

A wide-angle photograph of a snowy Antarctic landscape under a clear blue sky. A series of red flags on thin poles are planted in the snow, receding into the distance. The snow is bright and textured, and the sky is a deep, clear blue with a few wispy clouds near the horizon.

Forecast verification study for McMurdo and Palmer Stations: Preliminary Results

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A wide, flat, snow-covered landscape under a clear blue sky with a few wispy clouds. A path of red flags leads from the foreground towards the horizon. The flags are on thin poles and are spaced out along a line that recedes into the distance. The snow is bright and glistens in the sunlight. A long shadow is cast across the snow in the foreground, likely from the person taking the photo. The word "Motivation" is overlaid in large, bold, black letters in the center of the image.

Motivation

A wide-angle photograph of a snowy, flat landscape under a clear blue sky with some light clouds. A line of red flags on thin poles stretches from the foreground into the distance, following a path that appears to be a ski run or a trail. The snow is bright and glistens in the sunlight. The text "Forecast Sources" is overlaid in the center of the image.

Forecast Sources

McMurdo Forecast Sources

- **Resident SPAWAR Forecasters**
 - Antarctic Mesoscale Prediction System (AMPS)
- **FORECA provides forecasts for MSN.com**
 - Finnish Company → Largest in Nordic Countries
 - Data source not listed
- **The Weather Channel (weather.com)**
 - US company → Data source not listed
- **Weather Underground (wunderground.com)**
 - International forecasts → NCEP AVN model run

Palmer Forecast Sources

- **SPAWAR Forecasters in Charleston**
 - AMPS → send out “Town” forecasts daily
- **Qwikcast.com**
 - National Weather Service $.5^{\circ}$ GFS model for international forecasts
 - METAR’s from nearest location (Falkland Islands)
- **Weather Underground**
 - International forecasts → NCEP AVN model run

Palmer/McMurdo Town Forecast

TUESDAY, 25 DECEMBER 2007

PALMER STATION WEATHER FORECAST INFORMATION

*** THIS INFORMATION IS FOR OFFICIAL USE ONLY ***

*** AND IS LIMITED TO ACTIVITIES SPONSORED OR RECOGNIZED ***

*** BY THE UNITED STATES ANTARCTIC PROGRAM ***

REGIONAL WEATHER SUMMARY: The low in the eastern Bellingshausen Sea continues to dominate the weather pattern through tonight when a ridge of high pressure will begin to build into the area. The ridge will begin to dominate the weather pattern by nudday tomorrow.

Today 25 December	Tonight	Tomorrow 26 December
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Sky: Cloudy with light flurries.

Visibility (mi): Unrestricted with periods of less than 3 by early afternoon.

Wind (kts): NW 8 to 13

Max Temp: 3°C / 38F

Min Wind Chill: -3°C / 27°F

Sky: Cloudy with snow.

Visibility (mi): 2-4 in light snow with short period of less than 1 after midnight. Improving by morning.

Wind (kts): N 8 to 13

Min Temp: 0°C / 32°F

Min Wind Chill: -6°C / 21°F

Sky: Mostly cloudy with flurries

Visibility (mi): 3-5 in light snow becoming unrestricted by late morning.

Wind (kts): SW 8 to 13

Max Temp: 1°C / 34°F

Min Wind Chill: -5°C / 23°F

ASTRONOMICAL DATA

Date	Sunrise	Sunset
25 December 2007	0225L	26/0007L
26 December 2007	0226L	27/0006L

Forecaster: Bill Brown

25 December 2007

MCMURDO WEATHER FORECAST INFORMATION

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REGIONAL WEATHER SUMMARY: Light wind and weak circulation will allow the fog to linger in the Sound; receding with mid-day warmth, returning with the coolness of the evening...

