Odyssey Aerobraking: A Progress Report

Richard W. Zurek

For the Odyssey Atmospheric Advisory Group

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Odyssey Atmospheric Advisory Activities

Atmospheric Monitoring	Odyssey Data Analysis
MGS TES: K. Bender (ASU), M. Smith (GSFC), P. Christensen (ASU) **MGS MHSA:** T. Z. Martin (JPL) **MGS MOC:** B. Cantor & M. Malin (MSSS) **Kit Peak Microwave Spectrometer:** R. T. Clancy (SSI) & Stewart Obs.	**Odyssey Accelerometer:** G. Keating (GWU) R. Tolson (LaRC) A. Dwyer (LaRC) **JPL Navigation Team:** esp. R. Smith & J. Bell (JPL) **Spacecraft Team:** esp. W. Willcockson (LMA)

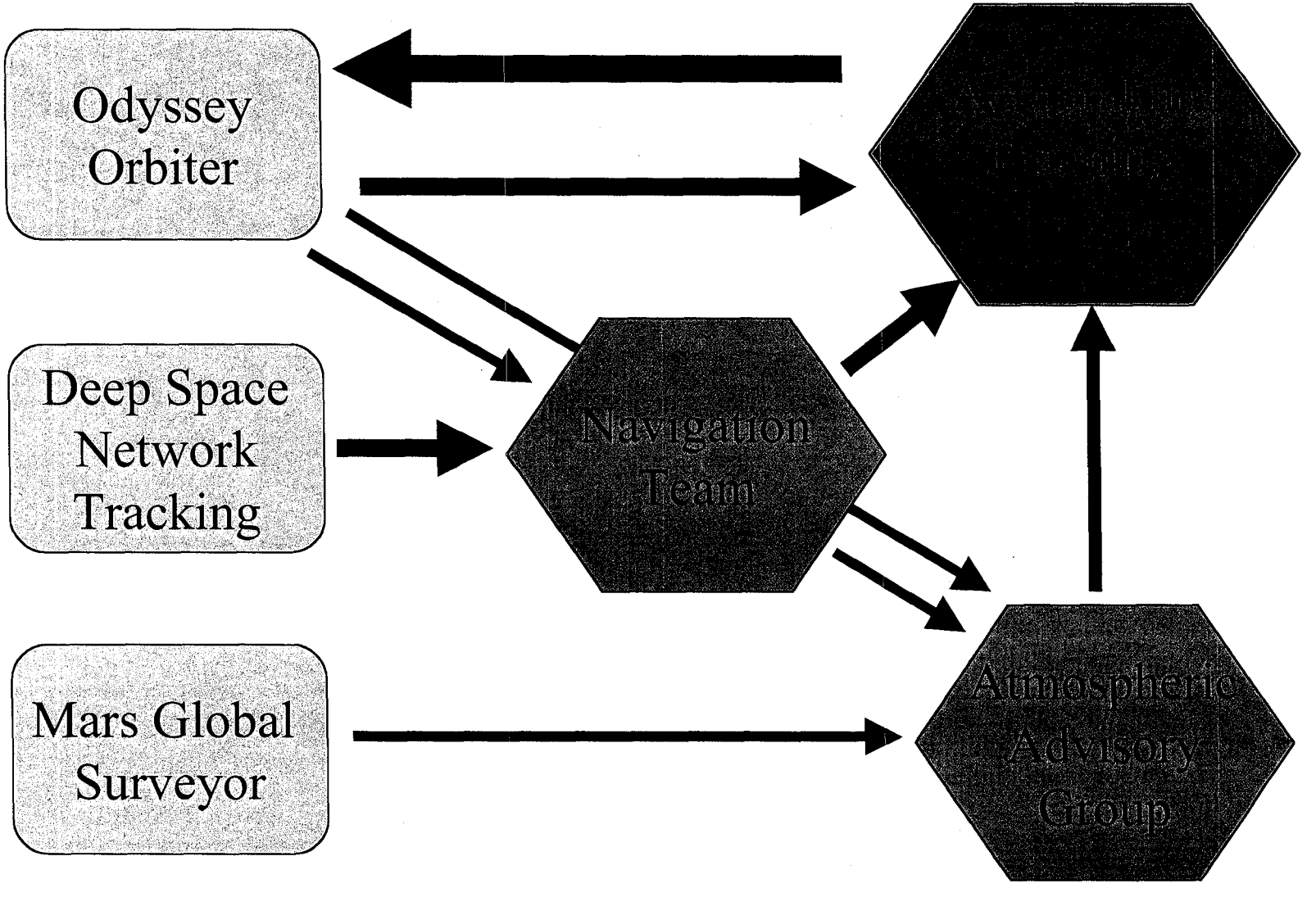
SYNTHESIS, DATA ANALYSIS, MODEL SIMULATION

