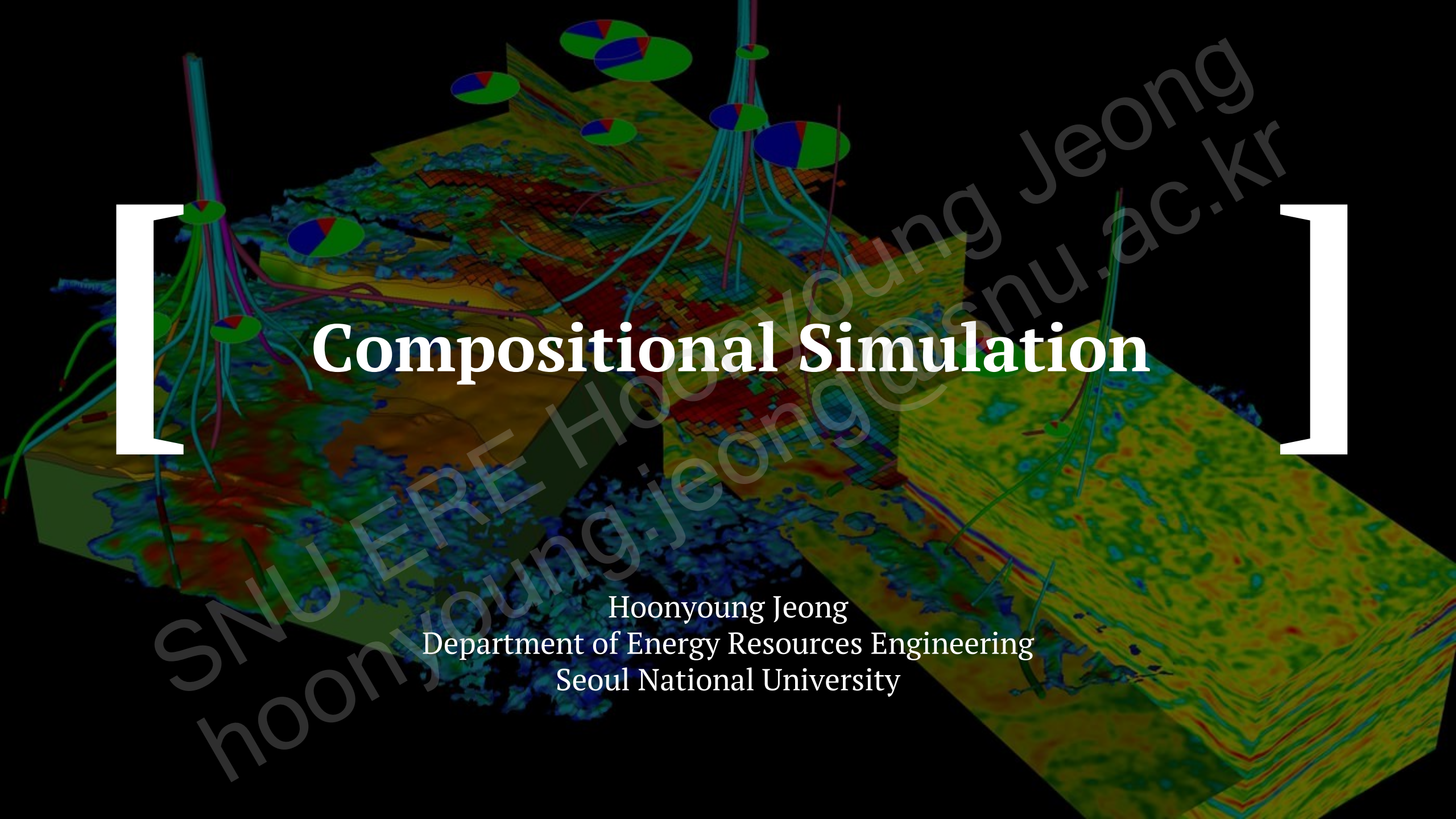

Compositional Simulation

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Why Compositional Simulation?

- Black oil simulation
  - ✓Pseudo-compositional
  - ✓Consider only vapor, liquid, water phases
- Phase envelope changes if the composition changes
- Miscibility
- …

Compositional Mass Conservation

- Single phase
  - ✓ $\frac{\partial(\rho C_\psi)}{\partial t} + \nabla \cdot (C_\psi \rho u) = \nabla \cdot (D \nabla C_\psi) + S_\psi$
- Phase $\beta = 1, \dots, N_\beta$: N_β immiscible fluid flows
  - ✓ $\sum_\beta S_\beta = 1$
- Component $\kappa = 1, \dots, N_\kappa$: Phase β contains N_κ components
  - ✓ $\sum_\kappa X_\beta^\kappa = 1$
  - ✓ X_β^κ: mass fraction of component κ in phase β
- For component κ,
  - ✓ $\sum_\beta \frac{\partial\left(\phi S_\beta \rho_\beta X_\beta^\kappa\right)}{\partial t} + \nabla \cdot \left[-X_\beta^\kappa \rho_\beta \frac{k k_{r\beta}}{\mu_\beta} \nabla\left(P_\beta - \rho_\beta g z\right)\right] = \nabla \cdot \left(\rho_\beta D_\beta^\kappa \nabla X_\beta^\kappa\right) + S_\kappa$
  - ✓ Gravity direction is positive
  - ✓ $P_\beta = P_{non-wetting} + P_{c,\beta}$
  - ✓ Tables for ρ_β, μ_β
  - ✓ EOS for X_β^κ ratios
    - Flash calculation
    - Kinetic equilibrium (hydrate)