Today 25 December	Tonight	Tomorrow 26 December
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Sky: Mostly Sunny

Visibility (mi): Unrestricted, 1/2 fog

Wind (kts): Variable 5 becoming E 7-12

Max Temp: +1°C/+34°F

Min Wind Chill: -9°C/+16°F

Sky: Mostly Cloudy

Visibility (mi): Unrestricted, 1/4 fog

Wind (kts): E 7-12 becoming Variable 5

Min Temp: -7°C/+19°F

Min Wind Chill: -11°C/+12°F

Sky: Partly Cloudy

Visibility (mi): Unrestricted, 1/4 fog (AM)

Wind (kts): Variable 5 becoming E 7-12

Max Temp: -1°C/+30°F

Min Wind Chill: -11°C/+12°F

SCOTT BASE 24-HR TEMPRATURE: High: -2°C/+28°F Low: -12°C/+10°F

ASTRONOMICAL DATA

Next Sunset 20 Feb 2008

YESTERDAY'S EXTREMES

Maximum Temperature: +3°C/+37°F Minimum Temperature: -6°C/+21°F
 Peak Wind: 19 Knots Lowest Wind Chill: -5°C/+23°F

Forecaster: Al

A wide-angle photograph of a snowy, flat landscape under a clear blue sky with some light clouds. A long, straight line of red flags is planted in the snow, receding into the distance. The snow is bright and reflective, with many small, sparkling highlights. A shadow is cast on the snow in the foreground, suggesting the sun is high in the sky. The word "Method" is overlaid in the center of the image in a bold, black, sans-serif font.

Method

Method

- **Compared High and Low Temperature forecasts versus the McMurdo/Palmer Station monthly climatologies**
 - Temperature → Universally forecasted across sources
- **Statistical analysis performed**
 - Computed the Error, Accumulated Error, Average Error, Root Mean-Squared Error (RMSE), Accumulated MSE, Maximum Error, and Correlation Coefficient
 - Produced scatter plots to visualize error

A wide, flat, snow-covered landscape under a clear blue sky with a few wispy clouds. A long, straight line of red flags is planted in the snow, receding into the distance. The snow is bright and glistens in the sunlight. A shadow is cast on the snow in the foreground. In the far distance, a small building or structure is visible on the horizon.

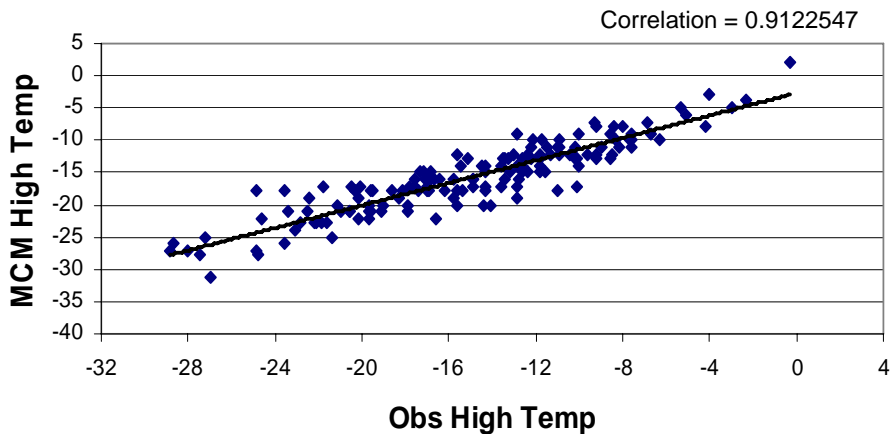
Results

A wide-angle photograph of a snowy, flat landscape under a clear blue sky with some light clouds. In the foreground, a red flag is planted in the snow. A long shadow is cast across the snow from the right side of the frame. In the distance, a line of smaller red flags stretches across the horizon. The text "McMurdo High/Low Temperatures" is overlaid in the center of the image.

