

# Analysis of Whistler Weather Data

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## Summary

In this study we analyze daily weather data from Whistler, BC obtained from <http://climate.weather.gc.ca/>. Data was recorded at an elevation of 657.80 metres, a longitude of 122°57'17.400" W and a latitude of 50° 07'44.001" N over the period 2006 – 2014. The variables analyzed were the amount of snow on the ground, the average temperature during each day and the total precipitation.

Our study was motivated by trying to answer the following questions:

1. When is the winter season? When does it start, peak and end?
2. How severe is the winter? How much snow is present at different points in the year?
3. What trends exist in the data? What odd behaviors have shown up over the past 9 years?

To answer our study questions, we used the following techniques:

1. Regression, to determine whether there was a trend in the snowfall data
2. Time series techniques, such as average smoothing, to compare different winter seasons
3. Correlation, to determine how different variables were related

We found that while temperature is very consistent year to year, the amount of snowfall has been showing a downward trend. In particular, the 2009–2010 winter in which Vancouver hosted the Olympics was far less severe, both in the amount of snow and the duration of snowfall, than typical winter seasons. This was shown by comparing the 2009–2010 to an average winter at each point in the year, by comparing the length of the winter to other years, and by comparing the peak snowfall and average snowfall to other years.

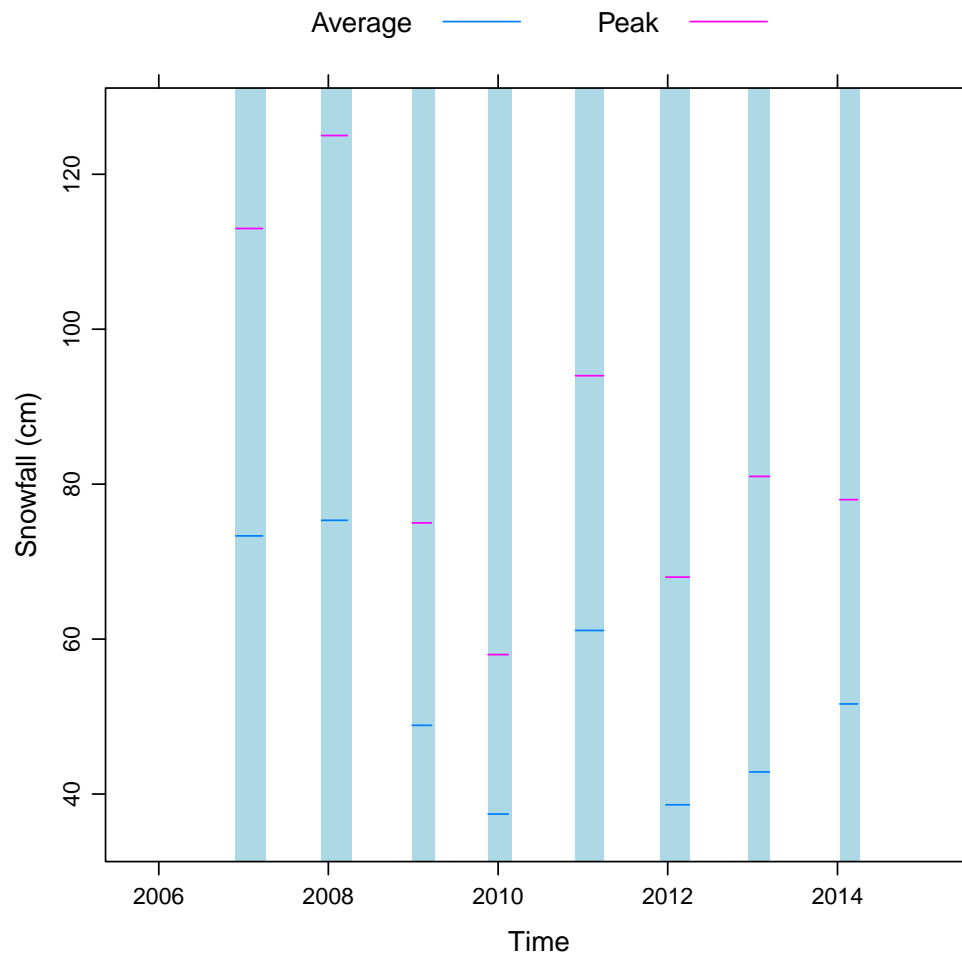
By averaging the different annual time series, we determined a typical length of a winter season in Whistler. This was done in two ways. First, we classified winter as the period when the snow present on the ground is above a given threshold. Second, we classified winter as the period when temperature stays below a given threshold. This contrasts the typical definition of winter as the period from December 21 to March 21.

