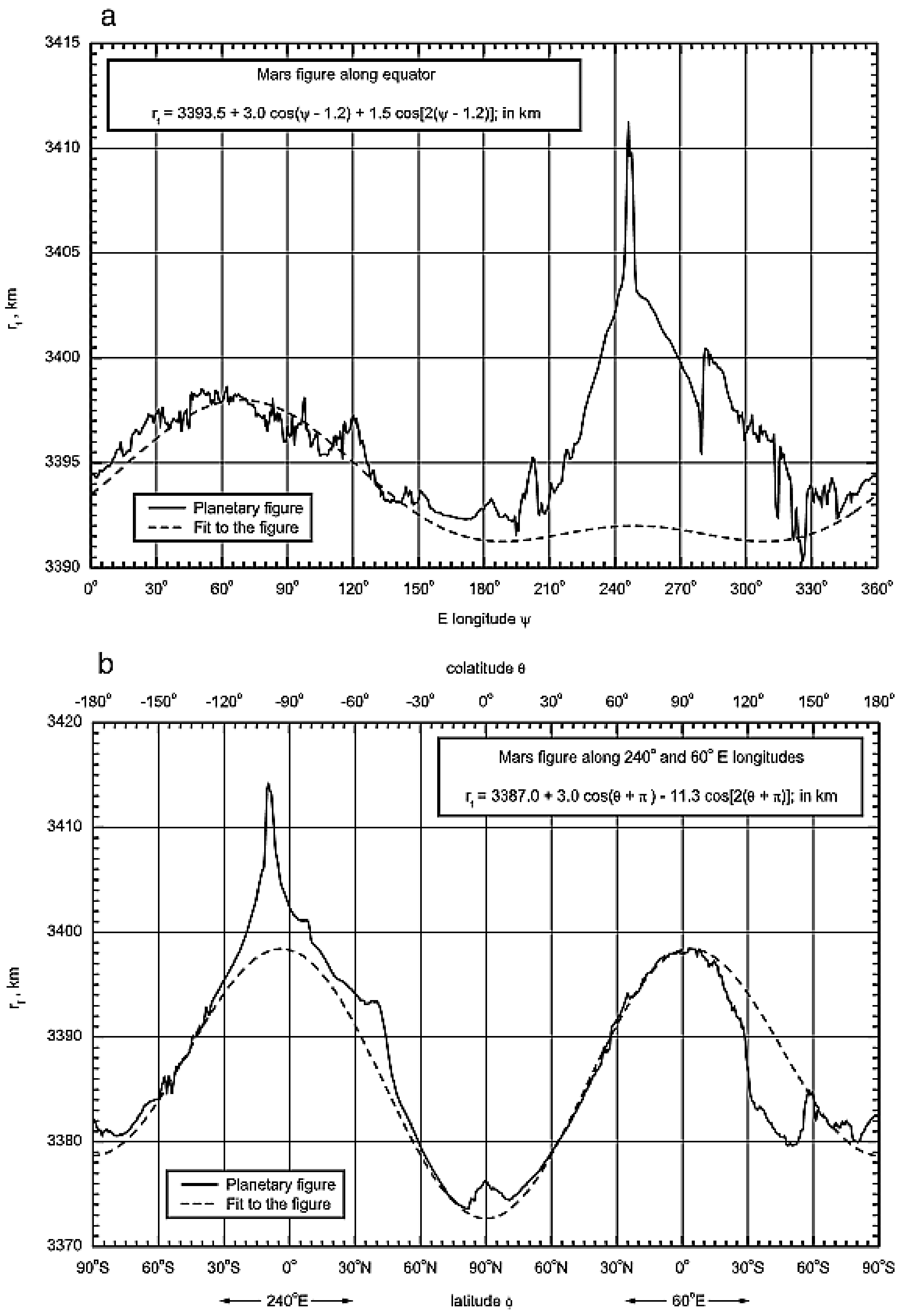
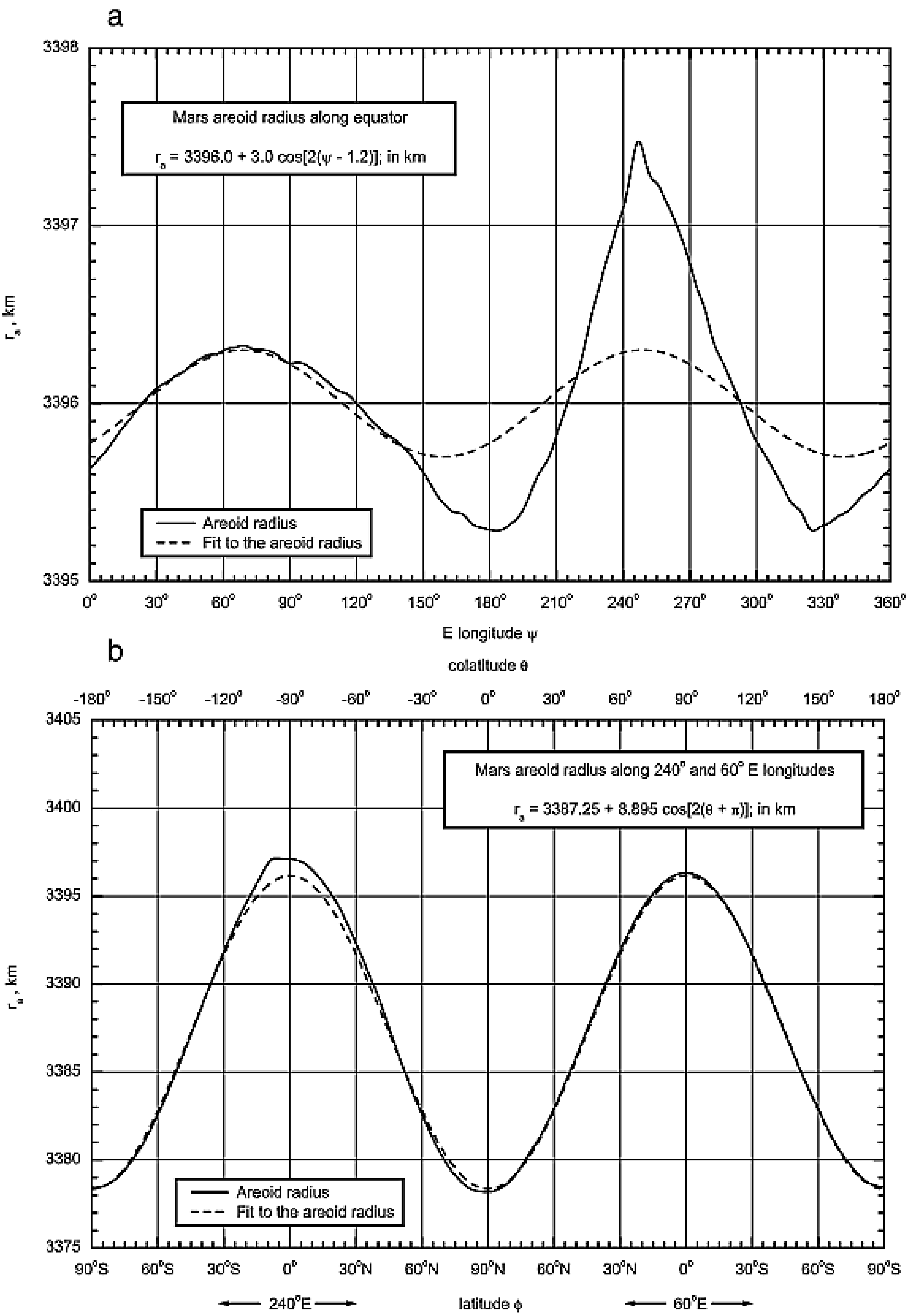
