

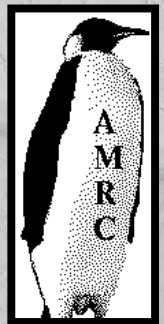
Fifty-year Amundsen-Scott South Pole Station Climatology: Quality Control and Analysis



Matthew A. Lazzara¹ and Linda M. Keller²
Antarctic Meteorological Research Center

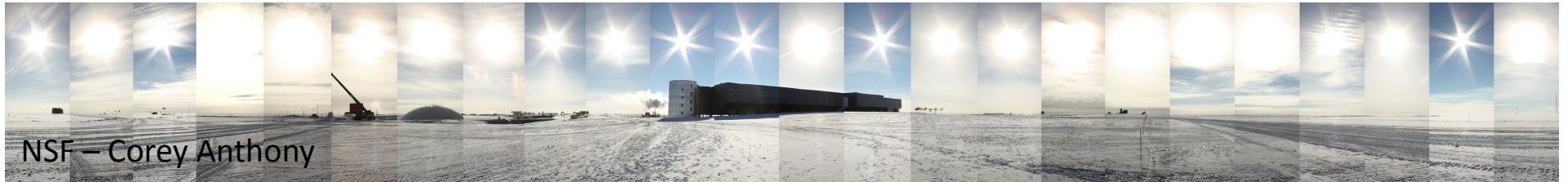
¹Space Science and Engineering Center

²Department of Atmospheric and Oceanic Sciences
University of Wisconsin-Madison



Outline

- Data set issues:
 - Quality Control
 - Issues with the data...
- Sample Analysis:
 - Initial results of temperature
- Outline Additional Analysis Underway...



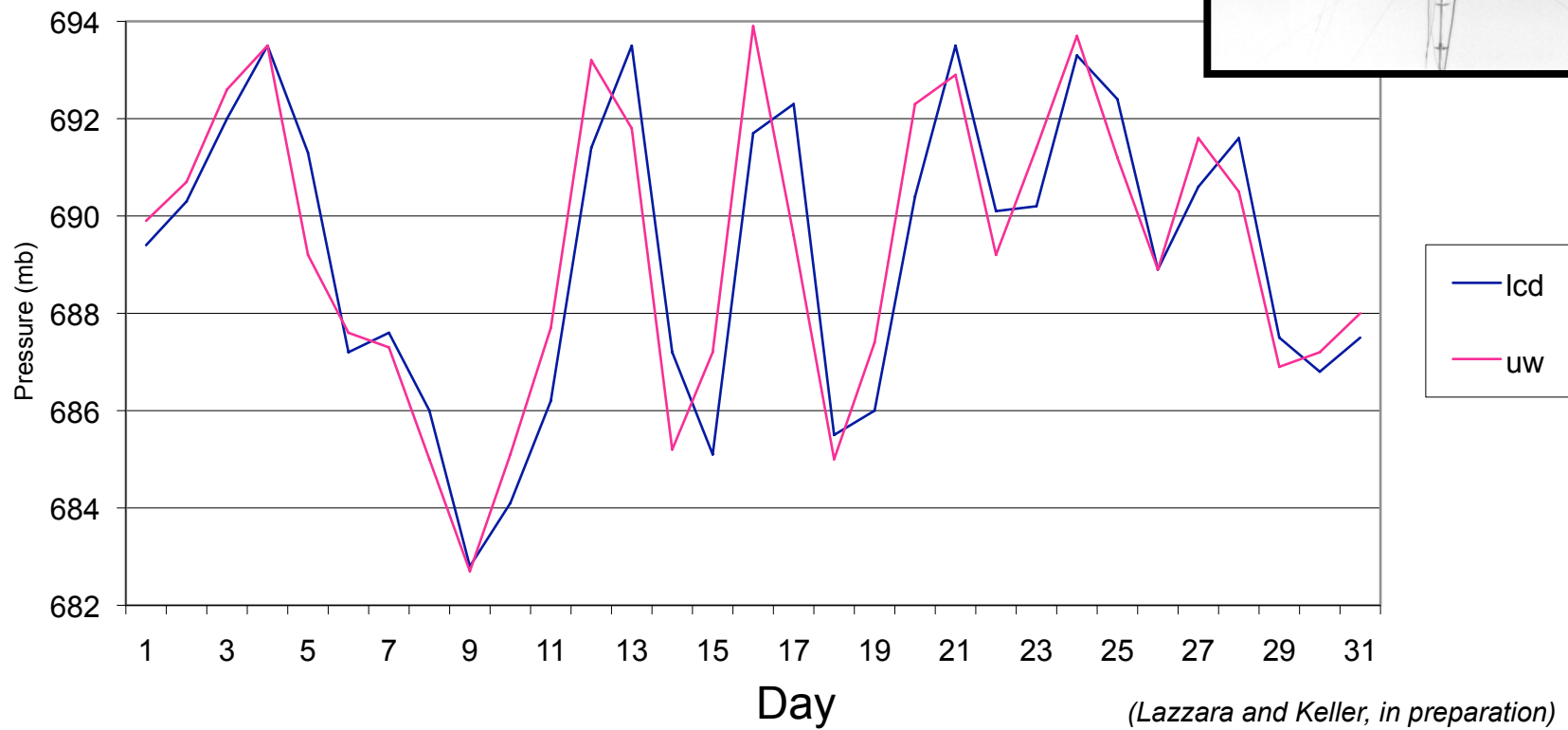
The Plethora of Problems...

