# Analysis of whistler weather data

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# Introduction

- Time series data from 2006 – 2014, Whistler (BC)
- Objectives
  1. Determine start, peak and end of winter season
  2. Determine how much snow is present at different points in year
  3. Determine trends and odd behaviors in data

# Data

- Elevation: 650m
- Precipitation and wind not used
- 2009–2010 had low snowfall (Olympics)

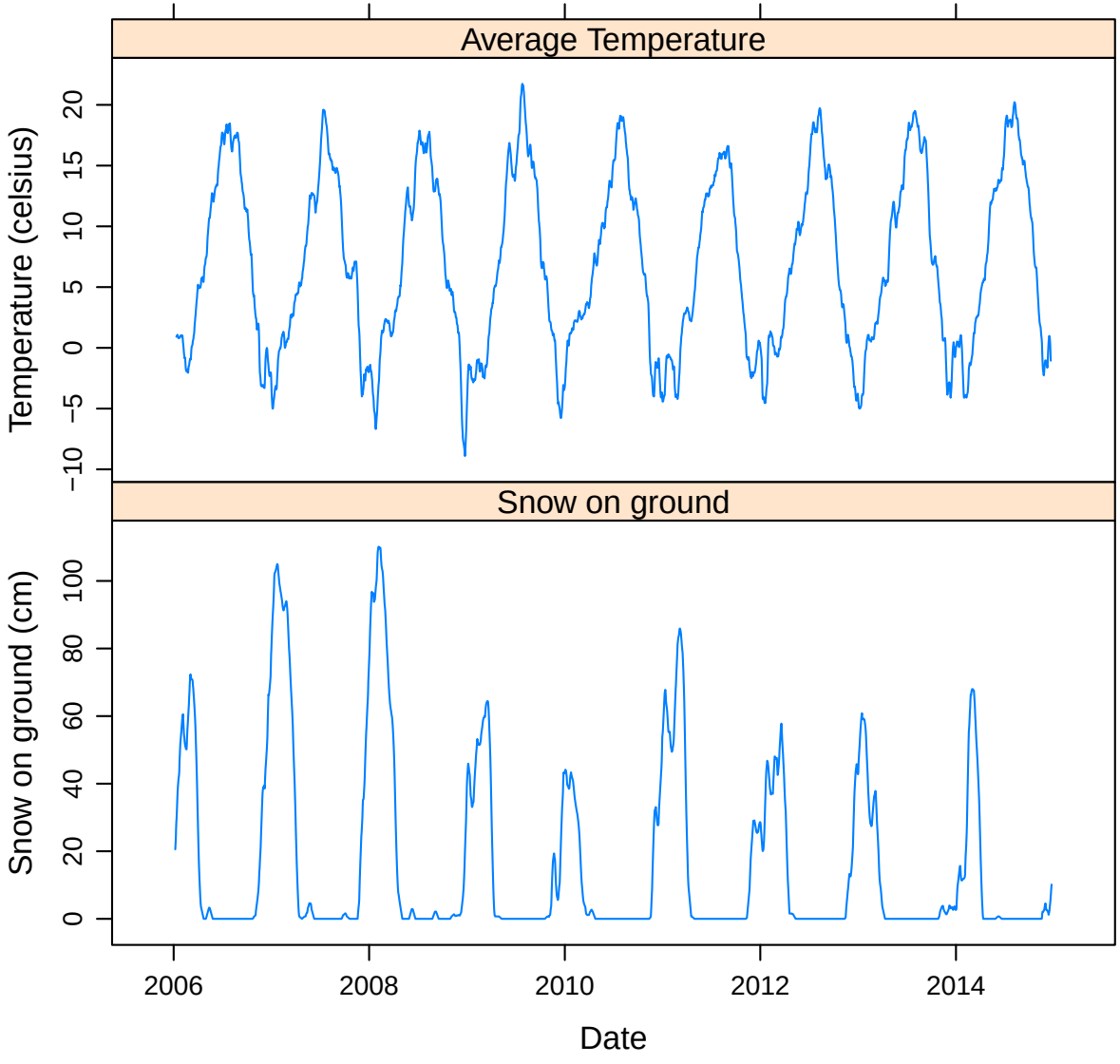


Figure: Whistler weather data from 2006–2014

# Methods

- Statistical techniques
  1. Regression: used to determine if there is trend in snowfall data
  2. Time series techniques: used to compare different winter seasons
  3. Correlation: used to examine relationship between temperature and snowfall
- Winter was characterized as period when snowfall was greater than 15 cm
- One week moving average used to negate fluctuations

# Snowfall trend

- $p$-value $< 0.001$
- Using trend for projection wouldn't be accurate (recent upward trend in peak snowfall)
- Temperature trend is not as noticeable

