

## **The Broken River Avalanche of August 1992; Craigieburn Range, New Zealand.**

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The Broken River avalanche resulted from a combination of factors typical of New Zealand weather conditions, especially in the intermontane areas - cold enough to develop depth hoar but maritime enough to allow rainfall to high elevations in mid-winter. It occurred in one of several ski basins located above timberline in south-east facing former cirques.

An overview of the starting zone shows that snow over almost the entire basin failed. The initial release was on the steeper shady aspects followed by propagation towards the sunny aspects. Approximately 40,000 t was involved. Avalanche speeds were relatively slow and most snow remained within the cirque basin deposited in depths up to 30 m. About one quarter of the debris flowed over the lip such that the total length of run-out was 1.2 km.

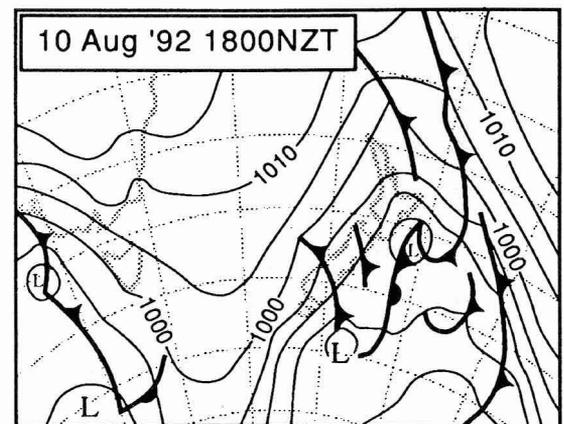
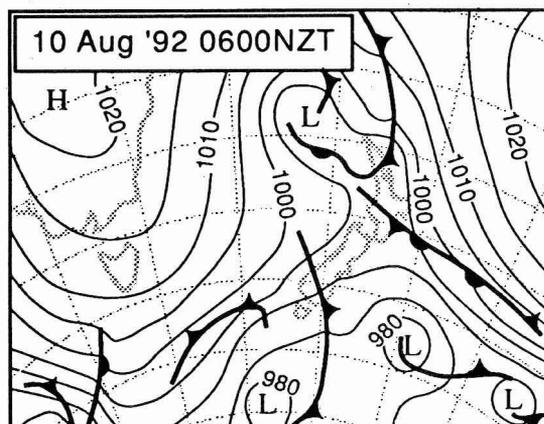
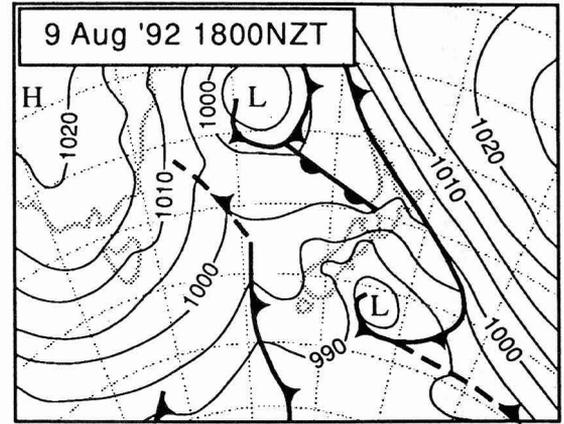
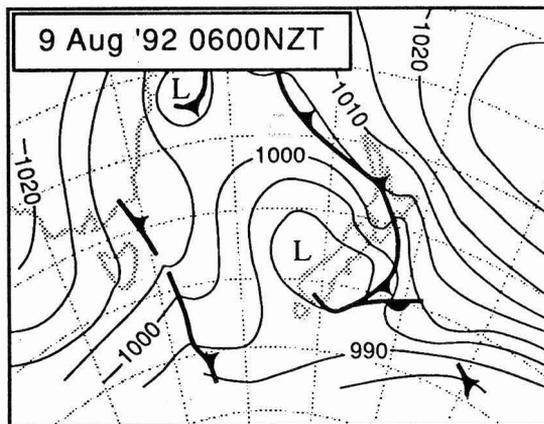
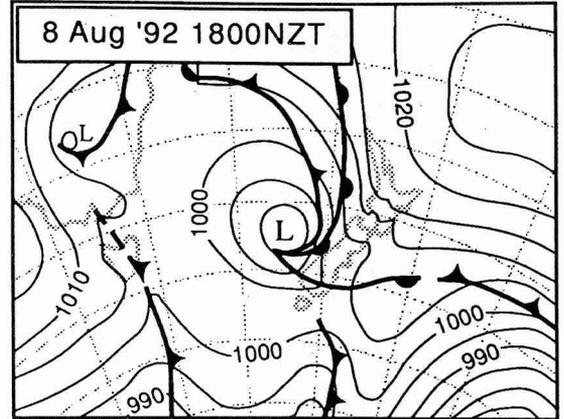
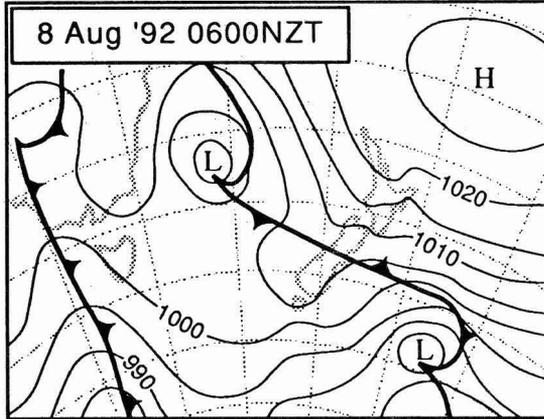
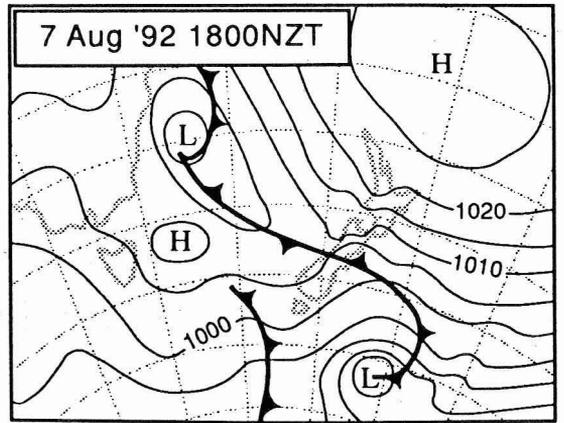
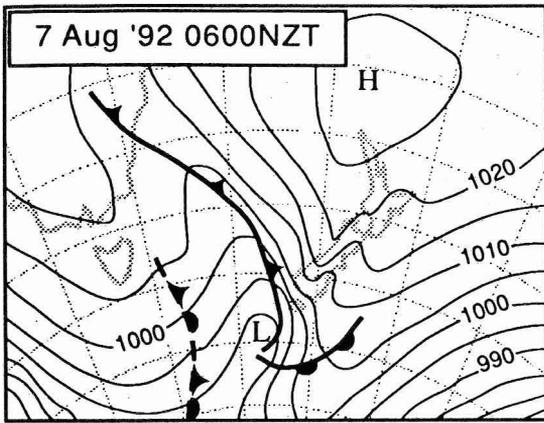
The avalanche occurred at 1300 hr on a clear day. While the skifield was open, only the Rugby Tow was operating. Three people were clearing the rope on the Main Tow when the avalanche occurred. Two near the top clung to the rope while the avalanche moved out from under them but one person lower down was swept away and has not yet been recovered. A groomer working near the Rugby Tow was engulfed by the avalanche and may have been the trigger. Approximately 60 people were on the field; fortunately most were in Palmer Lodge when the avalanche occurred.

