



The Mars Neutral Upper Atmosphere from Equator to Pole from the Mars Reconnaissance Orbiter Accelerometer Experiment

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Mars Reconnaissance Orbiter (MRO) was launched 12 August 2005, achieved Mars Orbital Insertion (MOI) 10 March 2006, and successfully completed aerobraking 30 August 2006. This aerobraking allowed a savings of 400kg of fuel. On each of more than 400 orbits accelerometer measurements were obtained of vertical and spatial structure on inbound and outbound trajectories resulting in in situ measurements of density, scale height, temperature, and pressure of over 800 vertical structures above 100km. The location of MRO periapsis precessed from near the South Pole 6pm Local Solar Time (LST) to near the equator at 3am LST. Comparisons were made between the MRO accelerometer experiment measurements and similar accelerometer experiment measurements aboard Mars Global Surveyor (MGS) and Mars Odyssey (MO). The MRO results show large solar minimum to maximum changes and large solar distance effects (perihelion to aphelion). Winter polar warming discovered by the accelerometer measurements is much weaker near the South Winter Pole (aphelion) than near the North Winter Pole (perihelion), largely because of lower solar input. High amplitude (+/-20%) Kelvin waves were detected. Strong latitudinal and seasonal variations are detected. Day/night variations of a factor of 2 in density are observed at low latitudes. Excellent agreement in densities was discovered between MRO climatology (2006) and previous Mars Express (2004) climatology from SPICAM stellar occultations. A wealth of information up to an altitude of 200km has been established.