These two approaches produced similar results. Under each approach, we found that the 2009–2010 winter was less severe than other winters and that the 2013–2014 winter was shorter than other winters. We also found that the amount of snowfall is correlated with how cold the winter is.

Winter criteria	Start	Peak	End	Length	Average snowfall	Peak snowfall
Snow threshold > 15 cm	12-07	02-12	03-29	112	54	86
Temperature < 0°C						

## Data and Methods

## Exploratory Data Analysis



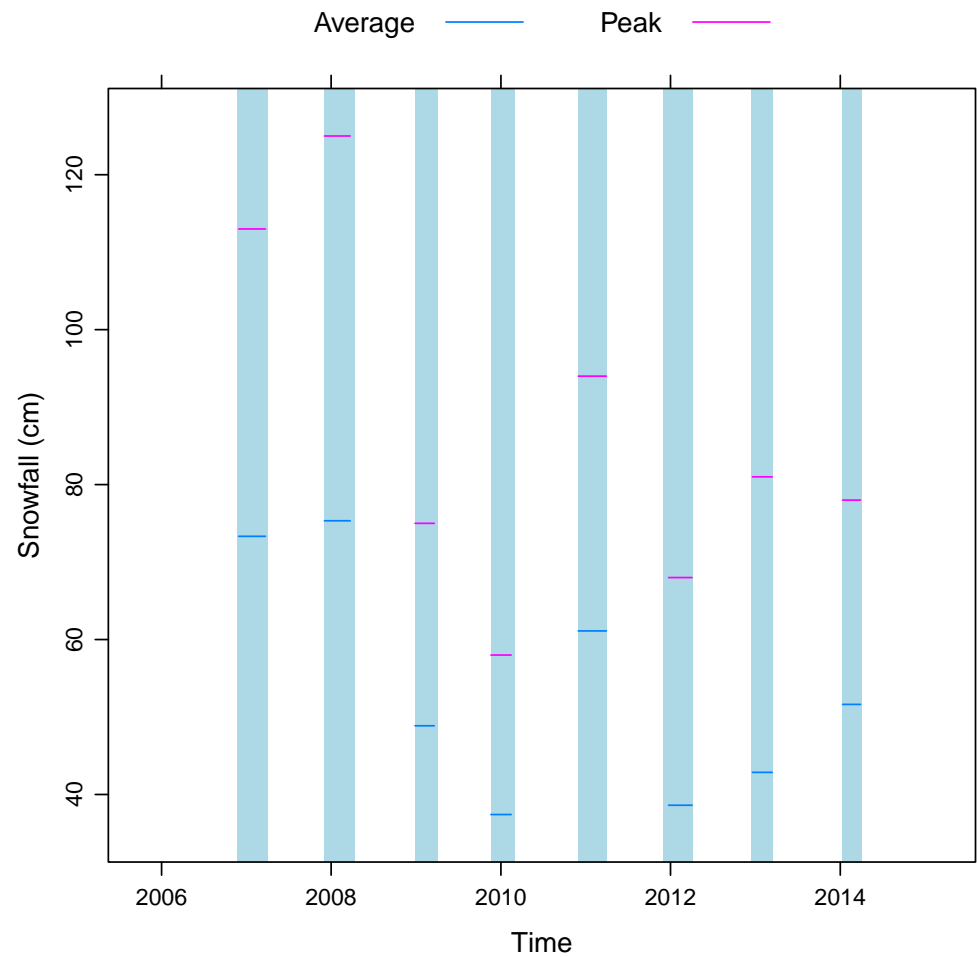
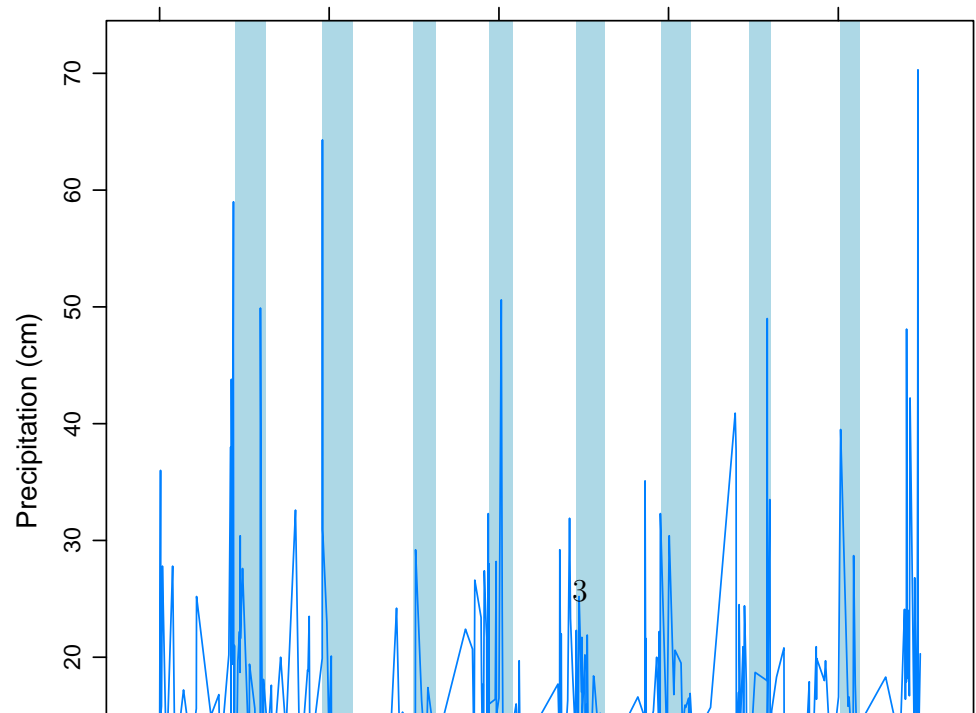
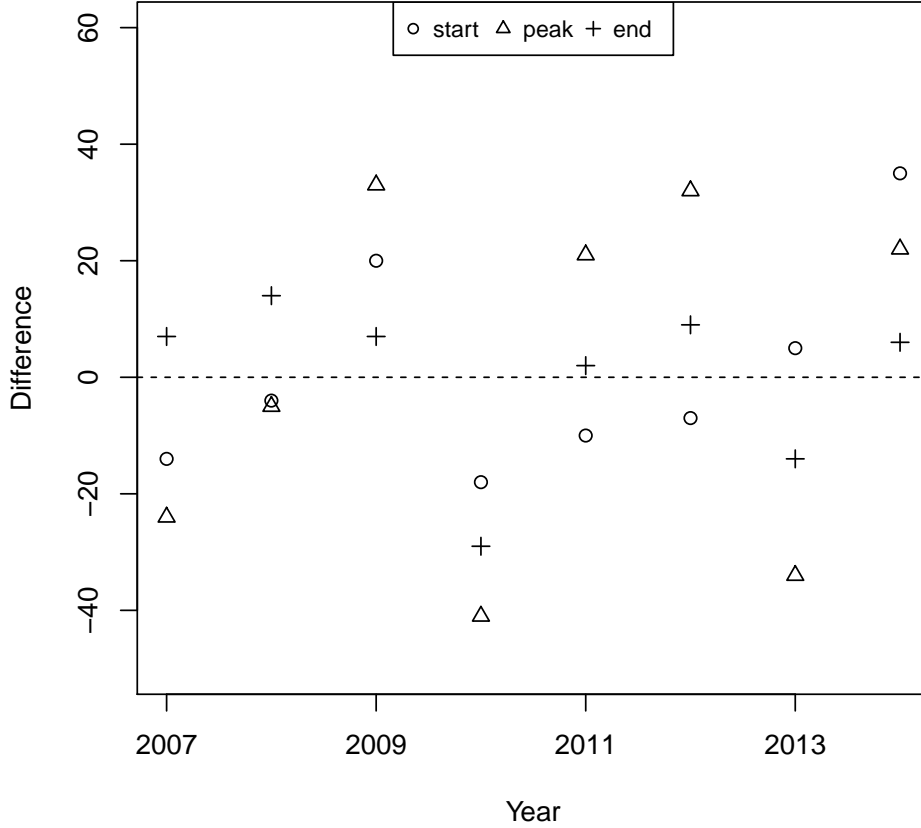


