THE WEST COAST
REGIONAL COUNCIL

Report on
West Coast Weather Event
27 & 28 December 2010

Flooding at Saltwater Creek, Paroa, 28 December 2010
photo courtesy of Jason Boddy

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1. Introduction

The 27 / 28 of December 2010 rainfall event produced flooding coast wide, affecting areas from Haast to Karamea. Analysis of the event shows that throughout the region it ranged between a 1 in 5 year event and 1 in 50 year event depending on the catchment. This event was unique in that it did not just affect a localised part of the West Coast but instead affected the whole region, and also the Tasman, Marlborough, Canterbury, and Otago regions making it an almost South Island wide event. In Tasman District it resulted in a 1 in 150 year event on the Aorere River, in Marlborough District it was a 1 in 60 year event on the Pelorus River, and in Canterbury between 1 in 50 and 1 in 100 year event for the Rakaia River.

The West Coast Region was almost completely cut off due to a number of slips and several bridges being damaged.

This report is a compilation of information collected from various sources to show the extent of the flood event. Information used in the report includes:

- Photographs and individual accounts (from council staff, territorial authorities and the public);
- West Coast Regional Council Flow/Rainfall Data;
- National Institute of Water and Atmosphere Flow/Rainfall Data;
- Information relating to West Coast Regional Council engineering assets affected by event; and,
- Information from Civil Defence and Emergency Management staff.

This report collates all of this material for the December 2010 event.

To compliment this report a study is being undertaken using an Envirolink grant examining the event from a South Island wide view. This has been instigated through Tasman District Council. West Coast Regional Council has provided information to this study.

The results of this report will be reported in the Journal of Hydrology.

The Council would like to acknowledge all the people who have contributed to this report through photos, interviews, and comments on the flood event.

The people in our community who are involved in our flood warning system are also acknowledged. They help us to provide a reliable service to the community.

2. Description of Event

A warm moist north-easterly flow followed by a large cold frontal system caused heavy rain from Haast to Karamea. This system tracked from south to north. Heavy rain began to fall in Haast around 0100hrs on 27 December and reached Karamea at approximately 1900hrs the same day.

Prior to this event, there were smaller rain events on 21 December and again on 24 December. This meant that ground conditions were already wet and moderately saturated prior to 27 / 28 rainfall, resulting in less rainfall required producing run off resulting in higher surface flows for rivers in the region.

Synoptic weather charts and satellite images of the event are attached as **Appendix 1**.

2.1 Information Collected

Analysis of the event that has been undertaken include:

- Peak flow/water level for a range of rivers in the region, and an estimation of return period for these rivers (Table 1);
- Rainfall frequency analysis (duration return period) for selected rain gauges in region (Table 2); and,

- Rainfall daily totals from 21st to 29th for above rain gauges (Table 3).

Both the rainfall frequency analysis and the river flow frequency analysis were done using a Gumbel distribution. Note: the estimated return periods should be treated with caution and are subject to change in the future as both rainfall and flow records are extended.

Table 1: Peak Flow/Water levels and return period analysis of peak

River / Location of gauge	Date and time of peak	Peak Level (mm)	Peak Flow (m3/s)	Est return period
Karamea River / Gorge	28/12/2010 09:30	5975	3126	19.
Mokihinui River / Welcome Bay	28/12/2010 08:00	n/a	2853	20-50*
Buller River / Te Kuha	28/12/2010 18:15	10927	6714	10
Buller River / Woolfs	28/12/2010 15:40	7229	3847	9
Inangahua River / Landing	28/12/2010 08:30	6255	2250	16
Inangahua River / Blacks Point	28/12/2010 09:00	3323	495	4
Grey River / Waipuna**	28/12/2010 09:45	5056	1115	8.0**
Ahaura River @ Gorge	28/12/2010 11:45	6731	2333	14
Grey River / Dobson	28/12/2010 16:30	5862	4614	6
Taramakau River / Greenstone Bridge #	28/12/2010 08:45	7168#	2750#	n/a
Taipo River / SH Bridge	28/12/2010 03:45	4321	617	>2
Hokitika River / Colliers Ck / Gorge##	28/12/2010 03:15	6181	3071	53
Whataroa River / SH Bridge	28/12/2010 00:30	7846	3442	7
Waiho River @ SH Bridge	27/12/2010 14:15	7885		n/a
Haast River / Roaring Billy	28/12/2010 00:30	6327	4729	6
Arawhata River / Country Bridge	27/12/2010 20:30	5471	2670	7.8

* Mokihinui based on anecdotal information not enough record to calculate return period

** Based on 12 years record Grey Rv @ New Waipuna

Peak not recorded due to flood damage to recorder

Combined record of Hokitika Rv @ Colliers and Hokitika Rv @ Gorge

Table 1 indicates that the event was a region wide event resulting in flood return periods ranging from 5 to 50 years. In some locations where there is no current data, it is likely that flood exceedances up to or greater than a 50 year return period occurred. Anecdotal evidence from people who have lived in these areas for a significant time suggests that the flood was the largest they had seen.

Table 2: Rainfall duration and frequency analysis for selected rain gauges in the West Coast Region.

Maximum rainfall depths (mm) and estimated return periods, 26-29th Decemeber 2010

Station(number)(Catchemnt)		1 hour	2 hours	6 hours	12 hours	24 hours	48 hours	72 hours
Karamea River @ Arapito	Depth	6.8	13	34	53.8	61.8	61.8	61.8
	Return Period	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years
Sirdar Ck @ Paparoa	Depth	23.5	45	113.5	181	247.5	284.5	285
	Return Period	<2 years	<2 years	5 years	7years	9 years	5 years	<2 years
Inangahua River @ Landing	Depth	19.5	36	87	117	138	152.5	152.5
	Return Period	<2 years	2 years	13 years	10 years	5 years	3 years	<2 years
Grey River @ Conical Hill	Depth	9	17	44	70	83.5	92	92
	Return Period	<2 years	<2 years	2 years	3 years	2 years	<2 years	<2 years
Grey River @ Waipuna	Depth	7	11.5	21.5	30.5	33.5	39.5	39.5
	Return Period	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years
Ahaura River @ Gorge	Depth	9.5	17.5	34.5	47.5	56	66.5	66.5
	Return Period	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years
Grey Rv @ WCRC 2	Depth	8.5	17	46	74.5	96.5	130	130
	Return Period	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years	<2 years
Taipo River @ SH Br	Depth	29.7	57.2	145	248.1	298.7	355.8	355.8
	Return Period	4 years	8 years	13 years	20 years	11 years	10 years	<2 year
Butchers Ck @ Butchers Gully	Depth	18.3	34.6	83.8	131.4	180.6	231.4	231.4
	Return Period	<2 years	<2 years	5 years	5 years	5 years	<2 years	<2 years
Hokitika River @ Colliers Ck	Depth	36.5	68	178	286	449	522	523
	Return Period	<2 years	<2 years	3 years	3 years	5 years	3 years	<2 years
Cropp @ Waterfall	Depth	48	92.5	258	396.5	656.5	774	780
	Return Period	<2 years	<2 years	4 years	5 years	11 years	5 years	2 years
Whataroa River @ SH Br	Depth	31	46	114.5	169	314	377	378
	Return Period	<2 years	<2 years	<2 years	7 years	9 years	5 years	<2 years
Waiho River @ Douglass Rock	Depth	32.5	61	166.5	244	421	481	482
	Return Period	<2 years	<2 years	9 years	6 years	8 years	4 years	<2 years
Haast River @ Roaring Billy	Depth	33	61	162	252	381.5	433	447.5

Rainfall depth is in mm. Yellow = Moderate return periods (2-5 years) and Blue = Larger return periods (5-50+).

Table 2 shows that the intensity of the rainfall event was again evenly spread throughout the region with intense rain falling from Haast to Karamea. Rain gauges in neighbouring regions also recorded very heavy rainfall with return periods greater than 50 years for some of the durations. Table 2 indicates that this was an intense medium to long term duration event with 6-24 hours producing significant rainfall depths and in some cases 48 hour significant falls. Note that rainfall intensities are somewhat lower return period for all duration than the estimated return period for flows (i.e. 10-20 year rainfall producing up to 50 year flows) this is in part due to the antecedent conditions in the catchment with produced larger flows (see Table 3). The Grey River Valley lower level rain gauges (mid catchment) did not receive significant rainfall depths (but did receive significant flows - see Table 1 Grey River @ Waipuna and Grey River @ Ahaura), indicating that rainfall depths in the southern part of the Grey catchment and the higher altitude parts of the catchment were the main sources of flooding for the Grey River during this event.

Table 3: Daily totals in mm for selected rain gauges in the region.

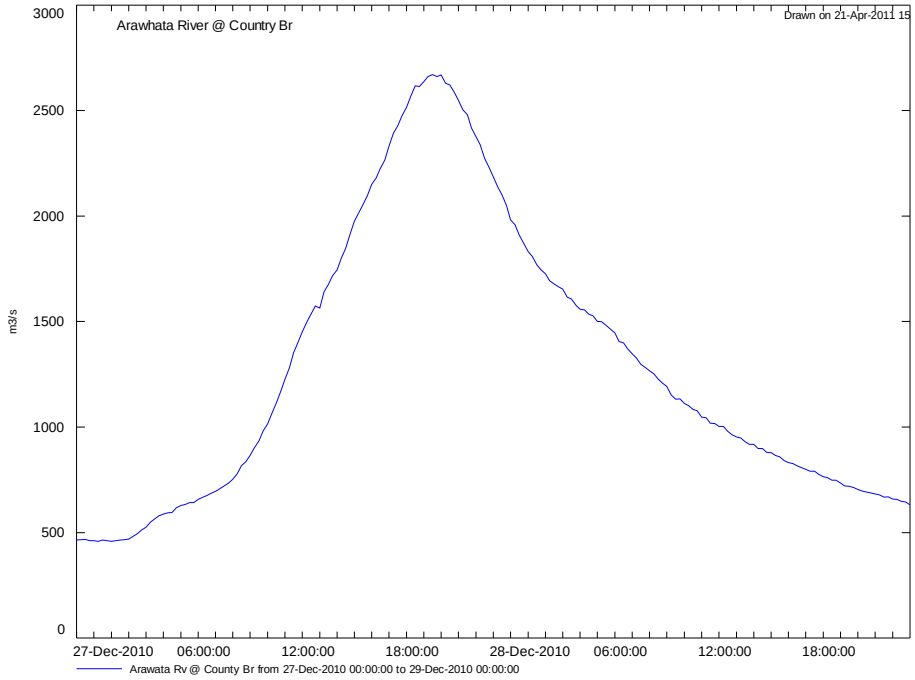
Station	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	28-Dec	29-Dec
Karamea River @ Arapito	33.9	3.5	0	10.4	0	0	12.4	49.4	0
Sirdar Ck @ Paparoa	45.5	26.5	0	40	2.5	0.5	89	195.5	0
Inangahua River @ Landing	49.5	26	0	23.5	0.5	0	51.5	101	0
Grey River @ Conical Hill	26	12	0.5	19	0.5	0	25	66.5	0.5
Grey River @ Waipuna	14	5	0.5	28	1	0	7.5	31.5	0.5
Ahaura River @ Gorge	22.5	10	0	32.5	0.5	0	20	46	0.5
Grey Rv @ WCRC 2	11	5	0	29.5	3	4	56.5	69.5	0
Taipo River @ SH Br	51.5	32	0	37	0	2.5	154	199.3	0
Butchers Ck @ Butchers Gully	31.4	30.4	0	50.3	0	5.8	125.1	100.5	0
Hokitika River @ Colliers Ck	97	80	0.5	91.5	0	10.5	337.5	174.5	0.5
Cropp @ Waterfall	348.5	204	0.5	149.5	1	14.5	501.5	264	0
Whataroa River @ SH Br	96	27.5	0.5	58.5	0.5	12	279	87	0
Waiho River @ douglass rock	180.5	47	1.5	93.5	0.5	2.5	387	92.5	0
Haast River @ Roaring Billy	214	86	22.5	103.5	0	34	373	40.5	0
Haast River @ Cron Ck	136.5	74	21.5	98.5	0.5	41.5	310.5	40	0

The rainfall daily totals in Table 3 show that heavy rain fell predominantly on the 27th and 28th of December region wide, but also that smaller events occurred on the 21st and 24th of December 20101. These events would have pushed river flows up and led to higher river flows for the 27th/28th event.

3. Catchment Information South to North of the Region

3.1 ARAWHATA RIVER

The Arawhata River at Country Br recorded a peak flow of 3738m3/s at 0015hrs on the 28th of December. This is a 7.5 year return period flow.



Graph 1: Arawhata River at Country Br Hydrograph

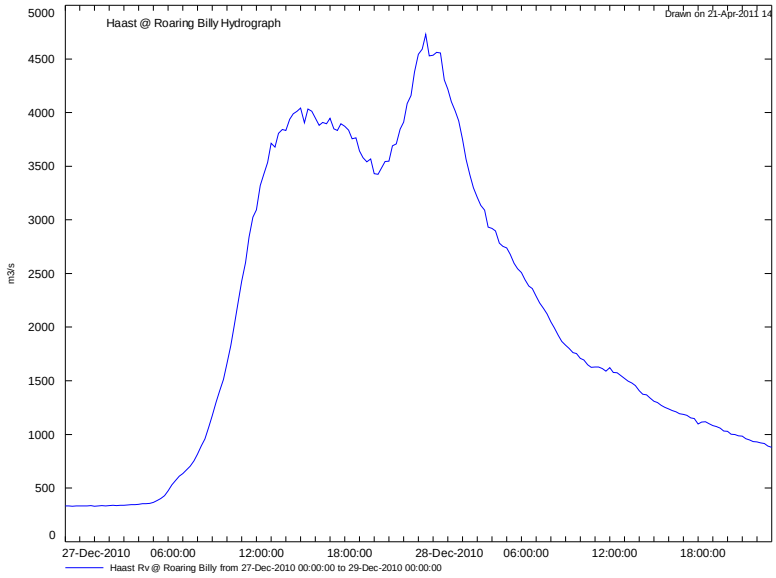
Surface flooding occurred in the South Westland region with reported damage to fences, roads, and property.

Flooding of property at Hannahs Clearing, photo courtesy of Brian and Phillipa Glubb

More flooding around Hannahs Clearing, photo courtesy of Brian and Phillipa Glubb

3.2 HAAST RIVER

The Haast River at Roaring Billy recorded a peak flow of 4729m3/s at 0030hrs on the 28th of December. This flow was a 6 year return period flow.



Graph 2: Haast at Roaring Billy Hydrograph

Surface flooding occurred in the South Westland region with reported damage to fences, roads, and property.

3.3 WAIHO RIVER

The 28 December 2010 event was a large event for the Waiho River. Due to the changing nature of the Waiho River system it is not possible to put a return period of the flow for the river. There were effectively a series of events from the 21st of December onwards, each pushing the river (and gravel bed) higher. The peak level was 7885mm of stage at 1415hrs on the 27th of December. The event also caused the Waiho River to spill across farmland to the Tartare River. These events also caused a large amount of aggradation in both the Waiho River and Callery River (a tributary of the Waiho). One to two metres of gravel build up has occurred on the Waiho and five to six metres of gravel build up on the Callery during the event. This has caused the closure of the Callery flood warning site.

Due to the nature of the Waiho River, civil defence staff were busy over this period. Consideration was given to evacuating some residents and tourists staying in the motel on

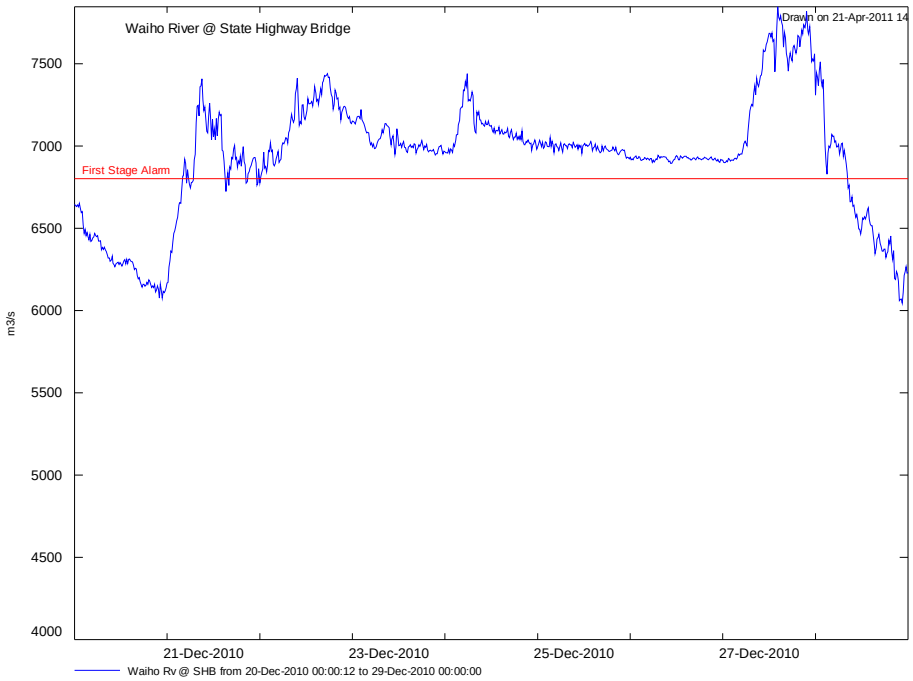
the south side of the River. Following the December flood event the Waiho has continued to aggrade, causing more concern for properties on the south side of the river. There is particular concern for the Callery River and the risk of a landslide dam forming, and failing, now the warning site is no longer operational.

