They requested us to come back on at 0900h to give weather again.
	0900h	AH	HF	5400	L/C	Gave weather report to SB. They requested us to come back on at 1000h to give weather again.
	1000h	AH	HF	5400	L/C	Gave weather report to SB. They requested us to come back on at 1100h to give weather again.
	2000h	AH	HF	5400	L/C	Told P.Cleary at SB that the moves went well. Peter asked if we'd had a PHI (American) helo come in and I said no. SB asked us to give weather tomorrow at 0700h.
	2130h	AH	HF	5400	W/R	Told SB that we received 08H this evening at 2120h and that they took all our retro. SB will pass message on to P.Cleary.
08/12/00	0700h	AH	HF	5400	L/C	Gave SB weather report. We were told that we will not receive a helo today.
09/12/00	0800h	AH	HF	5400	L/C	Gave weather report to SB.
	1000h	AH	HF	5400	L/C	Gave weather report to SB. Asked SB for helo schedule and they said they didn't know of any changes.
	1200h	AH	HF	5400	L/C	Gave weather report to SB. Asked SB for update on helo schedule and they said they didn't know.
	1300h	AH	HF	5400	L/C	Gave weather report to SB. They said it had launched and was inbound to us.
	1600h	MF	VHF	142.8/ 138.8	L/C	Advised SB that we had arrived at Mt. Feather and that the weather was beautiful and that out flight had been fantastic.
	2000h	MF	VHF	142.8/ 138.8	L/C	Advised SB that everything was fine. Then after the sked I jumped to 143.1/140.0 MHz and heard Alex Pyne talking to SB. I then called him up and we chatted for a bit. I talked to Warren too. We tried 142.2 MHz simplex and it was much better than 143.1/140.0 MHz because that had a lot of static. Their signal became broken due to a low battery so we signed off.
10/12/00	0800h	MF	VHF	142.8/ 138.8	L/C	Advised SB that we are well.
	2000h	MF	VHF	142.8/ 138.8	L/C	Normal check in. No news.
11/12/00	0800h	MF	VHF	142.8/ 138.8	L/C	Normal check in. No news.
	2000h	MF	VHF	142.8/ 138.8	L/C	Normal check in. No news.
12/12/00	0800h	MF	VHF	142.8/ 138.8	L/C	Normal check in. No news.
	2000h	MF	VHF	142.8/ 138.8	L/C	Asked SB about our helo schedule for 14/12/00 but they knew nothing. They said they would ask P.Cleary and then inform us at 0800h tomorrow.
13/12/00	0800h	MF	VHF	142.8/ 138.8	L/C	Asked SB again about the proposed helo schedule for tomorrow but again they didn't know anything. They said they'd ask P.Cleary and get back to us at our evening sked. We ordered the following for resupply: 1 flat Speight's, 1 Bailey's, 6 loaves bread, 1 tomato sauce.

Notes: L/C – loud and clear, G/R – good and readable, W/R – weak and readable, V/U – very weak and unreadable.

13 Scott Base and Arrival Heights Laboratory Facilities

Outline the use your event made of the following facilities:

i. Hatherton Geoscience Laboratory;

ii. Q-Hut Laboratory benches;

iii. Scott Base Wet Lab;

iv. Arrival Heights Laboratory;

v. Summer Lab

Describe any additional equipment your event needed to take to Scott Base to complement the laboratory equipment in these facilities. Comment on what equipment you think should be available at Scott Base laboratories.

None of our event members used the laboratory facilities.

14 **Refuge and Research Huts**

Detail your occupation of any United States or New Zealand field facility. Provide general comments on the condition of the huts as follows:

i. Overall condition;

ii. Scale and condition of provisions;

iii. Suitability of location;

iv. Unnecessary equipment or rubbish/debris in the area;

None of our event members used any United States or New Zealand field facilities.

15 **Environmental Impact**

i. From your event diary, please summarise for <u>each site visit made</u>:
- Location (for field camps please give coordinates)
- Dates occupied
- Total days (or part days) spent at site
- Maximum number of people at site
- Total person-days spent at site (e.g. 5 people on site for 3 days = 15 person days)
- Main activity undertaken (e.g. soil sampling, penguin census, hut maintenance)

Site 1: *location* Trudge Valley, Allan Hills (approx. 76°42'18" S, 159°47'24" E); *occupied* 19/11/00 – 08/12/00; *total days* 20; *maximum personnel* 3; *total person-days* 60; *activities* geological mapping, outcrop description, rock sampling and assisting K047A event with drilling (see Figure 2).

Site 2: *location* Mount Feather (approx. 76° 42' 00" S, 160° 24' 00" E); *occupied* 09/12/00 - 15/12/00; *total days* 7; *maximum personnel* 3; *total person-days* 21; *activities* outcrop description, rock sampling (see Figure 3).

Site 3: *location* Table Mountain (approx. 77° 58' 00" S, 161° 58' 00" E); *occupied* 16/12/00 - 22/12/00; *total days* 6; *maximum personnel* 3; *total person-days* 18; *activities* outcrop description, rock sampling, permafrost polygon measuring (see Figure 4).

ii. For any protected areas visited (including historic huts), provide details of:
- Date(s) of entry
- Total days (or part days) spent in area
- Maximum number of people in area
- Total person-days (or part person-days) spent in area
- Any comments on condition or management of area

No protected areas were visited by event members.

iii. Detail any interference with terrestrial, freshwater or marine plants or animals or animal parts (e.g. shells, bones, feathers etc.) For each site and/or species sampled or disturbed, provide:
- Species
- Location
- Dates or periods of each collection or disturbance
- Total number or quantity removed, restrained or disturbed
- Nature of interference (e.g. sampling, restraint for tagging, disturbance by...)

Event members did not interfere with any wildlife.

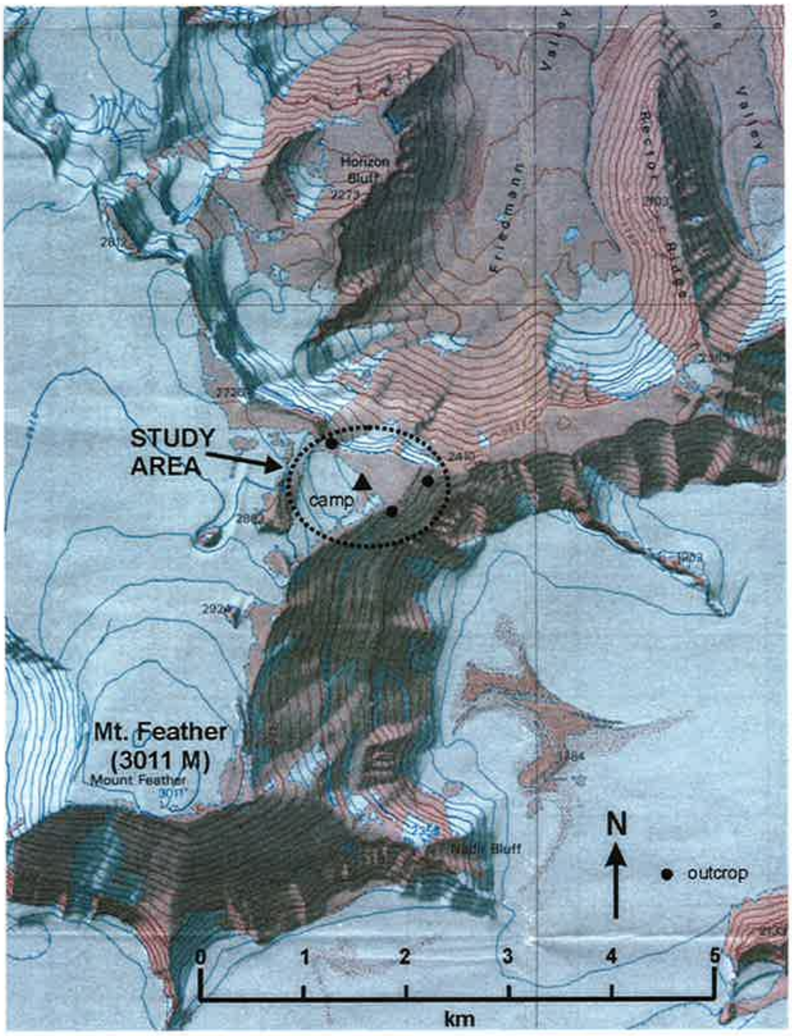


Figure 3. Map showing fieldsite at Mt. Feather.

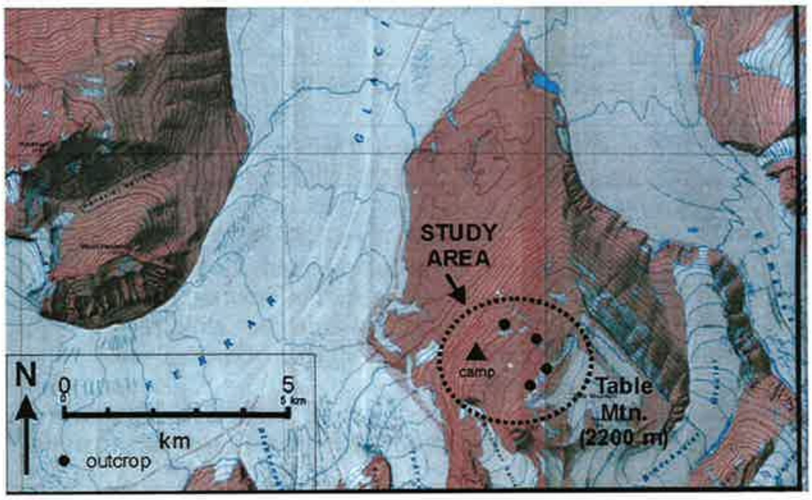


Figure 4. Map showing fieldsite at Table Mtn.

iv. Detail any collection of geological material (including meteorites, ventifacts, fossils or sub-fossils) or soil. For each sample (or group of samples) taken describe the location, specimen type and quantity in kg.

Location	# of samples	Type	Total mass (kg)
Allan Hills (AH): small outcrop on western Trudge Valley (TV)	1	rock	0.6
AH: small outcrop on eastern side of the Triangle	1	rock	0.8
AH: south flank of eastern TV	12	rock	6
AH: north flank of eastern TV	4	rock	2
AH: large outcrop on west side of the Triangle	2	rock	2
AH: large outcrop on east side of the Triangle	2	rock	2
AH: mid part of TV high in the north flank	1	rock	0.8
AH: high on the north flank of TV	1	rock	0.5
Mount Feather (MF): large outcrop at southwestern corner of Sirius Group plateau	2	rock	1.5
MF: large outcrop on east corner of Sirius Group platform	2	rock	2
MF: large outcrop on north corner of Sirius Group platform	2	rock	2
Table Mountain (TM): low outcrop about 150 m east of camp	2	rock	2
TM: medium size outcrop about 400 m southeast of camp	2	rock	2
TM: small outcrop about 400 m south of camp	2	rock	2
TM: small outcrop about 400 m south of camp	2	rock	2
TM: medium size outcrop about 400 m east of camp	3	rock	0.5

v. For each chemical (including radionucleides) taken to Antarctica, provide details of the chemical form and quantity and locations of use. Include details of use of fuel, paints, solvents etc in the field. If unused chemicals were not returned to New Zealand, provide details of location and quantities of material released or stored.

No chemicals were taken by event members to Antarctica.

vi. Detail any use of explosives in Antarctica, including:

- Date
- Locations of use
- Explosive type
- Size of charge (kg)

- Number exploded

No explosives were used by event members in Antarctica.

vii. Detail importation to Antarctica of any animals, plants (including any seeds), micro-organisms or soil, including any inadvertent introductions. Note the name and quantity of the species or substance(s), all the locations they were taken to, and whether they have been returned to New Zealand.

No animals, plants etc. were imported to or removed from Antarctica by event members.

viii. List any equipment, markers, stakes or cairns installed in the field during your visit. If any remain in the field, provide details of the location, size and number of items. Note any plans for their retrieval, including the date they will be removed.

No equipment, markers, stakes or cairns were installed by event members in the field.

ix. Provide details of any other environmental impacts of your activities including disturbance by trampling, sampling, use of vehicles (including aircraft), camp operations (including waste disposal), installation of equipment and buildings and/or cumulative impacts.

Daily activity by event members required tramping across the rock and snow surfaces of the fieldsites but no vehicles were used. Samples collected by Holme and Bornholdt were small and not of unique or single occurrence items. Any pits dug for sampling were small and filled back in.

Note any incidents which occurred or were observed (e.g. fuel spills, wildlife disturbance, inappropriate vehicle or aircraft use) and what reports or records have been made. If unreported, detail the date, time, location and nature of incident, and any action taken.

The only incident that occurred which impacted the landscape was when the HNZ helo 'HNO' picked up an underslung cargo box of K047A. The box was heavy and the pilot experienced difficulty lifting it so he was forced to drag the box beneath the helo to a point where the ground dropped off slightly and he could pick up the necessary momentum to lift off. The dragging of the box produced an irregular path in the lag surface of the ground which we were not able to return completely to its original condition.

x. If the activities described above differ from the Preliminary Environmental Evaluation (PEE) completed for this event (and any approved changes), or from the Environmental Authorisation issued to it, explain how and why they differed.

The incident with the HNZ helo is reported here because the K047A event members had been returned to Marble Point before the incident happened and therefore could not report on it. It is associated with their event not K042 and if necessary should be discussed with them.

16 Historic Sites

Detail any visit to a designated 'historic site' in the Ross Dependency and include any general observations about the condition of the site, in particular, note any damage.

No event members visited any historic sites in the Ross Dependency.

17 Management of Science in the Ross Dependency

Comment on the forward planning of your Antarctic science programme, especially relating to your field of research. Comment on Antarctica New Zealand's ability to cater for your type of work both at Scott Base and in the field.

The future plan is for the Dutch contingent to return to Table Mountain and Allan Hills for the 2001-2002 field season and sample. We were fully satisfied with the support we received from Antarctica New Zealand both at Scott Base and in the field. Again, we benefited greatly from the willingness of the Scott Base staff to help us far beyond the scope of their specific jobs. We feel it is important for Antarctica New Zealand to fully appreciate this when assessing the success of the New Zealand Antarctic program.

Comment on the involvement of any overseas scientists or students in your event, including the benefits and contribution gained by their participation in your programme.

This event exists because of international cooperation, initially between Swiss and New Zealand researchers, and then later between Holland and New Zealand. With the introduction of Hicock as Holme's Canadian co-supervisor, the international scope of the program was broadened further. This cooperation has brought different and complementary expertise together, greatly enhancing the depth and scope of the science conducted as part of the K042 Event.

Finally, identify any areas where management is required to protect areas of outstanding scientific, environmental, aesthetic or wilderness values. Note that you are able to propose any such area for protection under the Environmental Protocol.

No event members wish to identify any areas where management is required to protect areas of outstanding value.

18 Antarctic Geographic Place Names

The New Zealand Geographic Board has a responsibility to allocate suitable place names to important features in the Ross Dependency.

You are able to recommend names for features encountered in your travels, particularly as these may become important for describing your science in formal journals. New Zealand Geographic Board application guidelines and forms for use in naming features in the Antarctic can be obtained from the Antarctica New Zealand Library. The current policy is that "Antarctic names be descriptive or cover Antarctic activity and history or reflect New Zealand's culture and society".

