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1. INTRODUCTION

An on-going research project at the University of Wisconsin has been studying the polar fog events that do impact flights planned to and from McMurdo Station, Antarctica. The first part of the project aimed to inexpensively learn about fog events at McMurdo Station/Ross Island area of Antarctica via the collection of fog particles. With some limited success, a few droplets were indeed captured (Lazzara et al. 2003). The next phase of work includes a simple climatological review of fog events as reported at McMurdo Station. A database of McMurdo Station synoptic observations from 1973 to 1998 has been used as the basis for this review with some initial review of a second database of observations directly from the McMurdo Weather Office from 1999 to 2003. This paper reviews the occurrences of fog, a variety of meteorological parameters during fog events, and the implications of this climatology.

2. DATA SOURCE AND A "FOG" DAY

The data used in this climatology are from two sources. Observations from 1973 to 1998 are from the National Climatic Data Center (USAFETAC, 1986). US Navy personnel took observations during this time period. Observations from 1999 to 2003 are direct from the McMurdo Weather Office, via the archives at the Antarctic Meteorological Research Center. Both datasets are available online at [ftp://amrc.ssec.wisc.edu/pub/mcmurdo](http://amrc.ssec.wisc.edu/pub/mcmurdo)

In working with the observations of fog events with a goal of ease of use and quantifying the events, a "fog day" was defined. A fog day in this climatological review is defined as a day when at least one observation (current observation time or past observation time) reported fog.

3. FOG OVER TIME

Three time periods for viewing fog events were assembled: on a monthly basis for all 30 years, on a monthly view basis, and time of day basis. As seen in figure 1, the range for fog days per month is anywhere from none to as much as 17 days in a single month. In reviewing the data, there are periods in the mid-1970s

where there are few observations with regards to the quantity. It is also noteworthy that the mid-1990s show a less fog activity than prior years. It is not clear why this is the case.

McMurdo Fog Climatology: What's Normal?

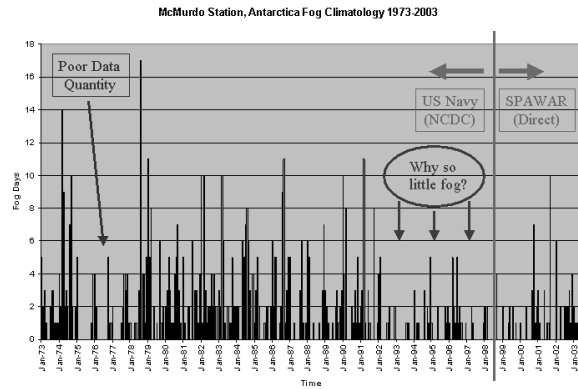


Figure 1 A graph of McMurdo Fog events is shown by fog days verse time.

McMurdo Fog Climatology 1973-2003: Monthly View

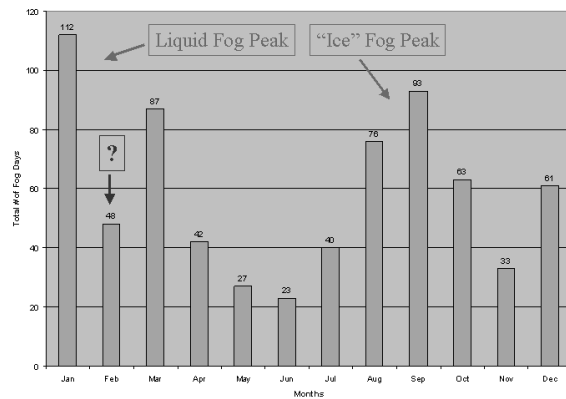


Figure 2 A graph of McMurdo Fog events is depicted in a month-by-month view.

In figure 2, with the same observations viewed on a month-by-month basis, it is clear that two peaks in the

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data reflect something that has been known by forecasters at McMurdo Station via experience – that there are two types of fog that affect the station: Liquid and Ice (NSFA, 1990, Turner and Pendlebury, 2004). One issue that is not clear from the display is the seeming low number of fog events occurring in February. It is not clear why this is so.

4. OTHER METEOROLOGICAL PARAMETERS AND FOG

For the bulk of the review, the focus of the analysis was on the largest reported category of fog in McMurdo's synoptic observations, WMO classification number 40. Also, the period of observations available from the NCDC database from 1973 to 1998 was used for the remainder of the study. In reviewing the behavior of other meteorological parameters during fog occurrences, it was found that fog occurs at a wide range of temperatures, pressures, wind speeds and cloud coverage. However, it was found that fog observations were highly correlated with wind direction (generally from the East), did gather about a group of preferred temperatures (depending on the state of the fog, be it frozen or liquid), and generally occurred at not too high nor too low a pressure. Figure 3 depicts the relationship between the fog days and the temperatures where two peaks are observed, likely reflecting the two types of fog at McMurdo Station. With regards to clouds, fog occurred in cases of few to no clouds, but also in case with moderate cloud coverage. This finding will indeed make it difficult to distinguish fog from clouds, especially overlapping fog and clouds via infrared satellite methods.

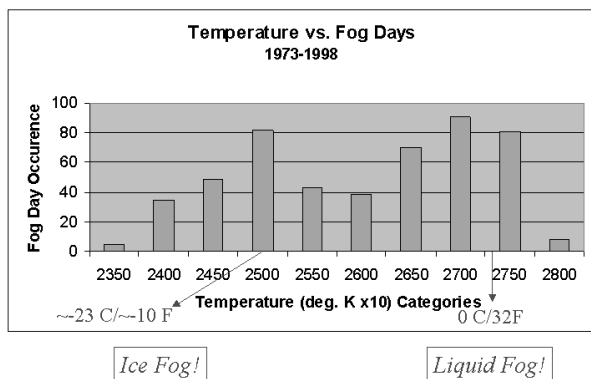


Figure 3 A graph of fog days (only WMO Classification number 40) verse matching observed temperatures depicting the grouping around the peak temperatures that liquid and ice fog occurs at.

5. FUTURE WORK

With two phases of this project completed, the next phase involves a very close examination of the last 5

years of fog events during the operational field season from 1999 to 2004. This comprehensive review of fog events using all available observations from the ground, airborne and space may lead to increased understandings of Antarctic fog, and perhaps open the door to improved forecasting of these events, cost savings and greater safety for aviation and other logistical operations. In addition, these case studies will be a valuable resource for forecaster training and extend some previous related efforts (Cayette, 1998 and 1999; ATS, 1999).

6. ACKNOWLEDGEMENTS

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