



## **Retrieval of atmospheric density variations in the Martian upper atmosphere using Mars Odyssey radio tracking data**

**E. Mazarico** (1), M. Zuber (1,2), F. Lemoine (3), D. Smith (2)

(1) Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139 United States, (2) Laboratory for Terrestrial Physics, NASA's Goddard Space Flight Center, Greenbelt, MD 20771 United States, (3) NASA Goddard Space Flight Center, Space Geodesy Branch Code 926, Greenbelt, MD 20770 United States

We investigated the seasonal density variations of the Martian upper atmosphere using radio tracking data from the Mars Odyssey spacecraft. We determined the orbit of the spacecraft in 5-day arcs using the X-band tracking data, applying the latest models for the Mars gravity field and solar tides. We developed a numerical model of the spacecraft shape that provided the cross-sectional area to the sun and the spacecraft velocity vector, and then solved for atmospheric drag and solar radiation pressure. From the drag we derived the atmospheric density at about 400 km above the Martian surface. We compared the results with the density derived from the drag on another Mars orbiting spacecraft, Mars Global Surveyor, which is in a similar orbit but at a different solar local time. Both spacecraft show variations in density with time, but indicate different densities for approximately the same altitude and time. We suspect that some of the difference is due to the two drag measurements being made at effectively different locations (latitudes south of  $55^{\circ}S$  for Mars Odyssey) although at similar altitudes. The small magnitude of the drag and the observational errors make the measurement difficult.