Thermohaline Convection 20160309-1

↔ Salt finger instability
observed in ocean

hot + heavy <u>above</u> light + cool medium

ocean heated on top → water evaporates
→ but salt is left behind

→ $\mu \uparrow$ but $T \downarrow$ (gradients)

→ cooling @ interface with cold water below
→ higher density → sinks

"fingers" cool more efficiently

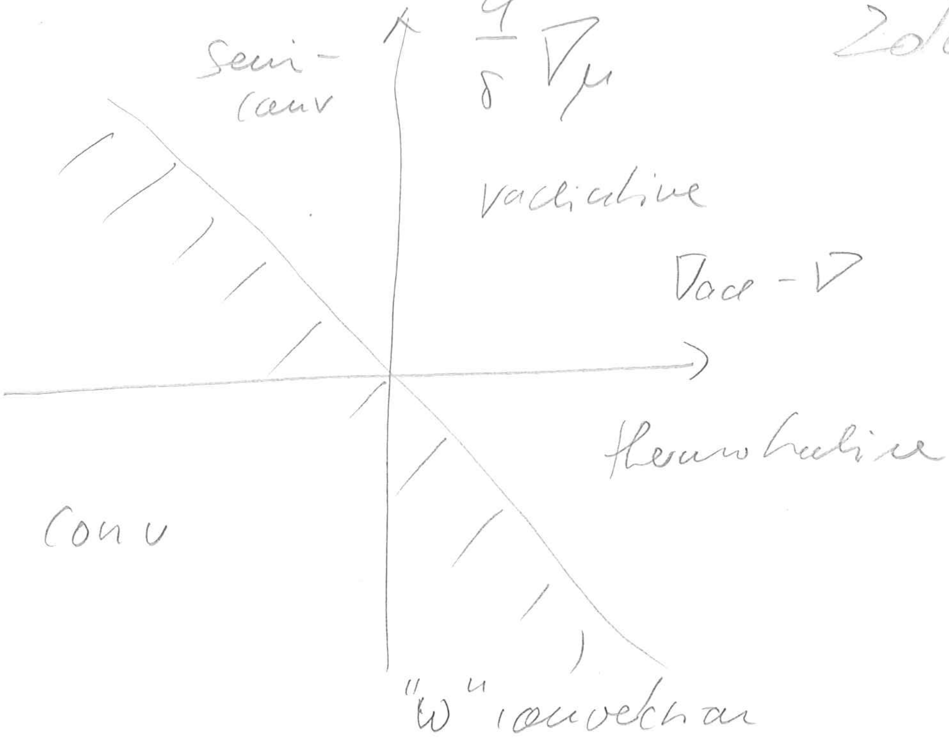
Acase in stars:
- accretion in binary star systems
- ^{3}He burning

$$^3He + ^3He \rightarrow p + p + ^4He$$

Q: derive μ change

compare μ on both sides
what will happen?

20160308-2



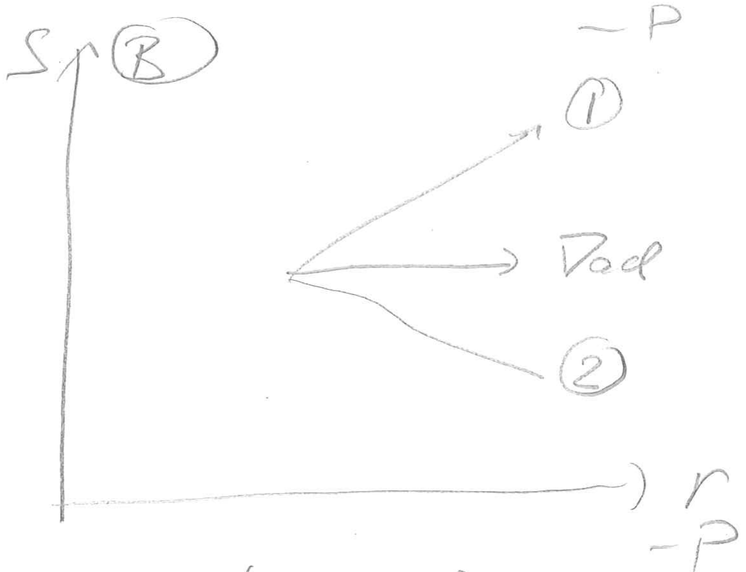
Regimes of stability

SC: $\nabla_{RAD} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$ + $\nabla_{RAD} > \nabla_{ad}$ / $\nabla_{ad} < \nabla_{rad} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$

TH: $\nabla_{rad} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$ + $\frac{\varphi}{\delta}\nabla_\mu < 0$ / $\nabla_{ad} - \nabla_{rad} < \frac{\varphi}{\delta}\nabla_\mu < 0$

Q: DRAW SCHWARZSCHILD CRITION in this diagram!

Adiabatic GRADIENT



Which of these (1, 2) are STABLE (or unstable) to convection

A1 B1