State the exact location or feature or peak, valley or glacier, and the origin of the name. Attach photographs clearly showing the feature. Link the photograph to a sketch map or photocopy of an existing map sheet. Keep each new name on a separate application form.

Antarctica New Zealand will ensure all applications are in the prescribed format and forward to the New Zealand Geographic Board.

No event members wish to name any part of Antarctica.

K042
2000/2001

IMMEDIATE SCIENTIFIC REPORT

K042: Styles of early glaciation near the margin of the East Antarctic Ice Sheet, South Victoria Land

ANTARCTICA NEW ZEALAND 2000/2001

Event Personnel :

Philip Holme (Victoria University of Wellington)
Carl Bornholdt (Victoria University of Wellington)
Dr. Stephen Hicock (University of Western Ontario)

1 Popular Summary of Scientific Work Achieved

This project is a detailed study of ancient glacial deposits termed the Sirius Group, focussed mainly at Allan Hills, but now including Mount Feather and Table Mountain, South Victoria Land (Figure 1). The Sirius Group is a collection of Neogene deposits that crop out at high elevations (mostly >1500 m) throughout the Transantarctic Mountains (TAM). Allan Hills occupies a low point in the TAM, making the site more susceptible to overriding by the East Antarctic Ice Sheet (EAIS) during minor volume fluctuations, while Mount Feather has the highest elevation deposits of the Sirius Group in the Dry Valley region; Table Mountain is nearby Mount Feather and of similar elevation to Allan Hills, but the deposits there are more varied. The aims of this project are to show whether the Sirius Group was deposited by valley glacier or continental ice sheet, by wet- or dry-based glacial ice, by a single depositional event or several overriding events and to determine paleoflow direction. The expansion of the study this season to include deposits at Mount Feather and Table Mountain significantly widens the scope of the project and will permit a valid regional perspective.

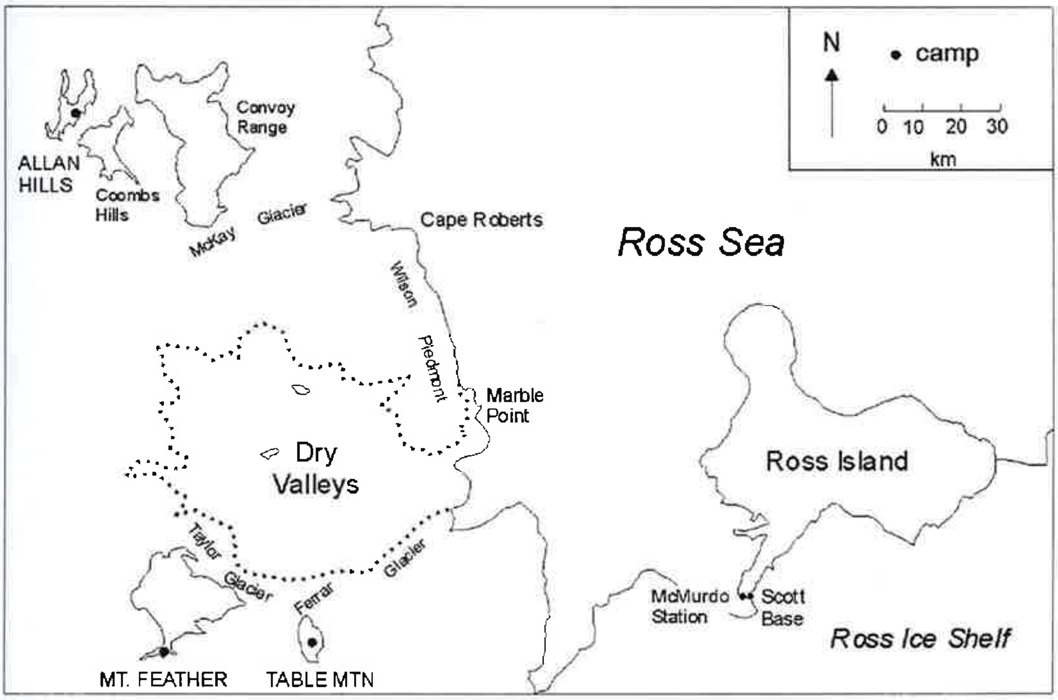


Figure 1. General location map showing fieldsites.

The recent field season ran from mid-November 2000 to 22 December 2000 and included visits to the three field sites: Allan Hills, Mount Feather and Table Mountain. Holme and Hicock's work at Allan Hills consisted of outcrop description and mapping (continued from the 1999/2000 field season), while their work at Mount Feather and Table Mountain focussed on outcrop studies. In total, nine outcrops were studied and 24 samples were taken. Collected data include: 330 stone orientations, 51 linear glacial abrasions and 79 planar deformational structures. Bornholdt's B.Sc Honours project was to map and sample volcanogenic and sedimentary deposits that comprise Mt. Watters and its immediate vicinity. Additionally, Holme aided K047a in choosing potential sites for their drilling program at Allan Hills.

2 Proposed Programme

The principal objectives of this season's work were as follows:

1. to study deposits of the Sirius Group for the purpose of interpreting the nature of ice responsible for its deposition
2. to expand the scope and regional significance of the project by the inclusion of deposits at Mount Feather and Table Mountain

3. to collaborate with K047a in drilling Sirius Group deposits at Allan Hills and Table Mountain

3 Scientific Endeavours and Achievements

This Event is a collaboration of researchers from Holland (Dr. Jaap van der Meer), Canada (Dr. Stephen Hicock) and New Zealand (Prof. Peter Barrett). The research proposal for the season's work initially included two PhD students (Holme and a Dutch student) and Hicock, but the Dutch student (Mark Lloyd-Davies) was forced to miss this field season because of a physical injury suffered in the weeks before the season was to begin.

The study of the Sirius Group at Allan Hills (Figure 2) began during the 1997-1998 season as a collaboration between Swiss and New Zealand researchers, but subsequently developed into the current configuration. The purpose of the research is to investigate glacial deposits termed the Sirius Group at three sites in the TAM. Initially the study was to be conducted only at Allan Hills, but through integration with the K047a event it became possible to study equivalent deposits at Mount Feather and Table Mountain for a minimum additional cost, thereby greatly increasing the scope of the project. A smaller study of deposits forming Mt. Watters, Allan Hills was conducted by Bornholdt for an Honour's project.

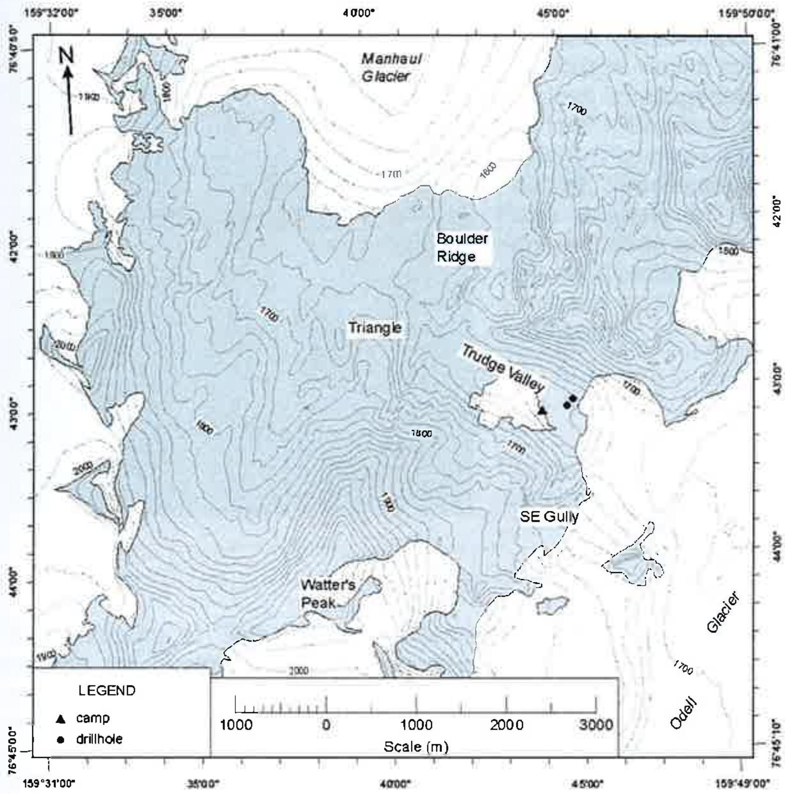


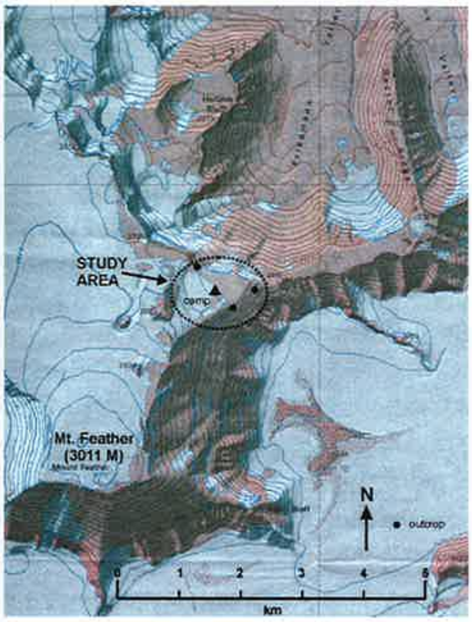
Figure 2. Allan Hills showing camp and locations mentioned in text.

For Hicock and Holme, the focus of work at Allan Hills was to finalise their field investigation of Sirius Group deposits. Following last season's near-completion of mapping, the tasks this year were to finish the mapping, describe additional outcrops, gather additional data (eg. a sampling transect) in Trudge Valley - an area of particular interest to the investigators in reconstructing the glacial history at Allan Hills (Figure 3). The main mapping goal was to conduct a reconnaissance of the eastern limb of Allan Hills to search for additional outcrops of the Sirius Group. Unfortunately plans for the venture had to be dropped because Hicock was delayed

Figure 3. Trudge Valley, Allan Hills.

for too long at Scott Base and it was necessary to devote his shortened visit to outcrop work. The use of GPS gear to collect high precision points for use in a computer-based reconstruction of the paleo-landscape was unsuccessful because internal batteries in the GPS units failed. Although useful, the data is not crucial to the reconstruction, which will be pursued anyway.

While at Allan Hills Bornholdt mapped and sampled volcanogenic and sedimentary deposits that comprise Mt. Watters to determine the nature of the feature and the eruptive event which produced it. His collected data include: samples collected for thin-sectioning and microprobe analysis, geological descriptions, and measurements of fracture and inter-unit orientations. He produced a geological map of Mt. Watters in the field.



At Mount Feather and Table Mountain Holme and Hicock focussed on investigations of Sirius Group outcrops while Bornholdt assisted. Deposits at Mount Feather were studied because they are the highest elevation occurrence of Sirius Group deposits in the Dry Valleys region and have been the focus of several previous investigations (eg. Bleakley (1996), Barrett et al. (1997), Bruno et al. (1997) and Wilson and Barron (1998)) (Figure 4). During the six days spent at Mount Feather, three outcrops were described and sampled. From analysis of the detailed data collected it is apparent even at this preliminary stage that the paleo-iceflow direction was not from the northwest, as proposed by Wilson and Barron (1998), but from the southeast.

Figure 4. Fieldsite at Mt. Feather showing outcrop locations.

The deposits at Table Mountain were chosen for investigation because they occur at a similar elevation to those at Allan Hills, but are sedimentologically more variable; previous investigations there include: (eg. Bleakley (1996) and Dickinson (1997)). During the eight days spent at Table Mountain, four outcrops were described and sampled (Figure 5).

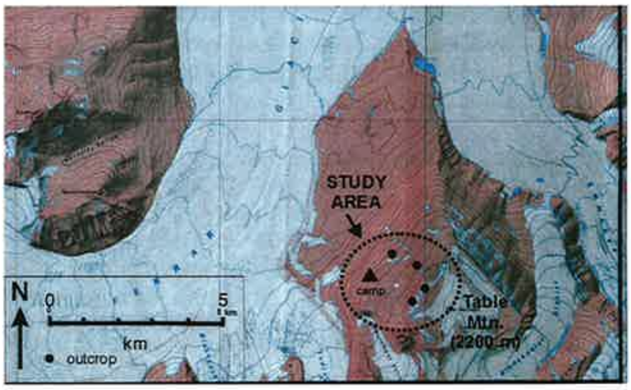


Figure 5. Fieldsite at Table Mountain showing outcrop locations.

From Allan Hills, Mt. Feather and Table Mountain, a total of nine outcrops were described and sampled this season. The data collected include: 24 samples taken for thin-sectioning and laboratory analysis, 330 clast orientations, 51 linear glacial abrasions (eg. Figure 6) and 79 planar deformational structures

Figure 6. Glacially abraded boulder at Mt. Feather. Note: paleoice-flow direction is from right to left.

Methodology:

Fieldwork was conducted using standard geological field tools (eg. geological hammers, compasses, cameras). No special actions or modifications were necessary for coping in the cold environment.

Summary of contributions by Hicock

Allan Hills: (Figure 2).

a) A ledge on Weller sandstone was discovered immediately northwest of "Boulder Ridge", which had impressive striae, grooves, rat tails, chattermarks (within grooves), and nail head striae caused by a southward advance of the Manhaul glacier at some time after deposition of the Sirius Group. These erosional features are associated with immature diamict and suggest that, at this place, the Manhaul was not cold based. A future Master's thesis could be done mapping the diamict and erosional evidence of the Manhaul, Odell, and other glacial lobes issuing from the main East Antarctic Ice Sheet. Surface exposure dating of stones in the diamict would be useful to reconstruct the timing of these post-Sirius glacial events. Sandstone boulder dispersal trains in Trudge Valley by the Manhaul Glacier, and quartzite by the Odell Glacier, further attest to the dynamic behaviour under those glaciers.

b) The ridge under the Odell glacier that parallels Trudge Valley may have been formed by the Odell overriding the dolerite dyke that crosses the valley at that place. Subsequently, the Odell may have dumped and streamlined sediment on the lee side of the dyke - the ridge could be a 'crag-and-tail' feature.

c) The ridges on the "Triangle" resemble recessional (ribbed) moraines.

d) Abundant roches moutonnees were discovered on the sides and bottoms of the SE gully, and adjacent gully to the northwest where Bornholdt worked. These are cirque basins that had local ice flowing downhill into Trudge valley.

Mt. Feather: (Figure 4)

Two boulder pavements were discovered in Sirius diamictite at the outcrop on the eastern corner of the Sirius Group plateau. Data collected imply that lodgement was the main process in pavement formation. Ice flow appears to have been across the bench of Sirius, roughly perpendicular to modern Ferrar glacier flow on the southeast side of Feather. Beneath the pavements is a dark grey comminution tillite that directly overlies Weller interbedded shale and coal which were overridden, deformed, and reconstituted to form the tillite.

Table Mountain: (Figure 5)

The southern edge of the Sirius platform resembles the distal side of a lateral moraine which could explain why it is the southern limit of Sirius at Table Mountain. It may mark the edge of an outlet glacier (ancestral Ferrar or Tedrow) that issued from the East Antarctic Ice Sheet to the southwest, sweeping eastward around an intrusive knob and over the north slope of Table.