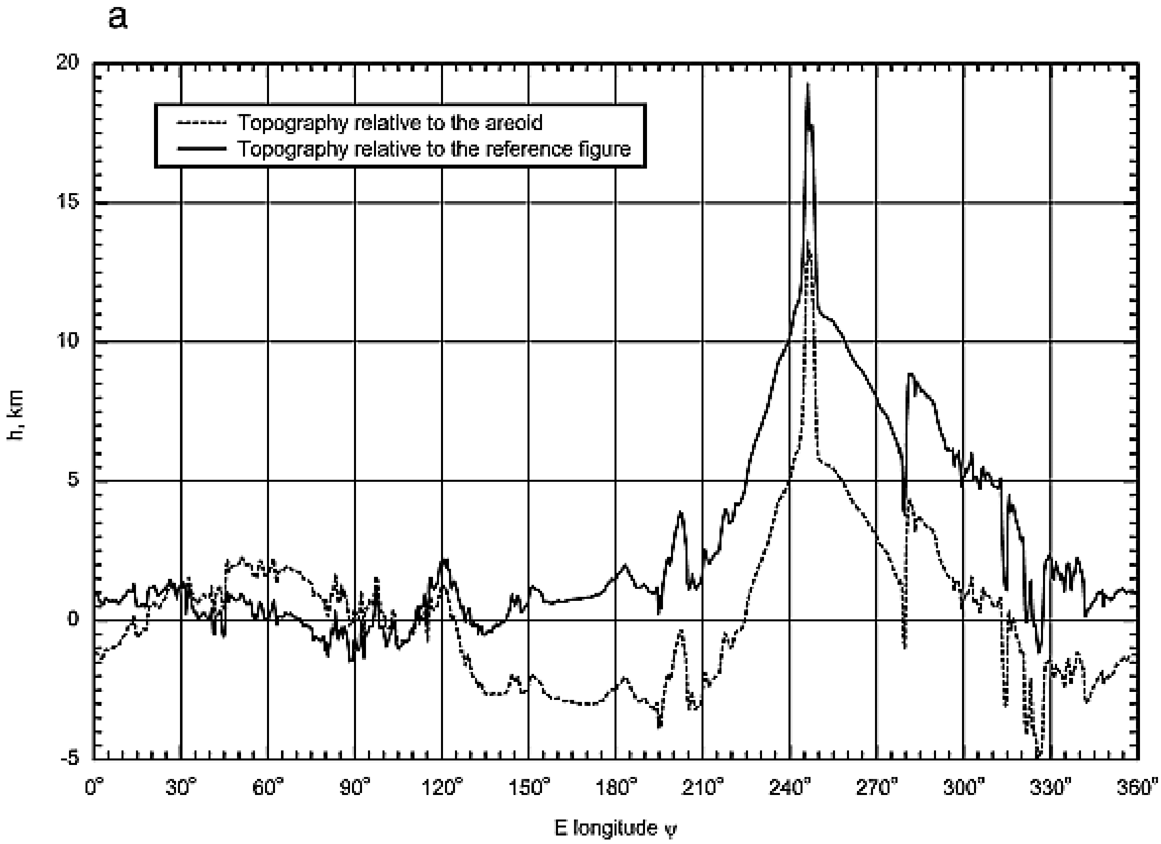
