Theory: Solifluction wavelength scaling analysis

A) Terraces (downslope instability)
B) Lobes (cross-slope instability)

Solifluction in Alaska
5 m
20 m
\( \lambda \)

Solifluction in Norway
100 m

Solifluction Patterns look similar to those founds in fluids

Dynamics at the front are also similar

What sets the wavelength of classic fluid instabilities?
1. At a fluid front, cohesive/surface tension holds back flow, causing it to thicken
2. Thicker flow moves faster
3. Small variations in thickness lead to growth of “trains” with wavelength (\( \lambda \))
   This is called a “counter flow instability.”

Fluid-inspired conceptual model for solifluction patterns

Theory: Solifluction wavelength scaling analysis

Assume:
- Soil flows like the laminar fluid
- Hydraulic component important (topographic and/or)=
- Instead of surface tension, effective viscosity increases toward front of lobe with characteristic length \( \lambda \)

Theory predicts average wavelengths in Norway

Numerical fluid model

Possible solifluction on Mars

Solifluction in fluids

Solifluction Patterns look similar to those founds in fluids

Dynamics at the front are also similar

Fluid inspired conceptual model for solifluction patterns

For more info (in press):
Fluid-inspired conceptual model for solifluction patterns
Arctic soil patterns analogous to fluid instabilities
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