The Wyoming State Plane Coordinate System
and
Transverse-Mercator Projections

Snow King Resort
Jackson, Wyoming, USA
March 26, 2003

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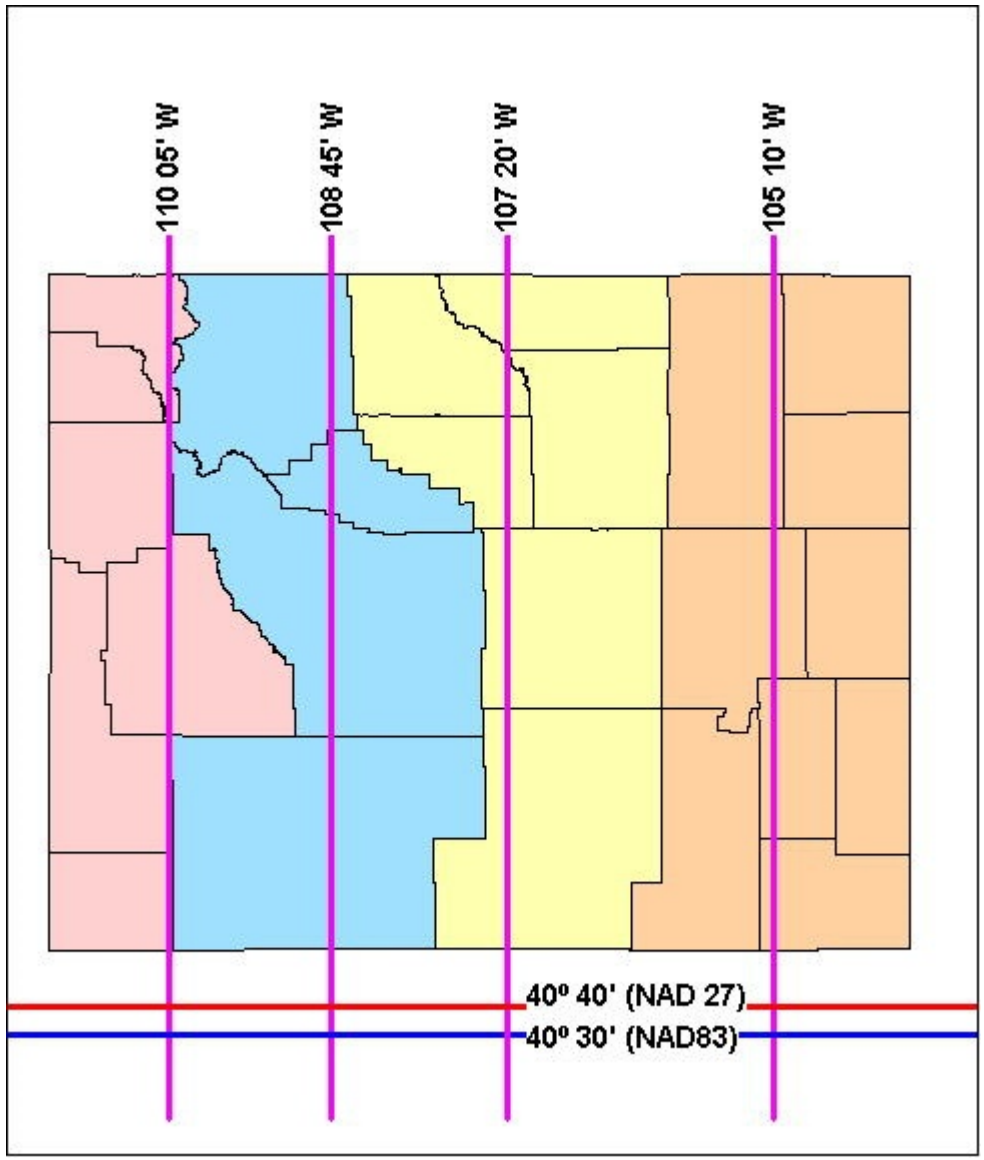
Wyoming SPCS Zones



