Analysis of whistler weather data

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Stat 300 Project, Fall 2015

December 2, 2015

Outline

Background

Methods and Results
- Trend
- Average smoothing
- Length of winter
- Severity of winter

Conclusion

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

Background

- Whistler Blackcomb
  - Dependent on snow
- Data
  - Elevation: 650m
  - Precipitation and wind not used

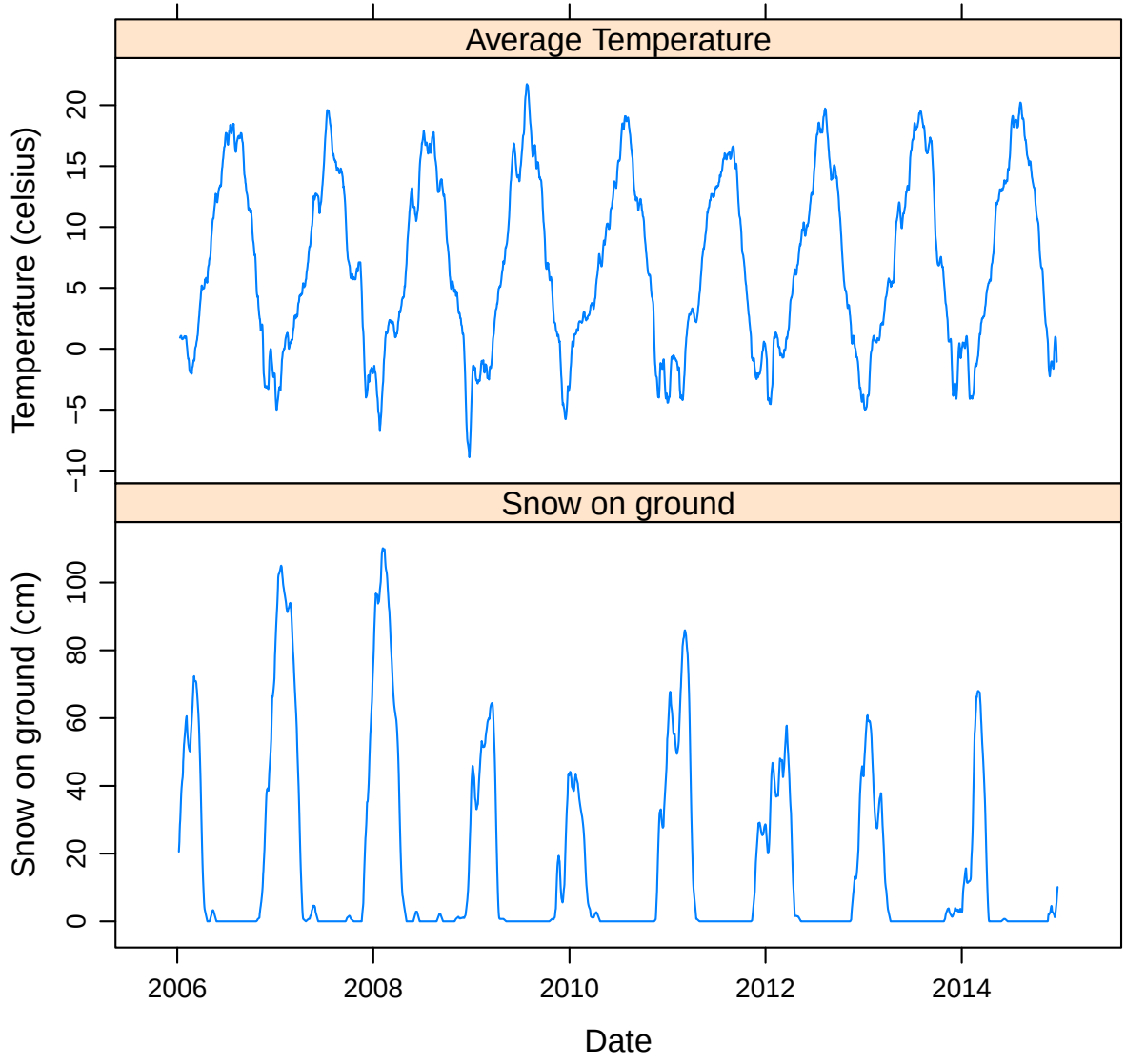

Figure: Whistler temperature and snowfall from 2006–2014

Methods

- Exploratory
- Statistical techniques
  1. Regression: trend
  2. Time series techniques: compare different winter seasons
  3. Correlation: relationship between temperature and snowfall
- Winter: period when one week moving average for snowfall was greater than 15 cm