Flood Protection Works

Since the event Council has been working closely with Westland District Council, Department of Conservation, and the New Zealand Transport Authority (NZTA). This work is based around the protection schemes each organisation administers, and how to better co-ordinate these. West Coast Regional Council (WCRC) has commissioned a report by an experienced river engineer to develop a long term strategy for flood management in this area.

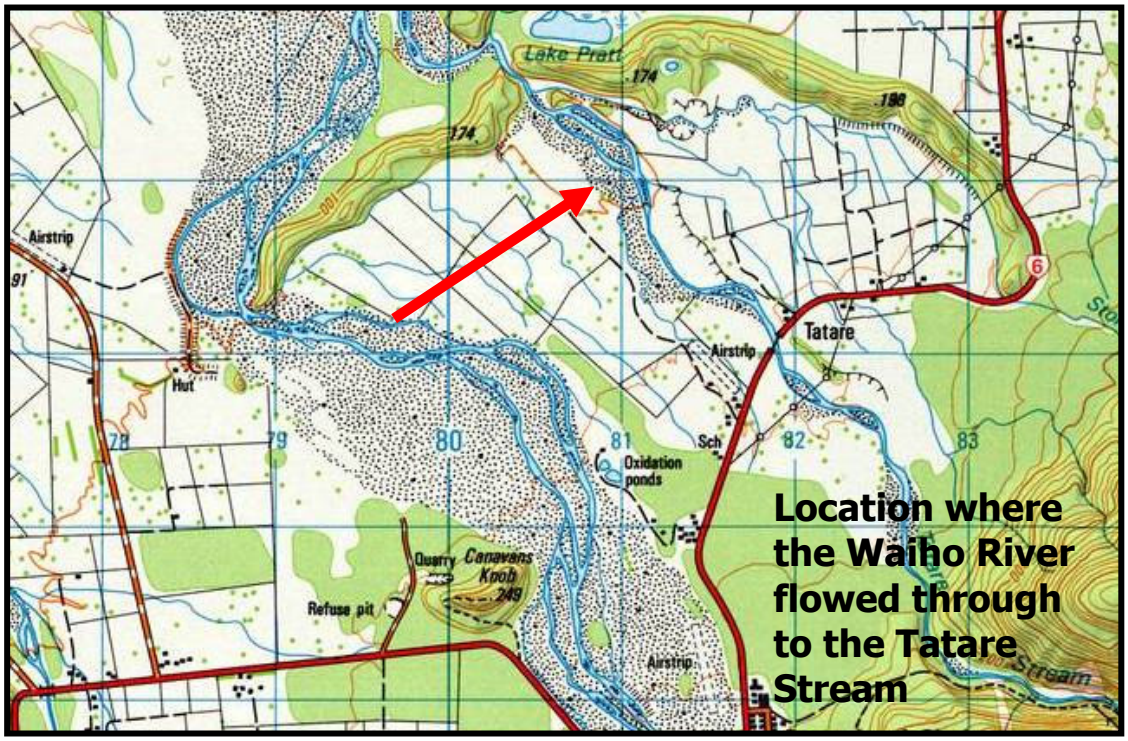
Since the event, NZTA raised the level of its stopbank on the south side of the river during a subsequent flood event, plus some of the adjoining WCRC stopbank; and NZTA are now in the process of raising the height of the road bridge by two meters, due to the aggradation of gravel since the flood event.

A planned stopbank upgrade has been delayed by the changes in riverbed levels following the event The riverbed has been re-surveyed since the event and the proposed upgrade is being redesigned.



Graph 3: Waiho River at State Highway Bridge Hydrograph

Figure 1: Map of Franz Josef showing where the Waiho River flooded across farmland to the Tartare River



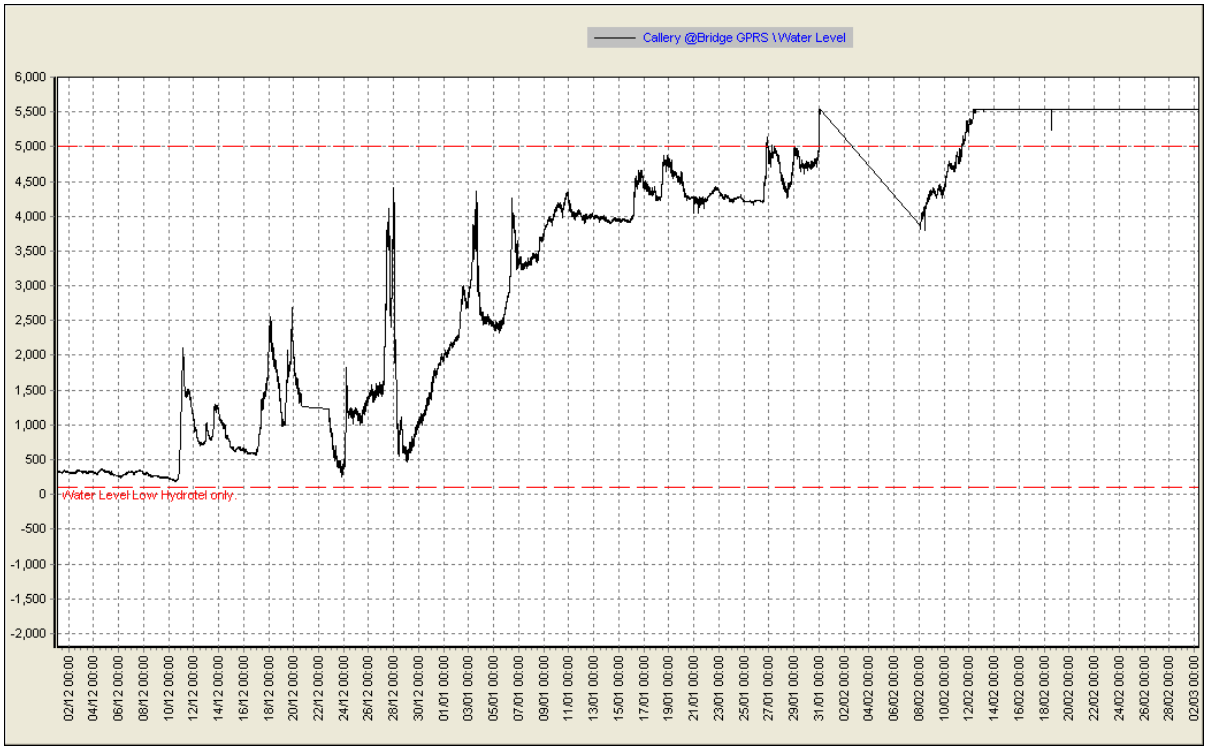
Waiho River where it cut through to the Tatare Stream in Figure 1, photo courtesy of Robert Fulton

3.4 CALLERY RIVER

The Callery River site has been closed due to a large build up of gravel after the 27th/28th. There is no flow figure available for the event due to the dynamic nature of the river, therefore no return period can be generated.

Callery @ Gorge flood warning site in September 2003. Note the 6 m drop to water.

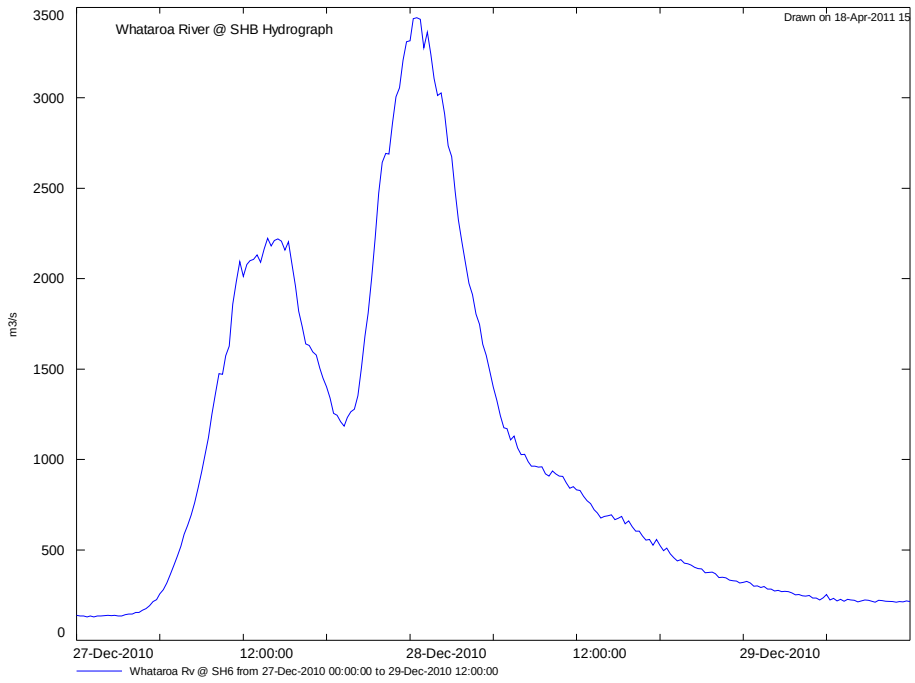
Callery @ Gorge flood warning site in March 2011. Note 0.75m-1m drop to water.



Graph 4: Callery River at Gorge water level for past 3 months. The water level rose 6 meters in this period due to gravel build up. The events from the 21st to 29th of December likely led to the rapid gravel build up

3.5 WHATAROA RIVER

The Whataroa River at the State Highway Bridge peaked at 3442 m3/s at 0030hrs on the 28th of December. This event caused water to lap around the edge of State Highway 6 (see photo below). The return period for the event was 7 years.



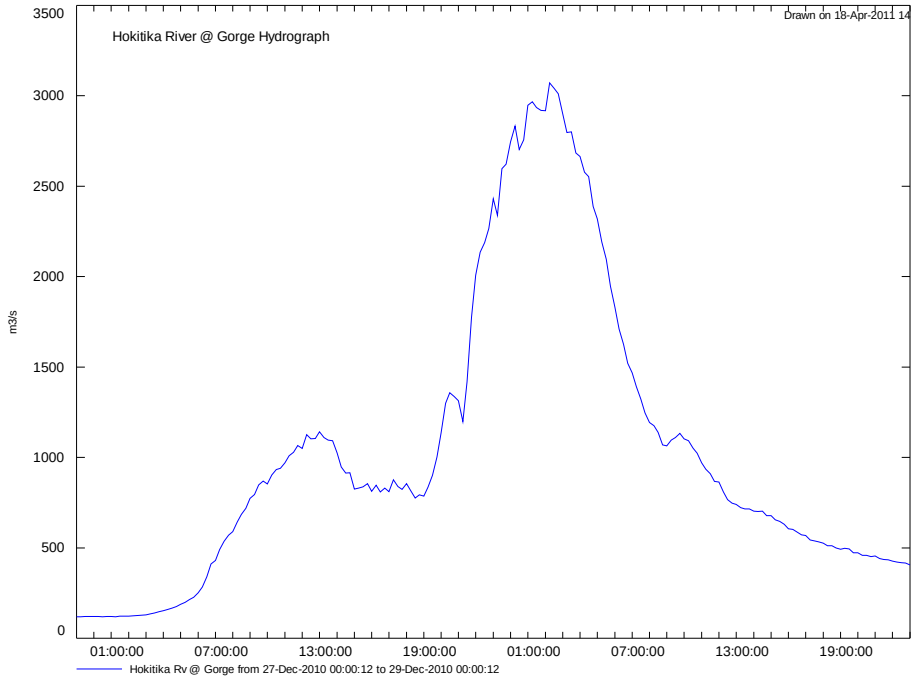
Graph 5: Whataroa River at State Highway Bridge Hydrograph

Whataroa River, photo courtesy of Martin London

3.6 HOKITIKA RIVER

The Hokitika River catchment had a significant flood event on 28 December. In the mid catchment there was significant damage around the Styx River, Kokatahi River, and Toaroha River. Further downstream in the catchment, roads were scoured out, and large areas of farmland were affected with stock losses and property damage.

The Hokitika River at the Gorge site recorded a peak of 3071m3/s at 0315hrs on 28 December. This has been calculated as a 53 year return period making this a significant event. This is the largest flood peak recorded for the Hokitika Rv at Gorge/Colliers site. The peak at the Hokitika River at Gorge was 0315hrs. It takes approximately 1-2 hours for this water to reach Hokitika Township, meaning that the peak observed at the town would have been closer to 0500hrs. High tide was 0455hrs corresponding with the peak of the event.



Graph 6: Hokitika River at Gorge Hydrograph

Surface flooding was common around Hokitika town during this event (though not from the river). For many locals it was the biggest flood they had seen in their lifetime.

The Kokatahi and Kowhitirangi areas were hit hard by the flooding with damage to houses, property, roads and loss of livestock. Both areas were cut off from Hokitika for some time before roads were able to be driven on again.

Murray Marshall of Kokatahi made the following comments:
The December flood did not cause as much damage as the 1991 flood, but was more rapid than the '91 event. My access was cut off to my property and there was significant damage to the main road where the seal was lifted.

I lost calves and 106 bales of silage during the event.

Colin Provis also of Kokatahi made the following comments:
Our house had 2 inches of water through it. This flood was different to previous floods in that the river breached its banks further upstream than normal. At our place the event was bigger than the 1991 event, and very similar to the 1967 event.

Both Murray and Colin suggested ways to improve Council's flood warning systems and discussed river management options that they believe will aid the area during flood events.

The students of Hoiho Class at Kokatahi-Kowhitirangi School also submitted comments on the event as part of their writing programme. From the comments below it is clear that the event was very scary for the children at the school and they were clearly aware of the damage caused by the flood.

Fergus made the following comments:
At the Grafton's it was over 4 feet deep. 100 cows were lost from one farm.

Thomas made the following comments:
Dawson Road was under 3 foot of water and we were trapped there was no way out. The main road was closed for at least a day.

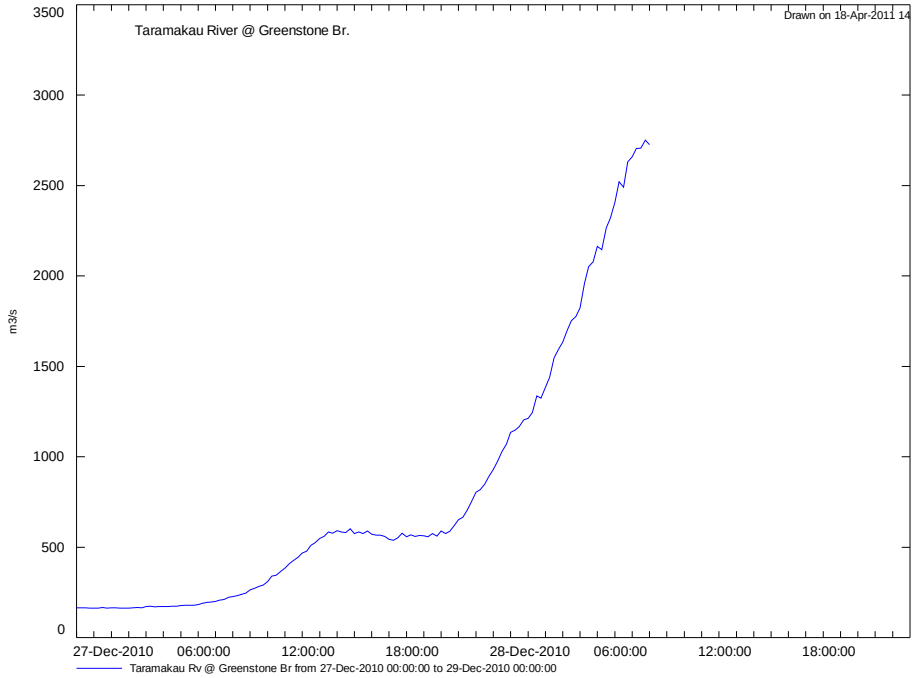
Amy made the following comments:
Tar seal was lifted up from the water and washed up into the paddocks on the side of the road. People were trapped in their houses because the tar seal was lifted off the driveways.

A dog watches the waters rise near the dairy factory, photo courtesy of Neville Climo.

Hokitika River at Kaniere Bridge, photo courtesy of Marg Delore

3.7 TARAMAKAU RIVER

The flood event in the Taramakau River produced some very high water levels. The river level was so high that it flooded the NIWA water recorder above the Stuart Cameron Bridge resulting in the peak of the event not being recorded. Upstream, the Taipo River rain gauge recorded significant rainfall depths and observational data suggest that this was a significant event, but given the lack of data available there is no return period figure for this event.



Graph 7: Taramakau River @ Greenstone Br Hydrograph

Flooding downstream of the Stanley Gooseman Bridge, photo courtesy of Gary Glasson

Beehives adjacent to the Taramakau River, photo courtesy of Gary Glasson

Taramakau River at State Highway Bridge during the event, photo courtesy of Fran Cohen

Locals who have lived in the Taramakau River catchment could not recall a bigger flood event in the river. The amount of water and the velocity in the river amazed some seasoned Taramakau Valley residents. Significant damage occurred to roading infrastructure including the Kellys Creek Bridge's approaches being washed out. This caused the road to be closed to all traffic from 0700hrs until 1830hrs that night. Contractors were inundated with work clearing slips from roads. Debris flowing down the numerous waterways was commonplace and resulted in a large clean up for contractors to ensure that the road could be reopened.

Wash out of state highway 73 at Kelly Creek. This is near the Taipo Rain gauge where 248mm of rain fell in 12 hours. Photo courtesy of NZTA

Flood Protection Works

Council has completed works to remediate the damage to the Taramakau Rating District stopbank. The floods caused approximately $50,000 of damage to this structure.