Zone	Lon	Lat	Easting	Northing
4901 NAD27 (feet)	-105º 10'	40º 40'	500000	0
4901 NAD83 (feet)	-105º 10'	40º 30'	656166.667	0
4901 NAD83 (meters)	-105º 10'	40º 30'	200000	0
4902 NAD27 (feet)	-107º 20'	40º 40'	500000	0
4902 NAD83 (feet)	-107º 20'	40º 30'	1312333.333	328083.333
4902 NAD83 (meters)	-107º 20'	40º 30'	400000	100000
4903 NAD27 (feet)	-108º 45'	40º 40'	500000	0
4903 NAD83 (feet)	-108º 45'	40º 30'	1968500.000	0
4903 NAD83 (meters)	-108º 45'	40º 30'	600000	0
4901 NAD27 (feet)	-110º 05'	40º 40'	500000	0
4901 NAD83 (feet)	-110º 05'	40º 30'	2624666.667	328083.333
4901 NAD83 (feet)	-110º 05'	40º 30'	800000	100000

Convert MapInfo colors to HTML colors

http://legisweb.state.wy.us/statutes/titles/title34/chapter25.htm

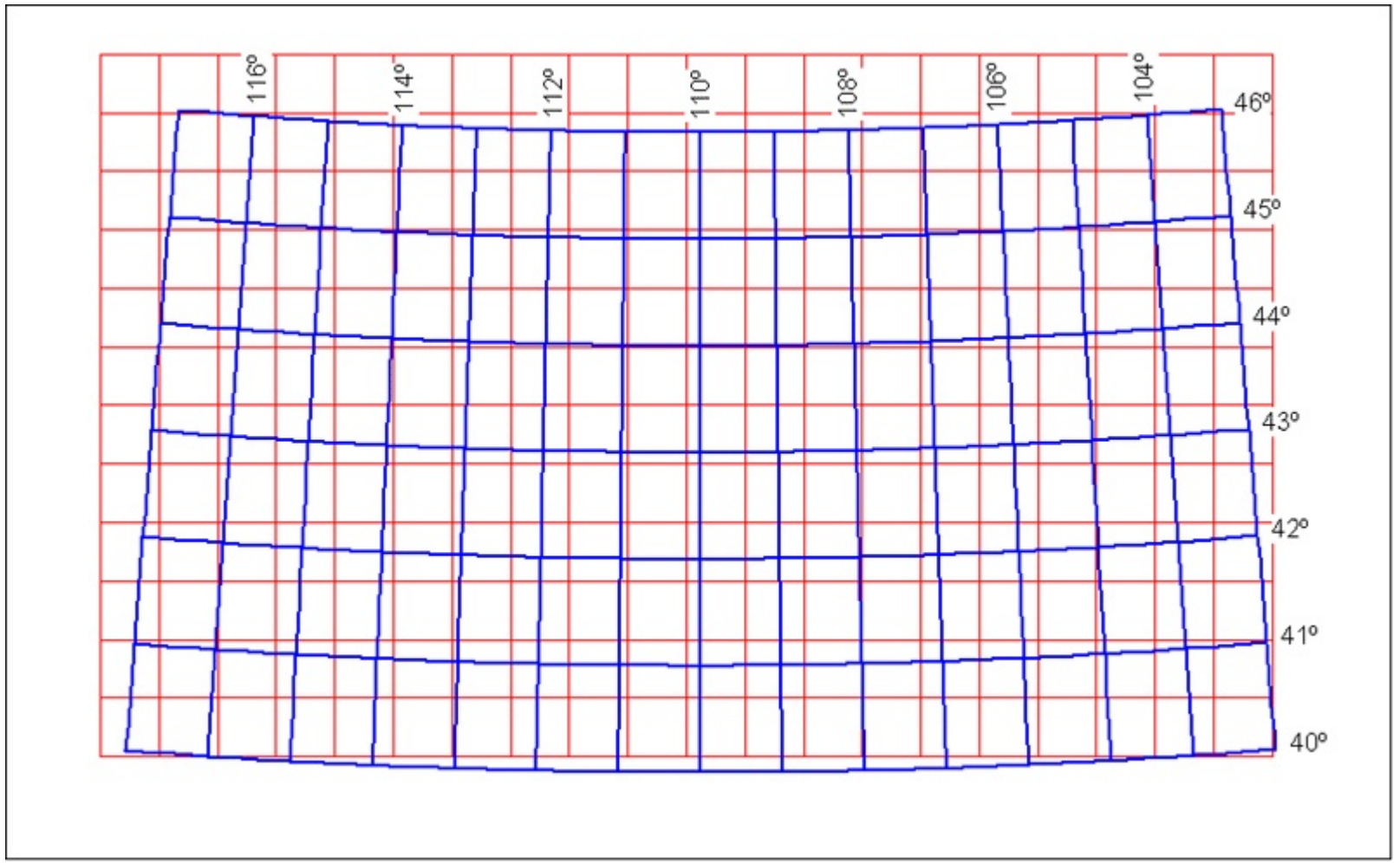
U.S. Survey Foot versus the International Foot

