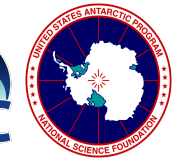




The Surface Climatology of the Ross Ice Shelf, Antarctica

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Abstract:

With approximately 30 years of observations, the Antarctic Automatic Weather Station (AWS) project has collected enough data for long-term climatology study of the Ross Ice Shelf. Fourteen stations, selected to represent the climatology in their surrounding areas, produce a fair coverage of the shelf with operational periods for each of the stations ranging from 5 to 30 years. Measurements of temperature, pressure, and wind are analyzed to determine maxima, minima, and average values for each parameter and each station across its operational period. Using 3 hourly quality controlled data, the analysis supports understanding of aspects of the Ross Ice Shelf such as the Ross Air Stream (RAS), barrier winds, and katabatic winds. This study demonstrates changes in instrumentation over the past 30 years, and the possibility of new AWS in the central Ross Ice Shelf.

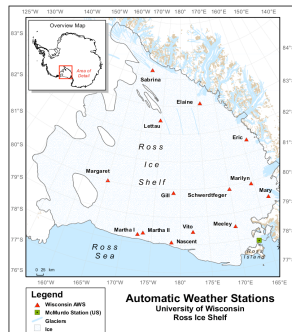


Figure 1 – 14 AWS stations with a zoomed in map of the Ross Ice Shelf

Station	Operational Period	Maximum Temperature (°C)	Minimum Temperature (°C)	Maximum Pressure (mb)	Minimum Pressure (mb)	Maximum Wind Speed (m/s)	Minimum Potential Temperature (K)
Elaine	1986-2013	3.6, Dec. 1995	-62.1, Aug. 2001	1038.8, Jun. 1999	928.4, Jul. 2007	33.2, Jul. 1988	211.1, Sep. 1998
Eric	2005-2013	4.8, Dec. 2009	-65.4, Sep. 2009	1023.3, Aug. 2011	928.8, Sep. 2010	28.7, Aug. 2011	254.8, Sep. 2011
Gill	1985-2013	8.8, Dec. 1987	-65.4, Aug. 2001	1034.4, Jun. 1999	922.8, Aug. 2007	25.9, Jun. 2007	299.3, May 2001
Lettau	1986-2011	4.9, Jan. 2005	-61.1, Aug. 2008	1027.4, Jan. 1999	927.3, Jul. 2007	31.8, Jun. 2007	218.4, Sep. 2009
Martha J	1984-1987	8.8, Dec. 1987	-59.4, Jul. 1984	1008.7, May 1986	937.5, Oct. 1985	22.4, May 1985	215.4, Aug. 1984
Martha II	1987-1992	8.5, Dec. 1989	-64.8, Aug. 1990	1017.9, May 1990	932.8, Aug. 1987	22.6, Aug. 1987	208.2, Aug. 1990
Marilyn	2009-2013	8.6, Nov. 2011	-65.9, Jul. 2010	1025.1, Aug. 2011	936.8, May. 2012	19.0, Jul. 2011	211.6, Aug. 2009
Marylyn	1984-2013	8.8, Dec. 2012	-58.6, Sep. 2009	1025.1, Jun. 1999	932.6, Jul. 1993	33.8, Jul. 1988	214.7, Sep. 2009
Mary	2005-2011	5.2, Dec. 2010	-58.6, Sep. 2009	1025.1, Jun. 1999	936.8, Jul. 2006	38.4, Aug. 2009	215.5, Sep. 2010
Meeley	1980-1985	2.7, Jan. 1982	-69.5, Jul. 1985	1025.8, Aug. 1981	942.5, Apr. 1984	29.1, Apr. 1981	218.2, Apr. 1981
Nascent	2004-2011	8.9, Jan. 2004	-64.8, Aug. 2009	1025.8, Jul. 2009	936.3, Aug. 2008	34.2, Aug. 2008	238.8, Nov. 2011
Sabrina	2009-2013	3.2, Jan. 2010	-57.8, Sep. 2009	1011.5, Jun. 2012	924.3, Sep. 2010	35.4, Jul. 2011	216.1, Sep. 2009
Schwertfeger	1985-2013	8.6, Dec. 1989	-63.1, Jul. 1985	1023.4, Jan. 1989	927.9, Sep. 1984	27.4, Jul. 2011	211.1, Jul. 2006
Vito	2004-2013	8.5, Dec. 2005	-66.6, Aug. 2008	1025.8, Jul. 2007	938.5, Aug. 2007	25.7, Jul. 2011	213.5, Sep. 2011

