2. Vnitřní struktura a vývoj Slunce

Sluneční fyzika
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Slunce:

- $M=(1{,}9891\pm0{,}0012)\times10^{30}$ kg
- $L=3{,}86\times10^{26}$ W
- R=695 980 km
- $\langle\rho\rangle=1400$ kg m^{-3}
- $g=27{,}4$ m s^{-2}
- $T_{eff}=(5785\pm10)$ K
- 1"=726 km ve vzdálenosti 1 AU
- Věk ~ $4{,}5\times10^{9}$ let
- $v_{esc} = 6{,}17\times10^{5}$ m s^{-1}
- $L=1{,}7\times10^{41}$ kg m^{-2} s^{-1}

Rovnice vnitřní struktury

$$\frac{\mathrm{d}m}{\mathrm{d}r} = 4\pi\rho r^2$$

$$\frac{\mathrm{d}P}{\mathrm{d}r} = \frac{-Gm\rho}{r^2}$$

$$\frac{\mathrm{d}L}{\mathrm{d}r} = 4\pi\rho r^2(\epsilon + \mathrm{korekce})$$

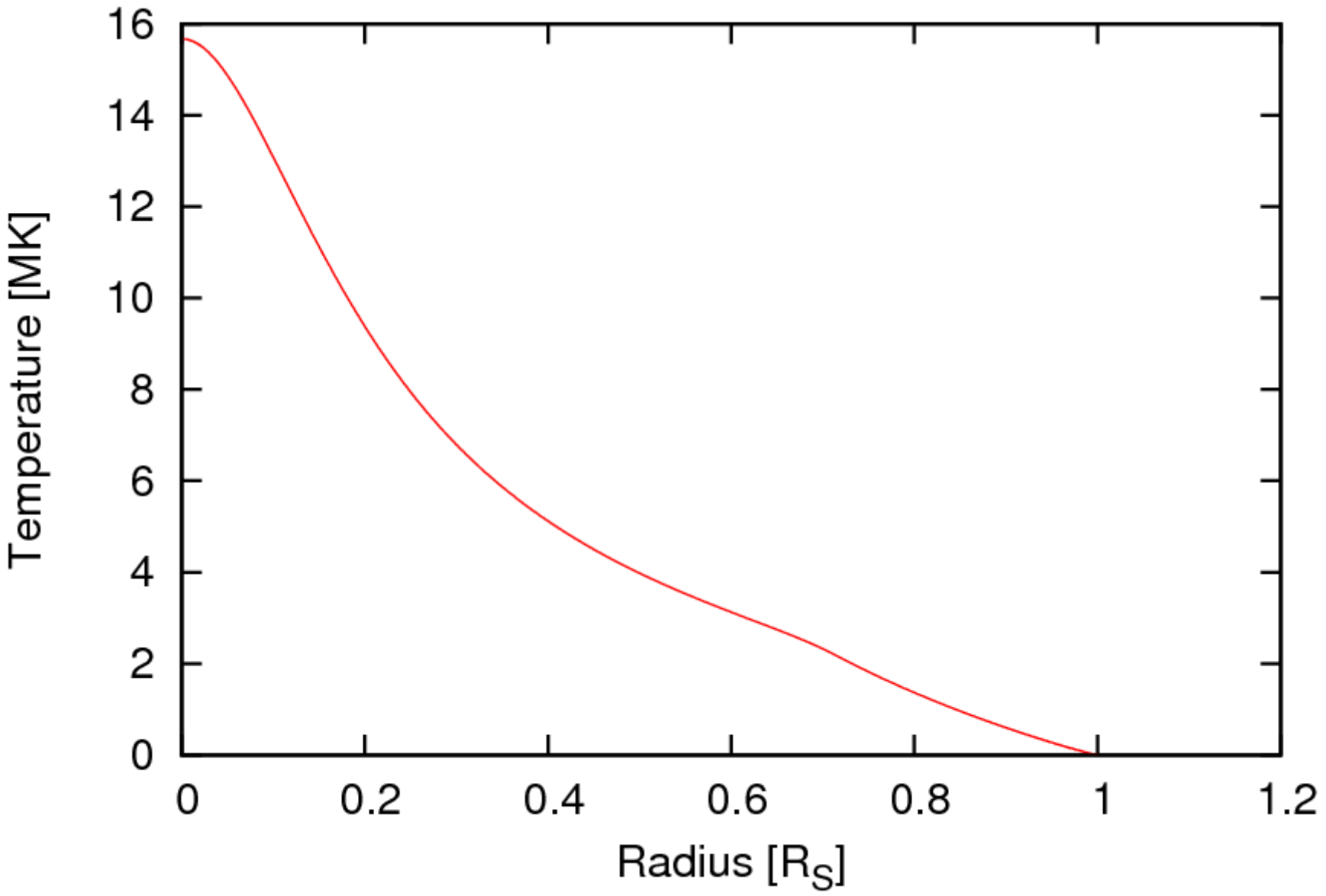
$$\frac{\mathrm{d}T}{\mathrm{d}r} = \frac{-GmT\rho}{r^2 P}\nabla \leftarrow \begin{cases} \nabla_{\mathrm{rad}} = \dfrac{3\kappa P L}{16\pi acGm T^4} \\ \nabla_{\mathrm{ad}} = \dfrac{\delta Gm}{c_p r^2} \end{cases}$$