Below TM-1 (Dickinson 1997) is a basin carved into Terra Cotta siltstone with Sirius exposed in its north side (not drilled in 1996 but studied by James Goff). This appears to be an old cirque, complete with recessional moraines resting on its floor and even over its northern edge. It could be that the ancestral outlet glacier overrode or pushed against the cirque glacier which prevented the deposition of Sirius in the basin proper.

4 Publications

Hiemstra, J.F., and van der Meer, J.J.M., Neogene Glacial History of the Allan Hills, Antarctica – Section Logs, ICG Report 99/3, 36 p.

Goff, J., et al., Table Mountain, (submitted).

Atkins, C.B., and Barrett, P.J., Allan Hills Project – field data from 1997-1999 (in prep for 2001)

Atkins, C.B., Barrett, P.J., et al. Striae and other features from a cold-based ice advance, Manhaul Glacier, Antarctica (??).

Atkins, C.B., Holme, P.J., and Mitchell, J., Antarctic Data Series No 24, Holocene glacial data from 1999-00 (??).

Holme, P.J., Antarctic Data Series No 25, Sirius data from 1999-00. (in prep for 2001)

Holme, Hicock, Barrett, Interpretation of subglacial dynamics and the thermal regime of the margin of the East Antarctic Ice Sheet during deposition of the Sirius Group at Allan Hills, South Victoria Land. (draft prepared by ??)

Holme, Barrett, Hicock, Dickinson, A synthesis of the Sirius Group at Allan Hills, Mount Feather and Table Mountain: the nature of the Sirius Group glacial event. (draft prepared by ??)

Hicock, Holme: A case study of the Sirius Group at Mt. Feather emphasising boulder pavements. Comparison with Wilson's drill hole study near east section. (draft for Sedimentary Geology prepared by ??)

Mitchell, J., Antarctic Data Series No 23, Ridge sets from 1999-00. (??)

Schluchter, C., and Tchudi, S., Cosmogenic exposure-age dates from Allan Hills (in prep).

5 Acknowledgements

We are grateful to Antarctica New Zealand and the staff of Scott Base for their logistical support and to the Victoria University of Wellington Science Faculty for funding this research.

Financial support for the Dutch contribution to research with K042 and K047a is in the form of a grant to Dr. Jaap van der Meer from the 'Nederlandse Organisatie voor Wetenschappelijk Onderzoek' (NWO or Dutch Organisation for Scientific Research).

6 References

Barrett, P.J., Bleakley, N.L., Dickinson, W.W., Hannah, M.J., and Harper, M.A., 1997, Distribution of Siliceous Microfossils on Mount Feather, Antarctica, and the Age of the Sirius Group: The Antarctic Region: Geological Evolution and Processes, p. 763- 770.

Bleakley, N.L., 1996, Geology of the Sirius Group at Mount Feather and Table Mountain, South Victoria Land, Antarctica, M.Sc. thesis, Victoria University of Wellington, 273 p.

Bruno, L.A., Baur, H., Graf, T., Schluchter, C., Signer, P., and Wieler, R., 1997, Dating of Sirius Group tillites in the Antarctic Dry Valleys with cosmogenic ^{3}He and ^{21}Ne: Earth and Planetary Science Letters, vol. 147, no. 1-4, p. 37-54.

Dickinson, W.W., ed., 1997, Field and Scientific Data Report: Sirius Group Study, Table Mountain, Antarctica, Nov-Dec 1996: Antarctic Data Series no. 19, Victoria University of Wellington, 98 p.

Wilson, G.S., Barron, J.A., eds., 1998, Mount Feather Sirius Group core workshop and collaborative sample analysis: BPRC Report no. 14, Byrd Polar Research Centre, The Ohio State University, Columbus, Ohio, 122 p.

K047A
2000/2001

LOGISTICS REPORT

K047: Climate and Landscape History from shallow Drilling in the Dry Valleys
ANTARCTICA NEW ZEALAND 2000/01

Event Personnel :

Warren Dickinson	(Victoria University of Wellington)
Alex Pyne	(Victoria University of Wellington)
Chris Hosie	(Victoria University of Wellington)
Wayne Pollard	(McGill University)
Tony Kingan	(Webster Drilling Inc)
Glen Kingan	(Webster Drilling Inc)
Pat Cooper	(Webster Drilling Inc)

1) AIMS

The main technical objective of the season was to test the capabilities and design of the refurbished Winkie drilling system which was modified for air coring. Along with this objective, there were three scientific objectives: 1) to provide a series of shallow (2 m) cores to assess the degree of contamination of diesel drilling fluid around DVDP-6 (drilled in 1972), and to locate and re-enter this hole to assess its current status; 2) to provide stratigraphic cores of the Sirius Group at Allan Hills and Mt Feather for thickness and facies analyses; 3) to provide shallow cores for comparative age analyses by Be and N inventory of three different aged deposits (Sirius, Sirius regolith, and debris flow) at Table Mt and deployment of 2 m thermistor probes in two of those deposits which have pattern ground.

2) PLANNING

i. No suggestions to change the application process
ii. Antarctica NZ staff are excellent
iii. No suggestions on maps and aerial photos
iv. Pre season information is generally good except **it would be most helpful if the first aid/field manual could be sent prior to arrival and kit-up in Christchurch**. Most all of the new comers would read these manuals with enthusiasm in trying to figure out what to pack and expect in Antarctica.
v. No suggestions on change to the medicals etc.

3) CARGO

The following equipment packages were consigned to Scott Base from Webster Drilling in Porirua in late October:

i. Flying box #1. Compressor and Drill Rods and parts.
   933kg: 4.2m^3 (Tare 300 kg)

ii. Flying box #1. Winkie Drill, Drill Shelter and parts.
   1055kg: 4.2m^3 (Tare 300 kg)

iii. ISO Space Cases of parts (3), Briggs cat head, Sigma box.
   405kg: 1.35m^3

iv. Core Boxes with splits and core packaging (6).
   560kg: 1.7m^3

v. In addition a further consignment of electronic equipment and gel cell batteries weighing approximately 250 kg was sent from VUW in early November.
   Total Weight = 3203kg

Gear box and compressor oils were noted in the flying boxes and these were accepted without hazardous requirements. The gel cell batteries however required repackaging as hazardous cargo which was unexpected given that this battery type can be flown under commercial IATA regulations and in helicopters in Antarctica. It would seem that batteries are now considered hazardous because they are an electrical storage device that would normally be transported in a charged state. A general note available from

Antarctica New Zealand regarding categories of hazardous cargo would be helpful for planning purposes.

3.1) Accompanied Cargo.

Approximately 105 kg of delicate scientific equipment including computers and survey equipment accompanied event personnel to Antarctica.

4) PERSONNEL

Warren Dickinson, Event Leader
School of Earth Sciences
Victoria University of Wellington
PO Box 600, Wellington

Pat Cooper, Head Driller, Lake Vida
Coopers Drilling Service
Rapid Creek, Waimangaroa
Westport

Chris Hosie, Student and Research Assistant
School of Earth Sciences
Victoria University of Wellington
PO Box 600, Wellington

Glen Kingan, Assistant Driller
Webster Drilling Inc
PO Box 50-354
Porirua

Alex Pyne, Field Leader
School of Earth Sciences
Victoria University of Wellington
PO Box 600, Wellington

Tony Kingan, Head Driller, Allan Hills & Table Mt
Webster Drilling Inc
PO Box 50-354
Porirua

Wayne Pollard, Canadian Scientist & Technical Observer
Dr Wayne H. Pollard
Department of Geography
McGill University
805 Sherbrooke St. W.
Montreal, Qc. H3A 2K6

5) FIELD PREPARATIONS

i. The K047A primary objective supported by Antarctica NZ was to carry out a program of shallow coring as proposed by Dr Warren Dickinson (VUW) with Webster Drilling providing drilling services in conjunction with VUW. In addition Webster Drilling were contracted by Raytheon Polar Services Company to carry out coring for an environmental remediation program at Lake Vida (DVDP bore hole #6). VUW considered this arrangement to be advantageous to the science program and supported it because it allowed the costs of drilling equipment development and mobilisation to be shared between two programs and also reduce helicopter requirements in Antarctica.

   During the planning phases prior to deployment to Antarctica we attempted to keep Antarctica NZ informed of the Raytheon contract developments and these were time tabled into the K047A schedule by Peter Cleary. The Lake Vida work, planned to be carried out first was to be supported in the field by the US program. However K047A cargo and personnel were manifested to Scott Base by the New Zealand Program where preparations were made for both US and NZ parts of the field program. During this period it became apparent that a few items of our Antarctica

NZ equipment requests were not considered to be available for the US part of the program, these were solved simply but the impression remained that official communication and planning between the NZ and US at the program level could have been improved and these ramifications made clear to VUW.

ii. The equipment made available to K047A from Scott Base was in good condition and performed well in the field. The generator service kit provided is a significant step forward. The idea of a complete field friendly kit with built in drip tray served us well and was used for other motorised equipment as well. We hope to use the same idea for field servicing of small drilling equipment in the future. The only significant concern when at Allan hills was that we mislaid the soft Polar Haven floor (12'x8') in the Marble Pt. equipment cache. Our field equipment had been taken by sea ice surface transport to Marble Pt. and the floor had been stored with a different NZ science event's equipment in another part of the equipment cache. We found the Polar Haven tent to be significantly colder without the floor at Allan Hills. The floor was later recovered and used at Table Mountain. A lesser concern was the absence of guy ropes on some of the newest foldable Polar Tents. Additional guy ropes were provided on a resupply but were also mislaid for a few hours in the excitement of helicopter operations. The use of coloured packing slip type documentation in mail bags accompanying cargo originating from Scott Base would help field parties keep track of re supplies. A similar coloured form could be used by parties returning equipment and samples to Scott Base. This becomes even more important when field groups are large and several events may be working together. Testing equipment at Scott Base, note on preparing hydrocarbon contaminated cores.

iii. Field training required for Chris Hosie, Glen Kingan and Wayne Pollard was carried out on their arrival at Scott Base for the move to Allan Hills.

iv. We were delayed 2-3 days from the scheduled put in at Lake Vida due to weather and consequent helo backup. This extra time was well used in drill testing and we drilled at a possible fuel contaminated site at Scott Base to test the practicality of drilling and core recovery in volcanic rocks for environmental tests. Notes on these tests are appended to this report.

6) **FIELD TRANSPORT** (Helicopter Operation)

For this season's drilling operations we constructed two 3.2 m long skid mounted "flying boxes" one, to carry the Winkie Drill and drilling equipment and the other to fit and operate the air compressor system. The boxes were primarily designed as underslung loads for the Bell 212 helicopters and were partly streamlined and built with a four point lift. The boxes were built as lightly as possible with tubular duragalv steel framing and plywood cladding. The tare weight of each box was about 300 kg including 2 side mounted drill deck units.

Equipment was consigned in the boxes and flown to Antarctica but required a double marriage pallet because of the overhang length of 0.8 m in excess of the single 8' long aircraft pallet. The flying boxes were repacked to reduce the weight to 1800 –1900 lb for helicopter sling loads. The boxes did not fly as well as we hoped and a tail fin were constructed at Scott Base and fitted in the field adding a further 40 lb to the box weight.

The boxes still did not fly well and this in part may be due to the PHI steel cable pendant where the swivel may not work properly with loads of 1800 lb.

We recognize that there is a significant weight penalty in the use of these boxes and this weight may be reduced a little in the future with redesigning. The advantages of the however outweigh this penalty and include:

i. Cargo consignment to Antarctica.
ii. Enables the heating/start up and operation of the compressor in a controlled temperature environment.
iii. Rapid packup and deployment of equipment.
iv. Confinement and protection of equipment from burial in snow.

In addition to the 2 large flying boxes which were each under slung, we required a third underslung load for drilling equipment/fuel and one Bell 212 internal load of equipment. An additional two Bell 212 internal loads were required for personnel (up to 6) and camp which included 3 folding Polar tents and the 12'by 8'Polar Haven with soft floor.

Most of the smaller drilling equipment was packaged in plastic space cases and consigned from New Zealand on pallets. These cases are designed to fit ISO pallet dimensions (1.10 x1.10 m) and two 1.1m long boxes fit across the back cabin area of the Bell 212. Drilling equipment is usually heavy and it is all to easy to over fill these versatile boxes which makes it harder to pack the helicopter especially if only the pilot and copilot are doing a remote pickup; (sorry HNZ). The boxes provide secure storage of equipment in the field and contribute to an efficient drilling operation.

7) EVENT DIARY

DATE	LOCATION	BRIEF DIARY
NOV 3	Chch	WD,AP,PC,TK boomerang flight
S 4	Chch-SB	WD,AP,PC,TK arrive SB 8:30p
Su 5	SB	Boxes to cold porch & begin unpacking
M 6	SB	Prep & repack drill equip
T 7	SB	AP,PC,TK,WD meet w/ BG,KW; Core boxes from BFC, Rig for test drill of SB diesel spill
W 8	SB	Test drill system; compressor operation in cold; took 1m core in basalt for contamination
Th 9	SB-Vida	Pack drill kit; WD,AP,PC,TK 7:30p to Vida; BG, KW av Vida 10pm; 4x sling loads follow; last av @ 5am
F 10	Vida	Set-up drill system; WD takes 1.5m Sipre core of L Vida ice near west end stream entry
S 11	Vida	12pm start drill PC-5; move to PC-4; finish @ 6pm
Su 12	Vida	10am start drill PC-1; 3pm move to PC-6 & finish 8pm; Cleary drops off spare bits from Websters
M 13	Vida	Visit by Craig Potton 9am 10am move to PC-7 & drill; 12:30p move to PC-3; 3pm move to PC-2 & finish drill 5:30p; AP,PC,TK,KW hike across lake
T 14	Vida	9am coms w/ SB and McM about next moves; 11am start drill PC-