Figure 1: Winter seasons and average snow fall for Whistler



Start	End	Peak	Peak (cm)	Average (cm)	Length (days)
2006-11-23	2007-04-05	2007-01-19	113	73.33	133
2007-12-03	2008-04-12	2008-02-07	125	75.33	131
2008-12-27	2009-04-05	2009-03-17	75	48.87	99
2009-11-19	2010-02-28	2010-01-02	58	37.41	101
2010-11-27	2011-03-31	2011-03-05	94	61.11	124
2011-11-30	2012-04-07	2012-03-15	68	38.61	129
2012-12-12	2013-03-15	2013-01-09	81	42.86	93
2014-01-11	2014-04-04	2014-03-06	78	51.63	83

 Table 1: Periods when there was  $\geq 20$  cm of snow on ground in Whistler


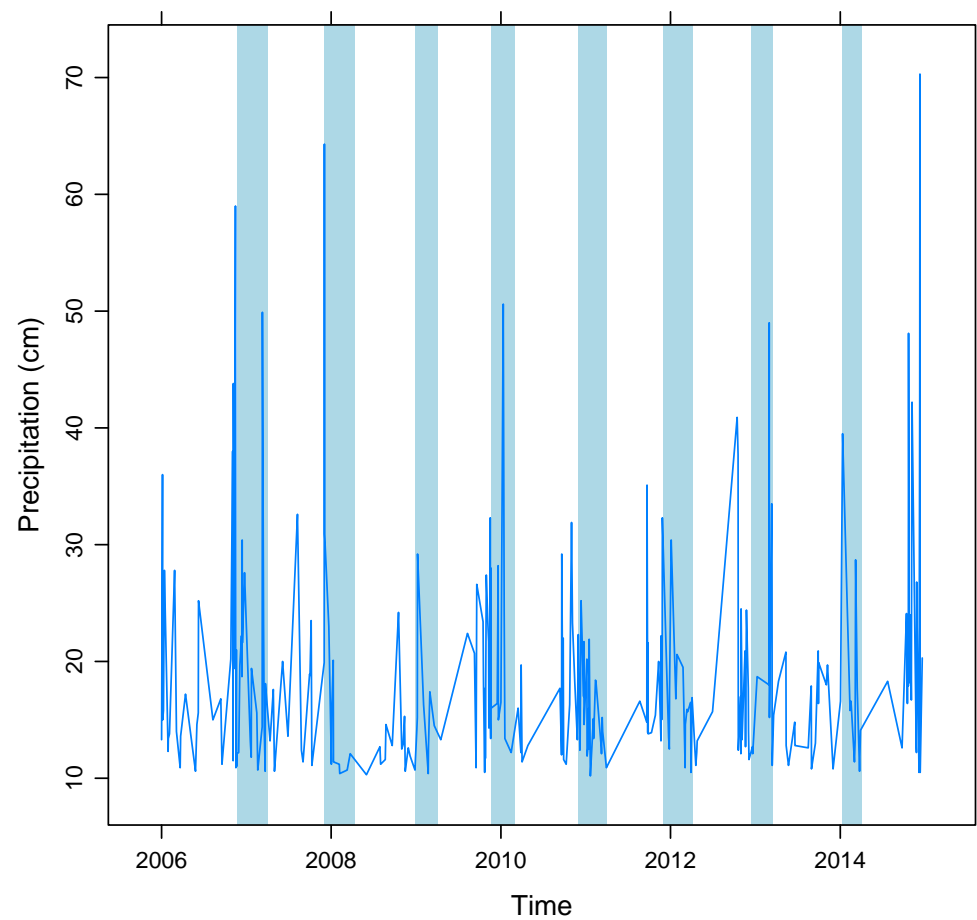
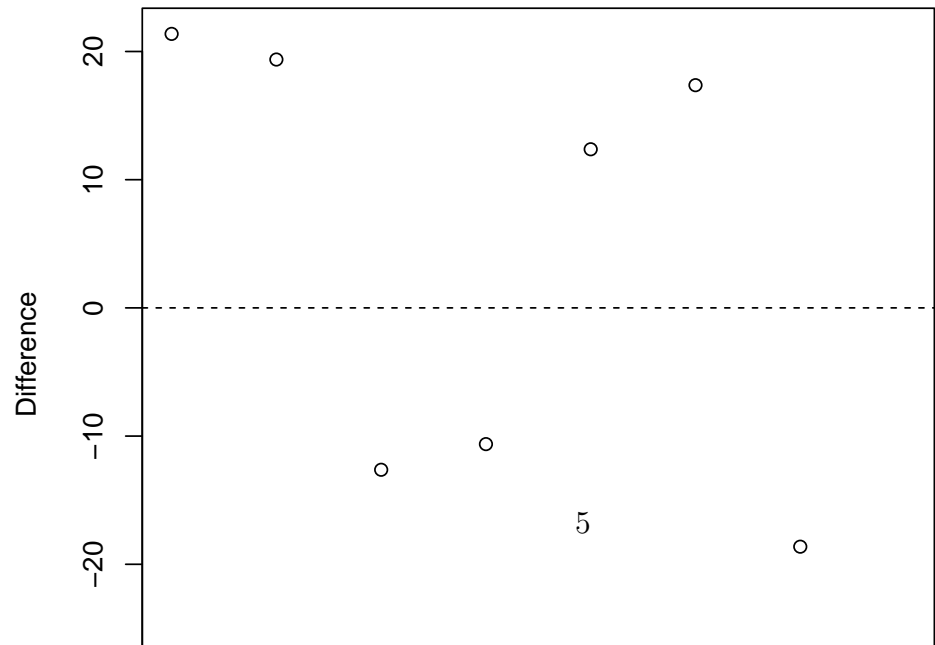