3.8 NEW RIVER / SALTWATER CREEK

Extensive flooding was observed in the Paroa area. Both New River and Saltwater Creek were very high resulting in flooding and subsequent property damage to the Paroa Hotel, school, play centre, and some nearby houses. This also caused State Highway 6 to be closed to all traffic for several hours, some properties adjacent to New River were also affected. The WCRC rain gauge recorded 95mm of rain in 24 hours. This is not a high amount of rainfall for the rain gauge suggesting that significant rainfall amounts must have occurred further upstream in both the New River and Saltwater Creek catchments. Based on Flow/Rainfall data from the Taramakau/Lower Grey areas, it is reasonable to suggest that the mid/upper New River catchment received significant rainfalls. However, given the lack of data for this catchment no figure can be placed on the size of the event for New River/Saltwater Creek

Photo showing extensive flooding caused by backing up of water in the drain system north of Saltwater Creek, and the dominant flow of New River, photo courtesy of Jason Boddy

Flooding of Paroa Hotel, shop, and houses. Note the traffic backup on State Highway 6, photo courtesy of Jason Boddy

Flooding at school and surrounding properties, photo courtesy of Jason Boddy

New River (light brown colour) meeting Saltwater Creek during the event, photo courtesy of Jason Boddy

Flood Protection Works
Since the flood event Grey District Council, has undertaken emergency works to move the outlet of Saltwater Creek and New River constructing a rock wall to prevent New River and Saltwater Creek mouths breaking back into their old channel.

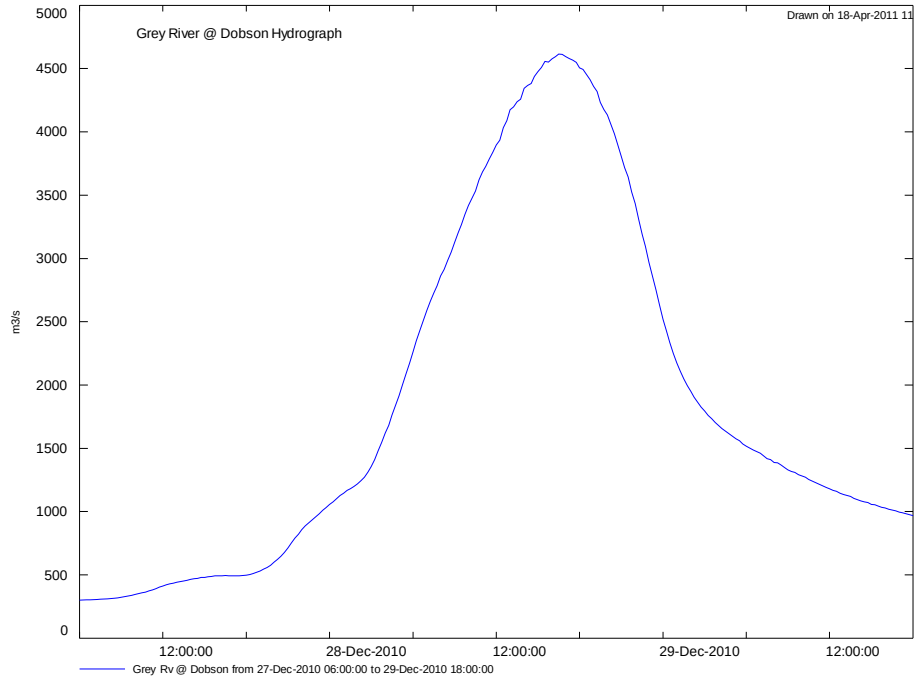
Resource Consent has been granted by WCRC for the periodic opening of the mouth and associated works.

The West Coast Regional Council wishes to form a rating district for ongoing river management in the area. A postal survey will be undertaken shortly to gauge the communities' views on a potential rating district to manage the flood effects of both New River and Saltwater Creek.

3.9 GREY RIVER

The December 2010 event was a moderate sized flood for the Grey Valley, comparable to the flood event that occurred on 12 June 2006**.** The December event resulted in the Greymouth Flood Committee meeting, which is something that has only occurred 4 times in the past 10 years. This event affected farmland throughout the Grey Valley and large flows were recorded in the Ahaura River.

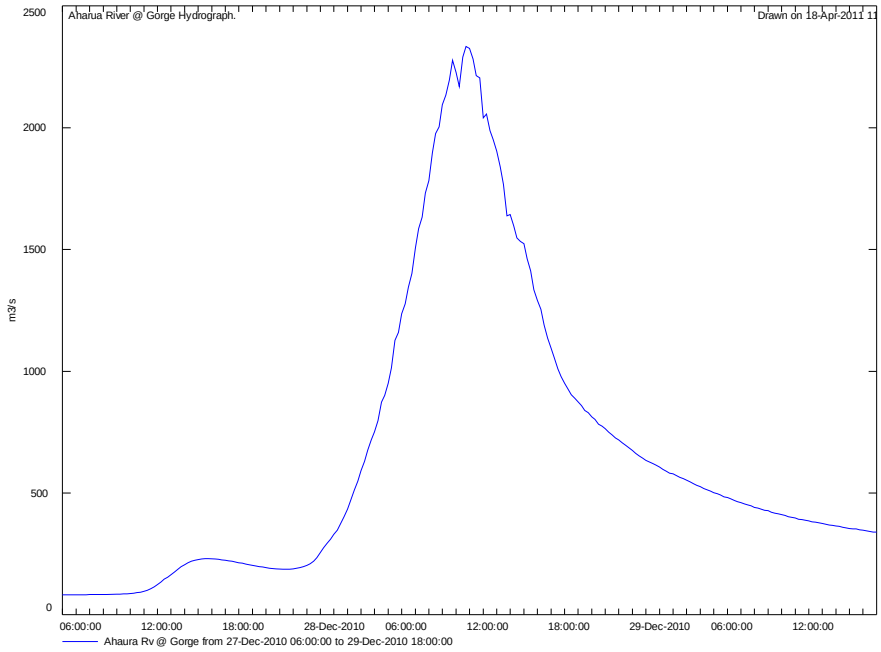
Grey River at Dobson
The Grey River at Dobson site peaked at 4614m3/s at 1630hrs on 28 December. This peak was calculated at approximately a 6 year return period. This is a moderate flow comparable to the event in 12 June 2006. Further upstream higher return periods were calculated.



Graph 8: Grey River at Dobson Hydrograph

Ahaura River at Gorge

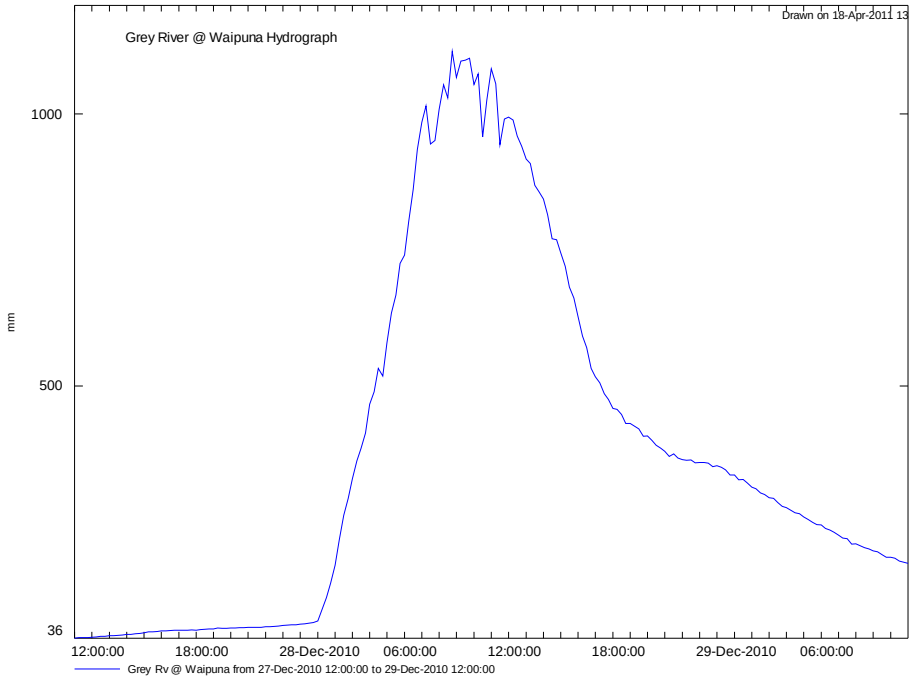
The largest eastern Grey River tributary, the Ahaura River, recorded a significant flood event. Ahaura River at Gorge peaked at 2333 m3/s at 1145hrs on 28 December. This peak flow has a 14 year return period.



Graph 9: Ahaura River at Gorge Hydrograph

Grey River at Waipuna

The Grey River at Waipuna recorded a peak of 1115m3/s which is calculated as a return period of 8 years. There is some uncertainty around this return period due to the short length of record used for calculation (12 years of record).



Graph 10: Grey River at Waipuna Hydrograph

The Grey River Flood Committee resolved that the Greymouth floodwalls barriers be put in place. Whilst the flood did not result in these being tested it was approaching high tide at the peak of the flood so no chances were taken.

There was surface flooding to properties and roads around Greymouth. Wingham Park was flooded along with the Jones's dairy farm at Coal Creek. Water came close to entering some low lying Cobden homes.

Flooding around Wingham Park, photo courtesy of J Reese.

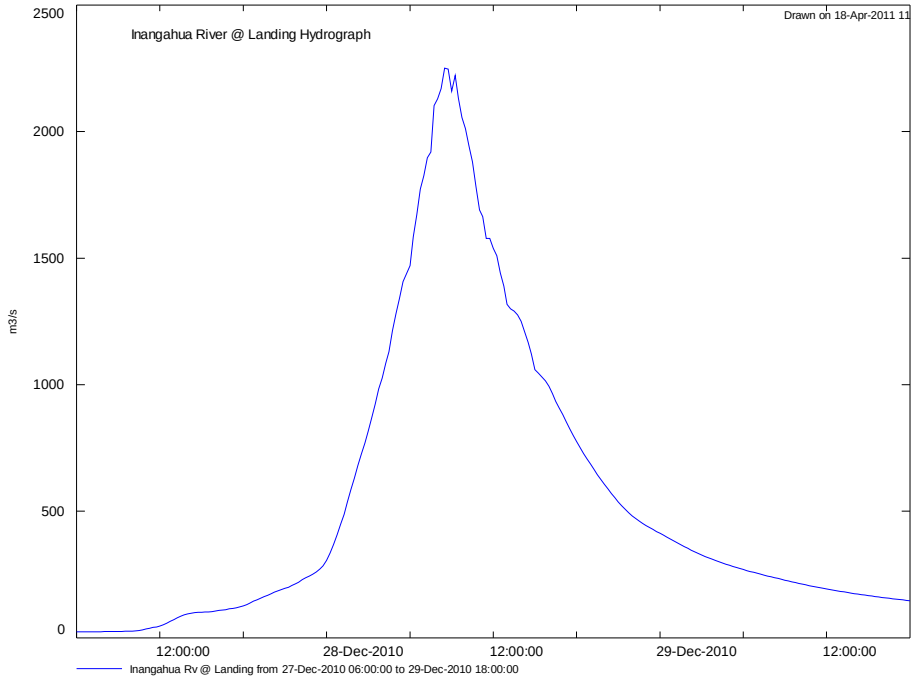
Flooding south of Stillwater, photo courtesy of J Reese

Flooding at Stillwater from the Arnold River, photo courtesy of J Reese

Grey River during the event, photo courtesy of J Reese

3.10 INANGAHUA RIVER

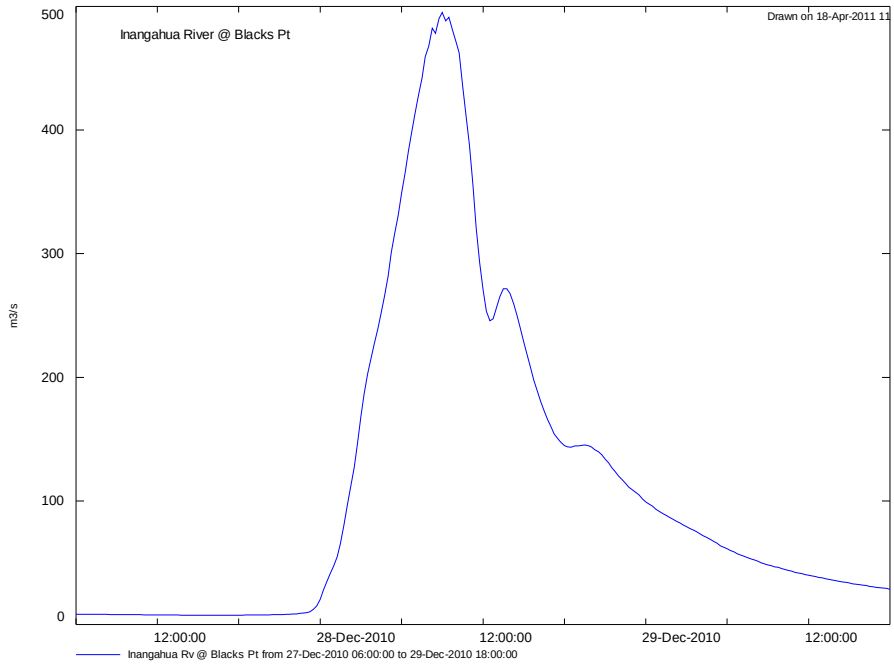
The peak flow for the Inangahua River at Landing was 2249 m3/s at 0830hrs on 28 December. This was calculated as a 16 year return period making this a significant event. The rainfall depths in Table 2 for Inangahua River at Landing were also significant.



Graph 11: Inangahua at Landing Hydrograph

Inangahua River at Blacks Point

Further upstream of Inangahua at Landing site is the Inangahua River at Blacks Point site. The peak here was 495m3/s which made this a 4 year return period event. This is far less than downstream at Inangahua at Landing, suggesting that larger rainfall amounts fell in the mid catchment but not as much in the southern end of the catchment, nearer to the upper Grey River catchment.



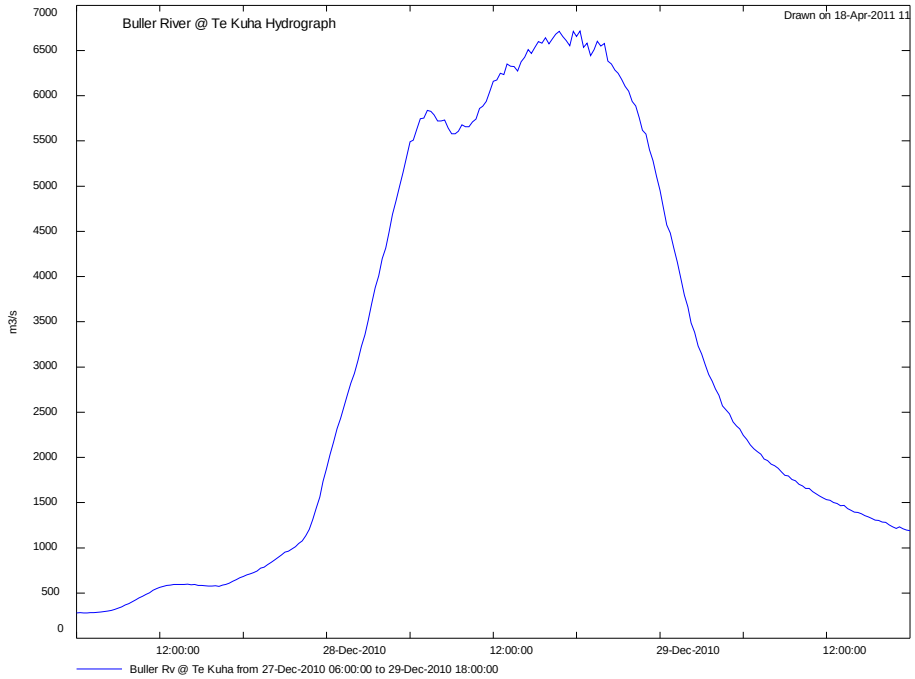
Graph 12: Inangahua River at Blacks Point Hydrograph

Council is aware that there was flooding of roads and a number of slips which resulted in traffic issues on the roads in this catchment. The road was closed at the Inangahua Dip for one and a half days. State Highway 7 was also closed due to significant flooding at Boatmans Creek.

3.11 BULLER RIVER

Buller River at Te Kuha

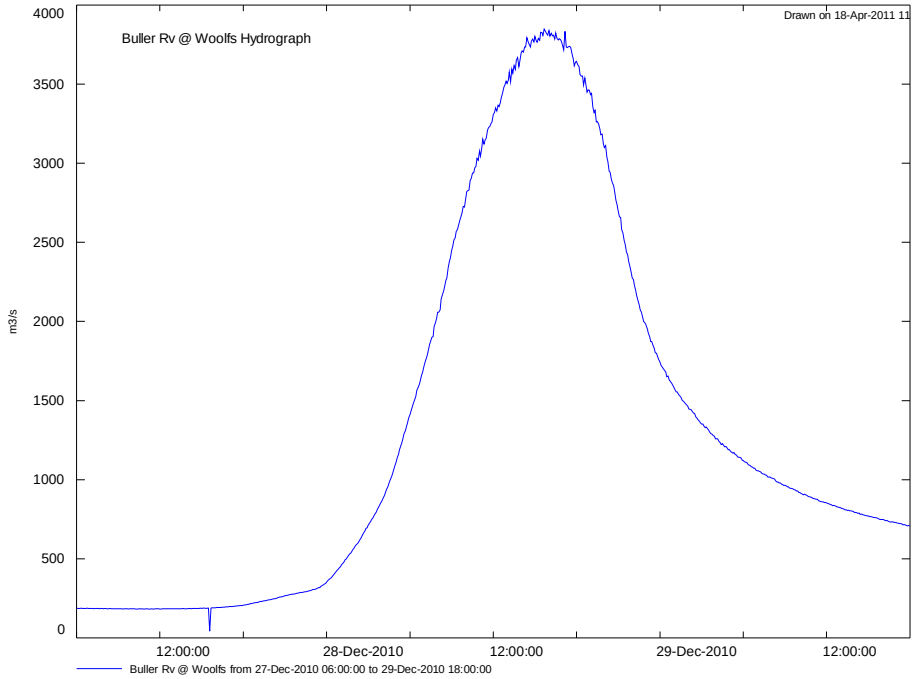
The December 2010 event was a moderate flood in the Buller River at Te Kuha, with a peak of 6714 m3/s at 1815hrs on 28 December. The return period for this event was approximately 10 years. On 31 August 1971 a far larger flood peak of 8497m3/s was recorded, which was calculated as a one in 50 year event. The 2010 event is comparable to an event on 12 June 2006 that affected both the Buller and Grey Rivers.



