NIWA

Taihoro Nukurangi

Climate and Severe Fire Seasons: Part IV - Daily Weather Sequences and High Fire Severity in Auckland West/Waikato, North Canterbury, McKenzie Basin and Central Otago/Inland Southland

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Climate and Severe Fire Seasons:
Part IV - Daily Weather Sequences and High Fire Severity in Auckland West/Waikato, North Canterbury, McKenzie Basin and Central Otago/Inland Southland

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Executive Summary

- This report completes the research on relationships on severe fire seasons and climatic factors experienced in four regions of New Zealand. It relates extreme daily severity ratings (DSR) and daily weather types for the regions of Auckland West/Waikato, North Canterbury, McKenzie Basin and Central Otago/Inland Southland. It builds on knowledge gained through several years' worth of research, linking fire risk to climate indicators, including a spatial analysis of 15 fire regions across New Zealand.

- The dominant daily weather type for the three of the four fire regions examined (Auckland West/Waikato, McKenzie Basin and Central Otago/Inland Southland), averaged over all of the months with extreme fire danger, is one where anticyclones and easterly winds onto the North Island dominate, with light winds elsewhere. In contrast, the dominant weather type for North Canterbury, are anticyclones producing westerly winds onto the South Island.

- A clear predominance of anticyclones and easterly winds increases the risk at the Auckland West/Waikato stations, with occasional north westerly winds at Woodhill and Hamilton. Extreme fire risk episodes occur with a prevalence of anticyclones at the North Canterbury stations, with the occasional northwesterly wind events. In this region anticyclones producing high monthly severity ratings (MSR) often produce westerly airflow over the region, with warm dry westerly quarter winds. Easterly winds prevail in the McKenzie Basin during extreme fire risk months, linked to a prevalence of anticyclones, although Wanaka also shows a high frequency of southwest or westerly winds. Stations in Central Otago/Inland Southland show a predominance of anticyclones producing easterly quarter wind flows for increased fire risk episodes, although Gore and Queenstown also demonstrate a secondary maximum of northwest winds in several extreme MSR months.

- There is good coherence at most of the stations between the prevalent wind flows during the extreme fire risk months, as classified by daily weather types, and the wind flow anomalies from monthly data correlations, calculated in earlier work. This demonstrates that the daily weather type analysis in these most extreme MSR months is capturing the daily sequences of weather types that contribute to the dominant climate circulation and wind flow anomalies in the New Zealand region for the month. Therefore the prediction of monthly and seasonal circulation patterns will be a useful guide to the predominance of daily weather types expected, and the prediction of high or extreme fire risk periods in any month for the four regions examined. Relationships between the daily weather types and large scale features producing seasonal climate variability, such as El Niño-Southern Oscillation will allow the

exploitation of seasonal climate forecasting for improved monthly and seasonal fire climate outlooks.

- For stations within the Auckland West/Waikato region, anticyclones are primarily responsible for high or extreme fire risk persisting over a number of days, with wind flows being of lesser importance, although easterly winds increase the risk. This is consistent with the anticyclonic circulation producing dry subsiding air onto the region.

- Either anticyclones producing light or westerly quarter winds over the South Island, or westerly wind flows associated with long sequences of the troughs in westerly flow (T) daily weather type, are important for persistent days of high or extreme fire risk in North Canterbury and the McKenzie Basin. The first pattern is by far the most common for days with extreme fire risk. The importance of daily wind direction in both patterns is consistent with the strong influence that the Southern Alps have on climate in these regions. Westerly quarter winds often produce warm dry conditions east of the Southern Alps.

- Anticyclones located over or to east of the South Island, usually linked to light or southwest winds in the region, produce persistent days of extreme fire risk in Central Otago/Inland Southland. However, Queenstown also reflected a pattern similar to those stations in the McKenzie Basin, displaying extreme DSR with westerly winds, primarily associated with periods of the T daily weather type.

- The analysis of daily weather types, and their associated wind flows, has been beneficial in understanding the climatic causes of persistent extreme fire risk, represented by extreme DSR. Analysis at the daily scale has shown more detail than previous monthly research. Similarly, analysis of several stations within a fire region has detailed some subtle differences between the stations, especially those in proximity to fire region boundaries. However, throughout the temporal and spatial scales of this research consistent results are produced. Anticyclonic climate patterns, typically with easterly wind flows, most commonly occur with extreme fire risk, at the monthly or daily scale. Anticyclonic daily weather types are linked to persistent extreme fire risk in all four regions over the period studied, with wind flows being of secondary importance, except in North Canterbury and the McKenzie Basin, where westerly quarter winds are significant in increasing fire risk, and underline the strong influence that the Southern Alps have on climate in these regions.

Introduction and Background

Severe fire seasons experienced in New Zealand have been attributed to various climatic circulation features, such as the influence of El Niño and La Niña events. The possible prediction of seasonal severity based on expected seasonal climate variations is important because detection of discernible trends coupled with seasonal climate prediction would allow some anticipation of potential higher regional fire risks. The National Rural Fire Authority (NRFA) has reported variable success in their endeavours to uncover specific factors that cause high seasonal fire risk (Pearce et al., 1995). In an initial study, the National Institute of Water and Atmospheric Research (NIWA) investigated linkages between climate predictors and severe fire seasons for 10 stations in New Zealand up to 1995 (Salinger, 1998).

The first part of a 3-year programme extended work presented by Salinger (1998) through detailed analysis of the relationships between global (such as El Niño and La Niña) and regional circulation indices, monthly severity ratings (MSR) and seasonal severity ratings (SSR) for 21 stations throughout New Zealand (Heydenrych et al, 2001).

The second part of the 3-year programme focused on inter-regional associations of the different fire regions throughout New Zealand. Heydenrych et al (2002) identified 15 fire regions in New Zealand based on daily severity rating (DSR) records from 128 stations. The analysis also provided key fire risk indicators (long-term climate and circulation indices) for each of the 15 fire regions based on pseudo MSR data.

The third part of the 3-year programme, described in Gosai et al., 2003, aimed to identify characteristic daily climatic patterns in months with extreme fire risk that cause high regional fire severity in Northland and Canterbury. The top decile (90^{th} percentile) months from the long-term MSR data and the DSR of these months were compared to the daily synoptic weather types identified by Kidson (1994, 2000). See Table 1 and Figure 1 for Kidson (2000) definitions.

Scope of this Research

The goal of this research is similar to the third part of the 3-year programme, yet the methodology was modified due to data constraints. The aim of this report is to identify characteristic daily climatic patterns that cause high regional fire severity in Auckland/Waikato, North Canterbury, McKenzie Basin and Inland Southland/Central Otago by analysing DSR in extreme MSR months. These four regions were selected, as they are prone to periods of very high or extreme fire danger, and links between monthly (MSR) and seasonal (SSR) severity ratings have not been fully uncovered.

Index	Pressure difference/Synoptic Type*	Type
Z1	Auckland-Christchurch	Zonal westerlies
Z2	Christchurch-Campbell Island	Zonal westerlies
Z3	Auckland-Invercargill	Zonal westerlies
Z4	Raoul Island- Chatham Island	Zonal westerlies
M1	Hobart-Chatham Islands	Meridional southerlies
M2	Hokitika-Chatham Island	Meridional southerlies
M3	Hobart-Hokitika	Meridional southerlies
MZ1	Gisborne-Hokitika	North-westerly flows
MZ2	Gisborne-Invercargill	North-westerly flows
MZ3	New Plymouth-Chatham Island	South-westerly flows
TSW	* Trough/southwesterly	Trough in southwest flow crossing New Zealand
T	* Trough	Trough in westerly flow crossing New Zealand
SW	* Southwesterly	Southwesterly flows
NE	* Northeasterly	Northeasterly flows
R	* Ridge	Ridge – light winds over the south, easterlies over the north
HW	* High to southwest	High to west of the South Island with light south – southwesterly flows
HE	* High to east	High to the east with developing northwesterly flow
W	* Westerly	Westerly flow
HNW	* High to northwest	High west of the North Island with southwesterly flow
TNW	* Trough in northwest	Trough to the west preceded by northwesterly flow
HSE	* High to southeast	High east of the South Island with easterly flow for the North Island and light winds elsewhere
H	* High	Light winds – North Island Westerly flow – far south

Table 1: Indices of Circulation in the New Zealand Region

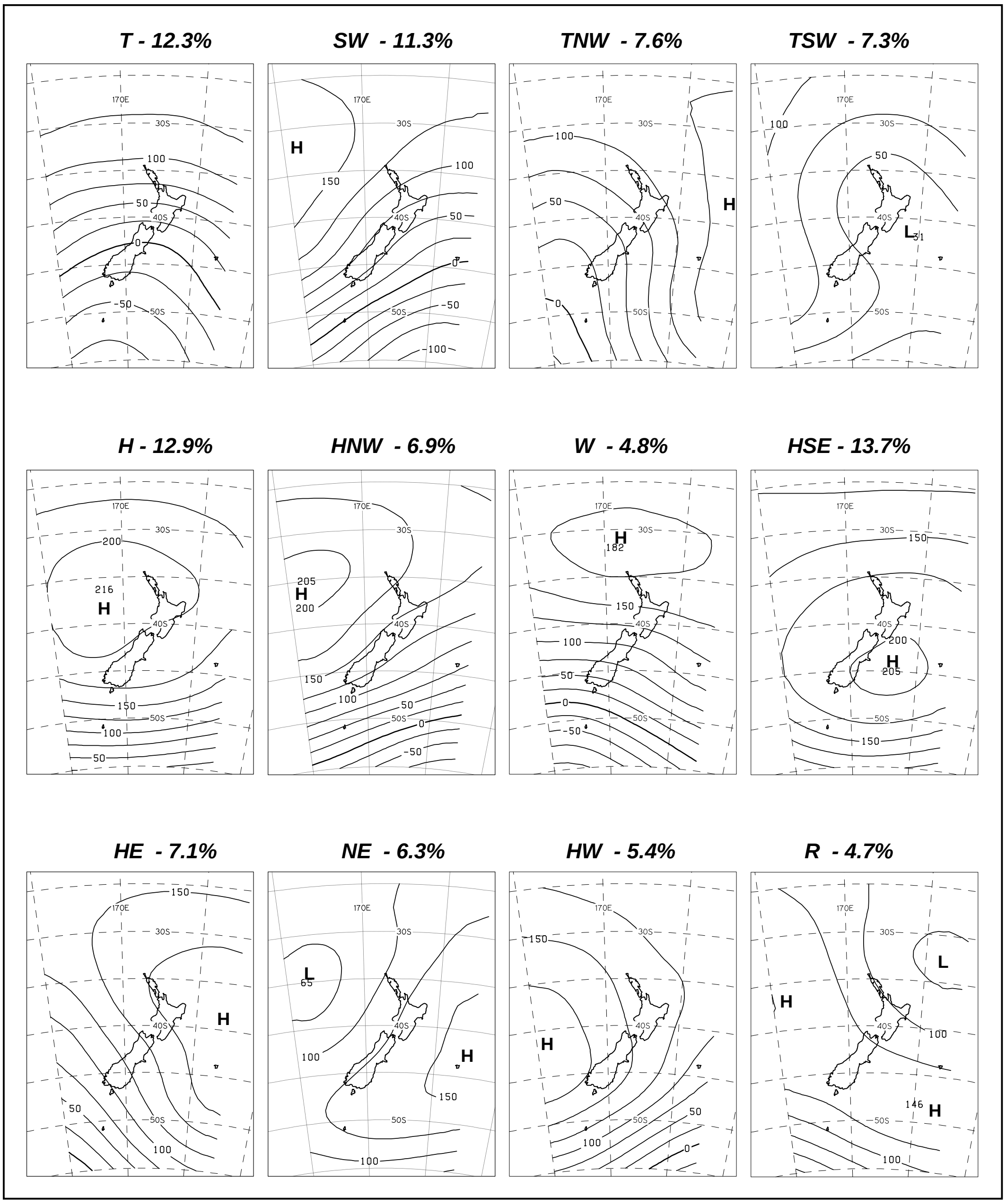

Figure 1: Cluster-mean (1000hPa) flow patterns used to categorise daily weather patterns (Kidson 2000). Percentage values represent the frequency of each type each year over the period studied (1958-1997). Winds flow along the contours shown, with speed inversely proportional to the contour spacing.

The scope of this research goes further than Gosai et al (2003) in that the daily climate patterns are identified for each extreme MSR month that produce runs of days with extreme DSR. These are then compared with results from Heydenrych et al (2001) who identified synoptic windflow and weather type anomalies from the mean situation, thus providing the link between daily climate patterns that influence the

DSR and MSR for the month, and broader scale monthly anomaly patterns that act on monthly to seasonal time scales.

Methodology

Daily Severity Ratings (DSR) for Auckland West/Waikato, North Canterbury, McKenzie Basin, Central Otago/Inland Southland were obtained from the National Rural Fire Authority (NRFA) for the years 1990 till 2003 (length varies from station to station depending on when the station was commissioned). NIWA has previously calculated long-term (1961-2003) MSR and SSR values for 21 stations used in Heydenrych et al (2001, 2002) and Gosai et al (2003).

In this study, DSR data is available at a sub-regional spatial scale, for example, several stations within a fire climate region. This should provide a better representation of climate responses within a fire region can be achieved by using the following methodology:

1. MSR Calculations

The MSR data used in this study were calculated from the available DSR data, (provided by NRFA) for 11 stations that represent the four fire regions, which are the focus of this study. MSR is calculated here as the mean DSR for a particular month, for each station. The data range varied from station to station (See Table 2 overleaf).

2. Selection of Extreme MSR Months

This study aims to identify only the extreme fire risk months for each station. Therefore, the MSR data were ranked for each station, and the top 10% of the MSR values were classified as being the extreme fire risk months for that station.

3. Dominant weather type

Twelve daily synoptic weather types described by Kidson (2000) were used to define winds flows for New Zealand (see Table 1 and Figure 1 for descriptions of the synoptic weather type and associated wind flow).

For the extreme MSR months, all available daily synoptic weather types were listed at each station (see Appendix 1). A 'dominant weather type' was found by counting the 12 possible daily synoptic weather types, and identifying the most frequent pattern overall. The single most frequent weather type for each station is shown in Figures 2 - 5.

STATION	LATITUDE	LONGITUDE	ELEVATION metres	RECORDING START DATE	RECORDING STOP DATE
Auckland West/Waikato					
Pukekohe	37°12 00'S	174°51 00'E	82	1 Oct 1991	20 Sep 1999
Woodhill	36°42 30'S	174°22 48'E	220	19 Sep 1996	3 0 Oct 2003
Hamitlon Aero	37°51 00'S	175°20 00'E	52	30 Sep 19 91	30 Oct 2003
North Canterbury					
Ashley Forest	43°10 22'S	172°30 41'E	280	29 Oct 1 993	30 Oct 2003
Balmoral Forest	42°51 50'S	172°45 05'E	205	4 Nov 1994	30 Oct 2003
Mckenzie Basin					
Lauder	45°02 00'S	169°41 00'E	370	1 Oct 1991	30 O ct 2003
Tara Hills	44°31 00'S	169°54 00'E	488	1 Oct 1991	30 Oct 2003
Wanaka	44°43 00'S	169°14 00'E	348	1 Jan 1992	30 O ct 2003
Central Otago/Inland Southland					
Gore	46°06 00's	168°53 00'E	123	1 Oct 1991	30 Oct 2003
Tapanui	45°54 54'S	169°14 23'E	200	21 Aug 1994	30 Oct 2003
Queenstown Aero	45°01 00's	168°44 00'E	357	1 Jan 1979	30 Oct 2003

Table 2: DSR data and station information for each fire region analysed

4. Prevalent wind flow for extreme MSR months, based on daily data

The dominant (most frequent) weather type in each of the extreme MSR months (approximately 30 day period) was identified. If there were two weather types that were equally frequent, both have been noted. The weather types were converted to a 'prevalent wind flow' based on the conversion found in column 3 of Table 1.

This converted wind flow is labelled "prevalent wind flow based on daily synoptic weather types" in column 2 of the tables for each station analysed.

5. Prevalent wind flow for extreme MSR months, based on monthly data

Heydenrych et al. (2001) produced monthly wind flow anomalies for months of extreme MSR, for every month of the year, based on long-term correlations of MSR and various climate predictors (such as found in Table 1), for various fire regions of New Zealand. For example, extreme MSR in December, in Auckland, is highly correlated to the MZ3 index (associated with anomalous southwesterly winds, as derived in column 3 of Table 1), and specifically seen in row 1 of Table 5.

This information is labelled "prevalent wind flow anomalies based on monthly synoptic weather types" in column 3 of the regional tables.

Comparisons between the mean monthly and daily observed climate patterns and wind flows are presented in the results for each regional section.

6. Persistence of extreme DSR versus daily synoptic daily weather type/wind flow

NRFA has a 5-group classification for fire danger (See Table 3). This fire danger classification scheme was used to identify all 'persistent extreme fire events'.

Fire Classification	Long-Term DSR Percentiles
Extreme	80^{th} – 100^{th}
Very High	60^{th} – 80^{th}
High	40^{th} – 60^{th}
Moderate	20^{th} – 40^{th}
Low	0 – 20^{th}

Table 3: Fire Classifications

'Persistent extreme fire events' are defined here to be periods when consecutive DSR values exceed the 80th percentile for longer than 3 days. Each station being studied in this report has different values for the 80^{th} percentile DSR (see Table 4 overleaf). Linking a sequence of daily synoptic weather types to persistent extreme fire risk at a station is useful for forecasting fire risk by identification of the patterns that will produce extreme fire risk during high and extreme MSR months.