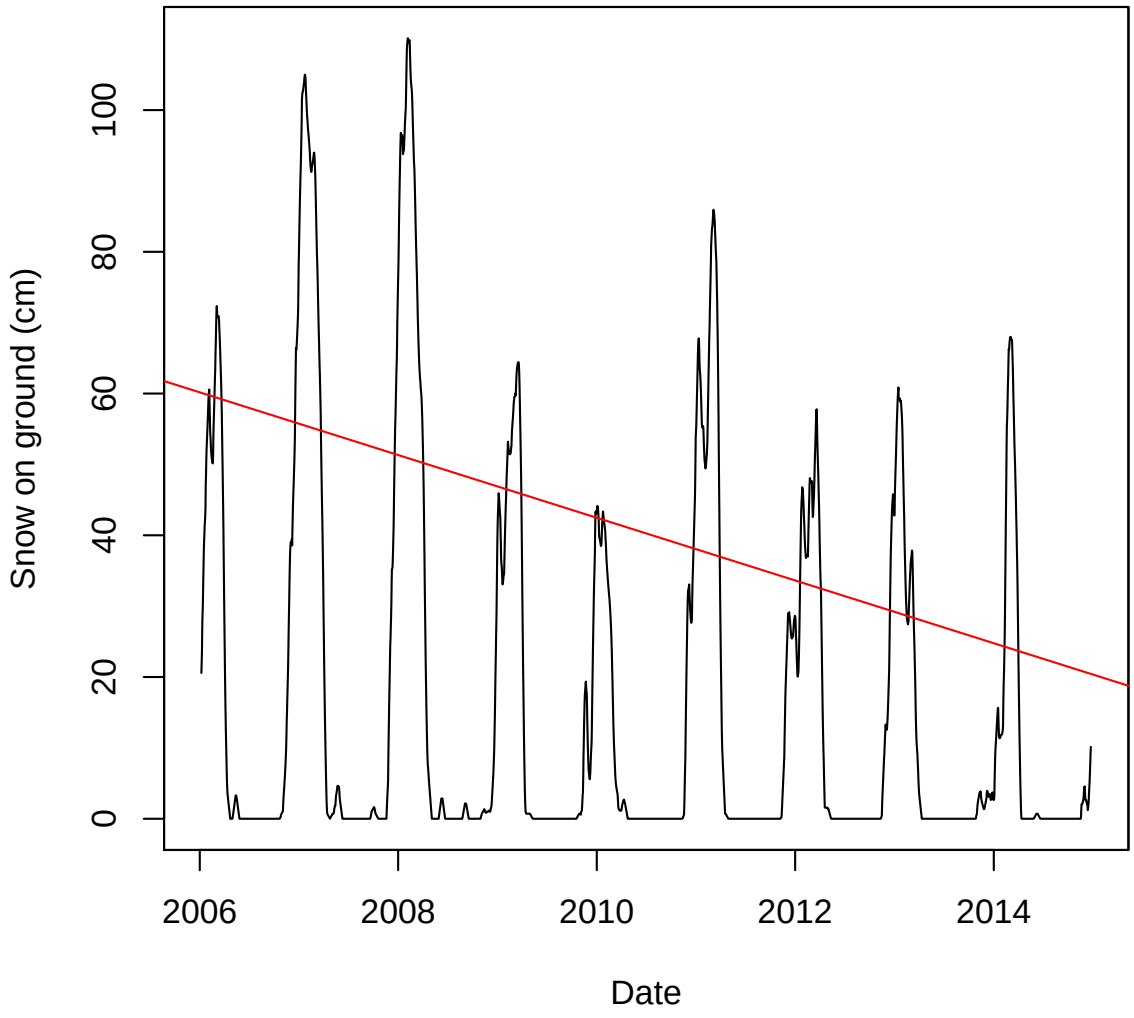


Figure: Downwards trend of 4.42 cm per year

# Average smoothing

- Period shown in July 1 – June 30
- Can get snow any month other than July, August
- Sometimes no snow until December and all gone by mid–April