Graph 13: Buller River at Te Kuha Hydrograph

<u>Buller River at Woolfs</u>

Upstream of the Buller/Inangahua Junction at Buller River at Woolfs return periods of around 9 years were recorded. The peak flow was around 3847m3/s at 1540hrs on 28 December.



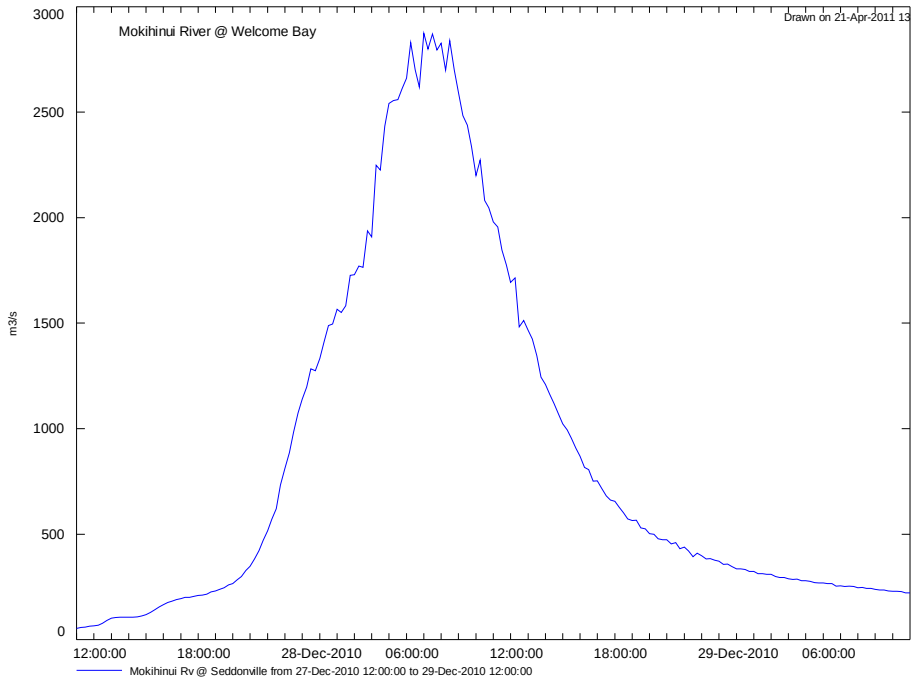
Graph 14: Buller River at Woolfs Hydrograph

This was a moderate flood for the Buller River although water closed the road at Hawks Crag and caused extensive damage to the Ohikaiti Bridge. Slips and road closures were common during this event and occurred throughout the Buller River catchment.

Flood Protection Works
Council is investigating flood return periods in conjunction with Buller District Council and NIWA. From this information decisions on flood protection for Westport can be made, in consultation with the community.

3.12 MOHIKINUI RIVER

The Mohikinui River's flow at Welcome Bay peaked at 2853 m3/s at around 0800hrs on 28 December. The data for this river is not sufficient to determine a return period, but anecdotally the return period would be between a 20 and 50 year return period (John Porteous pers comms 2011). This event caused extensive damage in Seddonville with houses, the hotel and library flooded and farmland affected.



Graph 15: Mokihinui River at Welcome Bay Hydrograph

Some residents were evacuated to the motor camp.

Local farmer Wayne Mulholland provided the following comments:
The flood was different to normal floods in that the Mokihinui River usually backs up from the Chasm. However, on this occasion the river simply broke its banks upstream of their family home and flowed into Seddonville.

I lost 273 silage bales each weighing a tonne, which were located 200-300 meters inland. As a direct result of the flood and erosion of the river banks I have had to move fences 3 meters. In total I have to replace 25 km of fencing and 80 meters of a race that was "blown out" during the event.

Amazingly a concrete trough weighing two tonnes was displaced during the event and found wedged in trees above head height when the water receded.

Twenty homes were affected including the Seddonville Pub which had 640mm of water inside. In comparison with the 1998 flood this flood was "cleaner" and "faster".

Mohikinui River in flood around Seddonville. Morning of 28/12/201

Frida Inta who lives in Seddonville made the following observations:
I recorded about 89mm from 11.00pm to 7.00am before the flood on 28 Dec 2010. This was on top of a total of 351mm for December (440mm altogether for December).

At 8.00am I had a look around Seddonville, and I could see a rapid on the river just downstream of the confluence with Coal Creek.

At this stage all ditches etc were full of water, and stationary. The entrance to Conn St was under a considerable amount of water (had been for a while). Just after 8am (heading towards 8.30am) the water in the ditches etc started moving upstream quite swiftly, with a wave about 5-10cm high heralding the push up my private ditch.

From about 8.30am the waters rose very fast indeed. In my home my alarm clocks stopped at 9.10am, when the waters inundated my house and tipped them over. I had a bird's eye view of the valley at this stage, after fleeing the waters, from the hill near the last house in Seddonville (the beginning of Charming Creek Rd).

What I saw:
- *The river had breached behind Wayne and Karen Mulholland's farm house, and seemed to stop within about 20-30m of their home. This formed a large lake area.*
- *The breach downstream of the Coal Creek confluence had created a huge lake, which merged with the back-up at the Chasm area and the river breach further upstream.*
- *The whole of the valley area was a lake with little islands sticking up out of it, although Broome St, and upstream of it was little affected.*

The WCRC is installing a new rainfall monitoring site in the Mokihinui catchment in the next financial year. This will improve the ability to provide flood warning information for this community.

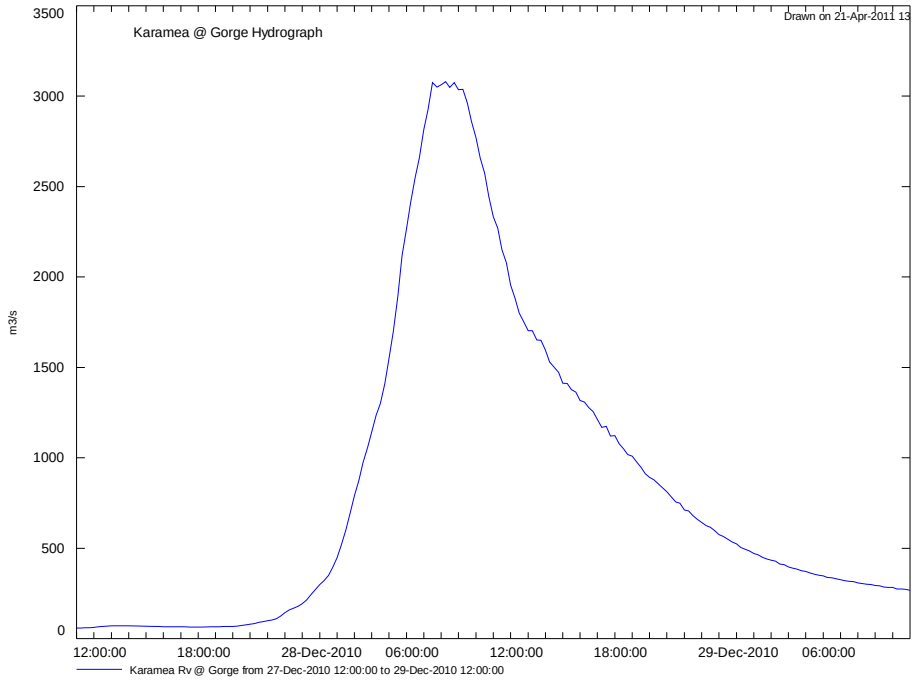
Buller District Council Civil Defence staff have met with locals post flood event to improve pre-event warning systems. There were issues identified after the flood event which have now been addressed.

The WCRC are investigating flood protection options and seeking advice through the government's Envirolink science advice scheme, to assess what protection may be feasible, and will then discuss with ratepayers what is affordable for the community.

This was a frightening event for residents in this area who were cut off from the main towns some with no telephone.

3.13 KARAMEA RIVER

The Karamea River reached the second largest flow on record. River levels at the recorder site were very close to the levels of the 1998 flood event but did not result in the same level of damage to property. It did however inundate a large area of the valley, with farmland being affected, and parts of Karamea Township having water around houses.



Graph 16: Karamea River at Gorge Hydrograph

The peak of the event was 3125m^3/s at 0930hrs on 28 December. High tide was recorded at 0430hrs, which meant that the tide did not affect the peak of the flood. Had the peak of event corresponded with the high tide, the effects of the event could have been similar to those experienced in October 1998.

Karamea at Arapito Rain gauge

The Karamea at Arapito rain gauge recorded 61mm of rainfall in 24 hours. This is only a moderate amount of rain. Based on the observed flows much more intense rainfall would have been falling in the mid/upper catchment. Unfortunately at this time there was no data in the mid catchment. There is now a mid-catchment site recording rainfall located on the Garibaldi Range. Rain gauges elsewhere in the eastern and northern Kahurangi National Park that are operated by Tasman District Council recorded between 250-450 mm of rainfall in 24-36 hours making this a very intense rainfall event for those locations.

The

Karamea River bridge looking north 28/12/2010. Photo taken by Hamish Macbeth.

Flood Protection Works

Flood modelling work is being undertaken by NIWA in consultation with the Karamea rating district. This information allows the community to analyse the risks from different sized events and it should identify affordable options for flood management.

4. Summary

The December 2010 flood event was a frightening event for many of our community. Fortunately there was no loss of life as a result of the event. There was however, damage to property, infrastructure and loss of livestock region wide.

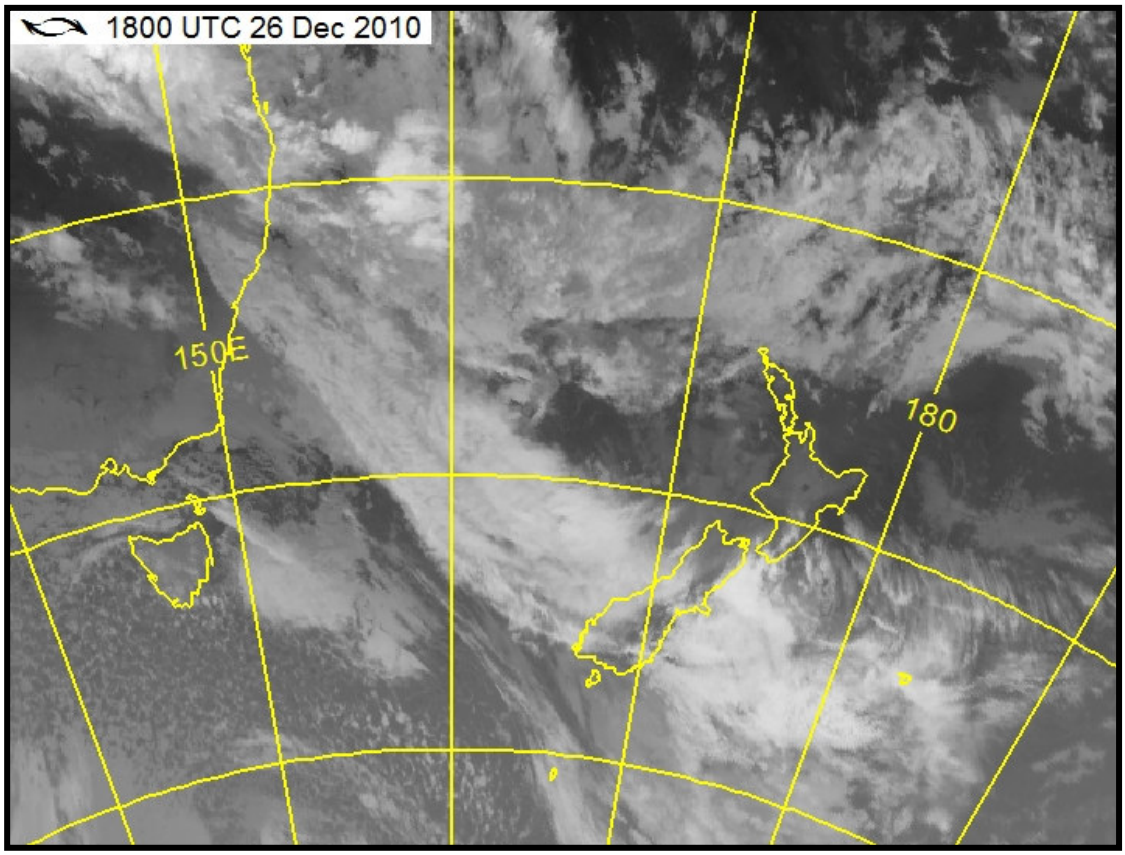
Demand for rock was at an all time high following the event, stretching Council's resources. Council has worked hard to make more rock available and has implemented measures to improve the amount of rock available post flood events.

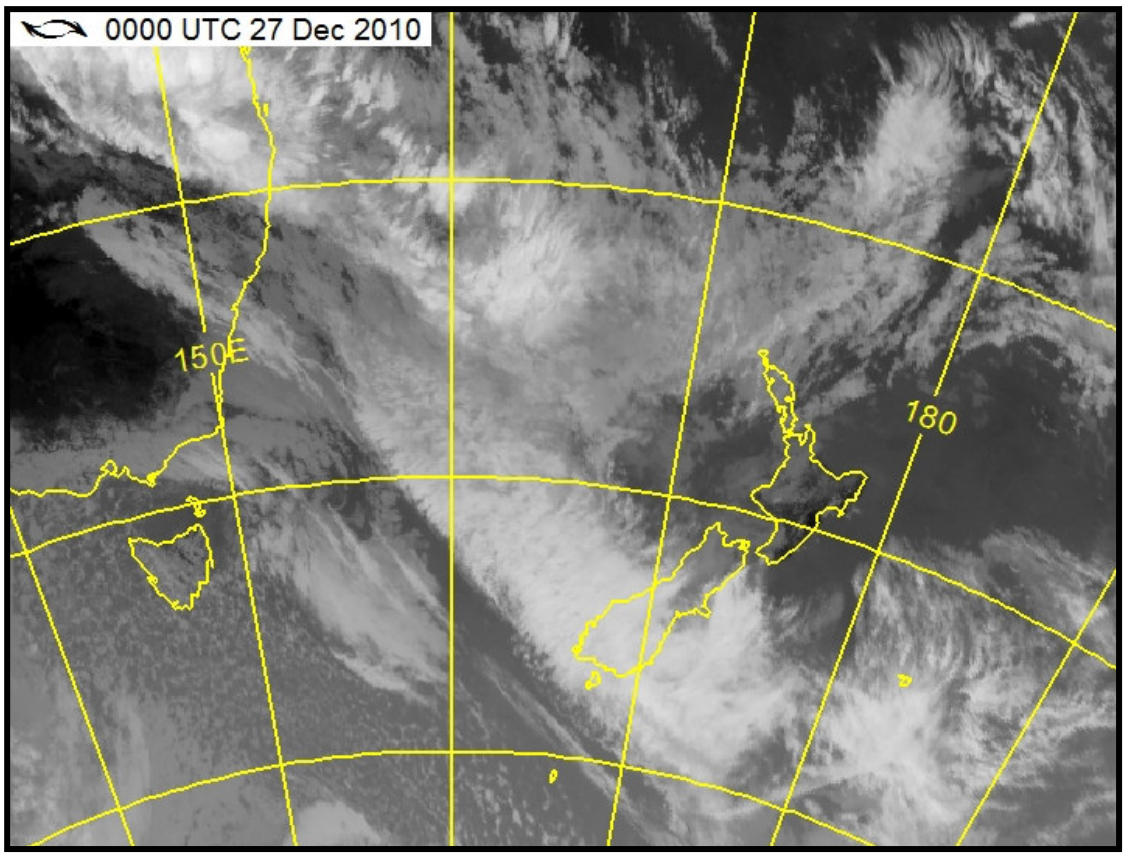
From a flood warning point of view the Regional Council team was again stretched due to the event being a coast wide event affecting all rivers. The team handled the situation well and provided the information that was necessary to our community. Council will examine the suggestions and observations that have come to light through compiling this report, and will make changes to our systems where indicated.

Council has learnt a lot from the event in regard to its preparedness and its information systems. Some changes have already been implemented and some are in the planning stage to provide a better service to our community.

Council appreciates the feedback that was provided by the members of the community to make this report an accurate reflection of what happened in the December 2010 floods. It also appreciates the people working in the community that perform sometimes thankless tasks of receiving phone calls in the middle of the night to warn of rivers rising. These people help to provide an effective flood warning system for their friends and neighbours.

