Plume of Enceladus

Computational Fluid Physics Laboratory
The University of Texas at Austin
				tac689@mail.utexas.edu

Free Molecular Plumes

- Plume model is constructed from 8 point sources in the South Polar Region [1] (Figures 1 & 2).
- Gas velocities are determined by DSMC simulation of converging diverging nozzle issuing into a vacuum.
- Flyby simulations are compared to Cassini INMS data [3].

Grain Trajectories

- Trajectories for 5 sizes of ice grains are modeled (Figures 3 A through E).
- Grain velocity distributions are determined using DSMC.
- At vent surface, the grain velocities are equal to the gas velocity, but gradually differ in expanding plume.
- As grain size increases, grain plumes become more collimated.

Cassini Flybys

- Water vapor escapes from sources at Mach 5.
- Sources are assumed to be axisymmetric vents with radii of 3 m.
- Total mass flux is 100 kg/s at a temperature of 52 K at the vent exit.
- Maximum densities and signal durations agree well with Cassini INMS data [3].
- A parametric approach to constraining individual source strength should yield more accurate results.

Occultation of Gamma Orionis

- A line-of-sight integration method was used to find column densities along a look vector using Cassini trajectory data from NAIF.
- Occultation simulation results are compared to Cassini UVIS data [2] (Figures 9 & 10).
- The magnitude and shape of the occultation agree well with in situ data, but constraining individual source strengths should improve the simulation.
- Further occultation simulations will help constrain source strength.