- The State Plane Coordinate System of 1927 was published in "U.S. Survey Feet."
- By 1959, except for surveying and mapping applications, the United States had switched to the "International Foot."
- The SPCS 83 is presently published by NGS only in meters.

11 States use the U.S. Survey Foot
6 States use the International Foot
remaining states lack legislation specifying the use of feet

Standard (or "international") foot:	0.3048 meters		
U.S. survey foot:	1200/3937 meters	(0.3048006096)	meters
Town of Jackson:	745115.57	431195.32	meters
	2444600.00	1414680.00	US Survey feet
	2444604.89	1414682.83	International Feet
	4.89	2.82	error

Wyoming West Grid
Latitude - Longitude



Grid to Geodetic.pdf (thanks to Skylar V. Wilson, PLS)

Rotation Geodetic

Grid to Geodetic Azimuth

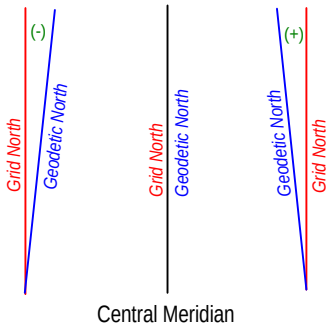
To convert from grid azimuth to geodetic azimuth, do the following:

1. If you are working in bearings, convert them to azimuth.
2. Locate the convergence angle (also known as delta-alpha angle) for a point on the line you want to convert. To be more accurate, find the convergence angles for both points on the line and average them. Note that the angles are signed (+ or -). The sign is important.
3. Algebraically add the convergence angle to the grid azimuth. The result is the geodetic azimuth of the line.

The sign of the angle will be determined by which side of the Central Meridian the line in question is located. It will be negative if it is west, and positive if it is east.

Why it seems that the signs of the convergence angles are opposite of what they should be.

Whenever we see a sketch or diagram of the relationship of grid north to geodetic north, it looks like the one below.