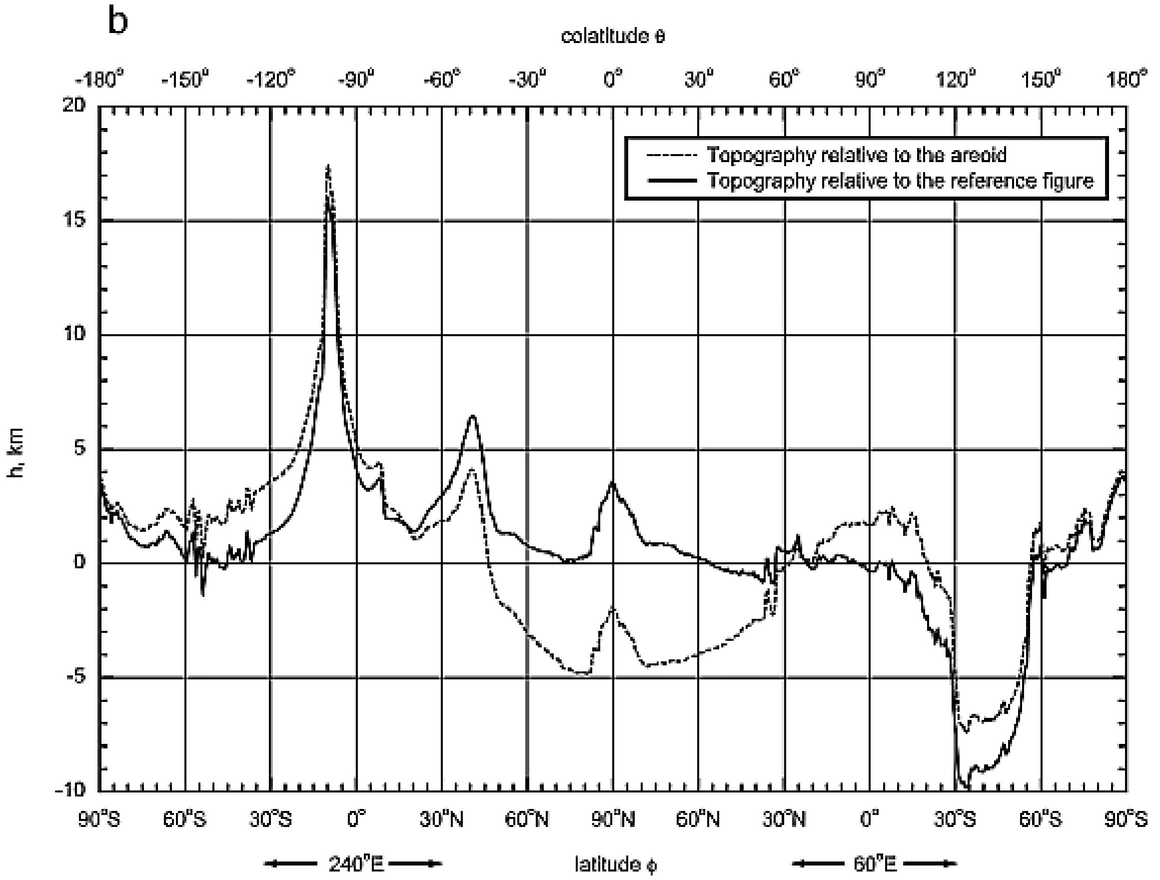
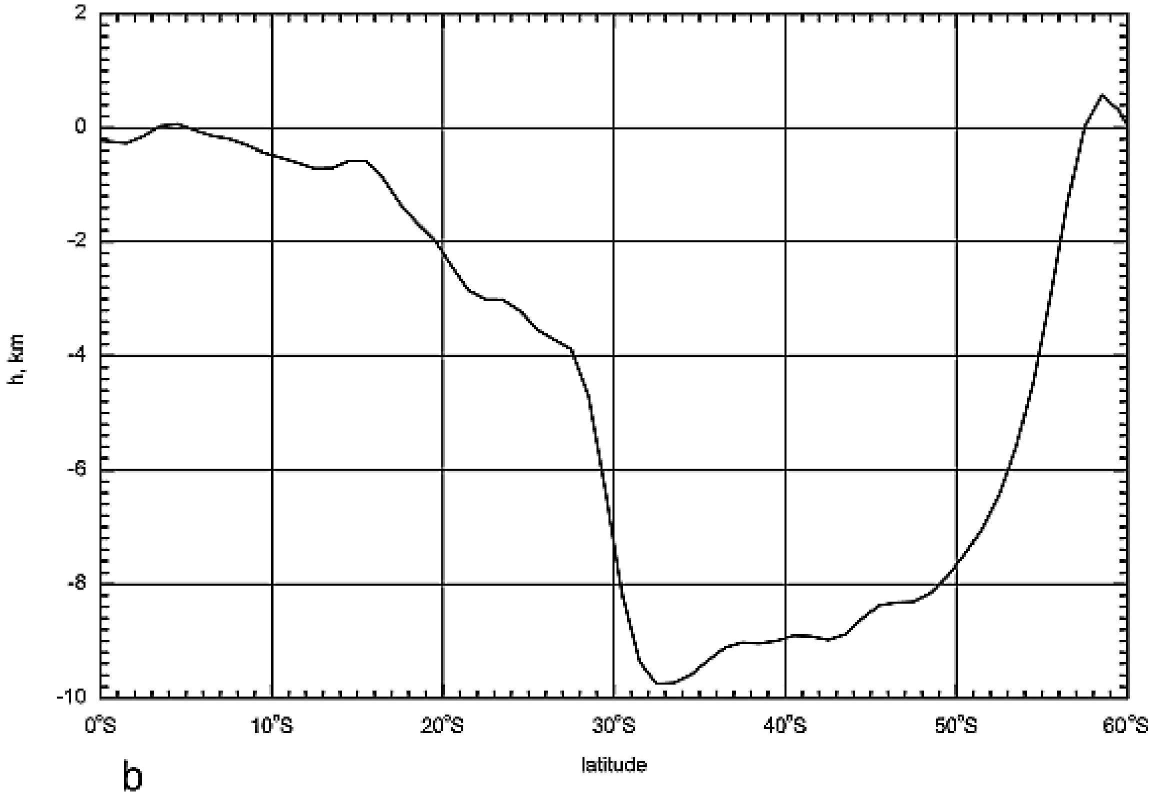

