MAXIMIZING SCIENCE RETURN:
A REPRESENTATIVE TRAJECTORY for DYNAMO

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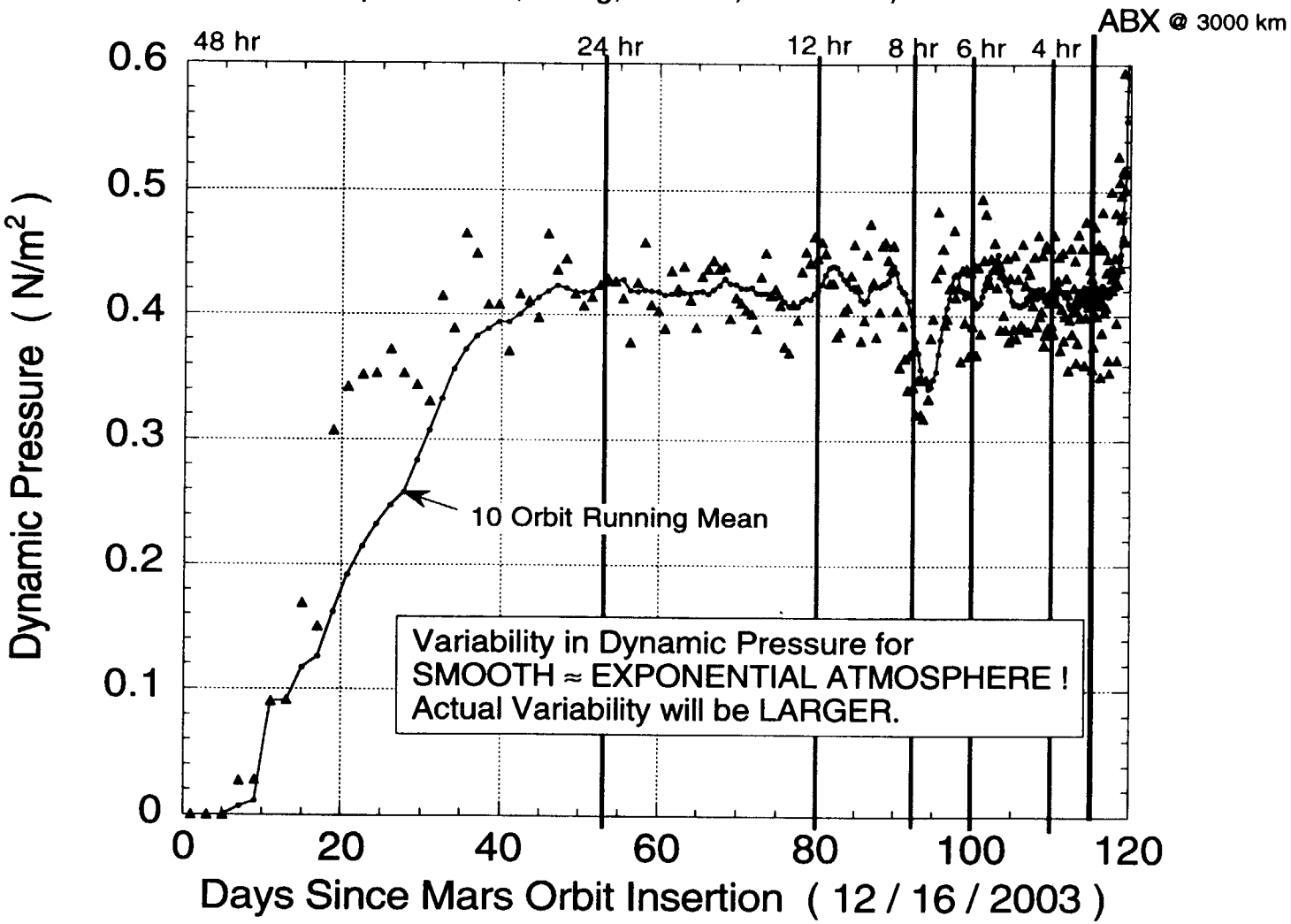
ASSUMPTIONS

- Launch Piggyback on Ariane V (Geosynchronous Transfer)
- Lunar and Earth Gravity Assist into Transfer Orbit.
- Propulsive Capture: 48 hour Orbit with 250 km Periapsis.
- SPACECRAFT
  - MASS = 80 kg ("Twin" Pallet Option)
  - AREA = 2.5 m^2 for Drag Pass (0.5 m^2 for Mapping)
  - C_D = 2.0
- Aerobraking Exit Maneuver (ABX) when Apo. = 3000 km.
- Try to keep periapsis as low as possible during mapping.