- Time offset #1: Jan. 1, 1959-Dec. 9, 1968 –
 - ✓ When data converted to UTC was found to be 12 hours off.
 - ✓ Day went from 13Z previous day to 12Z (*see next slide*)
 - ✓ Normally 1 UTC to 0 UTC the next day
- Time offset #2: Dec. 10, 1968-Nov. 30, 1985 –
 - ✓ Observations taken in NZST, but converted to UTC
 - Additional observations added for 1985 up to Nov 5
- Pressure added for 1981-1983 (was missing....)
- Local Climatological Data (LCD) publication issues – recreated *several* times:
 - ✓ Re-calculate average daily temperature using all observations
 - ✓ Instead of (max+min)/2 method
 - ✓ Correct values to fix the time problem above
 - ✓ New LCDs for 1959-1985, 1990, 1994-1996
 - ✓ Fix multiple typos in temperature, pressure , & wind

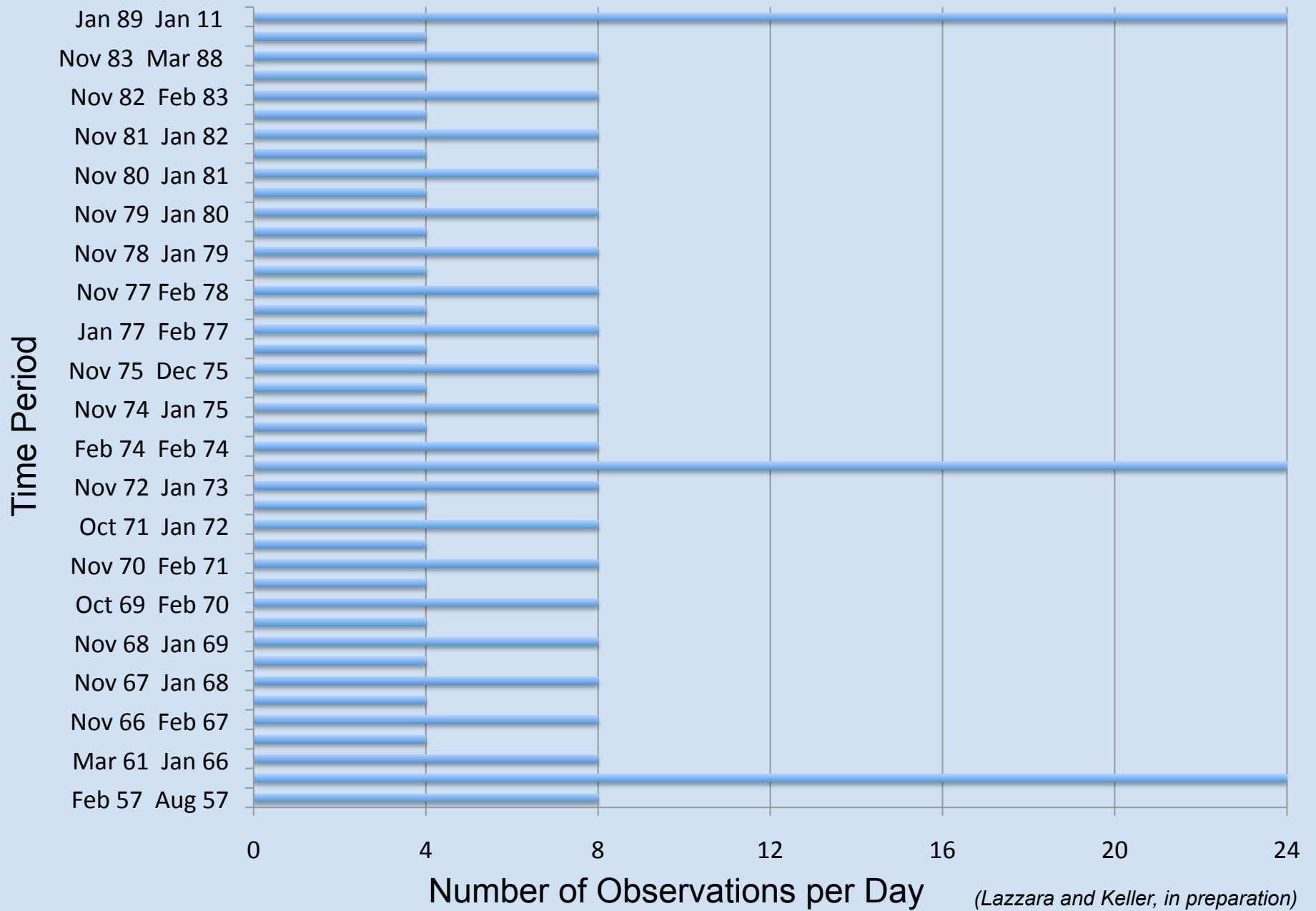
Time Problem: 12 hour Offset...



South Pole Jan 1968 Pressure



Variable Temporal Observing at South Pole



(Lazzara and Keller, in preparation)

History of South Pole Meteorology Office

Too many cooks in the kitchen?

First 20 years

- 1956:
 - IGY Field Team: Dr. Paul Siple
- 1957:
 - US Weather Bureau (Ed Flowers)
- 1975
 - New Zealand Weather Service
 - Directed by NSF and coordinated with NOAA
- 1978
 - Holmes and Narver
 - Take over with supervision from Navy Weather Section at McMurdo and Pt. Mugu, CA

Last 30 years

- 1980:
 - Support changes to ITT
- 1984
 - Training at Chanute AFB
- 1990:
 - Support changes to ASA
- 2000:
 - Support changes to RPSC
- 2012:
 - Support will change again – unknown who yet...

(Lazzara and Keller, in preparation)

Initial Analysis Results...

Temperature for the discussion today

- Basics
- Means
- Extremes
- Daily Temperature Range
- Reaching -100°F ...
- Winter from the point of view (POV) of an LC-130...