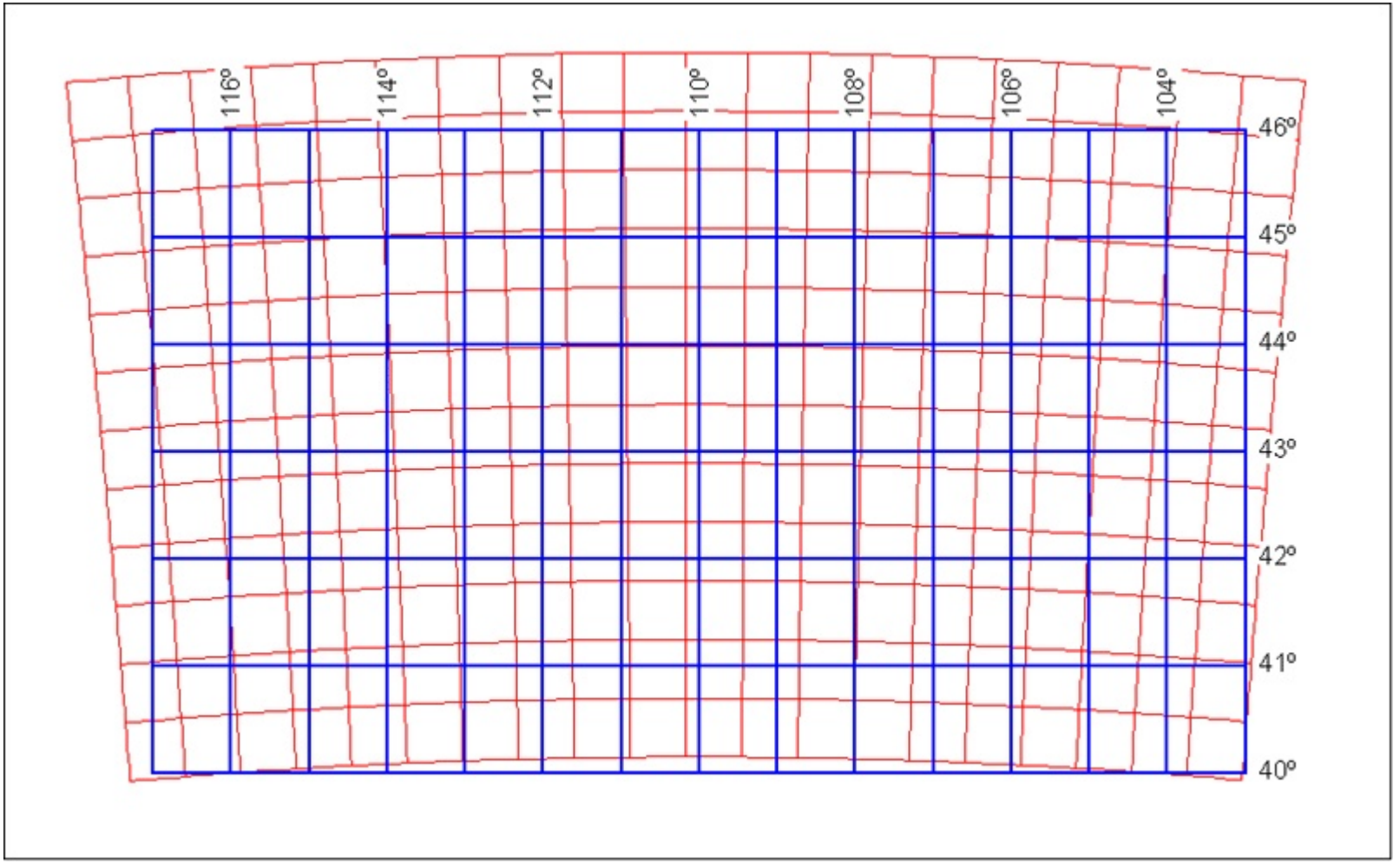
Let's consider a position easterly of the Central Meridian. By looking at the sketch, it would appear that adding the convergence angle to the grid azimuth would be exactly the opposite of what we should do. I think the problem is one of perception. We want to rotate that grid north line counterclockwise so it "matches" geodetic north. It won't, except at the Central Meridian.

By taking the right hand side of the sketch and rotating it until Geodetic North points straight up, the problem should become obvious. The farther east we move from the Central Meridian the more northeast our grid north becomes in relation to geodetic north. Since we want to know what the azimuth of the grid line is in relation to geodetic north, we add the convergence angle.

