

SOUTH POLE METEOROLOGICAL MODERNIZATION: A COMPARISON BEFORE AND AFTER INSTALLATION OF A NEW INSTRUMENTATION SUITE

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1. ABSTRACT

The Amundsen-Scott South Pole surface meteorological instrument suite was upgraded in 2004 as a part of the South Pole Station Modernization (SPSM) program. To ensure that the new and old instruments were recording similar information, the old and new suites of instruments ran simultaneously for a year. Statistical analysis of the time series of temperature, pressure and wind reports was used to determine if there were any significant differences in the observations. The results of the analysis found a pressure bias was introduced in the new suite as well as a systematic sign change between summer and winter. Significant differences were found in the winter months for temperature and wind speed, while no differences are found for wind direction distribution.

There were also noticeable differences in wind speed between the Clean Air platform near the Clean Air facility and the platform at the approach end of the skiway. Wind speeds are lower at the skiway when the wind is from the northeast quadrant and lower at the Clean Air tower when the wind is from the southwest quadrant, reflecting the effect of increased roughness due to the station structures on the airflow across the station. Clean Air also often reports lower speeds than the skiway in flow from the southeast, most likely due to interference from a building in that sector.

2. ACKNOWLEDGEMENTS

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3. REFERENCE

Keller, L.M., K.A. Hill, M.A. Lazzara and J. Gallagher, 2009: A comparison of meteorological observations from South Pole Station before and after installation of a new instrument suite. *J. Tech.*, accepted.

Table 1. Instruments and specifications for South Pole observations for both the old and new sensors.

Sensor	Location	Sensor	Operating Range	Accuracy
Temp.	CAT	RM Young	Down to -80C	+/- 0.2C
	DOME	Omega Platinum RTD	N/A	+/- 0.2C
Pressure	CAT	Druck	Down to -40C	+/- 0.75 hPa
	DOME	Navy Digital	N/A	+/- 0.30 hPa
Winds	CAT, SKI	RM Young	-70C to +55C	+/- 0.67 mph
	DOME	RM Young	-70C to +55C	+/- 0.67 mph

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Figure 1. An aerial photograph taken on January 29, 2005 showing the location of the observation towers at South Pole Station. The red arrow points to the location of the SKI set of instruments (which are off the left side of the photo beyond the radome). The red circle shows the location of the CAT instruments and the yellow circle indicates the location of the DOME instruments. The picture is looking to the north-northwest. (Photo courtesy of Bill Henriksen, NSF.)

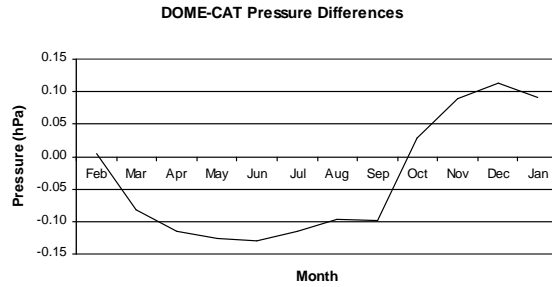


Figure 6. Difference in mean monthly pressure for the DOME observations minus CAT observations during the study period.

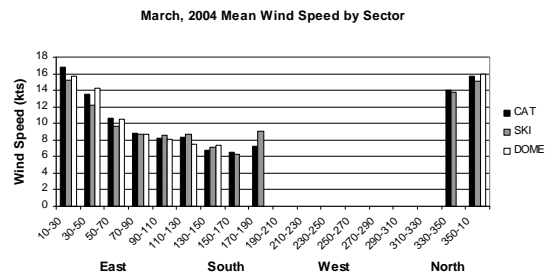


Figure 7. Wind speed in knots by 20 degree sectors for March, 2004 for each of the studied sites (CAT, SKI, and DOME).

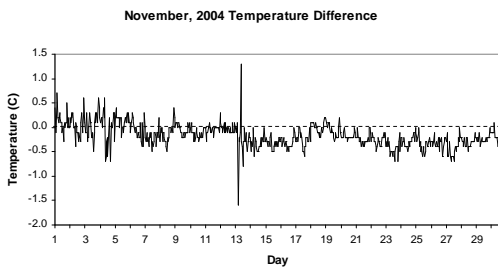


Figure 3. Difference in temperature for the DOME observations minus the CAT observations for November, 2004.

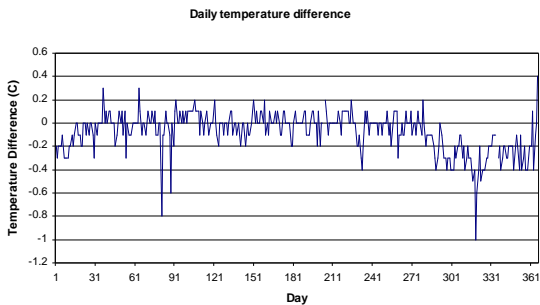


Figure 4. Mean daily temperature differences for February, 2004 through January, 2005.