APPENDIX 1: WEATHER RADAR MAPS

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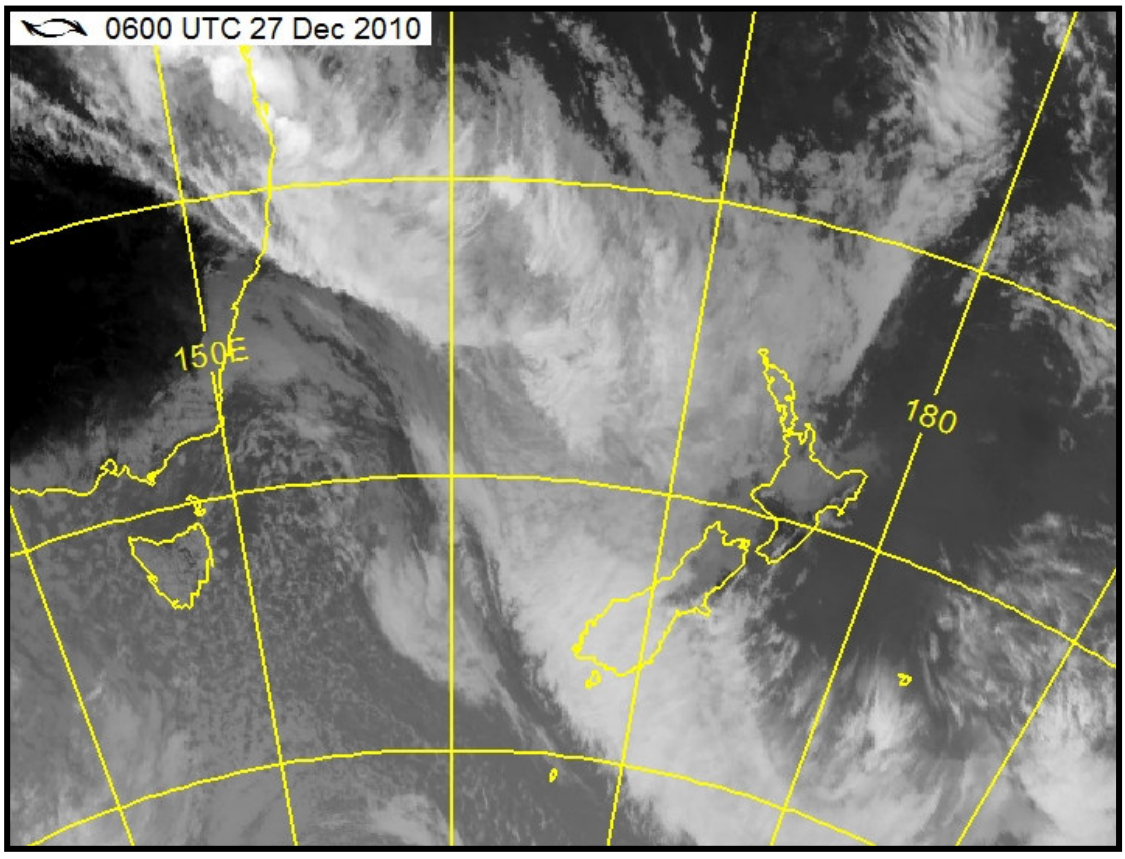
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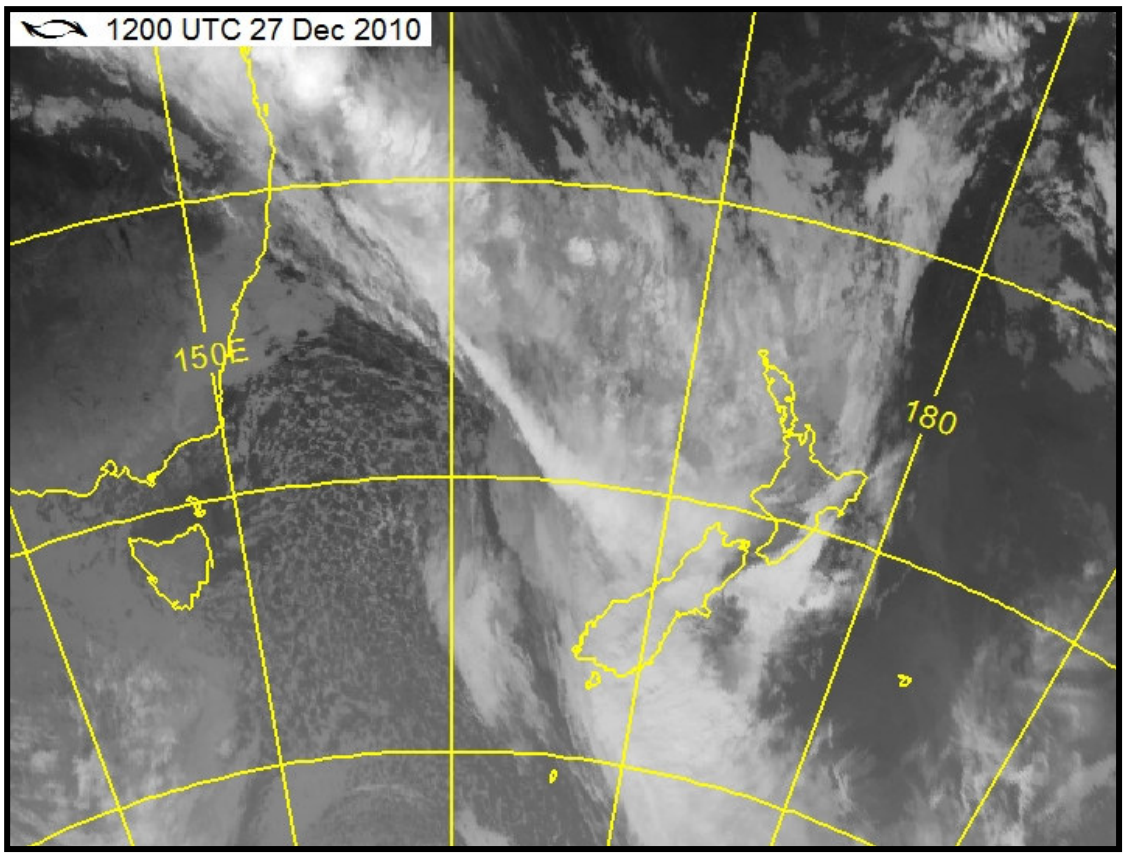
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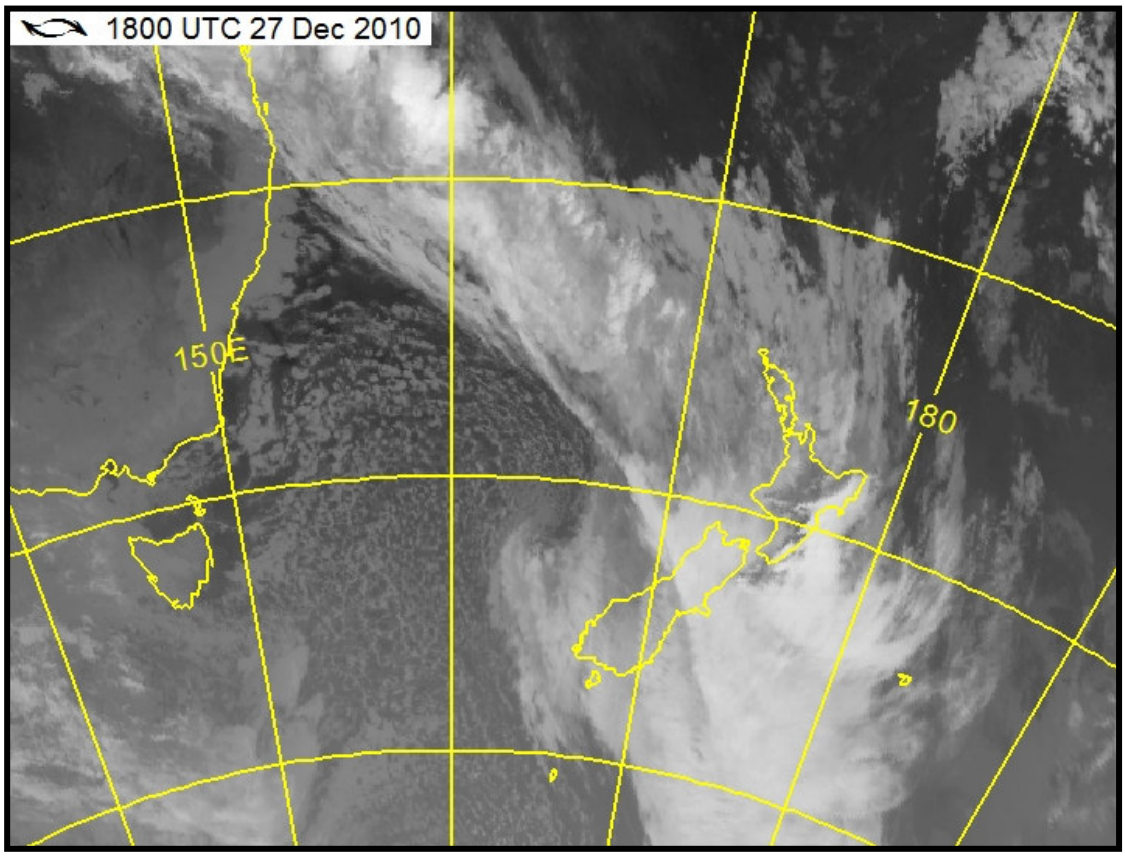
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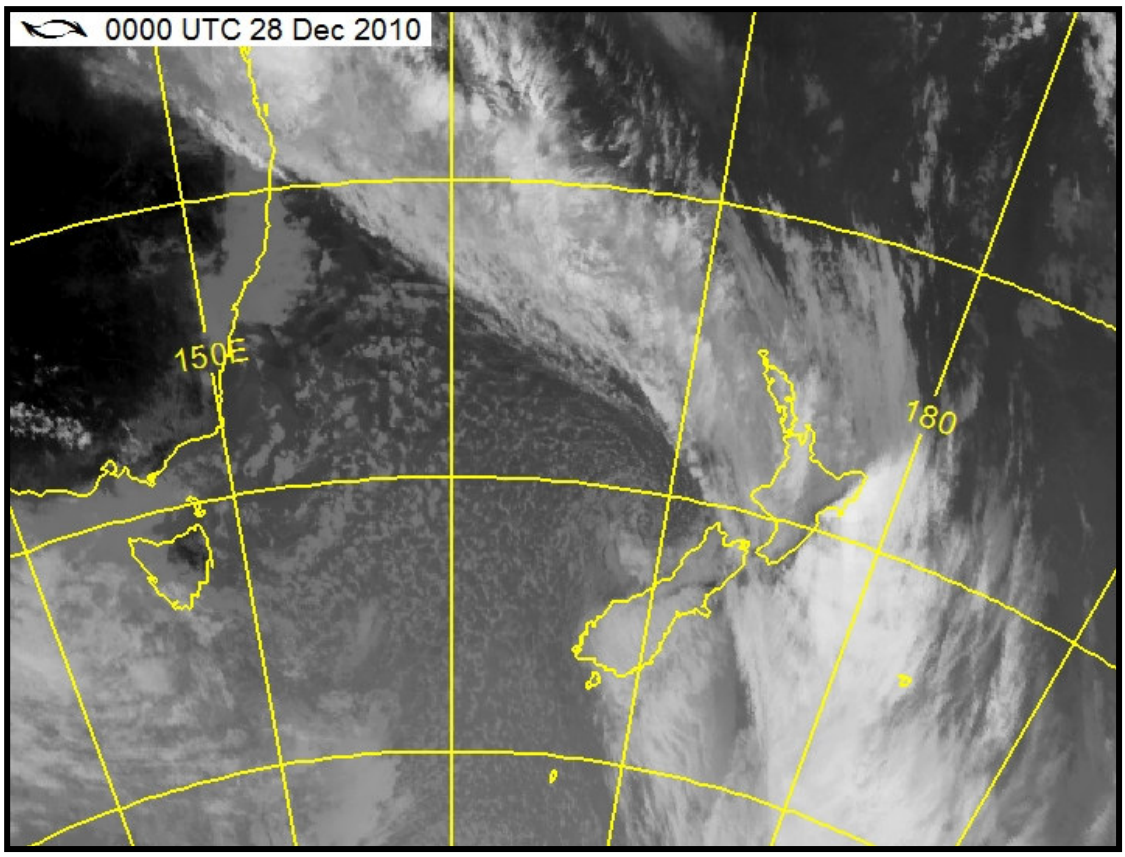
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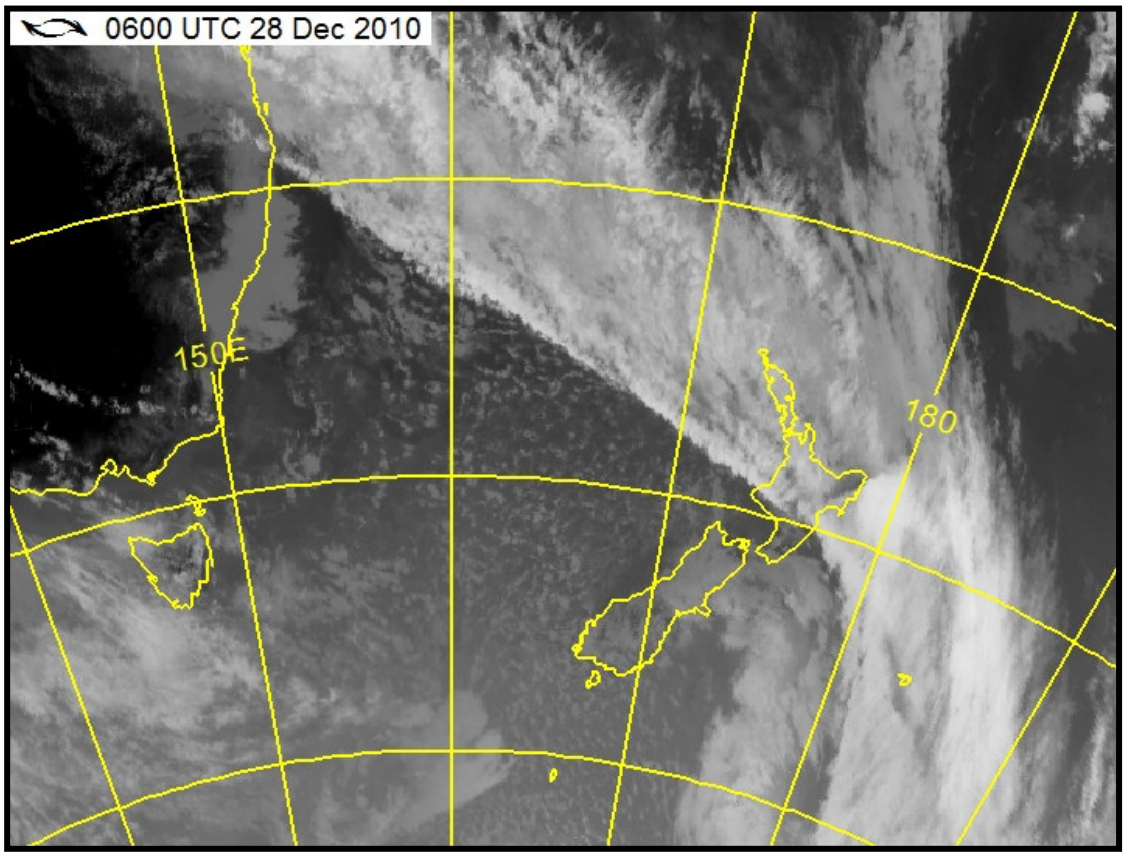
