

# LANDSCAPE EVOLUTION

## COUPLING FLUVIAL & HILLSLOPE PROCESSES

$$\frac{dz}{dt} \begin{matrix} \leftarrow \text{landscape: terrain, topography} \\ \rightarrow \text{Something.} \\ \leftarrow \text{Evolution of a landscape} \\ \leftarrow \text{time} \end{matrix}$$

Evolution of topography over time

$$\left(\frac{dz}{dt}\right)_{\text{hillslope}} = K_h \frac{\partial^2 z}{\partial x^2} \leftarrow \text{hillslope diffusion (ignores mass wasting)}$$

$$\left(\frac{dz}{dt}\right)_{\text{fluvial}} = -K A^m S^n \leftarrow \text{bedrock erosion/incision}$$

$$\left(\frac{dz}{dt}\right)_{\text{tectonic}} = U \leftarrow \begin{matrix} \text{Uplift (+)} \\ \text{Subsidence (-)} \end{matrix}$$

$$\frac{dz}{dt} = \left(\frac{dz}{dt}\right)_{\text{hillslope}} + \left(\frac{dz}{dt}\right)_{\text{fluvial}} + \left(\frac{dz}{dt}\right)_{\text{tectonic}}$$

$$\frac{dz}{dt} = K_h \frac{\partial^2 z}{\partial x^2} - K A^m \underset{\substack{\uparrow \\ |\frac{\partial z}{\partial x}|}}{S^n} + U$$

$$\boxed{\frac{\partial z}{\partial t} = K_h \frac{\partial^2 z}{\partial x^2} - K A^m \left| \frac{\partial z}{\partial x} \right|^n + U}$$

Simplest Landscape-evolution Equation.