		8; 4:30p start drill PC-9 finish 5p; dig & find DVDP-6; plans to case but need to make tools @SB
W 15	Vida	WoW to move AP to SB; BG & KW hike to dune; others in camp
Th 16	Vida	WoW; BG,WD hike to overlook; others in camp
F 17	Vida	WoW; BG,WD hike to Upper Victoria Glacier, others hike to Dune
S 18	Vida	9am PC,BG to McM; 2pm AP to Cape Roberts to repair tide gauge; WD studies pattern ground
Su 19	Vida	12pm WD,TK,KW hike to east end of Lake Vida
M 20	Vida	8:30am PC arrives w/tools; 11pm reaming DVDP-6 w/ casing; hole in good cond; AP arrives 1:30p; set 12m of casing w/10l water; capped by 5pm; packed up drill system by 7pm
T 21	Vida-Mpt	4pm WD,AP,PC,TK,KW + personal kit & ice core box to Mpt via K047B, Lower Vic Glacier to pick up solar panel; PC & KW on to McM; repack camp kit for AH
W 22	Mpt-AH	3pm WP,CH,GK move SB to Mpt; 4:30p AP,TK,GK,CH move to AH/Trudge Vly & set up camp by 8pm; WD,WP hike to Bay of Sails north of Mpt.
Th 23	Mpt-AH	10:30a WD,WP to AH/Trudge Vly; fuel sling from Mpt; 2x sling + internal loads from Vida to AH by 4pm; setting up drill rig
F 24	AH	Setting up rig; drilling@1pm; AH-T-1 ice free to 1.5m = no core! repair power head; WD,WP hike to U Triangle
S 25	AH	WD,PH observe Sirius @ U Triangle; Compressor mount sheared off, geo bolts found for repair! carb repair on power head; no drilling
Su 26	AH	WD,PH,CH,WP hike to L Triangle & LakeVly; 11am drilling AH-T-1 & TD in Weller @ 6:30p
M 27	AH	WD,AP,TK,GK,PH check L Triangle & decide not to drill there; WP,CH hike to Camp Vly; WD rtn to camp via Watters Pk; solar flares = no radio coms
T 28	AH	10am move rig 150m S; WD,WP,CH ice cored LV-1 = 1.1m and LV-2 = 2.05m w/ PICO auger; return 6pm; 4pm drill AH-T-2 to 1.8m no ice; hole caving; 7pm cmted rubble w/20l water to set for nite; no coms
W 29	AH	Coms w/SB;10:30a drill out cmted rubble & cored 2.0-4.5m w/reaming, finish 6pm; blowing >15knts all day
Th 30	AH	11am coring and reaming 4.5-8.3m; TD in Weller@ 7pm; used nearly all fuel; 11pm-2am packed rig for 10am sling out
DEC 1	AH	WoW @ AH, fine at SB; good coms for weather reports every 2hrs
S 2	AH	WoW; WD,AP,WP climb Sched Pk for weather rpt; WD,WP examine pattern ground in Trudge Vly
Su 3	AH	WoW; WD,CB examine Mawson on Mt Watters: others in camp all day; WD & CB collect & bag old rubbish from around supply cashe (ca 1963) left at tongue of Odell Glacier in Trudge Vly
M 4	AH-Mpt	9:45a WD,AP,WP,GK move to Battleship Prom. to collect endoliths; unload survival gear; helo moves TK,CH to Mpt; 12:45 WD,AP,WP,GK move to Mpt; clean & repack camp kit for TM
T 5	Mpt	WoW @ Mpt for move to TM; read, video, eat!
W 6	Mpt	WoW; outline prelim report; examine beach ridges N of Marble Pt
Th 7	Mpt-TM	10am WD,TK,GK move to TM; 10cm snow = difficult to locate

		drill sites; carried gear 400m downslope to SW and set-up camp; 2x slings + internal from AH; 1x sling from Mpt; AP,CH av @ 10:15p & finish camp set-up 1am!
F 8	TM	AP,WD find exact loc of camp on aerial photo; set up rig; new warm up procedure for compressor; drilling TM-00-1 by 6:30p & cored 0.5m when clutch on power head broke
S 9	TM	Drilling @ 11am 0.8m/hr; ice cuttings not clearing well; stopped @ 7:30p @6.1m, slow but steady day
Su 10	TM	10am changed to T-60 bit, drilled 0.2m & barrel got frozen in hole 11am; jacks in bad repair & could not jack out; poured hot salty water (6% sol'n) in hole but no give; rod twisted off @ sub; spare sub at SB; moral is low!
M 11	TM	11am AP to SB for tools and parts; WD,CH measure polygons; WD,CH,GK climb Mt Buggar; AP arrives 11pm with retrieval tools
T 12	TM	10am overdrilling w/NQ; 10:30a NQ bit is frozen & stuck; 3pm jacked out NQ; move to TM-00-2; 1.5hrs to start cooler; 10pm monkey jars & fuel av from SB; 11pm finished coring @2.37m
W 13	TM	Drilled data logger post hole TM-00-2a; spud TM-00-3 @1pm; TD@ 2.17 when radiator cooler clogged w/ ice @3:30p. AP sets up data logger in TM-00-2
Th 14	TM	Moved to TM-00-4 & cored 3.21m in 1.5 hrs and finished by 1pm; moved to TM-00-5; drilling dolerite clast (0.3m in 1.5hr) & decided to TD hole @ 1.83m; drilled data logger post hole TM-00-5a; WD sampled Sirius fractures
F 15	TM	10am drilling TM-00-6; 10:30a K042 av & set up camp around us; drilling slow but steady; 6:30p TD @ 4.40m & packed fly boxes; AP sets up #2 data logger in TM-00-6
S 16	TM	3x slings to SB @ 2, 3:30 & 5am; WD,SH climb Navajo Pk; upslope cloud @9am; WoW to move to SB
Su 17	TM-SB	9:30a WD,SH to SB; 11:30a AP,TK,GK to SB; clean camp kit; pack boxes for NZ; bag drag 6:30p
M 18	SB-Chch	9am WD,AP to Chch; av 5pm & de-kit; 6:30pm flight to Wgtn

K047A Personnel
WD (Warren Dickinson)
AP (Alex Pyne)
TK (Tony Kingan)
PC (Pat Cooper)
GK (Glen Kingan)
CH (Chris Hosie)
WP (Wayne Pollard)

K042 personnel
PH (Phil Holm)
CB (Carl Bornholdt)
SH (Steve Hicock)

NSF Personnel Lake Vida
BG (Bill Gilmore)
KW (Kirsten Wade)

Abbreviations
TD (total depth)
WoW (waiting on weather)
@ (at)
av (arrive)
lv (leave)
SB (Scott Base)
McM (McMurdo station)
Mpt (Marble Pt. station)
AH (Allan Hills)
TM (Table Mt)

8) EVENT MAP

(see attached for Lake Vida, Allan Hills, and Table Mt.)

9) WEATHER (9:00 am)

Date	**Location**	**Cloud Cover**	**Cloud Type**	**Wind Knots**	**Wind (dir)**	**Temp °C**	**Comments**
NOV 3	Chch	---	---	---	---	---	
S 4	Chch-SB	---	---	---	---	---	
Su 5	SB	---	---	---	---	---	Condition 2
M 6	SB	---	---	---	---	---	Condition 2
T 7	SB	---	---	---	---	---	Hi Cloud, no snow
W 8	SB	---	---	---	---	---	Lite Snow
Th 9	SB-Vida	0/8		5	E	-8	8p @ Lake Vida
F 10	Vida	1/8	Cs	<5	---	-4	inc 10kt E in pm
S 11	Vida	1/8	Cs	<2	---	-4	inc 10kt E in pm
Su 12	Vida	0/8		10	E	-2	20kt between 3am - 6am
M 13	Vida	0/8		<3	V	-3	inc 10kt in pm
T 14	Vida	8/8	As	<3	V	-4	unrestricted vis
W 15	Vida	7/8	As	<3	V	---	inc 15kt by 11am; cond 2 @ SB
Th 16	Vida	7/8	As	10	E	-4	cond 2 @ SB
F 17	Vida	7/8	As	17	E	-5	Helos not flying
S 18	Vida	5/8	As	5	E	-4	Helos flying
Su 19	Vida	0/8		15	E	-3	constant wind all day
M 20	Vida	0/8		<5	E	-3	
T 21	Vida-Mpt	8/8	As	<3	V	-4	unrestricted visibility
W 22	Mpt-AH	1/8	As	10	S	-2	for Mpt
Th 23	Mpt-AH	0/8		<5	S	-2	for Mpt
F 24	AH	7/8	Sc	17	SE	-10	
S 25	AH	8/8	Sc	20	SE	-13	snowing; wind dec to <3 by evening
Su 26	AH	5/8	Sc	13	SE	-12	Solar flares, no coms
M 27	AH	3/8	As	10	SE	-11	Solar flares, no coms
T 28	AH	8/8	Sc	20	SE	-14	Solar flares,no coms
W 29	AH	1/8	As	17	SE	-10	
Th 30	AH	1/8	As	17	SE	-12	
DEC 1	AH	8/8	Sc	5	SE	-13	clear @ 7a but socked in by 9am
S 2	AH	8/8	Sc	<5	SE	-13	lite snow thru day
Su 3	AH	8/8	Sc	5	SE	-15	snow dec thru day

M 4	AH-Mpt	5/8	Sc	<5	SE	-13	patchy lo cloud thru day @ AH
T 5	Mpt	8/8	Sc	10	S	-3	no helos from SB
W 6	Mpt	7/8	Sc	5	S	-3	cond 2 @ SB
Th 7	Mpt-TM	0/8		<2	V	-10	10am @ TM
F 8	TM	0/8		<2	V	-11	beautiful
S 9	TM	0/8		<2	V	-12	
Su 10	TM	0/8		<5	V	-12	clouds building thru day
M 11	TM	0/8		<5	V	-11	
T 12	TM	1/8	Cs	<3	V	-10	clouds building thru day
W 13	TM	1/8	Cs	<3	V	-10	snowing in late pm
Th 14	TM	2/8	Sc	<3	V	-11	Sc in lo valley
F 15	TM	2/8	Sc	<3	V	-10	Sc lo in valley
S 16	TM	7/8	Sc	<3	V	-10	lite snow thru day
Su 17	TM-SB	4/8	Sc	<3	V	-10	patchy cloud
M 18	SB-Chch	4/8	As	<3	V	-2	8am @ SB

--- Observation missing or not recorded
Cs = Cirro stratus; As = Alto stratus; Sc = Strato cumulus
SB = Scott Base; AH = Allan Hills; TM = Table Mt: Mpt = Marble Point

10) ACCIDENTS, INCIDENTS or HAZARDS

There were no accidents, incidents or hazards to report

11) FIELD EQUIPMENT

The event was issued with new folding Polar Tents that performed well and made packaging the helicopter significantly easier. Some care has to be taken when connecting the internal poles to prevent catching the surrounding fabric sleeve. This is more difficult in the cold when the internal bungie chord has lost its spring but this recovers when the tent is erected and warmed up.

The Polar Haven tent was used for messing up to 8 people as well as the warming and maintenance of equipment. These tents are a valuable resource for the NZ field operation and can provide quality lab space as well as a general messing and warm work area. The performance of the tent improves greatly with a rigid insulated floor but the canvas floor also helps and is more suitable for our mobile operation.

VUW has purchased a Sigma fuel heater that has been set up as a portable unit for use with the Polar Haven. However Antarctica NZ could consider the purchase of more of these heaters, set up for portable operation as well as other equipment specifically for Polar Haven use. The standard kitchen box, for example, is designed for use in the 2 man Polar Tent and is unsatisfactory in the warm Polar Haven Tent environment. A plastic space case based kitchen unit with small sink; pizo propane double burner, utensil and cookware storage could be developed to mess up to 6 people. Connection to a sigma heater with heat exchanger for ice melting would also be possible. Other camping accessories such as lightweight folding aluminium tables are also required for the Polar Haven tents.

12) RADIO COMMUNICATIONS

Scott Base communication operators generally seem unaware of their importance to field parties. Without citing specific examples, members of this event found it difficult and often unreliable to send messages through the base operators. A particularly difficult time with the radio operators occurred in early December when operator teams were changed. One suggestion may be to change over one operator at a time rather than all three at once. After this change over, there were several incidents where a Scott Base operator failed to respond to calls from field parties. These were calls heard clearly by other field parties indicating that the base operator was simply switched off.

Radio communications with the NSF helos is poor to nonexistent and needs improvement.

Communication with McMurdo helo ops should be available. Too often Kiwi field parties get word from Scott Base operators that the helo will arrive at a certain hour, but in fact it shows up 4-5 hours later. This is because the base operator has either mis-read the daily flight sheet or there is some genuine problem with the helo. It seems reasonable that since all helo movements are done through Mac Center, and since US parties have communication access to Mac Center, that Kiwi field parties should also have communication to Mac Center.

13) SCOTT BASE LABORATORY FACILITIES

Scott Base lab facilities were not used by this event.

14) REFUGE & RESEARCH HUTS

These huts were not used by this event.

15) ENVIRONMENTAL IMPACT

i. Site 1: Lake Vida, DVDP-6 (S 77°22 42.75854; E 161°48 59.57237); 9 Nov - 20 Nov; 11 days; 4 people; 44 person days; core drilling and remediation around old hole DVDP-6 (see attached Table for core taken at this site)

   Site 2: Trudge Valley, Allan Hills (approx. S 76°42 18.0; E 159°47 24.0) 23 Nov - 4 Dec; 10 days; 6 people; 60 person days; coring Sirius Group deposits (see attached Table for core taken)

   Site 3: Battleship Promontory (S 76° 54.971; E 161° 01.739) 4 Dec (10:15am - 12:45pm); 4 people; sampling and collecting endolithic algae from the Beacon Orthoquartzite; 10kg of rock collected.

   Site 4: Table Mountain (approx. S 77°57 37.0; E 161°57 45.0) 8 Dec - 16 Dec; 9 days; 5 people; 45 person days; coring Sirius and patterned ground (see attached Table for core taken)

ii. No protected areas were visited by event members. However, endolithic algae were collected at Battleship Promontory and perhaps this area should be considered as a protected area in the future.

iii. Event members did not interfere with any wildlife.

iv. Shallow core was taken from each of the three sites as detailed in the table below. The nature of the core varied from glacial dimict to well sorted sandstone. All of the core was ice cemented. An average density of the core was 2.65g/cc which, for a 60mm diameter core, is 7.5 kg /metre. The extracted weight of the total core was 319kg.