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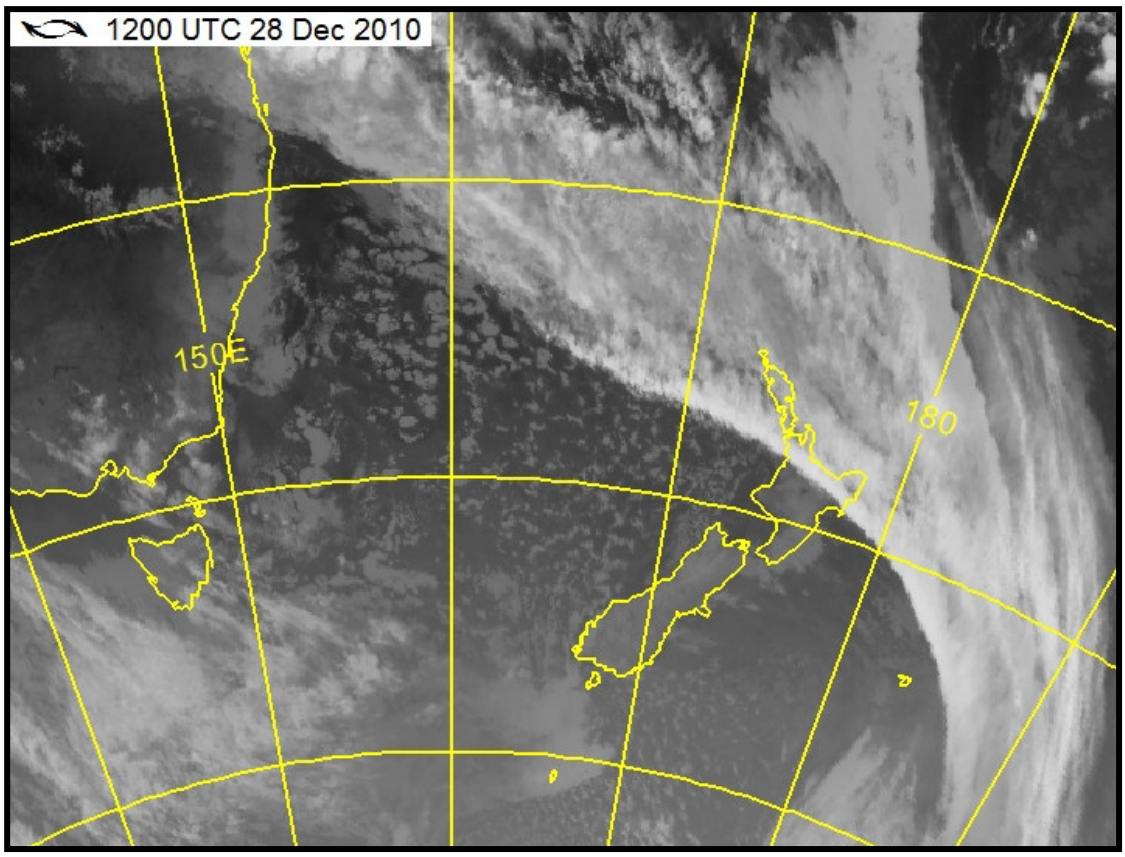
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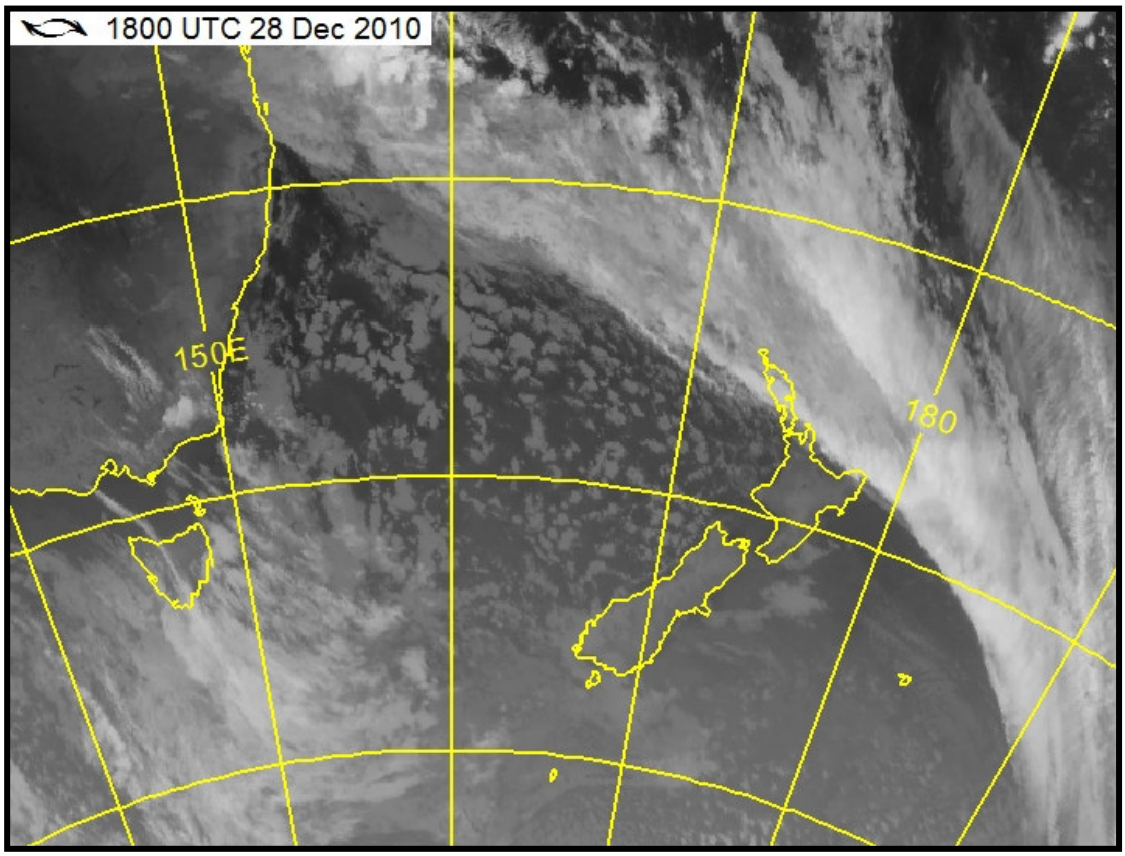
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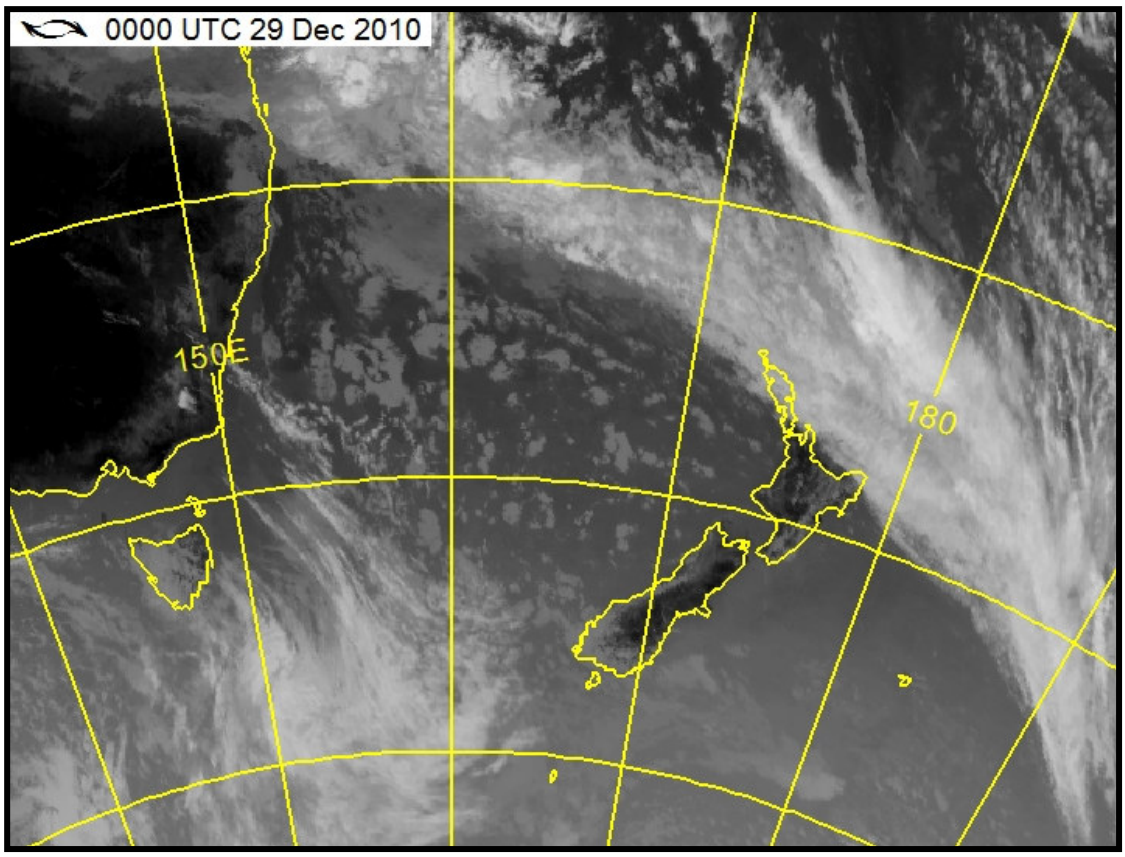
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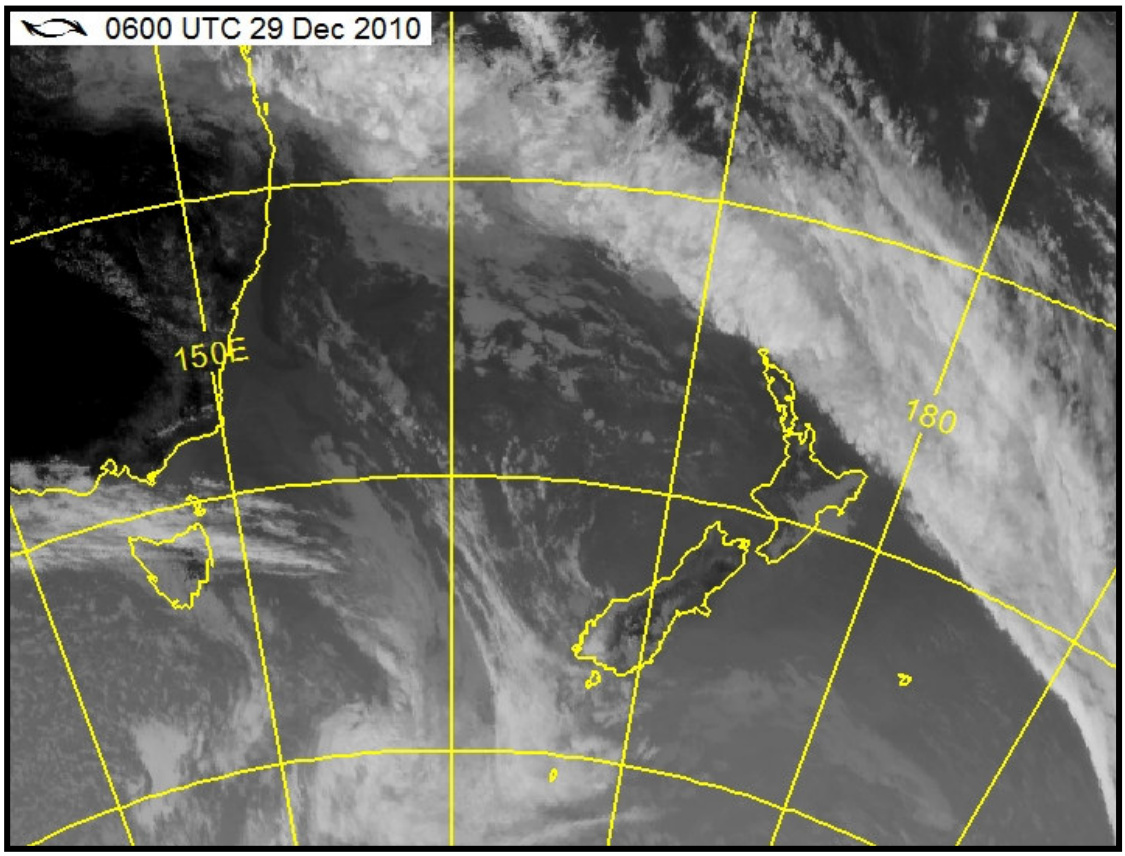
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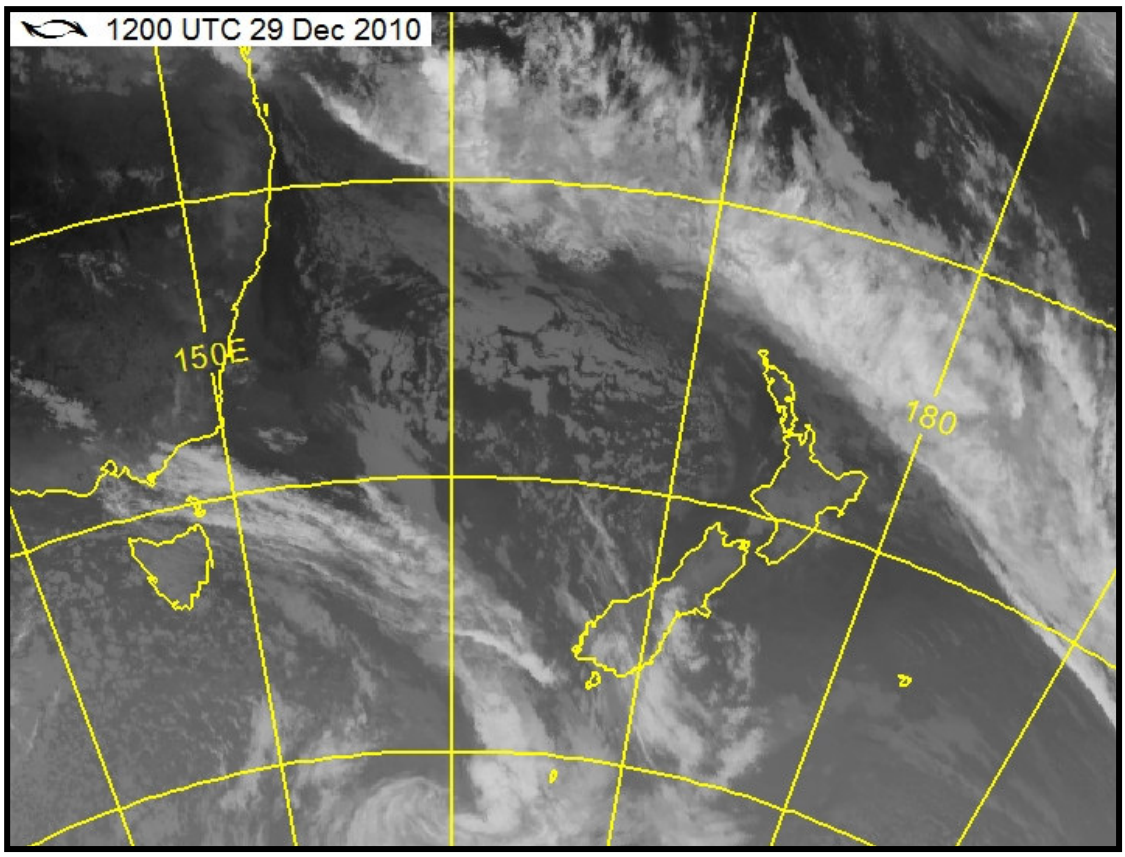
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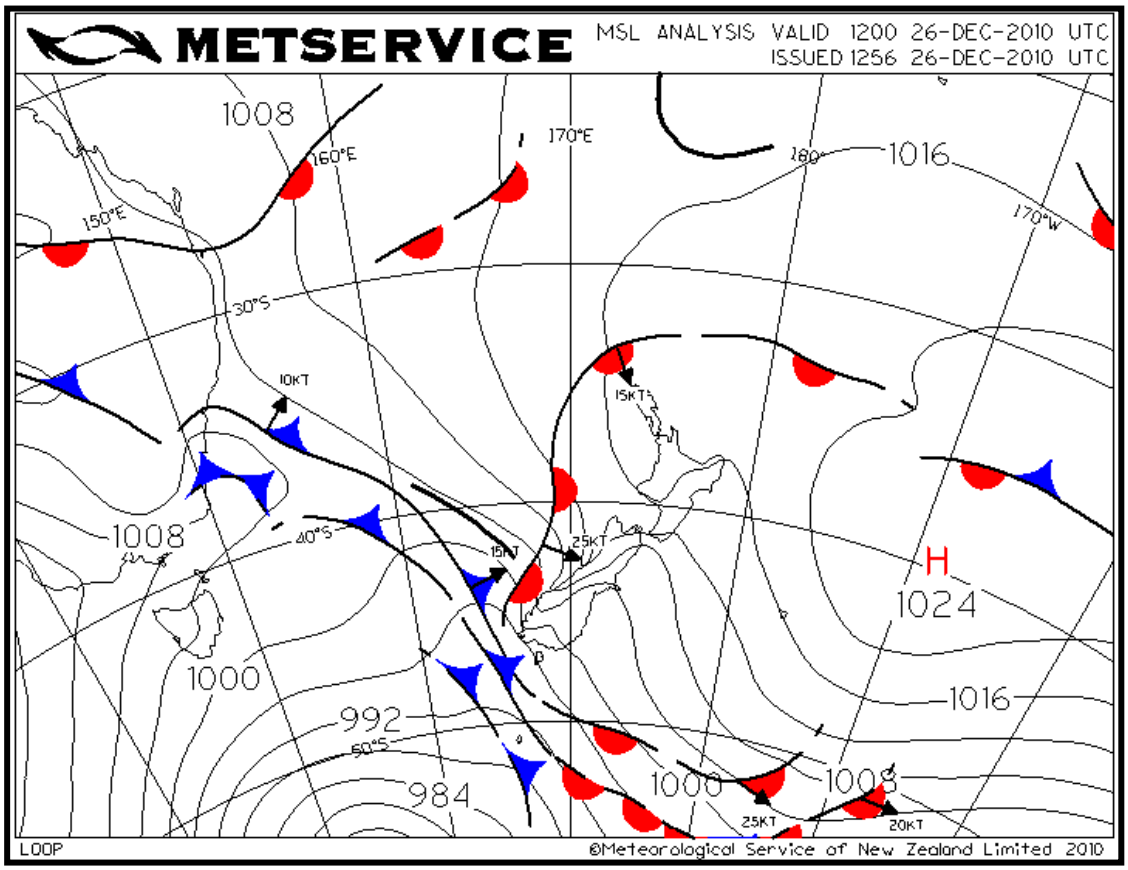
