



Meteorological factors impacting the 25 August 2018 medical evacuation flight at Phoenix Airfield, Ross Island, Antarctica

Taylor P. Norton^{1,2}, Sophie A. Orendorf⁴, William Tate*, and Matthew A. Lazzara^{1,3}

¹Antarctic Meteorological Research Center, Space Science and Engineering Center, University of Wisconsin-Madison, Madison, WI, USA

²Department of Atmospheric and Oceanic Sciences, University of Wisconsin-Madison, Madison, WI, USA

³Department of Physical Sciences, School of Arts and Sciences, Madison Area Technical College, Madison WI, USA

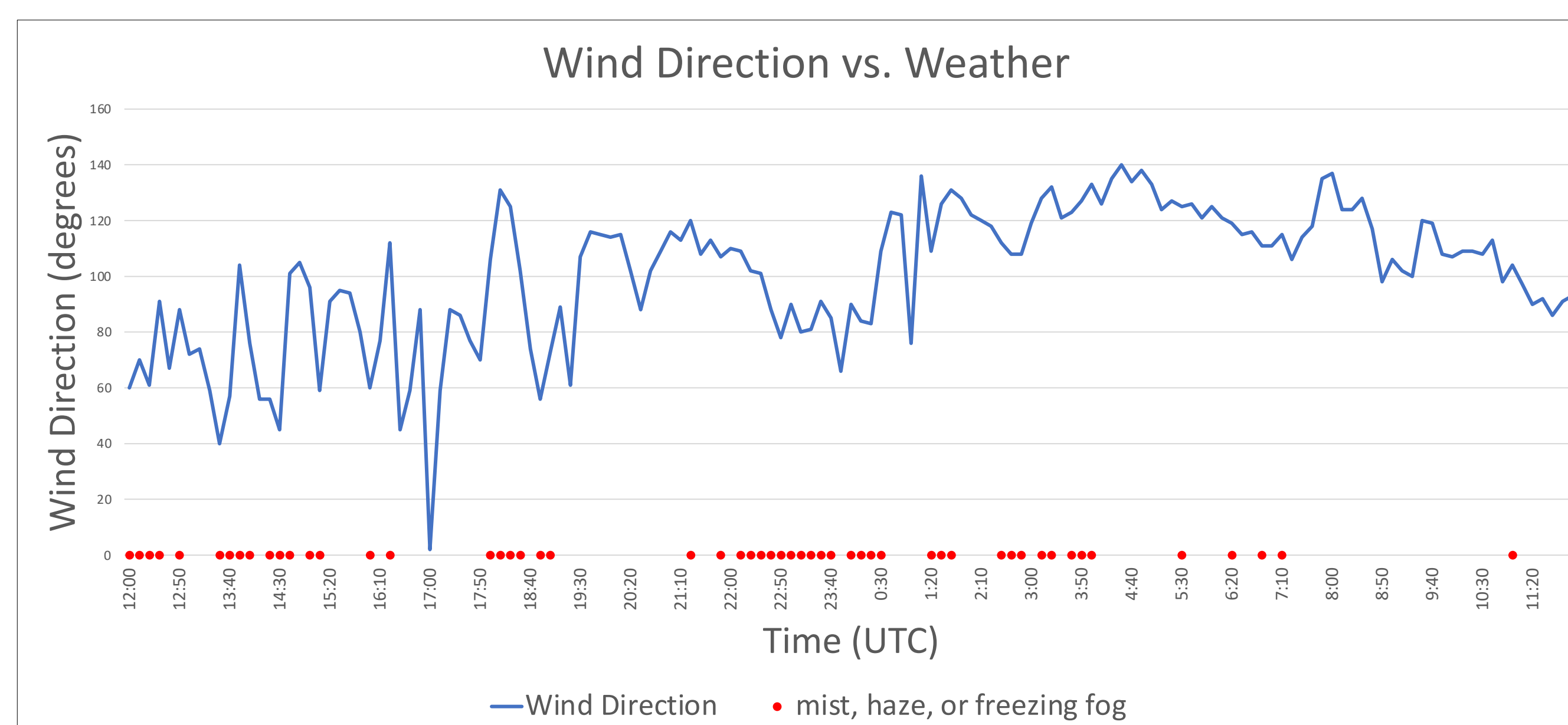
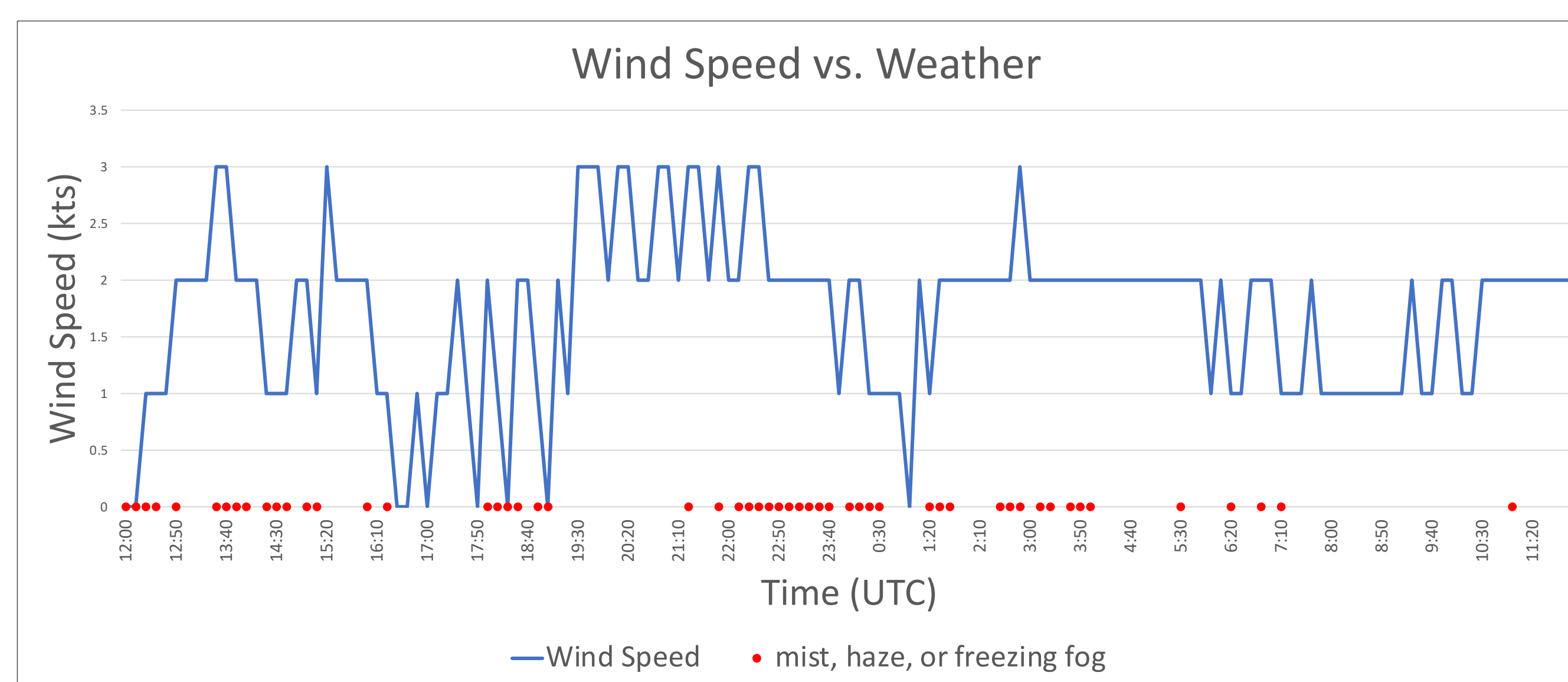
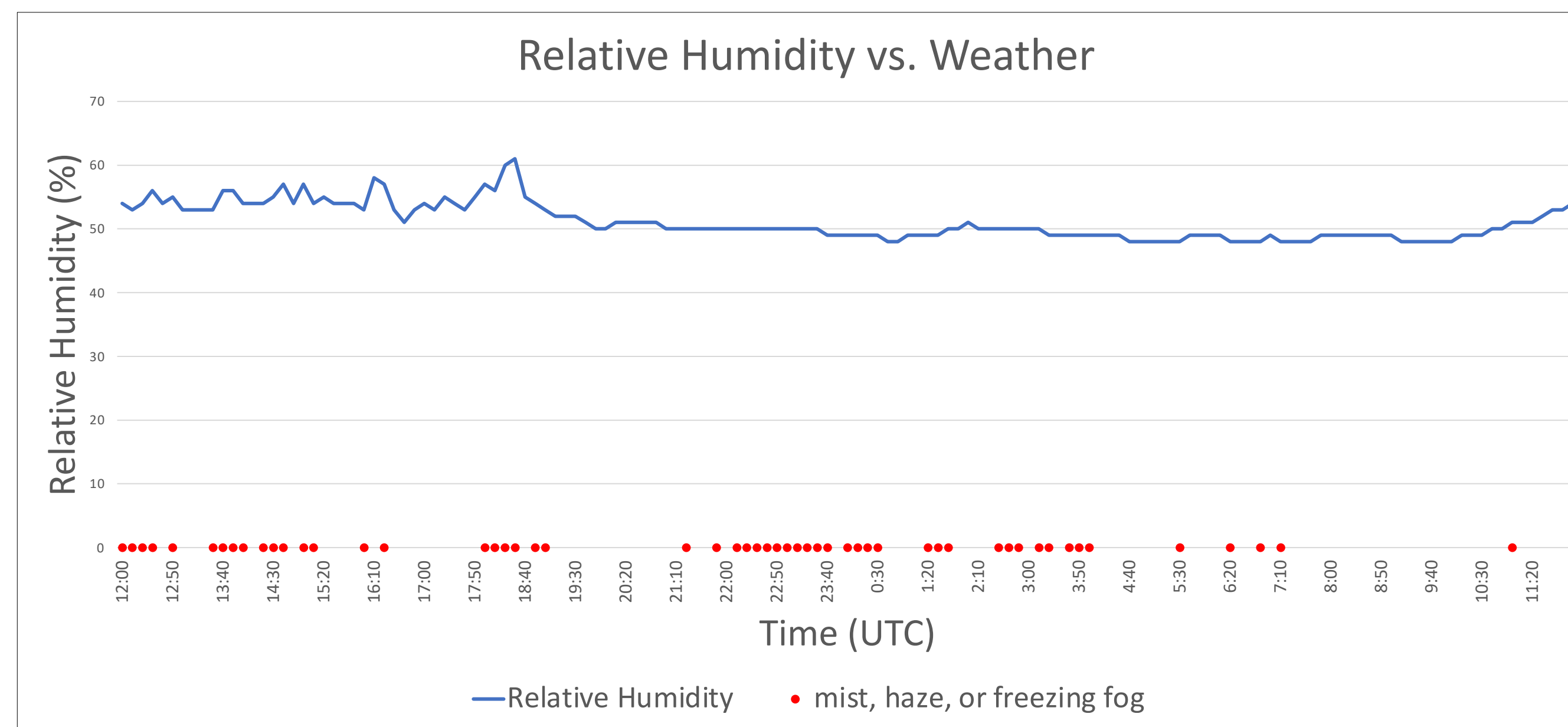
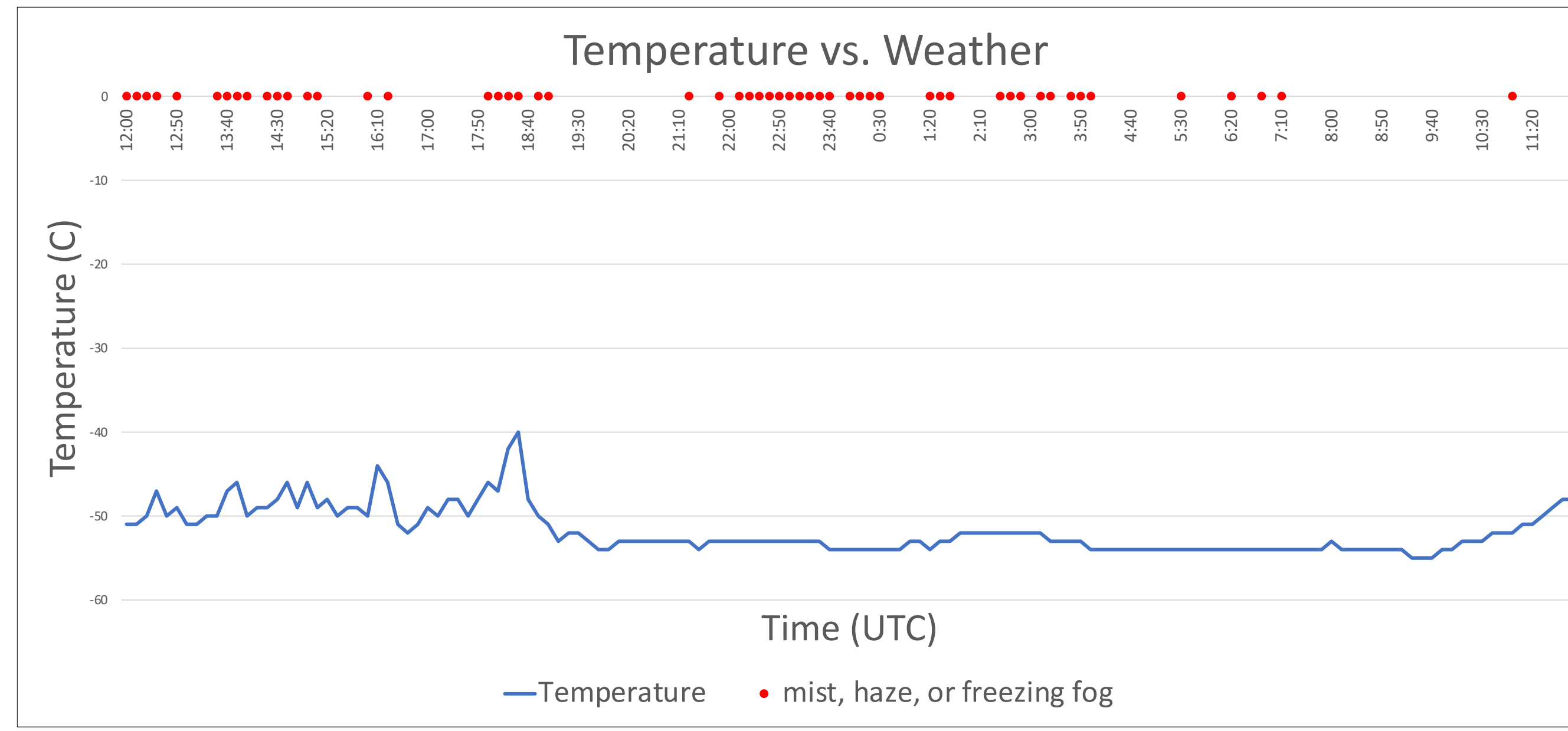


