

A 3D visualization of a reservoir with multiple wellbores. The reservoir is shown in cross-section with various geological layers. Wellbores are represented by vertical lines with pie charts at the top, indicating fluid flow. The pie charts are colored in green, blue, and red. The reservoir is surrounded by a dark background. The title 'Continuity Equation' is centered in white text. The background features a large watermark 'SNU ERE Hoonyoung Jeong' and 'hoonyoung.jeong@snu.ac.kr' in a light gray font.

Continuity Equation

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Continuity Equation

- Mass conservation (balance) equation
- In a control volume, the accumulation rate of mass equals the external source rate of mass minus the transport (outflow by convection and diffusion) rate of mass through the neighboring control surfaces

- $$\frac{\partial(\rho C_\psi)}{\partial t} + \nabla \cdot (C_\psi \rho u) = \nabla \cdot (D \nabla C_\psi) + S_\psi$$

- If ψ is mass for a single phase and a single component,

- ✓ $C_\psi = 1, \nabla C_\psi = 0$

- ✓ $\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho u) = S_m$

- If the fluid flow in porous media with ϕ (porosity)

- ✓ $\frac{\partial(\rho \phi)}{\partial t} + \nabla \cdot (\rho u) = S_m$