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April 4, 2008

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To: VSRT Group
From: Alan E.E. Rogers
Subject: Calculation of a geometry of antenna beam intersection with the mesosphere.

The calculation of the location of the region sensed by the ozone spectrometer involves several coordinate transformations (see Figure 1 for geometry) as follows:

- 1] Transform latitude and longitude of the antenna to rectangular coordinates x, y, z where
 x is the direction of zero longitude
 z is the direction of the Earth's pole
- 2] Calculate the distance from the antenna to the mesosphere say at the height of 100 km using the method given in memo #33.
- 3] Derive the local coordinates
 $E = d \sin (az) \cos (el)$
 $N = d \cos (az) \cos (el)$
 $U = d \sin (el)$

Where d = distance from 2]

az, el = azimuth and elevation of the antenna

- 4] Transform E, N, U to x, y, z and add to the x, y, z coordinates of the antenna
- 5] Transform x, y, z to latitude and longitude

For the setup at CHS

Antenna potions = 42 37.298, -71 22.54 (deg, min)

Antenna $az = 172 \pm 2$ degrees

$el = 8 \pm 1$ degrees

Intersection with mesosphere at 100 km at 37.813, - 70.525 (deg)

Also shown in Figure 1 is the "local" and "Earth" horizons at altitude. For an altitude of 100 km the "Earth" horizon is about 10 degrees below the local horizon.

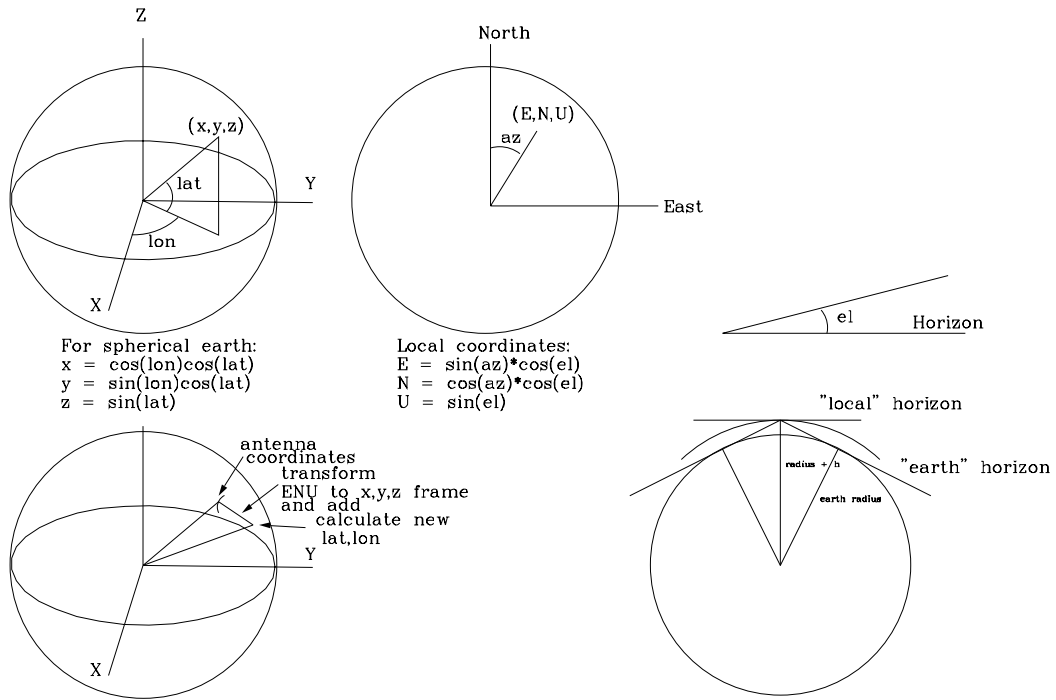


Figure 1.