Introduction

- Anomalously cold temperatures and variable fog were recorded by the Naval Information Warfare Center's (NIWC) Fixed Meteorological Equipment-19 (FMQ-19) Automatic Meteorological Station (AMS) at Phoenix Airfield on 25 August 2018
- There was a medical evacuation (medevac) for two patients that occurred on 25 August when the temperatures were exceptionally cold
- The risk limit for a C-17 Globemaster III aircraft, like the LC-130 Hercules aircraft, is -50°C on the ground, -55°C in the air, -58°C for jet fuel and -54°C for the hydraulics (Lazzara et al. 2012; Maasarani, Z., Senior Communications & Brand Specialist at Boeing, pers. comm.)
- Due to the cold temperature, the cargo door hydraulics were unable to allow the ramp to open (Davis 2018), so the flight crew had to load the two patients through the side door of the aircraft.

Data and Methods

- Automatic Weather Stations (AWS), AMS and METAR observational data were utilized to determine the conditions at Phoenix Airfield
 - 12 hours leading up to the beginning of runway preparations and 12 hours after the aircraft's departure.
- The University of Wisconsin-Madison Phoenix AWS was not operating properly during this period
- The variables examined were temperature, relative humidity, wind speed, wind direction, atmospheric pressure, weather type, and cloud cover



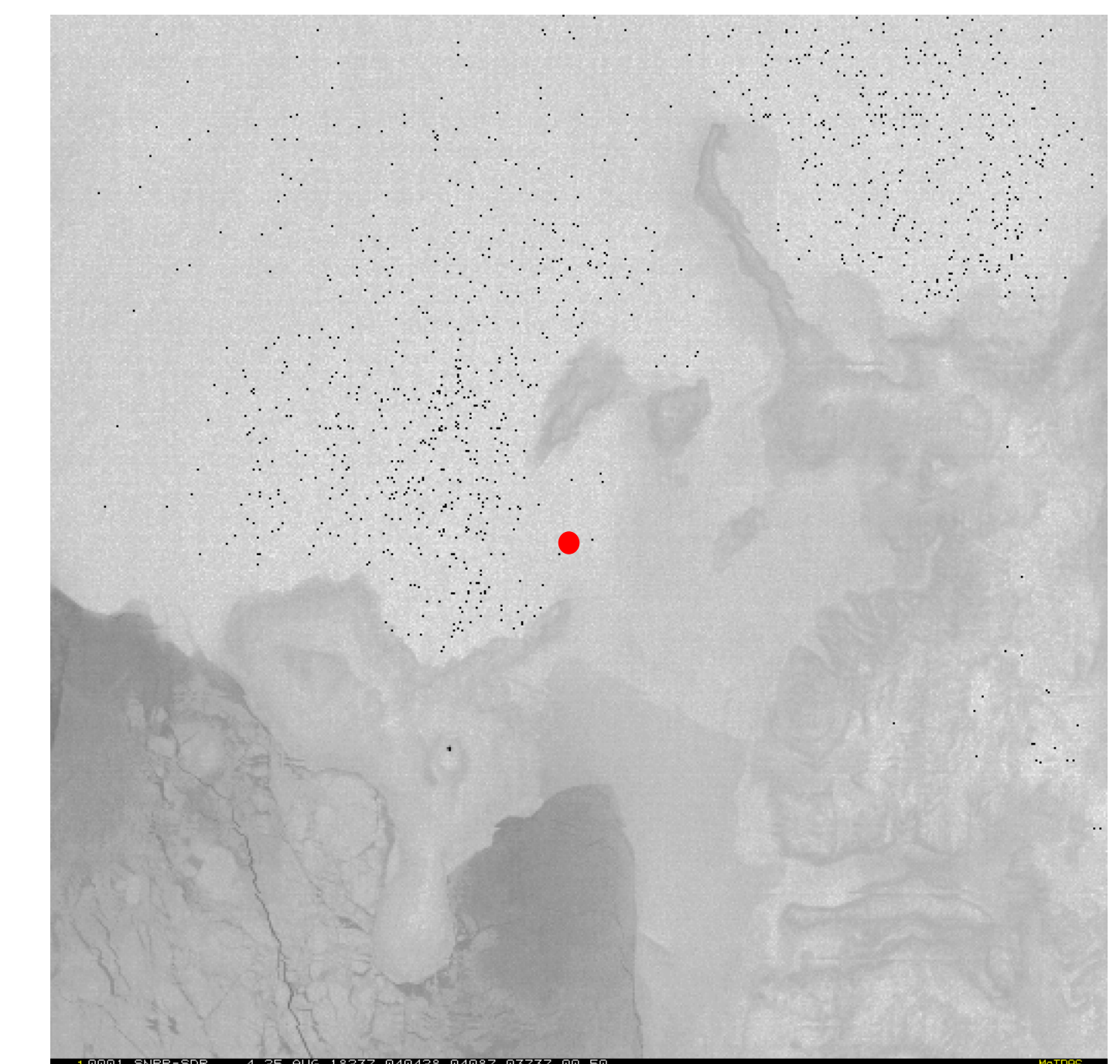
FMQ-19 data from 12:00 UTC 24 August 2018 – 12:00 UTC 25 August 2018.