DYNAMIC PRESSURE

DYNAMO AEROBRAKING PHASE

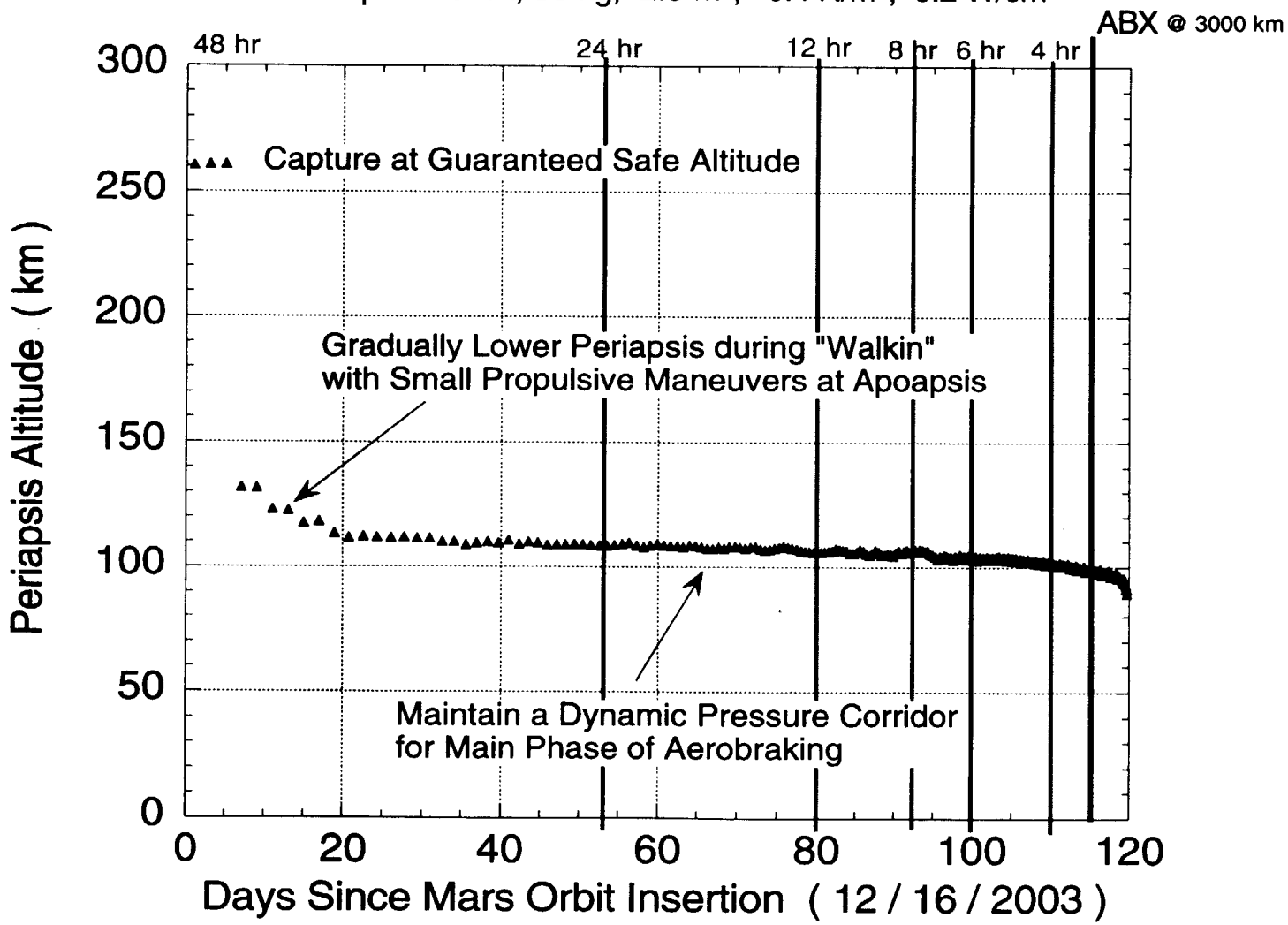
48 hr Capture Orbit, 80 kg, 2.5 m^2, 0.4 N/m^2, 0.2 W/cm^2