Cores from Holes Drilled for K047A (See attached maps for hole locations)

AREA	**HOLE #**	**DATE (2000)**	**START DEPTH (m)**	**TOTAL DEPTH (m)**	**TOTAL CORE RECOVERED (m)**
Lake Vida	PC-5	11/11	0	1.89	1.89
	PC-4	11/11	0	1.81	1.66
	PC-1	12/11	0	2.45	2.17
	PC-6	12/11	0	1.37	1.25
	PC-7	13/12	0	2.06	1.89
	PC-3	13/11	0	1.82	1.70
	PC-2	13/11	0	1.84	1.63
	PC-8	14/11	0	1.93	1.80
	PC-9	14/11	0	1.99	1.91
				17.16	**15.90 (119kg)**
Allan Hills (Trudge Valley)	AH-T-1	24-26/11	0	4.23	2.30
	AH-T-2	28-30/11	0	8.38	5.90
				12.61	**8.20 (62kg)**
Table Mt	TM-00-1	8-10/12	0.44	6.30	5.66
	TM-00-2	12/12	0.24	2.70	2.03
	TM-00-3	13/12	0.14	2.17	1.95
	TM-00-4	14/12	0.48	3.21	2.73
	TM-00-5	14/12	0.12	1.83	1.71
	TM-00-6	15/12	0.14	4.40	4.26
				20.81	**18.34 (138kg)**

	Total	**50.58**	**42.44 (319kg)**

v. No hazardous chemicals, other than fuels and lubricating oils, were taken into the field. All unused fuels and oils were returned to Scott Base. However, a note on the use of fuels and oils in the field is necessary. All kero for cooking was supplied in 20l plastic containers. These containers had fittings for taps, but taps for dispensing the fuel were not supplied. It is virtually impossible to pour a full 20l container into a two litre container for use in the tent without spillage. Taps for the 20l containers should be made available to field parties. Scott Base field managers should describe the use of the taps to all field parties. Portable plastic berms, borrowed from the US program at Lake Vida, were used for our fuelling operation of drilling equipment. These portable berms are light weight and fold into a small size and a variety of sizes should be purchased by Antarctica NZ.

vi. Explosives were not used by this event.

vii. No animals, plants, were imported to or removed from Antarctica by members of this event.

viii. One thermistor probe was left in each of two holes (TM-00-2 and TM-00-5) drilled at Table Mt (approx loc.S 77°57 37.0; E 161°57 45.0). Each probe was 6mm in diameter, 2 m long and suspended in the hole with open-cell armaflex pipe insulation. Cables from the probe were attached to a controller box (500x400x200mm) fitted with a solar panel and a space case (550x500x500mm) containing two 75Ah, sealed lead-acid batteries. These probes will be down loaded in November 2001 and reprogrammed for an additional year.

ix. Daily activity by event members required tramping across desert pavement, rock and snow surfaces at the field sites. Disturbance to these surfaces, was also caused by the portable drilling equipment, which was set up, used and taken apart. Several small shallow pits were dug at each site to determine the depth to the ground ice. All of the pits were back-filled and disturbed desert pavement surfaces were raked and swept to restore them as best as possible to their original state. However, skid marks and oil droppings left behind by various helicopter movements were not restored. The loss of hydraulic oil from helicopters working in the Dry Valleys remains a serious source of pollution.

x. For some reason, 60l greywater barrels were not issued at Scott Base this season, but they were replaced with 20l disposable plastic containers. Conservatively, the average person produces about 2l (urine + kitchen) of greywater per day. Our event was issued four 20l containers for Allan Hills and Table Mt. We used up all four at Allan Hills (60 person days x 2l = 120l total greywater) and as a consequence, we were forced to freeze buckets of greywater and set them out to ablate in the wind. In addition, the 20l containers were in short supply at Scott Base, and we ran short of them at Table Mt as well. We strongly recommend that for large (>3 persons) field parties, 60l barrels are used in the future to avoid the dumping of greywater. (approx 40l at Allan Hills and 20l at Table Mt were dumped)

16) HISTORIC SITES

Historic sites were not visited by member of this event

17) MANAGEMENT OF SCIENCE IN THE ROSS DEPENDENCY

During the early stages of our event at Scott Base and Lake Vida, we became aware that official communication and planning between NZ and the US at the program level could have been improved. We expect that drilling work similar to that carried out by K047A will be required in the future,for both NZ and US programs. It makes economic sense to spread drilling mobilisation costs between several groups where possible but we require agreed guidelines to enable NZ contractors to support both national programs without incurring unnecessary costs that could reduce NZ technical expertise, commercial advantage and leadership in this field.

Prior to K047A deployment to Antarctica, Peter Cleary determined that preparations and requests for the Lake Vida program within the US system had not been completed as per our expectations and stated in the Raytheon contract. We are grateful that he pursued this on our behalf so that this problem was largely dealt with on our arrival at Scott Base.

There is continuing problem about importing Antarctic soil, sediment, rock and ice samples. With all the snakes, mosquitos, spiders etc that have recently been found in the country, MAF are coming under real heat to control imports. As such they are loath to distinguish and make exceptions for samples which come from Antarctica. Scientifically however, it would be very difficult to justify a biosecurity threat from any antarctic samples. Rock samples seem to be OK, but sediment, soil and water (non seawater) seem to pose a risk. As you know, there is a very fine line between soils and sedimentary rocks which flake and crumble.

To date we have avoided the MAF dogma by claiming all of our samples are rocks, which when dealing with sedimentary rocks is really not the case. If we continue to do this MAF may eventually find out how we are bending the 'rules' and get very nasty on us. The bottom line will be the increased cost we will have to bear to appease the regulators that Antarctic samples are biologically safe. It would be most helpful if Antarctica NZ could approach this problem on some sort of higher level with MAF that would allow a variance for Antarctic rock, soil and ice samples.

Notes for Hydrocarbon Sampling of Frozen Core.

At Scott Base during the field preparation period in early November we cored frozen volcanic sediments and bedrock to test the drilling equipment using chilled compressed air and diamond drill bits. This was carried out in the road area adjacent to the Pump House and WetLab in an area which was expected to have some possible hydrocarbon contamination. The coring operation went very well with complete core recovery of a few centimetres of sediment on top of vesicular basaltic bedrock. The total core recovered was in excess of 1.0 metre. Vesicles and fractures in the bedrock were filled with ice that was recovered intact. At the time of core recovery a hydrocarbon smell was noted on several occasions but this disappeared after a few hours and the ice content also ablated away even though the cores were kept frozen. It was not clear if the hydrocarbon smell was associated with the ice content but this could be possible at shallow depths were flowing water and hydrocarbons may be present during the high summer melt period. The relationship between ice content and the volatile hydrocarbons may indicate how fluids move in the subsurface and at the permafrost interface.

We recommend that compressed air coring should be carried out with Ambient air temperatures not greater than -10°C to prevent downhole melting. Samples of core should be taken immediately on recovery of the core, stored in airtight containers to preserve both volatile and residual hydrocarbons and kept frozen –18°C. Containers where the headspace can be drawn off with a syringe for gas chromatograph analysis would be advantageous.

K047A
2000/2001

IMMEDIATE SCIENCE REPORT

K047: Climate and Landscape History from shallow Drilling in the Dry Valleys
ANTARCTICA NEW ZEALAND 2000/01

Event Personnel :

Warren Dickinson	(Victoria University of Wellington)
Alex Pyne	(Victoria University of Wellington)
Chris Hosie	(Victoria University of Wellington)
Wayne Pollard	(McGill University)
Tony Kingan	(Webster Drilling Inc)
Glen Kingan	(Webster Drilling Inc)
Pat Cooper	(Webster Drilling Inc)

1) Popular Summary of Scientific Work

This project is based on new portable drilling techniques which allow shallow coring of permafrosted glacial sediments in remote areas. The primary aim of this project is to recover a climate record from Antarctic ground ice and soils, which potentially hold detailed records that date back to 15 million years ago. The cored material will not only be used to determine climate and climate history from geo and biochemistry but will also provide stratigraphic information for ground penetrating radar studies and outcrop maps of glacial sediments.

One of the main scientific problems to be addressed by this project is the origin of ground ice at high elevations (<1000m) throughout the Dry Valleys of Antarctica. The origin is unclear because there is no obvious contemporary source of water. Three possible sources have been proposed: 1) The water came only with the original deposition of the sediments, 2) additional water was introduced after deposition during an undocumented warm period in Antarctic history, or 3) additional water has condensed from atmospheric vapour, which has diffused into the ground over millions of years. Preliminary work suggests that mechanism three is applicable and that this may be similar to the occurrence of water on Mars.

2) Proposed Programme

The main technical objective of the season was to test the capabilities and design of the refurbished Winkie drilling system which was modified for air coring. Along with this objective, there were three scientific objectives: 1) to provide a series of shallow (2 m) cores to assess the degree of contamination of diesel drilling fluid around DVDP-6 (drilled in 1972), and to locate and re-enter this hole to assess its current status; 2) to provide stratigraphic cores of the Sirius Group at Allan Hills and Mt Feather for thickness and facies analyses; 3) to provide shallow cores for comparative age analyses by Be and N inventory of three different aged deposits (Sirius, Sirius regolith, and debris flow) at Table Mt and deployment of 2 m thermistor probes in two of those deposits which have pattern ground.

3) Scientific Endeavours and Achievements

Main Results

Nine holes and 15.90 m of core were recovered from a grid pattern of drilling around DVDP-6, and they suggest that the diesel drilling fluid used in 1972 only penetrated the active permafrost layer to a depth of about 0.6 m. In addition, DVDP-6 was relocated, cased to a depth of 12 m, and capped. At Allan Hills (Trudge Valley) two holes and 8.20 m of core were recovered showing that the Sirius consists of a thin veneer (4-5 m) in the valley bottom and that it is ice-free to a depth of 1.5 to 2.5 m in this area. Coring did not reveal any new facies of the Sirius at Allan Hills. At Table Mt, six holes and 18.67 m of core were recovered. The cores revealed a new fluvial gravel facies of the Sirius and showed that depth of polygonal ground may extend deeper than 6 m. The two thermistor arrays were deployed in different polygonal ground and set to record temperatures (12 cm intervals to 2 m deep) 4 times a day for 11 months.

Summary

Dickinson and Pyne spent 39 days in the field and 5 days at Scott Base. Of the field days, 9 (includes one no-fly Sunday) were spent waiting on weather to clear. An additional 3-4 days were lost to technical problems with the drilling system. In all, 17 holes were drilled in three areas, Lake Vida, Allan Hills, and Table Mt and a total of 42.44 m of core were recovered for 48.44 m drilled.

Technical Summary
Technically, the drilling system was a success, and although it did not preform to its expected capabilities, the modifications necessary to accomplish this are feasible. The main problems and necessary modifications are listed below in order of importance:

1) Core bits need further testing and design. With the present system, the clearing of cuttings, and in particular ice-rich cuttings, becomes more difficult with depth below about 2 m. Unless this problem is solved, holes deeper than about 10 m are not practical with this system as reaming is required below 6 m.

2) The compressor system generally worked well, but consumes a lot of fuel and requires a dedicated operator. Modifications are required to the protective box so that the compressor and its coalescing filter can operate in a warm and uniform temperature. It may also be possible to reduce fuel consumption if demand air flow can be regulated.

3) Cooling of the compressed air is required and drilling in temperatures above -3°C is probably not practical. In addition, moisture from compressed air must be removed before entering the cooler. With the present system it is not practical to drill in either cloudy or snowy conditions because of ice build up in the air ways.

4) Unquestionably a drilling shelter is needed for winds greater than about 7 knots. However, the present shelter and platform can be lightened in weight and simplified in design to increase set-up and break-down time.

5) A drilling camp of at least 5 people is required to support the present drilling system. The camp, drilling system, and fuel (five 12 hour days of compressor operation) translate into 6 helo loads (3 internal and 3 sling). The logistics of such moves are complicated and demanding on Antarctica NZ resources and suggest that one and possibly two areas can only be drilled in a season.

Scientific Summary
Scientifically, much was accomplished during the field season, however, the initial objectives outlined above were extremely ambitious in view of the fact they were set before the capabilities of the drilling system were completely understood and tested under Antarctic conditions. Site selection for coring is critical and must be reviewed by both scientists and drillers prior to conception of logistical plans. The depth to ice-cemented sediment must be determined so that if necessary casing can be provided and used during coring. Core recovery in ice-free sediments is probably not possible and if this zone cannot be cleared by shovel it must cased off, if drilling below this zone is required. In logistics planning, allowance for bad weather is critical because of the time needed for 6 helo moves. November 2000 was one of the snowiest on record at Scott Base and given the variable conditions in the mountains, the weather must be suitable both at base and in the field for helo movement to occur.

At Allan Hills 2 core holes were drilled in Trudge Valley (Fig. 1). The site initially selected was on the top of the ‘ramp’, but high winds made drilling at this location impractical for field time allotted to the Allan Hills area. Therefore, to assess the thickness of the Sirius in Trudge Valley, we decided first to core the Sirius outcrop on the valley bottom NE of the ‘ramp’. To our surprise, we found the top 1.5 m of Sirius was ice-free and core from this section was lost. At this hole, the Weller was encountered at a depth of 3.40 m. It was decided to drill the second hole in Trudge Valley in the basal part of the ‘ramp’ sediments which overlie the Sirius. The idea was that the top of the ice-cement would lie in the ’ramp’ sediments and allow recovery of a complete section of the underlying Sirius. Unfortunately, the unconsolidated ‘ramp’ sediments made drilling extremely difficult and slow. Consequently, the first core recovered at a depth of 2.48 m was the Sirius, and it was not possible to core the contact between the ‘ramp’ sediments and the Sirius.

A move to other sites in the Allan Hills area became impractical because of time constraints. Persistent 30 - 40 knot winds on the Upper Triangle essentially ruled out access to this area. Good outcrops surrounding the Lower Triangle and the probability of a thin Sirius section due to the 1-2 m thickness of the ice-free horizon, ruled out coring in this area as well.

At Table Mt, 6 core holes were drilled in an area where a ridge of Sirius is truncated by a debris flow of dolerite blocks which is marked by large (15 m across) polygonal ground (Fig. 2). Adjacent to the ridge is the Sirius regolith which is marked by small (5 m across) polygonal ground. These three outcrops are within a 100 m radius so a helo move of the compressor was not necessary. The primary objective was to take 3 m deep cores in each of these outcrops for Be/N inventory dating. The secondary objective was to investigate the nature of the polygonal ground and determine the depth of the 'active' layer. In this case, the term active layer does not refer to annual freeze-thaw, but the depth to which the polygonal ground extends. In the large polygons, 3 holes were drilled; one in the centre, one at the perimeter and one half way in between these holes. Due to the blocky nature of the debris flow, depth to the ice-cemented horizon varied from about 10 to 45 cm. TM-00-1 drilled in the centre of a polygon terminated at a depth of 6.3 m due to a stuck and un-recovered bit and core barrel. TM-00-2 was drilled half way between the centre and perimeter of the polygon to a depth of 2.37 m so that a 2 m thermistor probe could be installed in this hole. The hole at the perimeter, TM-00-3, was drilled to 2.70 m and terminated when drilling became difficult.

TM-00-4 was drilled at the top and southern-most end of a kilometre long ridge of Sirius (Fig. 2). The ridge is mostly capped by the dimict facies of the Sirius which overlies the well sorted sandy facies of the Sirius. The surface of the ice-cemented horizon at 48 cm was very even and flat which probably reflects the homogeneous nature of the sandy facies. Coring was fast (1 m /0.5hr) and drilling was terminated after 3 runs at 3.21 m.

A small polygon in the Sirius regolith was cored in its centre and perimeter. Depth to the ice-cemented horizon was less variable than in the large polygon and averaged about 15 cm. In hole TM-00-5 at the polygon centre, ice-cemented dolerite clasts (10-20 cm diameter) were present to 1.03 m deep where the well sorted Sirius sand was encountered. This may represent the depth of the active layer. Unfortunately, coring was terminated in a large dolerite clast (only known to be a clast after drilling the perimeter hole) at 1.83 m after drilling only 0.3 m in 1 hr. The perimeter hole, TM-00-6, encountered the sandy Sirius facies at about 0.88 m. However, at about 1.47 m a gravelly facies probably of fluvial origin was encountered. This facies continued to 4.40 m when coring was stopped for the move back to Scott Base.

Mount Feather

Although K047A was scheduled to go to Mt Feather after completing work at Table Mt, several reasons prevented this movement:

1) Because of the weather in November and early December as well as the constraints on the drilling system, which were only determined during the field season, it was felt that at least 12 to 14 field days were required to complete an estimated 10 to 15 m deep hole through the Sirius Group at Mt Feather. Even though there were no helo moves within the Allan Hills area, we were still only able to leave for Table Mt on 7 December. With this late a departure, the required time at Mt Feather was simply not available in this field season.

2) With the drilling system, field camp and personnel, at least 6 and probably 7 helo loads would be required for K 047A to put in at Mt Feather. This was beyond the helo support which Antarctica NZ was prepared to give K 047A for the season. Although the exact helo hours used are not yet available, K 047A was allotted 33.1 hours for the season and 11.5 hours were used to move K 047A from Marble Pt and Lake Vida to Allan Hills. An additional sling load of fuel would probably have been necessary to complete the drilling at Mt Feather.