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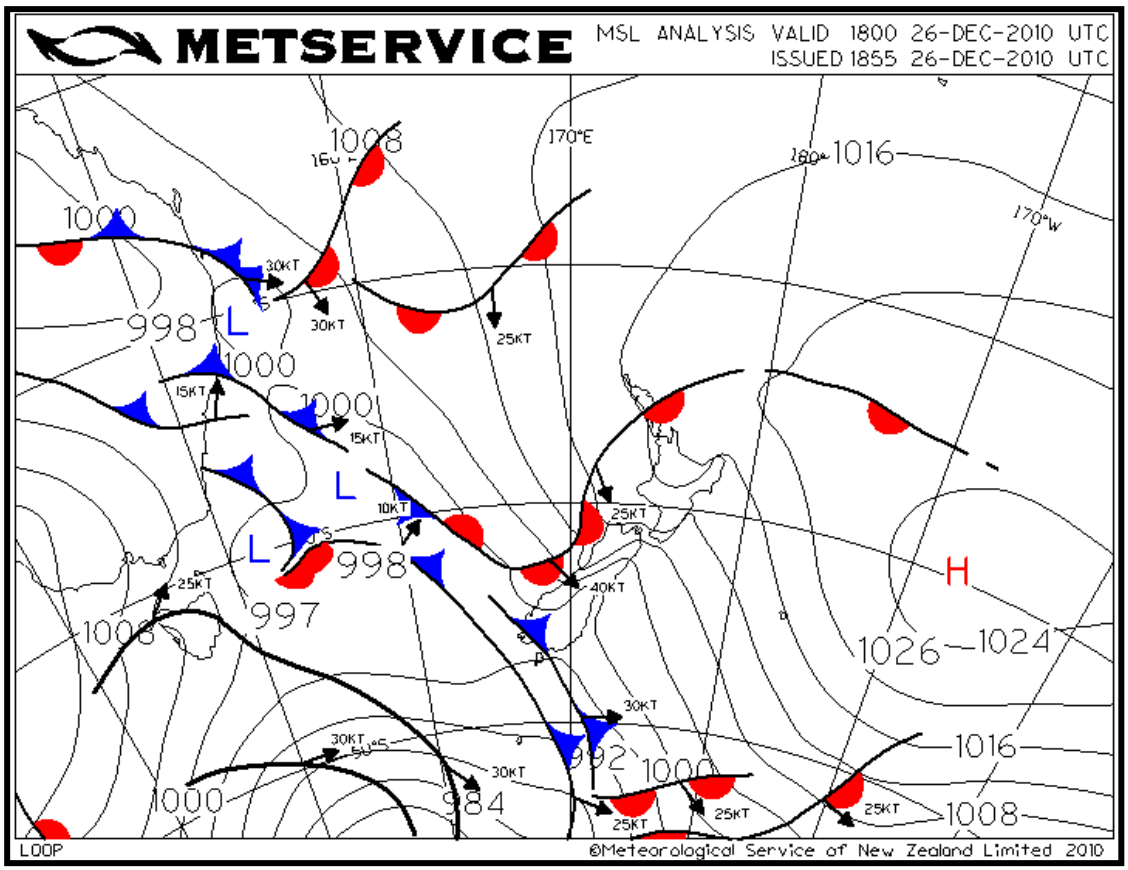
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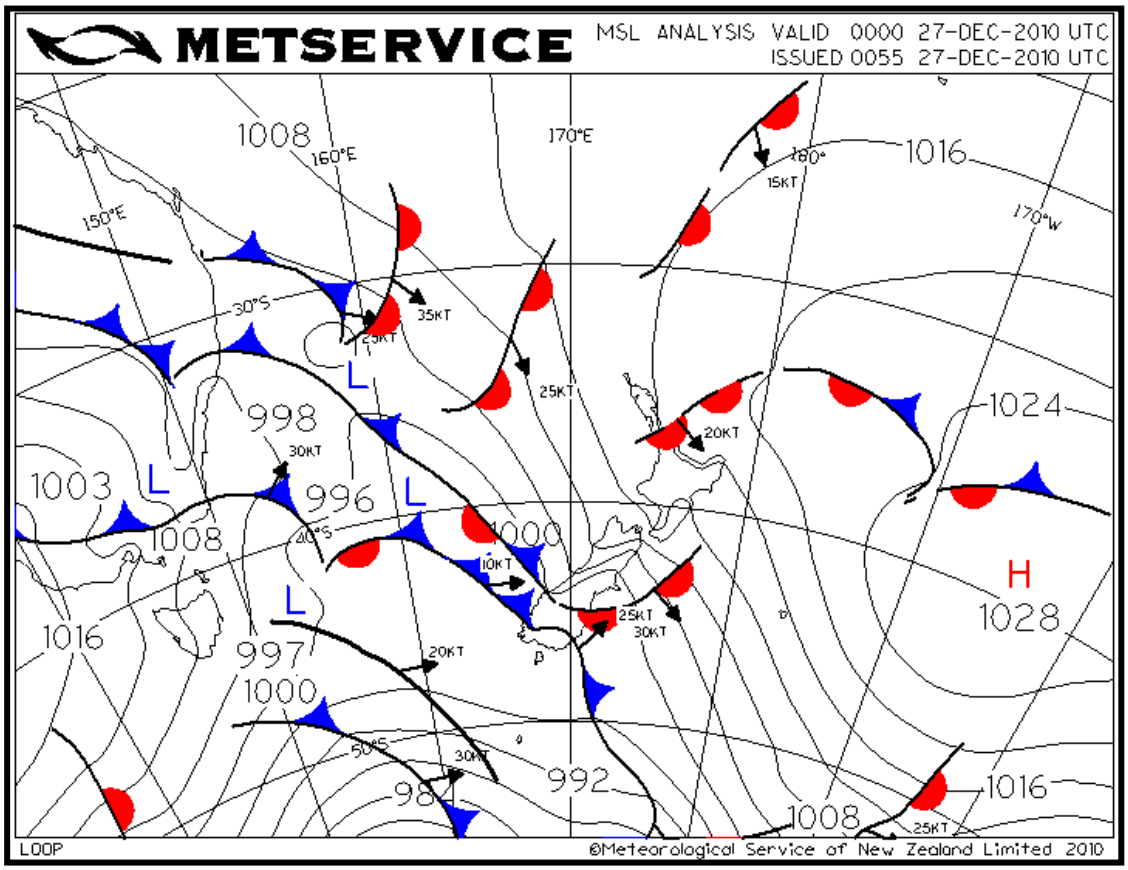
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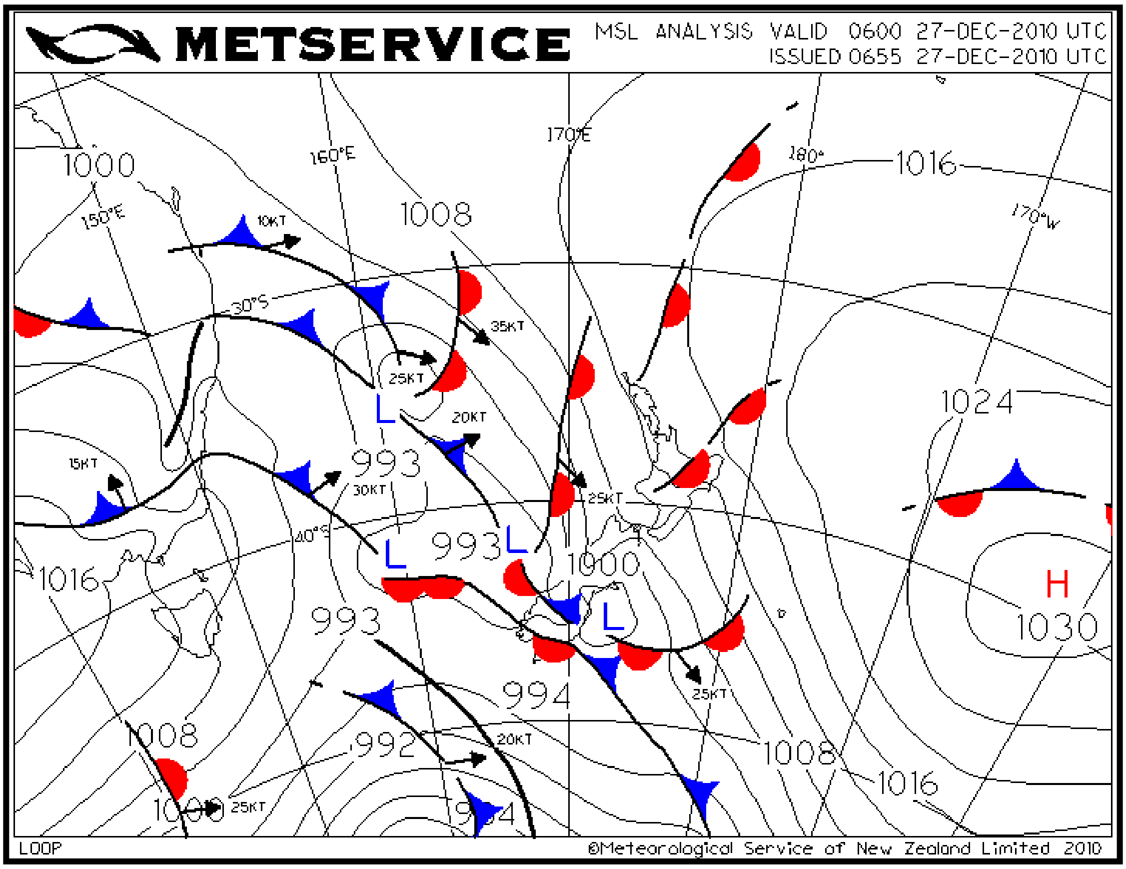
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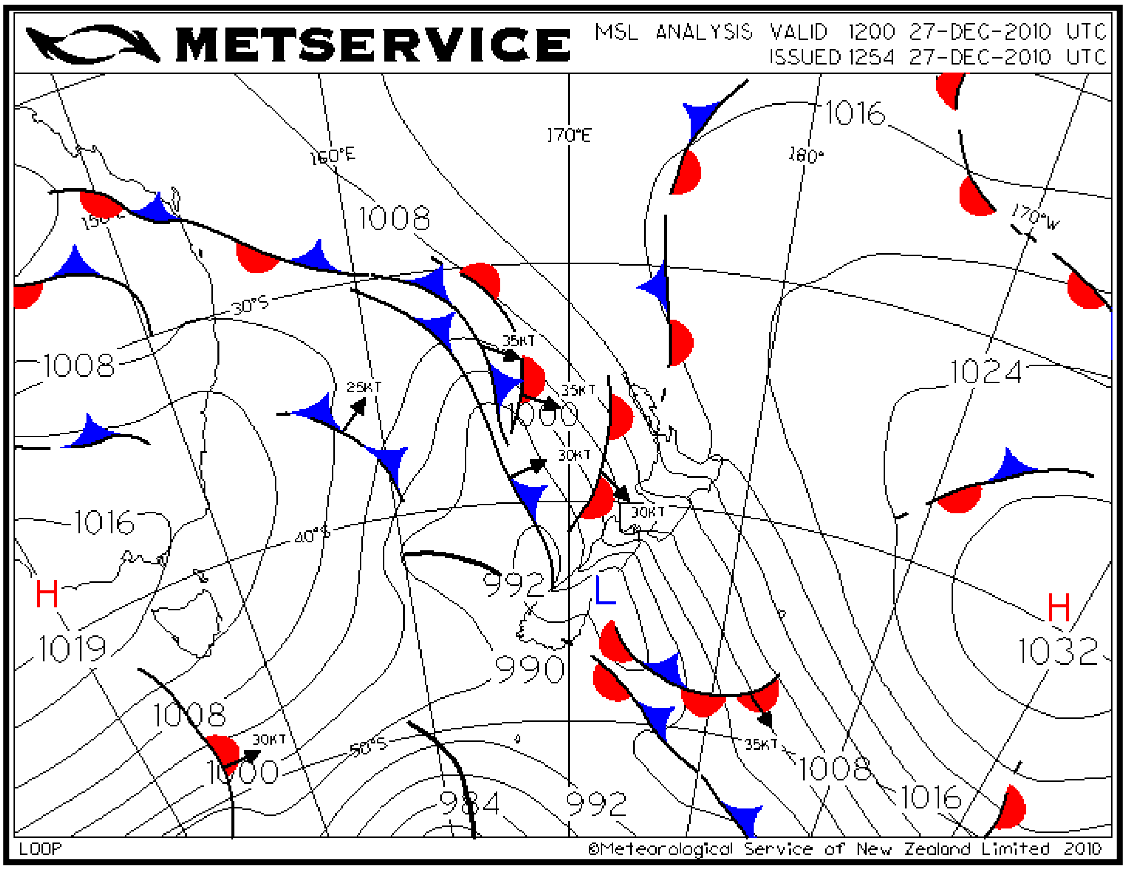
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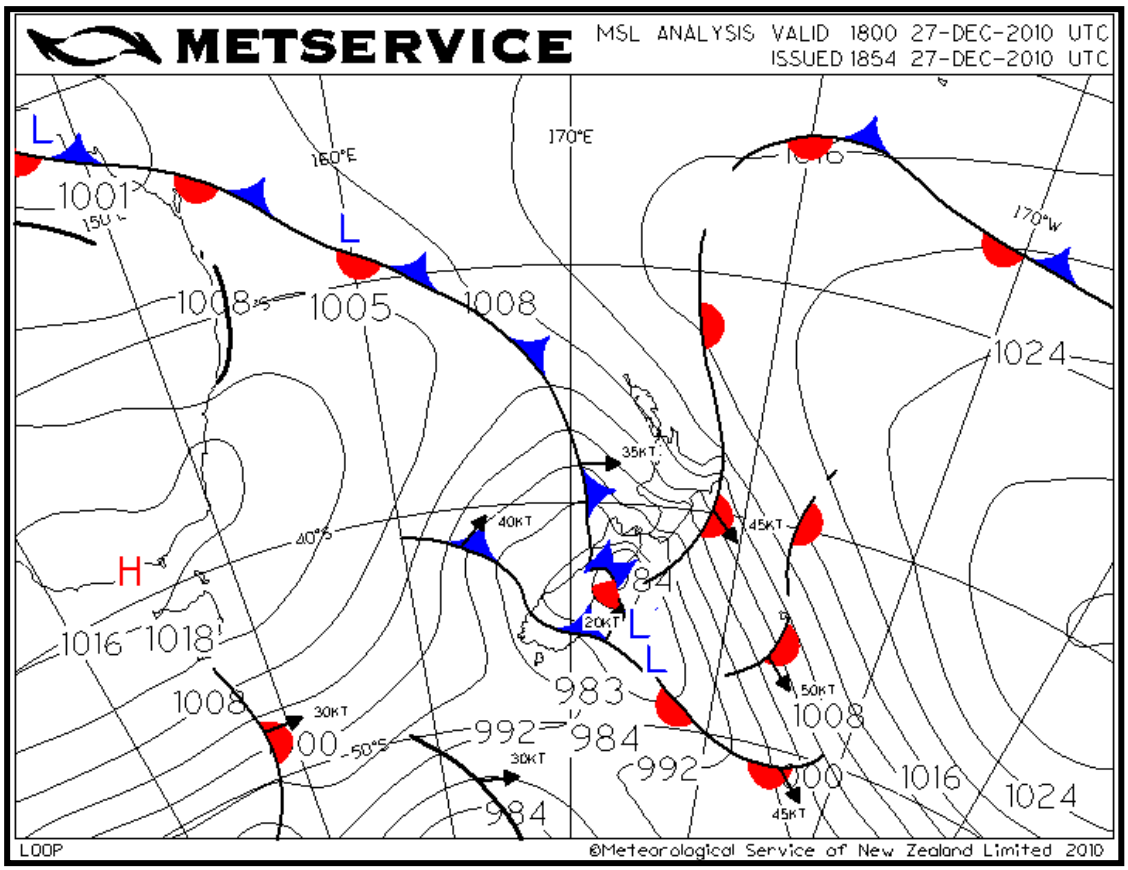
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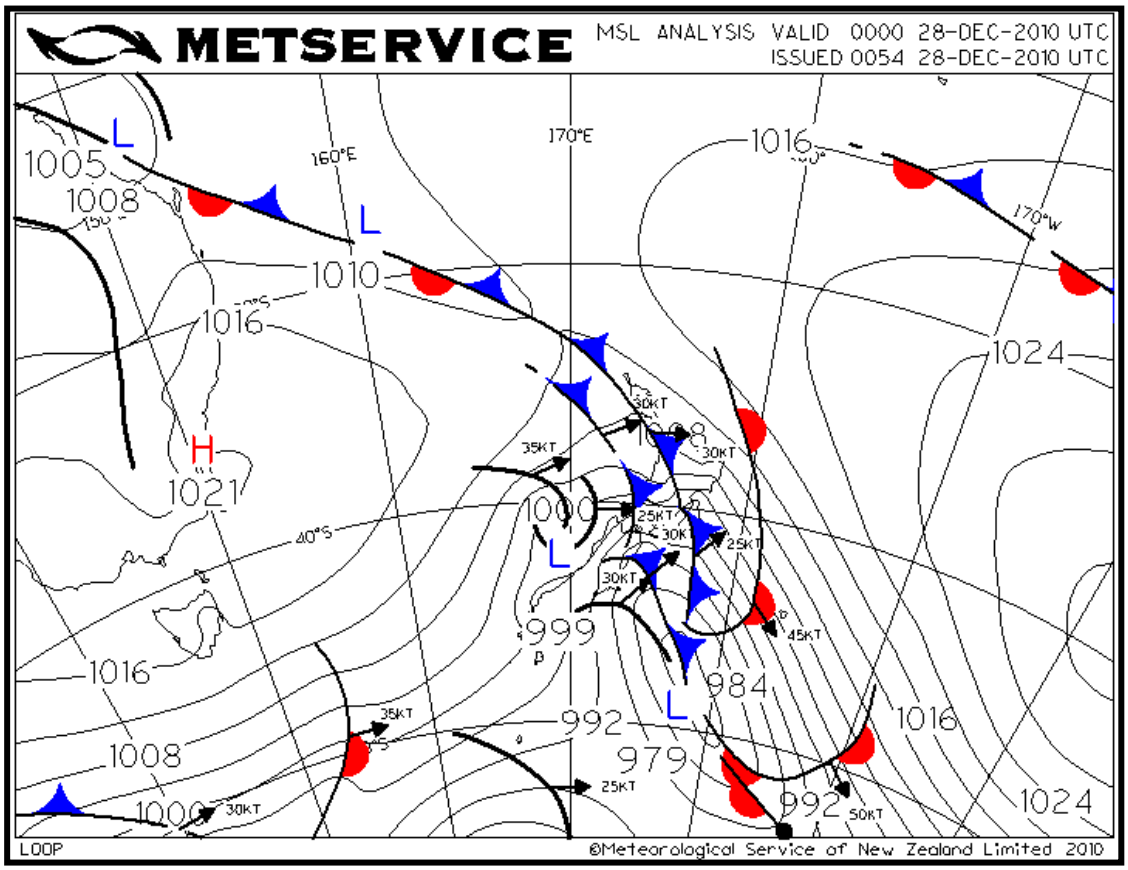