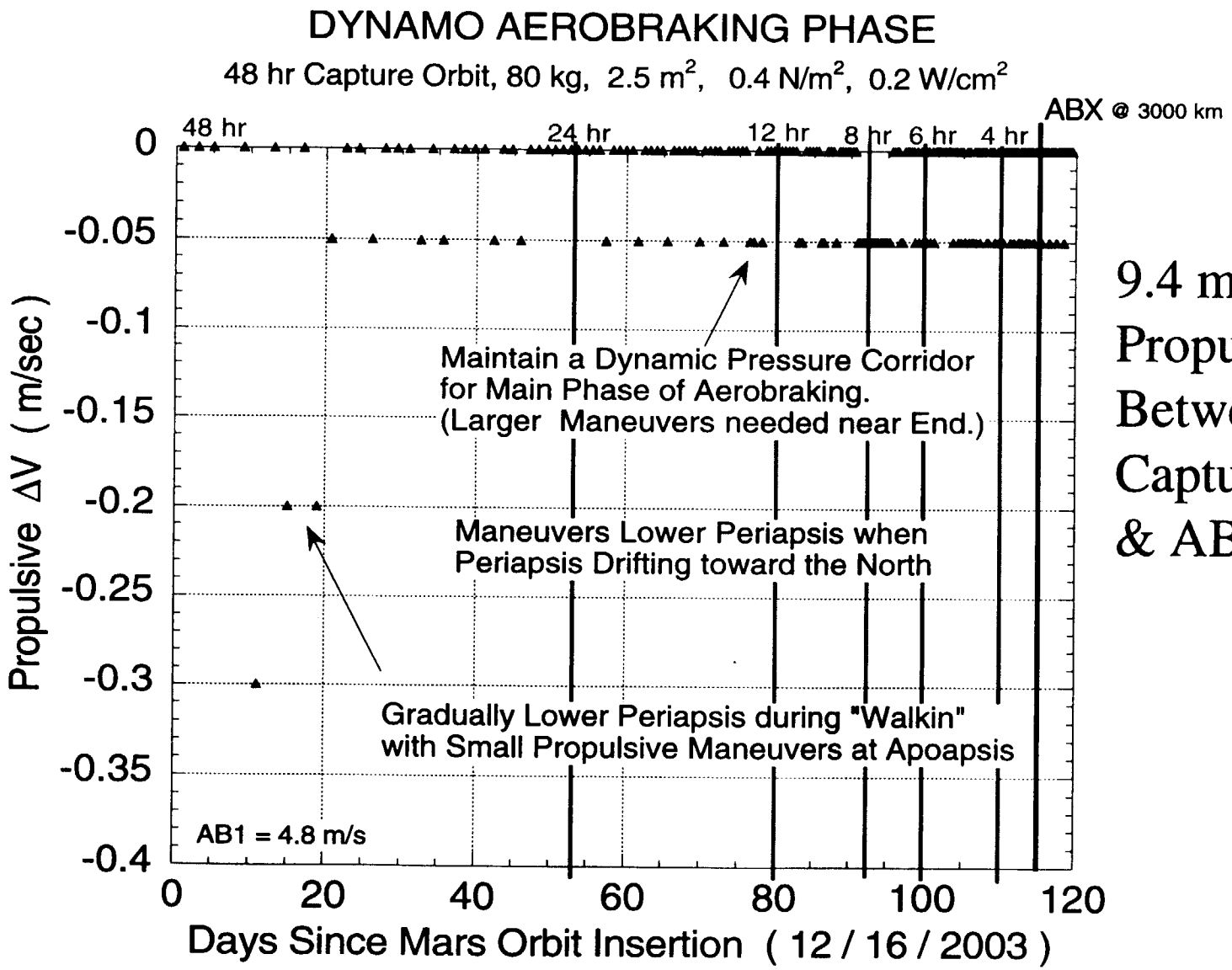
PERIAPSIS ALTITUDE

DYNAMO AEROBRAKING PHASE

48 hr Capture Orbit, 80 kg, 2.5 m^2, 0.4 N/m^2, 0.2 W/cm^2

