Lecture 25

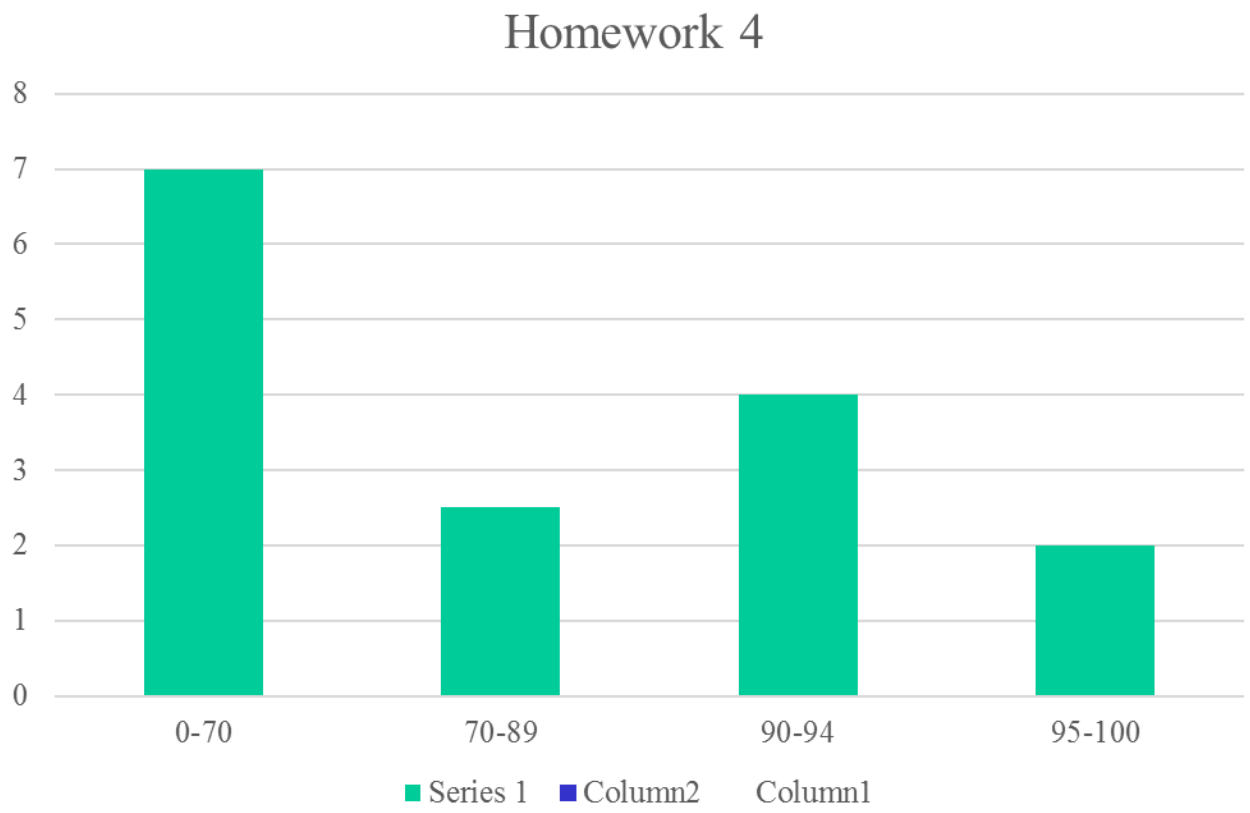
- Results from observations so far
- Third sample midterm exam
- More on convection