Figure 2: Winter seasons and average snow fall for Whistler



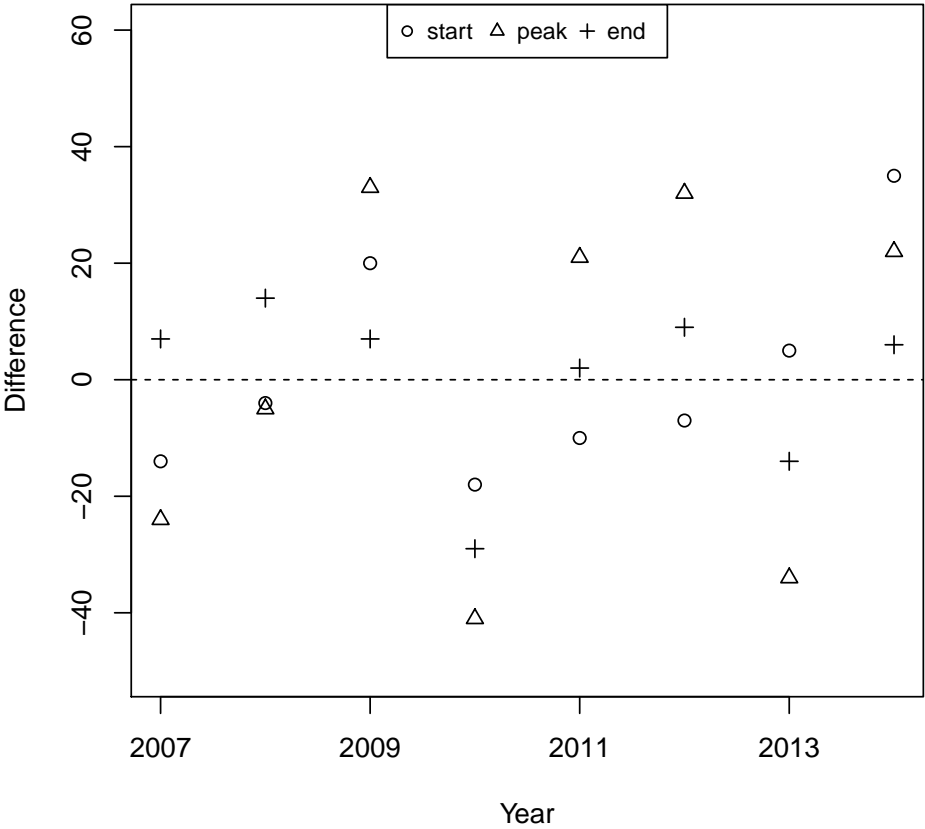


Figure 3: Winter seasons and average snow fall for Whistler