J. Murphy (NMSU), S. Bougher (UA), R. Zurek (JPL)

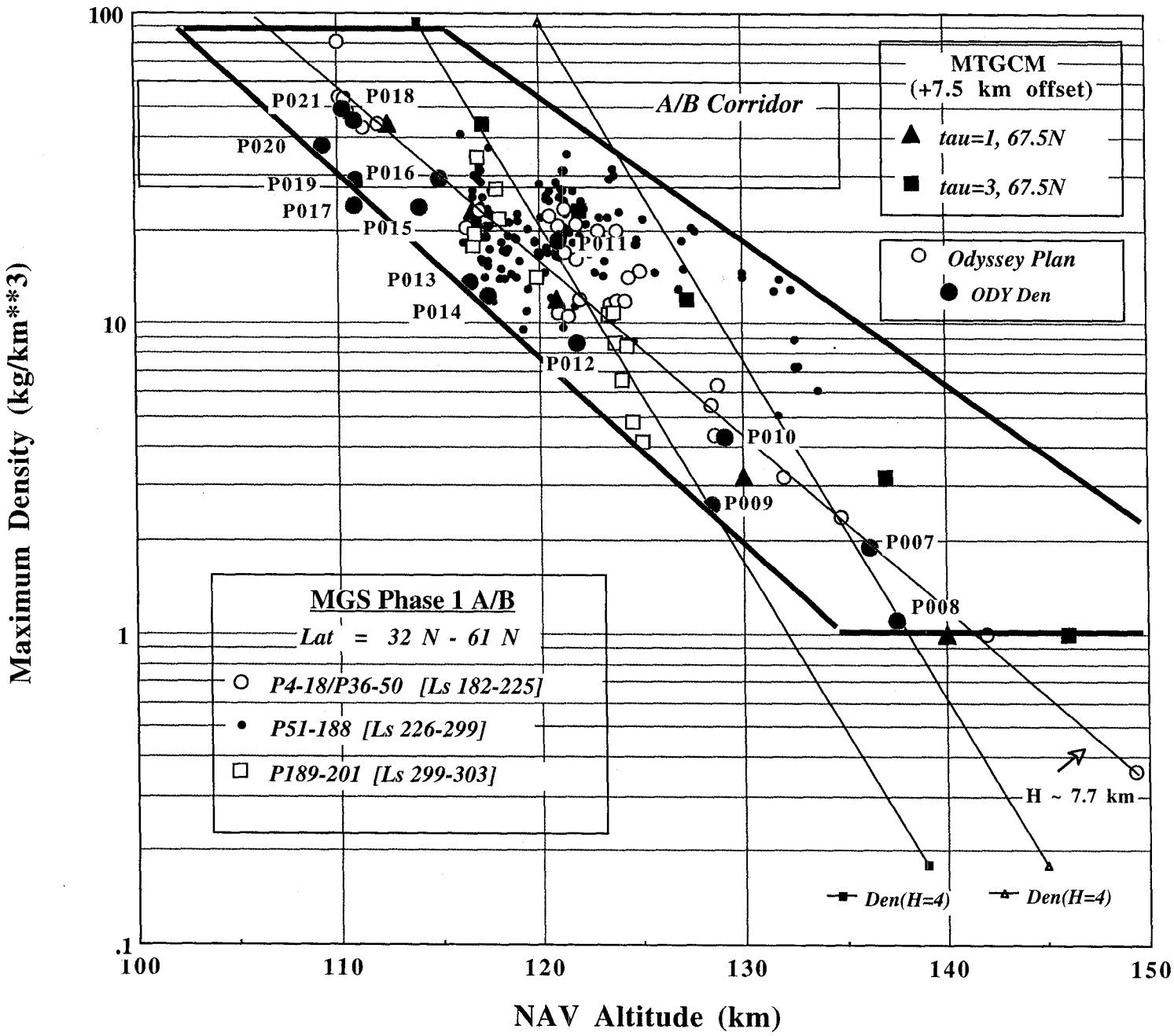
C. J. Justus (MSFC), P. Esposito(JPL)