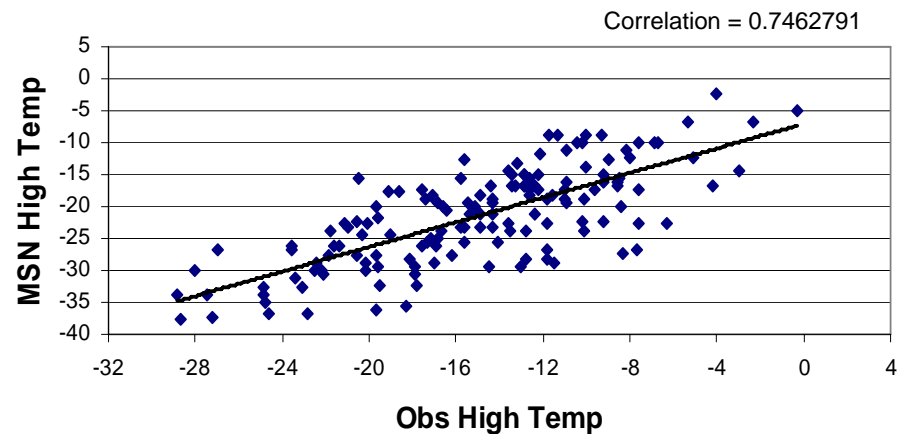
McMurdo High/Low Temperatures

McMurdo Station Forecasts: High Temperatures

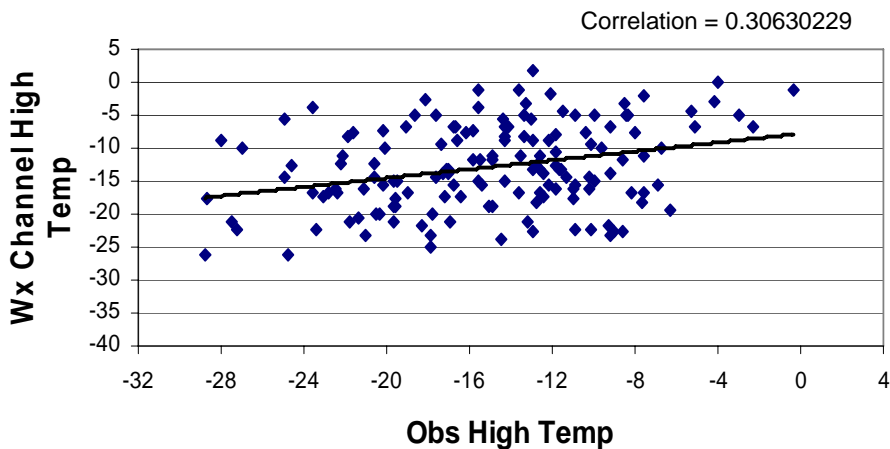
Obs vs. MCM High Temp (C)



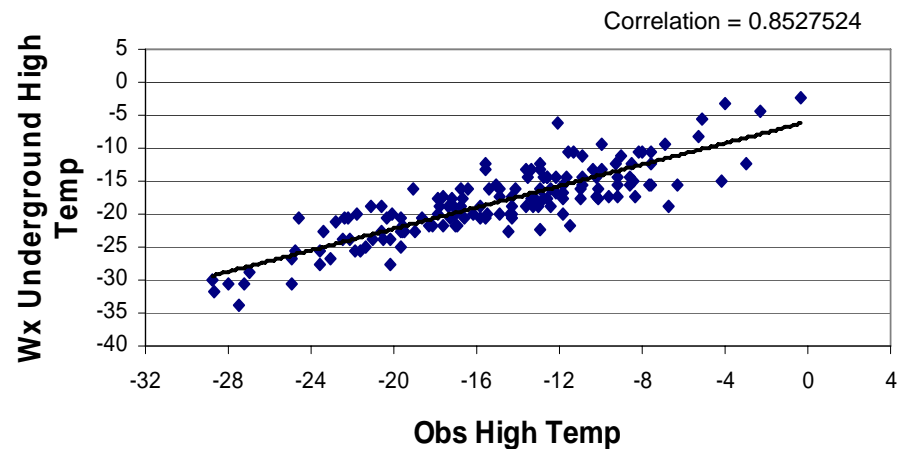
Obs vs. MSN High Temp (C)



Obs vs. WX Channel High Temp (C)



Obs vs. Wx Underground High Temp (C)



