Meridian Arc Length

The meridian arc distance (in meters if a is in meters) between latitude limits selected by the user is:

$$S_{\phi_1 - \phi_2} = a\,(1 - e^2)\ [A(\phi_2 - \phi_1) - (B/2)(\sin 2\phi_2 - \sin 2\phi_1) +$$

$$(C/4)(\sin 4\phi_2 - \sin 4\phi_1) - (D/6)(\sin 6\phi_2 - \sin 6\phi_1) +$$

$$(E/8)(\sin 8\phi_2 - \sin 8\phi_1) - (F/10)(\sin 10\phi_2 - \sin 10\phi_1)] \qquad (4)$$

where:

$$A = 1 + 3e^2/4 + 45e^4/16 + 175e^6/256 + 11025e^8/16384 + 43659e^{10}/65536$$

$$B = 3e^2/4 + 15e^4/16 + 525e^6/512 + 2205e^8/2048 + 72765e^{10}/16384$$

$$C = 15e^4/64 + 105e^6/256 + 2205e^8/4096 + 10395e^{10}/16384$$

$$D = 35e^6/512 + 315e^8/2048 + 31385e^{10}/131072$$

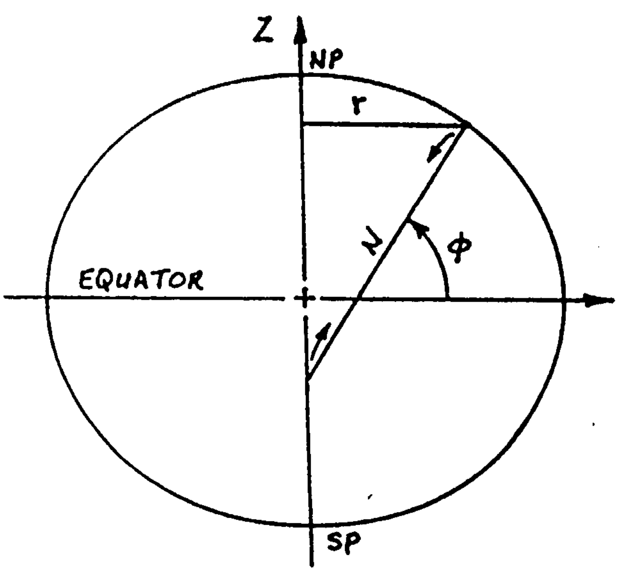
$$E = 315e^8/16384 + 3465e^{10}/65536$$

$$F = 693e^{10}/131072$$

Note in equation (4) the latitude difference in the "A" coefficient term is in radian units. And, if limits of 0° and 90° are chosen for latitude limits, the length of a meridian quadrant is:

$S_{quad} = a\,(1 - e^2)\,[A(\pi/2)]$ and should be close to 10,000,000 meters.

Length of a Parallel



A parallel of constant latitude on the ellipsoid describes a small circle (as opposed to a large circle) whose plane is parallel to the equatorial plane. A parallel crosses all meridians at 90° and is a circle whose radius is N cos ϕ. Since a parallel is a circle, its length is simply 2π N cos ϕ. Partial length of a parallel is computed as a proportionate part of the total circumference or computed directly as (longitudes in radians):

$$L_p = (\lambda_2 - \lambda_1)\,N\cos\phi = N\cos\phi\,d\lambda$$