The Martian Upper Atmosphere as Revealed by Mars Global Surveyor's Aerobraking

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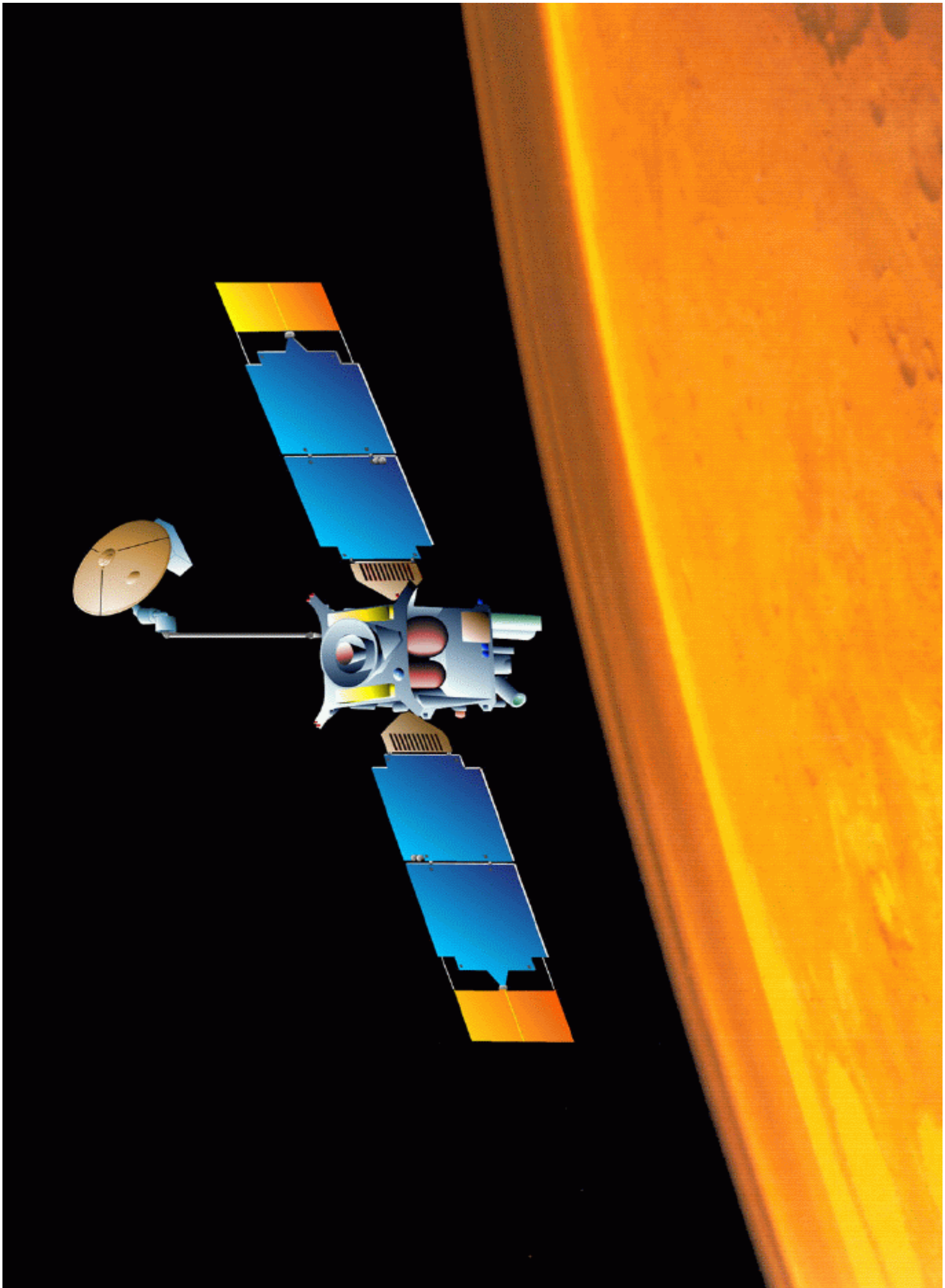
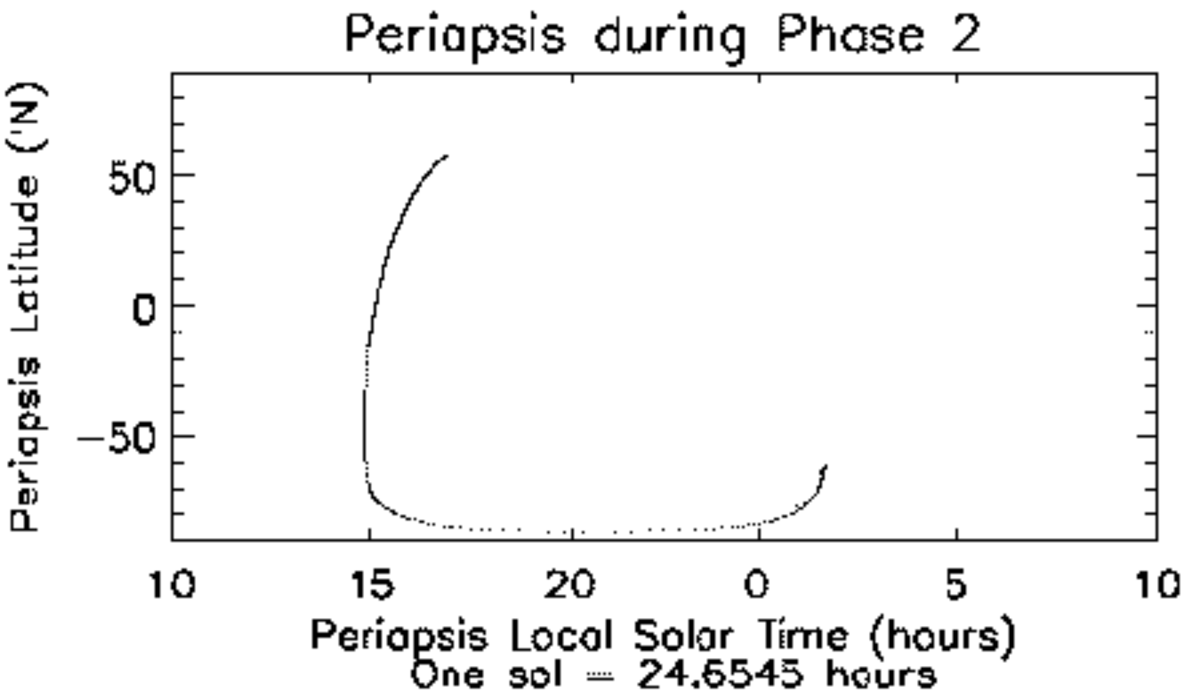
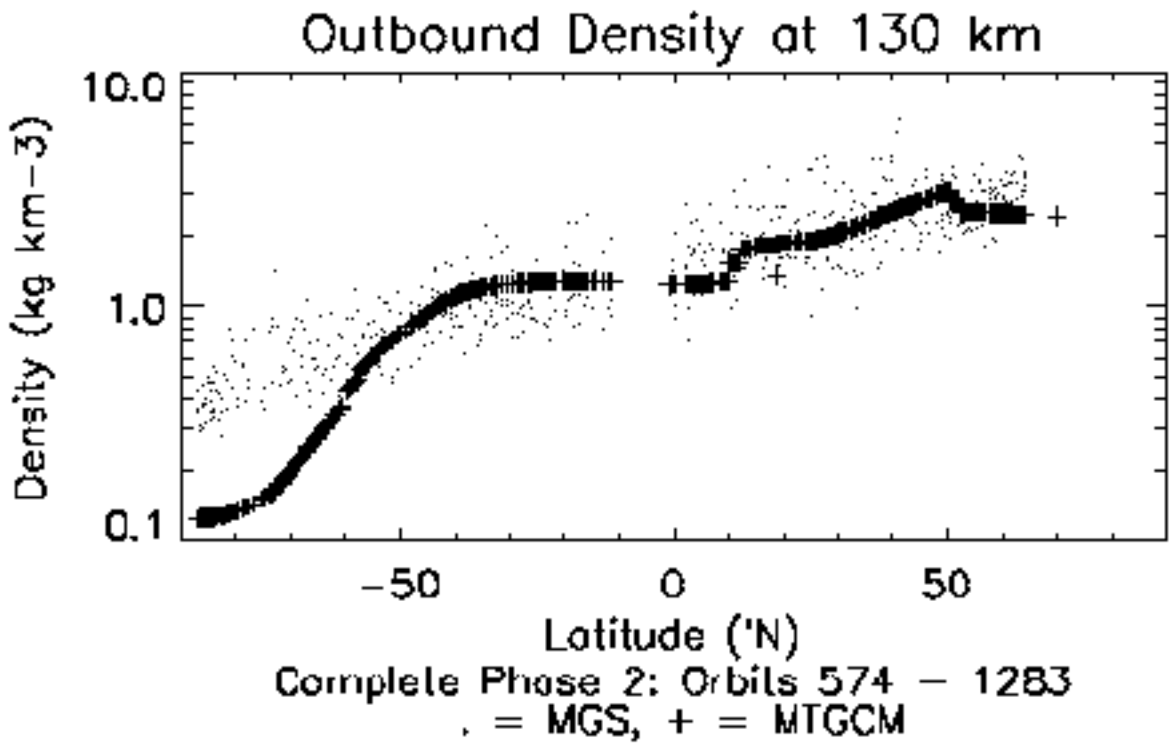
LPLC II
19 May 1999

