Thermohaline Convection

20150313-1

↔ salt fingering instability observed in ocean

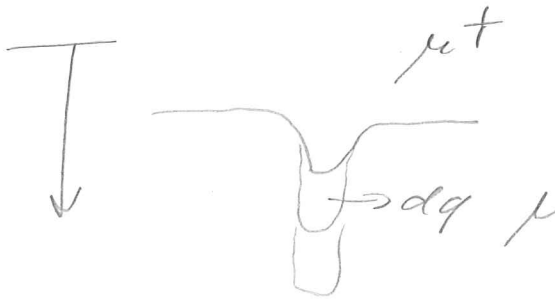
hot heavy above light + cool medium

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

→ $\mu \uparrow$, but $T \downarrow$

→ cooling @ interface w/ cold water below it

→ higher density → sinks



fingers cool more efficiently

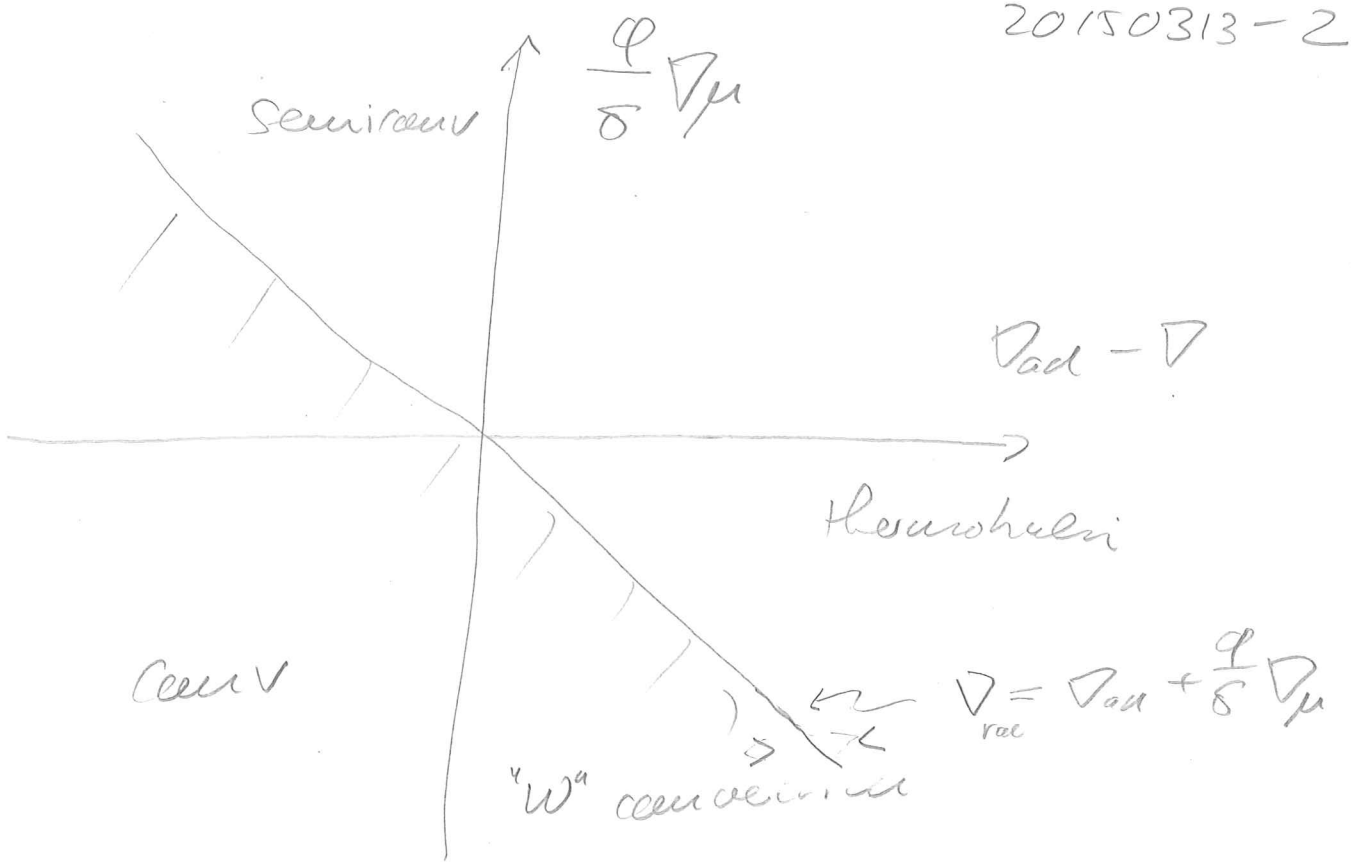
A case in stars:

- accretion in binary star system
- ^3He burning Q: derive μ change

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

compare μ_e on both sides

what will happen?



