HOW TO CREATE A PERSPECTIVE PROJECTION IN IDL

Do the following:

1. Decide where you want the pole of your projection to be. You can define the center in terms of Galactic or equatorial coordinates; we'll talk in terms of Galactic coordinates here as an example. Let the Galactic coordinates of your perspective pole be (gl_{pole}, bg_{pole}).

   Your projection pole defines a new spherical coordinate system. A particular position in Galactic coordinates is specified by (gl, gb) and in your new system it is specified by the angles $(long, lat)$. Given (gl, gb), you must find $(long, lat)$ using a proper spherical coordinate transformation using the rotation matrix **rot** that relates your projection to the Galactic one.

   To determine the rotation matrix **rtot**, use our procedure

   `rmatrix, gl_pole, gb_pole, rtot`

2. For your particular point, we have our coordinate conversion procedure

   `sph_coord_conv, gl, gb, rtot, long, lat`

3. The perspective projection represents the your particular position's angular coordinates $(long, lat)$ in terms of linear coordinates on the projection plane x and y, whose origin is the pole of your projection. The origin has sky coordinates (gl_{pole}, bg_{pole}). It's conceptually simpler to think of the projection plane in terms of polar coordinates R and θ, where as usual $R = (x^2 + y^2)^{1/2}$ and $\theta = \mathrm{atan}(y/x)$. Then R is uniquely related to lat and θ to $long$.

   For a stereographic projection,

   $$R = \tan\left(\frac{90. - lat}{2}\right) \tag{1}$$

   and

   $$\theta = long \ + \ longoffset \tag{2}$$

   where $longoffset$ is a zero point of your own choosing and is a keyword in `rmatrix`; you can leave it equal to zero. For a gnomic projection, replace equation 1 by

   $$R = \tan(90. - lat) \tag{3}$$

   For these, you can use our procedure `stereographic.pro` .