NSF – Nick Powell

Climatology Stats

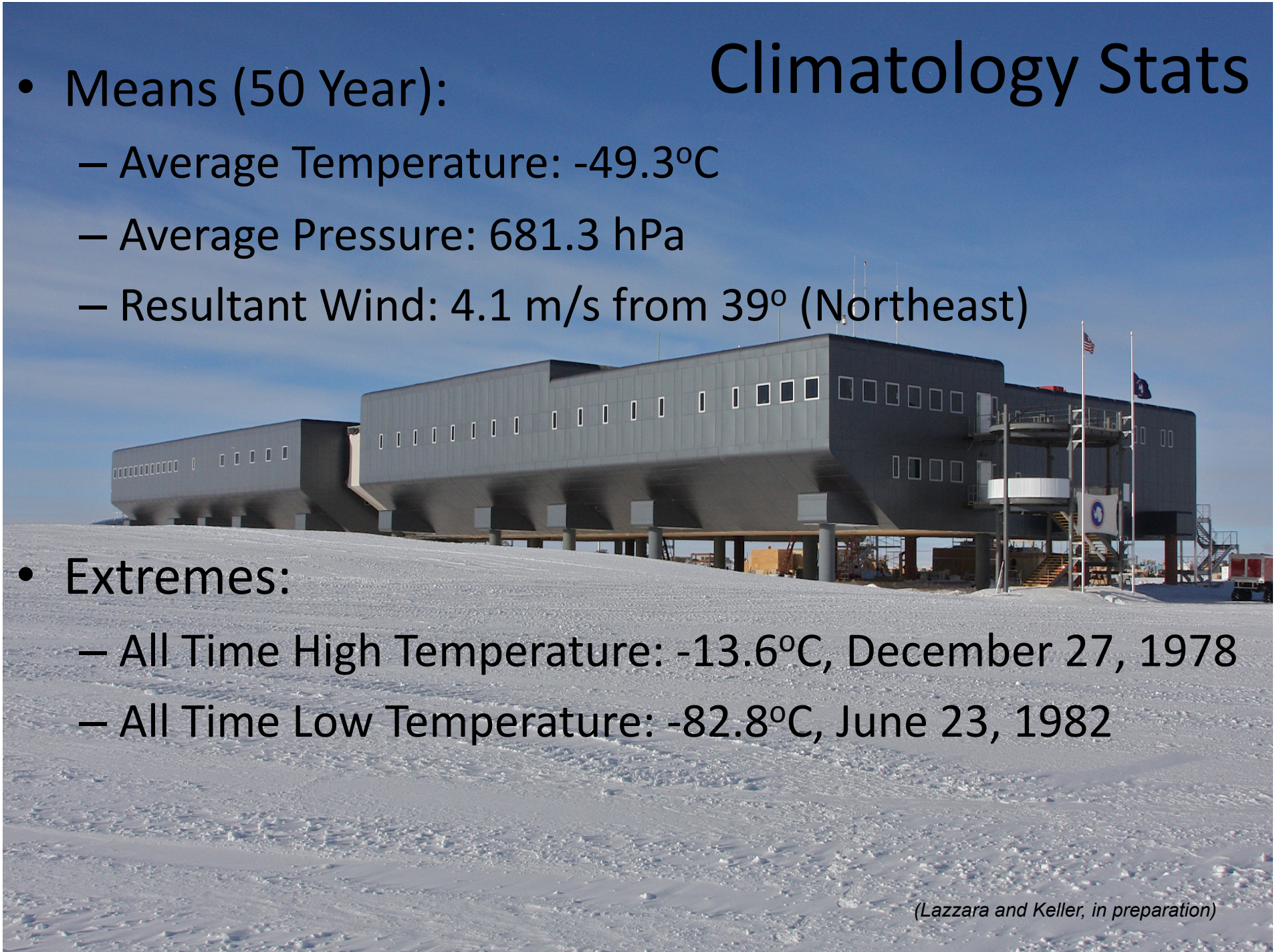
- Means (50 Year):

- Average Temperature: -49.3°C
- Average Pressure: 681.3 hPa
- Resultant Wind: 4.1 m/s from 39° (Northeast)

- Extremes:

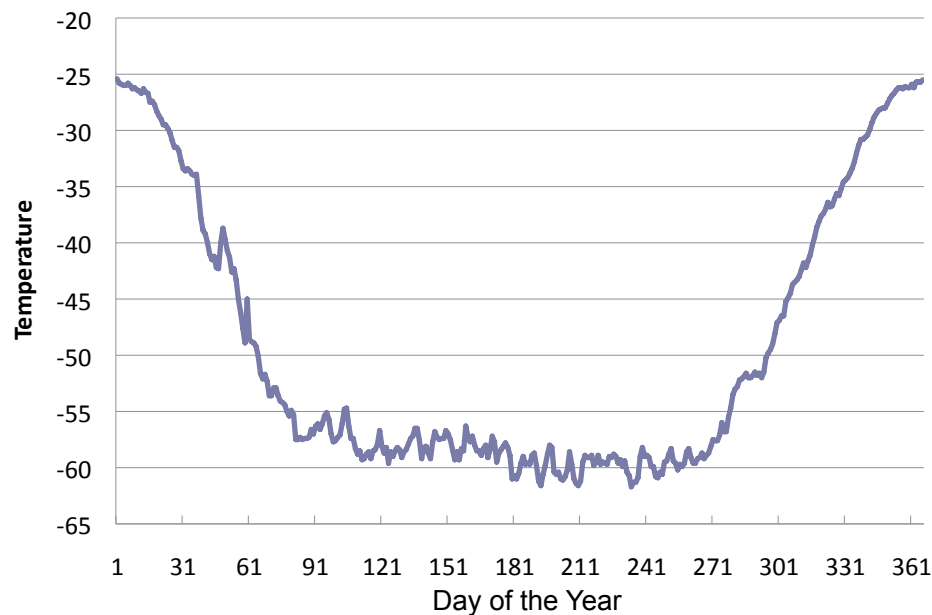
- All Time High Temperature: -13.6°C , December 27, 1978
- All Time Low Temperature: -82.8°C , June 23, 1982

(Lazzara and Keller, in preparation)