The 1992 winter was characterised by several heavy snowfalls interspersed with cold periods (at least by New Zealand standards). This produced a weak layer of depth hoar in the bottom 15 cm of the snowpack on all aspects.

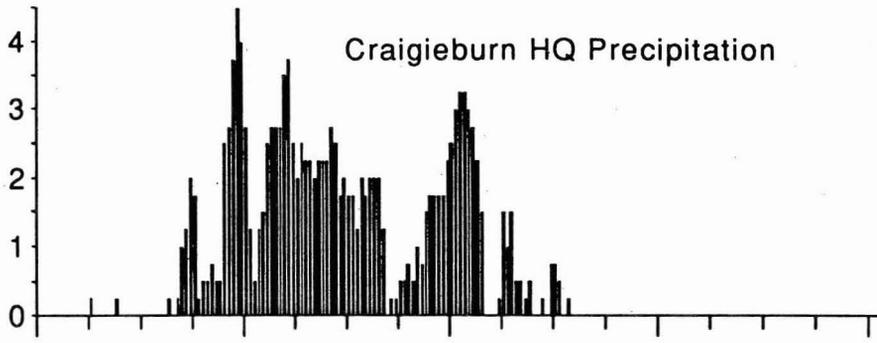
Synoptic conditions progressed from a period of north-westerly flow to passage of an intense low pressure system with associated fronts and ended with a disturbed south-westerly flow. As a result, very heavy rainfall totaling almost 150 mm (6") occurred to ridge line in the period 24 to 72 hours before the avalanche. The 24 hours before release were clear and cold and the top 30 cm or so of the snowpack was frozen to produce a hard slab. Below this the snow remained moist and creep within this layer undoubtedly placed the slab under considerable tension.