Snowfall trend

- Linear regression
- p-value < 0.001
- Temperature trend is not as noticeable

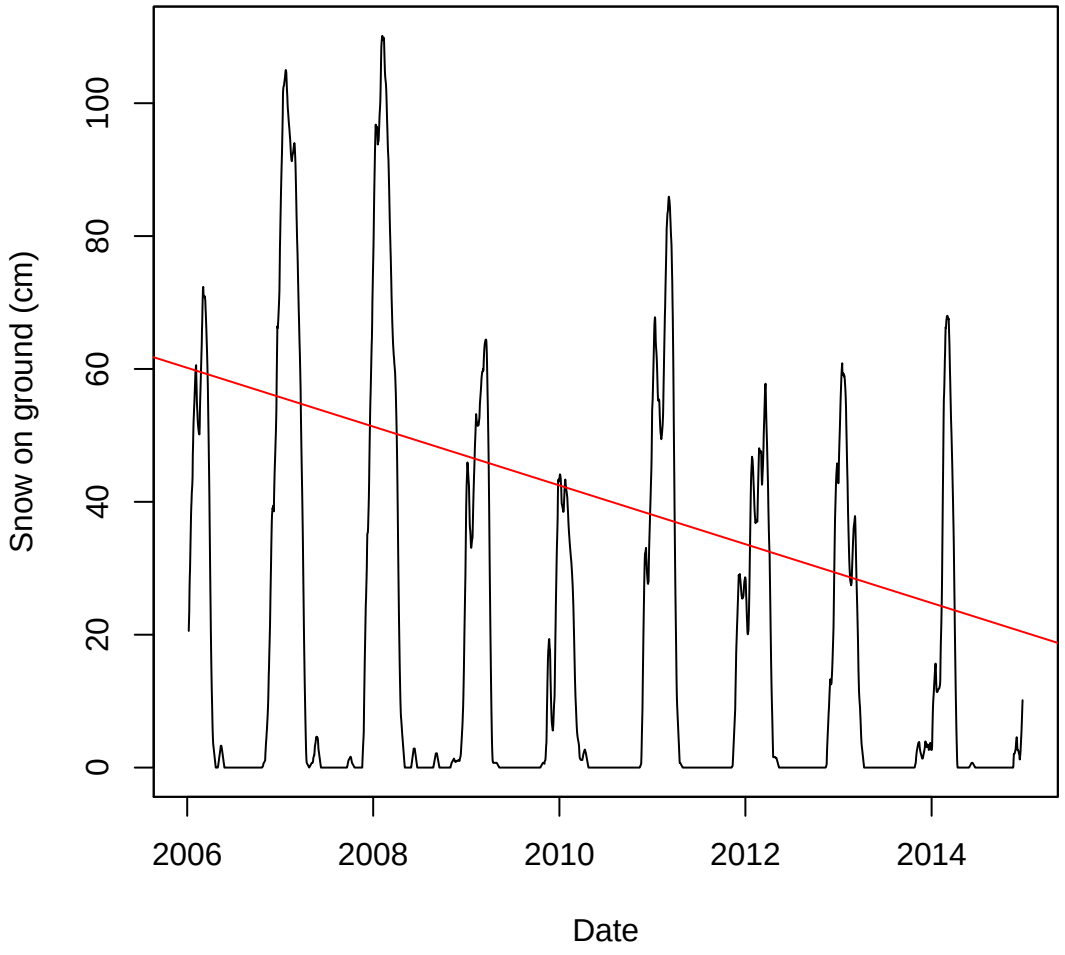

Figure: Downwards trend of 4.42 cm per year

Average smoothing

- Period shown is July 1 – June 30
- Maximum
  - Snow all months except July, August
- Minimum
  - Snow from December to mid–April

