

**Table 1.** Nominal values of quantities assumed for thermal evolution calculations.

Parameter	Value <sup>a</sup>
Planet radius	2440 km
Core radius	1850 km
Pressure, $P_{\text{cmb}}$ , $P_{\text{center}}$	8 GPa, 40 GPa
Density ( $P = 0$ ), $\rho_{\text{o,FeS}}$	5333 kg m <sup>-3</sup>
Density ( $P = 0$ ), $\rho_{\text{o,Fe}}$	7019 kg m <sup>-3</sup>
Specific heat capacity (core, mantle), $C_p$	800, 1200 J kg <sup>-1</sup> K <sup>-1</sup>
Thermal expansivity, $\alpha_c$	$3 \times 10^{-5}$ K <sup>-1</sup>
$\theta$	2.0
Sulfur concentration, $\chi$	3 (0 – 8) wt%
$T_{\text{m0}}$	1809 K
$T_{\text{m1}}$	$1.54 \times 10^{-11}$ Pa <sup>-1</sup>
$T_{\text{m2}}$	$-1.17 \times 10^{-22}$ Pa <sup>-2</sup>
Mantle reference viscosity, $\eta_0$	$10^{20}$ ( $10^{18} - 10^{21}$ ) Pa s
Viscosity reference temps <sup>b</sup> , $T_{\text{ref}}$	1573 K, 2000 K
Activation energy coeff., $\zeta$	$1.0 \times 10^{-2}$ K <sup>-1</sup>
Mantle density, $\rho_m$	3400 kg m <sup>-3</sup>
Thermal conductivity (core), $k$	40 W m <sup>-1</sup> K <sup>-1</sup>
Thermal diffusivity (mantle), $\kappa$	$1 \times 10^{-6}$ m <sup>2</sup> s <sup>-1</sup>
Partition coefficient, $D$	0.5
Latent heat of fusion, $L_h$	$250 \times 10^{-3}$ J kg <sup>-1</sup>
Compositional expansion coefficient, $\beta_c$	0.64
<i>Mantle abundances:</i>	
U	30 ppb
Th	120 ppb
K	0 ppb

<sup>a</sup> Values within parentheses reflect range of values studied.

<sup>b</sup> Values of  $T_{\text{ref}}$  for top, 1573 K, and bottom, 2000 K, of mantle selected to reflect pressure dependence of viscosity resulting in similar top and bottom mantle viscosities.