Input parameters

This file provides summary of input parameters and some suggestion for "ordinary" calculations.

Basic parameters

- Mass:$1.001 M_\odot$
- Radius: $1.000 R_\odot$
- Luminosity: $1.005 L_\odot$
- Age: 4.600×10^9 yr

Photosphere

Surface values

- Temperature: 5850.177 K
- Gravity: 2.740×10^4 cm/s^2
- Density: 2.027×10^{-7} g/cm^3
- Pressure: 7.822×10^4 dyn/cm^2
- Pressure scale height: 140.83 km
- Convection velocity (Maximum value): 3.48 km/s
- Speed of sound: 7.95 km/s
- Convection time scale (at maximum v_c): 3.44 min
- Equipartition magnetic field to
  - Gas pressure: 1402.1 G $= \sqrt{8\pi p_\mathrm{surface}}$
  - Convection flow: 556.2 G $= v\sqrt{4\pi\rho_\mathrm{surface}}$

Photospheric calculation suggestion

Calculation domain

- Vertical (upper): $R_* + 653.0$ km where $\rho_\mathrm{surface}/\rho = 250$
- Vertical (lower): $R_* - 4501.2$ km where $\rho_\mathrm{surface}/\rho = 1/500$
- Horizontal: 5633.3 km $= 4H_p \times 10$

Grid spacing (typical)

- Vetical: 35.2 km $= H_p/4$
- Horizontal: 70.4 km $= H_p/2$

Time

- Output cadence: 20.6 s $= 4H_p/v_\mathrm{c}/10$
- Calculation Duration: 51.5 min $= 4H_p/v_\mathrm{c} \times 15$

With sunspot

- Magnetic field strength = 3505.3 G = $2.5\sqrt{8\pi p_{\rm surf}}$
- Sunspot radius = 11.3 Mm = $80H_p$

Deep convection zone

Deep Convection zone values

- Location of base of the convection zone: $R_{\rm bcz}$= 0.711 R_*

Following values are at the middle of the convection zone $(R_* + R_{\rm bcz})/2$

- Temperature: 9.208×10^5 K
- Gravity: 3.728×10^4 cm/s^2
- Density:5.100×10^{-2} g/cm^3
- Pressure scale height: 33.55 Mm
- Convection velocity: 68.03 m/s
- Convection time scale: 22.84 day

Deep CZ calculation suggestion

calculation domain

- Vertical (upper): $0.9558R_*$ where $\rho_{\rm bcz}/\rho = 30$
- Vertical (lower): $0.7109R_* = R_{\rm bcz}$
- Horizontal domain should cover whole sphere

Grid spacing

- Vetical: $0.048R_* = H_p/4$
- Horizongal grid spacing is arbitrary

Time

- Output cadence: 2.3 day = $4H_p/v_{\rm c}/10$
- Calculation Duration: 342.6 day = $4H_p/v_{\rm c} \times 15$

Appendix

- Solar mass: 1.988×10^{33} g
- Solar radius: 6.957×10^{10} cm
- Solar luminosity: 3.828×10^{33} erg/s
- Solar age: 4.570×10^9 Gyr