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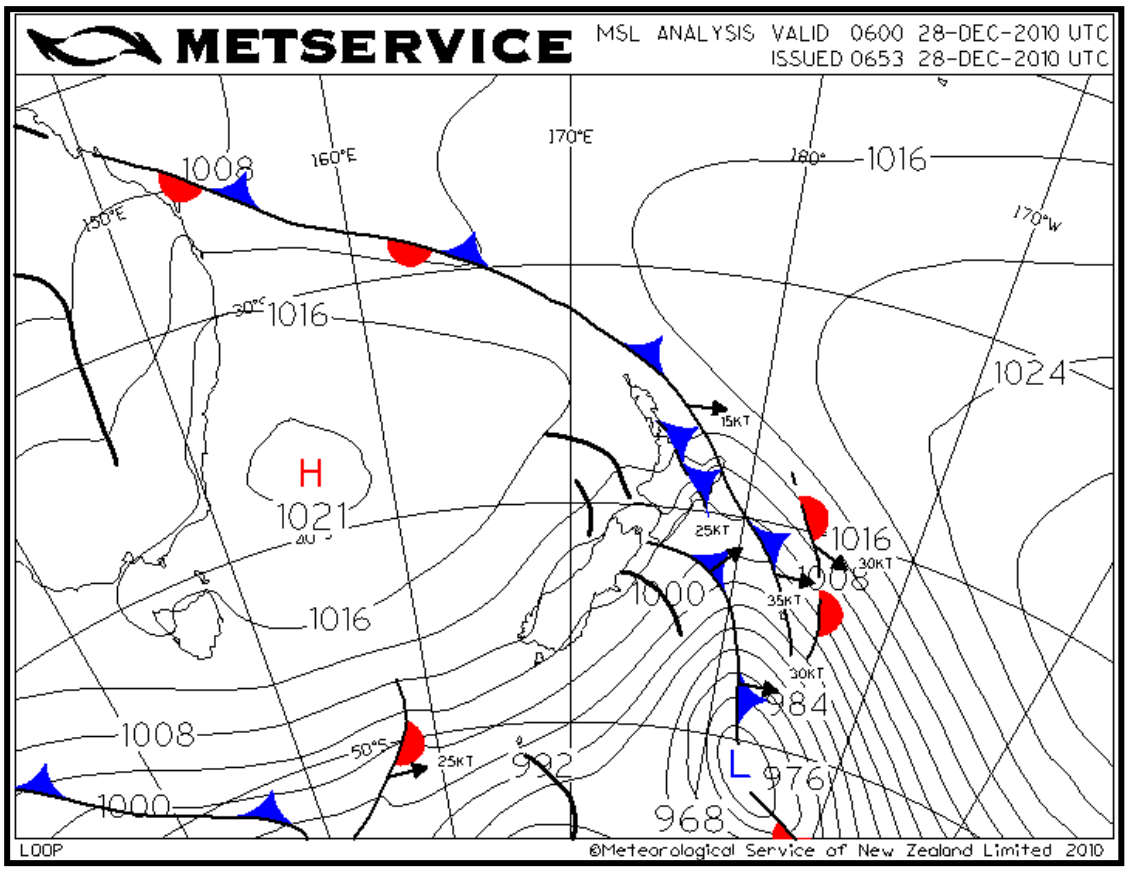
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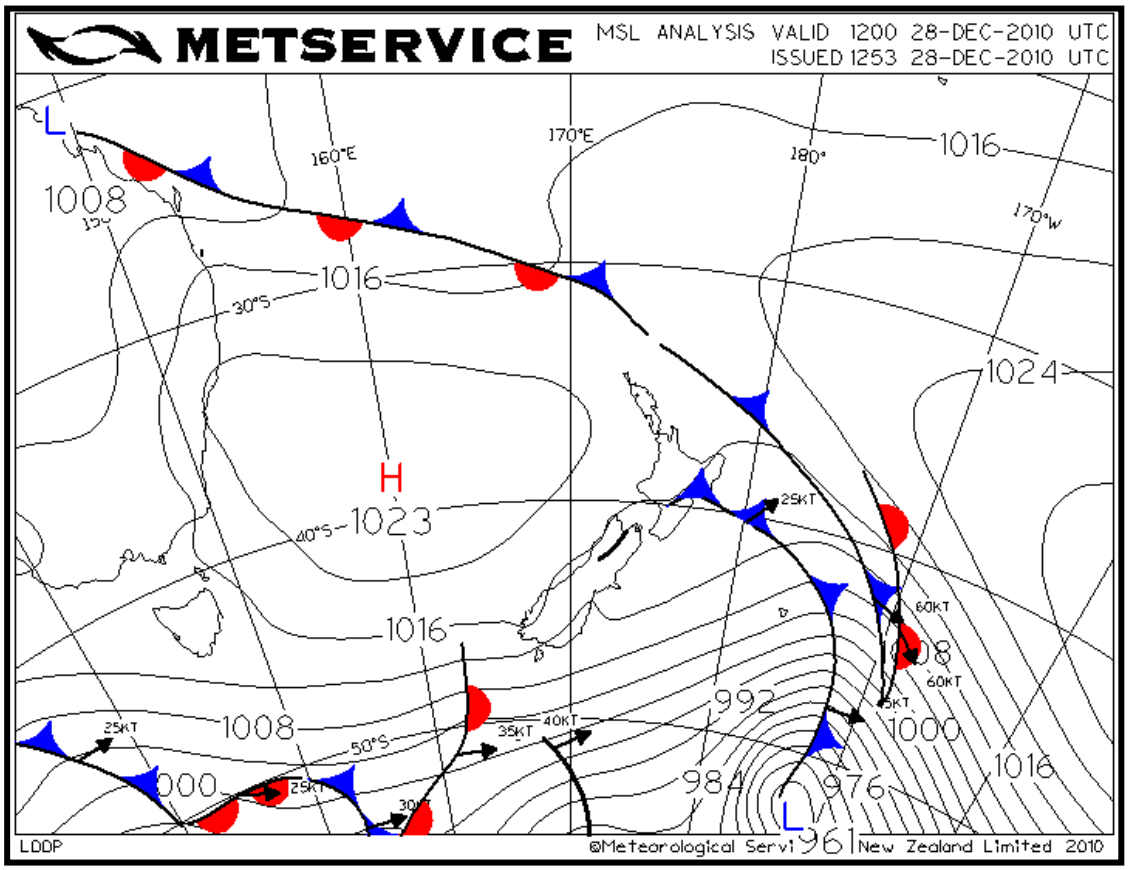
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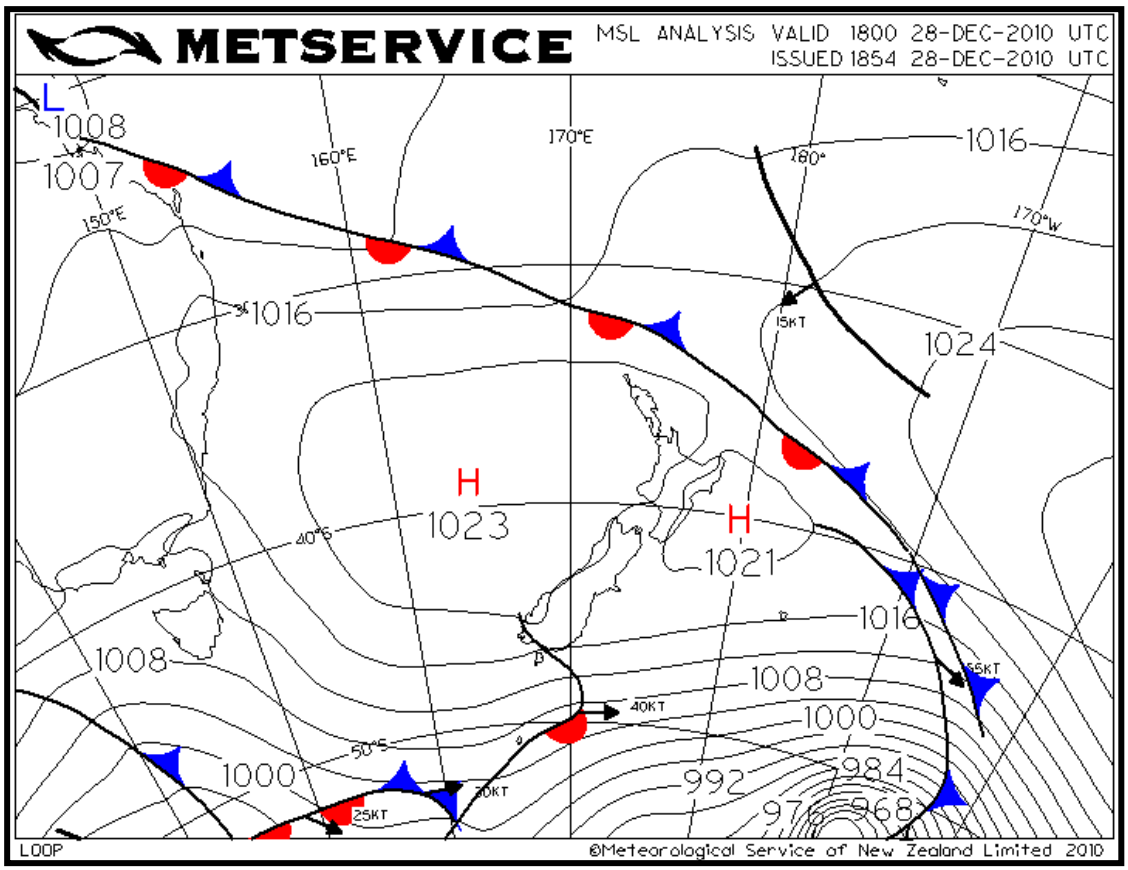
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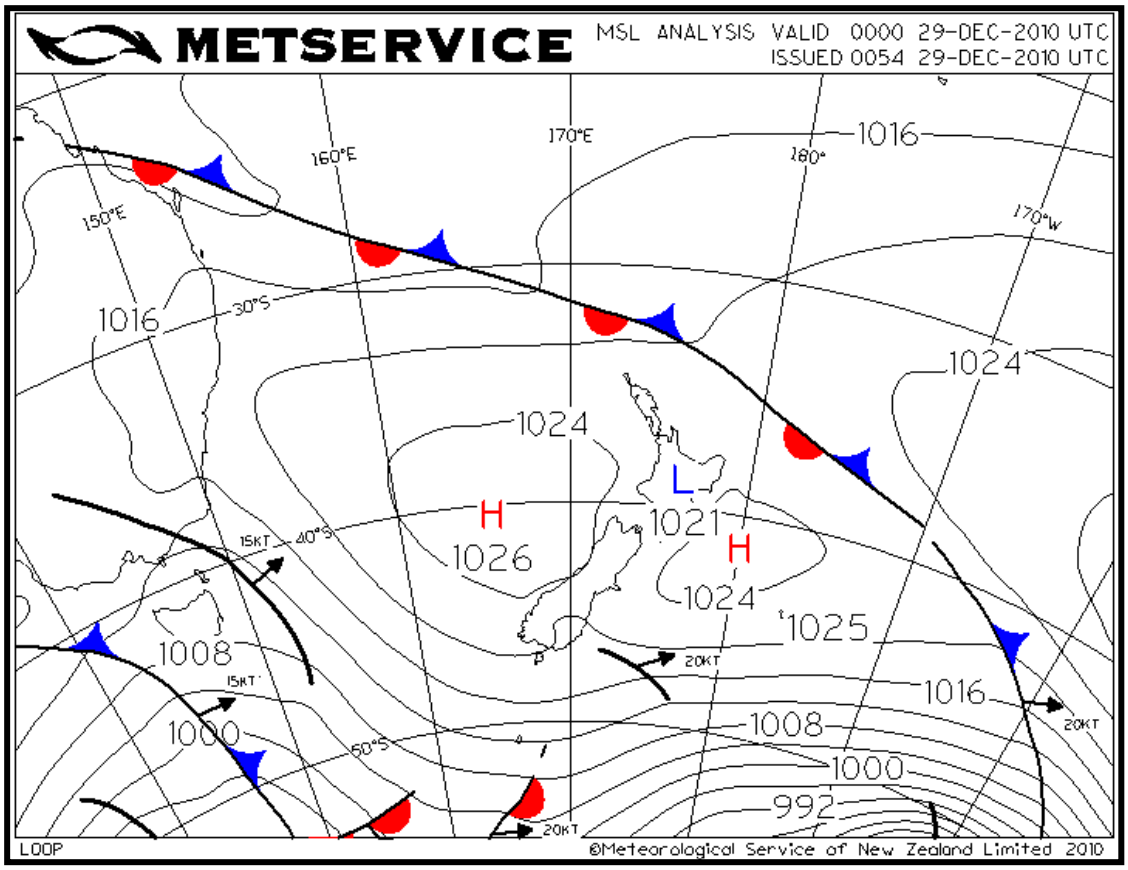
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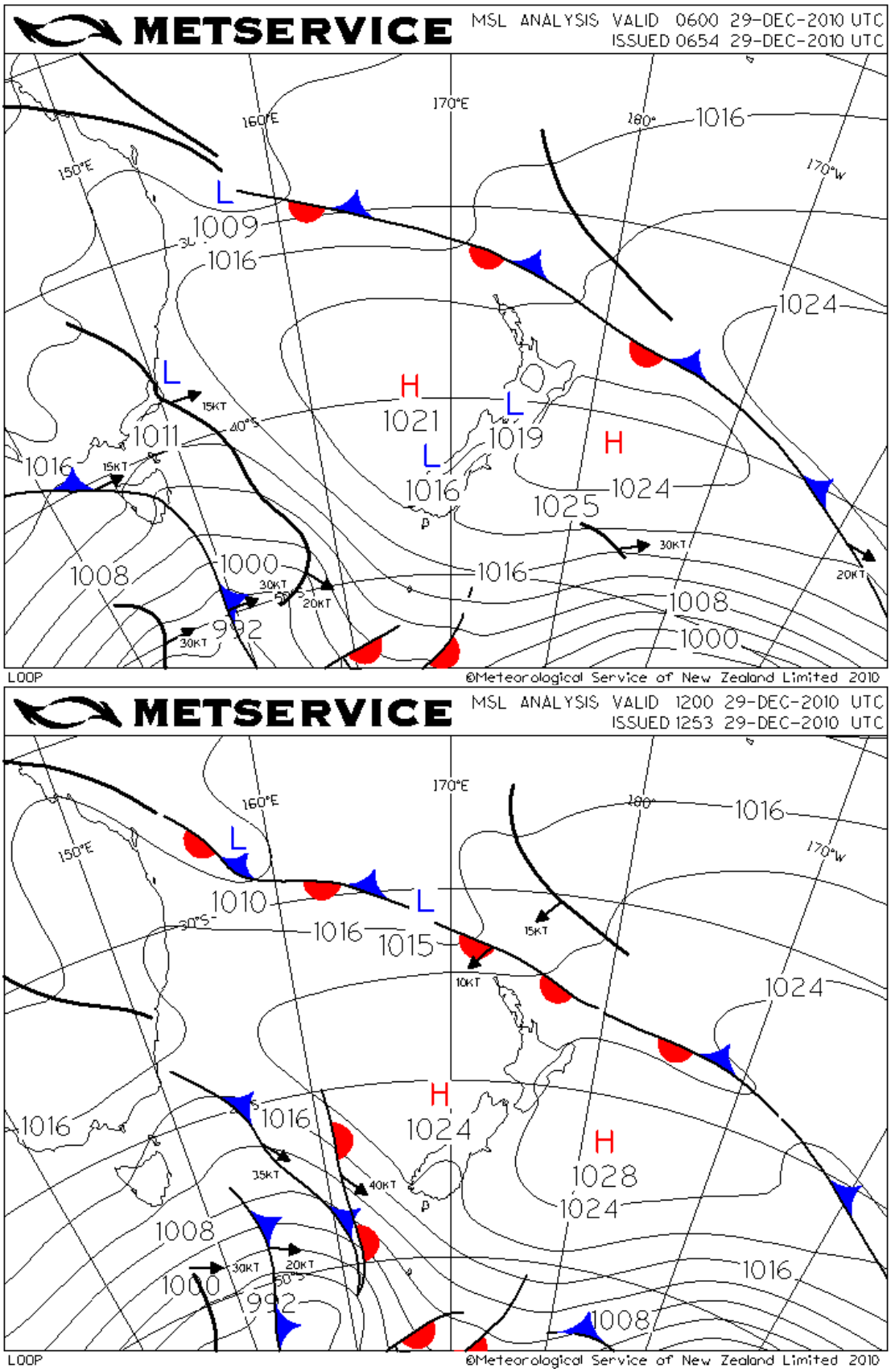
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