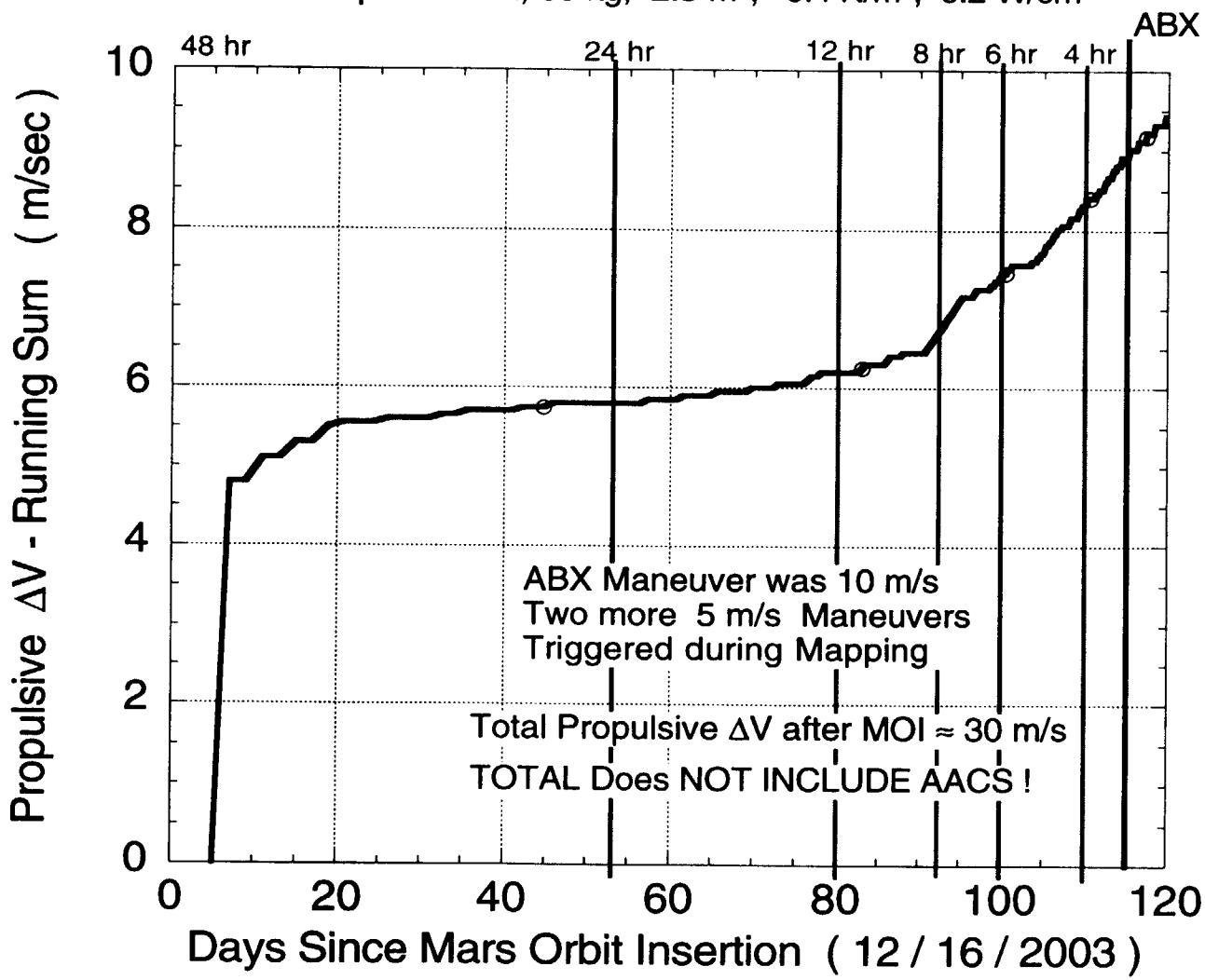


ΔV Maneuvers During Aerobraking



9.4 m/s Propulsive Between Capture & ABX

ΔV (Running Sum)