Collecting Endoliths at Battleship Promontory

On Monday 4 December 2000, helicopter HNO from Allan Hills unloaded Alex Pyne, Warren Dickinson, Wayne Pollard and Glen Kingan at approximately 10:15 am with emergency camp gear. Stratus cloud was at about 4/8, wind <3 knots and variable, and temperature was about -6°C. The helo returned from Marble point for pickup at about 12:45. During this time, cloud cover increased to about 7/8 but winds had remained about the same.

Endoliths with bright green colour were patchy in their habitat and more difficult to find than anticipated. Unfortunately, only 2 hours had been allotted for sampling, and due to sample variability, probably 3-4 hours were needed to collect the required amount.

Endoliths were found both in fractures and as a consistent layer about 5 mm below the surface in the more porous and weathered sandstone of the Beacon Heights Orthoquartzite. However, during the collection time an understanding of the most favourable growing conditions of the endoliths was not determined. To sample as efficiently as possible in the restricted time frame, tasks were divided as follows:

Warren Dickinson searched for endoliths with a geo pick and recorded notes on the collection. He also too 35mm pictures and digital video of the operations. Wayne Pollard, using a geo pick, searched the wider area for endoliths. Glen Kingan also searched for samples and used the kanga hammer for splitting large samples which were brought to Alex Pyne for processing. Alex Pyne, with two layers of latex gloves on, sized the samples with a small chisel, and bagged and labelled them.

The endolith samples were taken from two areas about 30 m apart and from numerous sites of boulders or slabs the size of which are listed in the following table.

Endolith Samples Collected

Area #1 (photos 4-7, 4-8, 4-9) about 150 m from helo landing		
Site #	Rock Size (mm)	Comments
1	---	surface outcrop
2	200x100x100	Endoliths in small fractures
3	200x150x100	North facing boulder w/smooth face
Area #2 (photos 4-10, 4-11) about 30m SE of area 1		
4	250x250x100	weathered & friable
5	---	weathered & friable
6	---	weathered & friable
7	---	highly weathered and pock-marked
8	1000x500x500	hard but few fractures
9	1000x500x200	crumbly and fractured
10	500x400x300	hard red horizon, surface is platy

11	---	surface crust over hard ss
12	1000x750x100	slab is very rich in endoliths
13	---	helo approaching

Record of Core Holes Drilled for K047A (in chronological order drilled)

AREA	HOLE #	DATE	START DEPTH (m)	TOTAL DEPTH (m)	TOTAL CORE RECOVERED (m)
Lake Vida	PC-5	11/11	0	1.89	1.89
	PC-4	11/11	0	1.81	1.66
	PC-1	12/11	0	2.45	2.17
	PC-6	12/11	0	1.37	1.25
	PC-7	13/12	0	2.06	1.89
	PC-3	13/11	0	1.82	1.70
	PC-2	13/11	0	1.84	1.63
	PC-8	14/11	0	1.93	1.80
	PC-9	14/11	0	1.99	1.91
				17.16	**15.90**
Allan Hills (Trudge Valley)	AH-T-1	24-26/11	0	4.23	2.30
	AH-T-2	28-30/11	0	8.38	5.90
				12.61	**8.20**
Table Mt	TM-00-1	8-10/12	0.44	6.30	5.66
	TM-00-2	12/12	0.24	2.70	2.03
	TM-00-3	13/12	0.14	2.17	1.95
	TM-00-4	14/12	0.48	3.21	2.73
	TM-00-5	14/12	0.12	1.83	1.71
	TM-00-6	15/12	0.14	4.40	4.26
				20.81	**18.34**
				50.58	**42.44**

4) Publications

A preliminary report on the shallow drilling methods and core results will be published as an Antarctic Research Centre Report in June 2001. This report will include much of the technical work on the drilling system, core logs and photographs, maps and cross sections. Copies of this report will be sent to Antarctica NZ.

Further publications of the scientific results will be published in international peer-reviewed scientific journals. Copies of this work will also be sent, when available, to Antarctica NZ.

5) Acknowledgments

Thanks to the following:

Prof Peter Barrett, (Director, Antarctic Research Centre, VUW)
Dean Peterson, Paul Woodgate and Pete Cleary, (Antarctica NZ)
All of the Scott Base personnel (Nov 2000 - Jan 2001)
Bill Gilmore and Kirsty Wade (Raytheon Polar Services, USA)
Bain Webster and Jeff Ashby (Webster Drilling Inc, NZ)
Prof Joe Trodahl and Eric Broughton (VUW)

Funding and Support

Antarctica New Zealand,
Strategic Development Fund, VUW
Netherlands National Science Foundation
Foundation for Research and Technology, NZ
US National Science Foundation, USA
Webster Drilling Inc, NZ

K047B
2000/2001

LOGISTICS REPORT

K 047 B Holocene Climate History from Coastal Ice
ANTARCTICA NEW ZEALAND 2000/2001

Event Personnel :

Ms. Nancy Bertler	Antarctic Research Centre, Victoria University of Wellington
Prof. Peter Barrett	Antarctic Research Centre, Victoria University of Wellington
Mr. Matthew Watson	University of Auckland and GroundSearch Ltd
Ms. Bridget Ayling	Victoria University of Wellington
Mr. Jordy Hendrikx	Victoria University of Wellington
Dr. Hamish McGowan	Victoria University of Wellington
Mr. Kevin Nicholas	Scott Base Staff

Holocene Climate History from Coastal Ice (K015B)

1. Aims of this Project

The dynamic climate system of Victoria Valley is created by the interacting influences of the Dry Valleys, the East Antarctic Ice Sheet and the Ross Sea. The sensitive balance and strong contrasts in this system means even subtle shifts in the regional annual temperature, sea ice extent, snow cover etc. significantly alter the local weather pattern. As such, a climate record of the Victoria Valley provides an ideal opportunity to study rapid, high frequency climatic variations.

During season 1999/2000 several shallow (30m) firn cores have been recovered from Victoria Lower and Baldwin Glacier. Their chemical and isotopic signals display the dynamics of the Victoria Valley, confirming the value of a long paleoclimate record from Victoria Lower Glacier (VLG). A 240m core from VLG is expected to provide a continuous data set of 10,000 years climate history, and will be recovered during season 2001/2002.

To fully explore the paleoclimatic significance of the ice cores, the Lower Victoria glacial system and the local climatic pattern have to be understood. For this bedrock topography and interior structures of VLG have been mapped, snow pits at VLG, Baldwin Glacier and Wilson Piedmont Glacier investigated and sampled, and current mass balance measured. A weather station, dust traps and ablation stakes haven been installed at VLG for the duration of eight weeks (Event Map).

In order to extent our record beyond 10,000 years, ice at the western snout of VLG (VIC2), has been investigated and sampled to determine its likely Pleistocene age.

Due to re-organisation of PICO (Polar Ice Coring Office, now Ice Core Drilling Services), the original plan of this *season 'Holocene Glacial Ice – a Continuous Paleothermometer'* has been altered, with the deep drilling (~240m) at VLG postponed until season 2001/2002. Instead we introduce some of the modules planned for our third field season*: 'Ancient Ice Deposits – Windows into the Past'*. The remaining project outline has been followed as proposed.

2. Planing

i) With the application process

The application procedure is very well organised resulting in a smooth process.

ii) With Antarctica New Zealand staff

Antarctica New Zealand staff appeared very helpful and competent

iii) Provision of maps and aerial photographs

No maps or aerial photographs have been requested

iv) To Pre-season Information

The information received was valuable and timely.

v) To Medicals, documentation and flights to Antarctica

It was well organised.

3. Cargo

All the cargo handling, including transport to and from Scott Base and storage at Scott Base and Christchurch, has been carried out with great care and professionalism.

Our cargo included ground penetrating radar, GPS, a weather station, snow sampling tools, a repair kit for the drilling system, mass balance measurement device, general equipment for ice core handling and laboratory items for the work at Crary Laboratory.

4. Personnel

Nancy Bertler, Principle Investigator
Antarctic Research Centre
Victoria University

Prof. Peter Barrett, Scientific Supervisor
Antarctic Research Centre
Victoria University

Matthew Watson, GPR Expert
University of Auckland
and GroundSearch Ltd

Bridget Ayling, Field Assistant
Victoria University of Wellington

Jordy Hendrikx, Field Assistant
Victoria University of Wellington

Dr. Hamish McGowan, Climatologist
Victoria University of Wellington

Mr. Kevin Nicholas, Field Guide
Scott Base Staff

5. Preparations for the field

i) Reception
The reception was well organised, friendly and efficient. The main issues of transport and time tables were discussed and determined.

ii) Equipment
The equipment requested from Scott Base was supplied in time and fully functional. This included two skidoos, a generator, and a chain saw. The Scott Base staff was very supportive and competent. In addition, equipment has also been requested from McMurdo Station, including, a light weight ice core drilling system from PICO, a generator (with American plug system and voltages), and a snow density kit.

iii) Field training
The field training was helpful and appropriate. The additional crevasse extraction training was appreciated.

iv) Delays at Scott Base
NA

6. Field Transport

i) Aircraft Operations

Date	Point of Departure	Destination	Personnel moved	General Comments
30 Oct 00	Dunlop Island	Victoria Lower Glacier	Bertler Watson Nicholas	weight 8,504 lb, 8 sling load shuttles with A-Star
09 Nov 00	Scott Base	Victoria Lower Glacier	Ayling Hendrikx	no incidents, weight ~ 800 lb, with 212
09 Nov 00	Victoria Lower Glacier	Scott Base	Watson Nicholas	no incidents, weight ~ 2600 lb, 2 shuttles with 212
20 Nov 00	Victoria Lower Glacier	Scott Base	Ayling	transferred to Scott Base for medical reasons, weight 300 lb, with 212
27 Nov 00	Scott Base	Victoria Lower Glacier	Ayling	no incidents, weight 300 lb, with 212

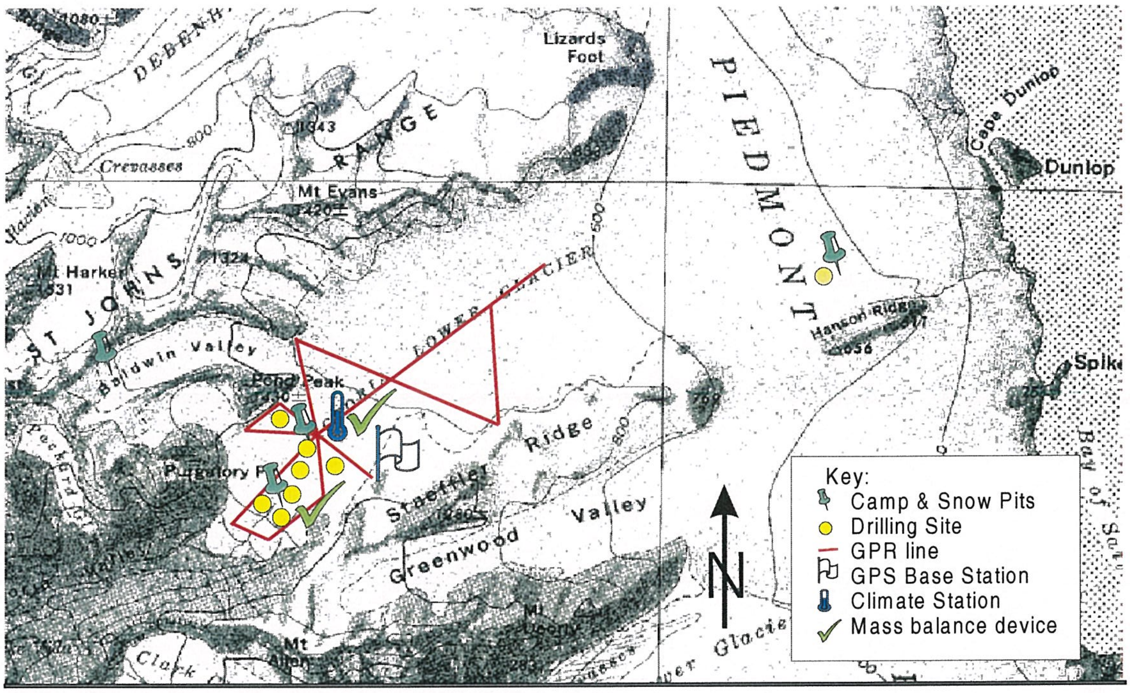
Date	Point of Departure	Destination	Personnel moved	General Comments
29 Nov 00	Victoria Lower Glacier	Cape Roberts	none	cargo only, sling double load of 1 skidoo and nansen sledge, weight 1,040 lb, with A-Star
02 Dec 00	Scott Base	Victoria Lower Glacier	McGowan	no incidents, weight 300 lb, with A-Star
02 Dec 00	Victoria Lower Glacier	Baldwin Glacier	Bertler Ayling Hendrikx McGowan	3 shuttles, weight 3200 lb, with A-Star
09 Dec 00	Baldwin Glacier	Wilson Piedmont Glacier	Bertler Ayling Hendrikx McGowan	via Victoria Lower Glacier, no incidents, 2.5 shuttles, weight 4030 lb, (including the equipment left at Victoria), with 212
09 Dec 00	Wilson Piedmont Glacier	Scott Base	McGowan	no incidents, weight 500 lb, with 212
14 Dec 00	Wilson Piedmont Glacier	Scott Base	Bertler Ayling Hendrikx	no incidents, weight 4000 lb, 2 shuttles with 212
18 Dec 00	Scott Base	Victoria Lower Glacier	Bertler	pick-up of climate station, no incidents, weight 400 lb, with 212

7. Event Diary

Date of Movement	Personnel moved	Destinations	Personnel at site, working tasks, and general comments
21 Oct 00	Bertler Watson	Arrival at Scott Base	Bertler, Watson and Nicholas • crevasse extraction training • preparation of the science gear • set up on skidoo and sledge
29 Oct 00	Bertler Watson Nicholas Leitch Brice	Dunlop Island (by Huggland)	Bertler, Watson, Nicholas, Brice, Leitch • preparation of the sling loads for transfer to Victoria Lower Glacier
30 Oct 00	Bertler Watson Nicholas	Victoria Lower Glacier	Bertler, Watson, Nicholas • camp set up at VIC1 • GPS base station set up • climate station set up • GPR/GPS survey of the glacier (a total of approximately 30km lines have been measured)

