

Demonstration of Spherical Harmonics

The SPH program is provided by Phil McFadden of Geoscience Australia (formerly Australian Geological Survey Organisation). It is a graphical representation of the spherical harmonics (see Figure 1.15) used in global modeling of the Earth's main field. To run the program, place your disk in the floppy drive and enter the letters SPH. The screen prompt will ask for the degree (n) of the polynomial that is desired; enter any value less than 17. Next, the prompt will ask you to enter the order (m) of the desired polynomial; select any value less than or equal to the n you have already selected. The program allows you to view the spherical surface at different rotations and tilts. The next prompt asks for the step size (in degrees) that you wish to have for rotation of the figure about the pole (e.g., 20). Then you are asked for the step size that you want for tilting the pole of the figure toward you (e.g., 20). An example screen is shown below.

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E:\web\projects\wally>sph
Enter degree n: 10
Enter order m, less than or equal to 10: 10
Enter angle of rotation away from vertical: 11
Enter rotation about vertical: 30

Program displays graphical representation of the
spherical harmonics which user can manipulate
with keyboard arrow keys.
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The rotation of the small slash in the upper left corner of your screen indicates that the computation is being processed. The displayed spherical polynomial surface is colored light green for values above the base-level sphere and dark green for those below. Use the S key to add (or remove) a grid of the base sphere in red line color. The up, down, right, and left arrow keys of your computer can be used to rotate or tilt the figure in degree steps of the increment size you selected at the start. The space bar can be used to select a new polynomial figure. The ESC key ends the program. The spherical harmonic, Schmidt normalized Legendre polynomials of degree n and order m are used to fit the global measurements of the main geomagnetic field producing the IGRF and DGRF Gauss coefficients g and h listed in ALL-IGRF.TAB below. A considerably more detailed form of this program along with a computation of associated field components can be obtained by writing to Phil.Mcfadden@ga.gov.au for his new version of SPH.