

II.1-HRAPGRID HYDROLOGIC RAINFALL ANALYSIS PROJECT (HRAP) GRID SYSTEM

The Hydrologic Rainfall Analysis Project (HRAP) grid system is used for precipitation estimations from the WSR-88D radars.

The grid is based on a polar stereo graphic map projection with a standard latitude of 60° North and standard longitude of 105° West.

The mesh length at 60° North latitude is 4.7625 KM.

Mesh lengths for other latitudes can be computed from:

$$zmesh = 4.7625 / ((1 + \sin(60)) / (1 + \sin(xlat))) \quad (1)$$

where $zmesh$ is the mesh length in KM
 $xlat$ is the latitude

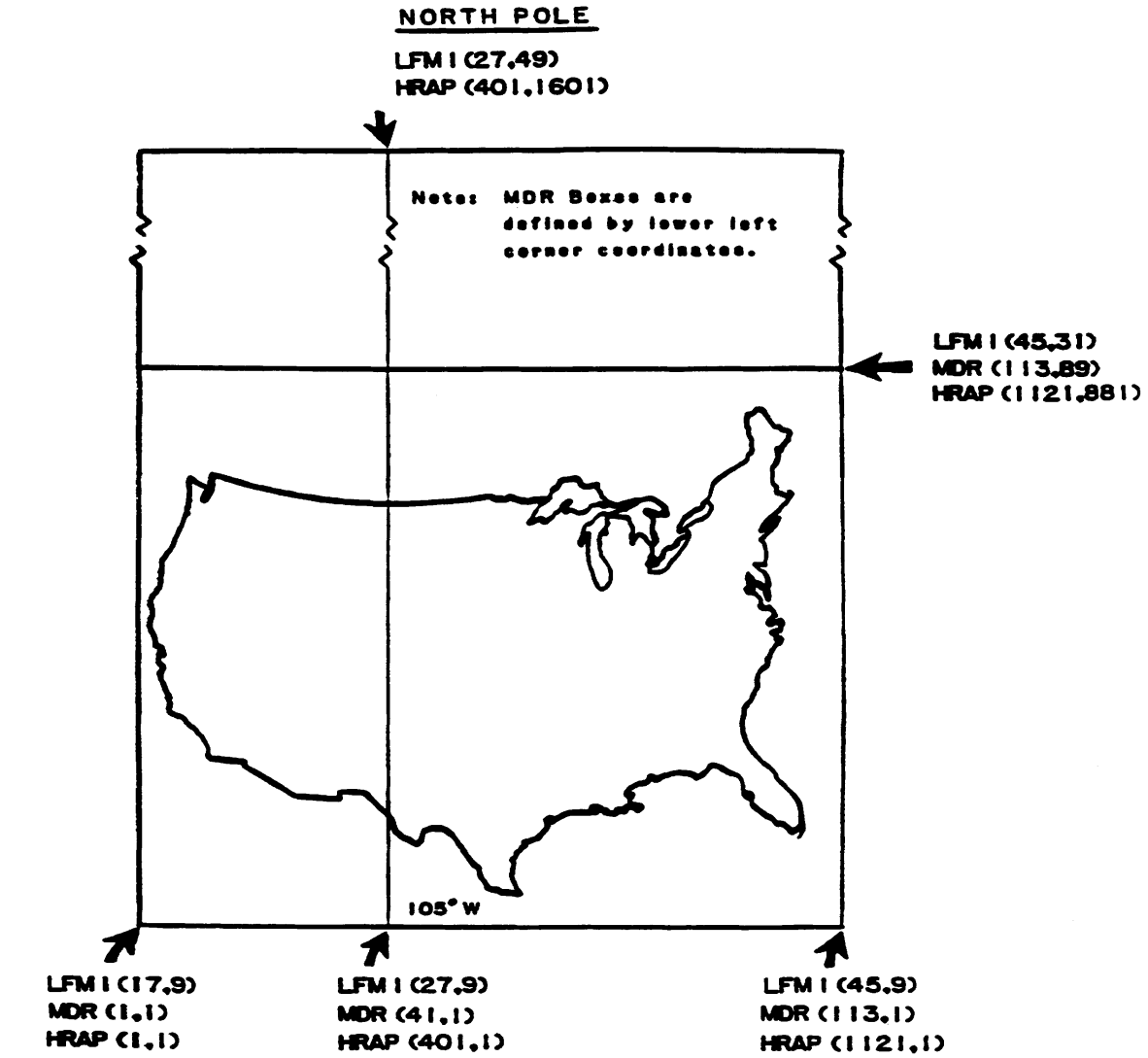
The grid is positioned such that coordinates (401,1601) are at the North Pole, resulting in all positive coordinates within the United States. The coordinates of a point P(X,Y) are computed as follows:

$$\begin{aligned} RE &= (EARTH * (1 + \sin(60))) / xmesh \\ R &= (RE * \cos(xlat)) / (1 + \sin(xlat)) \\ WLONG &= xlon + 75 \\ X &= R * \sin(WLONG) + 401 \\ Y &= R * \cos(WLONG) + 1601 \end{aligned}$$

where $EARTH$ is the radius of the earth (6371.2 KM)
 $xmesh$ is the mesh length at 60° latitude (4.7625 KM)
 $xlat$ is the latitude of point to be converted (decimal degrees)
 $xlon$ is the longitude of point to be converted (decimal degrees)

The orientation and mesh length of the grid was selected such that it contains the National Meteorological Center (NMC) Limited Fine Mesh I (LFM I) and the NWS Manually Digitized Radar (MDR) grids as subsets. The HRAP grid mesh length is 1/40 the size of the LFM I mesh length and 1/10 the size of the MDR mesh length. The coordinate systems are shown in Figure 1.

Figure 1. LFM I, MDR and HRAP Coordinate Systems



CONVERSIONS:

X Coordinates

$$\text{LFM I} = \left(\frac{\text{MDR} - 1}{4} \right) + 17$$

$$\text{LFM I} = \left(\frac{\text{HRAP} - 1}{40} \right) + 17$$

$$\text{MDR} = \left(\frac{\text{HRAP} - 1}{10} \right) + 1$$

Y Coordinates

$$\text{LFM I} = \left(\frac{\text{MDR} - 1}{4} \right) + 9$$

$$\text{LFM I} = \left(\frac{\text{HRAP} - 1}{40} \right) + 9$$

$$\text{MDR} = \left(\frac{\text{HRAP} - 1}{10} \right) + 1$$