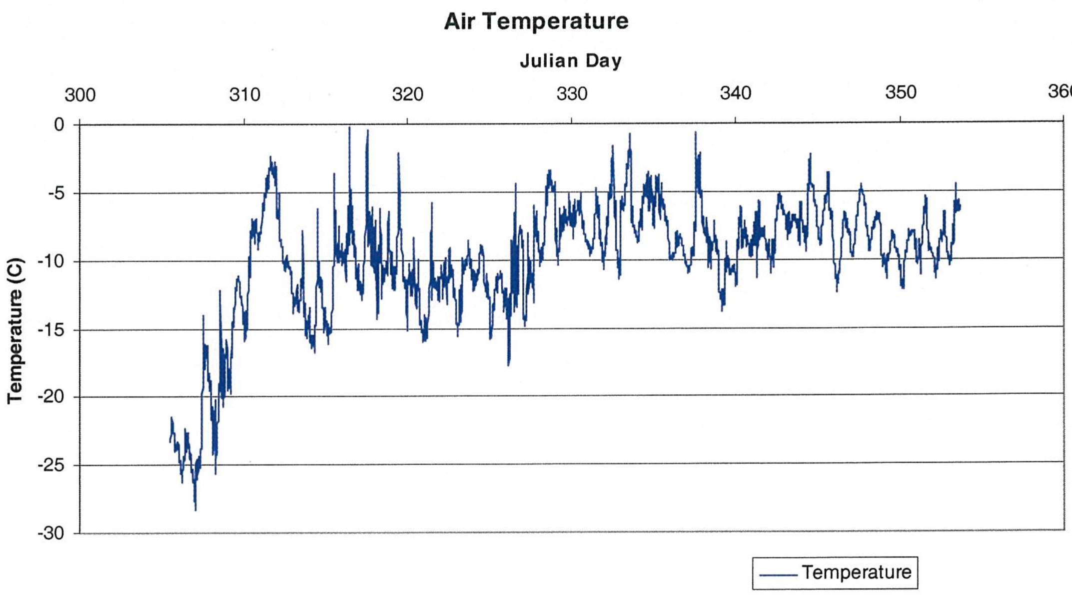
Date of Movement	Personnel moved	Destinations	Personnel at site, working tasks, and general comments
09 Nov 00	Watson* Nicholas* Ayling Hendrikx	Victoria Lower Glacier / Scott Base*	Bertler, Ayling, Hendrikx • emergency camp set-up at VIC2 • sampling two snow profiles at VIC 1 and VIC 2 (see location map) • recovery of ice cores from seven locations (see location map) including Pleistocene ice • GPS survey of all sampling sites • glacial mass balance measurement • ablation measurements • set-up of dust traps
20 Nov 00	Ayling	Scott Base	transferred to Scott Base for medical reasons
27 Nov 00	Ayling	Victoria Lower Glacier	return to field camp
02 Dec 00	Bertler Ayling Hendrikx McGowan	Baldwin Glacier	Bertler, Ayling, Hendrikx, McGowan • sampling of snow profile • set-up of dust traps • set-up of radiation measurement device for albedo values and radiant heat transfer within the snow pack • sampling of dust reference material • detailed hourly weather observation • GPS survey of glacier topography
09 Dec 00	Bertler Ayling Hendrikx McGowan*	Wilson Piedmont Glacier / *Scott Base	Bertler, Ayling, Hendrikx • camp set-up • sampling of snow profile • recovery of ice core • GPS survey of glacier topography • detailed weather observation
14 Dec 00	Bertler Ayling Hendrikx	Scott Base	Ayling, Hendrikx • leaving for Chch on 19 Dec 00 Bertler • work at Crary Lab, McMurdo on ice and snow samples • leaving for Chch on 02 Jan 01

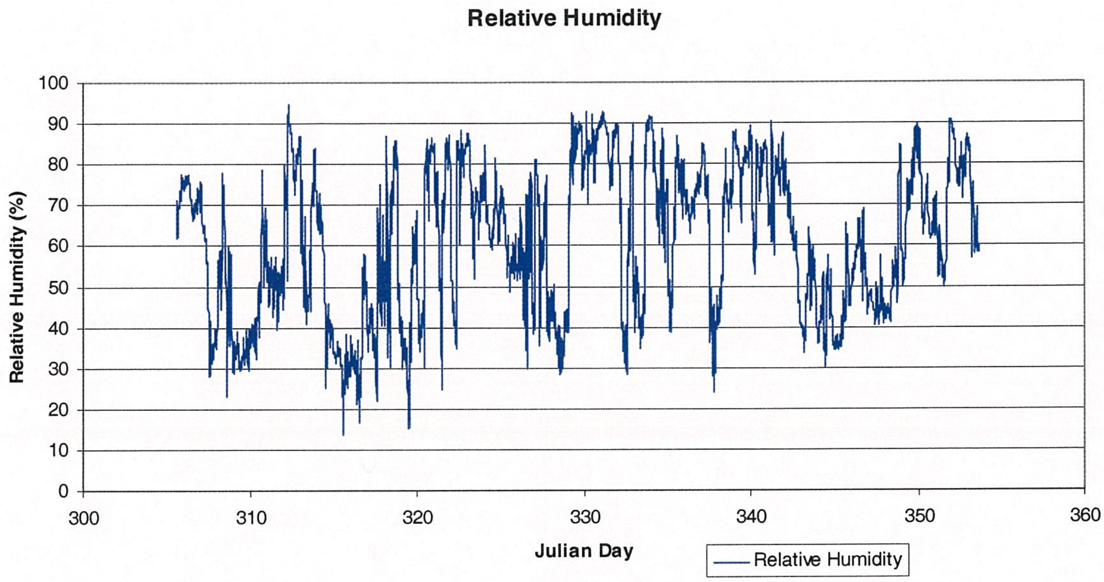
8. Event Map

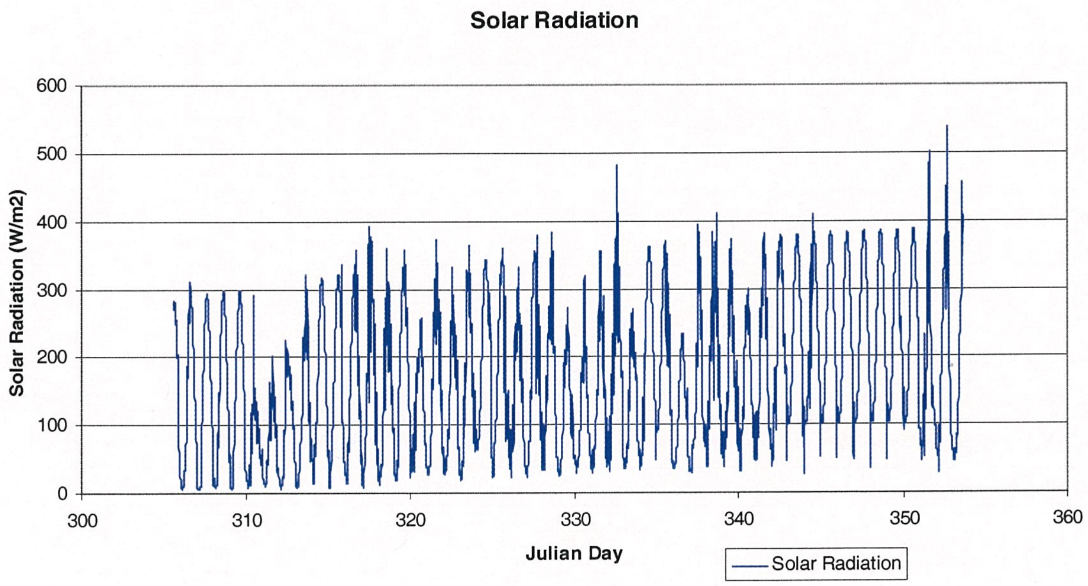


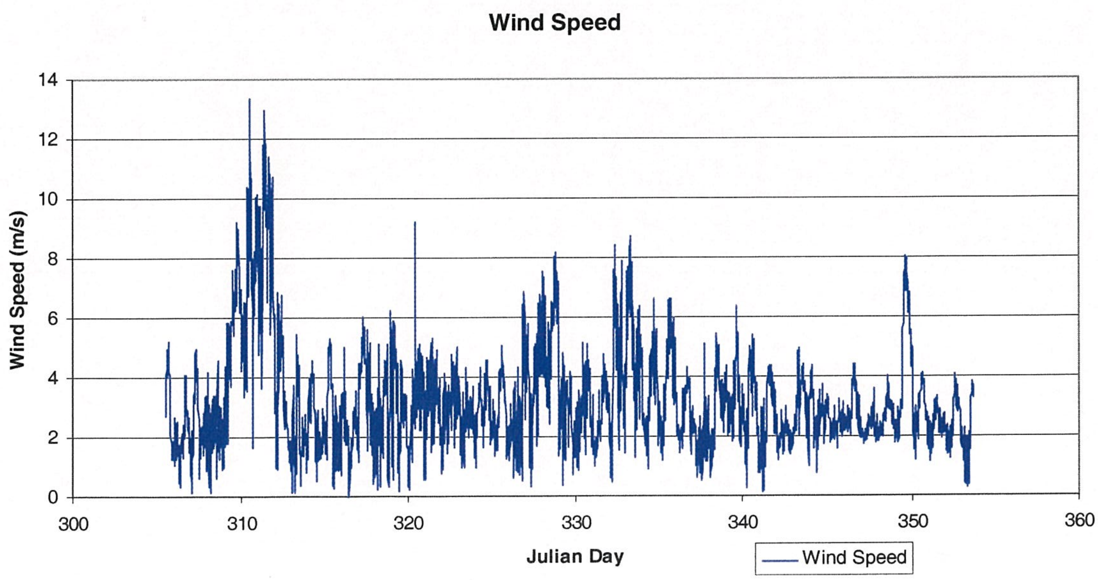
9. Weather

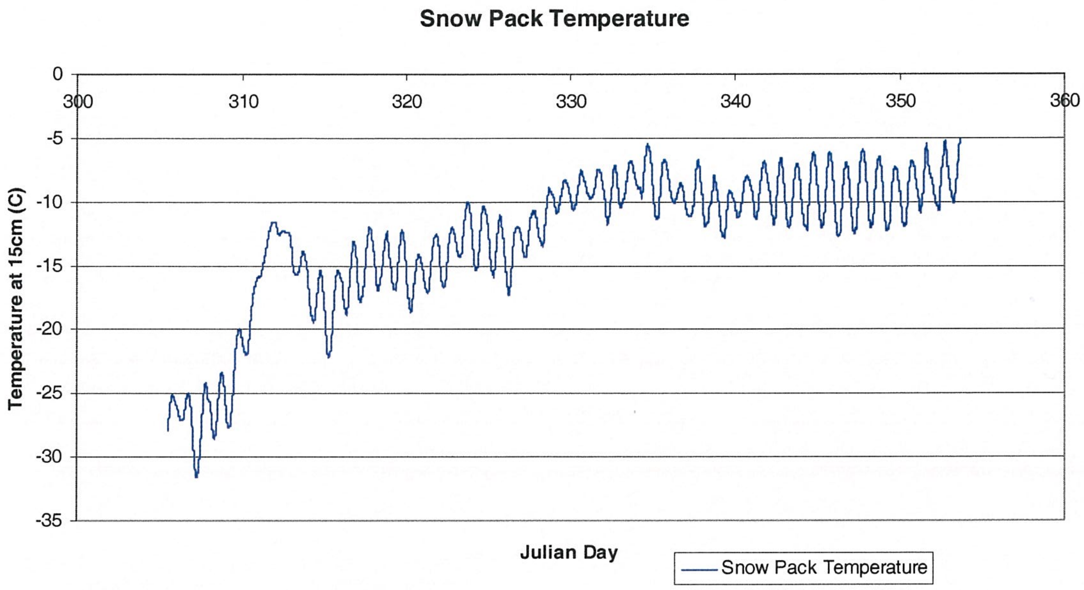
A weather station had been installed at Victoria Lower Glacier, S77°19.810'/ E162°31.991'




Relative Humidity
100
90
80
70
60
50
40
30
20
10
0
Relative Humidity (%)
300
310
320
330
340
350
360
Julian Day
Relative Humidity


Solar Radiation
600
500
400
300
200
100
0
Solar Radiation (W/m2)
300
310
320
330
340
350
360
Julian Day
Solar Radiation


Wind Speed
14
12
10
8
6
4
2
0
Wind Speed (m/s)
300
310
320
330
340
350
360
Julian Day
Wind Speed



10. Accidents, incidents or hazards

There have been no accidents, incidents or hazards.

11. Field Equipment

i) Field Clothing

The issued field clothing proved to be appropriate and satisfied greatly our requirements.

ii) Field Equipment

The supplied field equipment was in good shape and very reliable.

iii) Food in the field and at Scott Base

The 20 person day ration boxes were well packed in terms of nutrition and quantity.

The food offered at Scott Base was both: delicious and nutritious.

iv) Specific Field equipment

The allocated skidoos, the chain saw and generator were in good condition. The new service box proved to be of excellent use. The PICO hand auger with power head was in rather poor condition and without the re-supply of a variety of spare parts made up at Scott Base, drilling would not have been possible. We are very grateful for the innovative and supportive attitude of the Scott Base staff! The generator and snow density kit lent from the Berg Field Center performed well.

12. Radio Communication

i) Radio equipment
The radio kit issued (two VHF radios (old and new type), two batteries, one external aerial and two solar panels) worked reliably, with only minor communication problems.

ii) Reception and Transmission
The reception and transmission was in general satisfying. The external aerial was helpful, repeater stations were used during the whole time.

iii) Information during sheds
During the first part of our field work, the radio communication with Scott Base was very efficient, professional and highly appreciated.

13. Scott Base and Arrival Heights Laboratory Facilities

The summer laboratory has been used to test our science gear and was adequate.

14. Refuge and Research Hut

NA

15. Environmental Impact

i) Event Diary:

Victoria Lower Glacier

- Location S 77° 19.810' / E 162°31.991'
- Dates: 30 Oct to 02 Dec 2000
- Total days: 33
- Maximum number of people at site: 3
- Total person-days spent at site: 92
- Main activity undertaken: GPR, GPS, snow profile sampling and ice coring

Baldwin Glacier

- Location S 77° 19.836' / E 162°32.019'
- Dates: 02 Dec to 09 Dec 2000
- Total days: 7
- Maximum number of people at site: 4
- Total person-days spent at site: 28
- Main activity undertaken: snow profile sampling, GPS, radiation measurements

Wilson Piedmont Glacier

- Location S 77° 16.000' / E 163°15.000'
- Dates: 09 Dec to 14 Dec 2000
- Total days: 6
- Maximum number of people at site: 3
- Total person-days spent at site: 18
- Main activity undertaken: snow profile sampling, ice coring, and GPS survey

ii) Protected areas
N.A.

iii) Interference with terrestrial, freshwater or marine plants or animals
N.A.

iv) Collection of geological material
A total amount of 900 lbs of ice has been sampled

Victoria Lower Glacier:	~ 400lbs
Baldwin Glacier:	~ 100lbs
Wilson Piedmont Glacier	~ 400lbs

v) Chemicals taken to the field

0.5 ltr of Methanol have been taken into the field. The liquid has been handled with great care, no incident occurred.

vi) Use of explosives
N.A

vii) Importation to Antarctica
N.A.

viii) Equipment left in the field

Two mass balance systems (in form of 25m of wire and two 2.40m metal rods), which had been installed during season 1999/2000 have been visited and re-measured. An additional device has been installed at VIC 2 (see location map). Once further mass balance measurements are not required, as much as possible will be removed from the device.

Fig.1: Mass balance device

ix) Environmental impacts
The environmental impact of our work has been less than minor. The only observed source of pollution were exhaust fumes of the skidoos, generator, the chain saw and helicopters.

x) Occurrence of incidents
N.A.

xi) Changes from the PEE
Scenario I has been followed as described in the PEE

16. Historic Sites

NA

17. Management of Science in the Ross Dependency

The support from Scott Base was very helpful and highly appreciated.