-1	0	32	33	35	37	39	41	43	44	46	50	52	57
502	2629	76	29	15	9	10	3	2	3	3	1	2	1

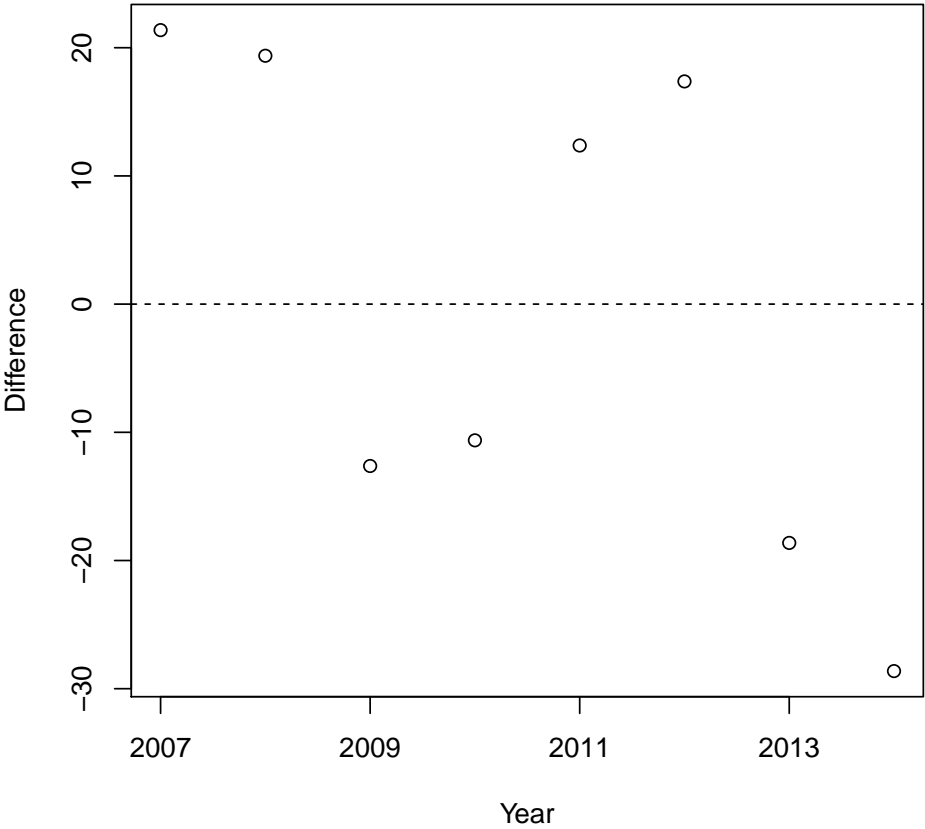
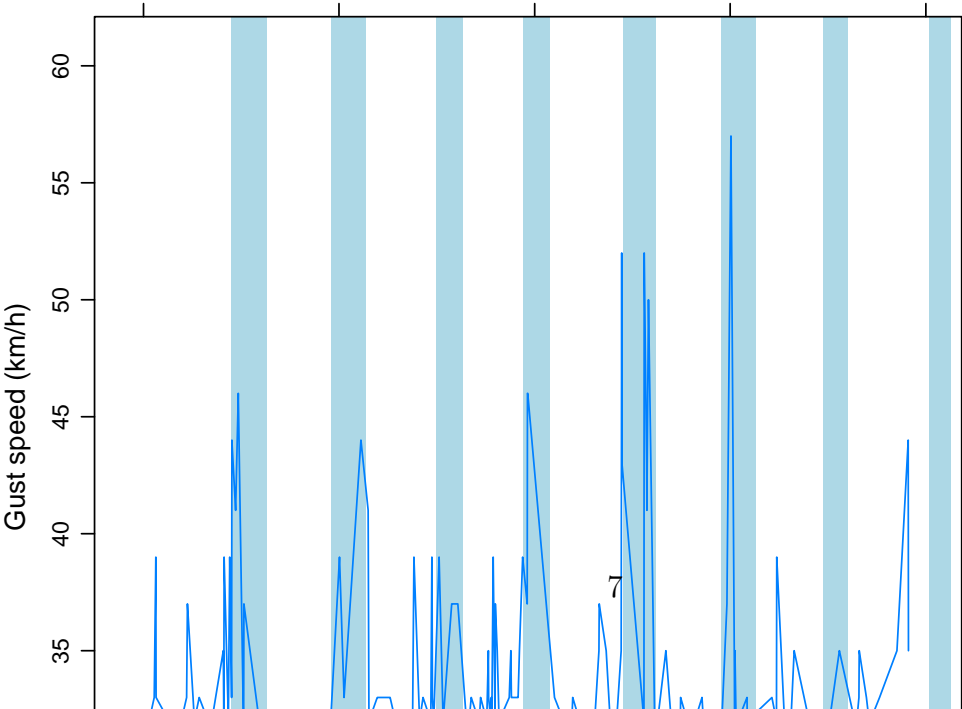
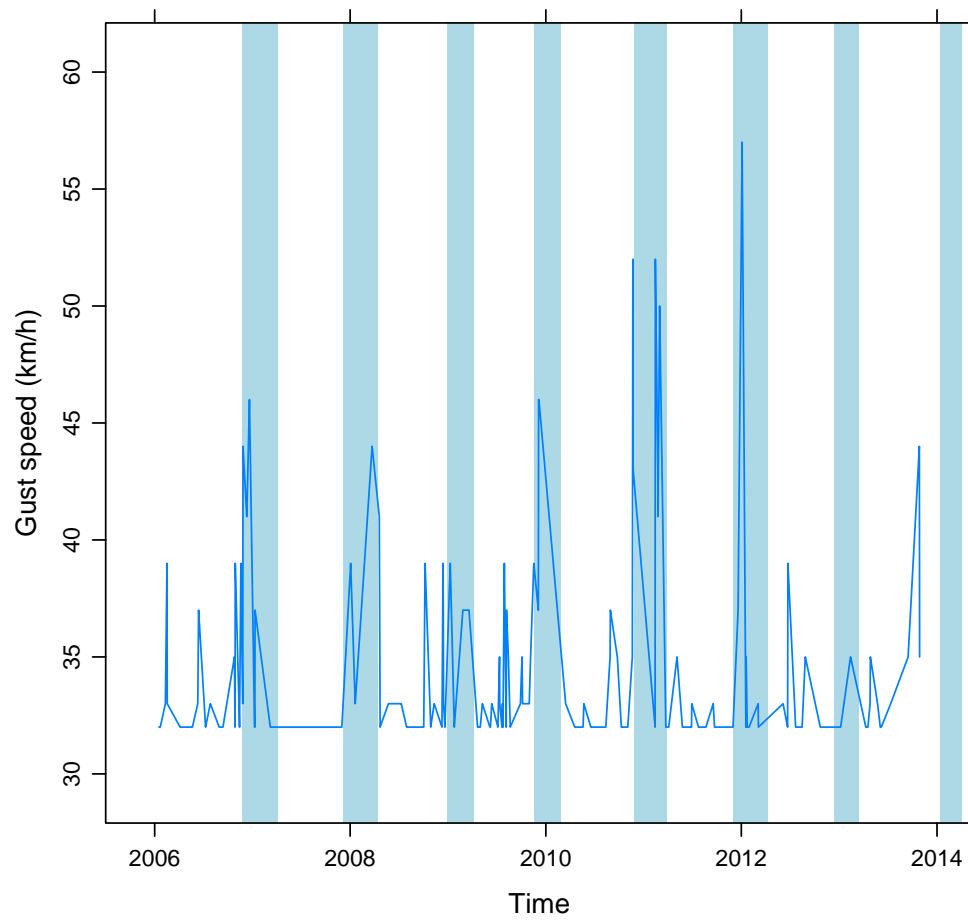


