CF-NetCDF

Proposed grid mapping for radar and lidar observations (Appendix F):

Radar/Lidar Radial Scan

`grid_mapping_name = radar_lidar_radial_scan`

Map parameters:

- **`latitude_of_projection_origin`**
- **`longitude_of_projection_origin`**
- **`observation_point_height`**

Map coordinates:

The line-of-sight slant **range**, **azimuth** and **elevation** coordinates are identified by the `standard_name` attribute values `line_of_sight_distance_from_instrument`, `sensor_to_target_azimuth_angle` and `sensor_to_target_elevation_angle` respectively. (These standard names have been requested for approval from the CF standard names committee).

Notes:

A general description of radar projection is given in [Doviak], page 21, equation 2.28b. There is no corresponding projection in PROJ.4.

The projection coordinates (**range**, **azimuth** and **elevation**) may be stored as either coordinate variables or auxiliary coordinate variables. It is common for radar/lidar data to be sored in a 2D variable with range and time dimensions. In this situation the azimuth and elevation coordinate variables should be provided as auxiliary coordinates on the time dimension.

Addition to Table F.1. Grid Mapping Attributes:

Attribute	Type	Description
observation_point_height	N	Records the height, in meters, of the instrument above the ellipsoid (or sphere). Used by radial_lidar_radial_scan projections to indicate the altitude of the sensor to which the polar coordinate system is referenced.

For a ground-based radar, the beam generally travels straight along a great circle, but bends in height as it is affected by refractive index changes in the atmosphere. The standard correction for refraction is to use a curvature of 4/3 the earth's radius, bending downwards away from the line of straight propagation. The correction from slant range to surface range is computed using the cosine of the elevation angle. In (x,y), since the beams follow great circles, the nominal mapping projection, after

correcting for elevation, is the **Azimuthal Equidistant Projection** with the origin at the instrument location.

References for radar propagation equation:

Doviak, R.J., and D.S. Zrnic, Doppler Radar and Weather Observations, pages 14-28, Second edition, 1993, Academic Press, 562pp.

Rauber, R.M., and S.W. Nesbitt, Radar Meteorology A First Course, pages 66-74. 2018. Wiley Blackwell.

Wikipedia: https://en.wikipedia.org/wiki/Radar_horizon