HWRS 505: Vadose Zone Hydrology

Lecture 18

10/24/2023

Today:

Review for midterm oral exam

Midterm Arrangement

Date: Oct. 26 (Thursday)
Location: Harshbarger 318C

Time slots:

10:30 – 10:45	Dallin Cook
10:45 – 11:00	Min Ma
11:00 – 11:15	Eden Harper
11:15 – 11:30	Jonathan Hasenstab
11:30 – 11:45	Starlivia Kaska
11:45 – 12:00	Charlie Cunningham
12:00 – 12:15	Jason Schlottman

Note on the format:

- Each of you will be asked 3 to 4 questions. In some cases, a question may include a couple of sub-questions that logically build up towards the final question.
- Make sure you understand the question before answering it. If you feel you do not understand the question, please ask for clarification.
- Try your best to demonstrate your **thought process** and **the line of reasoning**. They are much more important than the final answer.
- Like any face-to-face “exams”, it is common and OK to be stressed. Just make sure that you have a laser focus on the things you are doing, NOT the consequences.

Review for Midterm

- The concept of vadose zone
- Steady-state saturated flow: Darcy's law; permeability; hydraulic conductivity.
- Transient saturated flow: Deriving the governing equation (3D groundwater flow)
- Solute transport under saturated flow: Advection, mechanical dispersion, molecular diffusion.
- Air-water system: Interfacial tension; wettability; capillary pressure; bundle of tubes model (triangular vs. cylindrical).
- Macroscopic descriptions of two-phase systems: pc-s (SWC); kr-s. Mathematical descriptions of these curves (VG, BC). The idea of scaling (Leverett-J function and Miller-Miller scaling).
- Two-phase flow: two-phase extended Darcy's law; governing equations; unknowns vs. # of equations.
- Unsaturated flow: Richards' assumption; Richards' equation (different forms).
- Steady-state unsaturated flow: physical understanding; numerical solution; impact of heterogeneity.
- Transient unsaturated flow: water infiltration models; physical understanding; numerical solution; impact of heterogeneity.