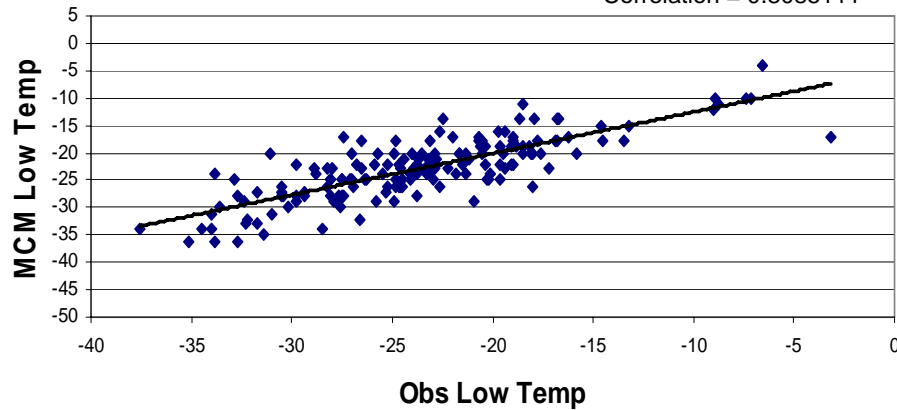
McMurdo Station Forecasts: High Temperatures (148 days)

Forecast Source	Acc. Error	Average Error	Max Error	RMSE	Corr. Coef.
MCM	292°	1.98°	7.12°	2.50°	0.9122
Wx Und.	540°	3.65°	12.18°	4.43°	0.8527
Wx Channel	884°	5.97°	19.71°	7.52°	0.3063
MSN Wx	1000°	6.76°	18.97°	8.19°	0.7462

McMurdo Station Forecasts: Low Temperatures

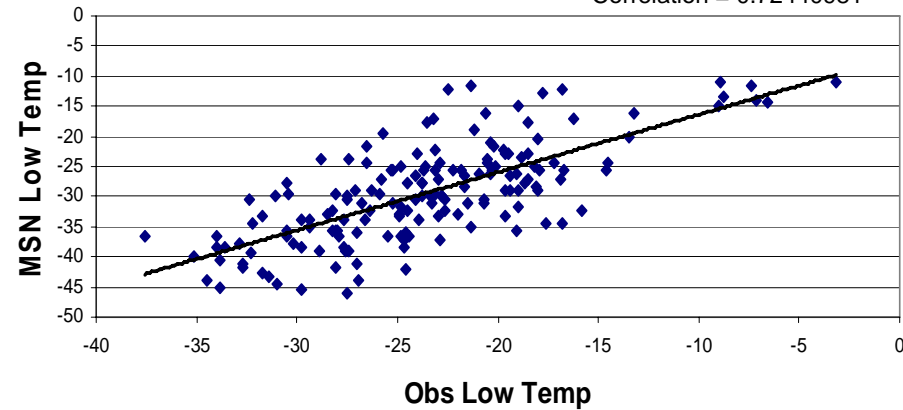
Obs vs. MCM Low Temp (C)

Correlation = 0.8085111



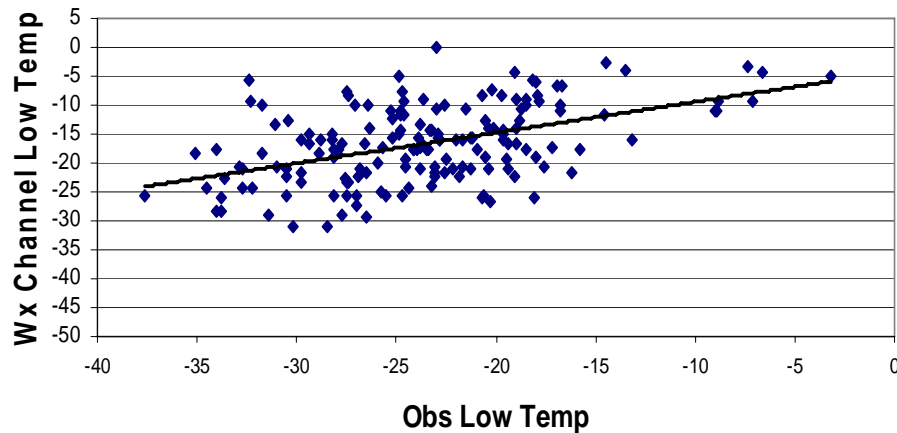
Obs vs. MSN Low Temp (C)