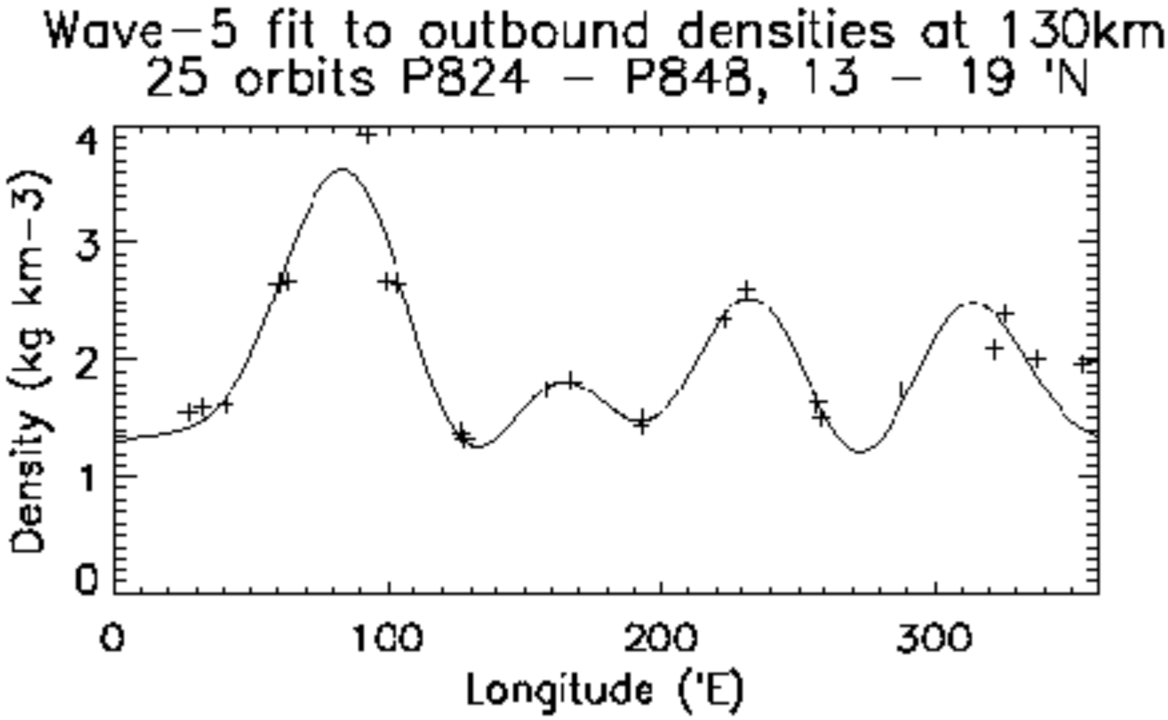


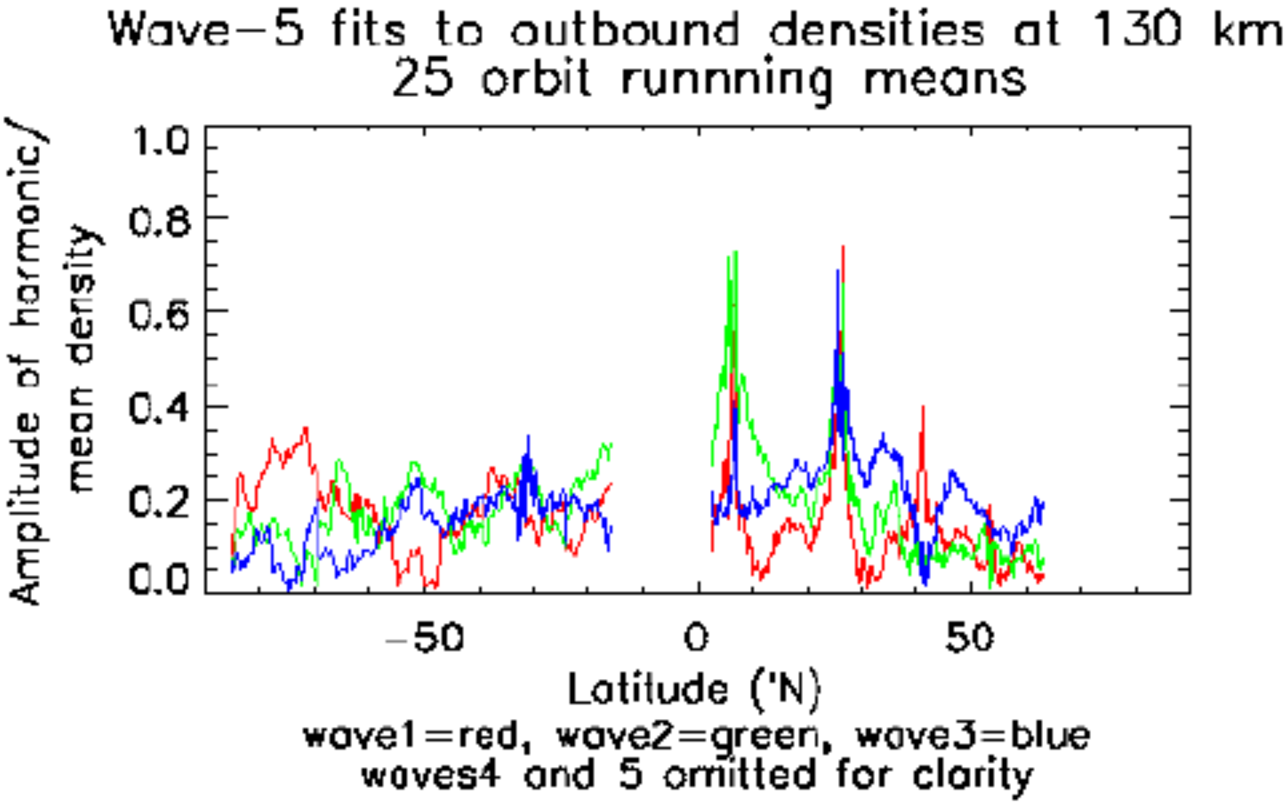

Periapsis during Phase 2
Periapsis Latitude (°N)
50
0
−50
10
15
20
0
5
10
Periapsis Local Solar Time (hours)
One sol = 24.6545 hours