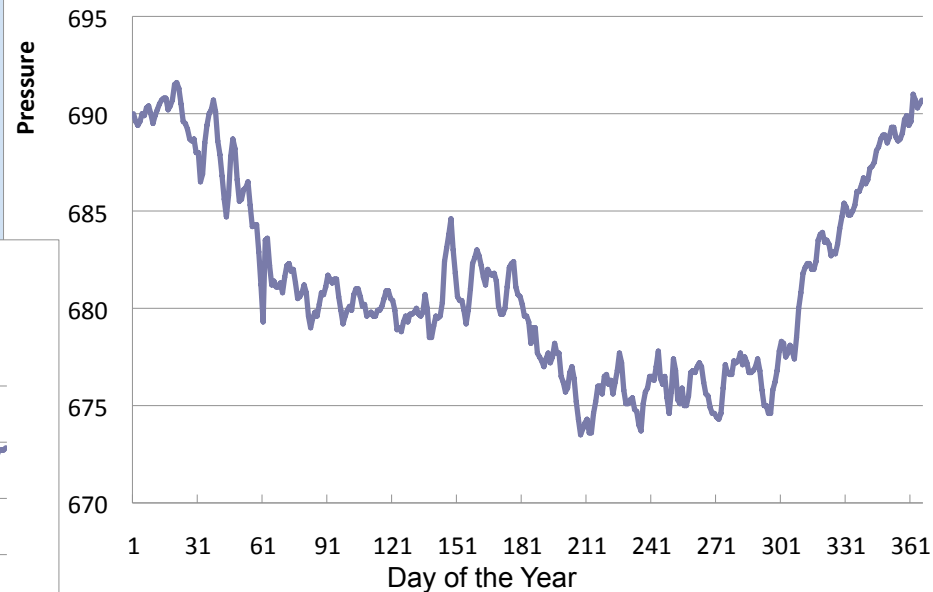


50 Year Daily Means...

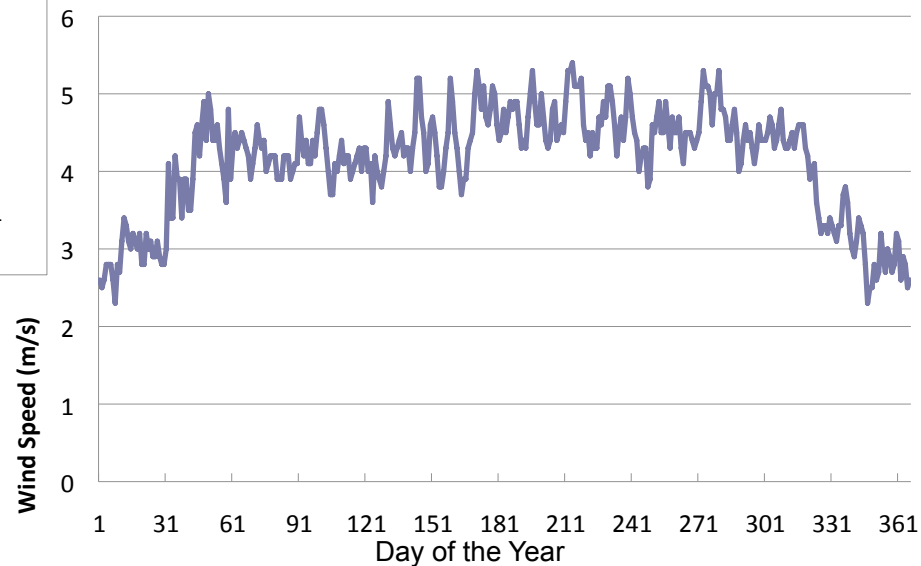
South Pole 50 Year Mean Daily Temperature



SP 50 yr Mean Daily Pressure



SP 50 yr Mean Daily Wind Speed



These are not smoothed...yet...

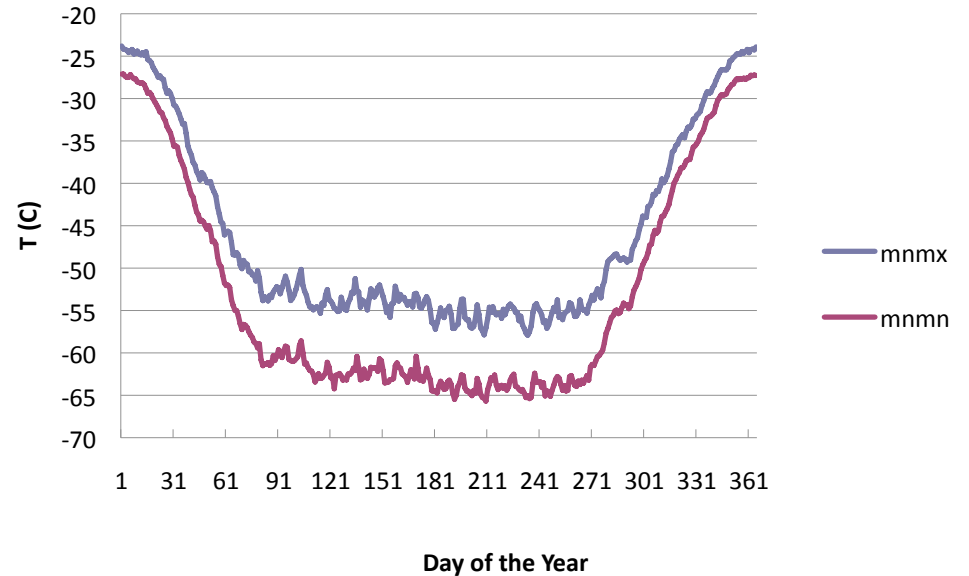
(Lazzara and Keller, in preparation)

50 Year Daily Extremes...

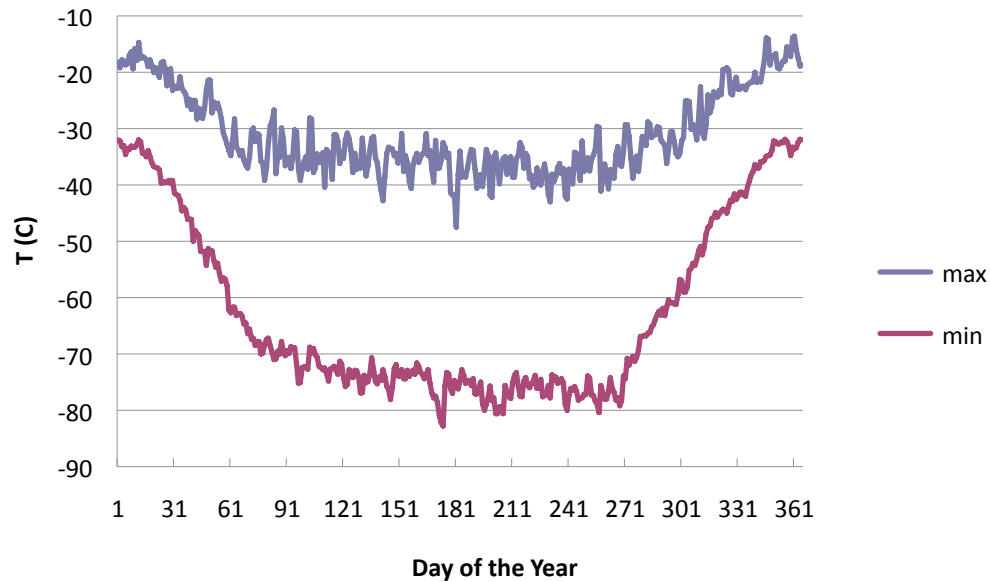
These are not smoothed...yet...