During 'persistent extreme fire events', the daily weather types, and associated wind flow (converted from column 3 of Table 1) were analysed subjectively, to determine what weather types (and associated wind flows) are linked to persistent extreme fire events, at each station. More weighting was given to persistence events that were long-lived, or particularly intense.

Fire Region (Stations)	80th Percentile	100th Percentile
Auckland West/Waikato		
Pukekohe	0.30	6.90
Woodhill	0.71	110.29
Hamilton	0.88	45.99
North Canterbury		
Ashley	1.58	51.89
Balmoral	5.56	71.39
McKenzie Basin		
Tara Hills	3.59	171.11
Wanaka	1.90	53.08
Lauder	3.40	239.45
Central Otago/Inland Southland		
Queenstown	1.15	42.53
Tapanui	0.39	40.01
Gore	0.46	78.01

Table 4: 80th and 100th Percentile of the DSR for each station

Results

For each fire region, the results were summarised from (i) the dominant weather type, (ii) the prevalent wind flow, and (iii) the persistent extreme DSR and associated daily weather types. The dominant synoptic weather type for each fire region for all of the extreme MSR months, are as described in Methodology section 3.

The dominant (most frequent) weather type in each of the extreme MSR months (approximately 30 day period) was identified. If there were two weather types that were equally frequent, both have been noted. The weather types were converted to a 'prevalent wind flow' based on the conversion found in column 3 of Table 1. These have been labelled 'prevalent wind flow based on daily synoptic weather types'.

Heydenrych et al. (2001) produced a mean monthly wind flow anomaly for months of extreme MSR, for every month of the fire season. For example, extreme MSR in December, in Auckland, is highly correlated to the MZ3 index (associated with more frequent southwesterly winds than normal, as seen in column 3 of Table 1). These have been labelled 'prevalent wind flow anomalies based on monthly synoptic weather types'. These results are displayed in the station tables - columns 2 and columns 3, respectively for each site analysed.

Persistent DSR values that exceeded the 80th percentile (e.g. persistent extreme fire events) were compared with the synoptic weather types for the same days, and a subjective assessment of links between persistent extreme DSR, and daily synoptic weather type, was made. Raw DSR and daily synoptic weather type data are contained in Appendix 1, and persistent DSR events are shown by arrows.

1. Auckland West - Waikato

Figure 2 shows the dominant synoptic weather type for this fire region for all of the extreme MSR months examined. Anticyclones to the east of the South Island with

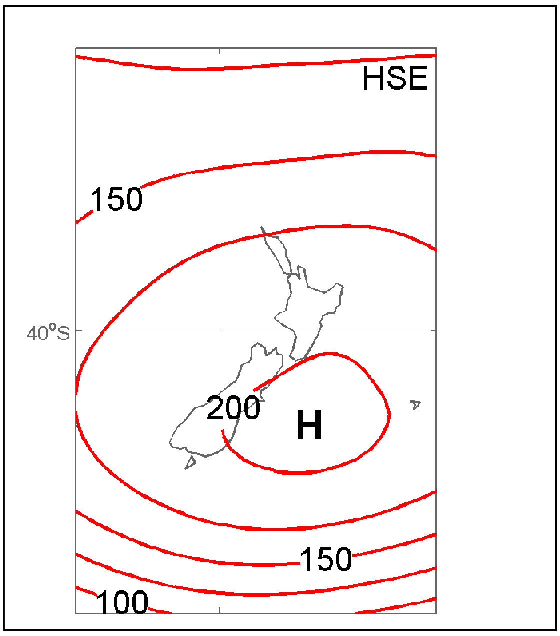

Figure 2: Dominant (most frequent) weather type for the extreme MSR months at all stations in the Auckland West/Waikato fire region

easterly flow over the region was the dominant type for this region. Tables 5 – 7 summarise the findings for Pukekohe, Woodhill and Hamilton Airport.

Pukekohe

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 1994	Easterlies or south-easterly	South-westerly
January 1995	Easterlies	Easterly
January 1996	Easterlies	Easterly
January 1999	Easterlies	Easterly
February 1999	Easterlies	Easterly
March 1999	Easterlies	No relationship

Table 5: Comparison of wind flow affecting Pukekohe between the current study and long-term correlations from Heydenrych et al, 2001

During periods of persistent extreme DSR at Pukekohe, the primary daily synoptic types are anticyclonic – H, HSE, or HNW. Anticyclonic conditions equate to higher mean sea level pressures and subsidence (descending air), with lower relative humidity (dry air). By far the most common daily synoptic weather type during persistent extreme DSR events at Pukekohe was H, associated with light winds.

Woodhill

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
November 1996	Easterly and North-easterly	South-westerly
January 1997	Easterlies	Easterly
January 1998	Easterlies, North-westerly and North-easterly	Easterly
January 1999	Easterlies and North-westerly	Easterly
February 1997	Easterlies	Easterly
February 1998	Easterlies and North-westerly	Easterly
February 1999	Easterlies	Easterly
March 1997	Easterlies and North-westerly	No Relationship
March 1999	Easterlies	No Relationship

Table 6: Comparison of wind flow affecting Woodhill between the current study and long-term correlations from Heydenrych et al, 2001

Periods of persistent extreme DSR at Woodhill are also characterized by anticyclonic daily synoptic weather types - HSE, H, or HE. By far the most common daily synoptic weather type during persistent extreme DSR events at Woodhill was HSE, associated with easterly winds.

Hamilton Airport

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 1994	Easterlies and North-easterly	South-westerly
January 1998	Easterlies, North-easterly and North-westerly	Easterly
January 1999	Easterlies and North-westerly	Easterly
February 1994	Easterlies	Easterly
February 1998	Easterlies and North-westerly	Easterly
February 1999	Easterlies	Easterly
February 2003	Light Winds	Easterly
March 1999	Easterlies	No Relationship
March 2000	Easterlies	No Relationship

Table 7: Comparison of wind flow affecting Hamilton between the current study and long-term correlations from Heydenrych et al, 2001

Similarly, extended duration extreme DSR at Hamilton are associated with two anticyclonic daily synoptic weather types - H, HSE, in approximately equal proportions.

At all sites the prevalent daily weather type and synoptic flow for days with extreme fire risk occurred in anticyclones with easterly flow over the region. At Woodhill and Hamilton Airport extreme fire risk days also occurred in anticyclones with northwesterly flow. Persistence for this region is shown in Table 10 below.

Name	**Average length of Persistent Extreme Fire Events (days)**	**Maximum length of Persistent Extreme Fire Events (days)**	**Number of Persistent Extreme Fire Events**
Auckland West/Waikato			
Pukekohe	9	20	11
Woodhill	10	25	19
Hamilton	12	30	17

Table 8: Summary statistics of Persistent Extreme Fire Events

In this region, although the prevailing wind flows at Pukekohe differ during these daily synoptic types (light winds, easterly, southwesterly, respectively), the results indicate that anticyclonic conditions are responsible for extended duration of extreme DSR at this station. For Woodhill Forest in the north, the wind flows in these daily weather types vary (easterly, light winds, northwest winds, respectively). Again, dry anticyclonic conditions are primarily responsible for extended duration extreme DSR at Woodhill, with daily wind flows being less important.

Similarly, extended duration extreme DSR at Hamilton are associated with two anticyclonic daily synoptic weather types - H, HSE, in approximately equal proportions. Although the prevailing wind flows at Hamilton differ during these daily synoptic types (light winds or easterly, respectively), again there is the clear indication that anticyclonic conditions with lower relative humidity are responsible for extended duration extreme DSR at this station.

At the course scale, the dominant synoptic weather type for Auckland/Waikato for all of the extreme MSR months is HSE (Highs to the south east), a strongly anticyclonic pattern bringing easterly flows onto the North Island. Examination of each extreme MSR month individually, reveals a clear predominance of easterly wind flows (associated with anticyclonic weather types and dry subsiding air) observed during these months at the Auckland West - Waikato stations, with the addition of some occasional northwest wind flows at Woodhill and Hamilton.

There is good consistency of prevalent wind flows based on daily weather type, and the average wind flow anomalies based on monthly data correlations, showing a predominance of easterly windflow anomalies under dry anticyclonic conditions. This demonstrates that the daily weather type analysis in these most extreme MSR months are capturing the daily synoptic sequences which contribute to months with high MSR.

For stations within the Auckland West -Waikato region, anticyclonic daily weather types are primarily responsible for persistent extreme DSR, with wind flows being of secondary importance. These systems produce very dry conditions in the warmer part of the year, particularly when the airflow is from the east.

2. North Canterbury

For North Canterbury anticyclones to the west of the North Island (Figure 3) producing dry westerly flow across the South Island, and dry foehn winds from time to time, produce extremely high DSRs.

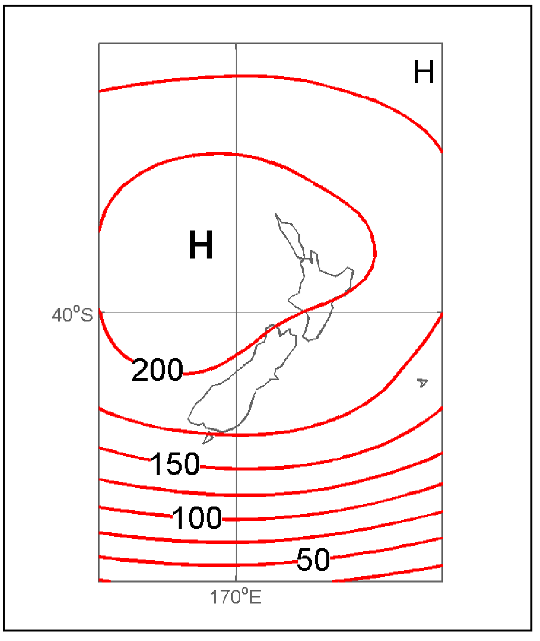

Figure 3: Dominant (most frequent) weather type for the extreme MSR months at all stations in the North Canterbury fire region

Tables 9 and 10 summarise the findings for Ashley and Balmoral Forests.

Ashley

During periods of persistent extreme DSR at Ashley, two daily synoptic weather type situations emerge.

The first, and most common, is due to anticyclonic daily synoptic types – H, HSE, HNW, HE. The prevailing wind flows at Ashley differ during these daily synoptic types (light winds, light winds, southwesterly, northwesterly, respectively), and the results suggest that anticyclonic conditions are responsible for extended duration extreme DSR at this station, but in particular when these anticyclonic conditions produce dry foehn westerly quarter winds.

The second situation of persistent extreme DSR at Ashley is slightly less frequent, and is more complicated. The daily synoptic weather types change more often (systems are more mobile), typically with long sequences of T, linked with brief SW or HNW.

All of these daily weather types have westerly quarter wind flows in common, although some patterns are anticyclonic in nature, and others are not.

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
October 1998	Easterly	Westerly
November 1997	Easterly and North-easterly	Westerly
December 2000	Easterlies	Westerly
January 1998	North-easterly and North-westerly	Westerly
February 1998	North-easterly and North-easterly	North-westerly
March 2002	Easterly	Westerly
March 2001	Easterly	Westerly
April 2001	North-easterly	Westerly

Table 9: Comparison of wind flow affecting Ashley between the current study and long-term correlations from Heydenrych et al, 2001

Balmoral

As with Ashley Forest, two daily synoptic weather type situations are associated with periods of persistent extreme DSR at Balmoral. By far the most common is due to anticyclonic daily synoptic types – HSE, H, and HE, occasionally mixed with R or HNW. The wind flows over the South Island produced by these daily weather types are light winds, southwesterly, and northwesterly, respectively, occasionally mixed with light winds or southwesterly winds. Persistent extreme DSR at Balmoral is also linked to long sequences of T (Westerly flows), but this is not common in the subset of months analysed.

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 1994	North-easterly and Easterly	Westerly
December 2000	Easterly	Westerly
January 1998	North-easterly and North-westerly	Westerly
January 1999	North-westerly and South-easterly	Westerly
February 1998	North-easterly and North-westerly	North-westerly
February 2001	Light North-easterly	North-westerly
March 1998	Easterly and North-easterly	Westerly

Table 10: Comparison of wind flow affecting Balmoral between the current study and long-term correlations from Heydenrych et al, 2001

These results show that either anticyclonic patterns producing light or westerly quarter winds over the South Island, or westerly flows producing dry foehn winds associated with westerly troughs (T daily weather type) are the predominant patterns producing extreme DSR in this region. This relates well with the monthly results.

Typically, extreme fire events can be quite lengthy (Table 11) in this region.

Name	Average length of Persistent Extreme Fire Events (days)	Maximum length of Persistent Extreme Fire Events (days)	Number of Persistent Extreme Fire Events
North Canterbury			
Ashley	10	26	19
Balmoral	17	31	11

Table 11: Summary statistics of Persistent Extreme Fire Events

Either anticyclonic patterns producing light or westerly quarter winds or strong dry foehn westerly wind flows associated with T daily weather types are important for extended duration extreme DSR at Ashley Forest. For Balmoral Forest similar results occur in that either anticyclonic patterns producing light or westerly quarter winds, or westerly wind flows associated with T daily weather type, are important for extended duration extreme DSR.

The dominant weather type for all extreme MSR months for North Canterbury is H (High), an anticyclonic pattern bringing westerly flow onto the South Island, followed closely by HSE (this result is not shown).

An analysis of each extreme MSR month individually shows that there is a clear predominance of easterly or northeast wind flows at the North Canterbury stations (also associated with anticyclonic weather types), with the occasional northwest event. This result has less coherence between the prevalent wind flows in North Canterbury observed in the daily weather type, and the wind flows based on monthly data correlations, except for several northwesterly events.

Both anticyclonic patterns producing light or westerly quarter winds over the South Island, or westerly wind flows associated with long sequences of the T daily weather type, are important for persistent extreme DSR in North Canterbury. The first pattern is most common. The importance of daily wind direction in both patterns on extreme DSR in this region is consistent with the strong influence that the Southern Alps have on Canterbury climate. These produce moisture loss as the winds flow over the Southern Alps, producing hot dry foehn winds during westerly conditions.

3. McKenzie Basin

Figure 4 shows the dominant synoptic weather type for this fire region for all of the extreme MSR months examined. Anticyclones to the east of the South Island with dry

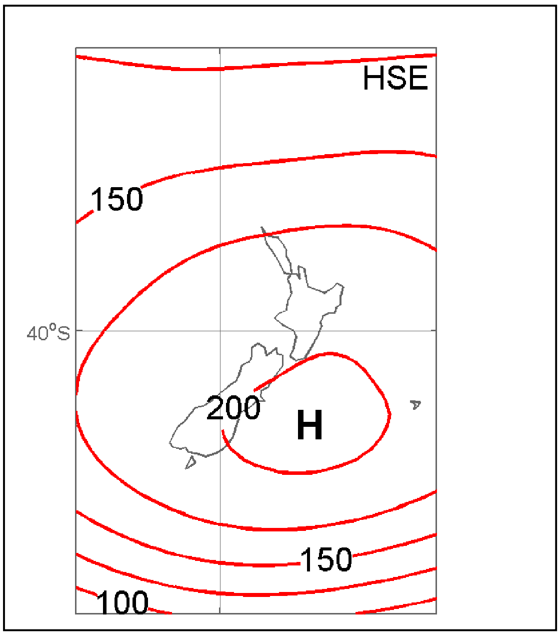

Figure 4: Dominant (most frequent) weather type for the extreme MSR months at all stations for the McKenzie Basin fire region

subsiding air over the region was the dominant daily type for this region. Tables 14 – 16) summarise the findings for Tara Hills, Lauder and Wanaka.

Tara Hills

As with the North Canterbury stations, two daily synoptic weather type patterns are associated with periods of persistent extreme DSR at Tara Hills. The most common pattern is linked to anticyclonic daily synoptic types – HSE and H. The wind flows over the South Island produced by these two daily weather types are light winds and south-westerly winds. The second pattern is due to long sequences of the T daily weather pattern, associated with westerly winds.

It is evident that either anticyclonic patterns producing light or southwesterly winds, or westerly wind flows associated with long sequences of the T daily weather type, are important for extended duration extreme DSR at Tara Hills.

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 2000	Easterly	N/A
January 1999	South-easterly and North-easterly	N/A
February 1998	North-easterly	N/A
February 1999	South-easterly	N/A
February 2001	North-easterly and South-easterly	N/A
February 2003	North-easterly	N/A
March 2000	South-easterly and North-easterly	N/A
March 2001	South-easterly and North-easterly	N/A
March 2002	Easterlies	N/A

Table 12: Comparison of wind flow affecting Tara Hills between the current study and long-term correlations from Heydenrych et al, 2001

Lauder

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 2000	Easterly	N/A
January 1998	South-easterly and North-easterly	N/A
February 1998	South-easterly and North-easterly	N/A
February 1999	South-easterly	N/A
February 2003	North-easterly	N/A
March 2001	South-easterly and North-easterly	N/A
March 2002	Easterly	N/A

Table 13: Comparison of wind flow affecting Lauder between the current study and long-term correlations from Heydenrych et al, 2001

Wanaka

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
November 1996	Easterly or South-westerly	N/A
November 1997	Easterly or South-westerly	N/A
December 1994	South-easterly and North-easterly	N/A
January 1998	South-easterly, North-easterly and North-westerly	N/A
January 2003	Easterly and Westerly	N/A
February 1993	North-westerly	N/A
February 1998	South-easterly	N/A
February 1999	South-easterly	N/A
February 2003	South-easterly	N/A

Table 14: Comparison of wind flow affecting Wanaka between the current study and long-term correlations from Heydenrych et al, 2001

Again, two daily synoptic weather type patterns are associated with periods of persistent extreme DSR at Lauder. The most common pattern is anticyclonic - HSE, H, or HNW. Wind flows over the South Island associated with these daily synoptic weather types are light winds or south-westerly.