# Crown Wall Profile

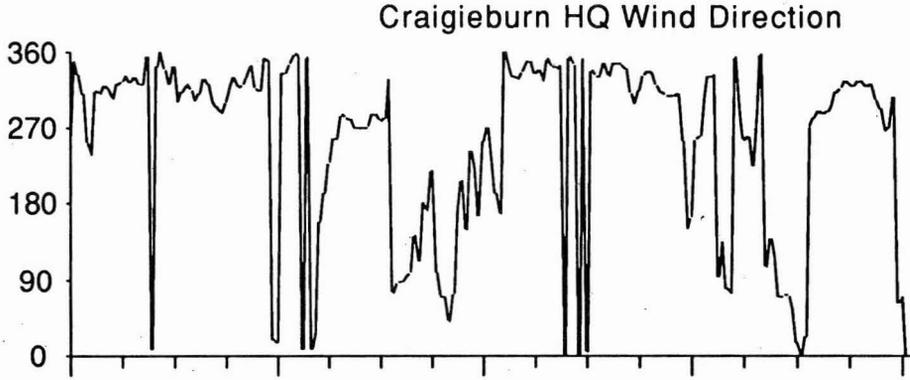
ORGANIZATION														
SNOW PROFILE														
DATE 11/8/92			TIME 1330			OBSERVER Ed & Gerry								
LOCATION Broken River (Skiers left, top main tow)						ELEVATION								
ASPECT East			SLOPE ANGLE 26°			SURFACE ROUGHNESS								
SKY		AIR TEMP -5.3°C		WIND SPEED		WEATHER NE (Light)								
WATER EQUIVALENT				FOOT PENETRATION				NR		AV DENSITY				
T	-16°	-14°	-12°	-10°	-8°	-6°	-4°	-2°	H	F	D	W	G	COMMENTS
									cm		mm		kg/m <sup>3</sup>	
									140					
									130					
									120					
									110					
									100					
									90	○ <sub>c</sub>	1 - 2	D	320	
									80	○ <sub>c</sub>	2	D		
									70	○	1	M	430	
									60	●	1	M		
									50	●	1 - 0.5	M		< collapse shovel shear x2
									40	○				
									30	●	.5	M		
									20					
									10	○ <sub>c</sub> □ <sub>c</sub> ^		M		< collapse at base easy x2
R	K				P		1F	4F	F					



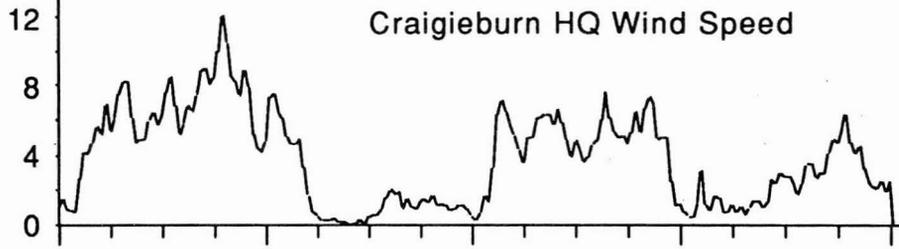
Precipitation (mm / 30min)



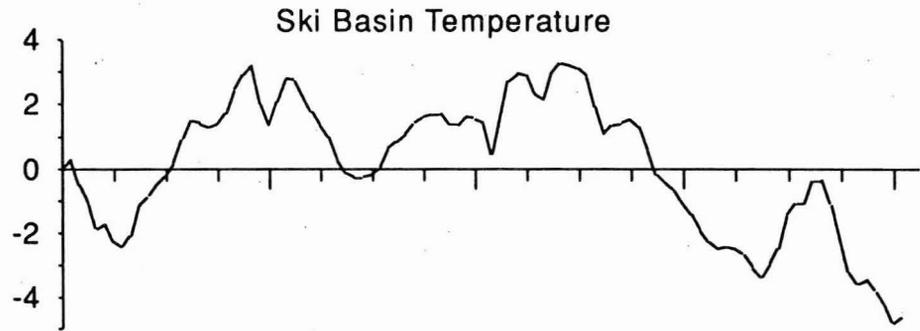
Wind direction (°)



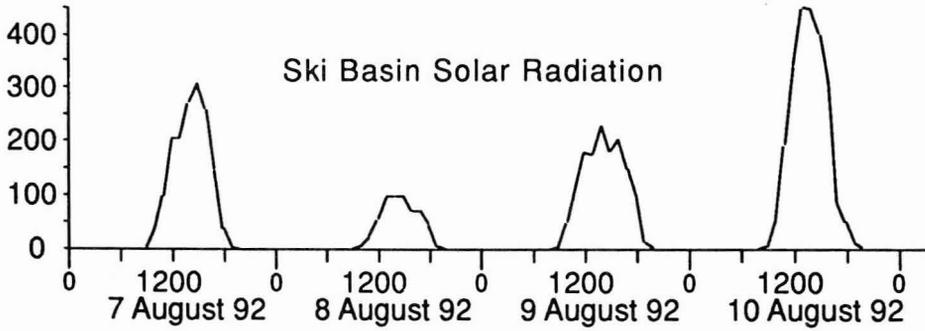
Wind speed (m/s)

