APPENDIX B

GENERATING CONSTANT ALTITUDE DATA FROM THE PDS PROFILES

Whilst analysing the MGS Accelerometer data archived with the PDS (Keating et al., 2001a; Keating et al., 2001b), I discovered an interesting complication in how the constant altitude data are generated. Although this is not of direct importance to the conclusions I present in the main body of this dissertation, I would like to document it here. The motivation for this investigation was an attempt to extract constant altitude data at 120 km since, as Figure B.1 shows, periapsis is below 120 km for nearly all of Phase 2 of aerobraking.

The constant altitude data in the PDS archive are generated from the profile data in the same archive (Keating et al., 2001a; Keating et al., 2001b). File catalog/altds.cat in the archive details the extraction of the constant altitude data at 130, 140, 150, and 160 km (Tolson et al., 2000). The PDS profile data contain two tables of densities and altitudes for each orbit. One is based on 7-second (or 6.7 second, the documentation contains some inconsistencies) averaging of accelerometer counts. The other is based on 40-second averaging.

I have generated constant altitude data at 120 km for all orbits where periapsis was below that altitude. I attempted to verify my technique for doing so by reproducing the PDS data at higher constant altitudes from the profile data. I was initially unable to get a good match. After discussions with Jill Hanna, who participated in the generation of the archive at NASA-Langley, I found that I could reproduce the PDS results by fitting 7-s densities to the 40-s altitudes and not incorporating the measurement uncertainties into the analysis.

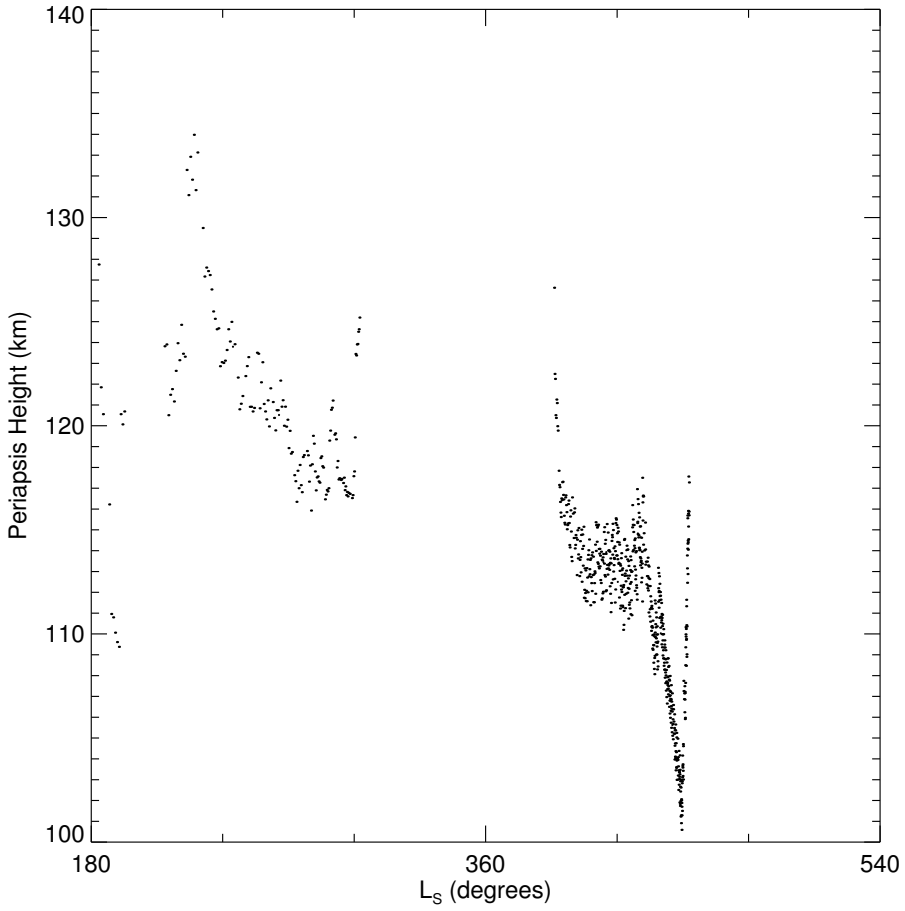

Figure B.1: Periapsis altitude versus L_S

It is unclear why different time averages are used for density and for altitude. I am unable to reproduce the results of some orbits where the 7-s density is not given, but the 40-s altitude is, at high altitude due to low signal to noise. On these occasions, I believe that data not given in the PDS profile data were used to generate the PDS constant altitude data. Since the measurement uncertainties are empirical, as discussed in Appendix A, it is not surprising that they have been ignored in the fitting procedure.