The second, much less frequent pattern is due to long sequences of the T daily weather pattern, associated with westerly winds, which appears to occur only on the shoulders of the fire season (December and March), although further analysis of a bigger sample would confirm this.

The results from Wanaka are almost identical to those from Lauder. The most common pattern is anticyclonic - HSE, H, or HNW. Wind flows over the South Island associated with these daily synoptic weather types are light winds or south-westerly, respectively.

The second, infrequent situation for extended extreme DSR at Wanaka results from long sequences of the T daily weather pattern, associated with westerly winds, occasionally interspersed by SW or W daily synoptic weather patterns (linked to south-westerly and westerly flows).

For Lauder, either anticyclonic patterns producing light or south-westerly winds, or westerly wind flows associated with the T daily weather type, are important for extended duration extreme DSR. Similar results occur for Wanaka: either anticyclonic patterns producing light or south-westerly winds, or westerly wind flows, primarily associated with the T daily weather type, are significant for extended duration extreme DSR.

In this region extreme fire event episodes average two weeks, and can last for up to a month Table 15).

Name	Average length of Persistent Extreme Fire Events (days)	Maximum length of Persistent Extreme Fire Events (days)	Number of Persistent Extreme Fire Events
McKenzie Basin			
Tara Hills	16	31	13
Lauder	16	31	11
Wanaka	15	31	14

Table 15: Summary statistics of Persistent Extreme Fire Events

At the course scale, the dominant synoptic weather type for the McKenzie Basin, for all of the extreme MSR months is HSE (Highs to the south east), a strongly anticyclonic pattern bringing light winds onto the air, with low relative humidity and high temperatures in the summer season.

There is a clear predominance of (anticyclonic) easterly wind flows at Tara Hills and Lauder during each extreme MSR month. Wanaka shows a mixed signal – primarily a prevalence of east or southeasterly flows, followed by a high frequency of southwest or west winds. There is no comparison available between the daily and monthly wind flow analysis.

For persistent extreme DSR events, it can be seen that the McKenzie Basin has the longest observed extreme episode within the data set (31 days), with the longest average event length (16 days).

Both anticyclonic patterns producing light or westerly quarter winds over the South Island, or westerly wind flows, primarily associated with long periods of the T daily weather type, are important for extended duration extreme DSR in the Mackenzie Basin. The first pattern is by far the most common, and there is a hint that the secondary pattern occurs towards the shoulders of the fire season, although analysis of a larger subset would be required to confirm this.

4. Central Otago/Inland Southland

The dominant synoptic weather type for this fire region for all of the extreme MSR months examined is one with anticyclones to the east of the South Island (Figure 5)

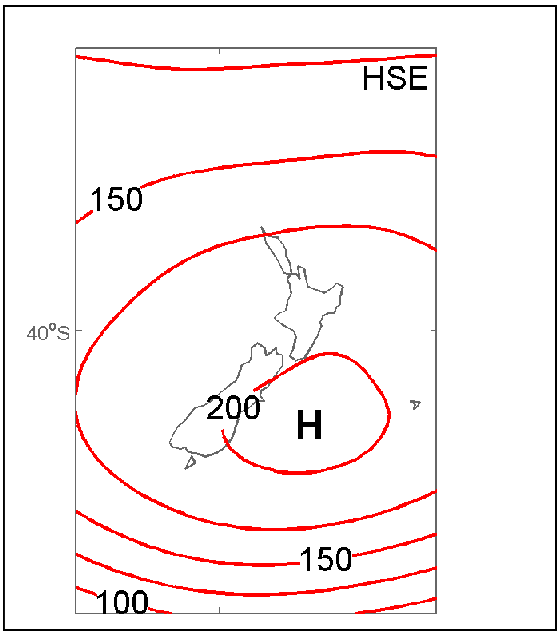

Figure 5: Dominant (most frequent) weather type for the extreme MSR months at all stations for the Central Otago/Inland Southland fire region

with dry subsiding air over the region was the dominant daily type for this region. Tables 16 – 18 summarise the findings for Gore, Queenstown and Tapanui.

Gore

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow anomalies based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
November 1997	Easterly, South-westerly and North-easterly	Easterly
December 1991	Easterly and South-easterly	South-westerly
December 1994	South-westerly and South-easterly	South-westerly
January 1998	South-easterly, North-easterly, Easterly and North-westerly	Easterly, South-easterly
January 1999	South-easterly and North-westerly	Easterly, South-easterly
February 1992	South-westerly and North-westerly	South-Easterly
February 1999	Easterly	South-Easterly
March 2001	South-easterly and North-easterly	Westerly
March 2003	South-easterly and North-easterly	Westerly

Table 16: Comparison of wind flow affecting Gore between the current study and long-term correlations from Heydenrych et al, 2001

The primary daily synoptic weather situations inducing extended extreme DSR for Gore were anticyclonic – HSE or H, with light winds or southwesterly winds over the South Islands.

Two daily synoptic weather type patterns (Table 16) are associated with periods of persistent extreme DSR at Queenstown. The most common pattern is anticyclonic - HSE, H. Flows over the South Island associated with these daily synoptic weather types are light winds or south-westerly winds.

The second, much less common pattern is due to long sequences of the T daily weather pattern (associated with westerly winds), interspersed with the SW daily weather type (south-westerly winds). Again, either anticyclonic patterns producing light or southwesterly winds, or westerly quarter wind flows primarily associated with the T daily weather type, are important for extended duration extreme DSR at Queenstown.

Queenstown

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
November 1989	North-westerly	Easterly
November 2000	Easterly and North-westerly	Easterly
December 1987	Easterly, South-easterly and South-westerly	South-westerly
December 1989	Easterly and South-easterly	South-westerly
December 1990	South-westerly	South-westerly
December 2000	Easterly	South-westerly
January 1979	South-westerly and Easterly	Easterly, South-easterly
January 1981	Easterly	Easterly, South-easterly
January 1997	Easterly	Easterly, South-easterly
January 1998	Easterly, North-easterly and North-westerly	Easterly, South-easterly
January 1999	Easterly and North-westerly	Easterly, South-easterly
January 2003	Easterly	Easterly, South-easterly
February 1981	Easterly and South-westerly	South-Easterly
February 1985	Easterly and North-easterly	South-Easterly
February 1998	North-easterly	South-Easterly
February 1999	Easterly	South-Easterly
February 2001	Easterly and North-easterly	South-Easterly
February 2003	North-easterly	South-Easterly
March 1999	Easterly and North-easterly	Westerly

Table 17: Comparison of wind flow affecting Queenstown between the current study and long-term correlations from Heydenrych et al, 2001

Two daily synoptic weather type situations are associated with periods of persistent extreme DSR at Tapanui, in approximately equal measure – HSE and TSW (ridging over the South Island). Both patterns are anticyclonic and associated with light winds.

Tapanui

Extreme Fire Risk Months	Prevalent Wind Flow based on Daily Synoptic Weather Types	Prevalent Wind Flow based on Monthly Synoptic Weather Types (Heydenrych et al, 2001)
December 2000	Easterly	South-westerly
December 2001	Easterly and South-westerly	South-westerly
December 2002	Easterly and North-easterly	South-westerly
January 1998	Easterly, north-easterly and North-westerly	Easterly, South-easterly
February 1999	Easterly	South-Easterly
March 2001	Easterly and North-easterly	Westerly
March 2003	Easterly and North-easterly	Westerly

Table 18: Comparison of wind flow affecting Tapanui between current study and long-term correlations from Heydenrych et al, 2001

Some summary statistics are found in Table 21 for the length of extreme events. These episodes are of shorter duration than in the other fire regions.

Name	Average length of Persistent Extreme Fire Events (days)	Maximum length of Persistent Extreme Fire Events (days)	Number of Persistent Extreme Fire Events
SLD/Central Otago			
Gore	7	23	12
Queenstown	9	28	38[1]
Tapanui	9	21	13

Table 19: Summary statistics of Persistent Extreme Fire Events

Although very prolonged extreme DSR events were rare at Gore and Tapanui, some common themes were evident from the data analysed. The primary daily synoptic weather situations inducing extended extreme DSR for Gore were anticyclonic – HSE or H, with light winds or southwesterly winds over the South Island and dry subsiding air.

Two daily synoptic weather type patterns are associated with periods of persistent extreme DSR at Queenstown. The most common pattern is anticyclonic - HSE, H. Flows over the South Island associated with these daily synoptic weather types are light winds or south-westerly winds.

[1] Queenstown has the longest record of DSR, see Table 2

The second, much less common pattern is due to long sequences of the T daily weather pattern (associated with westerly winds), interspersed with the SW daily weather type (south-westerly winds). Again, either anticyclonic patterns producing light or southwesterly winds, or westerly quarter wind flows primarily associated with the T daily weather type, are important for extended duration extreme DSR at Queenstown.

Two daily synoptic weather type situations are associated with periods of persistent extreme DSR at Tapanui, in approximately equal measure – HSE and TSW (ridging over the South Island). Both patterns are anticyclonic and associated with light winds.

At the course scale, the dominant synoptic weather type for Inland Southland/Central Otago for all of the extreme MSR months is HSE (Highs to the south east), a strongly anticyclonic pattern bringing light winds onto the region.

Gore and Queenstown show a predominance of (anticyclonic) easterly quarter wind flows, followed by a secondary maximum of northwest winds, during each extreme MSR month. There is some consistency between the wind flow analysis in these most extreme MSR months, and the average wind flow anomaly response to high MSR, in November, January and February. Tapanui shows a prevalence of easterly quarter winds for each extreme MSR month, which is consistent with the monthly wind flow anomaly to high MSR in January and February.

For persistent extreme DSR events, Inland Southland/Central Otago shows the shortest average event length of 9 days. The primary daily weather type for stations in Central Otago – Inland Southland is anticyclonic conditions located over or to the southeast of the South Island, usually linked to light or southwest winds in the region. However, Queenstown also reflected a pattern similar to the McKenzie Basin stations, displaying extreme DSR with westerly wind flows, primarily associated with periods of the T daily weather type, and this may reflect this station's proximity to the McKenzie Basin.

Discussion

The results for each fire climate region provide the link between daily climate patterns that influence the DSR and MSR for the month, and the broader scale monthly anomaly patterns that act on monthly to seasonal time scales.

For the Auckland-West Waikato region daily sequences of extreme fire risk episodes occurred in anticyclonic easterly conditions. These translated to monthly anomalies of anticyclonic easterlies, and are entirely consistent with the lack of the TNW synoptic pattern (troughs in northwest flow) and south east flow anomalies as the most important regional climate patterns identified by Heydenrych et al (2001) as producing high fire risk over the October – April season.

In the North Canterbury region, daily sequences of the H pattern (anticyclones with westerly flow across the South Island) and the T pattern (westerly troughs) gave the highest DSR. These aggregate up to give months of strong westerly flow anomalies. On a seasonal basis the strongest relationships of high fire risk was with MZ2 – west to north west flow anomalies across New Zealand. The two results are entirely consistent.

The persistence of days of the HSE synoptic type (anticyclones east of the South Island) over a month led to extreme DSR and MSR for the McKenzie Basin. As no longer term MSR records were available for this region, relationships at the seasonal level were not established by Heydenrych et al (2001), although Heydenrych and Salinger (2002) postulated that anticyclonic westerly flow anomalies (Z2) coupled with anticyclones over central New Zealand, and to the east of the South Island (H and HSE types) were likely to be important. The results here confirm this supposition.

Inland Southland – Central Otago show daily sequences of HSE (anticyclones east of the South Island as the most important synoptic type on promoting high DSR. The seasonal result identified by Heydenrych et al (2001) is one with above average sea surface temperatures in the New Zealand region and easterly or north easterly airflow anomalies over the south Island. These two results are coherent from daily to seasonal time scales.

Finally it is important to comment on the relationships between the daily weather types and large scale features producing seasonal climate variability. The Southern Oscillation, or more generally El Niño-Southern Oscillation (ENSO), is a tropical Pacific-wide oscillation that affects pressure, winds, sea-surface temperature (SST) and precipitation. ENSO is the primary global mode of natural climate variability in the 2-7 year time band defined by sea surface temperature (SST) anomalies in the eastern tropical Pacific. The most common indicator of the intensity and state of ENSO events is the Southern Oscillation Index, a measure of the anomalous atmospheric pressure gradient across the Pacific-Indian Ocean region. Persistence of the SOI below about –1 coincides with El Niño events, and periods above +1 with La Niña events.

In the El Niño phase, New Zealand experiences stronger than normal southwesterly airflow, which generally results in drier conditions in the northeast of the country, and wetter conditions in the southwest (Gordon 1986; Mullan 1995). Such patterns are likely to increase the daily weather types associated with west or southwest flow – T, SW, H, HNW and W. El Niño seasons are therefore likely to produce high DSR, MSR and SSR in North Canterbury.

Approximately reverse patterns occur during the La Niña phase of the phenomenon, enhancing northeast circulation over New Zealand, with wetter conditions in the north and east, and drier conditions in the south and west. A higher incidence of daily synoptic types HSE, NE and R are likely in the La Niña phase, raising the fire risk in the McKenzie Basin and Inland Southland – Central Otago during such seasons. If there is a prevalence of the HSE type, then fire risk is also raised in Auckland West - Waikato.

Conclusions

This report completes the research on relationships on severe fire seasons and climatic factors experienced in four regions of New Zealand. It relates extreme daily severity ratings (DSR) and daily weather types for the regions of Auckland West/Waikato, North Canterbury, McKenzie Basin and Central Otago/Inland Southland. It builds on knowledge gained through several years' worth of research, linking fire risk to climate indicators, including a spatial analysis of 15 fire regions across New Zealand.

The dominant daily weather type for the three of the four fire regions examined (Auckland West/Waikato, McKenzie Basin and Central Otago/Inland Southland), averaged over all of the months with extreme fire danger, is one where anticyclones and easterly winds onto the North Island dominate, with light winds elsewhere. In contrast, the dominant weather type for North Canterbury, are anticyclones producing westerly winds onto the South Island.

A clear predominance of anticyclones and easterly winds increases the risk at the Auckland West/Waikato stations, with occasional north westerly winds at Woodhill and Hamilton. Extreme fire risk episodes occur with a prevalence of anticyclones at the North Canterbury stations, with the occasional northwesterly wind events. In this region anticyclones producing high monthly severity ratings (MSR) often produce westerly airflow over the region, with warm dry westerly quarter winds. Easterly winds prevail in the McKenzie Basin during extreme fire risk months, linked to a prevalence of anticyclones, although Wanaka also shows a high frequency of southwest or westerly winds. Stations in Central Otago/Inland Southland show a predominance of anticyclones producing easterly quarter wind flows for increased fire risk episodes, although Gore and Queenstown also demonstrate a secondary maximum of northwest winds in several extreme MSR months.

There is good coherence at most of the stations between the prevalent wind flows during the extreme fire risk months, as classified by daily weather types, and the wind flow anomalies from monthly data correlations, calculated in earlier work. This demonstrates that the daily weather type analysis in these most extreme MSR months is capturing the daily sequences of weather types that contribute to the dominant climate circulation and wind flow anomalies in the New Zealand region for the month. Therefore the prediction of monthly and seasonal circulation patterns will be a useful guide to the predominance of daily weather types expected, and the prediction of high or extreme fire risk periods in any month for the four regions examined. Relationships between the daily weather types and large scale features producing seasonal climate variability, such as El Niño-Southern Oscillation will allow the exploitation of seasonal climate forecasting for improved monthly and seasonal fire climate outlooks.

For stations within the Auckland West/Waikato region, anticyclones are primarily responsible for high or extreme fire risk persisting over a number of days, with wind flows being of lesser importance, although easterly winds increase the risk. This is consistent with the anticyclonic circulation producing dry subsiding air onto the region.

Either anticyclones producing light or westerly quarter winds over the South Island, or westerly wind flows associated with long sequences of the troughs in westerly flow (T) daily weather type, are important for persistent days of high or extreme fire risk in North Canterbury and the McKenzie Basin. The first pattern is by far the most common for days with extreme fire risk. The importance of daily wind direction in both patterns is consistent with the strong influence that the Southern Alps have on climate in these regions. Westerly quarter winds often produce warm dry conditions east of the Southern Alps.

Anticyclones located over or to east of the South Island, usually linked to light or southwest winds in the region, produce persistent days of extreme fire risk in Central Otago/Inland Southland. However, Queenstown also reflected a pattern similar to those stations in the McKenzie Basin, displaying extreme DSR with westerly winds, primarily associated with periods of the T daily weather type.