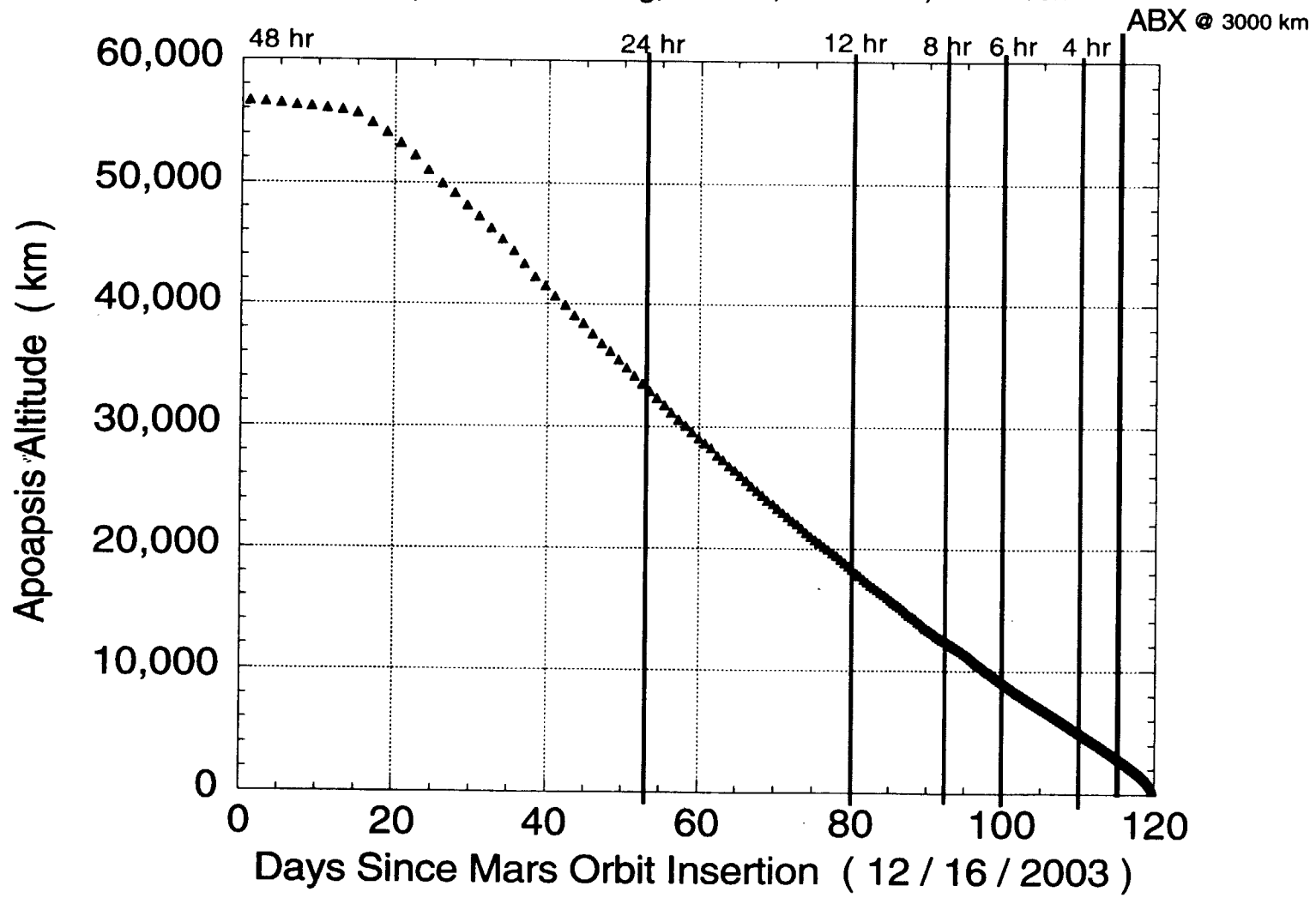


9.4 m/s Propulsive Between Capture & ABX

APOAPSIS ALTITUDE

DYNAMO AEROBRAKING PHASE

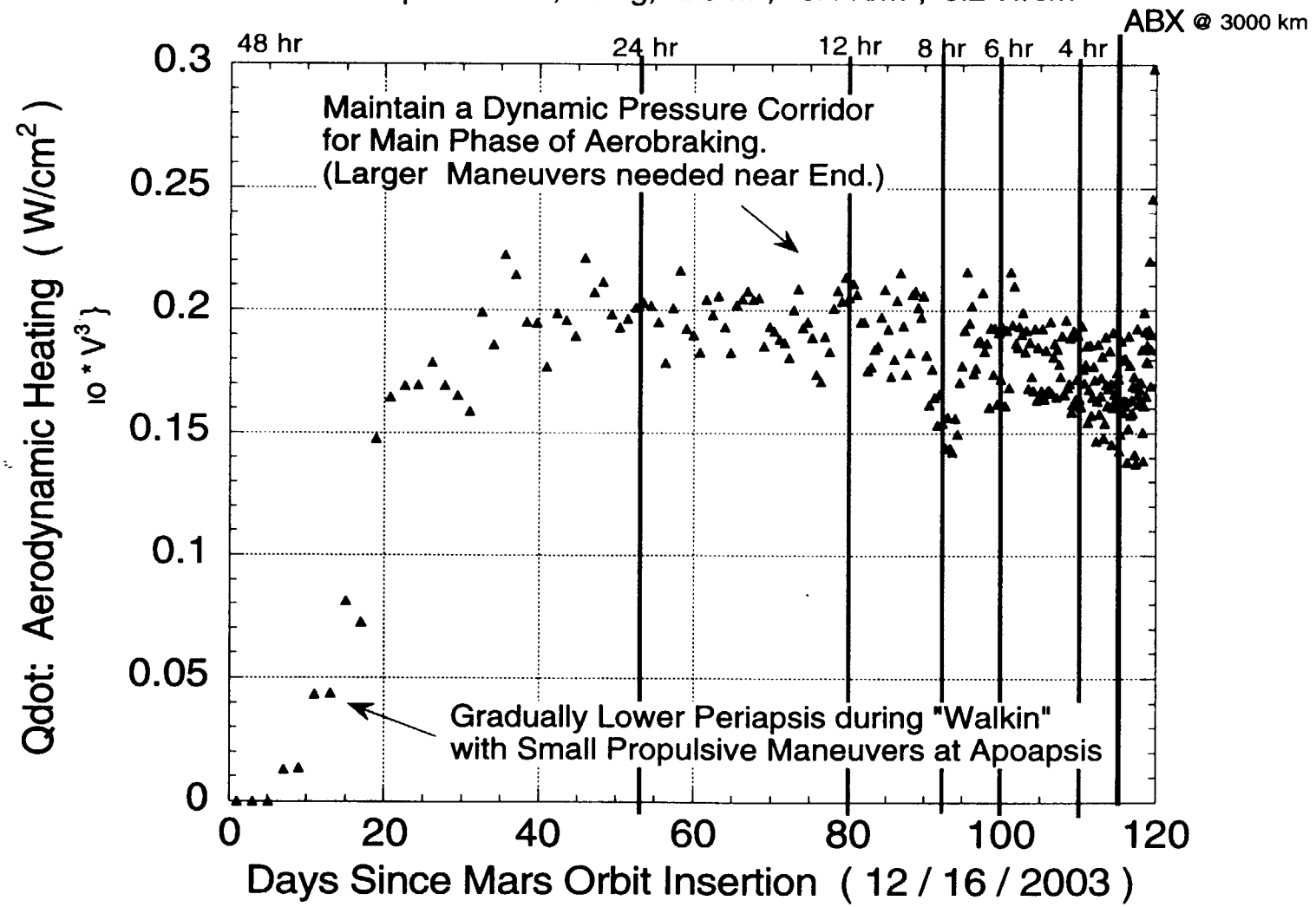
48 hr Capture Orbit, 80 kg, 2.5 m^2, 0.4 N/m^2, 0.2 W/cm^2



