LONGITUDE STRUCTURE IN THE MARS UPPER ATMOSPHERE : CHARACTERIZATION AND MODEL SIMULATIONS

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The Accelerometer Experiment aboard Mars Global Surveyor has revealed large, regular variations in upper atmosphere density with longitude at fixed latitude and local solar time [Keating et al. 1998; 2000; Bougher et al. 1999]. Such regular variations were not predicted prior to their discovery, and are superimposed upon the inflation/contraction of the entire atmosphere following dust events. This longitudinal structure varies with season, latitude, and local solar time, with changes in density of a factor of two over 45 degree of longitude being typical. Changes with local solar time and a lack of correlation with topography argue against a stationary wave origin. Detailed 3-D simulations, coupling the Mars lower (0-80 km) and upper (70-300 km) atmospheres, are conducted to examine the planetary wave mechanisms that might be responsible for these significant variations at thermospheric altitudes. Initial simulations from the coupled NASA Ames General Circulation Model (MGCM) and the NCAR Mars Thermospheric Circulation Model (MTGCM) are presented. Future Mars aerobraking activities will benefit greatly from an improved understanding of the origin and character of these waves.