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Appendix 1. Daily Synoptic Weather Types and DSR for Pukekohe, Woodhill Forest, Hamilton Airport, Ashley Forest, Balmoral Forest, Lauder, Tara Hills, Wanaka, Gore, Tapanui and Queenstown

Auckland/Waikato

Pukekohe

December 1994	DSR	Synoptic Types	January 1995	DSR	Synoptic Types
1	1.10	HSE	1	0.20	HE
2	0.70	HSE	2	0.90	HNW
3	**1.00**	*HW*	3	**3.70**	*H*
4	**1.50**	*HW*	4	**3.30**	*H*
5	**1.60**	*HW*	5	**4.40**	*H*
6	**1.80**	*H*	6	**6.40**	*H*
7	**4.30**	*HNW*	7	**3.80**	*H*
8	**4.10**	*HNW*	8	**6.90**	*H*
9	**2.60**	*H*	9	**1.90**	*H*
10	**4.50**	*HNW*	10	0.80	H
11	**1.90**	*H*	11	0.90	HSE
12	**2.00**	*H*	12	0.10	HSE
13	**2.70**	*HSE*	13	0.50	HSE
14	**3.90**	*HSE*	14	**2.30**	*HSE*
15	0.00	HSE	15	**2.40**	*HSE*
16	0.40	R	16	**3.00**	*HW*
17	0.80	R	17	0.00	HSE
18	0.20	R	18	0.30	HSE
19	**0.80**	*HNW*	19	0.00	HSE
20	**2.00**	*SW*	20	0.00	HSE
21	**1.90**	*T*	21	0.90	HE
22	**3.10**	*SW*	22	0.60	HSE
23	**1.60**	*W*	23	0.00	HSE
24	**1.40**	*T*	24	0.20	HSE
25	0.20	SW	25	0.10	TSW
26	0.20	H	26	0.10	TSW
27	1.00	HE	27	0.00	SW
28	1.30	HSE	28	0.00	HW
29	1.50	HE	29	0.00	HW
30	1.10	W	30	0.20	HSE
31	0.00	HNW	31	2.50	TNW

January 1996

	DSR	Synoptic Types
1	0.50	H
2	2.20	HE
3	0.00	HSE
4	0.00	HSE
5	0.00	HSE
6	0.00	HSE
7	0.10	HSE
8	0.50	HSE
9	1.00	HSE
10	0.80	NE
11	0.40	NE
12	**0.90**	*TNW*
13	**0.70**	*TNW*
14	**1.50**	*TSW*
15	**1.90**	*R*
16	0.00	R
17	0.00	HSE
18	0.40	HSE
19	0.00	HSE
20	0.00	HSE
21	0.10	HE
22	0.10	HSE
23	0.00	HSE
24	0.10	R
25	0.10	R
26	0.20	R
27	0.20	R
28	0.00	TSW
29	0.10	TSW
30	1.10	TSW
31	0.00	TSW

January 1999

	DSR	Synoptic Types
1	**2.57**	*R*
2	**1.95**	*HSE*
3	**2.09**	*HSE*
4	**2.31**	*HSE*
5	**2.13**	*HSE*
6	**2.38**	*HNW*
7	**2.38**	*SW*
8	**2.66**	*T*
9	**2.88**	*NE*
10	**2.43**	*H*
11	**2.57**	*H*
12	**2.77**	*HSE*
13	**2.69**	*R*
14	**1.67**	*NE*
15	**1.73**	*HSE*
16	**1.91**	*R*
17	**1.91**	*R*
18	**0.27**	*R*
19	**2.72**	*NE*
20	**5.09**	*TSW*
21	0.00	R
22	0.00	HSE
23	0.01	R
24	**1.25**	*R*
25	**1.56**	*NE*
26	**2.43**	*NE*
27	**1.34**	*HSE*
28	**1.46**	*HSE*
29	**1.12**	*HSE*
30	0.79	*TSW*
31	0.20	T

February 1999

	DSR	Synoptic Types
1	**0.88**	*H*
2	**1.39**	*H*
3	**1.49**	*H*
4	**1.55**	*H*
5	**1.56**	*H*
6	**1.68**	*HSE*
7	**1.95**	*HSE*
8	**2.05**	*HSE*
9	**2.06**	*HSE*
10	**2.04**	*HSE*
11	**2.50**	*HSE*
12	**2.44**	*HSE*
13	**2.32**	*HSE*
14	**2.50**	*HSE*
15	**2.54**	*HSE*
16	**2.68**	*T*
17	**2.70**	*R*
18	**2.97**	*NE*
19	**3.10**	*TSW*
20	0.01	R
21	0.26	HSE
22	**1.15**	*HSE*
23	**4.06**	*HSE*
24	**2.33**	*HSE*
25	**2.21**	*TSW*
26	0.00	T
27	0.00	W
28	0.04	W

March 1999

	DSR	Synoptic Types
1	**1.78**	*W*
2	**2.46**	*HNW*
3	**2.39**	*HSE*
4	**1.96**	*HSE*
5	**2.60**	*H*
6	0.00	H
7	0.00	H
8	0.00	HSE
9	0.01	HSE
10	0.02	HSE
11	0.09	HSE
12	0.00	HSE
13	0.02	HSE
14	0.22	NE
15	0.83	R
16	0.41	R
17	0.55	H
18	0.44	H
19	**1.67**	*H*
20	**2.71**	*H*
21	**1.09**	*H*
22	**2.33**	*W*
23	**2.11**	*HE*
24	**1.66**	*H*
25	**2.52**	*H*
26	**3.81**	*H*
27	**1.96**	*H*
28	**1.15**	*H*
29	**1.49**	*HSE*
30	**3.10**	*HNW*
31	0.83	H

Woodhill

November 1996

	DSR	Synoptic Types
1	**1.3**	*HW*
2	**0.9**	*HSE*
3	**5.6**	*HSE*
4	**0.6**	*HSE*
5	**2.8**	*R*
6	**8.9**	*SW*
7	**8.0**	*SW*
8	**6.2**	*TSW*
9	**2.3**	*TSW*
10	**2.9**	*TSW*
11	**3.2**	*T*
12	**1.1**	*T*
13	**1.6**	*T*
14	**2.2**	*T*
15	**3.2**	*T*
16	0.0	T
17	1.0	T
18	0.0	TNW
19	1.1	T
20	0.3	SW
21	0.5	SW
22	0.3	SW
23	0.5	SW
24	**3.0**	*SW*
25	**10.0**	*SW*
26	**1.8**	*T*
27	**4.7**	*SW*
28	**1.9**	*T*
29	**1.9**	*T*
30	**2.0**	*TNW*

January 1997

	DSR	Synoptic Types
1	0.4	HSE
2	0.7	HSE
3	0.8	HNW
4	**11.9**	*HW*
5	**9.6**	*SW*
6	**5.1**	*R*
7	**3.7**	*NE*
8	**4.3**	*NE*
9	**3.2**	*NE*
10	**18.3**	*NE*
11	**4.9**	*TSW*
12	**1.8**	*SW*
13	**2.8**	*HSE*
14	**1.7**	*HSE*
15	**2.3**	*HSE*
16	0.4	R
17	2.0	*T*
18	**7.6**	*SW*
19	**6.7**	*HNW*
20	**4.6**	*HNW*
21	**3.1**	*W*
22	**5.2**	*HW*
23	**8.5**	*HSE*
24	**1.8**	*HSE*
25	**3.4**	*HW*
26	**28.2**	*HSE*
27	**14.2**	*HSE*
28	**24.1**	*HSE*
29	**19.5**	*HSE*
30	**11.6**	*HSE*

January 1998

	DSR	Synoptic Types
1	**3.0**	*HSE*
2	**3.1**	*H*
3	**2.6**	*H*
4	**3.2**	*H*
5	**4.0**	*HNW*
6	**6.0**	*SW*
7	**0.7**	*TSW*
8	**6.0**	*SW*
9	**18.4**	*HW*
10	**9.8**	*HNW*
11	**7.8**	*HNW*
12	**7.7**	*HNW*
13	**3.6**	*HNW*
14	**3.8**	*W*
15	**3.8**	*T*
16	**9.5**	*SW*
17	**0.9**	*SW*
18	**3.3**	*T*
19	**5.1**	*HW*
20	**3.5**	*HSE*
21	0.0	HSE
22	0.8	HSE
23	0.9	HE
24	0.0	HSE
25	0.1	HSE
26	0.9	HE
27	**1.7**	*HE*
28	**3.1**	*HE*
29	**4.4**	*HE*
30	**4.7**	*H*
31	**2.4**	*H*

January 1999

	DSR	Synoptic Types
1	**6.4**	*R*
2	**3.0**	*HSE*
3	**2.5**	*HSE*
4	**4.9**	*HSE*
5	**4.4**	*HSE*
6	**3.9**	*HNW*
7	**5.4**	*SW*
8	**5.3**	*T*
9	**7.5**	*NE*
10	**5.0**	*H*
11	**11.3**	*H*
12	**3.3**	*HSE*
13	**3.4**	*R*
14	1.0	NE
15	0.0	HSE
16	0.0	R
17	0.0	R
18	0.0	R
19	0.0	NE
20	0.6	TSW
21	0.0	R
22	0.0	HSE
23	0.1	R
24	0.7	R
25	**1.5**	*NE*
26	**2.3**	*NE*
27	**2.3**	*HSE*
28	**3.0**	*HSE*
29	**3.1**	*HSE*
30	**1.4**	*TSW*
31	0.7	T

February 1997

	DSR	Synoptic Types
1	**3.7**	*R*
2	**4.7**	*TSW*
3	**4.2**	*TSW*
4	**1.3**	*TSW*
5	**16.6**	*TSW*
6	0.2	HSE
7	0.0	H
8	**2.5**	*SW*
9	**9.5**	*SW*
10	**5.5**	*T*
11	**15.4**	*T*
12	0.0	HW
13	0.2	HSE
14	0.8	HSE
15	**3.7**	*HSE*
16	**3.9**	*HSE*
17	**4.0**	*HSE*
18	**5.7**	*HSE*
19	0.0	R
20	0.0	TSW
21	0.8	TSW
22	0.6	T
23	0.1	TSW
24	**1.5**	*TNW*
25	**1.0**	*T*
26	**2.4**	*T*
27	**4.2**	*TSW*
28	**4.5**	*NE*

February 1998

	DSR	Synoptic Types
1	**3.7**	*HSE*
2	**5.9**	*HSE*
3	**5.7**	*HSE*
4	**5.9**	*H*
5	**7.5**	*H*
6	**4.7**	*H*
7	**6.0**	*HSE*
8	**6.5**	*HE*
9	**3.9**	*HNW*
10	**4.2**	*H*
11	**4.3**	*HSE*
12	**8.8**	*HE*
13	**1.6**	*H*
14	**5.0**	*H*
15	**5.9**	*HE*
16	**5.6**	*HE*
17	**12.8**	*W*
18	**7.0**	*HNW*
19	0.2	HE
20	2.2	TNW
21	0.0	W
22	0.1	TNW
23	0.2	T
24	0.0	SW
25	0.1	H
26	0.8	H
27	1.7	HE
28	2.1	H

February 1999

	DSR	Synoptic Types
1	**7.6**	*H*
2	**3.2**	*H*
3	**3.8**	*H*
4	**4.6**	*H*
5	**5.0**	*H*
6	**5.7**	*HSE*
7	**5.3**	*HSE*
8	**10.8**	*HSE*
9	**8.1**	*HSE*
10	**9.1**	*HSE*
11	**5.7**	*HSE*
12	**8.6**	*HSE*
13	**7.5**	*HSE*
14	**7.9**	*HSE*
15	**5.4**	*HSE*
16	**6.1**	*T*
17	**4.3**	*R*
18	**6.2**	*NE*
19	**6.3**	*TSW*
20	**6.4**	*R*
21	**10.5**	*HSE*
22	**5.4**	*HSE*
23	**6.1**	*HSE*
24	**11.0**	*HSE*
25	**10.3**	*TSW*
26	0.0	T
27	0.8	W
28	4.0	W

March 1997

	DSR	Synoptic Types
1	0.5	TNW
2	0.0	HW
3	0.0	NE
4	0.0	TNW
5	0.0	TSW
6	0.0	NE
7	0.0	R
8	0.0	TNW
9	0.6	TSW
10	8.2	HW
11	0.6	R
12	0.1	R
13	**14.5**	*R*
14	**2.3**	*T*
15	**1.4**	*T*
16	**5.6**	*SW*
17	**6.7**	*SW*
18	**10.6**	*SW*
19	**12.9**	*HNW*
20	**4.1**	*HNW*
21	0.0	NE
22	0.0	TSW
23	0.0	R
24	0.1	TNW
25	0.7	SW
26	**2.0**	*HW*
27	**2.5**	*HSE*
28	**1.7**	*HSE*
29	**1.9**	*HSE*
30	**4.3**	*HSE*
31	0.1	HSE

March 1999

	DSR	Synoptic Types
1	**8.4**	*W*
2	**8.6**	*HNW*
3	**9.9**	*HSE*
4	**7.4**	*HSE*
5	**2.4**	*H*
6	0.1	H
7	0.0	H
8	0.0	HSE
9	0.2	HSE
10	0.1	HSE
11	0.0	HSE
12	0.1	HSE
13	**1.2**	*HSE*
14	**1.4**	*NE*
15	**2.3**	*R*
16	**1.1**	*R*
17	**1.4**	*H*
18	**1.3**	*H*
19	**3.1**	*H*
20	**4.4**	*H*
21	**3.2**	*H*
22	**1.5**	*W*
23	**4.0**	*HE*
24	**4.2**	*H*
25	**3.2**	*H*
26	**3.5**	*H*
27	**3.0**	*H*
28	**1.9**	*H*
29	**2.7**	*HSE*
30	**4.0**	*HNW*
31	0.5	H

Hamilton

December 1994	DSR	Synoptic Types
1	**1.6**	*HSE*
2	**2.0**	*HSE*
3	**1.1**	*HW*
4	**1.3**	*HW*
5	**2.5**	*HW*
6	**2.2**	*H*
7	**4.7**	*HNW*
8	**6.0**	*HNW*
9	**8.8**	*H*
10	**8.1**	*HNW*
11	**0.7**	*H*
12	**1.7**	*H*
13	**2.0**	*HSE*
14	**2.1**	*HSE*
15	**0.0**	HSE
16	0.2	R
17	**1.4**	*R*
18	**1.8**	*R*
19	**2.4**	*HNW*
20	**10.5**	*SW*
21	**3.0**	*T*
22	**1.9**	*SW*
23	**5.2**	*W*
24	**1.6**	*T*
25	0.8	SW
26	**1.1**	*H*
27	**3.1**	*HE*
28	**1.7**	*HSE*
29	**1.4**	*HE*
30	**3.4**	*W*
31	0.1	HNW

January 1998	DSR	Synoptic Types
1	**0.7**	*HSE*
2	**2.2**	*H*
3	**2.4**	*H*
4	**6.4**	*H*
5	**6.1**	*HNW*
6	**1.7**	*SW*
7	**3.7**	*TSW*
8	**2.0**	*SW*
9	**6.4**	*HW*
10	**16.7**	*HNW*
11	**5.9**	*HNW*
12	**14.8**	*HNW*
13	**11.9**	*HNW*
14	**4.7**	*W*
15	**4.0**	*T*
16	**20.7**	*SW*
17	**0.5**	*SW*
18	**0.6**	*T*
19	**8.1**	*HW*
20	**3.7**	*HSE*
21	**0.0**	*HSE*
22	**1.3**	*HSE*
23	**2.3**	*HE*
24	**3.5**	*HSE*
25	**2.1**	*HSE*
26	**2.1**	*HE*
27	**3.4**	*HE*
28	**2.7**	*HE*
29	**0.5**	*HE*
30	**2.0**	*H*
31	0.6	H

January 1999

	DSR	Synoptic Types
1	**6.0**	*R*
2	**4.3**	*HSE*
3	**4.3**	*HSE*
4	**4.8**	*HSE*
5	**5.7**	*HSE*
6	**4.1**	*HNW*
7	**2.0**	*SW*
8	**5.5**	*T*
9	**4.1**	*NE*
10	**7.8**	*H*
11	**6.2**	*H*
12	**8.6**	*HSE*
13	**6.1**	*R*
14	**4.7**	*NE*
15	0.0	HSE
16	0.1	R
17	0.0	R
18	0.0	R
19	0.0	NE
20	0.3	TSW
21	0.6	R
22	0.0	HSE
23	0.0	R
24	0.6	R
25	**1.9**	*NE*
26	**2.2**	*NE*
27	**1.8**	*HSE*
28	**3.5**	*HSE*
29	**2.5**	*HSE*
30	**3.9**	*TSW*
31	0.5	T

February 1994

	DSR	Synoptic Types
1	**3.9**	*R*
2	**3.2**	*TSW*
3	**4.5**	*SW*
4	**0.8**	*HW*
5	**0.0**	*HSE*
6	**0.2**	*HSE*
7	**1.5**	*HSE*
8	**2.2**	*HSE*
9	**1.6**	*HSE*
10	**2.3**	*HSE*
11	**2.5**	*HSE*
12	**2.8**	*H*
13	**2.4**	*HSE*
14	**10.7**	*HSE*
15	**14.4**	*HW*
16	**4.4**	*HE*
17	0.7	TNW
18	0.8	TNW
19	0.2	NE
20	0.2	NE
21	0.0	HE
22	0.5	HSE
23	0.7	HSE
24	**1.2**	*HSE*
25	**1.5**	*HSE*
26	**2.0**	*HSE*
27	**2.6**	*NE*
28	**10.6**	*TNW*

February 1998

	DSR	Synoptic Types
1	0.6	HSE
2	**2.5**	*HSE*
3	**3.3**	*HSE*
4	**3.6**	*H*
5	**3.8**	*H*
6	**3.0**	*H*
7	**3.3**	*HSE*
8	**3.5**	*HE*
9	**10.3**	*HNW*
10	0.7	H
11	0.4	HSE
12	1.9	HE
13	2.0	H
14	0.2	H
15	**3.0**	*HE*
16	**3.1**	*HE*
17	**6.0**	*W*
18	**10.1**	*HNW*
19	0.0	HE
20	0.1	TNW
21	0.0	W
22	0.0	TNW
23	0.2	T
24	0.0	SW
25	0.0	H
26	0.2	H
27	0.5	HE
28	4.6	H