The Women & Men of the 2001 Mars Odyssey Project

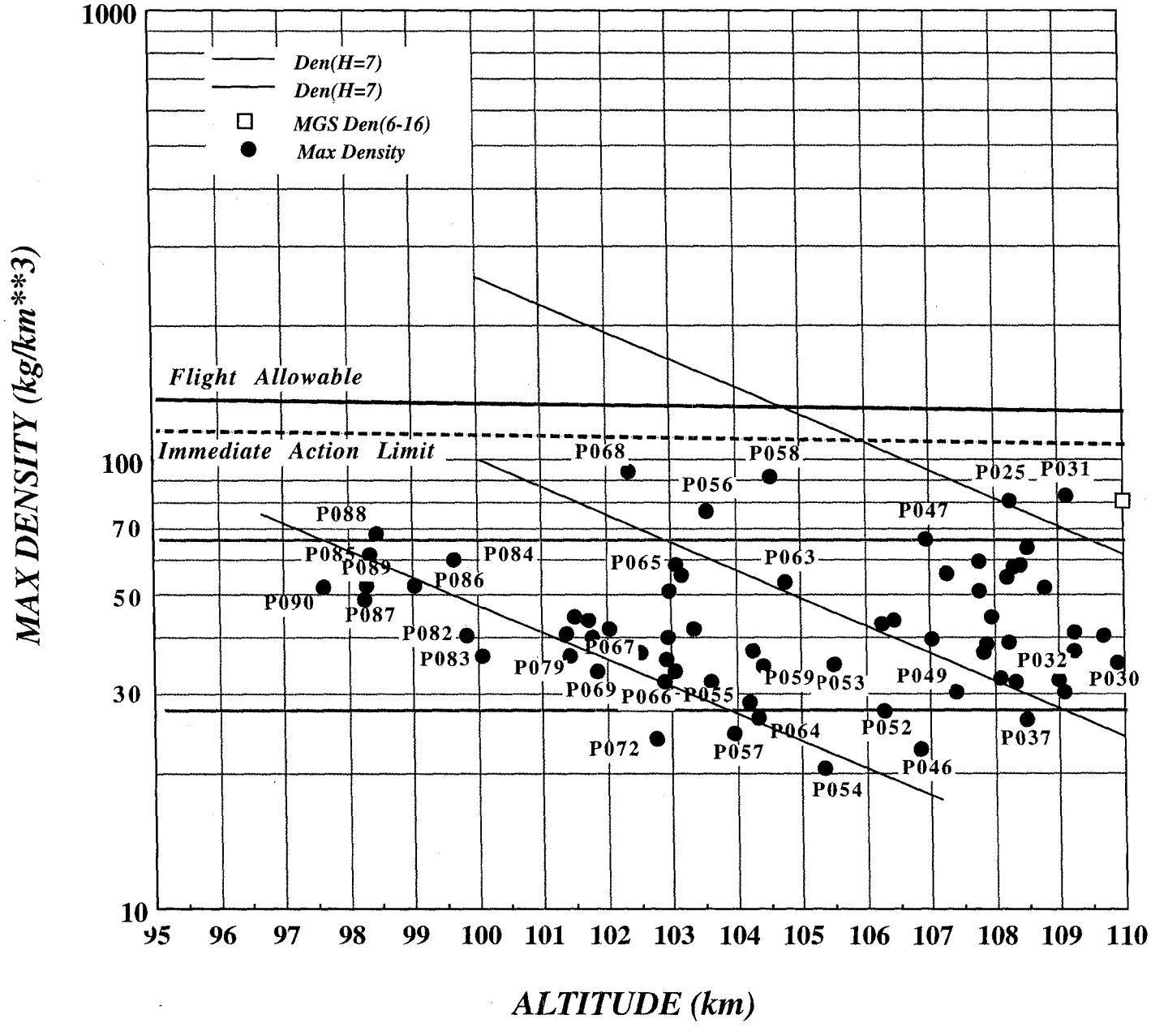
Odyssey Aerobraking