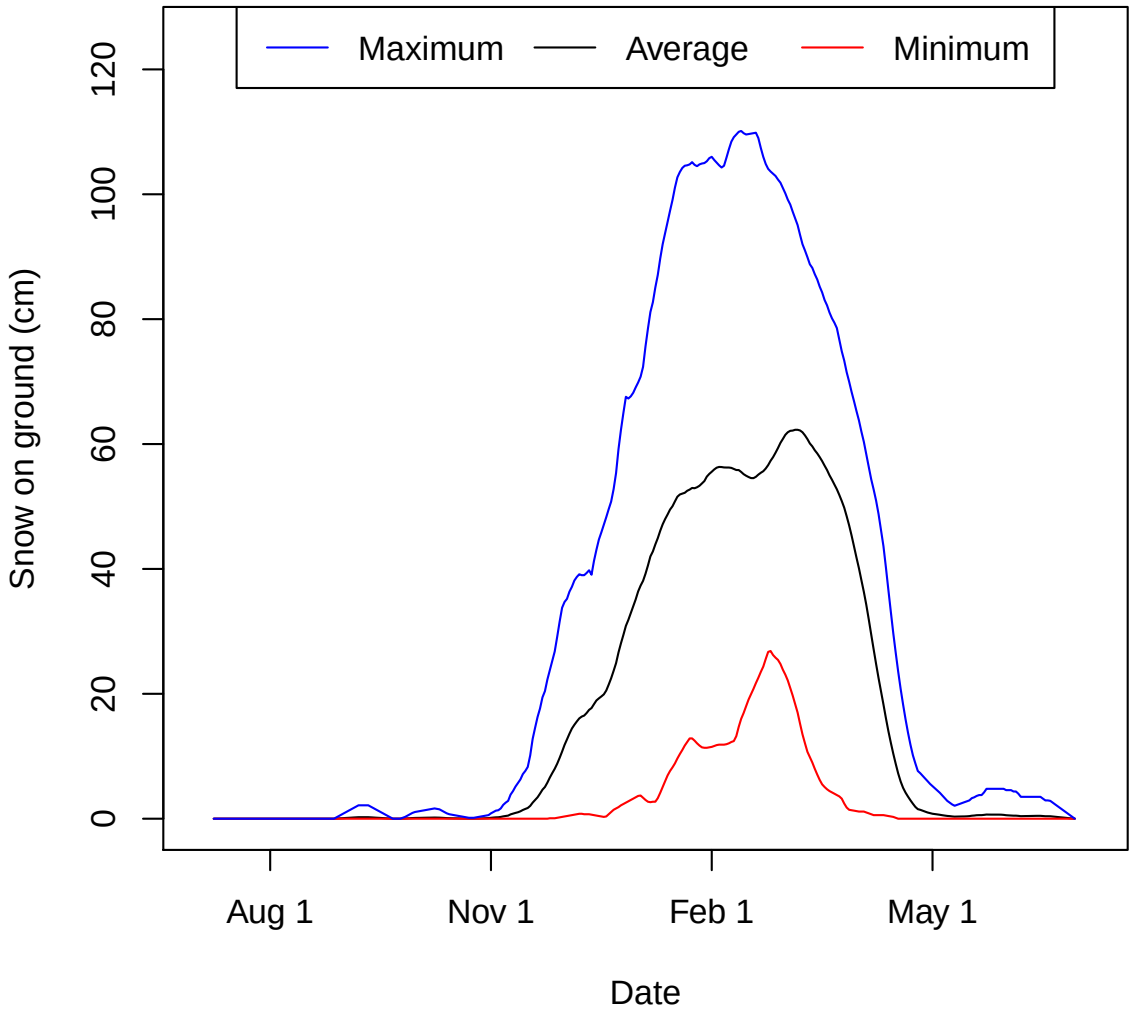

Figure: Amount of snow present at each day during the year

Length of winter

- Longest: 2006-2007
- Shortest: 2009–2010
- Earliest start: 2013–2014
- Earliest end: 2009–2010

