Effective slip lengths for Stokes flow over rough, mixed-slip surfaces

PhD Defense Presentation

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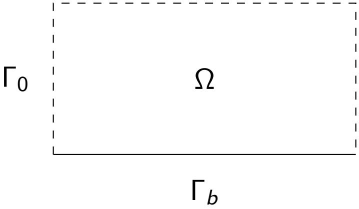
So it begins...

Limitations of Homogenization



$$\nabla^2 u = f \quad \text{on } \Omega$$

$$u = b\frac{\partial u}{\partial n} \quad \text{on } \Gamma_b$$

Multiply by test function g and integrate over Ω:

$$\int_\Omega g\nabla^2 u = \int_\Omega gf \tag{1}$$

Use vector identity and divergence theorem to get:

$$\int_\Gamma g\frac{\partial u}{\partial n} - \int_\Omega \nabla u \cdot \nabla g = \int_\Omega gf \tag{2}$$

The slip condition on Γ_b implies:

$$\frac{\partial u}{\partial n} = \frac{1}{b} u \tag{3}$$

Substitute this, to get variational form:

$$\int_{\Gamma_b} g \frac{1}{b} u - \int_\Omega \nabla u \cdot \nabla g = \int_\Omega gf \tag{4}$$