$$P = \frac{\Re\rho T}{\mu},\quad \mu = \frac{1}{2\mathrm{X} + \frac{3}{4}Y + \frac{1}{2}Z}$$

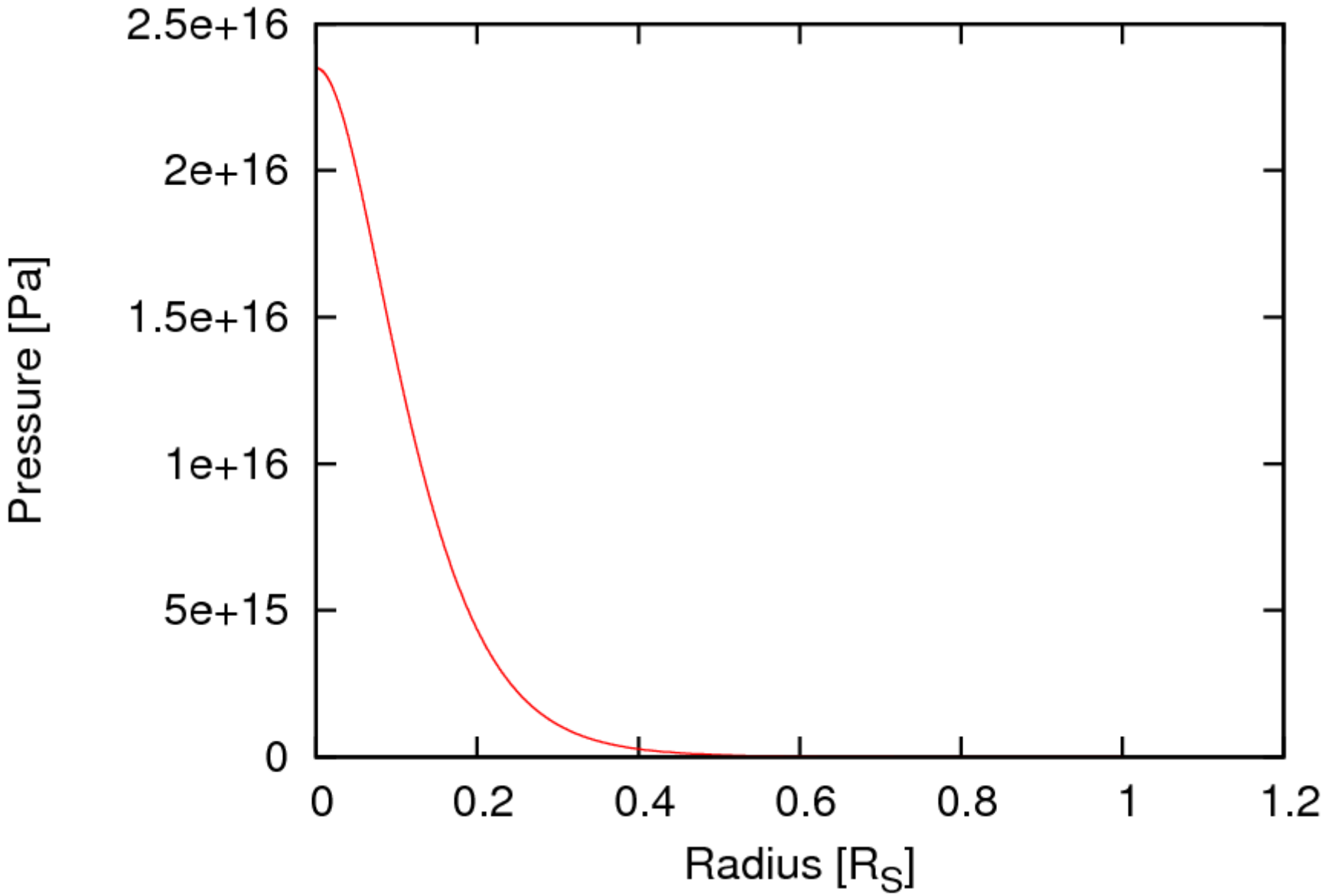
$$\epsilon = \epsilon_0 X^2 \rho T^4$$

$$\kappa = \kappa_0 (X+1) Z \rho T^{-3.5}$$