For example:

```
        grid azimuth of red line =  0°00'00"
              convergence angle = +0°10'00"
                                  ---------
     geodetic azimuth of red line = 0°10'00"
```

Latitude - Longitude
Wyoming West Grid

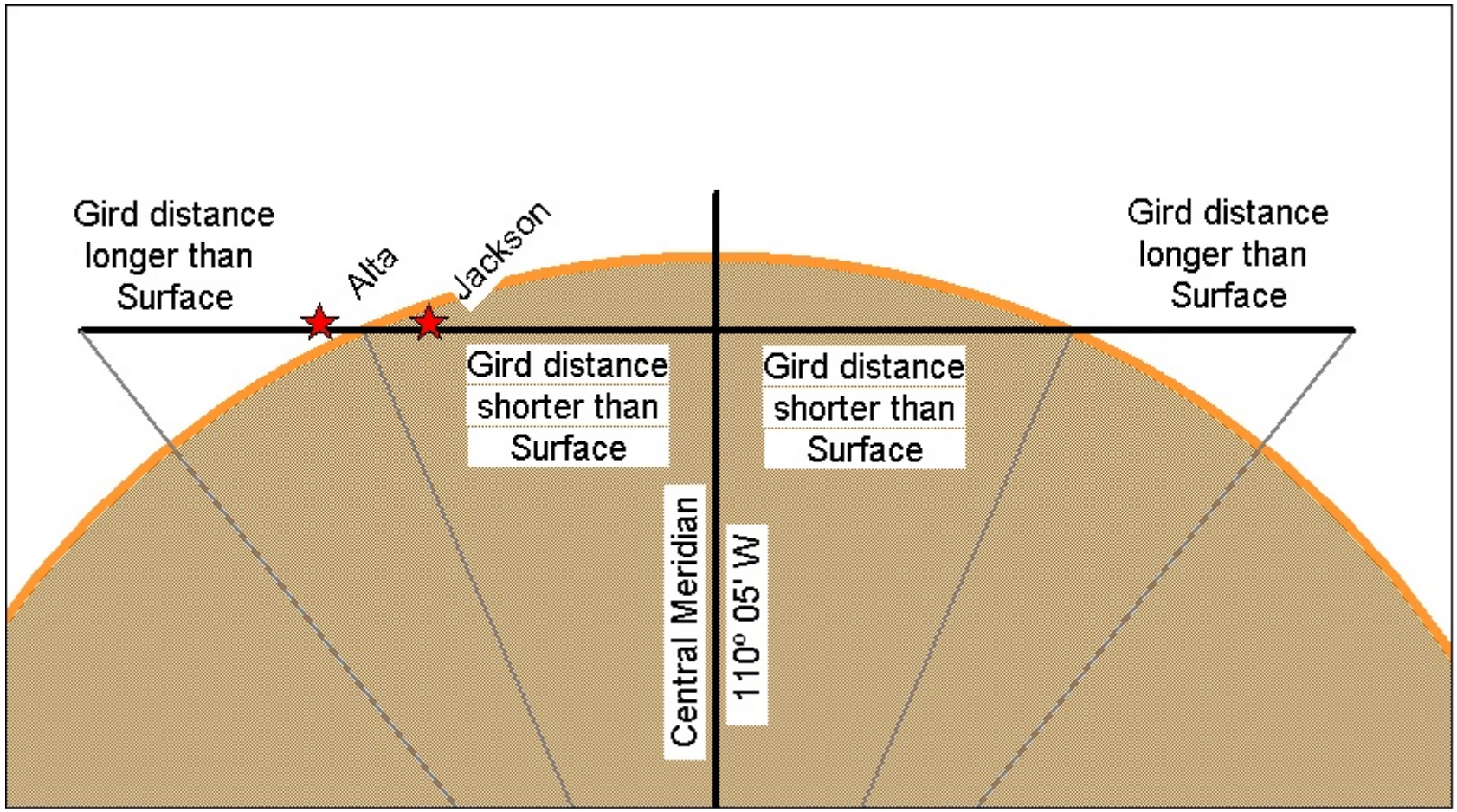


Grid to Geodetic.pdf (thanks to Skylar V. Wilson, PLS)