Correlation = 0.72440981



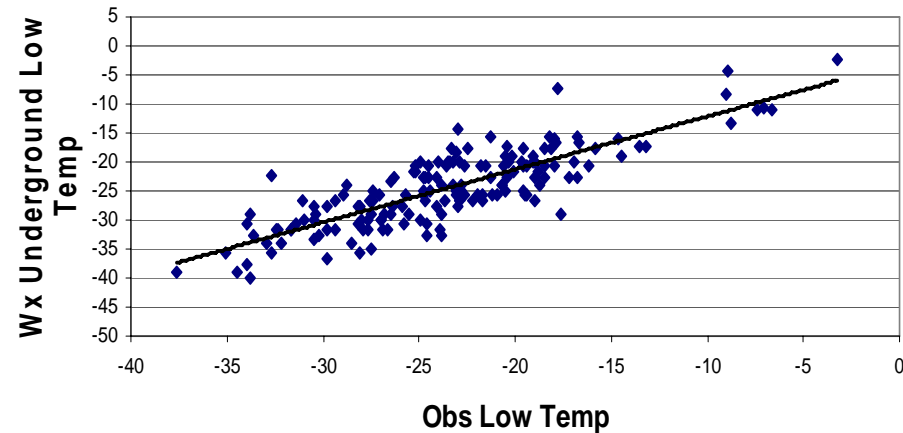
Obs vs. Wx Channel Low Temp (C)

Correlation = 0.4851495



Obs vs. Wx Underground Low Temp (C)

Correlation = 0.834095



McMurdo Station Forecasts: Low Temperatures (164 days)

Forecast Source	Error Sum	Average Error	Max Error	RMSE	Corr. Coef.
MCM	464°	2.83°	14.02°	3.72°	0.8085
Wx Und.	505°	3.08°	11.29°	3.81°	0.8341
MSN Wx	1121°	6.84°	18.61°	8.02°	0.7244
Wx Channel	1268°	7.74°	26.84°	9.47°	0.4851

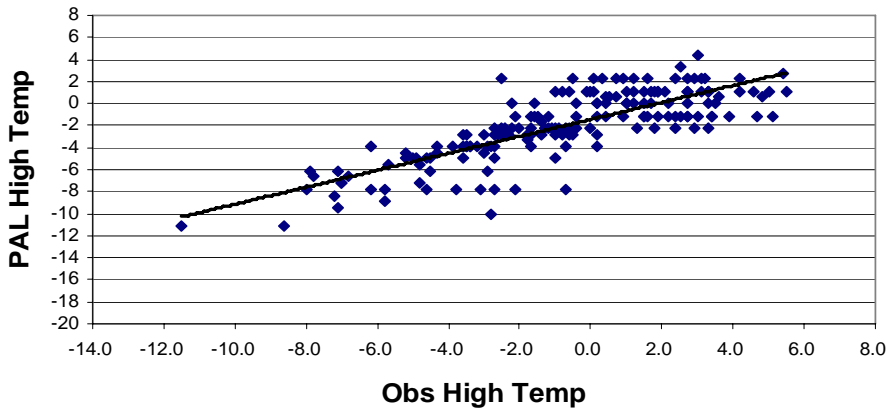
A wide, flat, snow-covered landscape under a clear blue sky with some light clouds. A long line of red flags is planted in the snow, receding into the distance. The foreground shows a single red flag on a thin pole, with its shadow cast on the snow. The text "Palmer High/Low Temperatures" is overlaid in the center in a large, bold, black font.

