



New Projection Available in HYPACK®

By Mircea Neacsu

Our friends at the French hydrographic service wanted to install HYPACK® for data collection on a sailing boat that is undergoing a circumpolar expedition (for more details about this cool project check <http://oceans.taraexpeditions.org/>). They wanted to setup a single HYPACK® project for the whole expedition and thought of using the Polar Stereographic projection.

They asked us for an opinion and, in turn, we went to the good old Snyder¹ manual to check what the best projection to use would be.

According to Snyder, there are three possibilities: Polar Stereographic, Azimuthal Equidistant and Azimuthal Equal Area. The scale factors (distortion) at 70° are 3%, 2% and 1% respectively. As maps go, these scale factors are an order of magnitude larger than those encountered on a normal map (for a UTM map the scale factor is somewhere around 0.05%) but they are still usable and that is the price to pay if you want to use a single projection over such a large area.

In order to help them, we decided to implement the Azimuthal Equal Area projection to shave two percentage points from their projection error.

Being an equal area projection, it has different scale factors along the latitude (h) and along the meridians (k). As one goes above one (inflating) the other one is less than one (deflating) to maintain a constant area for a feature.



1. Snyder, John P. Map Projections – A Working Manual , USGS Professional Paper 1395.

FIGURE 1. Azimuthal Equal Area Projection

TABLE 29.—Ellipsoidal polar Lambert Azimuthal Equal-Area projection (International ellipsoid)

Latitude	Radius, meters	<i>h</i>	<i>k</i>
90°	0.0	1.000000	1.000000
89	111,698.4	.999962	1.000038
88	223,387.7	.999848	1.000152
87	335,058.5	.999657	1.000343
86	446,701.8	.999391	1.000610
85	558,308.3	.999048	1.000953
84	669,868.8	.998630	1.001372
83	781,374.2	.998135	1.001869
82	892,815.4	.997564	1.002442
81	1,004,183.1	.996918	1.003092
80	1,115,468.3	.996195	1.003820
79	1,226,661.9	.995397	1.004625
78	1,337,754.7	.994522	1.005508
77	1,448,737.6	.993573	1.006469
76	1,559,601.7	.992547	1.007509
75	1,670,337.9	.991446	1.008628
74	1,780,937.2	.990270	1.009826
73	1,891,390.6	.989018	1.011104
72	2,001,689.2	.987691	1.012462
71	2,111,824.0	.986289	1.013902
70	2,221,786.2	.984812	1.015422

h = scale factor along meridian.

k = scale factor along parallel.

So now you know, if you find yourself circumnavigating the pole and you don't have the time to fiddle around with your HYPACK® project you can just select Azimuthal Equal Area projection and off you go:

Don't forget to write us when you get back!

Hypack - Geodetic parameters

File Tools Options Help

Predefined
Grids: none
Zone:
Distance Unit: Meter
Depth Unit: same as horizontal
Vertical Datum:
Elevation Mode (Z-axis positive going up): ☐

Ellipsoid: WGS-84
Semi-Major Axis: 6378137.000
Flattening (1/f): 298.257223563

Projection: Azimuthal Equal Area
Central Meridian: 000d00'00.0000"E
Reference Latitude: 90d00'00.0000"N

Datum transformation parameters
Delta X: 0.00 Delta rX: 0.00000
Delta Y: 0.00 Delta rY: 0.00000
Delta Z: 0.00 Delta rZ: 0.00000
Delta Scale: 0.00000
Datum shift file:
False Easting (X): 3000000.0000
False Northing (Y): 2000000.0000
☐ Local Grid Adjustment Local Grid

RTK Tide Calculation
☒ Not using RTK tide
☐ (K-N) from KTD file
☐ N from geoid model, K from KTD file
☐ N from geoid model, K from VDatum
☐ N from geoid model, K from user value
☐ (K-N) from user value

Geoid Model:
Orthometric Height Correction: -0.016 m
VDatum zone:
Chart datum:
Chart datum level: 0.00

OK Cancel

FIGURE 2. An Example of a S-57 Chart Covering the Polar Area and Presented Using this New Projection