Day	Hour (UTC)	AMPS Temp. (C)	FMQ-19 Temp. (C)	AMPS Wind Spd. (kts)	FMQ-19 Wind Spd. (kts)
24	18	-42.8	-46	5	2
24	19	-43.1	-51	6	0
24	20	-43.2	-54	7	2
24	21	-43.9	-53	6	3
24	22	-43.7	-53	5	2
24	23	-42.8	-53	4	2
25	0	-41	-54	2	2
25	1	-40.1	-53	1	0
25	2	-41.6	-52	1	2
25	3	-40.6	-52	2	2
25	4	-40	-54	3	2
25	5	-39.9	-54	4	2
25	6	-40.2	-54	4	1
25	7	-39.6	-54	4	2
25	8	-39.9	-53	3	1
25	9	-39.7	-54	3	1
25	10	-39.5	-54	2	2
25	11	-39.6	-52	2	2
25	12	-38.5	-48	2	2
25	13	-37.3	-46	2	2
25	14	-37.1	-46	3	1
25	15	-37	-45	9	0
25	16	-36.9	-43	9	1
25	17	-36.6	-42	7	1
25	18	-35.4	-40	11	1
25	19	-34.6	-38	11	1
25	20	-34.1	-38	15	1

AMPS forecast tabular data vs. FMQ-19 observations



Image of a C-17 aircraft on Phoenix Runway on 25 August 2018 during a medevac (Photo courtesy of 304th Expeditionary Air Unit).



VIIRS satellite image from 25 August 2018 at 04:04 UTC with Phoenix Airfield marked with a red dot

Impacts

- Temperatures for the winter fly-in period were exceptionally low across the McMurdo Ice Shelf due to a combination of clear skies and an unusually persistent period of light wind.
- The below-average temperatures also increased the potential for ice fog. Dense fog was reported on two of the three flight days, with satellite imagery and anecdotal evidence suggesting the fog was largely anthropogenic in nature due to release of hydrocarbon ice nuclei from combustion engines and aircraft.
- A significant positive bias in the surface temperature forecast, with models over-forecasting the temperature by 10-14°C
- Knowledge of the climate extremes and factors that lead to below average temperatures over the McMurdo Ice Shelf are beneficial and allow forecasters to assist aviation mission planners with operational risk management.
- Accurate temperature and wind forecasts aid in the determination of optimal positioning of vehicles and airfield support staff to mitigate ice fog development and reduce the threat of cold injuries.

Acknowledgements

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References

- Lazzara, M. A., L. M. Keller, T. Markle, and J. Gallagher, 2012: Fifty-year Amundsen-Scott South Pole station surface climatology. *Atmos. Res.*, **118**, 240–259, <https://doi.org/10.1016/j.atmosres.2012.06.027>.
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