18. Antarctic Geographic Place Names

NA

K047B
2000/2001

IMMEDIATE SCIENCE REPORT

K 047 B Holocene Climate History from Coastal Ice

ANTARCTICA NEW ZEALAND 2000/2001

Event Personnel :

Ms. Nancy Bertler	Antarctic Research Centre, Victoria University of Wellington
Prof. Peter Barrett	Antarctic Research Centre, Victoria University of Wellington
Mr. Matthew Watson	University of Auckland and GroundSearch Ltd
Ms. Bridget Ayling	Victoria University of Wellington
Mr. Jordy Hendrikx	Victoria University of Wellington
Dr. Hamish McGowan	Victoria University of Wellington
Mr. Kevin Nicholas	Scott Base Staff

Holocene Climate History from Coastal Ice – K047B

1. Popular Summery of Scientific Work Achieved

The dynamic climate system of Victoria Valley is created by the interacting influences of the Dry Valleys, the East Antarctic Ice Sheet and the Ross Sea. The sensitive balance and strong contrasts in this system means even subtle shifts in the regional annual temperature, sea ice extent, snow cover etc. significantly alter the local weather pattern. As such, a climate record of the Victoria Valley provides an ideal opportunity to study rapid, high frequency climatic variations.

During season 1999/2000 several shallow (30m) firn cores have been recovered from Victoria Lower and Baldwin Glacier. Their chemical and isotopic signals display the dynamics of the Victoria Valley, confirming the value of a long paleoclimate record from Victoria Lower Glacier (VLG). A 240m core from VLG is expected to provide a continuous data set of 10,000 years climate history, and will be recovered during the 2001/2002 season.

To fully explore the paleoclimatic significance of the ice cores, the Lower Victoria glacial system and the local climatic pattern have to be understood. For this bedrock topography and interior structures of VLG have been mapped, snow pits at VLG, Baldwin Glacier and Wilson Piedmont Glacier investigated and sampled, and current mass balance measured. A weather station, dust traps and ablation stakes haven been installed at VLG for the duration of eight weeks (Map 1).

In order to extend our record beyond 10,000 years, ice at the western snout of VLG (VIC2), has been investigated and sampled to determine its likely Pleistocene age.

2. Proposed Programme

Due to re-organisation of PICO (Polar Ice Coring Office, now Ice Core Drilling Service), the original plan of this *season 'Holocene Glacial Ice – a Continuous Paleothermometer'* has been altered, with the deep drilling (~240m) at Victoria Lower Glacier (VLG) postponed until season 2001/2002. Instead we introduce some of the modules planned for our third field season*: 'Ancient Ice Deposits – Windows into the Past'*. The remaining project outline has been followed as proposed.

Hence the main emphasis of this year's fieldwork was to conclude the preparation for drilling and interpreting a 10,000 year climate record and to investigate the western snout of VLG for the possibility of providing a Pleistocene climate record.

For this we proposed:

- to map bedrock topography and internal glacial structures of VLG
- to sample four snow pits on VLG, Baldwin and Wilson Piedmont Glacier
- to recover shallow ice and firn cores from VLG and Wilson Piedmont Glacier
- to measure the current glacial mass balance of VLG
- to record the weather observations from VLG, Baldwin, and Wilson Piedmont Glacier and to compare them with climate records from Marble Point, Lake Vanda and Lake Vida
- to measure current dust flux
- to quantify radiant heat flux in the snow pack and albedo values

3. Scientific Endeavours and Achievements

The second field season of our project: *Holocene Climate History from Coastal Ice* has been interesting and successful. Four main sites have been visited: Victoria Lower Glacier (VIC 1 and 2), Baldwin Glacier and Wilson Piedmont Glacier.

Victoria Lower Glacier S77°19.810', E162°31.991'

In order to map bedrock topography and internal structures of Victoria Lower Glacier, we used ground penetrating radar, employing different antennae frequencies (35, 200, and 400MHz) for different resolution and penetration depths. The radar profiles are accurately located using differential, kinematic GPS, with a base station device deployed on the southern margin of the glacier. The radar profile displays a glacier depth of 240m at the proposed deep drilling site (VIC1), with a maximum depth of 350m further to the north and confirms the suitability of VIC1 for a long-term paleoclimate record. The internal structures indicate the possibility of an inverse flow to the west of the Wilson Piedmont Glacier during the last 18,000 years.

Fig.1: Ground penetrating radar Measurement

Eight shallow firn and ice cores have been recovered from VLG. The sites are aligned along two transects perpendicular to each other. One from west to east along the glacier axis (glacier snout towards the future deep drilling site, located on the glacier dome) and one south to north, across the glacier with the deep drilling site in the middle (Map 1). The west-east sequence cuts across the assumed Pleistocene ice towards the active, Holocene part of Victoria Lower Glacier. Although no extended ice core could be recovered from the western snout, enough material was recovered to extract methane from the enclosed air bubbles to determine, whether this part of the glacier is in fact of Pleistocene age. The sequence of cores will allow us to test the results of the GPR and to quantify the variability of the climate record on the glacier.

Two snow profiles (5m and 1m depth at VIC1 and VIC2) have been investigated and sampled in 1cm resolution for major ion content, isotope ratios, and in 5cm resolution for dust flux and beta radioactivity. The samples were stored below 2m depth in a cave within the pit to secure temperatures below –17C. Temperature, crystal geometry, and density of the snow profile have been measured on site.

Fig.2: Snow profile sampling

Fig.3: Mass balance device

Mass balance measurements, deployed during season 1999/2000 season, have been continued using high precision, differential, static GPS. The device has been left at the site (VIC 1) for future measurements and a new system has been installed at VIC2 (Map 1). The set-up allows to quantify total accumulation or ablation of the glacier.

A climate station, measuring temperature, wind speed and direction, relative humidity, solar radiation and snow pack temperature had been installed for the duration of eight weeks in the proximity of Victoria Lower Glacier Camp (VIC1).

The correlation of our observations with meteorological records from Marble Point, Lake Vida and Lake Vanda will determine the differences between local weather pattern. This will help us to establish transfer functions between the 40 year Marble Point record and our ice core parameter.

Furthermore temporary ablation stakes for mass balance measurements and dust/diatom traps have been employed for the same length of time. The ablation stakes were used to quantify weekly changes in snow cover due to precipitation and ablation. Dust mineralogy, grain size and relative quantity will be correlated with the VLG weather record to determine source areas and associated wind characteristics. Diatom analysis serves as a reference record for species found in the snow and ice samples.

Fig.4: Climate Station at VIC 1

Baldwin Glacier S77°19.836', E162°32.019'

Baldwin Glacier serves as a reference record for our Victoria Lower Glacier analyses. The differences in the data set will allow to separate the regional input from the local one. A 4m snow profile has been sampled in 1cm resolution for major ion content, isotope ratios, and in 5cm resolution for dust flux and beta radioactivity. Temperature, crystal geometry, and density have been measured on site. Due to unusually high snowfall during November 2000 we were able to take contemporary snow samples during different synoptic weather conditions. Dust samples have been collected from the rocky outcrops around the glacier to allow the source area of the dust in the ice cores to be determined and distinguished from the Victoria Lower Glacier Source.

To study post-depositional processes within the snow pack, a radiation and snow temperature flux device have been installed for the time of our staying on Baldwin Glacier. The radiation device measures incoming and outgoing levels, so a radiation balance can be calculated. The temperature flux device measures the temperature at different heights in the snow pack, allowing the warming or cooling gradient within the pack to be calculated and modelled.

Hourly weather observations on site will be correlated with the measurements from the climate station on Victoria Lower Glacier to construct typical weather patterns of the region.

The glacier topography has been surveyed in the vicinity of our study site using differential, static GPS to correct for the slope angle.

Wilson Piedmont Glacier S77°16.000', E163°15.000'

The site at the Wilson Piedmont Glacier allows investigation of succeeding precipitation composition from the sea to the Dry Valleys, and serves therefore as a reference for our Victoria Lower Glacier record. The correlation between the data sets enables us to distinguish between marine and terrestrial major ion species and their varying influence through seasons and time. A 3m snow profile has been sampled in 1cm resolution for major ion content, isotope ratios, and in 5cm resolution for dust flux and beta radioactivity analyses. Temperature, crystal geometry, and density have been measured on site.

A shallow (23m) firn core has been recovered from the Wilson Piedmont Glacier. The correlation of this transect of cores from the coast to the Dry Valleys enables a model of input source and timing to be established.

Fig.5: Drilling of firn cores at Wilson Piedmont Glacier

Borehole temperature indicates an average annual temperature of –21.6C, with the winter wave located between 3 and 8m depth. The glacier topography has been surveyed in the vicinity of our study site using differential, static GSP.

Six hourly weather observations on site will be correlated with the measurements from the climate station on Victoria Lower Glacier and assist in tracing typical weather paths.

Crary Laboratory

Ice cores were to be split and logged in a working freezer at the Crary laboratory, McMurdo Station, over a two week period. An ice core light table helped to record crystal structures, melt and dust layers and to identify areas of material loss. However the fresh water ice core band saw had been used by other research groups to cut sea ice cores and fish, which prohibited the use of the saw for our samples. For this reason we were unable to split the cores, and they were subsequently all sent to the United States for processing.

Methodology

- *Ground Penetrating Radar (GPR) Measurements*
  A GPR system was hired from Auckland University and GroundSearch Ltd. We employed three different antennae (35, 200 and 400 MHz). The 35 MHz antenna pair was used in differential mode, so absolute depths of the glacier could be calculated. The system was deployed on a Nansen sledge towed and secured by two skidoos, allowing a vast area of the glacier to be investigated.

- *Differential Global Positioning System (GPS) Measurements*
  The GPS system Trimble 4000 SSE performed well, with the base station installed on the southern glacier margin. The GPS system was used for our GPR and mass balance measurements.

Fig.6: GPS base station

- *Snow Profiling and Sampling*
  Four snow profiles (5, 1, 4 and 3m) were described and sampled. After a detailed description of the physical features, the pits were sampled in 1cm resolution for isotopic ratios and major ion content. In order to avoid contamination of the chemistry samples, clean suits and high density polyethylene gloves were used. All sampling tools have been regularly cleaned with methanol. Dust and beta activity samples were taken with 5cm spacing. While the dust could be filtered in the field, the radioactivity samples had to be transported back to NZ. Density and temperature values were measured on site.

- *Ice Core Drilling*
  For the ice core drilling the PICO (Polar Ice Coring Office) hand auger with power head was used. The system was received in poor condition, and drilling hard ice was not possible. However Scott Base supplied numerous spare parts, wherefore the drilling performance was improved and firn cores were recovered.

- *Borehole Temperature Measurement*
  Coupled conductivity wire were used to read the temperature profile. The meter displayed a high sensitivity to the ambient air temperature and had to be kept above 0°C.

- *Meteorological Measurements*
  A climate station was installed at Victoria Lower Glacier for eight weeks. The record included air temperature, relative humidity, wind speed and direction, air pressure, and snow pack temperature.

- *Current Dust and Diatom Flux*
  In order to measure current dust and diatom flux on Victoria Lower Glacier two traps were deployed in the proximity of the VLG camp (VIC 1). The containers in the traps were collected and replaced every three days.

- *Current Ablations Measurements*
  15 Ablation stakes were placed at VLG in the vicinity of the climate station. The relative change of snow depth was measured weekly or after individual snowfall events.

4. Publications

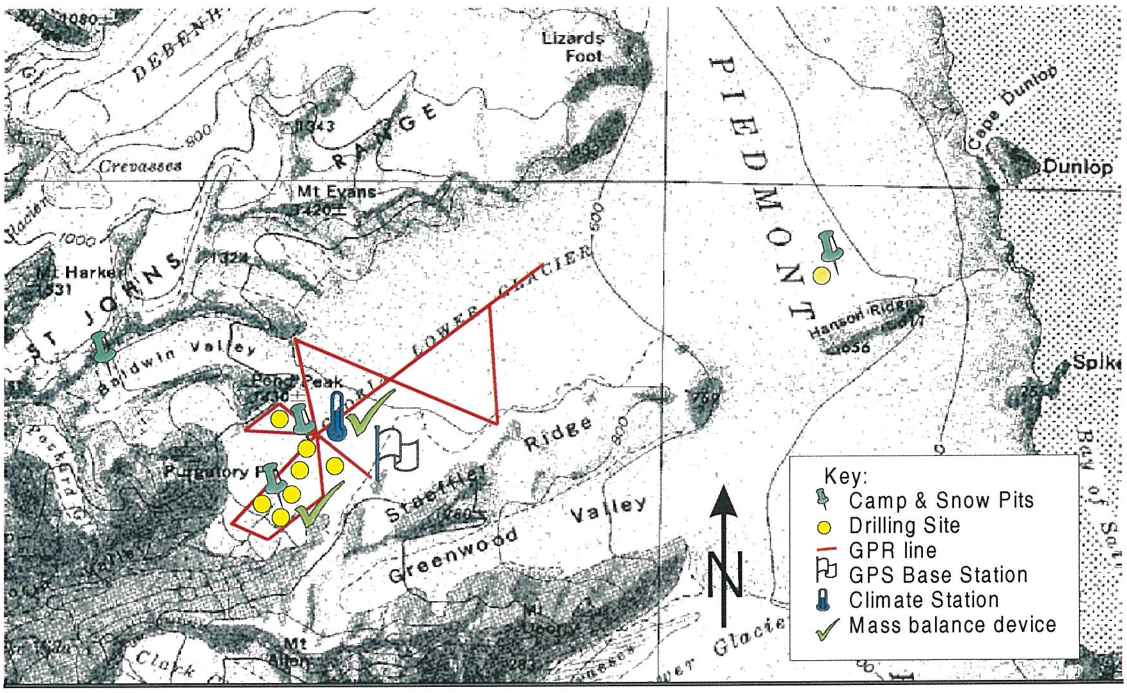
The results will be published in peer reviewed papers in co-authorship with Peter Barrett, Paul Mayewski, Matt Watson, James Shulmeister, Warren Dickinson, Alex Pyne, Todd Saywers, Karl Kreutz, and Tony Gow.

5. Acknowledgements

Many people were involved in the successful completing of this field season. Of particular note are:

- Peter Barrett, Warren Dickinson, Alex Pyne and Jamie Shulmeister for useful discussion on scientific goals and field techniques
- Scott Base Staff, especially Peter Cleary for field assistance, logistical and mechanical support,
- Paul Mayewski, Gordon Hamilton, for providing the laboratory facilities in the United States
- Tim Haskell, for providing freezer facilities in New Zealand
- PICO, especially Dave Giles, for technical advice on the drilling gear
- Crary Laboratory, especially Robbie Score, Berg Field Center, US Science Cargo and NSF, especially Julie Palais, for logistical and mechanical support at McMurdo Station

Event Map


Key:
Camp & Snow Pits
Drilling Site
GPR line
GPS Base Station
Climate Station
Mass balance device
Lizards Foot
PIEDMONT
Cape Dunlop
Dunlop
Mt Evans
Mt Harker
Crevasses
LOWER GLACIER
Baldwin Valley
Hanson Ridge
Ridge
Valley
Greenwood
Purgatory
Spike
Bay of Salt
Mt Allen