Lithosphere deformation due to tearing at STEPs 
an analogue model approach
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Physical model of STEP evolution

questions
• how does the surface deform close to STEPs?
• where does tearing occur?

Lithosphere: Newtonian (low stress) / power-law rheology (high stress)
Asthenosphere: Newtonian rheology

- no overriding plate (or: very weak overriding plate)
- pre-existing tear for first part of slab
- no other weak zones
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Model lithosphere rheology

Zero stress viscosity scaled:
6.10^{25} \text{ Pa s}

- mix of plasticine-silicone polymer
- transition to power-law rheology with increasing stress
- stress weakening required for localization of deformation
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Model evolution

- Rollback ahead of tearing
- Tearing commences as thinning

successive side views
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Model evolution

Resistance to tearing results in:
- theater shaped subduction zone
- surface extension
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Outlook

Model applicable to natural subduction zones?

Late tearing may explain seemingly absent STEP such as in eastern Hellenic subduction zone.