Table 1 - The operational period, maximum temperature, minimum temperature, maximum pressure, minimum pressure, maximum wind speed, and potential temperature for each AWS station given in month, year

1. Temperature

- Average -25.0 °C
- Maximum 8.8 °C at Gill on Dec. 15, 1987
- Minimum -69.5 °C at Meeley on Jul. 21, 1985
- 8th harmonic fit
- Annual trends

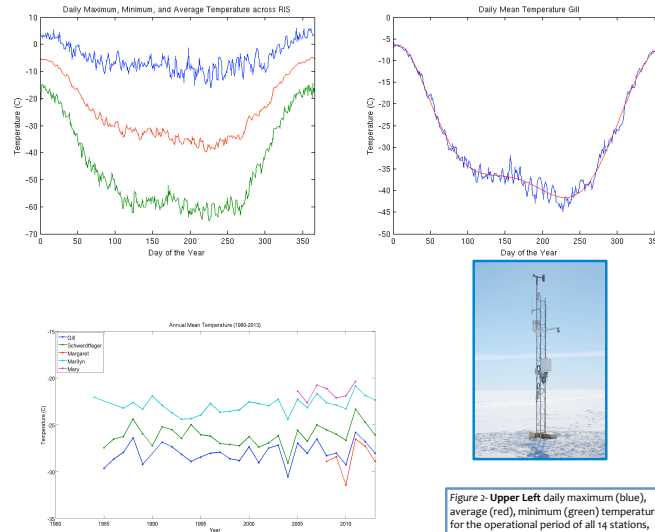


Figure 2 - Upper Left daily maximum (blue), average (red), minimum (green) temperature for the operational period of all 14 stations, Upper Right daily mean temperature for Gill (blue) fit to the eighth harmonic (red), Lower Left annual mean temperature plotted for 5 stations, Lower Right photo of Gill AWS

2. Pressure

- Average 980.9mb
- Maximum 1032.2mb at Mary on Aug. 2, 2011
- Minimum 922.0mb at Gill on Aug. 13, 2007
- Annual trends

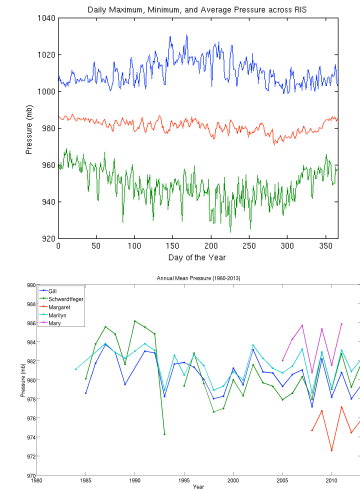
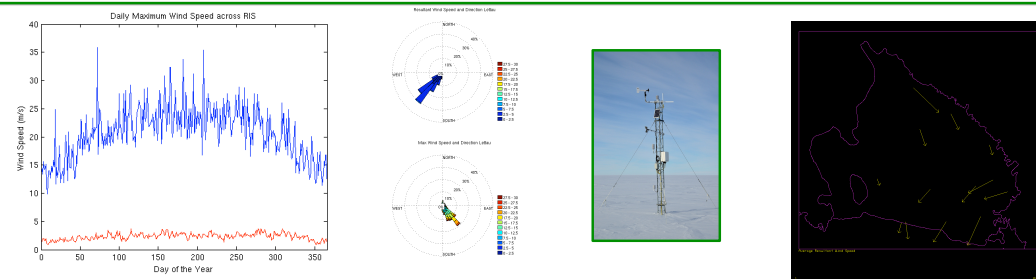


Figure 3 - Top daily maximum (blue), average (red), minimum (green) pressure for the operational period of all 14 stations, Bottom annual mean pressure plotted for 5 stations

3. Wind Speed

- Average resultant wind speed 2.28 m/s
- Maximum 35.4 m/s at Sabrina Jul. 27, 2011
- Differences in wind direction for maximum wind and average resultant wind at some stations
- Depiction of the Ross Ice Shelf Air Stream using 13 stations across the RIS

Figure 3 - Left daily maximum (blue), and average resultant wind speed (red) for the operational period for all 14 stations except Nascent, Center Lettau average resultant wind speed above maximum wind speed using daily values, Right photo of Lettau AWS, Far Right average resultant wind speed and average resultant wind direction for wind vector map



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