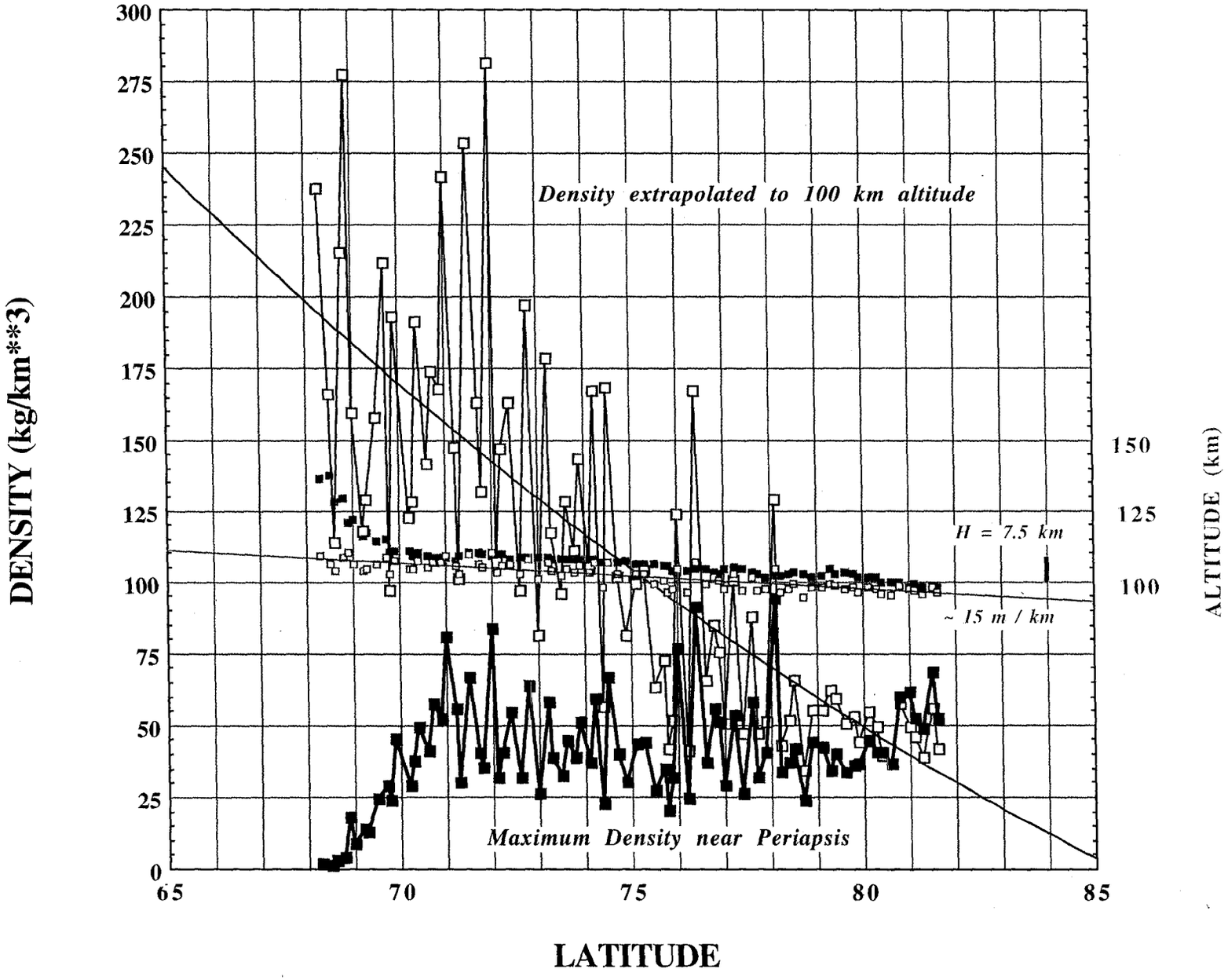
ODYSSEY WALK-IN



Odyssey Main Phase Aerobraking