February 1999

	DSR	Synoptic Types
1	**2.2**	*H*
2	**2.5**	*H*
3	**2.8**	*H*
4	**2.1**	*H*
5	**2.6**	*H*
6	**3.9**	*HSE*
7	**6.1**	*HSE*
8	**5.3**	*HSE*
9	**4.3**	*HSE*
10	**13.4**	*HSE*
11	**10.3**	*HSE*
12	**10.8**	*HSE*
13	**5.2**	*HSE*
14	**7.5**	*HSE*
15	**5.0**	*HSE*
16	**7.0**	*T*
17	**5.6**	*R*
18	**7.6**	*NE*
19	**5.1**	*TSW*
20	**2.6**	*R*
21	**14.2**	*HSE*
22	**7.1**	*HSE*
23	**6.6**	*HSE*
24	**9.0**	*HSE*
25	**16.4**	*TSW*
26	**0.0**	*T*
27	**5.7**	*W*
28	**3.4**	*W*

February 2003

	DSR	Synoptic Types
1	**2.5**	*H*
2	**1.8**	*H*
3	**2.5**	*H*
4	**3.6**	*H*
5	**1.9**	*H*
6	**2.4**	*H*
7	**3.5**	*H*
8	**2.5**	*H*
9	**4.7**	*H*
10	**2.3**	*H*
11	**2.5**	*H*
12	**4.8**	*HSE*
13	**1.7**	*TSW*
14	**2.3**	*R*
15	**8.9**	*H*
16	**3.6**	*H*
17	**3.8**	*W*
18	**9.1**	*T*
19	**1.4**	*T*
20	**1.3**	*T*
21	**1.6**	*HE*
22	**1.2**	*H*
23	**1.5**	*H*
24	0.0	HSE
25	0.3	HSE
26	0.0	HSE
27	0.0	HSE
28	0.0	R

March 1999

	DSR	Synoptic Types
1	**15.1**	*W*
2	**13.3**	*HNW*
3	**5.4**	*HSE*
4	**9.8**	*HSE*
5	**20.2**	*H*
6	0.0	H
7	0.0	H
8	0.0	HSE
9	0.0	HSE
10	0.0	HSE
11	0.1	HSE
12	0.2	HSE
13	0.4	HSE
14	**1.9**	*NE*
15	**1.0**	*R*
16	**1.1**	*R*
17	**1.2**	*H*
18	**1.2**	*H*
19	**2.9**	*H*
20	**2.1**	*H*
21	**1.3**	*H*
22	**1.5**	*W*
23	**2.4**	*HE*
24	**2.4**	*H*
25	**2.1**	*H*
26	**2.8**	*H*
27	**2.4**	*H*
28	**2.5**	*H*
29	**4.8**	*HSE*
30	**3.7**	*HNW*
31	0.5	H

March 2000

	DSR	Synoptic Types
1	**5.3**	*HW*
2	**0.2**	*W*
3	**1.0**	*H*
4	**1.4**	*H*
5	**1.2**	*HSE*
6	**2.3**	*TSW*
7	**3.7**	*HSE*
8	**1.4**	*H*
9	**2.3**	*H*
10	**3.1**	*H*
11	**2.6**	*H*
12	**5.1**	*TSW*
13	0.4	R
14	0.9	TSW
15	0.6	NE
16	**2.3**	*HSE*
17	**6.7**	*H*
18	**2.9**	*W*
19	**7.1**	*HE*
20	**4.8**	*H*
21	**3.2**	*HE*
22	**2.8**	*HSE*
23	0.3	HSE
24	**1.8**	*HSE*
25	**5.8**	*HSE*
26	**5.7**	*HSE*
27	**3.1**	*HSE*
28	**2.8**	*HSE*
29	**3.6**	*T*
30	0.0	HNW
31	0.0	HNW

North Canterbury

Ashley

October 1998	DSR	Synoptic Type
1	2.70	SW
2	0.02	SW
3	0.01	T
4	**19.40**	*T*
5	**18.18**	*W*
6	**10.20**	*HE*
7	**18.87**	*HE*
8	**24.31**	*HE*
9	**3.86**	*HE*
10	**1.40**	*NE*
11	0.03	NE
12	0.00	T
13	0.00	T
14	0.02	T
15	2.39	T
16	0.01	SW
17	0.02	SW
18	**16.54**	*W*
19	**1.73**	*T*
20	**9.87**	*T*
21	**6.05**	*T*
22	**2.12**	*SW*
23	**5.23**	*HNW*
24	**5.16**	*W*
25	**9.53**	*HNW*
26	**1.88**	*W*
27	**7.81**	*T*
28	0.00	TNW
29	0.01	T
30	0.00	R
31	0.00	NE

November 1997	DSR	Synoptic Type
1	0.26	HE
2	8.99	*W*
3	**8.54**	*HNW*
4	**4.54**	*HNW*
5	**1.38**	*H*
6	**1.60**	*H*
7	**15.01**	*T*
8	0.19	SW
9	0.67	SW
10	0.64	HNW
11	0.26	W
12	**1.70**	*T*
13	**3.19**	*W*
14	**14.87**	*T*
15	**3.66**	*SW*
16	0.04	T
17	1.47	T
18	**13.33**	*T*
19	**6.57**	*T*
20	**6.64**	*SW*
21	**1.20**	*SW*
22	**0.19**	*HNW*
23	**1.80**	*HNW*
24	**22.64**	*HNW*
25	**0.35**	*SW*
26	**7.27**	*SW*
27	**11.23**	*SW*
28	**9.63**	*SW*
29	**3.13**	*W*
30	0.00	T

December 2000	DSR	Synoptic Type
1	0.04	TNW
2	0.09	W
3	0.07	H
4	0.51	H
5	**2.57**	*H*
6	**9.02**	*TSW*
7	**3.82**	*TSW*
8	**1.81**	*NE*
9	**1.14**	*NE*
10	**2.47**	*NE*
11	**1.60**	*R*
12	**1.40**	*R*
13	**4.20**	*HSE*
14	**6.22**	*HSE*
15	**1.83**	*HSE*
16	**1.67**	*H*
17	**1.40**	*H*
18	**1.66**	*HNW*
19	**4.91**	*T*
20	**16.35**	*T*
21	**25.62**	*T*
22	**3.86**	*T*
23	**8.75**	*T*
24	**29.30**	*T*
25	**51.90**	*T*
26	**33.07**	*T*
27	**21.73**	*T*
28	**5.14**	*T*
29	**15.77**	*T*
30	**36.06**	*T*
31	0.32	T

January 1998	DSR	Synoptic Type
1	0.01	HSE
2	1.46	H
3	**21.02**	*H*
4	**13.36**	*H*
5	**2.13**	*HNW*
6	0.28	SW
7	**1.75**	*TSW*
8	**22.03**	*SW*
9	**0.67**	*HW*
10	**0.61**	*HNW*
11	**2.38**	*HNW*
12	**2.44**	*HNW*
13	**4.08**	*HNW*
14	**7.89**	*W*
15	**44.26**	*T*
16	**0.00**	*SW*
17	**0.23**	*SW*
18	**5.45**	*T*
19	**10.29**	*HW*
20	0.36	HSE
21	0.28	HSE
22	1.36	HSE
23	**4.72**	*HE*
24	**7.27**	*HSE*
25	**8.71**	*HSE*
26	**9.47**	*HE*
27	**6.20**	*HE*
28	**13.74**	*HE*
29	**7.24**	*HE*
30	**9.47**	*H*
31	**12.98**	*H*

February 1998

	DSR	Synoptic Type
1	**2.76**	*HSE*
2	**2.50**	*HSE*
3	**5.49**	*HSE*
4	**14.24**	*H*
5	**18.34**	*H*
6	**14.52**	*H*
7	**11.36**	*HSE*
8	**27.83**	*HE*
9	**35.66**	*HNW*
10	**8.82**	*H*
11	**0.63**	*HSE*
12	**2.96**	*HE*
13	**20.88**	*H*
14	**25.97**	*H*
15	**14.53**	*HE*
16	**12.05**	*HE*
17	**19.21**	*W*
18	0.00	HNW
19	0.56	HE
20	**10.91**	*TNW*
21	**12.14**	*W*
22	**26.70**	*TNW*
23	**6.92**	*T*
24	0.00	SW
25	0.47	H
26	**2.78**	*H*
27	**4.72**	*HE*
28	**15.26**	*H*

March 2001

	DSR	Synoptic Type
1	9.10	HSE
2	0.07	HSE
3	0.17	R
4	**1.97**	*R*
5	**1.94**	*HSE*
6	**1.54**	*HSE*
7	**4.04**	*H*
8	**8.42**	*H*
9	0.00	HSE
10	0.00	HSE
11	0.25	HSE
12	**1.01**	*HE*
13	**4.34**	*W*
14	**2.68**	*H*
15	**1.14**	*H*
16	**1.53**	*H*
17	**1.00**	*HSE*
18	**1.99**	*HSE*
19	**1.72**	*HSE*
20	**3.14**	*HSE*
21	**4.80**	*HSE*
22	**5.93**	*HSE*
23	**7.27**	*HSE*
24	**2.46**	*H*
25	**22.21**	*H*
26	**12.81**	*W*
27	**8.19**	*T*
28	**14.82**	*T*
29	**20.83**	*T*
30	**13.88**	*H*
31	**16.80**	*H*

March 2002	DSR	Synoptic Type
1	0.98	T
2	**6.07**	*T*
3	**4.17**	*T*
4	**20.56**	*T*
5	**0.37**	*HE*
6	**1.50**	*HSE*
7	**5.03**	*H*
8	**16.70**	*NE*
9	**4.99**	*R*
10	**1.57**	*HSE*
11	0.05	HSE
12	0.56	HSE
13	**5.61**	*T*
14	**1.28**	*T*
15	**5.86**	*T*
16	**8.70**	*T*
17	**4.90**	*T*
18	0.00	T
19	0.63	T
20	0.26	T
21	**6.38**	*W*
22	**10.87**	*H*
23	**4.36**	*H*
24	**5.20**	*H*
25	**3.13**	*R*
26	**2.19**	*R*
27	**3.64**	*SW*
28	**11.99**	*T*
29	**12.82**	*T*
30	**14.57**	*T*
31	**13.65**	*TSW*

April 2001	DSR	Synoptic Type
1	12.47	H
2	8.01	R
3	0.00	T
4	0.36	T
5	**2.82**	*T*
6	**17.85**	*W*
7	**6.18**	*H*
8	**4.68**	*H*
9	**48.18**	*W*
10	**21.52**	*W*
11	**11.12**	*W*
12	**9.27**	*TSW*
13	**2.55**	*T*
14	**2.91**	*H*
15	**5.84**	*H*
16	**6.51**	*H*
17	**6.27**	*H*
18	**6.71**	*H*
19	**5.84**	*H*
20	**23.41**	*H*
21	0.00	H
22	0.10	H
23	0.76	H
24	0.80	H
25	**1.79**	*H*
26	**1.92**	*H*
27	**5.45**	*H*
28	**6.15**	*H*
29	**7.95**	*H*
30	**8.75**	*HSE*

BALMORAL

December 1994	DSR	Synoptic Types	December 2000	DSR	Synoptic Types
1	**7.87**	*HSE*	1	1.30	TNW
2	**2.36**	*HSE*	2	4.02	W
3	**4.11**	*HW*	3	0.02	H
4	0.13	HW	4	0.45	H
5	0.57	HW	5	**3.69**	*H*
6	3.72	H	6	**15.13**	*TSW*
7	**6.54**	*HNW*	7	**5.57**	*TSW*
8	**71.39**	*HNW*	8	**4.86**	*NE*
9	**4.48**	*H*	9	**2.34**	*NE*
10	0.45	HNW	10	**5.49**	*NE*
11	2.40	H	11	**6.28**	*R*
12	3.79	H	12	**7.53**	*R*
13	0.21	HSE	13	**9.75**	*HSE*
14	**3.21**	*HSE*	14	**18.47**	*HSE*
15	**5.41**	*HSE*	15	**3.86**	*HSE*
16	**1.64**	*R*	16	**2.00**	*H*
17	**3.38**	*R*	17	**4.53**	*H*
18	**24.59**	*R*	18	**4.33**	*HNW*
19	**17.37**	*HNW*	19	**16.00**	*T*
20	**5.91**	*SW*	20	**42.16**	*T*
21	**30.32**	*T*	21	**51.16**	*T*
22	**32.81**	*SW*	22	**12.33**	*T*
23	**14.91**	*W*	23	**8.69**	*T*
24	**26.58**	*T*	24	**21.76**	*T*
25	**54.85**	*SW*	25	**45.52**	*T*
26	**11.05**	*H*	26	**37.45**	*T*
27	**10.68**	*HE*	27	**17.63**	*T*
28	**29.10**	*HSE*	28	**2.10**	*T*
29	**25.45**	*HE*	29	**28.83**	*T*
30	**0.00**	*W*	30	**11.89**	*T*
31	**9.48**	*HNW*	31	**17.10**	*T*

January 1998	DSR	Synoptic Types
1	0.63	HSE
2	**7.05**	*H*
3	**69.16**	*H*
4	**22.15**	*H*
5	**4.85**	*HNW*
6	**2.71**	*SW*
7	**4.64**	*TSW*
8	**16.65**	*SW*
9	0.69	HW
10	0.86	HNW
11	**6.28**	*HNW*
12	**24.52**	*HNW*
13	**9.81**	*HNW*
14	**14.04**	*W*
15	**35.95**	*T*
16	**1.88**	*SW*
17	**12.73**	*SW*
18	**16.64**	*T*
19	**39.91**	*HW*
20	**4.28**	*HSE*
21	**3.89**	*HSE*
22	**4.85**	*HSE*
23	**8.10**	*HE*
24	**25.62**	*HSE*
25	**23.04**	*HSE*
26	**17.82**	*HE*
27	**33.99**	*HE*
28	**28.51**	*HE*
29	**17.71**	*HE*
30	**22.17**	*H*
31	**30.65**	*H*

January 1999	DSR	Synoptic Types
1	**12.32**	*R*
2	**5.48**	*HSE*
3	**12.75**	*HSE*
4	**14.51**	*HSE*
5	**28.51**	*HSE*
6	**10.65**	*HNW*
7	**34.93**	*SW*
8	**3.76**	*T*
9	**3.08**	*NE*
10	**5.38**	*H*
11	**23.91**	*H*
12	**26.94**	*HSE*
13	**12.70**	*R*
14	**3.60**	*NE*
15	**0.49**	*HSE*
16	**2.35**	*R*
17	**7.75**	*R*
18	**6.68**	*R*
19	**18.05**	*NE*
20	**26.51**	*TSW*
21	**11.11**	*R*
22	**1.57**	*HSE*
23	**2.69**	*R*
24	**7.89**	*R*
25	**14.51**	*NE*
26	**14.59**	*NE*
27	**25.20**	*HSE*
28	**7.74**	*HSE*
29	**6.77**	*HSE*
30	**37.45**	*TSW*
31	**1.20**	*T*

February 1998	DSR	Synoptic Types
1	1.74	HSE
2	2.90	HSE
3	**6.94**	*HSE*
4	**20.86**	*H*
5	**16.92**	*H*
6	**28.88**	*H*
7	**29.30**	*HSE*
8	**31.55**	*HE*
9	**32.74**	*HNW*
10	**14.52**	*H*
11	**8.71**	*HSE*
12	**14.86**	*HE*
13	**44.78**	*H*
14	**49.16**	*H*
15	**29.97**	*HE*
16	**21.63**	*HE*
17	**45.81**	*W*
18	**1.39**	*HNW*
19	**9.39**	*HE*
20	**23.15**	*TNW*
21	**34.47**	*W*
22	**27.20**	*TNW*
23	**10.81**	*T*
24	**1.37**	*SW*
25	**3.08**	*H*
26	**12.06**	*H*
27	**17.11**	*HE*
28	**19.11**	*H*

February 2001	DSR	Synoptic Types
1	0.28	H
2	1.10	H
3	**5.42**	W
4	**15.69**	W
5	**8.20**	T
6	**8.09**	W
7	**0.24**	HNW
8	**4.59**	SW
9	**7.26**	HNW
10	**21.78**	HNW
11	**56.60**	R
12	**7.35**	R
13	**9.34**	R
14	**26.05**	T
15	**22.92**	T
16	**5.06**	TSW
17	**6.07**	TSW
18	**6.59**	HSE
19	**5.59**	H
20	**43.70**	H
21	**14.02**	H
22	**65.10**	TSW
23	**13.03**	TSW
24	**18.81**	R
25	**16.34**	HSE
26	**2.53**	HSE
27	**6.04**	HSE
28	**13.75**	HSE

March 1998

	DSR	Synoptic Types
1	**28.17**	*H*
2	**15.05**	*H*
3	**12.32**	*HSE*
4	**7.96**	*HE*
5	**31.81**	*HE*
6	**41.46**	*NE*
7	**7.76**	*HE*
8	**27.62**	*HSE*
9	**18.16**	*HE*
10	**1.52**	*NE*
11	**1.15**	*HSE*
12	0.00	HSE
13	0.57	TNW
14	16.39	T
15	0.01	SW
16	0.13	H
17	**3.75**	*W*
18	**5.25**	*T*
19	**37.07**	*SW*
20	**27.38**	*SW*
21	**17.58**	*SW*
22	**3.97**	*H*
23	**8.97**	*H*
24	**23.66**	*H*
25	**30.41**	*H*
26	**7.35**	*HSE*
27	**6.07**	*HSE*
28	**3.44**	*TNW*
29	**8.37**	*SW*
30	**15.14**	*SW*
31	**4.13**	*W*

MCKENZIE BASIN – (Heydenrych et al (2001) did not do a long term analysis for this region)