- Today: Boulder Solar Day (BSO)
  → no office hours today

Last time

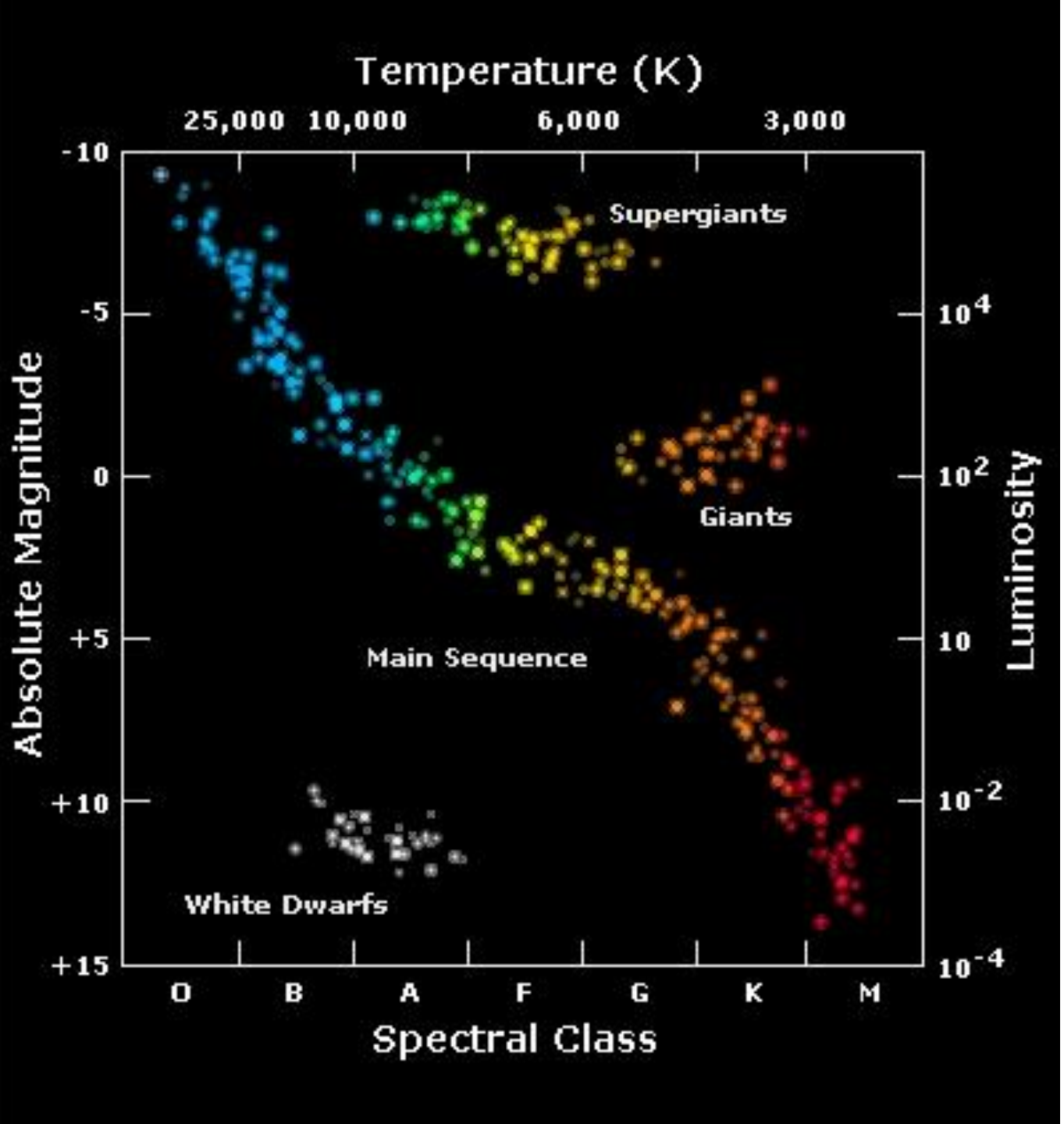
- SBO observing sessions
- More on mean-field dynamos
- Second sample midterm exam

