

Basic Geodesy

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"Ideal" Maps

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One of the greatest difficulties that cartographers have is "projecting" the earth's curved surface onto a flat sheet of paper while minimizing the distortions. An example of a map distortion can be seen in Figures 1 and 2. Figure 1 shows that Greenland's land area is much smaller than South America. However, the relative size of Greenland to South America is distorted on the Mercator projection shown in Figure 2 and Greenland appears, incorrectly, to be larger than South America. If it were possible to produce a perfect or "ideal" map, it would have all of the following properties:

1. All distances should be correct. (Equidistant property)
2. All directions should be correct. (Azimuthal property)
3. All areas should retain their correct shape. (Conformal property)
4. Meridians (lines of longitude) and parallels (lines of latitude) should intersect at right angles. (also, Conformal property)
5. All areas should retain their relative size. (Equal Area property)
6. Great circles (a circle on the surface of the earth, the plane of which passes through the center of the earth) should be represented by straight lines. (Gnomonic projection)
7. Rhumb lines (a line on the surface of the earth making the same angle with all meridians) should appear as straight lines. (Mercator projection)

It is important to note that maps may have some of these properties (or some of them over a portion of the map), but will never have all of these properties.

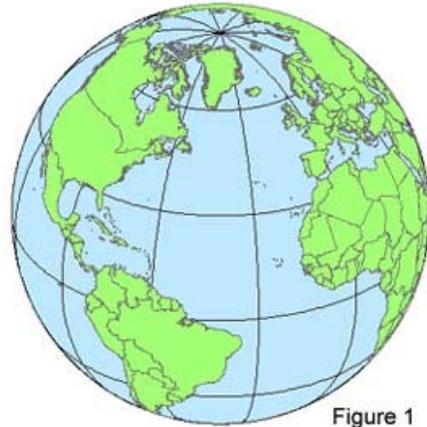


Figure 1

Even though a Mercator projection is a poor projection for showing relative sizes, it does have the benefit that bearings plot as straight lines, which is the reason it is commonly used on hydrographic charts.



Figure 2

Map Projections

The next article will begin discussing map projections and projection surfaces.