Lecture 26: Wrapping up bits & pieces

Logistics: • all HW's are done ✓ Thank you!

• course evaluations

• Thursday → feedback.

Last time: Lecture 23: Steady coupled ocean-GW model

Lecture 24: Filling craters

⇒ BC is integral constraint

$$h'(1) \sim \int_0^1 h' dx'$$

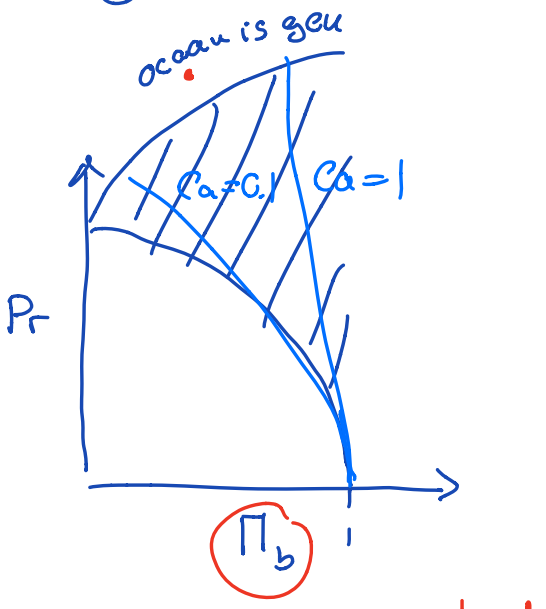
Lecture 25: Mars topography

Today: - go over topography live script

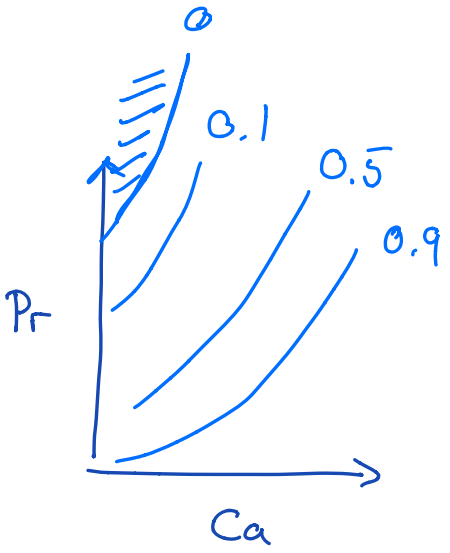
- Solve problem with surface water coupling numerically with Newton-Raphson

- Summary of what we have learned

Steady GW problem



head on bud



$\Pi_b(R, Ca)$

Lake filling problem

PDE: $\phi \frac{\partial h}{\partial t} - K \nabla \cdot h \nabla h = 0$

ODE: $\omega \frac{dh_0}{dt} = (hq)|_0$

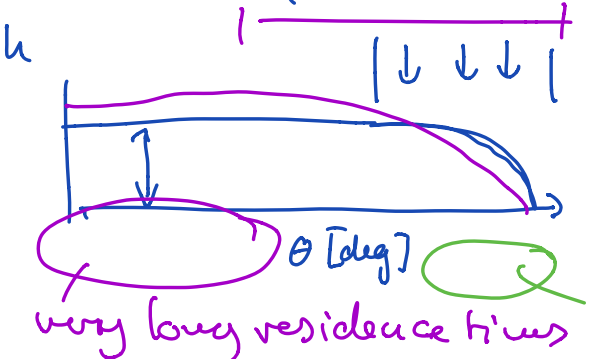
↑

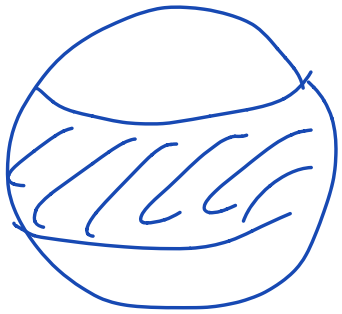
That's it folks!

Outline Mars GW paper

1) Steady solutions for confined & unconfined flow on a sherical shell.

- with precip
- with recharge
- combine





⇒ show how head changes with precip distribution

learn that comb. of decay of K with depth + precip near equator makes for a very flat GW with steep decline near the edge

⇒ h ~

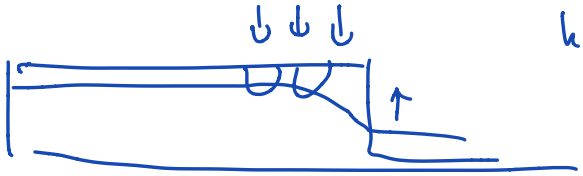
V ~

⇒ residence times

2) Steady coupled GW-ocean problem

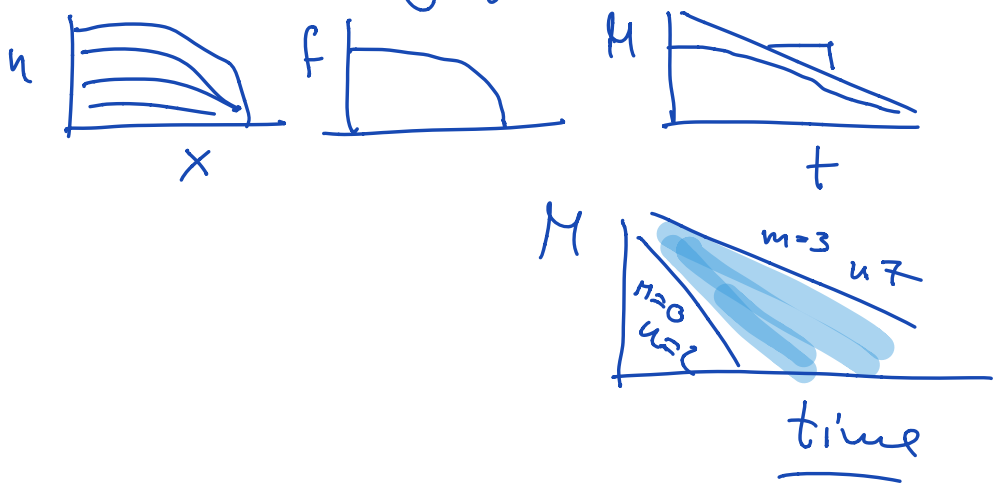
→ extended to physical depth & k changing overall planet scale water balances

100 – 1500 m global layer



how much precip do I need to raise GW to inferred height

3) Transient decay of GW



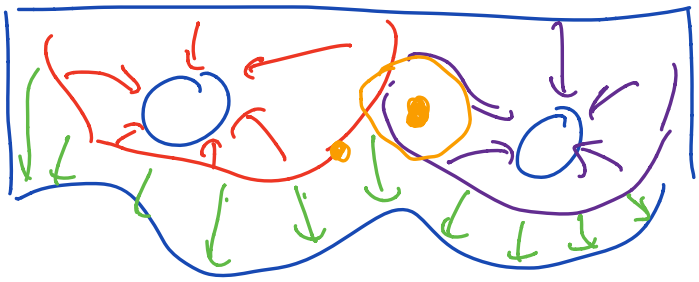
PDE: $\frac{\partial h^{n+1}}{\partial t} + D_n \nabla \cdot (h^{n+1} \nabla h) = 0$

ODE: $\frac{n+1}{n-n+1} f^{n+1} + \frac{d}{dx}\left(f^{n+1} \frac{df}{dx}\right) =$

same structure

$$\frac{m+1}{n-m+1} f^{m+1} + \nabla \cdot (f^{n+1} \nabla f) = 0$$

This self similar solu exists on complex geometry



⇒ allow to map global drainage patterns of Martian highlands.