Palmer High/Low Temperatures

Palmer Station Forecasts: High Temperatures

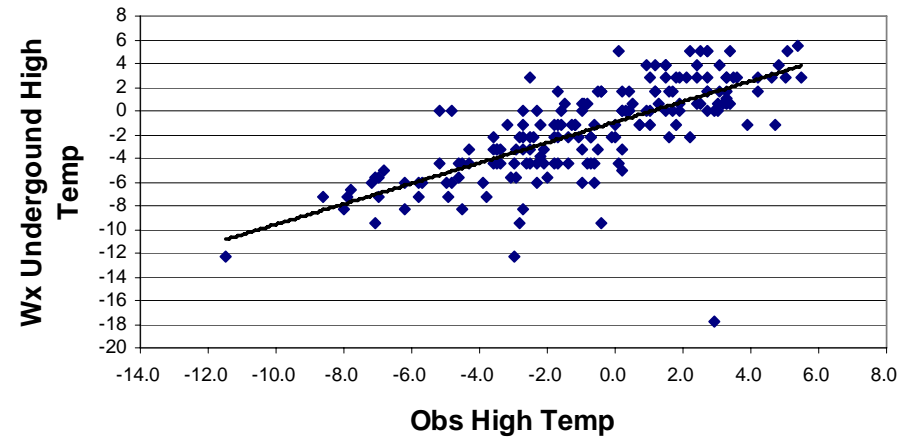
Obs vs. PAL High Temp (C)

Correlation = 0.806663



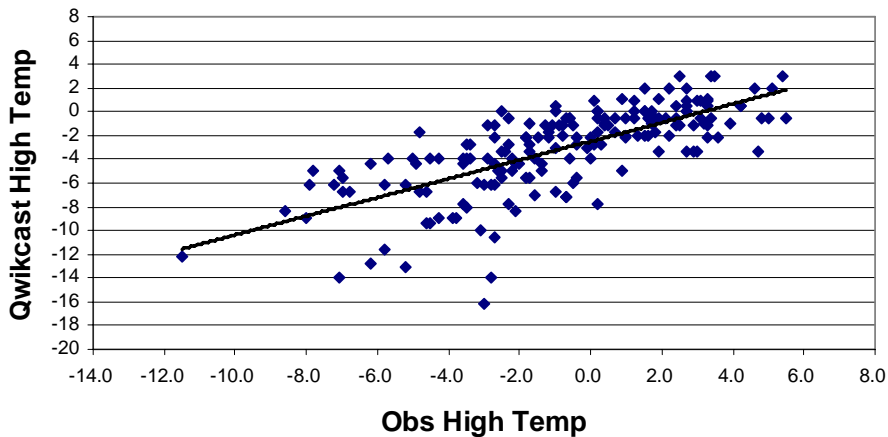
Obs vs. Wx Underground High Temp (C)

Correlation = 0.720408



Obs vs. Qwikcast High Temp (C)

Correlation = 0.714855



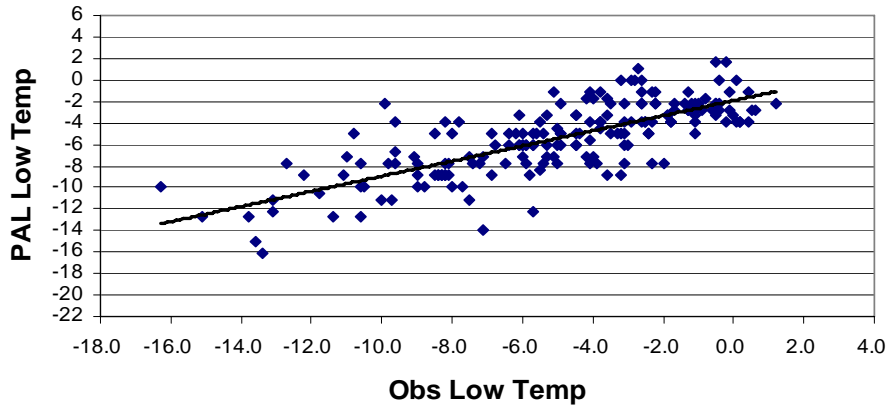
Palmer Station Forecasts: High Temperatures (178 days)

Forecast Source	Error Sum	Average Error	Max Error	RMSE	Corr. Coef.
PAL	315°	1.77°	7.20°	2.36°	0.8067
Wx Und.	347°	1.95°	20.68°	2.88°	0.7204
Qwikcast	480°	2.70°	13.11°	3.49°	0.7148