a
Mars figure along equator
r1 = 3393.5 + 3.0 cos(ψ - 1.2) + 1.5 cos[2(ψ - 1.2)]; in km
Planetary figure
Fit to the figure
r1 , km
3415
3410
3405
3400
3395
3390
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
E longitude ψ
b
colatitude θ
-180°
-150°
-120°
-90°
-60°
-30°
0°
30°
60°
90°
120°
150°
180°
Mars figure along 240° and 60° E longitudes
r1 = 3387.0 + 3.0 cos(θ + π) - 11.3 cos[2(θ + π)]; in km
Planetary figure
Fit to the figure
r1 , km
3420
3410
3400
3390
3380
3370
90°S
60°S
30°S
0°
30°N
60°N
90°N
60°N
30°N
0°
30°S
60°S
90°S
240°E
latitude φ
60°E


a
Mars areoid radius along equator
r_a = 3396.0 + 3.0 cos[2(ψ - 1.2)]; in km
Areoid radius
Fit to the areoid radius
r_a , km
E longitude ψ
b
colatitude θ
Mars areoid radius along 240° and 60° E longitudes
r_a = 3387.25 + 8.895 cos[2(θ + π)]; in km
Areoid radius
Fit to the areoid radius
r_a , km
latitude φ
240°E
60°E