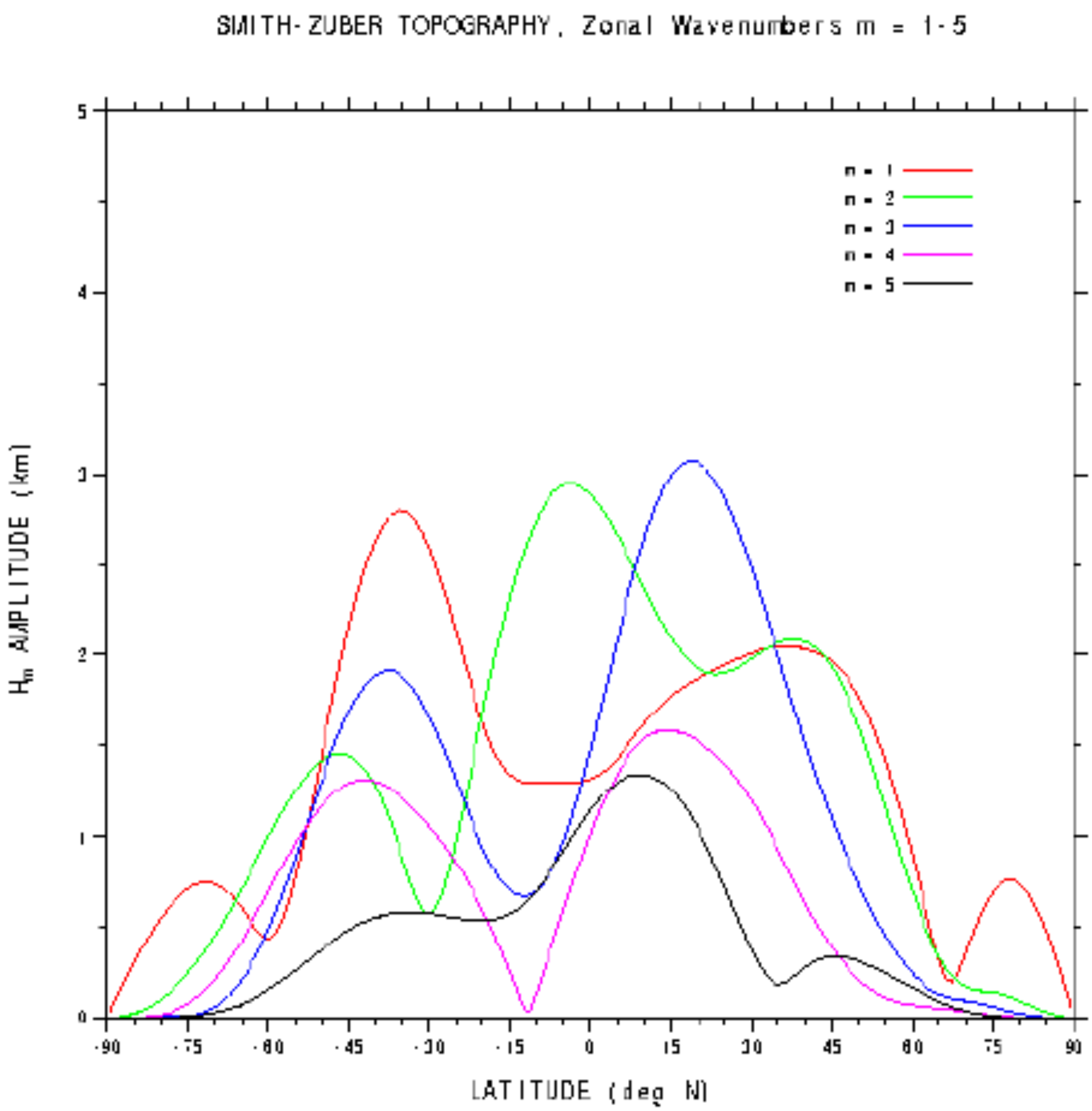
Data and Predictions

- Density, density scale height & temperature at 130 km (in & out) and periapsis (100-110 km)
- Mars Thermosphere Global Circulation Model predicts mean atmospheric behaviour
- Predictions cover ~ 1 month


Outbound Density at 130 km
10.0
1.0
0.1
Density (kg km−3)
−50
0
50
Latitude ('N)
Complete Phase 2: Orbits 574 − 1283
. = MGS, + = MTGCM


Wave−5 fit to outbound densities at 130km
25 orbits P824 − P848, 13 − 19 'N
Density (kg km−3)
0
1
2
3
4
0
100
200
300
Longitude ('E)


Wave-5 fits to outbound densities at 130 km
25 orbit runnning means
Amplitude of harmonic/
mean density
1.0
0.8
0.6
0.4
0.2
0.0
-50
0
50
Latitude ('N)
wave1=red, wave2=green, wave3=blue
waves4 and 5 omitted for clarity



SMITH-ZUBER TOPOGRAPHY, Zonal Wavenumbers m = 1-5
m = 1
m = 2
m = 3
m = 4
m = 5
0
1
2
3
4
5
H_m AMPLITUDE (km)
-90
-75
-60
-45
-30
-15
0
15
30
45
60
75
90
LATITUDE (deg N)

Points to remember

- Unexpected stationary longitudinal variations mean surface effects propagating up over 100km
- Mid-latitude models useful
- Polar night badly modelled