(Lazzara and Keller, in preparation)

South Pole Daily Mean Max/Min Temperature 1957-2006



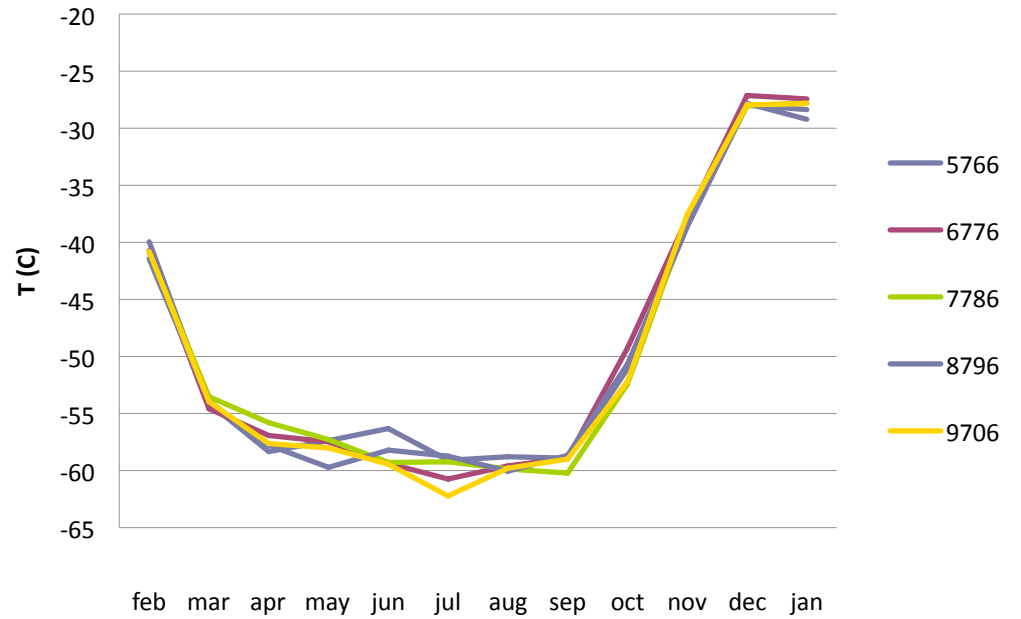
South Pole Daily Extreme Max/Min Temperature 1957-2006



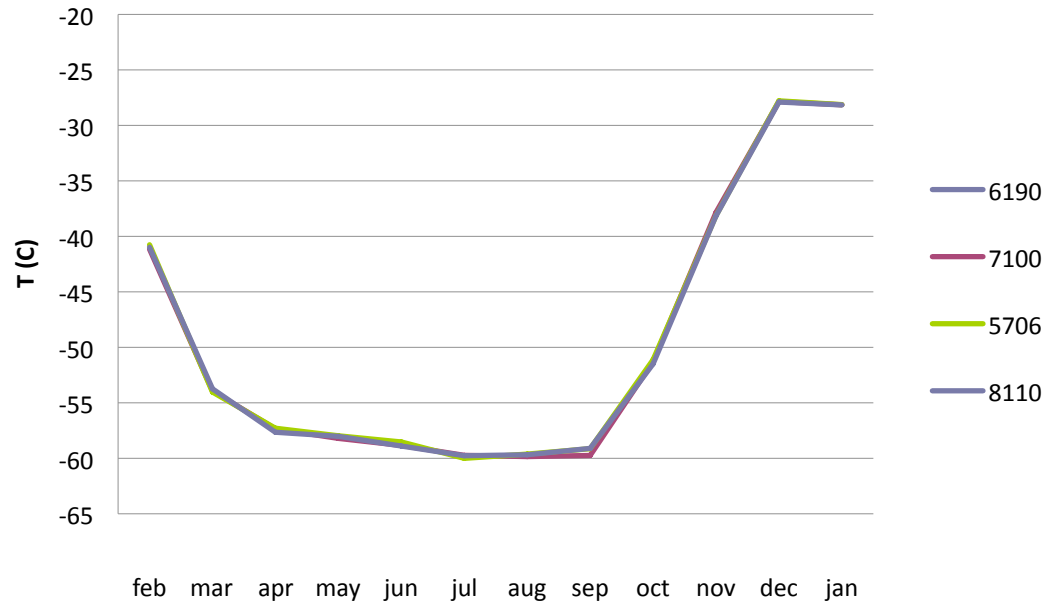
South Pole Decadal and Monthly Mean

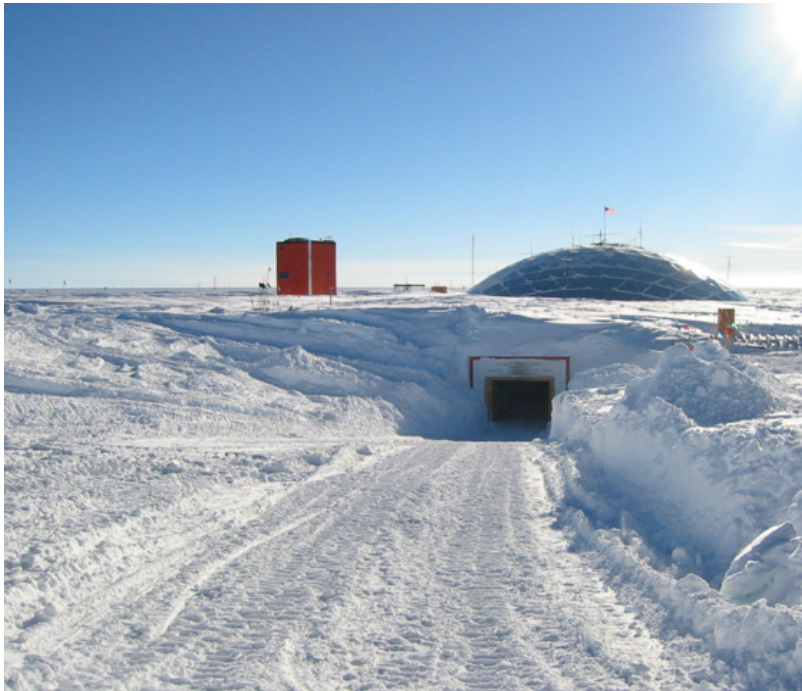
(Lazzara and Keller, in preparation)