TARA HILLS

December 2000	DSR	Synoptic Types	January 1999	DSR	Synoptic Types
1	1.58	TNW	1	**40.21**	*R*
2	6.81	W	2	**13.18**	*HSE*
3	0.05	H	3	**11.71**	*HSE*
4	0.61	H	4	**16.75**	*HSE*
5	1.90	H	5	**23.20**	*HSE*
6	**35.93**	*TSW*	6	**12.85**	*HNW*
7	**20.81**	*TSW*	7	**4.73**	*SW*
8	**7.97**	*NE*	8	**10.61**	*T*
9	**2.95**	*NE*	9	**12.12**	*NE*
10	**3.24**	*NE*	10	**8.76**	*H*
11	**5.43**	*R*	11	**23.19**	*H*
12	0.14	R	12	**15.54**	*HSE*
13	**6.72**	*HSE*	13	**16.07**	*R*
14	**1.87**	*HSE*	14	**10.87**	*NE*
15	**1.30**	*HSE*	15	0.87	HSE
16	**2.84**	*H*	16	**4.44**	*R*
17	**7.94**	*H*	17	**17.30**	*R*
18	**7.56**	*HNW*	18	**10.58**	*R*
19	**22.26**	*T*	19	**11.55**	*NE*
20	**70.00**	*T*	20	**40.90**	*TSW*
21	**66.45**	*T*	21	**17.31**	*R*
22	**24.31**	*T*	22	**13.33**	*HSE*
23	**171.11**	*T*	23	**6.23**	*R*
24	**67.69**	*T*	24	**12.98**	*R*
25	**15.32**	*T*	25	**17.76**	*NE*
26	**1.71**	*T*	26	**12.68**	*NE*
27	**4.60**	*T*	27	**25.88**	*HSE*
28	**4.33**	*T*	28	**20.93**	*HSE*
29	**5.21**	*T*	29	**13.27**	*HSE*
30	0.00	T	30	**42.57**	*TSW*
31	0.07	T	31	**3.74**	*T*

February 1998

Day	DSR	Synoptic Types
1	**10.79**	*HSE*
2	**9.64**	*HSE*
3	**4.74**	*HSE*
4	**3.05**	*H*
5	**8.99**	*H*
6	**10.73**	*H*
7	**28.15**	*HSE*
8	**13.13**	*HE*
9	**9.85**	*HNW*
10	**13.21**	*H*
11	**5.77**	*HSE*
12	**16.70**	*HE*
13	**21.08**	*H*
14	**27.98**	*H*
15	**10.42**	*HE*
16	**33.33**	*HE*
17	**50.30**	*W*
18	**18.09**	*HNW*
19	**20.89**	*HE*
20	**15.59**	*TNW*
21	**59.90**	*W*
22	**20.43**	*TNW*
23	0.00	T
24	0.00	SW
25	0.16	H
26	0.63	H
27	3.56	HE
28	2.27	H

February 1999

Day	DSR	Synoptic Types
1	2.51	H
2	**5.50**	*H*
3	**7.69**	*H*
4	**7.74**	*H*
5	**23.95**	*H*
6	**11.37**	*HSE*
7	**25.37**	*HSE*
8	**34.06**	*HSE*
9	**42.83**	*HSE*
10	**24.44**	*HSE*
11	**7.41**	*HSE*
12	**14.22**	*HSE*
13	**12.78**	*HSE*
14	**12.94**	*HSE*
15	**10.92**	*HSE*
16	**7.30**	*T*
17	**10.84**	*R*
18	**13.66**	*NE*
19	**46.73**	*TSW*
20	**26.85**	*R*
21	**14.26**	*HSE*
22	**11.62**	*HSE*
23	**12.33**	*HSE*
24	**7.18**	*HSE*
25	**14.64**	*TSW*
26	**8.16**	*T*
27	0.05	W
28	15.15	W

February 2001	DSR	Synoptic Types
1	**5.88**	*H*
2	**9.74**	*H*
3	**12.23**	*W*
4	**78.86**	*W*
5	**10.10**	*T*
6	**70.23**	*W*
7	**7.98**	*HNW*
8	**38.90**	*SW*
9	**19.44**	*HNW*
10	**17.40**	*HNW*
11	**13.45**	*R*
12	**35.05**	*R*
13	**5.84**	*R*
14	**53.55**	*T*
15	**2.00**	*T*
16	0.11	TSW
17	0.71	TSW
18	3.81	HSE
19	2.92	H
20	2.00	H
21	2.60	H
22	**48.06**	*TSW*
23	**6.90**	*TSW*
24	**39.63**	*R*
25	**4.69**	*HSE*
26	**6.68**	*HSE*
27	**3.85**	*HSE*
28	**8.83**	*HSE*

February 2003	DSR	Synoptic Types
1	**30.50**	*H*
2	**12.65**	*H*
3	**12.02**	*H*
4	**13.01**	*H*
5	**9.41**	*H*
6	**52.85**	*H*
7	**13.03**	*H*
8	**89.07**	*H*
9	**15.79**	*H*
10	**22.01**	*H*
11	**25.83**	*H*
12	**4.88**	*HSE*
13	**62.79**	*TSW*
14	0.06	R
15	0.43	H
16	29.34	H
17	49.57	W
18	2.37	T
19	0.00	T
20	1.62	T
21	1.04	HE
22	1.20	H
23	1.69	H
24	2.27	HSE
25	2.67	HSE
26	3.67	HSE
27	3.84	HSE
28	3.04	R

March 2000

	DSR	Synoptic Types
1	3.65	HW
2	**7.97**	*W*
3	**7.76**	*H*
4	**108.45**	*H*
5	**13.57**	*HSE*
6	**78.70**	*TSW*
7	**17.42**	*HSE*
8	**5.26**	*H*
9	**40.13**	*H*
10	**10.17**	*H*
11	**13.60**	*H*
12	**32.97**	*TSW*
13	0.00	R
14	0.00	TSW
15	0.02	NE
16	0.13	HSE
17	0.35	H
18	2.53	W
19	**40.86**	*HE*
20	**1.86**	*H*
21	**7.89**	*HE*
22	**3.49**	*HSE*
23	2.56	HSE
24	3.06	HSE
25	1.81	HSE
26	1.30	HSE
27	2.43	HSE
28	2.23	HSE
29	2.31	T
30	0.12	HNW
31	1.13	HNW

March 2001

	DSR	Synoptic Types
1	**30.61**	*HSE*
2	**6.34**	*HSE*
3	**4.90**	*R*
4	**5.86**	*R*
5	**3.85**	*HSE*
6	**3.44**	*HSE*
7	**4.35**	*H*
8	**17.30**	*H*
9	**15.08**	*HSE*
10	**4.84**	*HSE*
11	**6.94**	*HSE*
12	**7.09**	*HE*
13	**11.13**	*W*
14	**20.72**	*H*
15	**7.71**	*H*
16	**8.35**	*H*
17	**3.23**	*HSE*
18	**3.90**	*HSE*
19	**5.95**	*HSE*
20	**3.82**	*HSE*
21	**9.38**	*HSE*
22	**9.42**	*HSE*
23	**10.82**	*HSE*
24	**11.11**	*H*
25	**82.46**	*H*
26	**8.13**	*W*
27	**103.29**	*T*
28	**49.69**	*T*
29	**18.21**	*T*
30	**18.24**	*H*
31	**9.48**	*H*

March 2002

	DSR	Synoptic Types
1	1.27	T
2	4.39	T
3	**19.54**	*T*
4	**32.45**	*T*
5	**9.39**	*HE*
6	**6.33**	*HSE*
7	**2.91**	*H*
8	**23.77**	*NE*
9	**5.85**	*R*
10	**2.07**	*HSE*
11	**2.13**	*HSE*
12	**2.51**	*HSE*
13	**7.53**	*T*
14	**11.25**	*T*
15	**52.33**	*T*
16	**23.24**	*T*
17	**29.82**	*T*
18	**5.39**	*T*
19	**44.00**	*T*
20	**22.67**	*T*
21	**12.45**	*W*
22	**23.00**	*H*
23	**15.60**	*H*
24	**8.69**	*H*
25	**9.67**	*R*
26	**2.68**	*R*
27	**6.61**	*SW*
28	**35.33**	*T*
29	**19.57**	*T*
30	**51.23**	*T*
31	**17.59**	*TSW*

LAUDER

December 2000	DSR	Synoptic Types
1	0.15	TNW
2	0.09	W
3	0.00	H
4	0.02	H
5	0.23	H
6	10.72	TSW
7	10.86	TSW
8	0.68	NE
9	2.65	NE
10	1.11	NE
11	2.01	R
12	0.13	R
13	**8.95**	*HSE*
14	**34.00**	*HSE*
15	**5.71**	*HSE*
16	**3.62**	*H*
17	**3.64**	*H*
18	**3.19**	*HNW*
19	**7.04**	*T*
20	**14.75**	*T*
21	**239.45**	*T*
22	**6.72**	*T*
23	**8.13**	*T*
24	**17.75**	*T*
25	**7.90**	*T*
26	**35.29**	*T*
27	**4.82**	*T*
28	**60.45**	*T*
29	**61.87**	*T*
30	0.00	T
31	1.71	T

January 1998	DSR	Synoptic Types
1	0.01	HSE
2	**4.50**	*H*
3	**13.69**	*H*
4	**9.13**	*H*
5	**1.10**	*HNW*
6	**2.87**	*SW*
7	**2.22**	*TSW*
8	**41.90**	*SW*
9	**2.66**	*HW*
10	**2.16**	*HNW*
11	**14.99**	*HNW*
12	**55.20**	*HNW*
13	**12.66**	*HNW*
14	**33.79**	*W*
15	**22.16**	*T*
16	0.46	SW
17	2.13	SW
18	**5.45**	*T*
19	**47.84**	*HW*
20	**4.06**	*HSE*
21	**3.75**	*HSE*
22	**4.48**	*HSE*
23	**3.62**	*HE*
24	**29.89**	*HSE*
25	**11.58**	*HSE*
26	**5.38**	*HE*
27	**17.48**	*HE*
28	**3.90**	*HE*
29	**23.20**	*HE*
30	**33.82**	*H*
31	**61.42**	*H*

February 1998

	DSR	Synoptic Types
1	**9.38**	*HSE*
2	**6.59**	*HSE*
3	**6.54**	*HSE*
4	**7.19**	*H*
5	**13.35**	*H*
6	**28.92**	*H*
7	**13.17**	*HSE*
8	**41.43**	*HE*
9	**11.26**	*HNW*
10	**20.31**	*H*
11	**18.95**	*HSE*
12	**18.16**	*HE*
13	**13.19**	*H*
14	**95.53**	*H*
15	**57.65**	*HE*
16	**39.39**	*HE*
17	**74.56**	*W*
18	0.28	HNW
19	**23.32**	*HE*
20	**21.23**	*TNW*
21	**136.61**	*W*
22	**34.58**	*TNW*
23	0.29	T
24	0.00	SW
25	0.02	H
26	3.58	H
27	9.55	HE
28	0.55	H

February 1999

	DSR	Synoptic Types
1	0.13	H
2	0.83	H
3	1.00	H
4	3.19	H
5	**9.00**	*H*
6	**9.95**	*HSE*
7	**18.95**	*HSE*
8	**16.85**	*HSE*
9	**28.89**	*HSE*
10	0.23	HSE
11	1.16	HSE
12	**4.86**	*HSE*
13	**4.57**	*HSE*
14	**4.66**	*HSE*
15	**12.24**	*HSE*
16	**6.31**	*T*
17	**10.94**	*R*
18	**9.87**	*NE*
19	**38.06**	*TSW*
20	**23.34**	*R*
21	**8.67**	*HSE*
22	**11.90**	*HSE*
23	**7.28**	*HSE*
24	**8.37**	*HSE*
25	**7.81**	*TSW*
26	**5.25**	*T*
27	**36.74**	*W*
28	**97.40**	*W*

February 2003

	DSR	Synoptic Types
1	**41.15**	*H*
2	**12.12**	*H*
3	**34.34**	*H*
4	**9.05**	*H*
5	**6.33**	*H*
6	**57.78**	*H*
7	**11.73**	*H*
8	**37.33**	*H*
9	**16.26**	*H*
10	**6.29**	*H*
11	**26.45**	*H*
12	**4.74**	*HSE*
13	**37.65**	*TSW*
14	0.32	R
15	0.22	H
16	**6.25**	*H*
17	**43.39**	*W*
18	**0.01**	*T*
19	**1.13**	*T*
20	**6.56**	*T*
21	**14.83**	*HE*
22	**2.09**	*H*
23	**4.44**	*H*
24	**1.91**	*HSE*
25	**3.63**	*HSE*
26	**3.09**	*HSE*
27	**3.62**	*HSE*
28	**4.02**	*R*

March 2001

	DSR	Synoptic Types
1	**5.03**	*HSE*
2	**3.13**	*HSE*
3	**3.34**	*R*
4	**3.61**	*R*
5	**1.62**	*HSE*
6	**1.73**	*HSE*
7	**4.11**	*H*
8	**8.49**	*H*
9	**3.35**	*HSE*
10	**2.57**	*HSE*
11	**4.33**	*HSE*
12	**3.98**	*HE*
13	**6.99**	*W*
14	**11.40**	*H*
15	**5.73**	*H*
16	**2.93**	*H*
17	**1.95**	*HSE*
18	**2.90**	*HSE*
19	**3.44**	*HSE*
20	**3.03**	*HSE*
21	**13.68**	*HSE*
22	**7.25**	*HSE*
23	**8.03**	*HSE*
24	**35.44**	*H*
25	**51.39**	*H*
26	**13.72**	*W*
27	**98.27**	*T*
28	**106.71**	*T*
29	**52.47**	*T*
30	**24.06**	*H*
31	**8.18**	*H*

March 2002

	DSR	Synoptic Types
1	2.50	T
2	3.21	T
3	**12.04**	*T*
4	**15.02**	*T*
5	**3.90**	*HE*
6	**2.42**	*HSE*
7	**4.45**	*H*
8	**14.13**	*NE*
9	**2.38**	*R*
10	**1.30**	*HSE*
11	**2.68**	*HSE*
12	**3.09**	*HSE*
13	**4.68**	*T*
14	**5.83**	*T*
15	**8.30**	*T*
16	**14.25**	*T*
17	**22.48**	*T*
18	**2.37**	*T*
19	**167.82**	*T*
20	**10.99**	*T*
21	**28.97**	*W*
22	**23.10**	*H*
23	**37.47**	*H*
24	**11.61**	*H*
25	**5.90**	*R*
26	**2.98**	*R*
27	**34.09**	*SW*
28	**51.17**	*T*
29	**44.81**	*T*
30	**38.00**	*T*
31	**17.00**	*TSW*

WANAKA

November 1996	DSR	Synoptic Types	November 1997	DSR	Synoptic Types
1	0.32	HW	1	1.71	HE
2	**2.87**	*HSE*	2	0.97	W
3	**2.74**	*HSE*	3	1.86	HNW
4	**1.66**	*HSE*	4	2.01	HNW
5	**3.36**	*R*	5	2.30	H
6	0.53	SW	6	0.28	H
7	**2.28**	*SW*	7	0.42	T
8	**3.27**	*TSW*	8	0.04	SW
9	**3.29**	*TSW*	9	1.64	SW
10	**1.80**	*TSW*	10	**33.13**	*HNW*
11	**2.39**	*T*	11	**4.27**	*W*
12	**1.24**	*T*	12	**3.36**	*T*
13	0.89	T	13	**8.07**	*W*
14	**11.05**	*T*	14	0.95	T
15	**2.56**	*T*	15	3.51	SW
16	**18.21**	*T*	16	0.00	T
17	**17.93**	*T*	17	0.00	T
18	**1.00**	*TNW*	18	0.30	T
19	**1.66**	*T*	19	**8.02**	*T*
20	**9.51**	*SW*	20	**3.54**	*SW*
21	**5.84**	*SW*	21	**7.27**	*SW*
22	**4.52**	*SW*	22	**6.20**	*HNW*
23	**6.21**	*SW*	23	**4.60**	*HNW*
24	**11.11**	*SW*	24	**21.97**	*HNW*
25	**17.17**	*SW*	25	**6.62**	*SW*
26	**12.15**	*T*	26	**15.73**	*SW*
27	**9.34**	*SW*	27	**4.34**	*SW*
28	**4.00**	*T*	28	**19.36**	*SW*
29	**22.68**	*T*	29	**6.59**	*W*
30	**18.22**	*TNW*	30	**4.22**	*T*

December 1994	DSR	Synoptic Types	January 1998	DSR	Synoptic Types
1	**4.60**	*HSE*	1	**6.36**	*HSE*
2	**4.80**	*HSE*	2	**6.60**	*H*
3	**2.30**	*HW*	3	**6.03**	*H*
4	**4.10**	*HW*	4	**6.14**	*H*
5	**6.10**	*HW*	5	**9.46**	*HNW*
6	**12.60**	*H*	6	**10.01**	*SW*
7	**9.30**	*HNW*	7	**12.90**	*TSW*
8	**9.60**	*HNW*	8	**7.98**	*SW*
9	**12.10**	*H*	9	**10.59**	*HW*
10	**8.50**	*HNW*	10	**31.11**	*HNW*
11	0.60	H	11	**21.50**	*HNW*
12	**5.10**	*H*	12	**53.08**	*HNW*
13	**5.70**	*HSE*	13	**15.96**	*HNW*
14	**4.40**	*HSE*	14	**16.80**	*W*
15	**7.10**	*HSE*	15	**17.81**	*T*
16	**3.70**	*R*	16	**16.39**	*SW*
17	**9.00**	*R*	17	**9.17**	*SW*
18	**11.70**	*R*	18	**6.90**	*T*
19	**11.80**	*HNW*	19	**10.60**	*HW*
20	**18.60**	*SW*	20	**12.16**	*HSE*
21	**10.20**	*T*	21	**8.46**	*HSE*
22	**25.90**	*SW*	22	**3.97**	*HSE*
23	**15.40**	*W*	23	**6.82**	*HE*
24	**9.70**	*T*	24	**0.60**	*HSE*
25	**9.20**	*SW*	25	**2.17**	*HSE*
26	**5.50**	*H*	26	**4.27**	*HE*
27	**6.90**	*HE*	27	**3.34**	*HE*
28	**8.10**	*HSE*	28	**7.03**	*HE*
29	**4.70**	*HE*	29	**1.08**	*HE*
30	**4.50**	*W*	30	**3.14**	*H*
31	**5.20**	*HNW*	31	**6.63**	*H*

