THE FIGURE OF PHOBOS: AN UPDATE FROM THE PHOBOS MISSION;

T. Duxbury, M. Wang, and K. Herkenhoff, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109.

Analytic expressions were derived to model the surface topography and the normal vector to the surface of Phobos. The analytic expressions are comprised of a spherical harmonic expansion for the global figure of Phobos, augmented by addition terms for the large crater Stickney and other craters. Over 300 craters were measured in more than 100 Viking Orbiter images to produce the model. In general, the larger craters were measured since they have a significant affect on topography. The derived topographic model has a global spatial and topographic accuracy ranging from about 50m in areas having the highest resolution and convergence coverage up to 500m in the poorest areas.

These analytic expressions, together with camera and viewing geometry parameters, are used to simulate the Soviet Phobos Mission images of Phobos with good success. A Hapke-Irvine scattering law is used to study the surface brightness (albedo) of Phobos at the pixel level. The derived volume from the model yields a density of 1.90 ± 0.05 g/cm^3. The model predicts a forced rotational libration amplitude of about 0.9 deg as compared with the observed value of about 0.8 deg, supporting Phobos having a uniform density throughout its interior.

The Soviet Phobos mission imaging data is being used to improve the figure model accuracy and add higher frequency details. Also, a study is being made to determine if there is an offset between the center-of-mass and the center-of-figure to give additional information on the Phobos interior. A short video was prepared based upon the model and the Soviet imaging data.