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

- 2009–2010 winter was least severe
  - Peak snowfall: 58 cm
  - Average snowfall: 30 cm

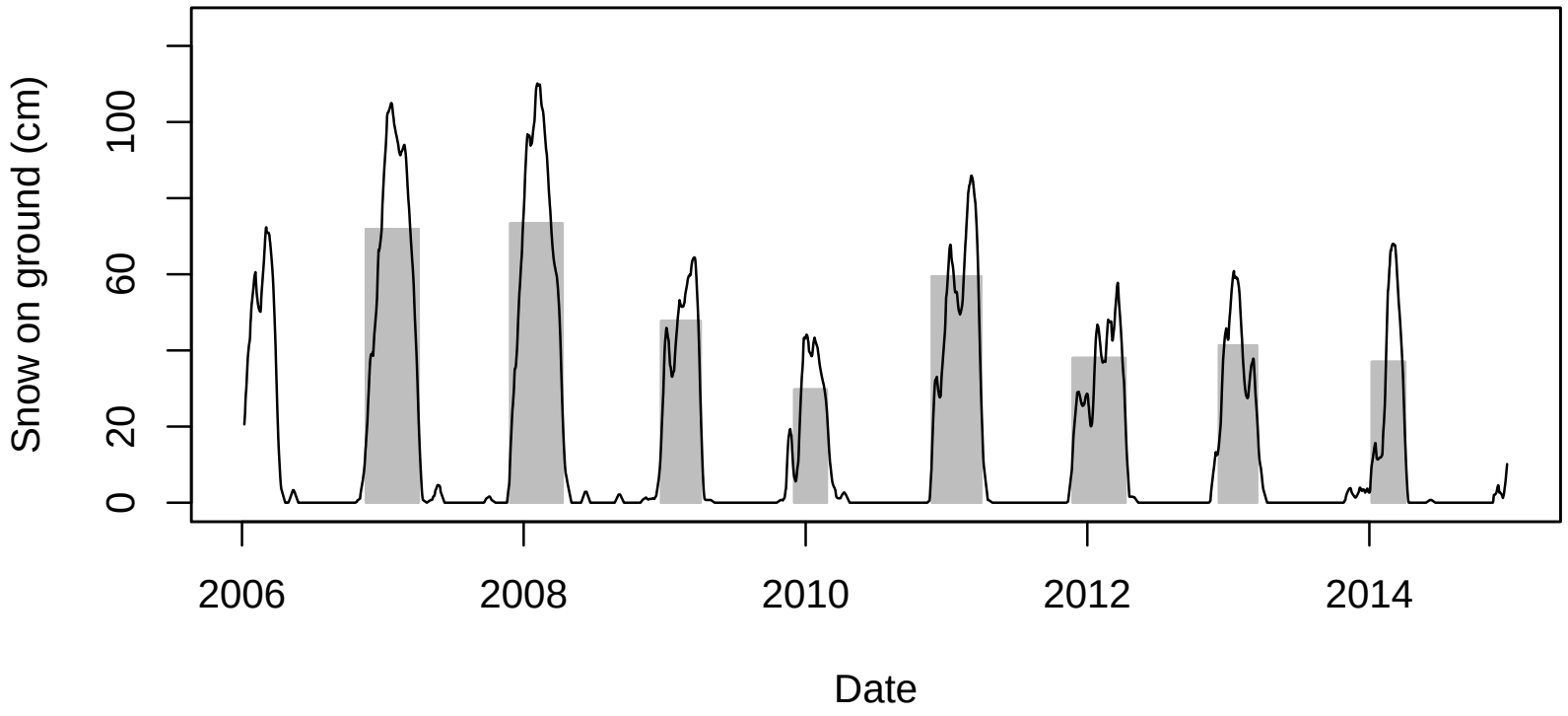

Figure: Average amount of snow over each winter season

Correlation

- Average snow and temperature: –0.15
- Peak and average snow: 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 downward trending
- 2009–2010 was least severe winter
- Limitations
  - No projections – predictive ARIMA model could be used
  - Didn't account for wind, precipitation