EGM96 & OSU91 in ANTARCTICA

OSU91 is a global geopotential model produced by the Ohio State University (OSU). This spherical harmonic model of the Earths gravitational potential incorporates Geosat altimeter data, surface gravity data represented by a 1° X 1° grid of mean gravity anomalies, and additional altimeter data below S63° latitude, in the Mediterranean Sea and in several areas of high frequency signal (Rapp et al 1991).

EGM96 is a later global geopotential model produced through a collaborative effort of the NASA Goddard Space Flight Centre (GSFC), the National Imagery and Mapping Agency (NIMA), and the Ohio State University (OSU). This improved spherical harmonic model of the Earths gravitational potential incorporates improved surface gravity data, altimeter derived gravity anomalies and direct altimeter ranges. The model was used to compute geoid undulations to an accuracy of 1 meter in areas where surface gravity data is available (Lemoine, 1998). EGM96 has been widely tested and "*the results of these comparisons showed a clear improvement of the new versions in terms of the mean value and standard deviation of the reduced observations against OSU91A, at least in some test areas*" (Arabelos & Tscherning).

In Antarctica the altimetry reached latitude 72° south, but not beyond. Airborne gravity was used in Antarctica to fill many of the gaps, resulting in an additional 6868 gravity points with a standard deviation of 4 mGal over the Antarctic. With this additional data, EGM96 undulations and the sea surface heights obtained from ERS-1 altimetry data, were shown to give a better agreement between than was possible with the OSU91 mode, especially in higher latitudes. (Lemoine, pp 5-28).

At AUSLIG's permanent GPS tracking stations, comparisons have been made between the geometric and gravimetric separation determined. These comparisons are shown in figure 1, and indicate that there is probably considerably uncertainty in both the mean sea level and the geoid-ellipsoid separation determined from both models.

Figure 2 shows the difference between EGM96 and OSU91 in the Antarctic region. This information was produced by computing 1° x 1° grids of OSU91 and EGM96 geoid-ellipsoid separation values and differencing them. The differences are typically of the order of a metre, which is within the expected noise of the models in this region, but there are areas where the differences are up to 9 metres.

References

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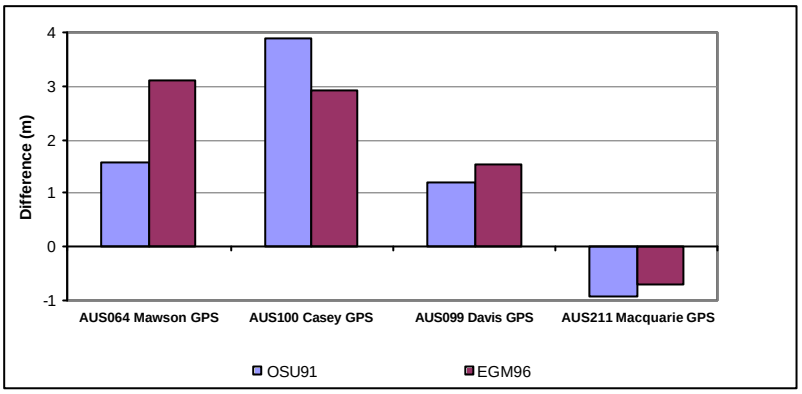

Figure 1: Comparison of Geometric and gravimetric geoid-ellipsoid separations at AUSLIG GPS stations, using OSU91 and EGM96

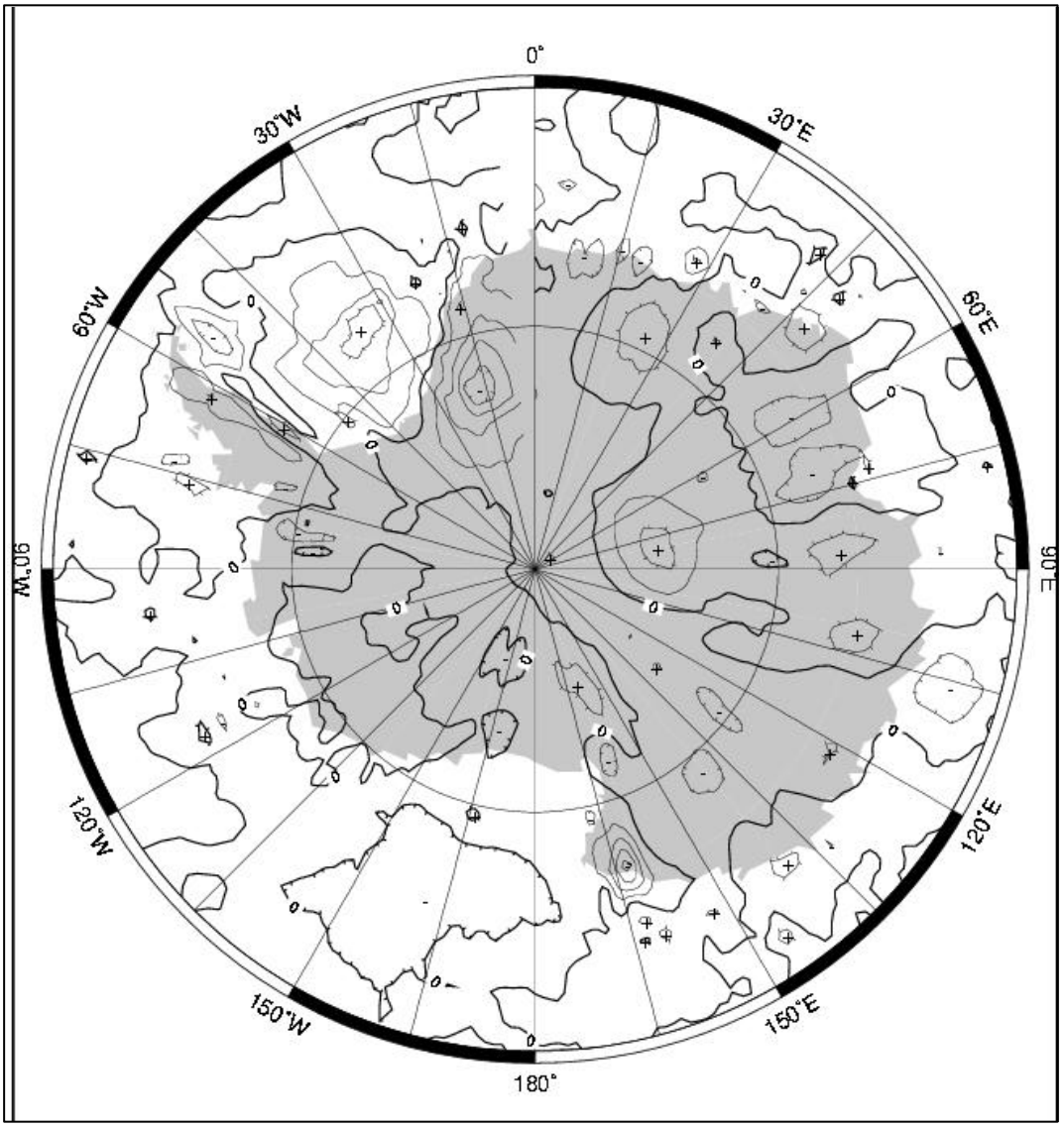

Figure 2: EGM96 minus OSU91 geoid ellipsoid separations (1 metre contour interval)