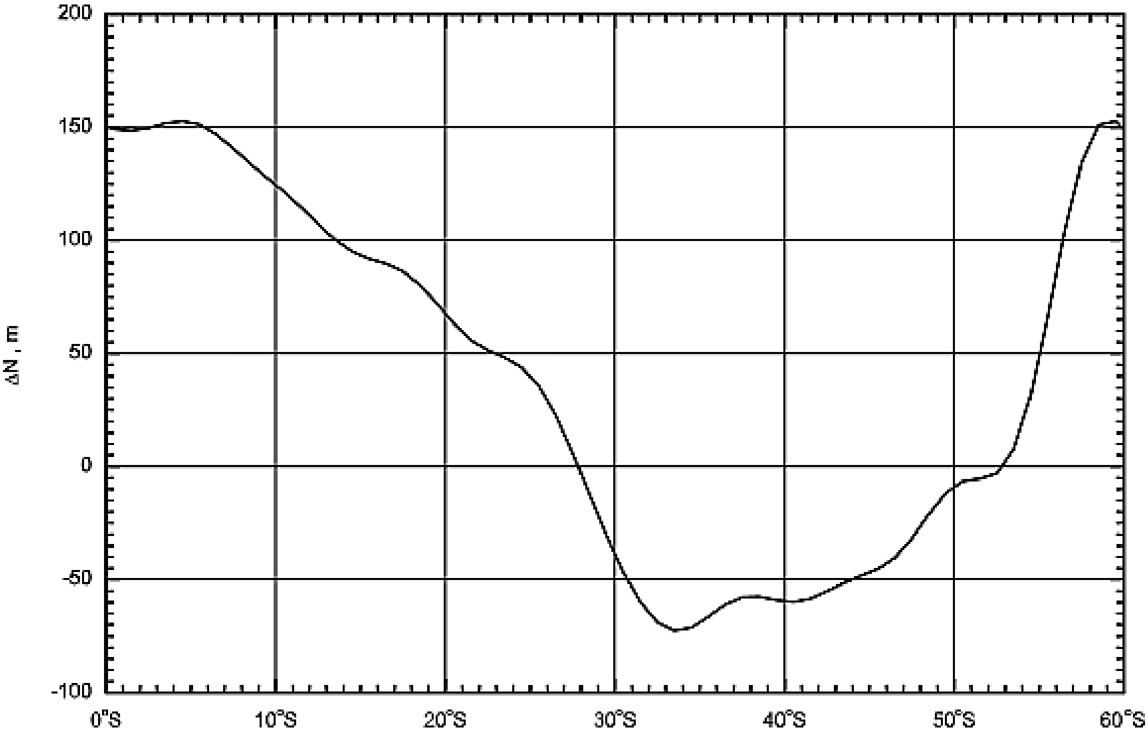

a
Topography relative to the areoid
Topography relative to the reference figure
h, km
20
15
10
5
0
-5
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
E longitude ψ