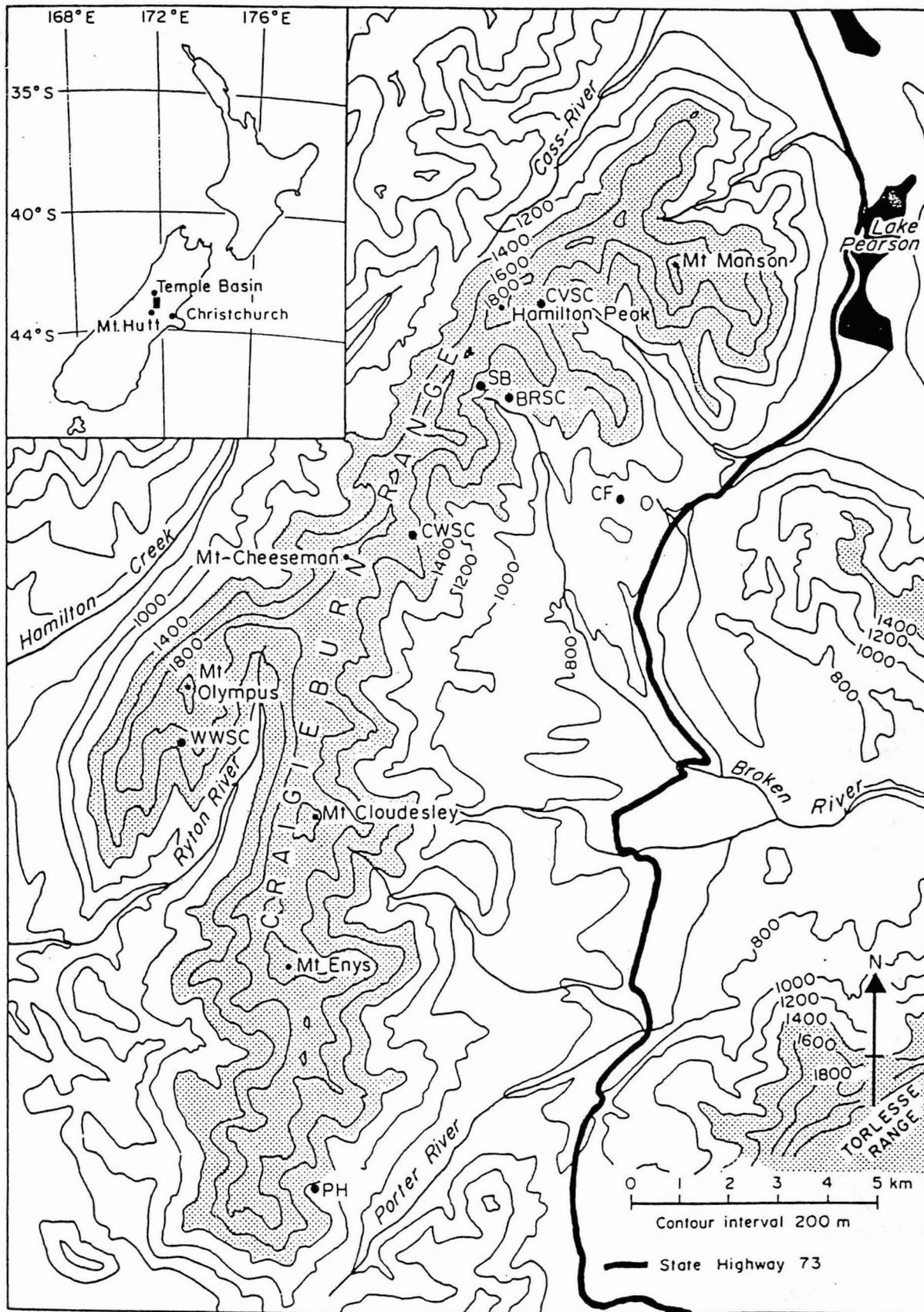


Air Temperature (°C)



Solar radiation (W/m<sup>2</sup>)





PH — Porter Heights, WWSC — Windwhistle Winter Sports Club, CWSC — Canterbury Winter Sports Club, BRSC — Broken River Ski Club, SB — Ski Basin Meteorological Station, CF — Craigieburn Forest Park HQ, CVSC — Craigieburn Valley Ski Club.