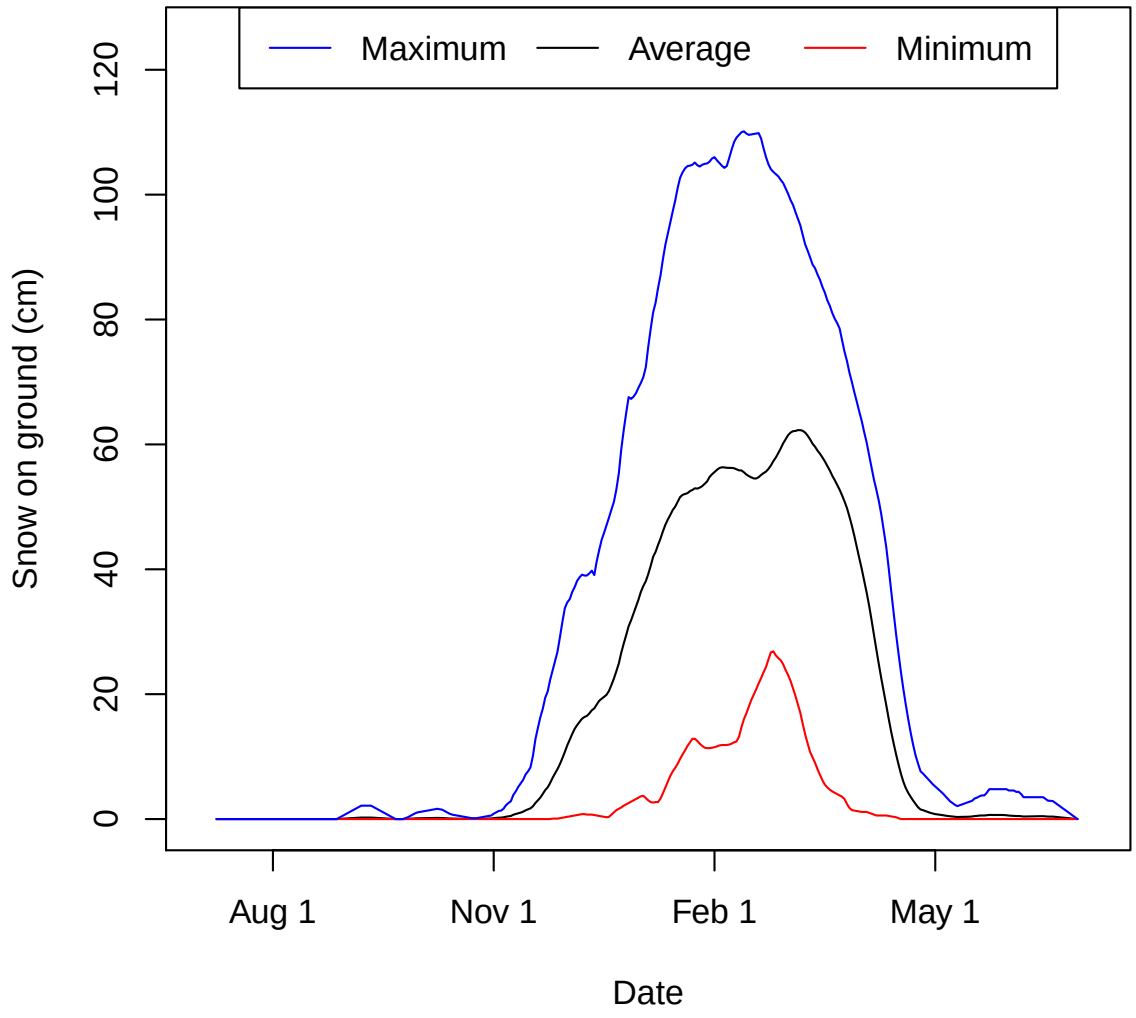


Figure: Amount of snow present at each day during the year

# Length of winter

- 2009–2010 ended earliest and 2013–2014 started latest

| Winter | Start Date | End Date | Length | Peak Date |
|---|---|---|---|---|
| 2006–2007 | Nov 18 | Apr 4 | 137 days | Jan 19 |
| 2007–2008 | Nov 27 | Apr 11 | 135 days | Feb 7 |
| 2008–2009 | Dec 22 | Apr 4 | 103 days | Mar 17 |
| 2009–2010 | Nov 14 | Feb 7 | 85 days | Jan 2 |
| 2010–2011 | Nov 24 | Apr 1 | 128 days | Mar 5 |
| 2011–2012 | Nov 24 | Apr 9 | 136 days | Mar 15 |
| 2012–2013 | Dec 7 | Mar 16 | 99 days | Jan 9 |
| 2013–2014 | Jan 7 | Apr 4 | 87 days | Mar 6 |
| Average | Dec 3 | Mar 26 | 114 days | Feb 12 |

Table: Dates of winter seasons based of a threshold of 15 cm of snow

# Severity of winter

- Bars represent average amount of snow over winter season
- 2009–2010 winter had the least average snow and peak snow