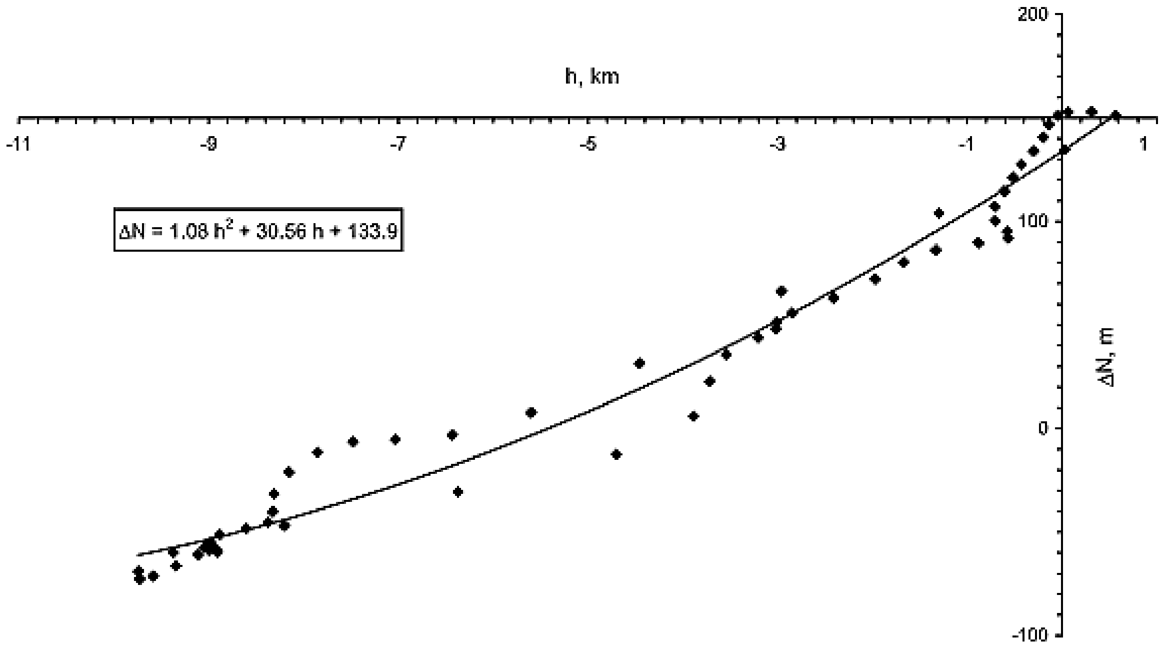

b
colatitude θ
-180°
-150°
-120°
-90°
-60°
-30°
0°
30°
60°
90°
120°
150°
180°
Topography relative to the areoid
Topography relative to the reference figure
h, km
20
15
10
5
0
-5
-10
90°S
60°S
30°S
0°
30°N
60°N
90°N
60°N
30°N
0°
30°S
60°S
90°S
240°E
latitude φ
60°E

a


2
0
-2
-4
-6
-8
-10
h, km
0°S
10°S
20°S
30°S
40°S
50°S
60°S
latitude

b


200
150
100
50
0
-50
-100
ΔN , m
0°S
10°S
20°S
30°S
40°S
50°S
60°S
latitude



Turcotte et al. (2002) fit a degree 2 figure to the equatorial topography, except in the Tharsis region (their Figure 1). In this way they determine

$\Delta_f = 3.0\,\text{km}$ C. F. offset from C. M.

$a_f = 3393.5$ km mean equatorial radius

$e_f^{-1} = 1131.17$ e_f is the equatorial flattening

Turcotte et al. (2002) also fit a degree 2 figure to the polar topography (Figure 1) assuming the same value for Δ_f as above. They obtain (omitting Tharsis)

$\bar{r}_f = 3387.0$ km mean radius of fit

$f_f^{-1} = 150.15$ $f_f =$ polar flattening of figure

Turcotte et al. (2002) remove Tharsis to get the polar flattening due to rotation by assuming that the equatorial flattening is due to Tharsis and by axisymmetry Tharsis contributes the same to the polar flattening

$f_{fr} =$ polar flattening due to rotation = $f_f - e_f$

$$= \frac{1}{150.15} - \frac{1}{1131.17} \qquad f_{fr}^{-1} = 173.13$$

Similar degree 2 fits are made to the aeroid along the equatorial and meridional tracks.

$f_{ar} =$ aeroid polar flattening due to rotation = $f_a - e_a$

They obtain $f_{ar}^{-1} = 197.56$.

From the value of $C/MR^2 = 0.365$ for Mars and the Radau relation, the hydrostatic polar flattening of Mars is

$$f^{-1} = 198.47$$

This is less flattening than the flattening of the figure. The figure may be a paleoflattening of a more rapidly spinning Mars.

Using the aeroid flattening and the Radau relation to predict C/MR^2 gives 0.366!

Reference

Turcotte, D.L., R. Shcherbakov, B.D. Malamud, and A.B. Kucinskas, 2002. Is the Martian crust also the Martian elastic lithosphere? *J. Geophys. Res.*, **107**, 5091, doi:10.1029/2001JE001594, 2002.