Aerodynamic Heating Rate

DYNAMO AEROBRAKING PHASE

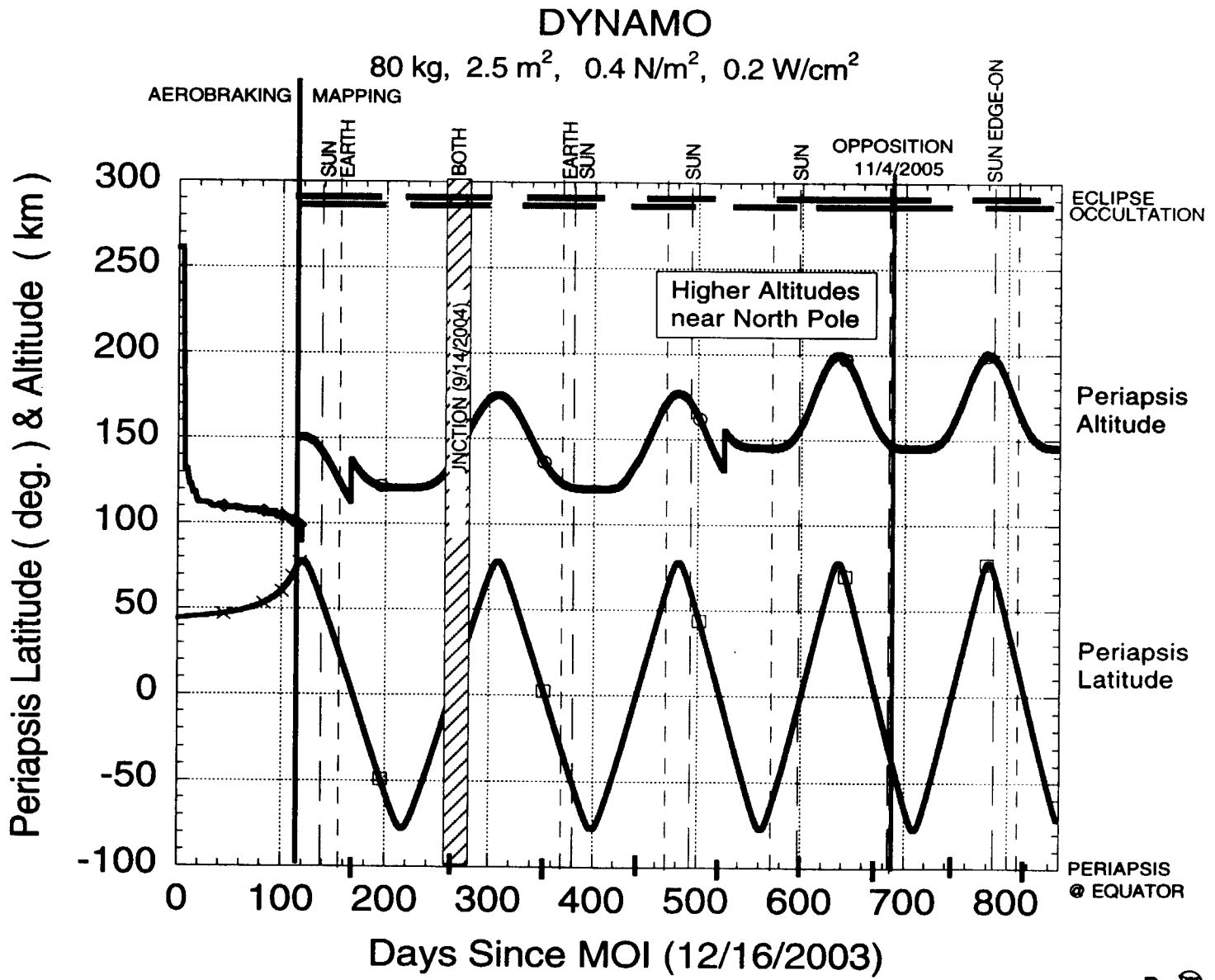
48 hr Capture Orbit, 80 kg, 2.5 m^2, 0.4 N/m^2, 0.2 W/cm^2