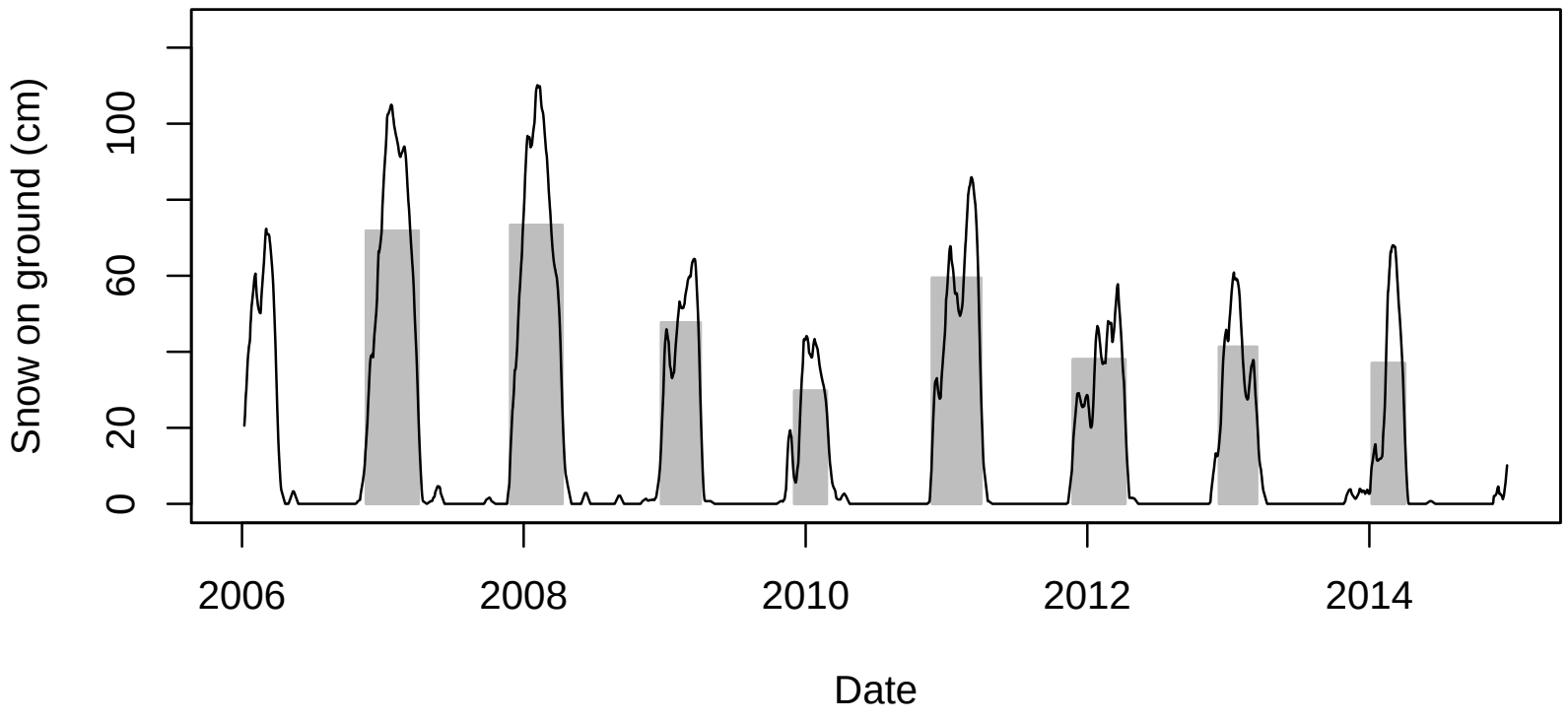


Figure: Amount of snow present at each day during the year

# Correlation

- Average snow and temperature have correlation of –0.15
- Peak and average snow have correlation of 0.96

| Winter | Peak snow | Average snow | Average temperature |
|---|---|---|---|
| 2006–2007 | 113 cm | 72 cm | -0.56 °c |
| 2007–2008 | 125 cm | 73 cm | -1.23 °c |
| 2008–2009 | 75 cm | 48 cm | -1.80 °c |
| 2009–2010 | 58 cm | 30 cm | -1.17 °c |
| 2010–2011 | 94 cm | 59 cm | -1.31 °c |
| 2011–2012 | 68 cm | 38 cm | -0.37 °c |
| 2012–2013 | 81 cm | 41 cm | -1.26 °c |
| 2013–2014 | 78 cm | 37 cm | -0.17 °c |
| Average | 86 cm | 50 cm | -0.98 °c |

Table: Snow and temperature measurements for winter seasons

# Conclusion

- Winter season starts Dec 3, ends Mar 26
- Average snow present is 50 cm
- Snowfall trending downwards at 4.42 cm per year
- 2009–2010 was least severe winter
- Limitations
  - No projections
  - Didn't account for wind, precipitation