Palmer Station Forecasts: Low Temperatures

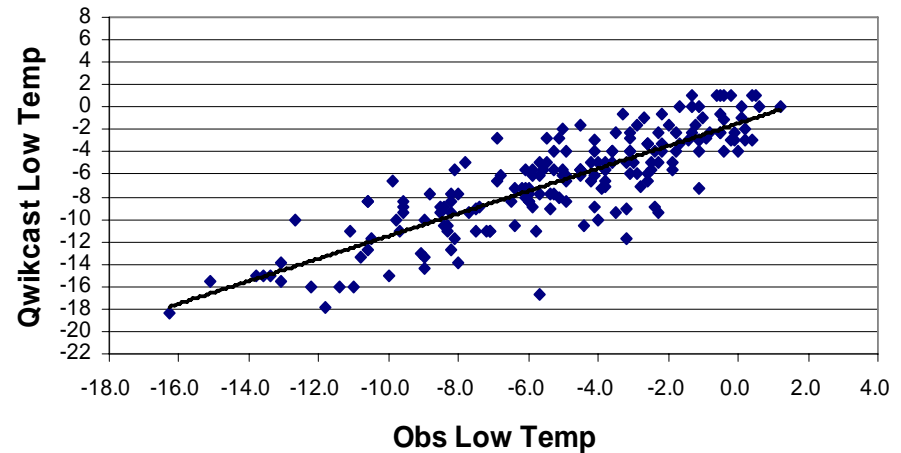
Obs vs. PAL Low Temp (C)

Correlation = 0.762566



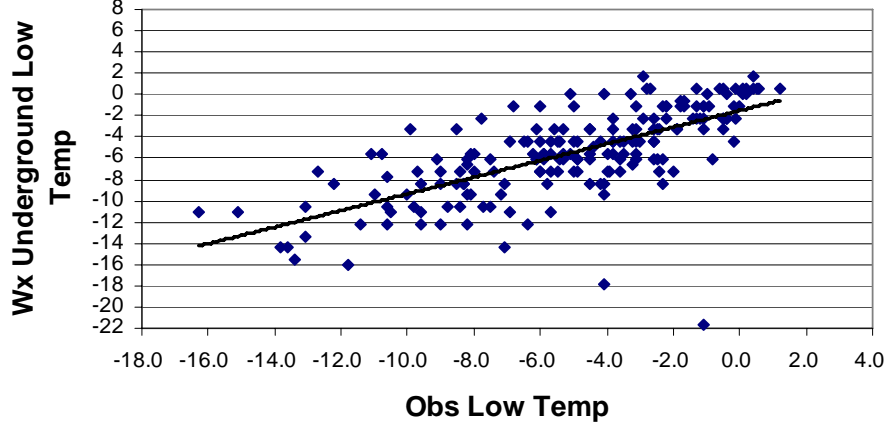
Obs vs. Qwikcast Low Temp (C)

Correlation = 0.840359



Obs vs. Wx Underground Low Temp (C)

Correlation = 0.690919



Palmer Station Forecasts: Low Temperatures (187 days)

Forecast Source	Error Sum	Average Error	Max Error	RMSE	Corr. Coef.
PAL	359°	1.92°	7.67°	2.45°	0.7626
Qwikcast	403°	2.20°	11.00°	2.77°	0.8403
Wx Und.	394°	2.11°	20.57°	3.11°	0.6909

A wide-angle photograph of a snowy, flat landscape under a clear blue sky with some light clouds. A path of red flags is visible, starting from the foreground and leading towards the horizon. The snow is bright and reflective, with some shadows cast by the flags. The overall scene suggests a journey or a path towards a goal.

Conclusions/Future Work

Conclusions

- **SPAWAR forecasters most accurate**
 - Accumulated Error, Average Error, and Mean Squared Error
 - Despite forecast “hiccups”
- **Average Error and Mean Squared Error most significant indications of accuracy**
 - Correlation Coefficient not the best indicator of forecast accuracy

Future Work

- **Perform similar study but:**
 - **Use longer dataset**
 - preferably an entire year
 - **Compare multiple parameters**
 - Wind direction/speed, precipitation, cloud cover
 - **Compare more forecast sources**
 - Other private forecast companies
 - i.e. AccuWeather

Acknowledgements

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