Model S (Christensen-Dalsgaard et al. 1996)



Model S (Christensen-Dalsgaard et al. 1996)



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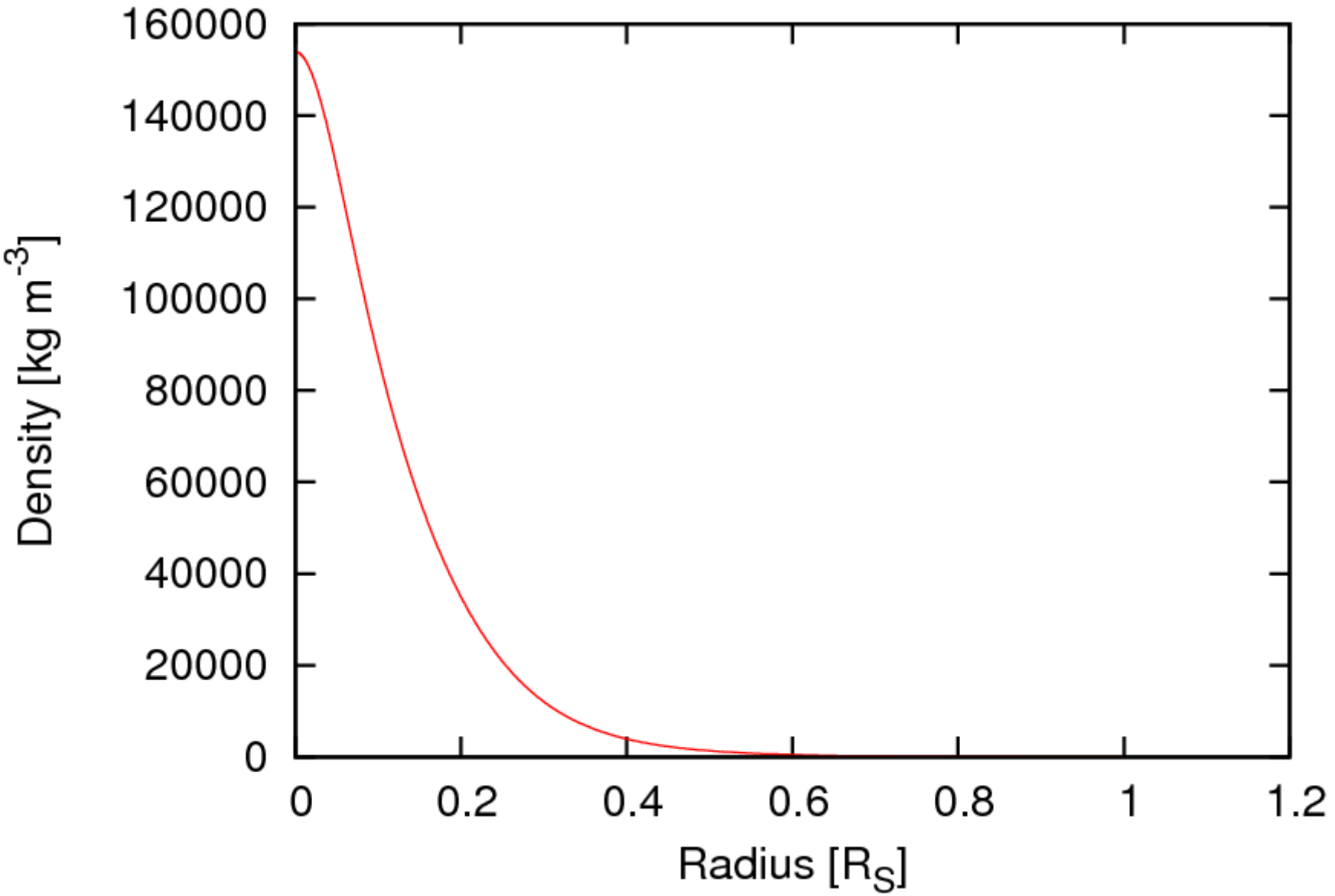