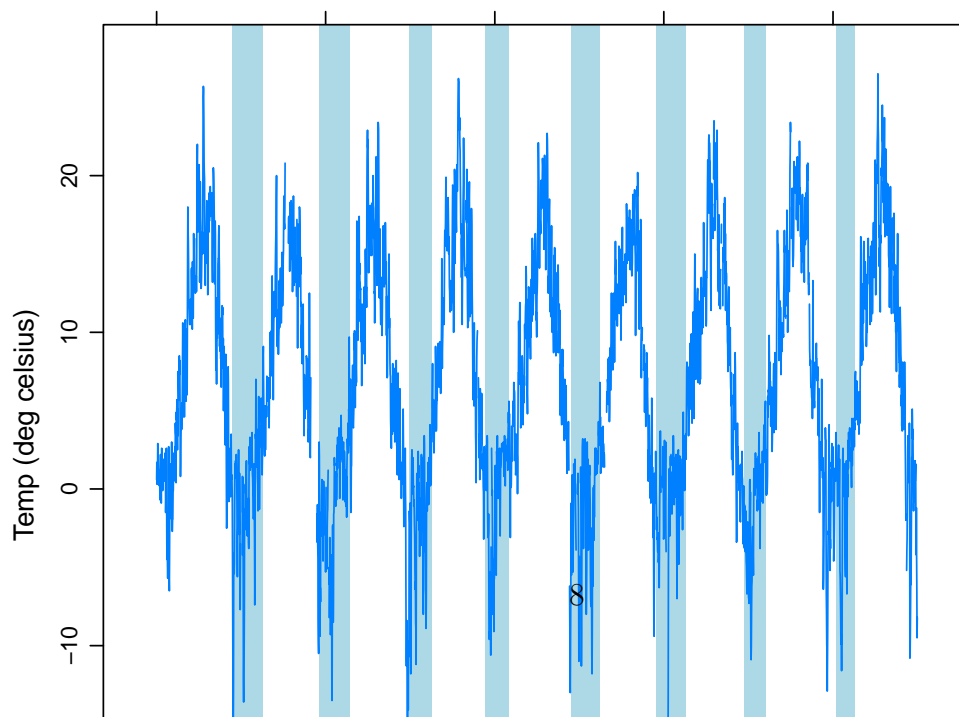
Figure 4: Winter seasons and average snow fall for Whistler





