Rayleigh - Taylor Instability
Growth of Boundary Undulations

- salt domes
- diapirs
- continental delamination

\[ \lambda = \lambda_0 \]

\[ \eta_u, \eta_l \]

\[ \xi = \xi_0 \cos \frac{2\pi x_1}{\lambda} = \xi_0 \cos kx \]

Figure 24.18
Figure by MIT OCW.

General problem: topography on an interface

\[ \xi = \xi_0 \cos kx_1 \quad k = \frac{2\pi}{\lambda} \]

1. If \( \rho_u < \rho_l \) topography decays as \( \xi_0 e^{-t/\tau} \).
2. If \( \rho_u > \rho_l \) topography grows.

Initially \( \xi = \xi_0 e^{t/\tau} \).

Eventually many wavelengths interact, problem is no longer simple.

Characteristic time \( \tau \) depends on \( \Delta \rho, \eta_u, \eta_l \), thickness of layers, …
Weight of ice causes viscous flow in the mantle.

After melting of ice, the surface rebounds – “postglacial rebound”.

Different regions have different behaviors (e.g., Boston is now sinking).
Figure 24.20
Figure by MIT OCW.

Problem: how to reconcile physical boundary conditions with mathematical description?