January 2003

	DSR	Synoptic Types
1	**8.55**	*H*
2	**5.78**	*HSE*
3	**5.37**	*HSE*
4	**6.42**	*W*
5	0.24	W
6	0.00	H
7	0.25	HSE
8	9.70	HSE
9	0.00	R
10	0.02	HSE
11	0.07	HSE
12	0.38	R
13	**2.72**	*NE*
14	**3.75**	*NE*
15	**6.02**	*R*
16	**4.53**	*H*
17	**2.51**	*H*
18	**2.98**	*W*
19	**3.85**	*W*
20	**5.00**	*W*
21	**6.85**	*W*
22	**7.23**	*T*
23	**1.85**	*T*
24	**21.30**	*T*
25	**7.16**	*TSW*
26	**1.86**	*T*
27	**13.77**	*T*
28	**10.29**	*T*
29	**4.42**	*T*
30	**3.96**	*W*
31	**8.41**	*W*

February 1993

	DSR	Synoptic Types
1	**9.90**	*SW*
2	**2.30**	*SW*
3	**6.20**	*SW*
4	**3.20**	*T*
5	**6.80**	*SW*
6	**10.80**	*HW*
7	**14.40**	*H*
8	**8.30**	*HSE*
9	**4.70**	*R*
10	**2.70**	*R*
11	**1.80**	*R*
12	**6.50**	*R*
13	**9.20**	*HW*
14	**16.20**	*HW*
15	**12.40**	*HW*
16	**11.80**	*HSE*
17	**7.40**	*HSE*
18	**18.10**	*HSE*
19	**9.40**	*R*
20	0.00	R
21	0.70	R
22	1.30	NE
23	0.20	NE
24	1.20	HE
25	0.10	HE
26	0.20	NE
27	0.90	NE
28	1.30	HE

February 1998	DSR	Synoptic Types	February 1999	DSR	Synoptic Types
1	**7.93**	*HSE*	1	1.56	H
2	**7.27**	*HSE*	2	**2.75**	*H*
3	**5.49**	*HSE*	3	**3.29**	*H*
4	**7.56**	*H*	4	**3.58**	*H*
5	**7.81**	*H*	5	**4.29**	*H*
6	**6.40**	*H*	6	**3.99**	*HSE*
7	**12.27**	*HSE*	7	**4.88**	*HSE*
8	**7.73**	*HE*	8	**4.70**	*HSE*
9	**19.96**	*HNW*	9	**4.40**	*HSE*
10	**10.53**	*H*	10	**9.38**	*HSE*
11	**8.35**	*HSE*	11	**12.60**	*HSE*
12	**8.58**	*HE*	12	**7.66**	*HSE*
13	**6.03**	*H*	13	**8.98**	*HSE*
14	**10.81**	*H*	14	**5.85**	*HSE*
15	**12.48**	*HE*	15	**6.13**	*HSE*
16	**8.37**	*HE*	16	**4.33**	*T*
17	**10.93**	*W*	17	**5.15**	*R*
18	**14.93**	*HNW*	18	**6.11**	*NE*
19	**1.90**	*HE*	19	**3.33**	*TSW*
20	**3.80**	*TNW*	20	**8.02**	*R*
21	**3.20**	*W*	21	**6.95**	*HSE*
22	0.77	TNW	22	**4.98**	*HSE*
23	2.17	T	23	**9.17**	*HSE*
24	0.00	SW	24	**11.57**	*HSE*
25	0.19	H	25	**10.67**	*TSW*
26	1.42	H	26	0.43	T
27	2.48	HE	27	0.83	W
28	5.29	H	28	1.79	W

February 2003

	DSR	Synoptic Types
1	**8.29**	*H*
2	**7.61**	*H*
3	**5.39**	*H*
4	**6.73**	*H*
5	**6.50**	*H*
6	**8.54**	*H*
7	**7.21**	*H*
8	**8.48**	*H*
9	**7.79**	*H*
10	**8.21**	*H*
11	**4.36**	*H*
12	**7.50**	*HSE*
13	**4.06**	*TSW*
14	**8.46**	*R*
15	**14.04**	*H*
16	**11.00**	*H*
17	**8.92**	*W*
18	**13.98**	*T*
19	**13.67**	*T*
20	**14.53**	*T*
21	**14.52**	*HE*
22	**16.69**	*H*
23	**10.61**	*H*
24	0.02	HSE
25	0.03	HSE
26	0.02	HSE
27	0.01	HSE
28	0.14	R

INLAND SOUTHLAND AND CENTRAL OTAGO

GORE

November 1997

	DSR	Synoptic Types
1	0.01	HE
2	3.24	W
3	0.59	HNW
4	0.04	HNW
5	0.02	H
6	0.87	H
7	11.52	T
8	0.01	SW
9	0.00	SW
10	0.00	HNW
11	0.42	W
12	0.00	T
13	0.01	W
14	32.74	T
15	0.01	SW
16	0.39	T
17	0.68	T
18	**14.80**	*T*
19	**1.39**	*T*
20	**2.32**	*SW*
21	0.00	SW
22	0.00	HNW
23	0.22	HNW
24	0.13	HNW
25	0.00	SW
26	0.02	SW
27	2.42	SW
28	0.00	SW
29	0.06	W
30	0.01	T

December 1991

	DSR	Synoptic Types
1	0.01	T
2	0.00	SW
3	0.00	SW
4	0.00	TSW
5	0.02	TNW
6	0.02	TNW
7	0.37	TNW
8	0.00	T
9	0.11	SW
10	0.05	R
11	4.68	R
12	0.03	HW
13	0.05	HW
14	1.65	TSW
15	0.59	TSW
16	**1.15**	*NE*
17	**1.12**	*HSE*
18	**3.52**	*H*
19	**3.01**	*HNW*
20	**1.62**	*T*
21	**6.40**	*T*
22	**14.97**	*T*
23	**11.94**	*HSE*
24	**10.42**	*HSE*
25	**2.57**	*HSE*
26	0.00	HSE
27	0.29	H
28	0.13	HSE
29	0.00	NE
30	0.00	TSW
31	0.01	TSW

December 1994

	DSR	Synoptic Types
1	0	HSE
2	0.00	HSE
3	0.23	HW
4	0.17	HW
5	0.35	HW
6	0.13	H
7	3.10	HNW
8	57.83	HNW
9	0.02	H
10	0.56	HNW
11	0.58	H
12	0.45	H
13	0.27	HSE
14	1.36	HSE
15	0.02	HSE
16	0.18	R
17	0.67	R
18	11.10	R
19	2.46	HNW
20	0.00	SW
21	1.53	T
22	0.00	SW
23	0.00	W
24	0.02	T
25	0.01	SW
26	0.01	H
27	0.02	HE
28	0.43	HSE
29	0.68	HE
30	0.07	W
31	0.01	HNW

January 1998

	DSR	Synoptic Types
1	**1.32**	*HSE*
2	**10.55**	*H*
3	**13.32**	*H*
4	0.00	H
5	0.00	HNW
6	0.10	SW
7	0.83	TSW
8	3.86	SW
9	0.00	HW
10	0.00	HNW
11	0.04	HNW
12	0.13	HNW
13	0.02	HNW
14	**3.43**	*W*
15	**2.56**	*T*
16	**0.27**	*SW*
17	**0.71**	*SW*
18	**4.20**	*T*
19	**1.42**	*HW*
20	0.24	HSE
21	0.28	HSE
22	0.80	HSE
23	0.08	HE
24	0.05	HSE
25	1.85	HSE
26	0.38	HE
27	0.46	HE
28	0.23	HE
29	**1.00**	*HE*
30	**9.80**	*H*
31	**15.19**	*H*

January 1999	DSR	Synoptic Types
1	**1.34**	*R*
2	**0.86**	*HSE*
3	**1.17**	*HSE*
4	**24.13**	*HSE*
5	**12.64**	*HSE*
6	0.00	HNW
7	0.00	SW
8	0.15	T
9	0.11	NE
10	0.14	H
11	0.26	H
12	12.08	HSE
13	1.83	R
14	0.00	NE
15	0.01	HSE
16	0.02	R
17	0.05	R
18	0.20	R
19	0.58	NE
20	**1.06**	*TSW*
21	**2.89**	*R*
22	**2.17**	*HSE*
23	**1.77**	*R*
24	**1.60**	*R*
25	0.62	NE
26	0.68	NE
27	0.18	HSE
28	0.67	HSE
29	1.31	HSE
30	0.72	TSW
31	0.01	T

February 1992	DSR	Synoptic Types
1	0.01	W
2	0.10	SW
3	2.88	W
4	0.00	T
5	0.00	HW
6	0.01	HSE
7	0.04	NE
8	0.27	NE
9	0.01	R
10	0.00	HW
11	0.09	HW
12	0.04	HSE
13	1.61	HE
14	0.00	T
15	0.00	SW
16	0.01	HW
17	0.07	H
18	**26.44**	*SW*
19	**1.54**	*SW*
20	**1.48**	*T*
21	**3.38**	*SW*
22	**4.72**	*NE*
23	**2.11**	*TNW*
24	0.14	SW
25	2.28	HW
26	8.31	SW
27	0.07	SW
28	0.00	HW
29	0.02	H

February 1999	DSR	Synoptic Types
1	0.00	H
2	0.19	H
3	0.19	H
4	0.34	H
5	0.38	H
6	**1.48**	*HSE*
7	**2.05**	*HSE*
8	**2.01**	*HSE*
9	**5.01**	*HSE*
10	**1.87**	*HSE*
11	**1.50**	*HSE*
12	**2.03**	*HSE*
13	**1.08**	*HSE*
14	**2.00**	*HSE*
15	**2.03**	*HSE*
16	**3.85**	*T*
17	**9.25**	*R*
18	**6.81**	*NE*
19	**8.66**	*TSW*
20	**8.35**	*R*
21	**2.01**	*HSE*
22	**4.66**	*HSE*
23	**0.71**	*HSE*
24	**3.12**	*HSE*
25	**2.82**	*TSW*
26	**2.10**	*T*
27	**0.25**	*W*
28	**30.28**	*W*

March 2001	DSR	Synoptic Types
1	0.30	HSE
2	0.17	HSE
3	0.13	R
4	0.70	R
5	0.27	HSE
6	1.28	HSE
7	1.36	H
8	0.10	H
9	0.12	HSE
10	0.53	HSE
11	0.56	HSE
12	0.59	HE
13	21.36	W
14	4.99	H
15	0.82	H
16	0.51	H
17	0.65	HSE
18	0.50	HSE
19	**1.67**	*HSE*
20	**1.33**	*HSE*
21	**1.27**	*HSE*
22	**2.05**	*HSE*
23	**1.41**	*HSE*
24	**1.15**	*H*
25	**19.16**	*H*
26	**4.58**	*W*
27	**46.68**	*T*
28	**78.02**	*T*
29	0.01	T
30	0.01	H
31	0.25	H

March 2003

	DSR	Synoptic Types
1	0.22	R
2	**1.32**	*TSW*
3	**15.89**	*T*
4	**5.48**	*H*
5	**1.56**	*HSE*
6	0.01	HSE
7	0.05	HSE
8	0.06	HSE
9	3.55	HSE
10	0.41	HSE
11	0.17	R
12	0.57	TSW
13	1.03	TSW
14	1.00	TSW
15	0.78	TSW
16	0.39	HSE
17	0.91	H
18	1.61	H
19	0.88	H
20	1.29	H
21	0.48	H
22	**1.34**	*H*
23	**9.25**	*H*
24	**1.92**	*HSE*
25	**1.71**	*HSE*
26	**1.10**	*HSE*
27	**1.48**	*HSE*
28	**0.94**	*HSE*
29	**2.95**	*HSE*
30	**2.47**	*TNW*
31	0.00	TNW

QUEENSTOWN

November 1989	DSR	Synoptic Types	November 2000	DSR	Synoptic Types
1	3.23	W	1	3.01	NE
2	0.17	H	2	0.68	HSE
3	0.87	H	3	0.62	HSE
4	0.98	HSE	4	0.80	R
5	1.14	HSE	5	1.19	TSW
6	0.57	HE	6	**2.13**	*TSW*
7	1.52	H	7	**1.37**	*TSW*
8	0.17	HE	8	**0.80**	*NE*
9	0.12	W	9	**0.98**	*HSE*
10	0.20	SW	10	**1.42**	*HSE*
11	0.31	H	11	**1.72**	*HSE*
12	0.72	HE	12	**5.80**	*HSE*
13	**3.84**	*T*	13	**2.56**	*SW*
14	**12.54**	*T*	14	**6.40**	*T*
15	**10.90**	*SW*	15	**8.05**	*T*
16	**7.39**	*R*	16	**7.01**	*W*
17	**1.83**	*TNW*	17	**8.29**	*T*
18	**1.09**	*T*	18	**10.98**	*T*
19	**10.39**	*TSW*	19	**5.97**	*T*
20	0.24	R	20	**6.64**	*T*
21	0.95	R	21	**5.01**	*T*
22	**2.07**	*R*	22	**0.50**	*T*
23	**6.93**	*R*	23	**1.56**	*T*
24	**4.53**	*R*	24	**1.88**	*TSW*
25	**6.11**	*R*	25	**3.76**	*T*
26	**3.60**	*TSW*	26	**5.67**	*T*
27	**8.63**	*TSW*	27	**5.87**	*TSW*
28	**4.37**	*HW*	28	0.00	TSW
29	**3.40**	*HNW*	29	0.06	TSW
30	**3.97**	*HNW*	30	0.15	T

December 1987

	DSR	Synoptic Types
1	0.58	TNW
2	0.00	TNW
3	0.09	T
4	1.17	T
5	1.54	SW
6	1.85	SW
7	1.12	W
8	0.46	TNW
9	0.02	SW
10	0.01	HNW
11	0.13	HW
12	0.35	HSE
13	**3.97**	*HSE*
14	**2.62**	*HSE*
15	**2.53**	*HSE*
16	**2.72**	*HE*
17	**2.99**	*T*
18	**6.88**	*TNW*
19	**10.07**	*HNW*
20	**5.49**	*HSE*
21	**8.31**	*HSE*
22	1.40	NE
23	0.00	TNW
24	0.37	T
25	3.14	T
26	0.23	SW
27	**1.83**	*HNW*
28	**3.66**	*W*
29	**9.34**	*SW*
30	**19.13**	*SW*
31	**10.08**	*HW*

December 1989

	DSR	Synoptic Types
1	**7.53**	*HNW*
2	**20.55**	*W*
3	**1.62**	*W*
4	0.26	H
5	0.67	HSE
6	**1.34**	*HSE*
7	**1.13**	*HSE*
8	**1.81**	*HSE*
9	**1.89**	*HW*
10	**4.26**	*HW*
11	**2.96**	*HSE*
12	**7.68**	*HE*
13	**19.73**	*W*
14	2.75	*T*
15	0.00	T
16	0.00	T
17	0.00	TSW
18	0.00	HW
19	0.02	HSE
20	0.08	HE
21	1.47	TNW
22	6.00	T
23	0.25	T
24	0.61	SW
25	1.59	SW
26	3.29	T
27	0.00	T
28	0.01	W
29	0.31	HNW
30	0.92	HSE
31	4.74	HSE

December 1990	DSR	Synoptic Types	December 2000	DSR	Synoptic Types
1	**9.12**	*SW*	1	1.46	TNW
2	**9.65**	*SW*	2	1.91	W
3	**23.20**	*SW*	3	0.01	H
4	**12.74**	*SW*	4	0.22	H
5	**4.31**	*H*	5	**1.51**	*H*
6	**12.09**	*HNW*	6	**5.27**	*TSW*
7	**29.16**	*SW*	7	**2.85**	*TSW*
8	**32.96**	*SW*	8	**2.53**	*NE*
9	**20.56**	*HNW*	9	**3.64**	*NE*
10	**3.96**	*W*	10	**6.73**	*NE*
11	0.01	TNW	11	**3.46**	*R*
12	0.00	T	12	**5.99**	*R*
13	0.00	T	13	**4.17**	*HSE*
14	0.01	W	14	**10.16**	*HSE*
15	0.03	T	15	**4.88**	*HSE*
16	0.02	HNW	16	**8.20**	*H*
17	0.34	H	17	**7.35**	*H*
18	2.42	HE	18	**9.93**	*HNW*
19	0.05	SW	19	**7.19**	*T*
20	0.09	SW	20	**25.50**	*T*
21	0.67	TSW	21	**15.48**	*T*
22	1.23	NE	22	**9.99**	*T*
23	1.39	NE	23	0.00	T
24	6.45	TNW	24	0.67	T
25	0.26	TNW	25	0.14	T
26	0.56	TNW	26	0.01	T
27	0.01	T	27	0.00	T
28	0.29	TNW	28	0.02	T
29	0.00	T	29	0.09	T
30	0.26	SW	30	0.01	T
31	1.37	HW	31	0.18	T

