Technical Information Page for G99SSS, GEOID99 and DEFLEC99

G99SSS

The G99SSS geoid model is a purely gravimetric, geocentric geoid model covering the Conterminous United States. Input data for G99SSS consisted of:

- ☐ 2.6 million terrestrial, ship,and altimetric gravity measurements
- ☐ 30 arc second Digital Elevation Data
- ☐ A 1 arcsecond DEM for the Northwest USA (NGSDEM99)
- ☐ The EGM96 global geopotential model

Using EGM96 as an underlying long wavelength model, G99SSS was computed using a 1-D FFT remove/compute/restore application of the spherical Stokes integral, where Faye anomalies approximated Helmert anomalies. In computing G99SSS, the geopotential value of the geoid was chosen as $W_0 = 62636856.88 \ m^2 / s^2$. The G99SSS geoid undulations refer to the GRS-80 ellipsoid, centered at the ITRF97 origin. G99SSS was computed on a 1 x 1 arc minute grid, covering the Conterminous United States in the region 24-58 N latitude and 230-300 E longitude.

For most regions, thirty arcsecond resolution DEMs were employed for the terrain correction calculations. In the Northwest USA (39-49N, 234-256E), however, three arcsecond DEMs (decimated from the NGSDEM99 data) were used. Because the highest frequency information in the geoid comes mostly from local terrain, and the accuracy of NGSDEM99 surpassed previous models, it was theorized that geoid signal missing at the two arcminute spacing (such as for G96SSS) could be accurately modeled if the geoid were computed at one arcminute. Details on the successful validation of this theory appear in a forthcoming paper on G99SSS and GEOID99. Additionally, a one-arcminute grid retains more information in regions of higher density gravity observations. An ellipsoid correction to reduce the spherical assumption implicit in the Stokes equation was then applied to the intermediate model to create the G99SSS model (See Fei and Sideris, 1999).

GEOID99

The GEOID99 geoid model is (in the Conterminous United States) a hybrid geoid model, combining the gravimetric geoid G99SSS with datum transformations and NAD 83 GPS ellipsoid heights on NAVD 88 leveled bench marks. Unfortunately, the areas of Alaska, Hawaii and Puerto Rico and the U.S. Virgin Islands do not currently have GPS on Bench Mark data sufficient to create a hybrid model, and in those three areas, the GEOID99 model is a purely gravimetric, geocentric geoid model.

In addition to the gravimetric geoid model G99SSS, the GEOID99 model consisted of the following input:

- ☐ 6169 NAD 83 GPS heights on NAVD 88 leveled bench marks

The G99SSS geoid undulations were compared nationally these GPS/Bench Marks. After removing a 52 cm bias and a trend (0.15 ppm, 327 degrees azimuth), an 18.2 cm RMS difference remained. These