

The Gravity Field of Mars: A 75th Degree and Order Model

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Radiometric tracking data collected by NASA's Deep Space Network (DSN) for Mariner 9, Viking 1 and 2 orbiters, and Mars Global Surveyor (MGS) have been analyzed to determine a 75th degree and order gravity field model. The significant improvement in the Mars gravity model is mainly a consequence of globally distributed data set collected from the MGS mapping orbits, the use of optimal weighting and constrained least squares solution techniques, and improved force and measurement models in the orbit determination process.

The gravity anomaly map reveals significantly more detail and larger amplitudes than any previous Mars gravity map over the major impact and volcanic areas on Mars. Olympus Mons remains the largest known gravity anomaly in our solar system and Isidis Planitia, the highest amplitude mascon. The accuracy of the MGS orbit using different gravity solutions will be evaluated by orbit overlap comparisons. Statistics of MGS orbit fit will be shown as well as the error predictions using the formal covariance of the gravity solution. The correlation of the gravity anomalies with topography derived from the Mars Orbiter Laser Altimeter (MOLA) will be examined. An Airy isostasy crustal thickness map will be produced.