Homework


Homework 4
8
7
6
5
4
3
2
1
0
0-70
70-89
90-94
95-100
Series 1
Column2
Column1

Review of second sample exam

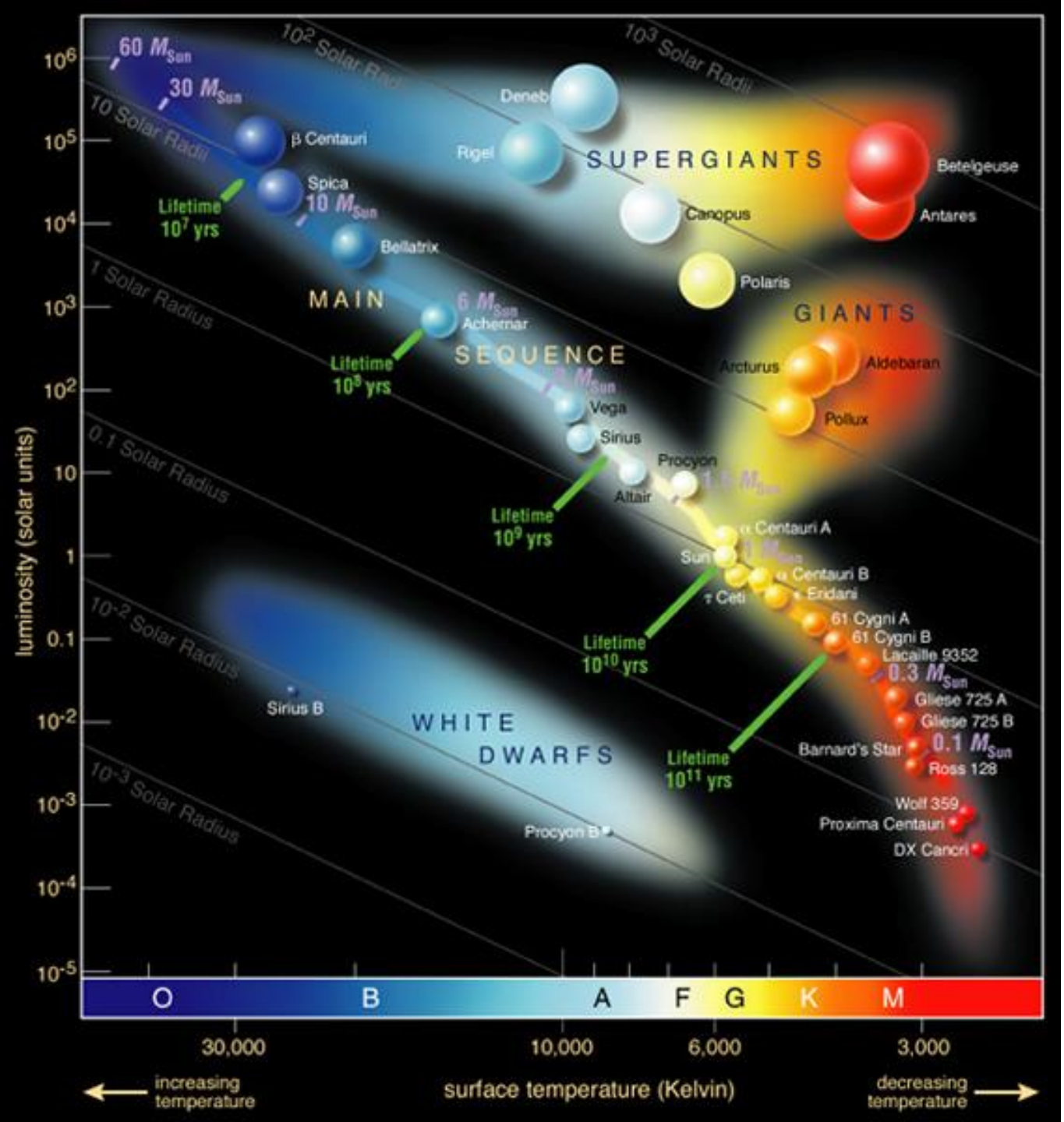
- Solar luminosity: 4e26 W
  - Neutrino flux 5e14/m^2/s
- Sunspots & solar cycle
- Sound wave refraction
  - Lower turning point: evanescant