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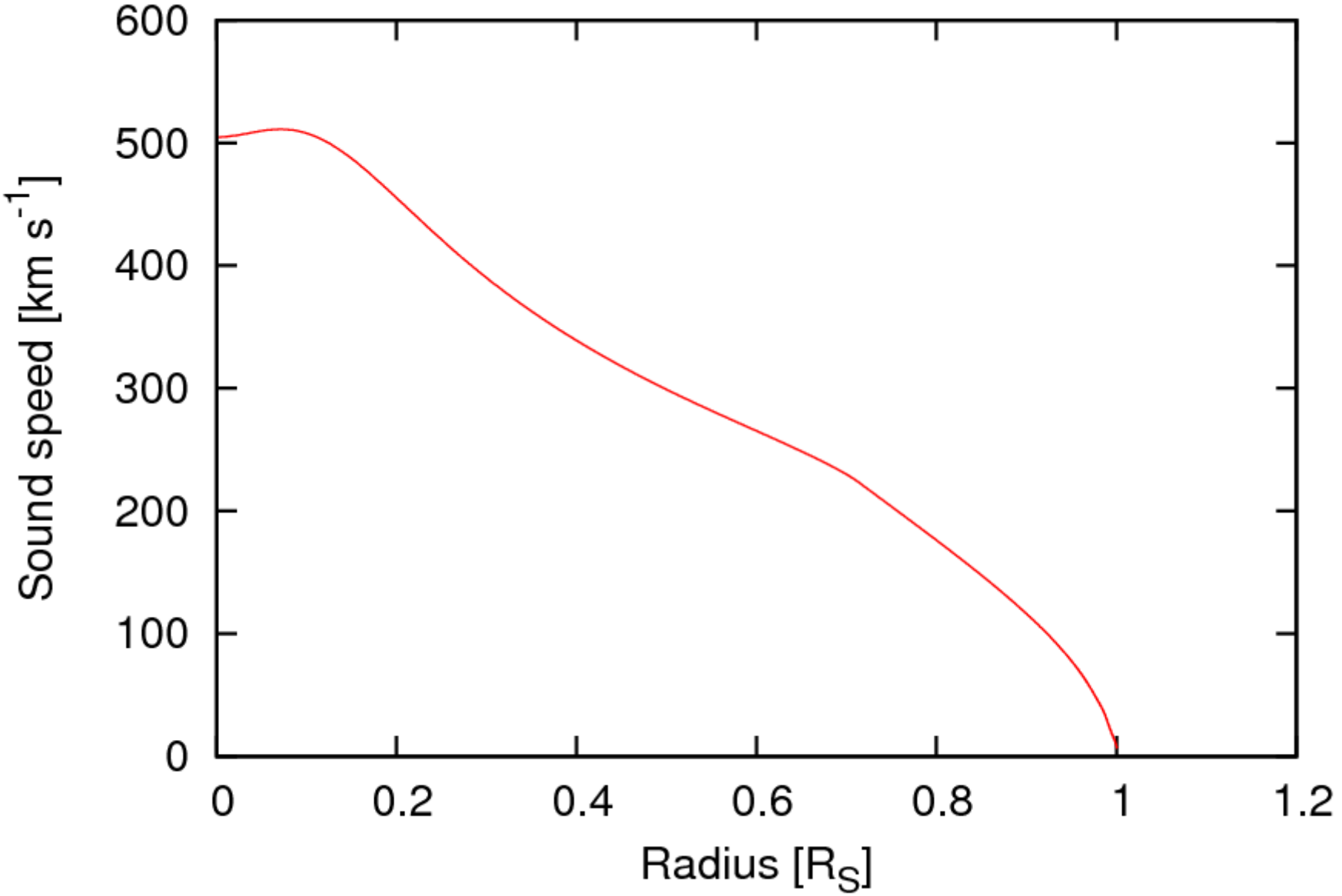

