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The Variations in the Masses of the Seasonal Icecaps of Mars over 3 Mars Years

Maria T. Zuber (1), David E. Smith (2)

(1) MIT, Cambridge, MA 02139 USA (zuber@mit.edu), (2) NASA Goddard Space Flight Center, Greenbelt, MD, 20771 USA (dsmith@tharsis,gsfc.nasa.gov)

We have developed theoretical gravity models for each of the Mars seasonal polar caps incorporating both cap size and depth of precipitation from the MOLA laser altimeter and radiometry data as a function of season (Ls). We have used these models in the analysis of the Mars Global Surveyor tracking data for the determination of the MGS orbit and for the estimation of the masses of the seasonal caps every 5 days for a period of 6 Earth-years. We introduced a constraint that the total volatile mass of the planet was a constant and we made a constrained adjustment for the atmospheric mass. The results show the characteristic seasonal variations of mass and generally broad agreement with GCM computations but there are subtle differences that appear to repeat from year to year that we suspect are real but surprising. These include the observation that, in the south at least, the accumulation of CO2 on the polar cap seems to start as soon as the sublimation process is complete. At this stage we are not sure if this is a real observation or if it is a result of errors in our basic seasonal icecap model.