Mean Monthly Decadal Temperature



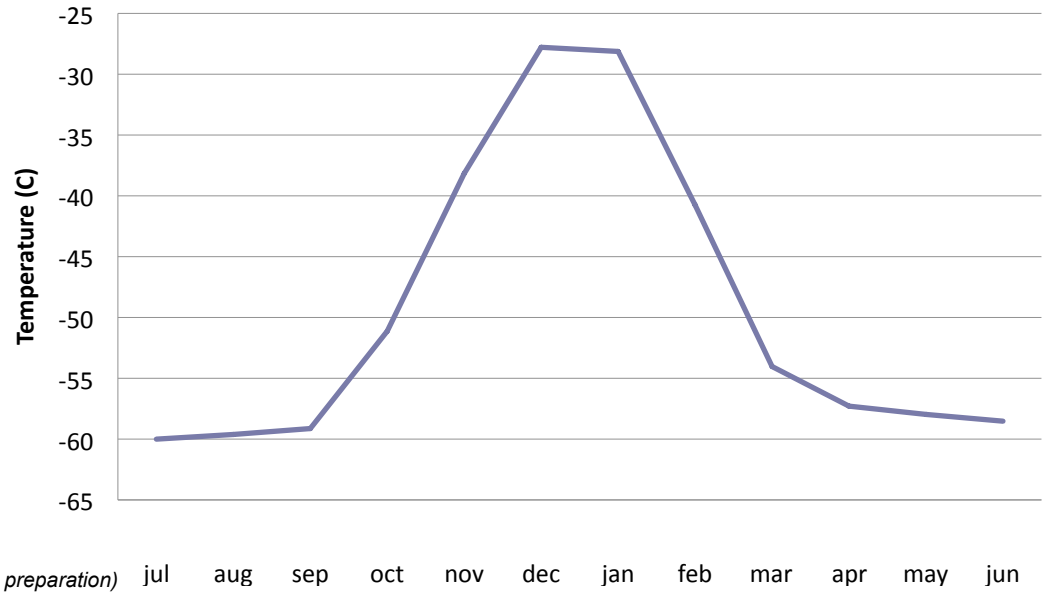
Monthly Mean Temperature



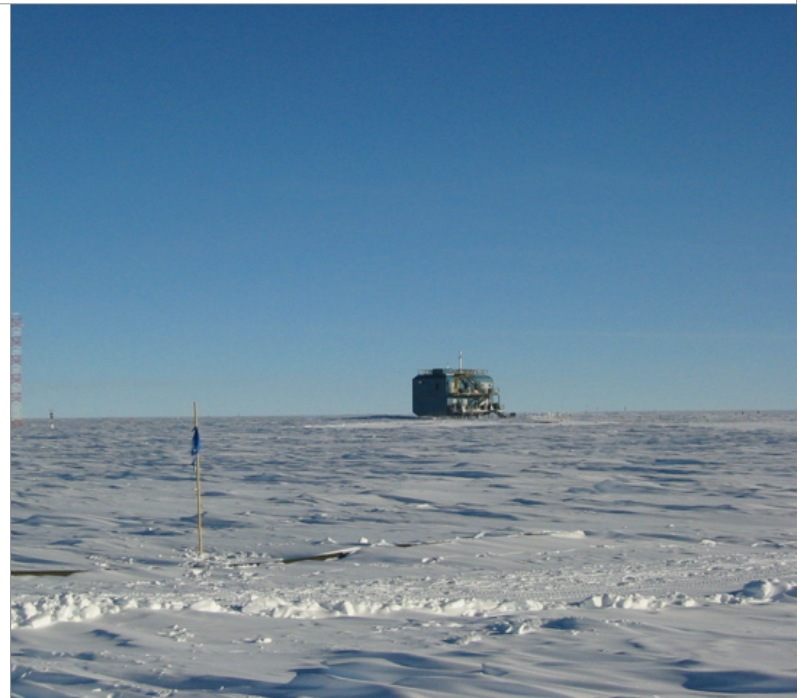
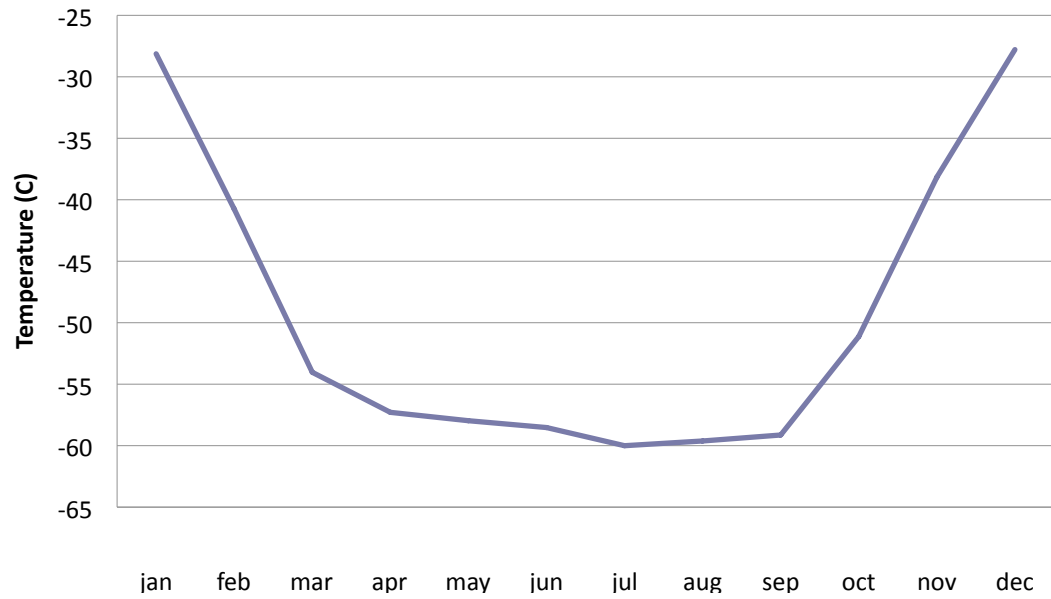


(Lazzara and Keller, in preparation)