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Figure 5: Winter seasons and average snow fall for Whistler





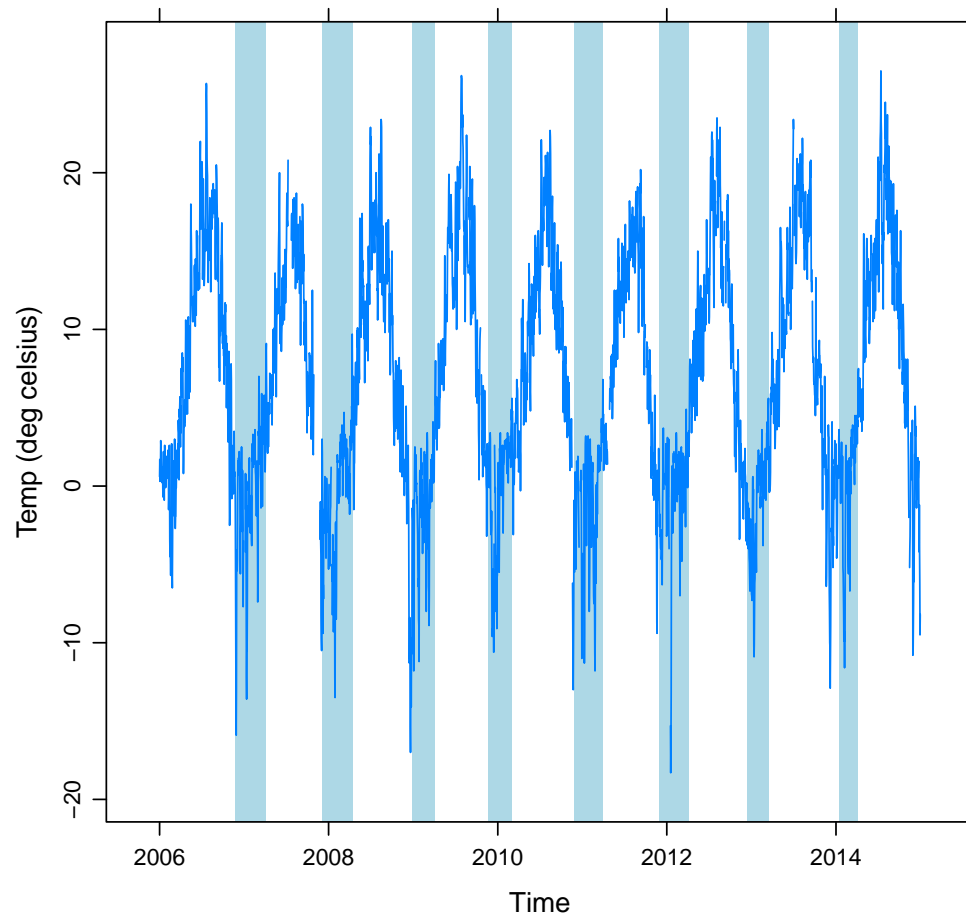


Figure 6: Winter seasons and average snow fall for Whistler