ODYSSEY AEROBRAKING



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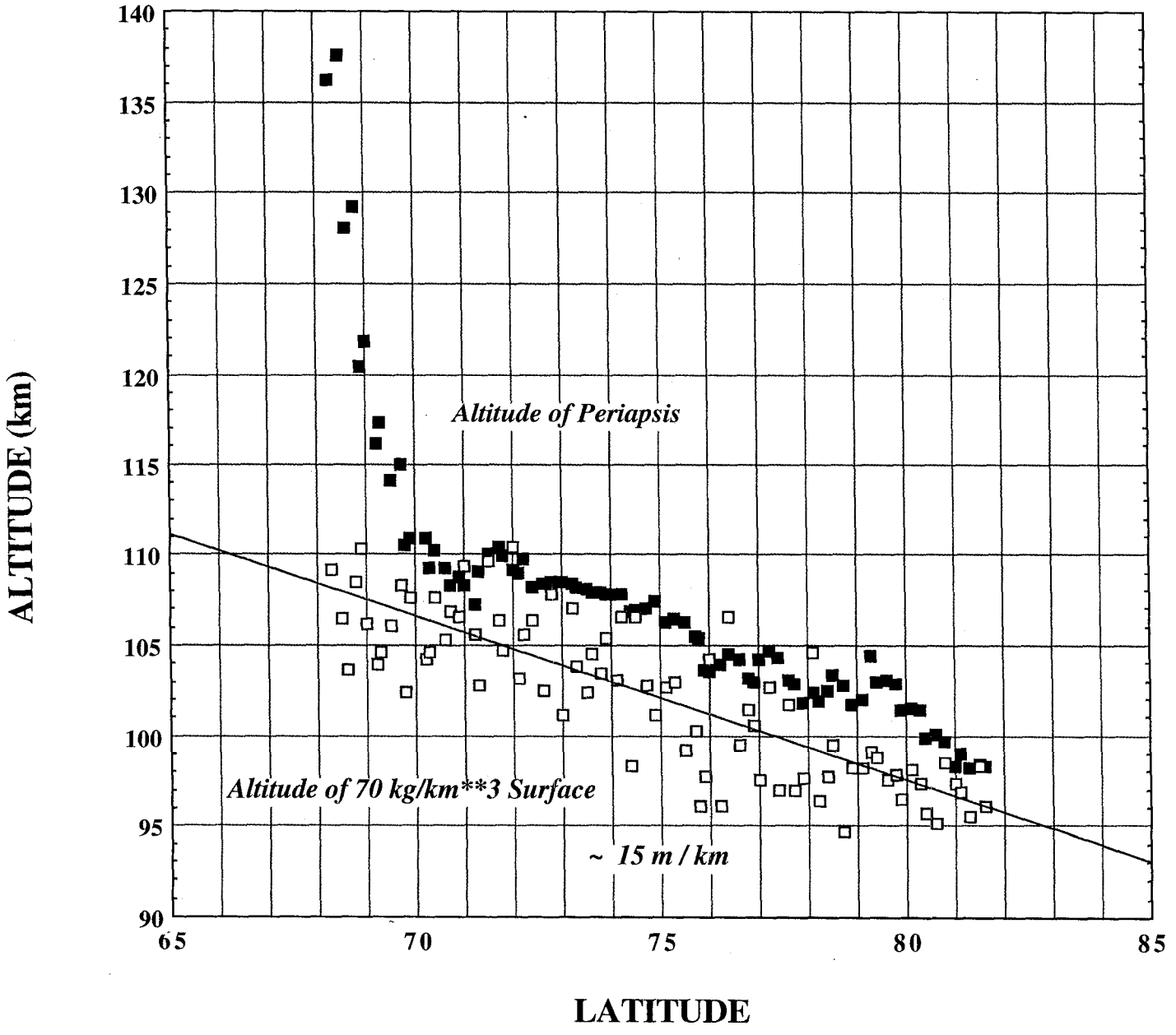

