Chapter 10
Weather

Figure 10-1: Storm approaching. (photo by Tim Cully)

Weather in Antarctica is characterized by extremes: extreme temperatures, extreme winds, and extremely variable localized conditions. All of these extremes make Antarctica a difficult place to work and live. The temperatures can vary from below -40 degrees F to above freezing during the course of a season. The polar plateau experiences even colder temperatures because of its higher altitudes and greater distance from the moderating effect of the ocean. Moderate winds are common in Antarctica. It's an unusual day when there is not at least a breeze blowing. The winds take their toll on people, making camp chores such as setting up tents and operating Zodiacs difficult. More importantly, the winds increase the wind chill effect, thus making people more susceptible to hypothermia and frostbite.

The chart on the following page (figure 10-2) details the effects of wind on temperature.

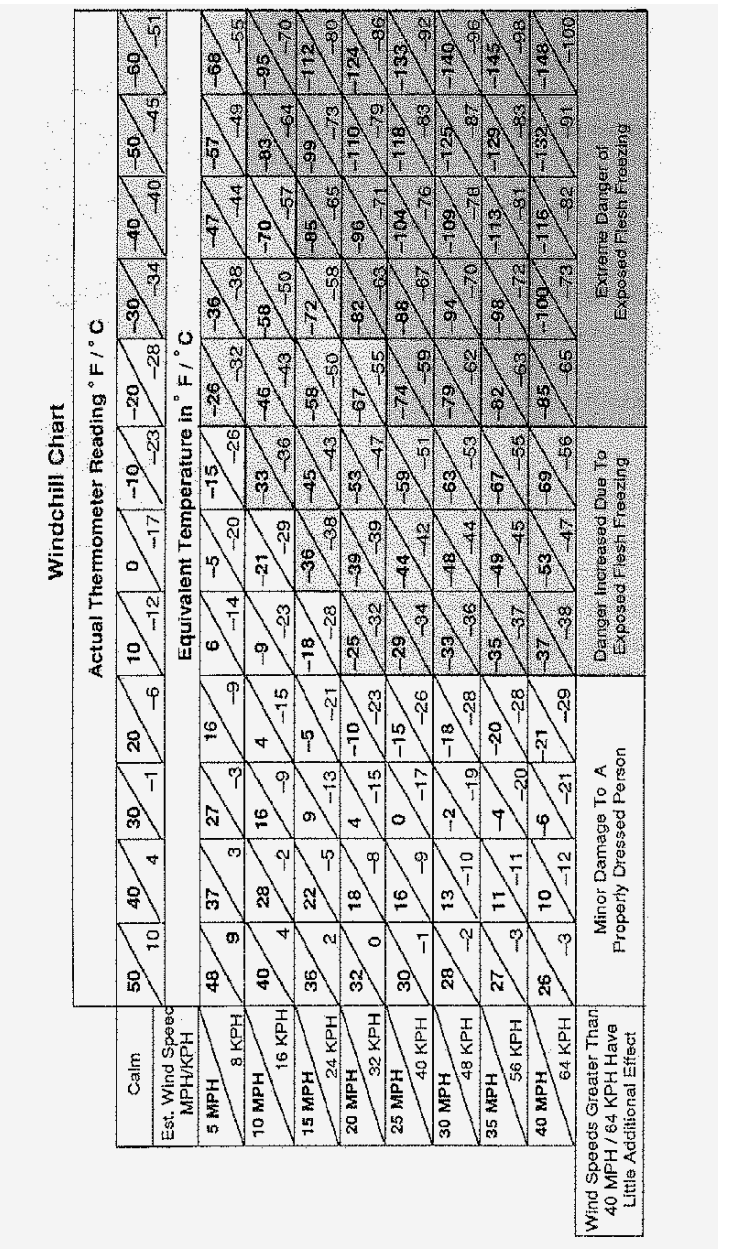

Figure 10-2: Windchill chart.

10.1 McMurdo Area Weather

Storms arrive quickly and are sometimes fierce enough to halt all outside activity. Storms can also be very localized. Weather in McMurdo can cause close to zero visibility with blowing snow (halting flight operations), while the Dry Valleys, which are 50 miles away from McMurdo, might be calm and sunny.

Approaching storms are usually preceded by high thin bands of cirrus clouds (mare's tails) followed by thicker layers of cirrus which may cause a halo-like effect around the sun. The clouds grow progressively thicker and lower over the next 6 to 12 hours until the arrival of low cumulus clouds and the main front. Blizzards, or "Herbies," can happen any time of year and and may last as little as several hours to as long as several days.