January 1979	DSR	Synoptic Types
1	3.07	T
2	1.51	T
3	0.33	SW
4	1.48	HW
5	0.54	HNW
6	0.30	SW
7	0.12	W
8	6.41	SW
9	3.15	W
10	1.41	W
11	0.61	W
12	3.61	T
13	0.47	SW
14	0.23	T
15	0.04	T
16	0.22	HW
17	0.36	R
18	1.83	TSW
19	0.14	HW
20	0.10	HSE
21	**10.64**	*SW*
22	**5.87**	*SW*
23	**12.33**	*H*
24	**5.09**	*H*
25	**11.10**	*HE*
26	**18.72**	*HE*
27	0.00	T
28	0.00	SW
29	0.19	HW
30	0.15	HSE
31	2.35	HSE

January 1981	DSR	Synoptic Types
1	**3.68**	*HSE*
2	**13.12**	*H*
3	**2.80**	*HSE*
4	**8.63**	*W*
5	0.72	SW
6	**2.10**	*SW*
7	**4.95**	*SW*
8	**4.00**	*HW*
9	**6.21**	*HW*
10	**6.23**	*R*
11	**9.24**	*TSW*
12	**8.87**	*TSW*
13	**3.23**	*NE*
14	**2.73**	*HW*
15	**3.06**	*HSE*
16	**10.47**	*HW*
17	**5.48**	*HSE*
18	**6.14**	*HSE*
19	**9.13**	*HE*
20	**1.46**	*H*
21	0.39	HSE
22	**1.77**	*HE*
23	**3.00**	*W*
24	**17.54**	*H*
25	**18.61**	*H*
26	**14.13**	*HSE*
27	**10.75**	*SW*
28	**3.63**	*TSW*
29	**5.60**	*NE*
30	**7.48**	*NE*
31	**5.45**	*HSE*

January 1997

	DSR	Synoptic Types
1	**1.93**	*HSE*
2	**1.21**	*HSE*
3	**1.78**	*HNW*
4	**4.97**	*HW*
5	**2.05**	*SW*
6	**2.37**	*R*
7	**4.22**	*NE*
8	**2.11**	*NE*
9	**3.69**	*NE*
10	**3.68**	*NE*
11	0.23	TSW
12	0.42	SW
13	0.92	HSE
14	**1.42**	*HSE*
15	**1.61**	*HSE*
16	**2.96**	*R*
17	**4.53**	*T*
18	**3.03**	*SW*
19	0.46	HNW
20	0.71	HNW
21	**4.23**	*W*
22	**10.27**	*HW*
23	**1.29**	*HSE*
24	**13.39**	*HSE*
25	**2.77**	*HW*
26	**2.95**	*HSE*
27	**3.33**	*HSE*
28	**4.43**	*HSE*
29	**4.57**	*HSE*
30	**3.44**	*HSE*
31	**3.80**	*HSE*

January 1998

	DSR	Synoptic Types
1	**1.06**	*HSE*
2	**4.02**	*H*
3	**6.29**	*H*
4	**1.24**	*H*
5	0.04	HNW
6	0.63	SW
7	3.29	TSW
8	4.36	SW
9	0.11	HW
10	0.30	HNW
11	**5.78**	*HNW*
12	**13.60**	*HNW*
13	**5.22**	*HNW*
14	**6.46**	*W*
15	**12.02**	*T*
16	0.01	SW
17	**1.96**	*SW*
18	**3.08**	*T*
19	**7.22**	*HW*
20	**2.25**	*HSE*
21	**1.26**	*HSE*
22	**1.35**	*HSE*
23	0.76	HE
24	**1.42**	*HSE*
25	**3.62**	*HSE*
26	**2.10**	*HE*
27	**1.85**	*HE*
28	0.25	HE
29	0.54	HE
30	7.55	H
31	14.74	H

January 1999	DSR	Synoptic Types	January 2003	DSR	Synoptic Types
1	**3.72**	*R*	1	**4.55**	*H*
2	**4.53**	*HSE*	2	**2.85**	*HSE*
3	**9.03**	*HSE*	3	**4.60**	*HSE*
4	**12.94**	*HSE*	4	**4.30**	*W*
5	**10.71**	*HSE*	5	**7.50**	*W*
6	1.27	HNW	6	**5.46**	*H*
7	0.00	SW	7	**3.97**	*HSE*
8	0.23	T	8	**6.08**	*HSE*
9	**2.09**	*NE*	9	**3.97**	*R*
10	**1.98**	*H*	10	0.45	HSE
11	**6.90**	*H*	11	0.01	HSE
12	**5.73**	*HSE*	12	0.00	R
13	**4.18**	*R*	13	0.02	NE
14	**4.11**	*NE*	14	0.41	NE
15	**4.34**	*HSE*	15	0.82	R
16	**5.21**	*R*	16	**3.15**	*H*
17	**3.04**	*R*	17	**2.78**	*H*
18	**5.45**	*R*	18	**1.14**	*W*
19	**5.46**	*NE*	19	**3.42**	*W*
20	**15.31**	*TSW*	20	**7.06**	*W*
21	**15.37**	*R*	21	**3.41**	*W*
22	**8.34**	*HSE*	22	**4.38**	*T*
23	**5.93**	*R*	23	0.79	T
24	**7.96**	*R*	24	1.08	T
25	**7.32**	*NE*	25	1.42	TSW
26	**6.71**	*NE*	26	0.87	T
27	**18.12**	*HSE*	27	1.85	T
28	**15.63**	*HSE*	28	0.59	T
29	**7.32**	*HSE*	29	**4.66**	*T*
30	**23.54**	*TSW*	30	**5.95**	*W*
31	0.01	T	31	**11.18**	*W*

February 1981	DSR	Synoptic Types
1	**8.95**	*TSW*
2	**14.44**	*SW*
3	**14.95**	*SW*
4	**17.87**	*SW*
5	**18.47**	*T*
6	**16.89**	*SW*
7	**12.52**	*HW*
8	**7.88**	*HSE*
9	**16.03**	*HE*
10	**19.36**	*HE*
11	0.69	H
12	**2.20**	*H*
13	**2.62**	*HSE*
14	**1.83**	*HSE*
15	**3.82**	*H*
16	**29.56**	*SW*
17	**2.63**	*TSW*
18	**11.00**	*TSW*
19	**8.60**	*TSW*
20	0.42	SW
21	5.19	HW
22	2.60	NE
23	0.00	NE
24	0.36	NE
25	0.26	HE
26	3.20	HSE
27	1.61	HSE
28	1.87	NE

February 1985	DSR	Synoptic Types
1	4.50	T
2	0.01	HNW
3	0.01	H
4	0.01	H
5	1.30	H
6	1.94	H
7	1.28	TSW
8	0.09	NE
9	1.02	R
10	**1.83**	*TSW*
11	**7.46**	*TSW*
12	**5.27**	*HW*
13	**1.99**	*HSE*
14	**1.13**	*NE*
15	**2.39**	*R*
16	**2.21**	*NE*
17	**1.78**	*TNW*
18	**4.25**	*SW*
19	**13.11**	*HW*
20	**1.36**	*HSE*
21	**4.55**	*HSE*
22	**3.38**	*HSE*
23	**1.84**	*HSE*
24	0.99	HSE
25	**1.67**	*NE*
26	**3.02**	*NE*
27	**14.56**	*TNW*
28	**2.34**	*TNW*

February 1998

	DSR	Synoptic Types
1	**8.43**	*HSE*
2	**5.45**	*HSE*
3	**3.99**	*HSE*
4	**1.58**	*H*
5	**5.75**	*H*
6	**7.32**	*H*
7	0.00	HSE
8	**1.68**	*HE*
9	**7.92**	*HNW*
10	**3.84**	*H*
11	**2.81**	*HSE*
12	**4.89**	*HE*
13	**1.60**	*H*
14	**1.60**	*H*
15	**5.00**	*HE*
16	**9.33**	*HE*
17	**8.64**	*W*
18	0.24	HNW
19	**2.96**	*HE*
20	**2.41**	*TNW*
21	**1.64**	*W*
22	**2.23**	*TNW*
23	0.00	T
24	0.00	SW
25	0.22	H
26	0.65	H
27	1.32	HE
28	1.60	H

February 1999

	DSR	Synoptic Types
1	**1.13**	*H*
2	**2.48**	*H*
3	**2.64**	*H*
4	**3.15**	*H*
5	**6.94**	*H*
6	**10.52**	*HSE*
7	**10.14**	*HSE*
8	**9.24**	*HSE*
9	**9.68**	*HSE*
10	**4.92**	*HSE*
11	**6.06**	*HSE*
12	**7.10**	*HSE*
13	**5.77**	*HSE*
14	**5.23**	*HSE*
15	**2.39**	*HSE*
16	**6.58**	*T*
17	**8.54**	*R*
18	**13.42**	*NE*
19	**25.50**	*TSW*
20	**1.77**	*R*
21	**3.31**	*HSE*
22	**6.27**	*HSE*
23	**12.87**	*HSE*
24	**9.84**	*HSE*
25	**7.81**	*TSW*
26	**4.53**	*T*
27	**10.01**	*W*
28	**42.53**	*W*

February 2001

	DSR	Synoptic Types
1	**1.76**	*H*
2	**3.52**	*H*
3	**11.07**	*W*
4	**5.86**	*W*
5	**8.16**	*T*
6	**14.98**	*W*
7	**8.49**	*HNW*
8	**8.98**	*SW*
9	**7.89**	*HNW*
10	**3.87**	*HNW*
11	**6.75**	*R*
12	**2.87**	*R*
13	**4.49**	*R*
14	**9.43**	*T*
15	0.70	T
16	0.00	TSW
17	0.29	TSW
18	**1.36**	*HSE*
19	**1.05**	*H*
20	**1.55**	*H*
21	**1.61**	*H*
22	**4.94**	*TSW*
23	**2.54**	*TSW*
24	**6.05**	*R*
25	0.45	HSE
26	0.18	HSE
27	0.29	HSE
28	1.32	HSE

February 2003

	DSR	Synoptic Types
1	0.41	H
2	**2.63**	*H*
3	**4.53**	*H*
4	**10.77**	*H*
5	**3.17**	*H*
6	**11.01**	*H*
7	**7.56**	*H*
8	**7.98**	*H*
9	**4.03**	*H*
10	**8.52**	*H*
11	**10.03**	*H*
12	**4.37**	*HSE*
13	**14.69**	*TSW*
14	0.91	R
15	0.20	H
16	1.29	H
17	4.25	W
18	0.20	T
19	0.00	T
20	0.04	T
21	0.45	HE
22	0.29	H
23	1.81	H
24	1.31	HSE
25	1.20	HSE
26	0.75	HSE
27	1.89	HSE
28	1.76	R

March 1999

	DSR	Synoptic Types
1	**2.43**	*W*
2	**7.44**	*HNW*
3	**10.84**	*HSE*
4	**5.29**	*HSE*
5	**26.04**	*H*
6	**9.92**	*H*
7	**7.85**	*H*
8	**2.10**	*HSE*
9	0.00	HSE
10	0.00	HSE
11	0.19	HSE
12	0.01	HSE
13	0.07	HSE
14	0.40	NE
15	0.65	R
16	0.68	R
17	**2.99**	*H*
18	**2.40**	*H*
19	**6.30**	*H*
20	**6.31**	*H*
21	**4.17**	*H*
22	**3.87**	*W*
23	0.00	HE
24	0.01	H
25	0.22	H
26	0.32	H
27	1.59	H
28	2.10	H
29	0.02	HSE
30	0.57	HNW
31	0.97	H

TAPANUI

December 2000	DSR	Synoptic Type	December 2001	DSR	Synoptic Type
1	0.03	TNW	1	1.96	H
2	0.01	W	2	0.02	H
3	0.00	H	3	0.00	H
4	0.02	H	4	0.00	HE
5	0.35	H	5	0.00	TNW
6	0.60	TSW	6	0.00	T
7	0.42	TSW	7	0.00	T
8	0.38	NE	8	0.00	TSW
9	**1.63**	*NE*	9	0.05	TSW
10	**1.24**	*NE*	10	0.03	T
11	**1.15**	*R*	11	0.09	T
12	0.01	R	12	1.37	T
13	**1.65**	*HSE*	13	0.24	W
14	**0.90**	*HSE*	14	**0.91**	*HNW*
15	**1.18**	*HSE*	15	**0.82**	*TSW*
16	**1.37**	*H*	16	**1.76**	*TSW*
17	**3.59**	*H*	17	**1.00**	*R*
18	**1.79**	*HNW*	18	**1.17**	*NE*
19	**5.98**	*T*	19	**2.74**	*NE*
20	**2.11**	*T*	20	**3.94**	*NE*
21	**12.30**	*T*	21	**2.44**	*NE*
22	**1.72**	*T*	22	**1.58**	*TSW*
23	0.00	T	23	**3.36**	*TSW*
24	**11.61**	*T*	24	**1.44**	*TSW*
25	**2.98**	*T*	25	**1.63**	*TSW*
26	**6.80**	*T*	26	**13.38**	*TSW*
27	0.58	T	27	0.02	TSW
28	0.03	T	28	0.07	T
29	0.17	T	29	0.00	T
30	0.01	T	30	0.05	T
31	0.12	T	31	0.08	T

December 2002	DSR	Synoptic Type	January 1998	DSR	Synoptic Type
1	0.01	HSE	1	0.02	HSE
2	0.10	HSE	2	0.89	H
3	**0.58**	*NE*	3	2.65	H
4	**0.69**	*TSW*	4	0.21	H
5	**3.42**	*TSW*	5	0.18	HNW
6	**12.77**	*TSW*	6	0.50	SW
7	**4.18**	*TSW*	7	1.04	TSW
8	0.00	TNW	8	0.11	SW
9	0.02	T	9	0.00	HW
10	0.00	T	10	0.00	HNW
11	0.05	T	11	0.02	HNW
12	0.22	T	12	0.92	HNW
13	0.70	T	13	0.38	HNW
14	0.25	T	14	**4.12**	*W*
15	0.41	W	15	**9.14**	*T*
16	0.53	HE	16	**1.08**	*SW*
17	0.01	HSE	17	**1.41**	*SW*
18	0.02	HSE	18	**0.69**	*T*
19	0.09	HSE	19	**2.97**	*HW*
20	0.27	HSE	20	**0.56**	*HSE*
21	**1.97**	*H*	21	**0.74**	*HSE*
22	**0.71**	*SW*	22	**0.75**	*HSE*
23	**4.63**	*W*	23	0.00	HE
24	**1.05**	*T*	24	0.02	HSE
25	**1.68**	*T*	25	0.04	HSE
26	**0.70**	*T*	26	0.07	HE
27	**1.66**	*H*	27	0.35	HE
28	0.05	H	28	0.06	HE
29	0.03	H	29	0.53	HE
30	0.39	H	30	1.42	H
31	2.16	H	31	26.91	H

February 1999	DSR	Synoptic Type	March 2001	DSR	Synoptic Type
1	0.01	H	1	**9.78**	*HSE*
2	0.05	H	2	**0.41**	*HSE*
3	0.02	H	3	**0.84**	*R*
4	0.08	H	4	**1.30**	*R*
5	0.15	H	5	**1.00**	*HSE*
6	**0.62**	*HSE*	6	**1.77**	*HSE*
7	**1.18**	*HSE*	7	**2.27**	*H*
8	**3.52**	*HSE*	8	**0.86**	*H*
9	**2.56**	*HSE*	9	**1.12**	*HSE*
10	**0.72**	*HSE*	10	**1.39**	*HSE*
11	**1.09**	*HSE*	11	**1.67**	*HSE*
12	**1.29**	*HSE*	12	**5.16**	*HE*
13	**0.97**	*HSE*	13	**9.08**	*W*
14	**0.93**	*HSE*	14	**7.46**	*H*
15	**0.40**	*HSE*	15	0.41	H
16	**7.66**	*T*	16	0.22	H
17	**6.37**	*R*	17	**0.45**	*HSE*
18	**13.53**	*NE*	18	**0.90**	*HSE*
19	**10.74**	*TSW*	19	**2.29**	*HSE*
20	**10.29**	*R*	20	**2.09**	*HSE*
21	**1.89**	*HSE*	21	**8.04**	*HSE*
22	**3.47**	*HSE*	22	**10.15**	*HSE*
23	**0.59**	*HSE*	23	**2.90**	*HSE*
24	**2.09**	*HSE*	24	**8.01**	*H*
25	**2.35**	*TSW*	25	**0.52**	*H*
26	**0.85**	*T*	26	**16.56**	*W*
27	0.34	W	27	**5.08**	*T*
28	40.01	W	28	**21.16**	*T*
			29	0.14	T
			30	2.08	H
			31	0.61	H

March 2003

	DSR	Synoptic Type
1	**0.60**	*R*
2	**2.53**	*TSW*
3	**27.36**	*T*
4	**13.81**	*H*
5	**6.20**	*HSE*
6	0.04	HSE
7	0.11	HSE
8	0.21	HSE
9	0.05	HSE
10	0.16	HSE
11	0.29	R
12	0.27	TSW
13	**0.49**	*TSW*
14	**0.46**	*TSW*
15	**0.91**	*TSW*
16	**0.68**	*HSE*
17	**1.25**	*H*
18	**1.19**	*H*
19	0.12	H
20	0.61	H
21	0.17	H
22	**0.74**	*H*
23	**1.31**	*H*
24	**1.52**	*HSE*
25	**2.35**	*HSE*
26	**2.10**	*HSE*
27	**2.21**	*HSE*
28	**1.53**	*HSE*
29	**4.39**	*HSE*
30	**3.57**	*TNW*
31	0.00	TNW