Chapter 21
Antarctic Navigation

Land navigation in Antarctica has undergone a dramatic change over the past several years due to the increased availability of Global Positioning System (GPS) coverage and equipment.

While GPS is a valuable resource to field parties, it should not be relied upon as the sole method of navigation. There are several methods to plot position and navigate if a GPS is unavailable. Magnetic compasses, sun compasses, sextants, and dead reckoning are all valuable tools to the Antarctic traveler, but they each have their drawbacks.

Prior to your field deployment, you should choose the navigational methods that best suit your location and learn how to use them. You won't have time to figure it out in the field - you can't afford to be wrong while you're learning on the job.

21.1 Global Positioning System

There are still some problems with using GPS in the field. Coverage at the higher latitudes is limited to certain, yet predictable, hours of the day. At time, accuracy is diminished by the low incident angles of the satellites to the horizon. Before planning to use GPS, use the software provided with your system to check availability of coverage at your expected location. If

GPS is a part of your work in the field, you will likely have to plan your work day around the "windows" of satellite coverage.

21.2 Magnetic Compasses

Magnetic compasses must be modified for use in polar latitudes by reweighting the needle. As the compass gets closer to the South Pole, the south-seeking end of the needle is pulled downward toward the earth and will drag on its enclosure unless the proper nonmagnetic counterweight (copper wire) is added to the north-seeking end.

Field parties must be careful of localized magnetic variations. On Ross Island, for example, magnetic compasses are unusable because there is so much iron in the rock. Likewise, compasses are affected by the metal in vehicles. Bearings must be taken well away from such disturbing influences.

Navigation with magnetic compass over long distances is difficult because the magnetic variation (the difference between magnetic and true north) is so high, and changes significantly over short distances. Field parties may elect to travel by using a Grid North system (see the "Grid North" section), versus a magnetic or true-north system.

21.3 Grid North

Grid North is an artificially-convened reference direction which is taken to be parallel to the Greenwich

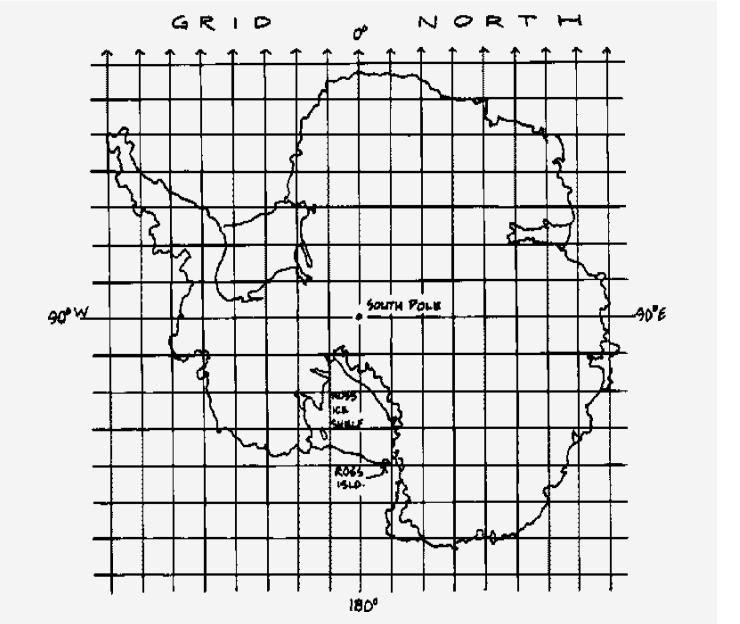

Figure 21-1: Grid North

Meridian. The north/south grid lines run parallel to each other and do not converge at the poles (see figure 21-1).

By contrast, meridians of longitude converge so sharply near the poles that expressing headings with respect to True North becomes impractical.

Aviators circumvent this problem by using Grid North's constant reference direction. This is not only practical for the aviator, but can also greatly simplify matters for the land traveler using a magnetic compass.

For locations south of the equator, the following rules apply:

Easterly Longitudes:

Grid direction =True direction + Longitude of your camp
True direction = Grid direction - Longitude of your camp

Westerly Longitudes:

Grid direction = True direction - Longitude of your camp
True direction = Grid direction +Longitude of your camp

Note: When giving a Field Weather Observation, wind direction must always be given in relation to Grid North.

21.4 Compasses and Sextants

Using compasses is an accurate way to determine bearings. Using sextants (in conjunction with an artificial horizon) is a good way to fix your position. Both methods require an accurate chronometer and extensive knowledge on how to use navigational tables to get good results.