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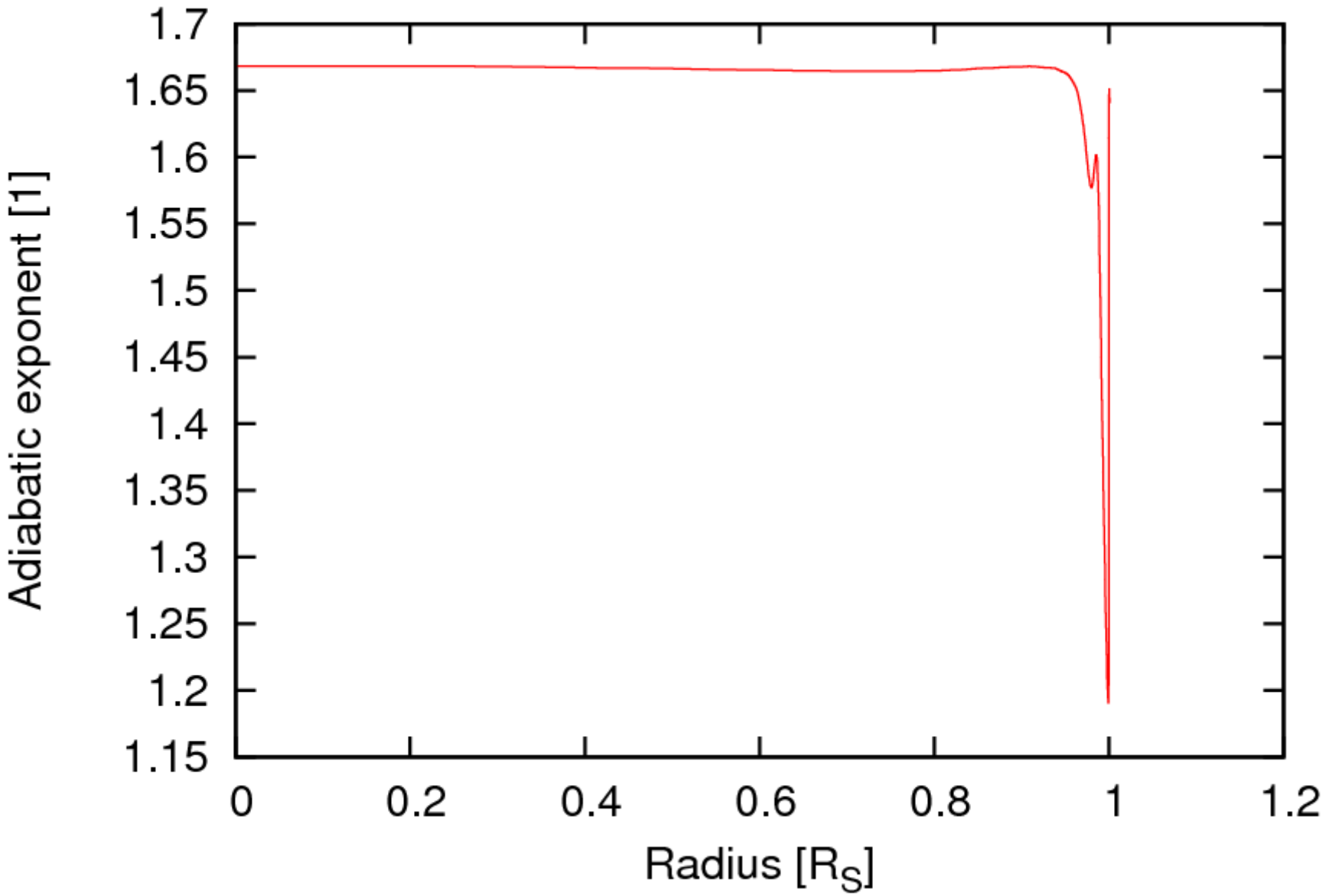
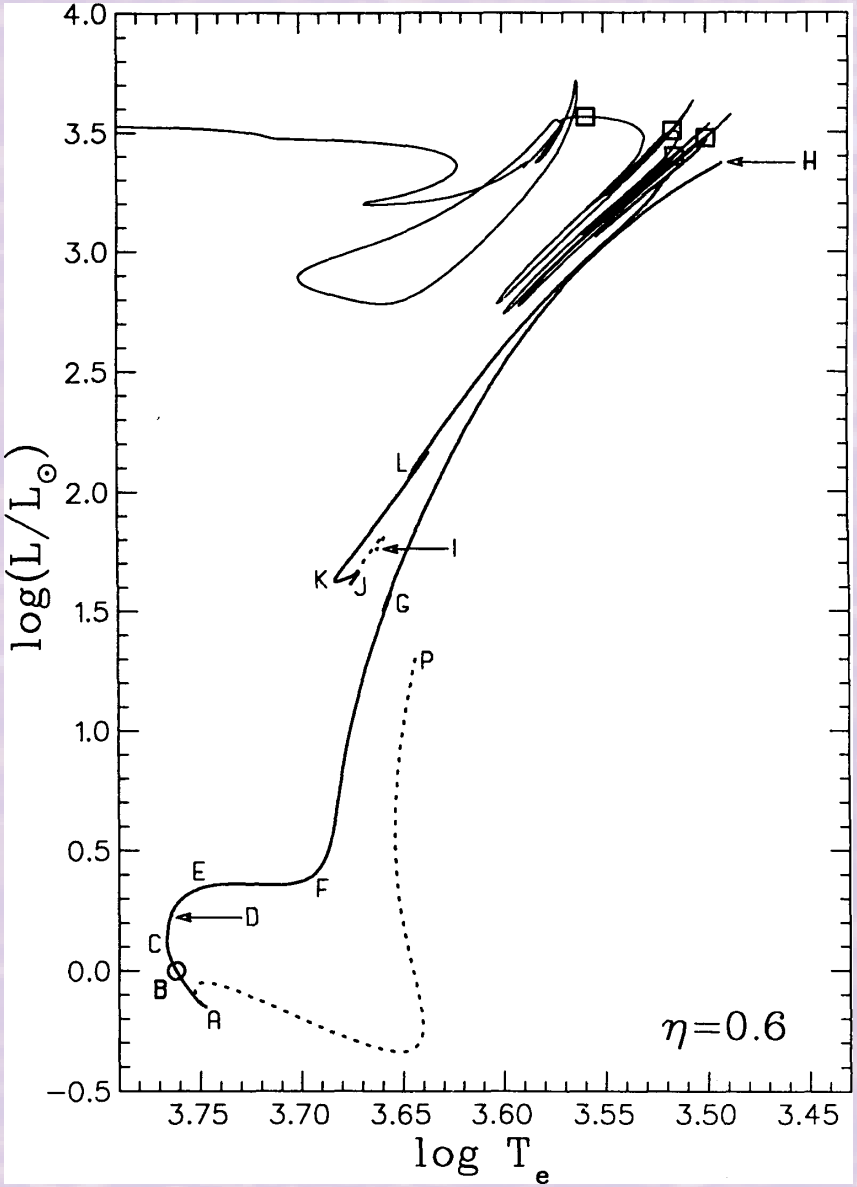