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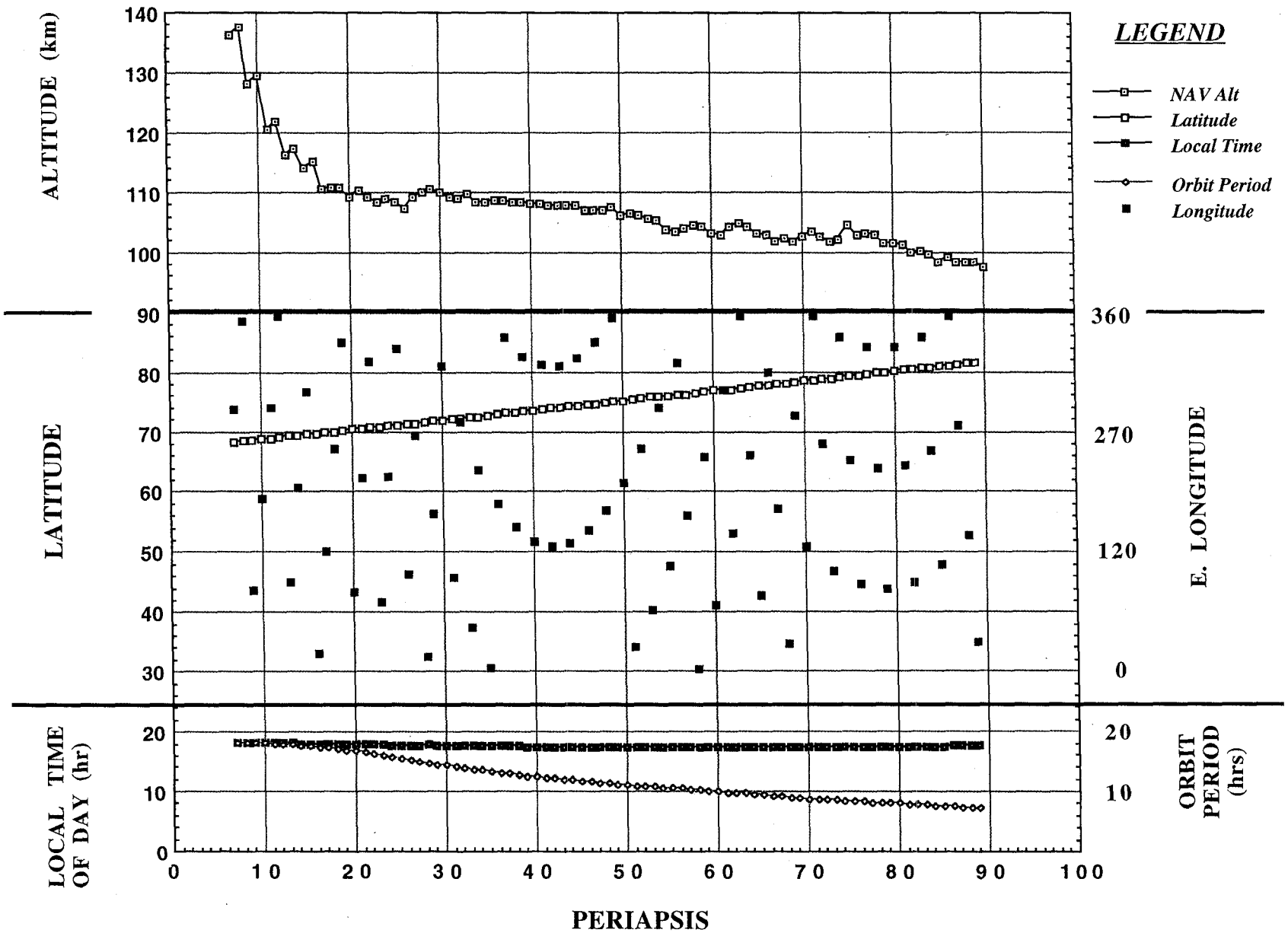