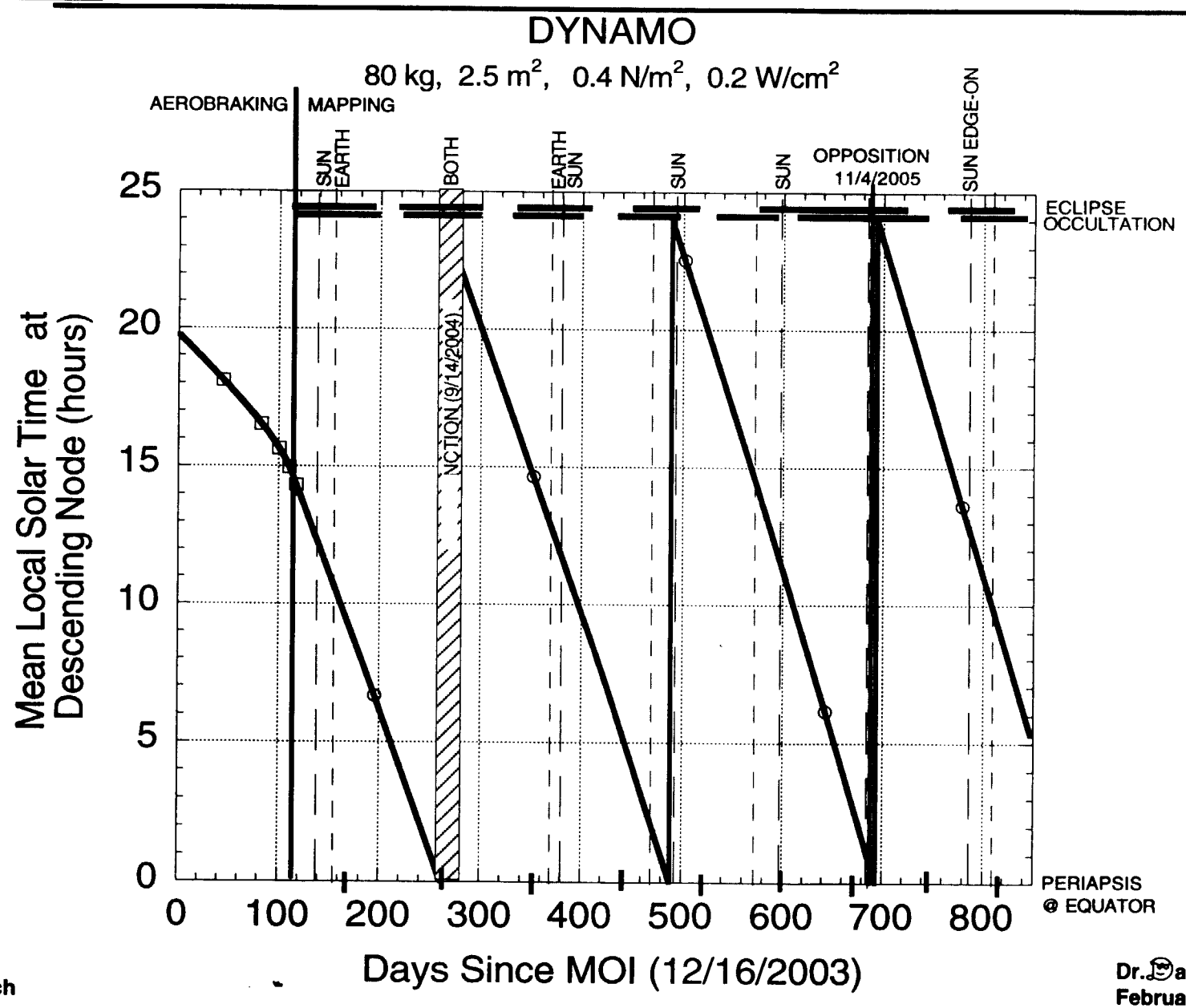
MAPPING PHASE

- 3000 km Apoapsis at Start of Mapping
  - To allow further Orbit Decay during Mapping with Low Altitude Periapsis
- Periapsis Precession
  - Opposite the Orbital Motion
  - Walks from "North to South to North"
  - Argument of Periapsis Precession Rate relatively constant.
  - Gives nearly Global Coverage (limited by Chosen Inclination of 78°)
- Conjunction puts a Gap in the Data