REGIMES OF STABILITY

SC $\quad \nabla_{RAD} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$

$+$

$\nabla_{RAD} > \nabla_{ad}$

$\Big| \quad \nabla_{ad} < \nabla_{rad} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$

TH: $\quad \nabla_{rad} < \nabla_{ad} + \frac{\varphi}{\delta}\nabla_\mu$

$+$

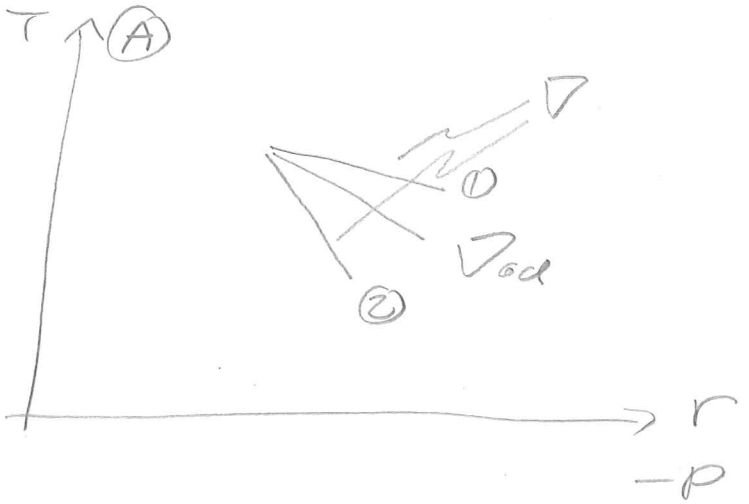
$\frac{\varphi}{\delta}\nabla_\mu < 0$

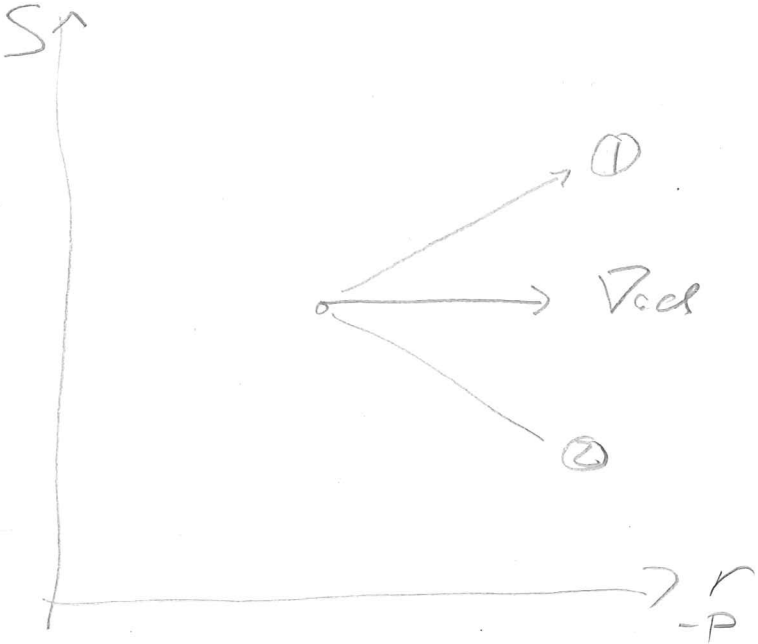
$\Big| \quad \nabla_{ad} - \nabla_{rad} < \frac{\varphi}{\delta}\nabla_\mu < 0$

Q: DRAW SCHWARZSCHILD CRITERION IN THIS DIAGRAM

ADIABATIC GRADIENT

20150313-3





Which of these (①, ②) are <u>STABLE</u> (or unstable) to convection?

A1 B1