Projection Plane

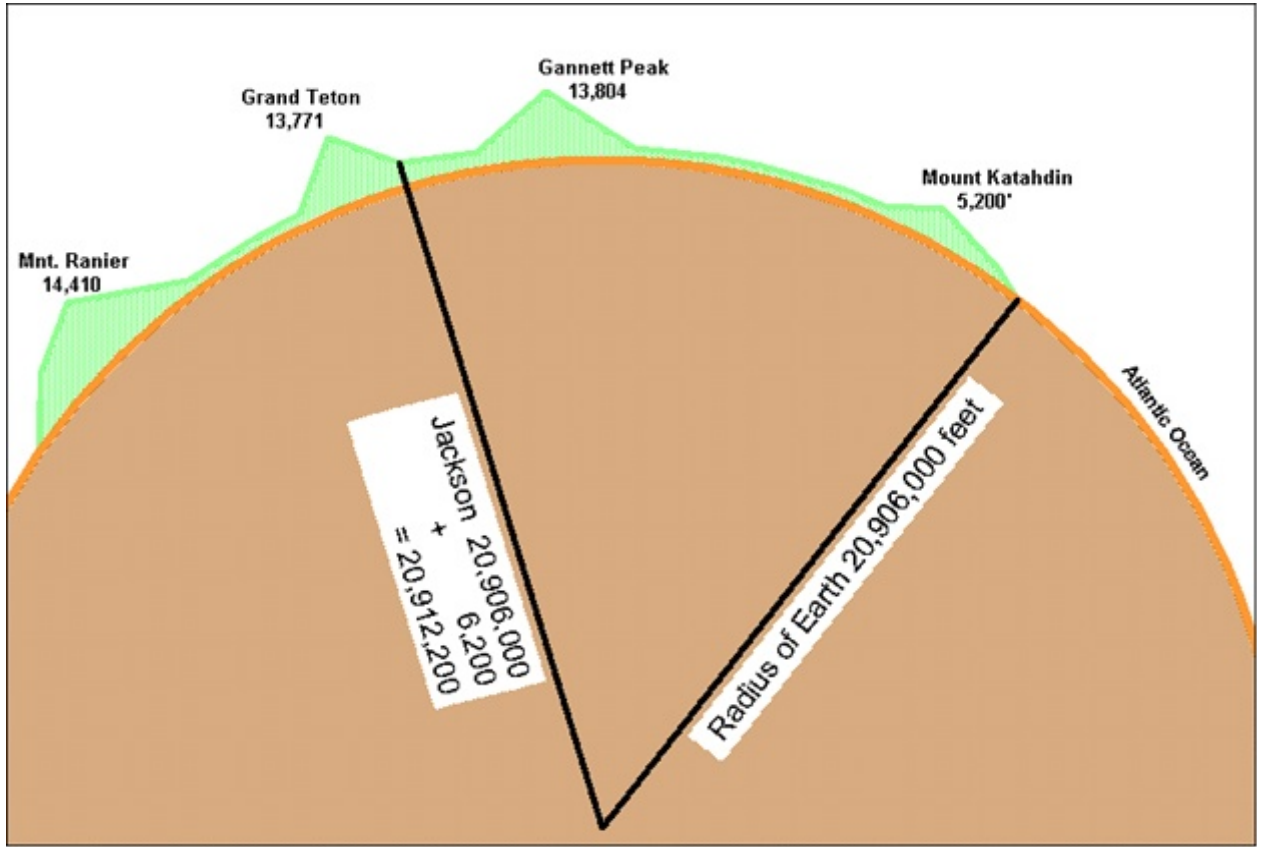
Projection Plane

Jackson	**110.761769 W**	**43.479951 N**	**scale factor 0.99997454**
Alta	**111.041390 W**	**43.753470 N**	**scale factor 1.00001069**



Elevation Scale Factor

Elevation Scale Factor
Earth's Radius / (Local Elevation + Earth Radius) = Elevation Factor
20,906,000 / 20,912,200 = 0.999703



Combined Scale Factor

Elevation Scale Factor * Projection Scale Factor = Combined Scale Factor

0.999703 * 0.999975 = 0.999678

Geodetic Azimuth = Grid Azimuth + Convergence Angle
Grid Azimuth = Geodetic Azimuth - Convergence Angle