Storms approaching McMurdo Station usually arrive from the south in the gap between Black Island and White Island, an area known as "Herbie Alley." As the storms approach, they eventually obscure Minna Bluff with blowing snow or low clouds, at which point there's usually less than an hour before the bad weather hits.

Travel will be extremely difficult and dangerous during storms. Blowing snow or whiteouts can be disorienting and can make seeing crevasses or cracks in the sea ice impossible. Even moderate winds can produce a layer of dense, blowing snow that may be as thin as a few feet or as thick as 1000 feet.

A whiteout is an equally dangerous phenomenon. Thick, low clouds reduce surface definition, and the

horizon is obscured. It's difficult or impossible to know if you are on a flat or sloping surface. It is likewise difficult to judge distances or the size of objects. Travel should be avoided during whiteouts, unless there is an emergency.

10.1a McMurdo Weather Classifications

The McMurdo Weather Office issues weather forecasts every six hours. These forecasts are available by calling the Weather Office or Mac Ops. The weather office also issues a weather classification for the immediate vicinity of McMurdo that restricts certain activities when the weather deteriorates. These weather conditions are divided into the following three categories:

Condition III: Winds up to 48 knots, wind chill down to -75 degrees F, and visibility over 1/4th mile. Unrestricted travel and activity are allowed.

Condition II: Winds 48 to 55 knots, wind chill -75 to -100 degrees F, or visibility 100 feet to 1/4th mile. Restricted pedestrian traffic only between buildings is allowed. Vehicular travel is allowed in radio equipped, enclosed vehicles only, and check out is required.

Condition I: Winds over 55 knots, wind chill lower than -100 degrees F, or visibility less than 100 feet. Severe weather is in progress. All personnel must remain in buildings or the nearest shelter.

10.1b Weather Observations from the Field

Prior to deep-field put-ins, at least two members of your field team should attend a briefing at the Weather Office. At this office, you will be instructed in weather observations and how to relay this information to McMurdo. You'll also be issued a meteorological kit

Figure 10-3: Storm in McMurdo. (photo by Tim Cully)

that includes a thermometer, an anemometer, an altimeter, and a cloud identification chart. Refer to the booklet in the meteorological kit for in-depth information on field weather observations.

Taking a weather observation entails viewing the meteorological conditions at your camp and reporting those conditions in such a way that they can be visualized by the forecasters at McMurdo. A typical field weather observation in Antarctica relayed by radio includes the following:

Figure 10-4: Storm at Shackleton Glacier Camp. (photo by Tim Cully)

1. **Wind direction** is expressed in degrees (Grid North) and is rounded off to the nearest whole 10 degrees. Refer to Chapter 21: "Antarctic Navigation" for information on Grid North.

2. **Wind speed** is expressed in knots/hour. A wind gust is a sudden change in wind speed characterized by a variation of 10 knots between peak and lull. Both the prevailing wind speed and wind gust (if applicable) are reported. An anemometer is used to determine wind speed and direction.

3. **Visibility** is given in meters; it is dependent on the geographical features near your camp. Skiway markers, which are set up at known distances can be used to determine surface visibil-

ity. The maximum visibility on a clear day is seven miles, after which a flat ground horizon will fall away to a point that surface conditions cannot be observed.

4. **Cloud height** is expressed in feet. At an open field, cloud height is estimated. If you are in an area with geographical features of known elevations, use those features to determine cloud height. Cloud heights are reported "Above Ground Level (AGL)."

5. **Cloud type and cloud cell appearance** will help determine the height of a cloud layer. The atmosphere over the Antarctic is shallower than it is at the equator; therefore, the heights of cloud layers are lower.

   - **Low clouds (stratus and stratocumulus)** are commonly found at the surface and up to 6500 feet (AGL).
   - **Mid-level clouds (altostratus and altocumulus)** are generally found from 6500 to 13,000 feet (AGL).
   - **High clouds (cirrostratus and cirrus)** are found from 12,000 to 16,000 feet (AGL).

6. **Cloud coverage** is expressed in eighths of the sky. When reporting cloud layers, start at the ground and proceed upward.

Clear and few	Trace to 2/8ths of sky cover
Scattered	3/8ths to 4/8ths sky cover.

Broken	More than 4/8ths, but not total sky cover.
Overcast	Total sky cover.
Partial Obscurity	Sky is partially obscured, typically by snow or blowing snow. Some clouds are discernible.
Total Obscurity	Sky is totally obscured, typically by snow or blowing snow.

