



Inappropriate Projection Grids

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Every now and then, we receive a call from someone whose soundings plot downtown instead of in the harbor, so we are no stranger to an occasional bad sign in the datum transformation parameters or some other small geodetic peccadillo. Recently, a surveyor decided to use a Mercator projection below 60 degrees South and was complaining about the skewed survey results.

Mercator is one of the oldest map projections still in use. It is a cylindrical projection, meaning that spherical surface of the Earth is stretched onto a vertical cylinder and that stretching becomes bigger and bigger as you approach the poles. It's great if you are operating between the Tropics, but starts to suffer larger and larger distortions as you continue northward (or southward). It's the reason everybody tells me I live in such a big country! (Yes Canada is big country but the Mercator projection makes it appear even larger than it actually is.)

One way to check to see if your projection choice is appropriate is to convert a point in the GRID CONVERSION program and then check the Scale Factor. In the example below, the Scale Factor for a Mercator grid at 63°S is 2.19. A layman's explanation would be that 1,000m measured in the real world would measure 2,190m on your projection.

FIGURE 1. *Geodetic Parameters (left), Grid Conversion Test (right)*

The left window, 'Hypack - Geodetic parameters', shows the following settings:

- Predefined: Grids: none, Zone: [empty]
- Projection: Mercator
- Central Meridian: 000d00'00.0000"E
- Reference latitude: 00d00'00.0000"N
- Distance Unit: Meter
- Depth Unit: same as horizontal
- False Easting (X): 0
- False Northing (Y): 0
- Elevation Mode (Z-axis positive going up): [checked]
- Datum transformation parameters:
 - Ellipsoid: WGS-84
 - Semi-Major Axis: 6378137.000
 - Flattening (1/f): 298.257223563
 - Delta X: 0.00, Delta Y: 0.00, Delta Z: 0.00
 - Delta X': 0.00000, Delta Y': 0.00000, Delta Z': 0.00000
 - Delta Scale: 0.00000
 - Datum shift file: [empty]
- Geoid Model: [empty]
- Local Grid Adjustment: [unchecked]
- Orthometric Height Correction: 0.000 m
- VDatum zone: (none)
- Chart datum: user defined
- Chart datum level above geoid: 0.00

The right window, 'Grid Conversion - test', shows the following settings:

- Geographic to XY: Latitude: 63.00000000dS, Longitude: 060.00000000dw, Ellipsoid: WGS-84
- Datum Transformation: [unchecked]
- XY to Geographic: Easting(X): -6679169.448 m, Northing(Y): -9062139.390 m, Scale Factor: 2.196828 (highlighted in red)
- Lat/Lon Options: Deg Min Sec, Deg Min, Decimal Degrees (selected)
- Height Conversion: Ellipsoidal, Orthometric, Chart Datum (all unchecked)
- Point Name: Antarctic Circle
- Buttons: Convert, Print...
- Table:

Name	Latitude	Longitude	Easting	Northing
Antarctic Circle	63.00000000dS	060.00000000dw	-6679169.448	-9062139.390

Buttons at the bottom: Convert from list, Delete Point, Clear List, Save List..., Close.

If you are not very familiar with projections, it might be a good time to take a look at the "Bible" of map projections. We highly recommend "John P. Snyder, Map Projections – A Working Manual". It can be found online at: <http://pubs.er.usgs.gov/publication/pp1395>.