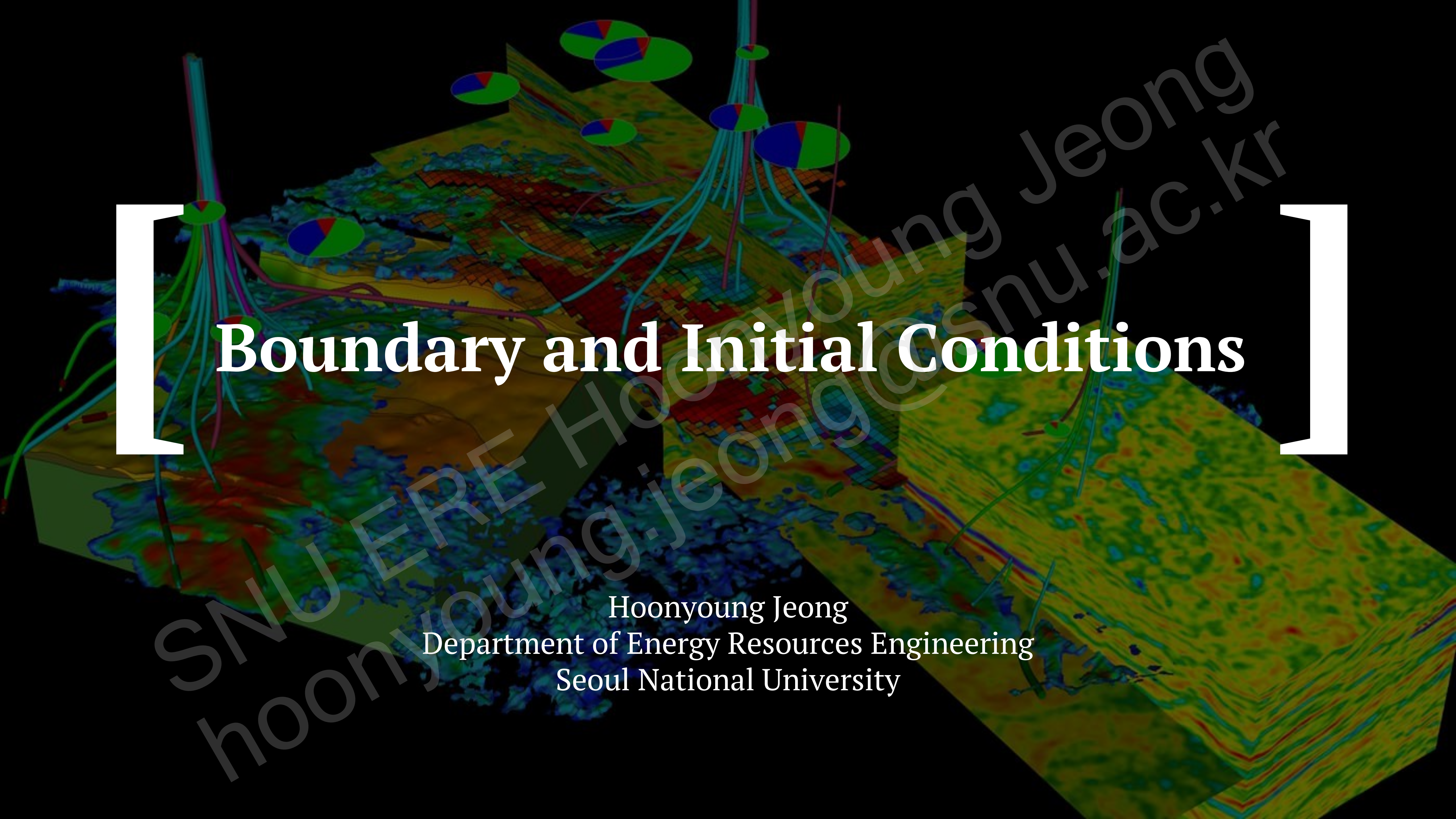

Boundary and Initial Conditions

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Boundary and Initial Conditions

- What is our differential equation?
  - ✓ $\frac{\partial}{\partial x}\left(\frac{k}{\mu B}\frac{\partial P}{\partial x}\right) + \frac{Q}{A\partial x} = \frac{\partial}{\partial t}\left(\frac{\phi}{B}\right)$
- What do we want to see by solving the differential equation?
  - ✓A function P (pore pressure) of x (location) and t (time)
- Why do we want to see pore pressure for locations and times?
  - ✓압력이 너무 떨어지면 생산이 안됨 ➔ 생산 기간 계산 가능
  - ✓압력이 너무 올라가면 파쇄, 단층 슬립 발생 ➔ 안정성 검토 가능
  - ✓…
- What do we need to solve the differential equation?
  - ✓Conditions for t=0 ➔ initial conditions
  - ✓Conditions for t>0 ➔ boundary conditions

Boundary and Initial Conditions in Reservoir Simulation

- Initial conditions in reservoir simulation
  - ✓Initial pressure
  - ✓Initial saturation
  - ✓…
- Boundary conditions in reservoir simulation
  - ✓Production/Injection rates at a well
  - ✓Well pressure at a well
    - ▪ Wellhead/Bottom-hole pressure
  - ✓Conditions at aquifers and faults
  - ✓…

Dirichlet Condition

- Specify the values that the solution needs to have along the boundary
- In reservoir simulation
  - ✓ $Q = -\frac{kA}{\mu}\nabla P$
  - ✓ For a well, a constant well bottom-hole pressure condition
  - ✓ For a reservoir boundary, a constant pressure condition
    - Pore volume is infinite

Neumann Condition

- Specify the values that the derivative of the solution needs to have at the boundary
- In reservoir simulation
  - ✓For a well, a constant flow rate condition
  - ✓For a reservoir boundary, a constant temporal derivative of pressure condition