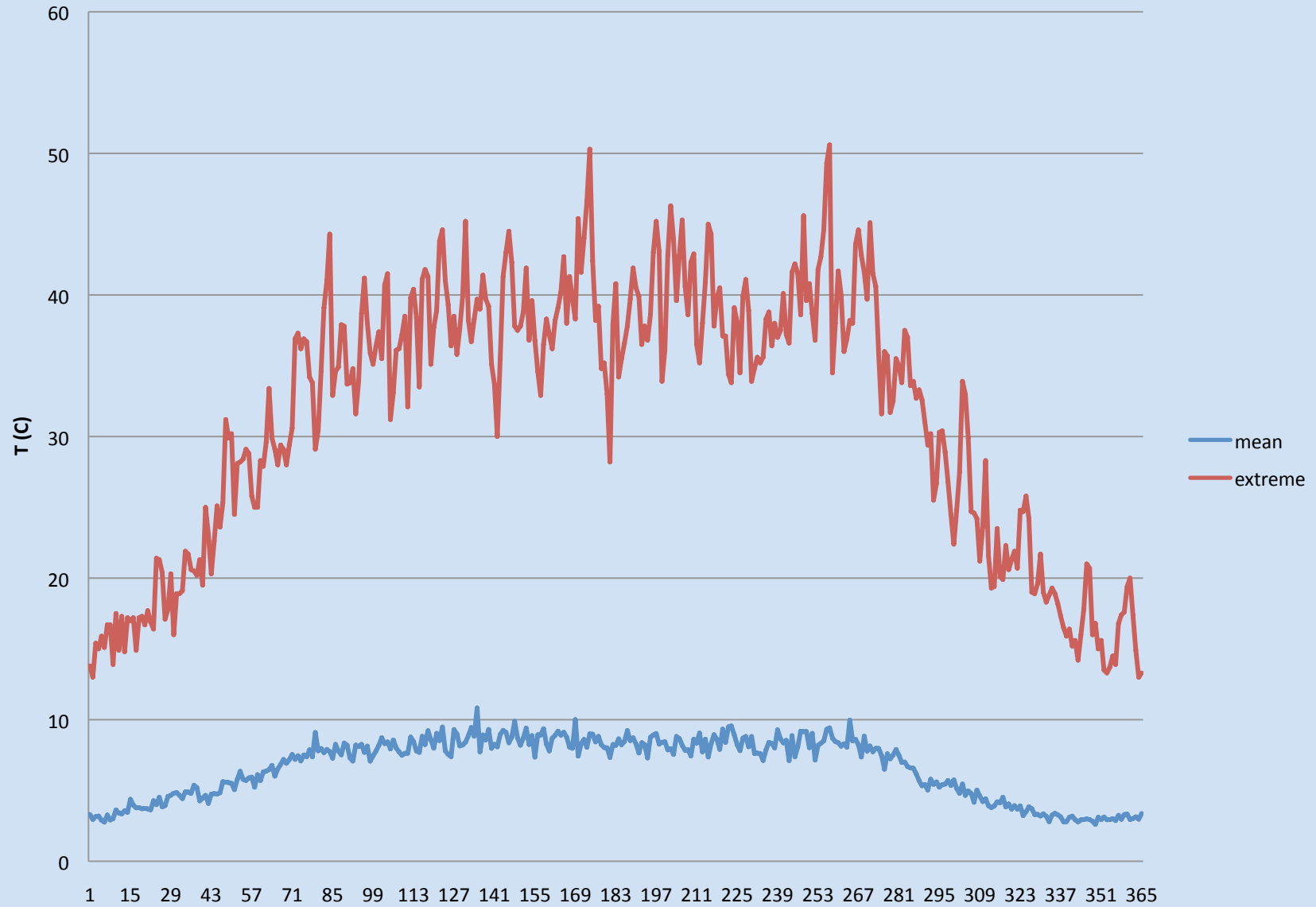
50 yr Mean Monthly Temperature



50 yr Mean Monthly Temperature

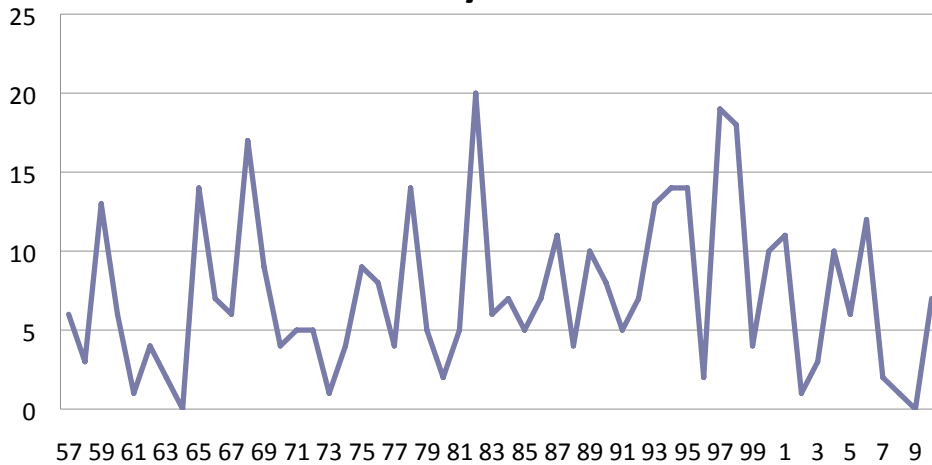


South Pole Mean Daily Temperature Ranges 1957-2006

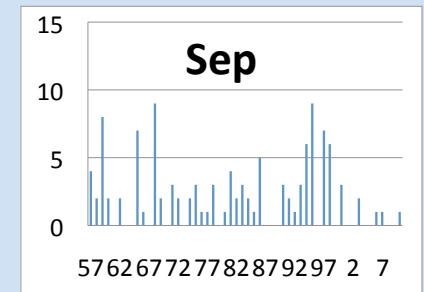
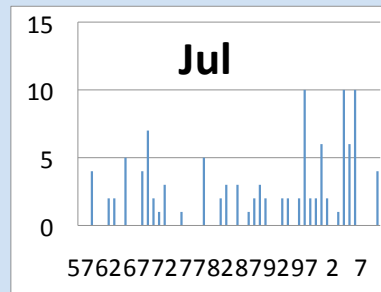
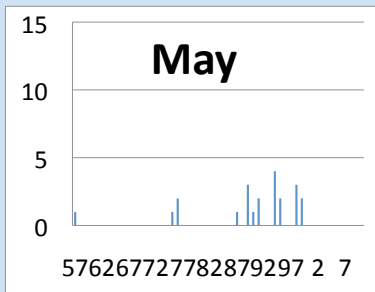
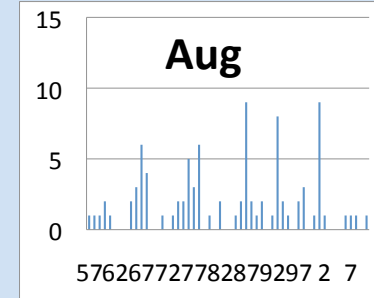
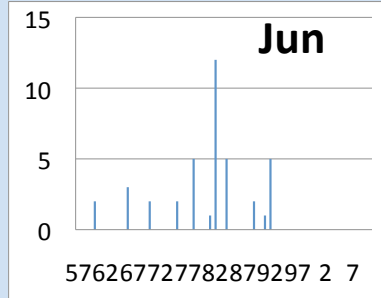
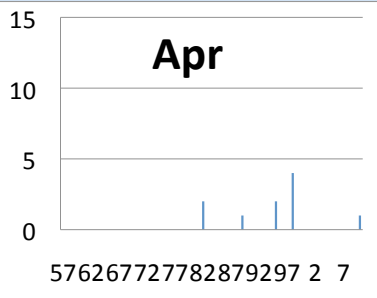
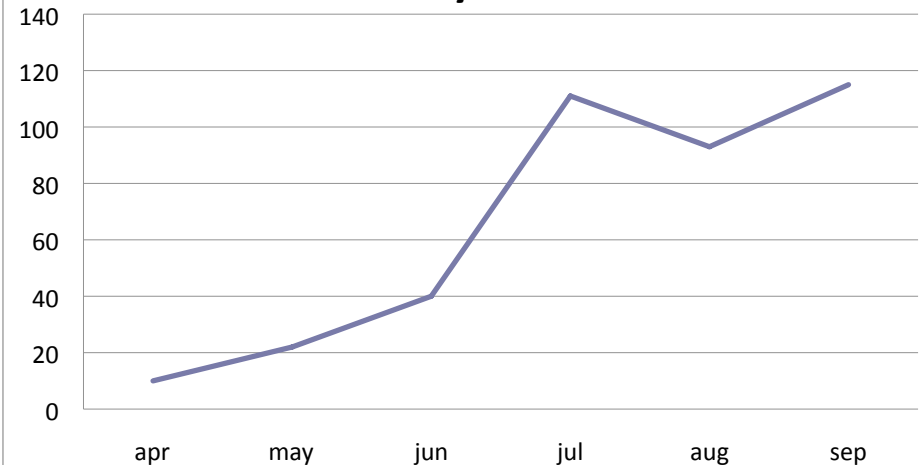


How often does it reach -100°F ?

Number of Days Below -100°F



Number of Days Below -100°F

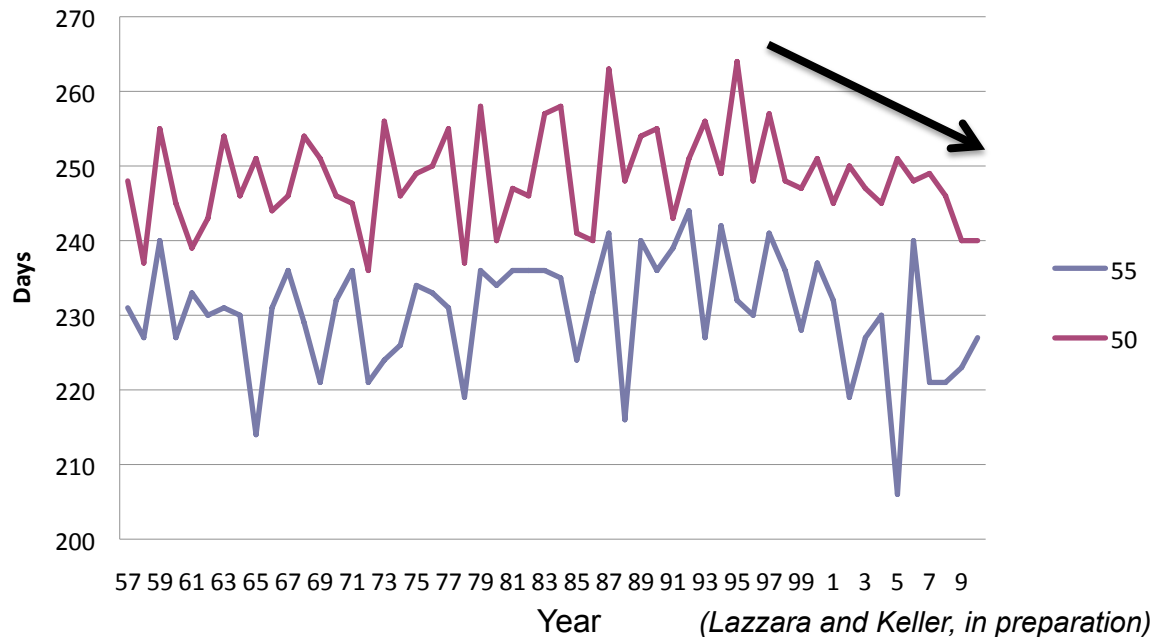


Winter from the POV of an LC-130



- Temperature is important to LC-130 operations!
 - Controls first flights in to Pole, and last flight of the season
- Critical Temperatures:
 - -50°C is ideal on the ground
 - -55°C is in-flight
 - -58°C is AN-8 fuel freezing point
- Are austral winters getting shorter?

Length of Winter Season



Future Efforts

- Complete analysis for the base variables:
 - Temperature
 - Pressure
 - Wind
 - Secondary:
 - Visibility
 - Sunshine
 - Snow stake field
- Clouds are excluded from this study....
- Climatology made for
 - 1961-1990
 - 1971-2000
 - 1981-2010
 - ...and 1957-2006
- Analysis is ongoing....paper in progress... (Lazzara and Keller, in preparation)



NCDC: New Climate Normals...

- New 1981-2010 Climate Normals
 - to be released by NCDC 1 July 2011
 - to NWS via AWIPS after 1 August 2011
 - full release by 1 January 2012
- New method for the normals:
 - Constrained Harmonic Fit – new!
 - Constraining the daily normals to fit the monthly normals....
- Will consider this for South Pole....



Thank you!
Questions?

Thank you to Office of Polar Programs National Science Foundation
#ANT-0537827 & ANT-0838834

Thanks to South Pole Meteorology Office:
John Gallagher, Tim Markle, Kathie Baker, Sue O'Reilly, Mike Carmody
Thanks to Lt. Col. Mark Doll, USAF, ANG Liaison/NSF