7. **Temperature** is given in degrees Celsius. Make sure that the thermometer is not directly exposed to sunlight. Protect the thermometer from the wind.

8. **Altimeter** setting is expressed in inches of mercury to the hundredths. The altimeter setting is the figure that incoming pilots will want the most, because it allows them to determine the altitude (in reference to mean sea level) at which the aircraft will make contact with the landing field.

9. The following **surface definition** terms should be used to report observations:

- **Good:** Snow surface features such as sastrugi, drifts, and gullies are easily identified by shadow.
- **Fair:** Snow surface features can be identified by contrast. No definite shadows exist.
- **Poor:** Snow surface features cannot be readily identified except from close up.

- **Nil:** Snow surface features cannot be identified. No shadows or contrast. Dark objects appear to float in the air.

10. The following **horizon definition** terms should be used to report observations:

- **Good:** Horizon is sharply defined by shadow or contrast.
- **Fair:** Horizon may be identified, but the contrast between sky and snow surface is not sharply defined.
- **Poor:** Horizon is barely discernible.
- **Nil:** Total loss of horizon, the snow surface merges with the whiteness of the sky.

10.1c Radio Transmissions to McMurdo regarding Weather Observations

The primary frequencies for passing weather observations are:

- **11553 kHz** for remote-site field parties.

- **4770 kHz** for Dry Valley and surrounding areas field parties.

10.2 Peninsula-Area Weather

Palmer Station's weather is dominated by its close proximity to the ocean. The nearby water provides the moderating influence that keeps Palmer's temperatures relatively mild (in comparison to other Antarctic loca-

tions) and reasonably constant, and it also acts as a ready source of moisture to fuel Palmer's ubiquitous precipitation.

Figure 10-5: Palmer Station in a snow storm. (photo by Dave Bell)

During the summer, the temperature at Palmer tends to stay in a very restricted range, from about 32 degrees F to 42 degrees F, though on rare calm sunny days it can climb to near 50 degrees F. Temperatures during the winter are much more variable than during the summer. The average winter maximum temperature is around 30F, with an average winter minimum of perhaps 15 degrees F to 20 degrees F. During a typical winter, the station might experience several cold spells, lasting from several days to as much as a week, during which the daily minimum temperature will dip below 0 degrees F, with the daily maximum remaining in single

digits. Palmer's extreme temperatures are 53.6 degrees F, recorded on 03 March 1985, and -23.8 degrees F, reached on 12 August 1980.

The dominant characteristic of Palmer Station's weather is frequent precipitation. While the total yearly precipitation is not extreme, averaging about 28 inches, it is remarkably evenly distributed. Heavy rain or snow is a rarity, but some form of precipitation is observed on about 80% of the days. Average cloud cover is 90-95%, and the most prevalent type of day includes unbroken low clouds with occasional light rain or snow. Snow can fall throughout the year, but the summer temperatures are high enough and rain is frequent enough to prevent accumulation until roughly April. Average yearly snowfall is approximately 12 feet, and the snow cover tends to increase until late October, peaking at an average depth of three to four feet, before it rapidly dwindles to nothing about a month later.

High winds are also common at Palmer, and while they are usually associated with well developed low- pressure systems, it's not uncommon for squalls to appear "out of nowhere," accompanied by winds that may increase from essentially calm to 30-40 knots in a matter of a few minutes. The average wind speed at Palmer is about 12 knots, but that average is composed of many calm days and many days with 20-40 knot winds throughout the day. It is rare for a week to go by without experiencing a wind gust in excess of 40 knots, and the vast majority of months include a peak gust above 60 knots.

Newcomers should be aware that the worst storms come out of the north-east. Groups working south of station should always be on guard. When the wind is strong and it starts to switch directions, special consideration should be made in regard to returning to station and/ or emergency landing contingencies. Watch the flags on the survival caches. If the wind starts to pick up and also begins switching directions, pay extra attention and prepare for worse weather. If it suddenly increases and becomes steady out of the north, prepare to head back to station.

All boaters should have “escape” strategies for their particular location. For example, working south of the station and getting hit by a storm out of the north, the team can skirt the glacier along shore to keep out of the wind and waves, and then get to Christy Cove. Getting around Bonaparte Point is usually the worst part. If it’s bad, tie up at Christy and walk home. Hence, anyone working south of station should have a good feel for Christy Cove (i.e. where the tie ups are, where the rocks are that can tear up the prop, etc.) since they may be using this area in an emergency.