HR diagram

- M=-2.5 lg L/L_0
- $M=M_{bol}$
- $L_0 = 3x10^{28}W$

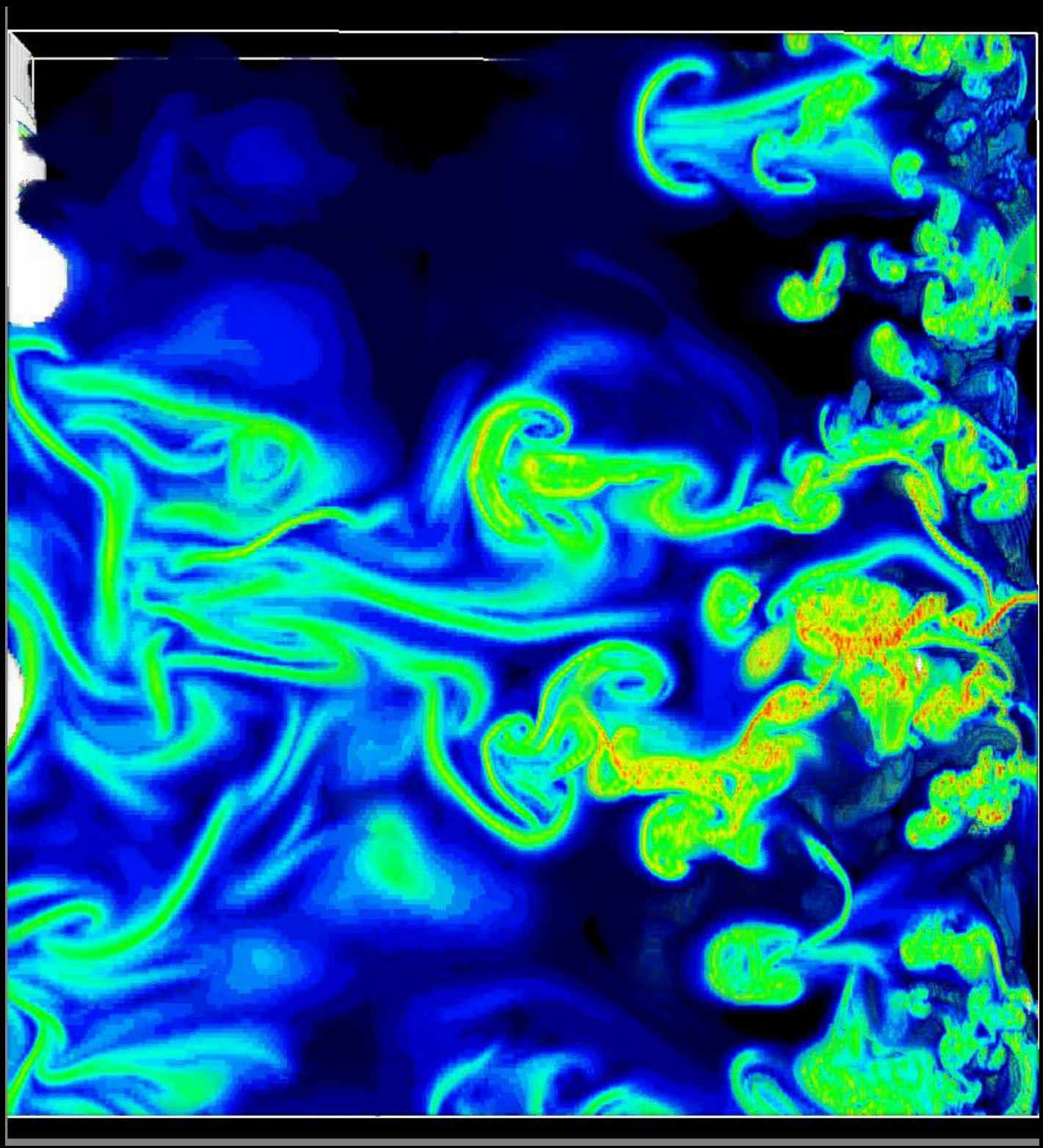
- Distance = 1AU
- $1AU=1.5x10^{11}m$



The Sun in the HR diagram

- L=3.8x10^{26}W
- T_{eff}=5778K

Courtesy: Bob Stein (MSU)



Why does convective velocity decrease with depth?

A. Because of cooling only from the top
B. Because density increases downward
C. Because the gas spreads over large scales

Convective velocity

Enthalpy flux

$$F_{\mathrm{conv}} = \overline{\rho u c_p \delta T}$$

Mixing length approximation

$$u^2 / \ell \sim g \delta T / T$$

Scaling behavior

$$F_{\mathrm{conv}} = \overline{\rho}\, u_{\mathrm{rms}}^3$$

→ Slower with depth

What we learned

- Convection experiment
- Solar convection simulations
- Questions on HW4
- Sign up for SBO observing sessions