PERIAPSIS ALTITUDE & LATITUDE

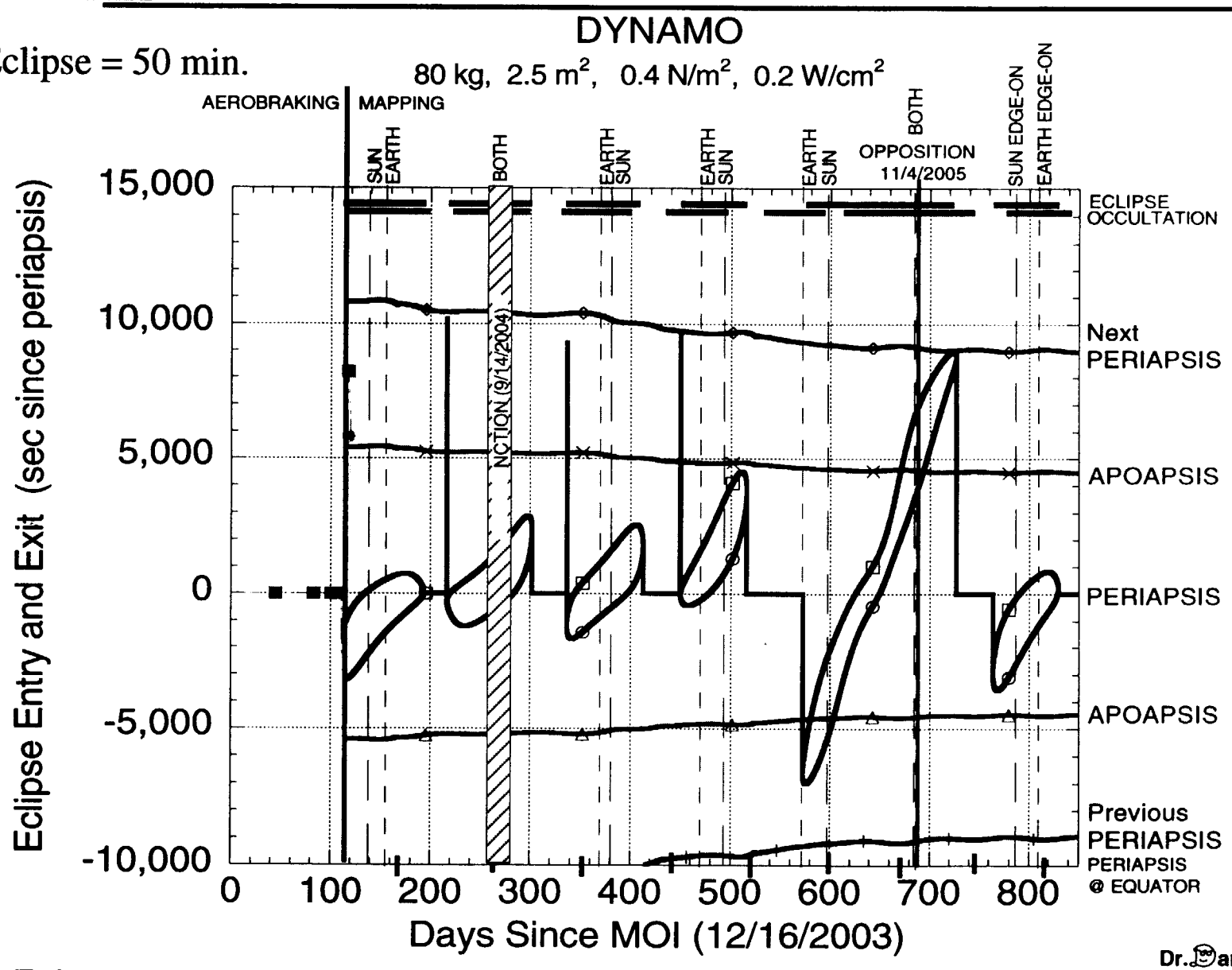


LOCAL SOLAR TIME at Descending Node



ECLIPSE Entry & Exit

Max.Eclipse = 50 min.



SUMMARY

- A Possible Dynamo Orbit Strawman was Shown
- Maximum Eclipse = 50 min.
  - 60 min. was "Dangerous" for MGS
- Average Dynamic Pressure $\approx$ 0.4 N/m^2
  - Original MGS used Average $\approx$ 0.6 N/m^2 (100% Heating Margin)
  - Current MGS (with Broken Wing) uses Average $\approx$ 0.2 to 0.3 N/m^2
  - Does Not Protect against Dust Storm Induced Increases !!
- Provides nearly Global Sampling at Periapsis