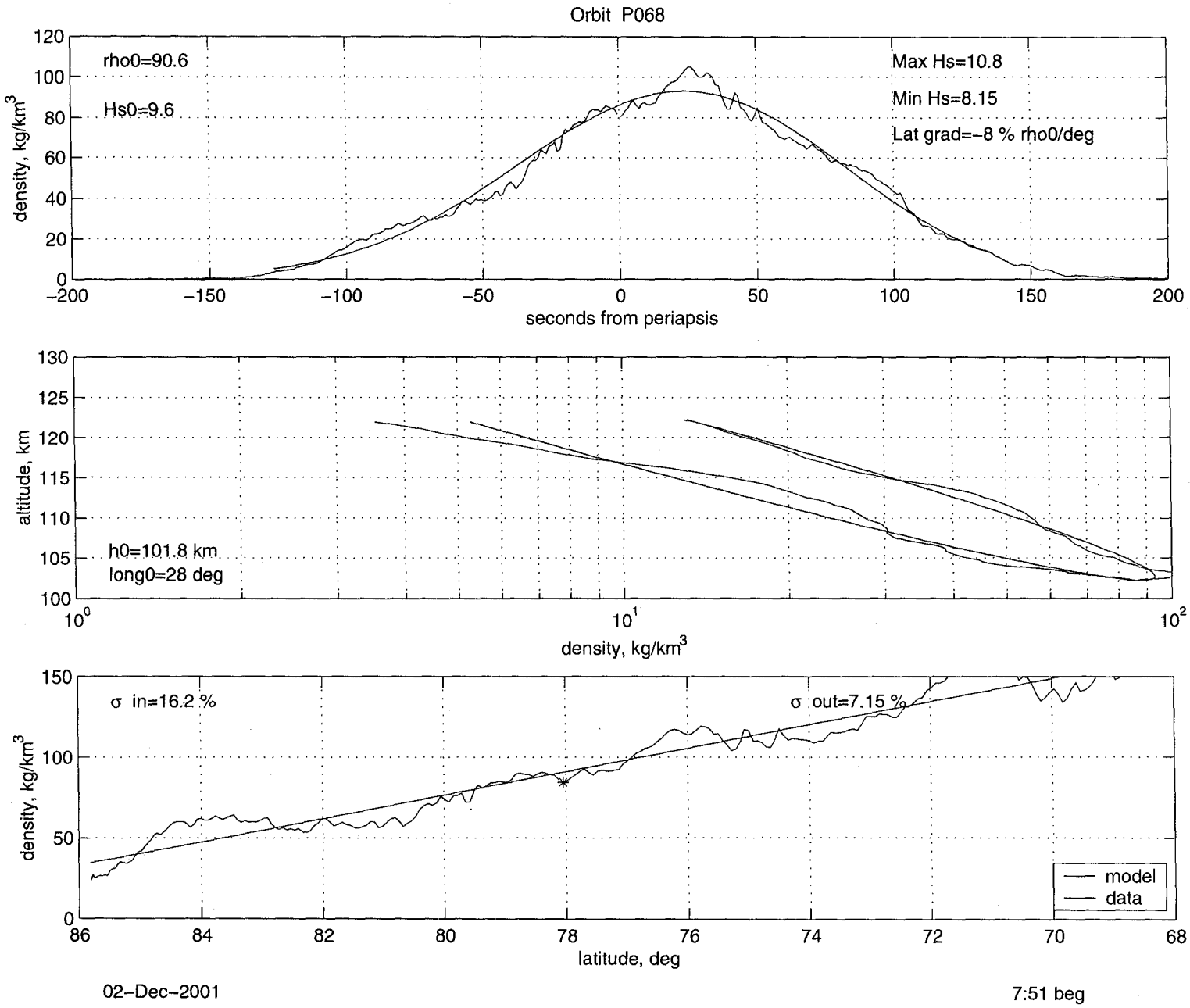
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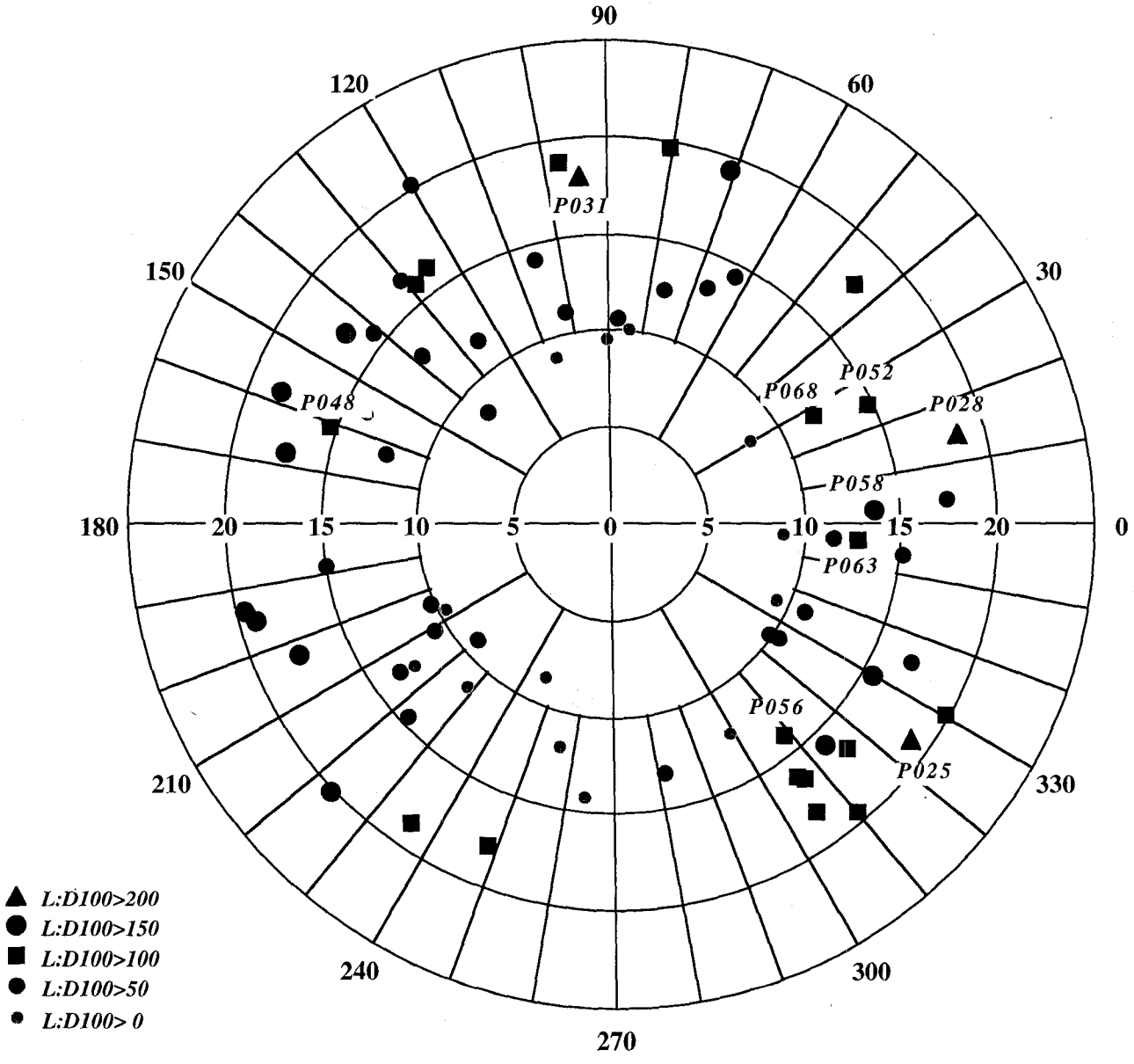
Hs0=9.6
Max Hs=10.8
Min Hs=8.15
Lat grad=-8 % rho0/deg
density, kg/km3
seconds from periapsis
altitude, km
h0=101.8 km
long0=28 deg
density, kg/km3
σ in=16.2 %
σ out=7.15 %
density, kg/km3
model
data
latitude, deg
02-Dec-2001
7:51 beg

ODYSSEY AEROBRAKING POLAR PROJECTION



East Longitude

Observations

- Atmospheric variability was larger than expected during the early part of Odyssey aerobraking because of the temporal and longitudinal variation of the sharp latitudinal gradient associated with the winter polar vortex.
- Attempts to use standing and/or travelling wave patterns to predict atmospheric variations for aerobraking have not been very successful. There may also be local effects, perhaps due to upward propagating gravity waves.
- There was no substantial effect of the planet-wide dust storm that occurred well before the start of the Odyssey aerobraking, except that the latitudinal gradients associated with the polar vortex edge may have been somewhat larger than in a year without such a dust storm.
- Atmospheric monitoring by MGS has removed a major uncertainty with respect to aerobraking operations. However, the longitudinal and temporal variability of the polar vortex observed in the lower atmosphere has not yet provided any predictive capability at aerobraking altitudes.
- The major challenge remaining is to finish aerobraking on time as the spacecraft periapsis, having crossed the pole, moves southward across the vortex edge once more, in late December and early January, 2002.