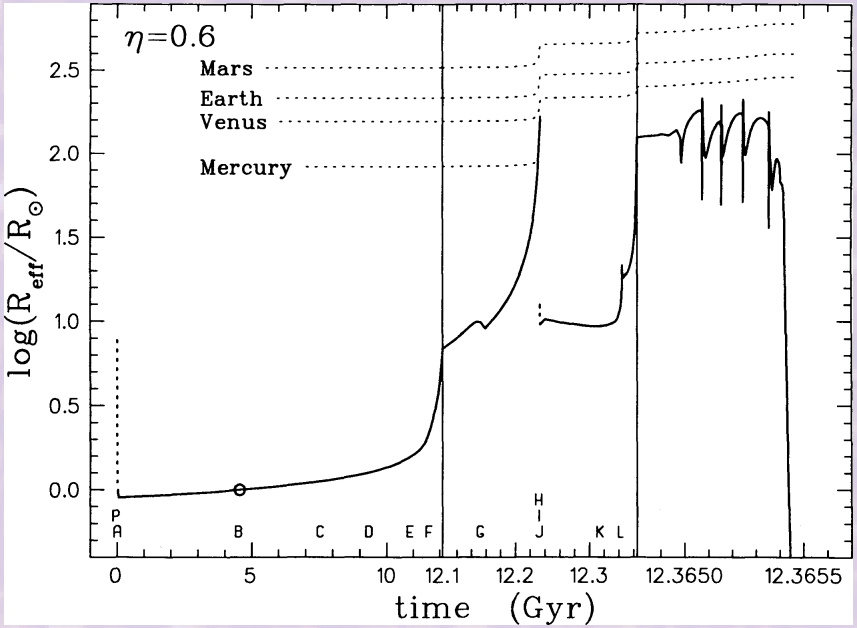
Slunce na H-R diagramu v budoucnosti

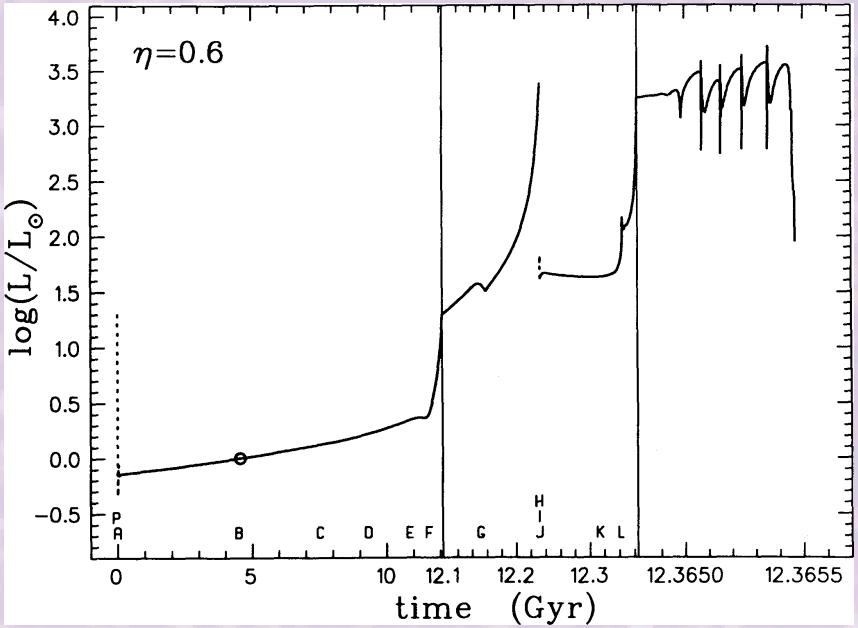
- Sackmann, I. J. (1993)
- P-A před MS
- A-E MS, B současné Slunce
- H-J heliový záblesk
- I-J před horizontální větví rudých obrů
- Čtverečky – záblesky slupek He na AGB

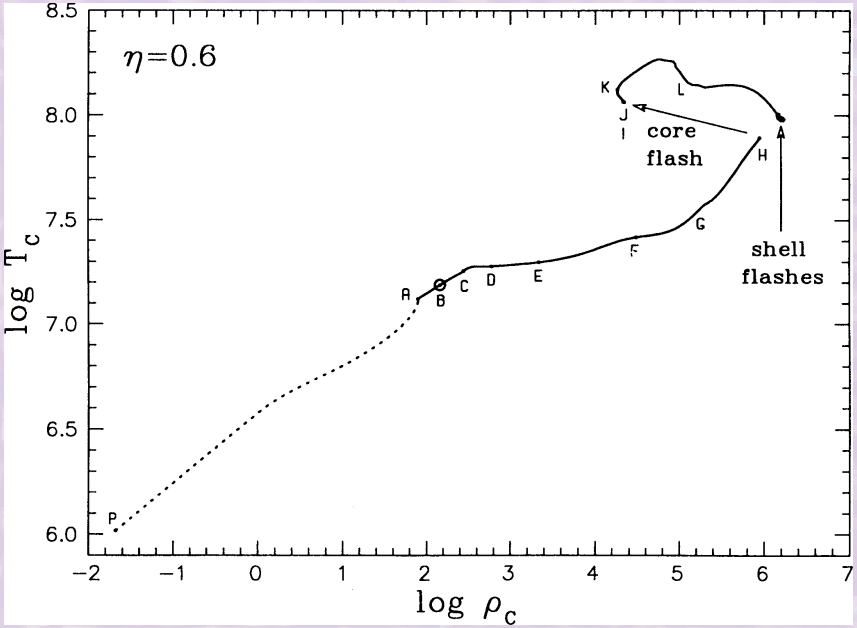
- MS ještě cca 6,4 Gy (celkově 11 Gy)
- RGB 0,6 Gy
- AGB 0,1204 Gy



Vývoj parametrů Slunce v čase







- Téma seminárky?