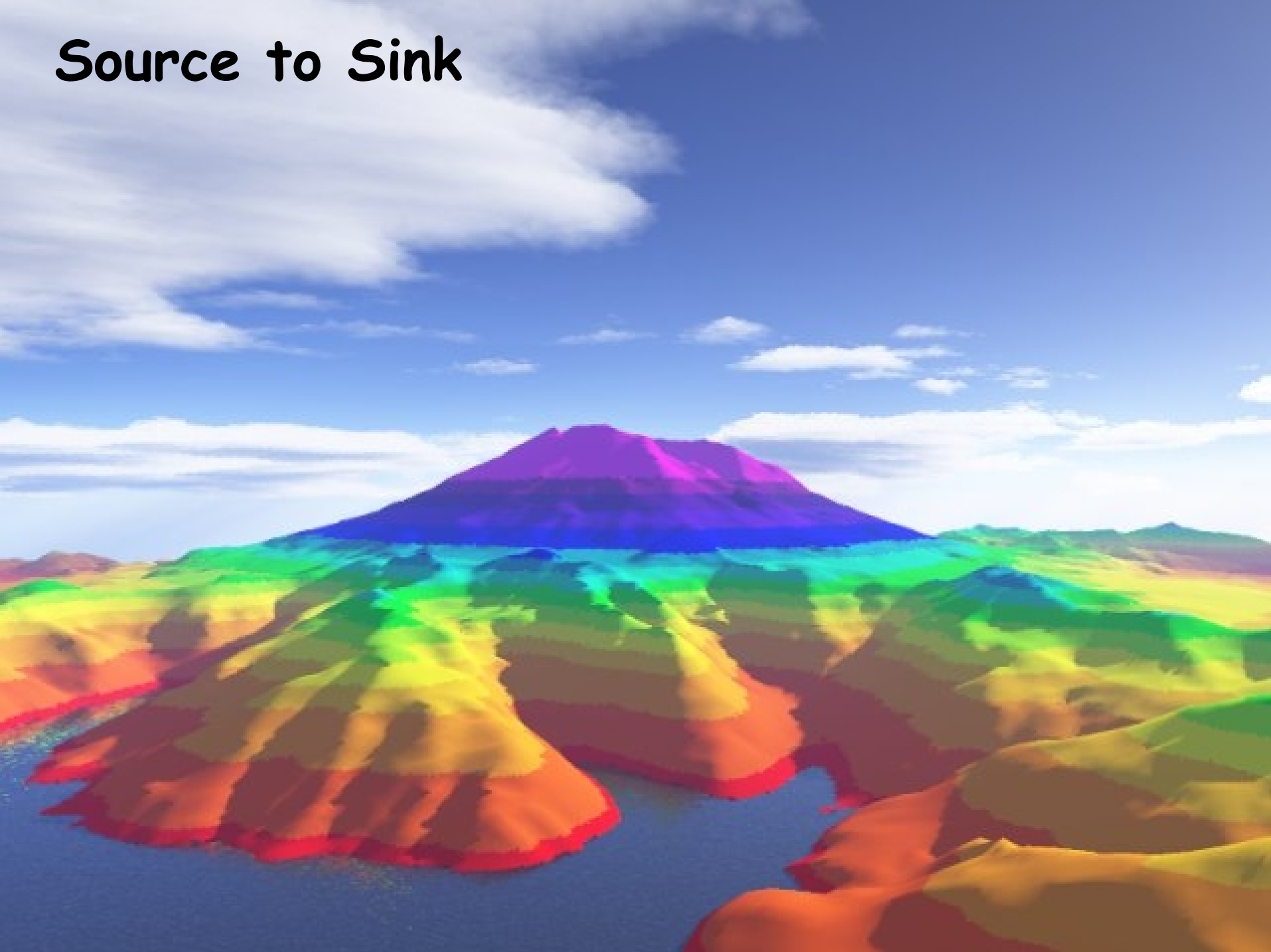


Source to Sink

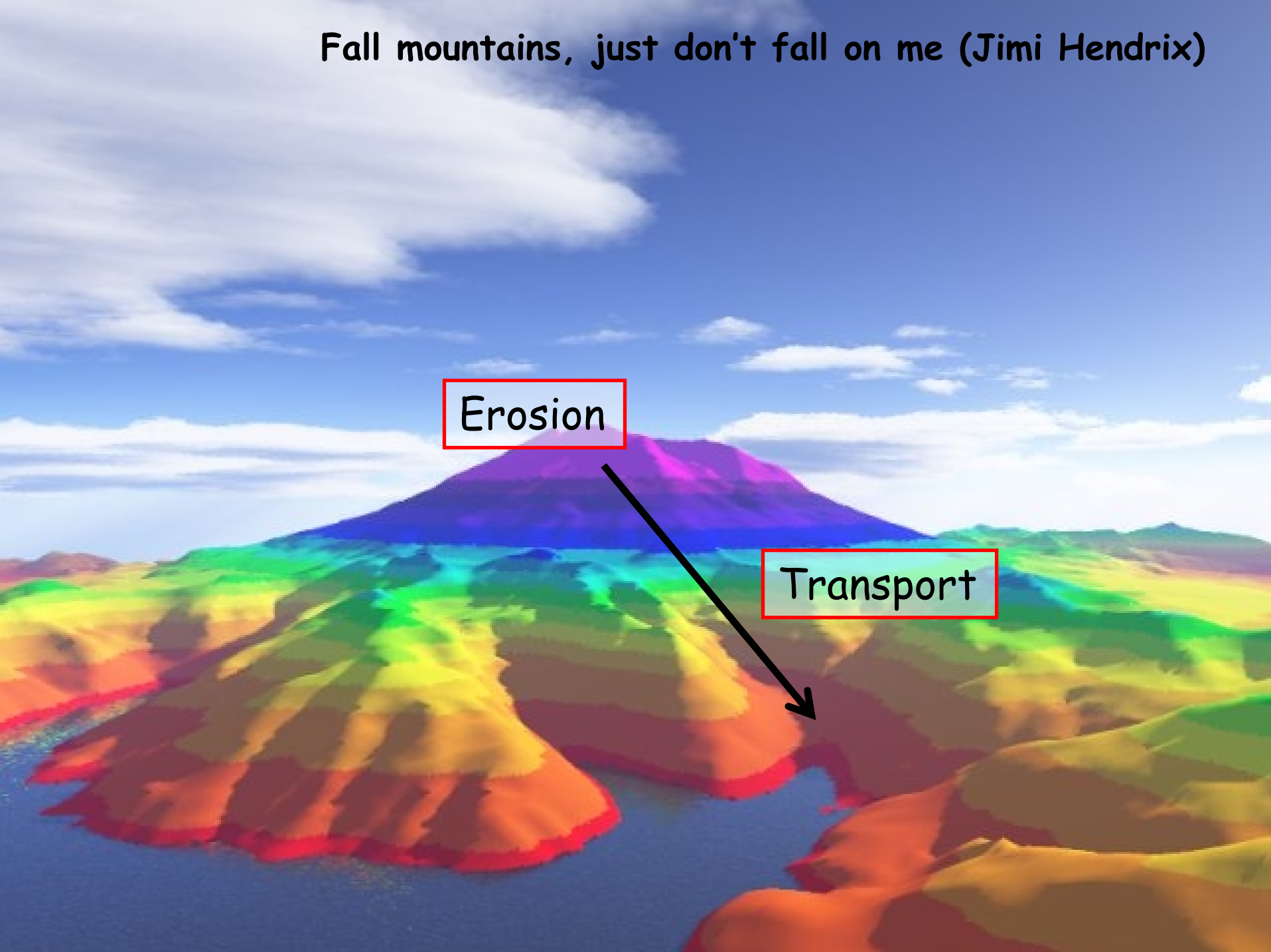


If the mountains fell in the sea, let it be (Jimi Hendrix)

Erosion



Fall mountains, just don't fall on me (Jimi Hendrix)



Erosion

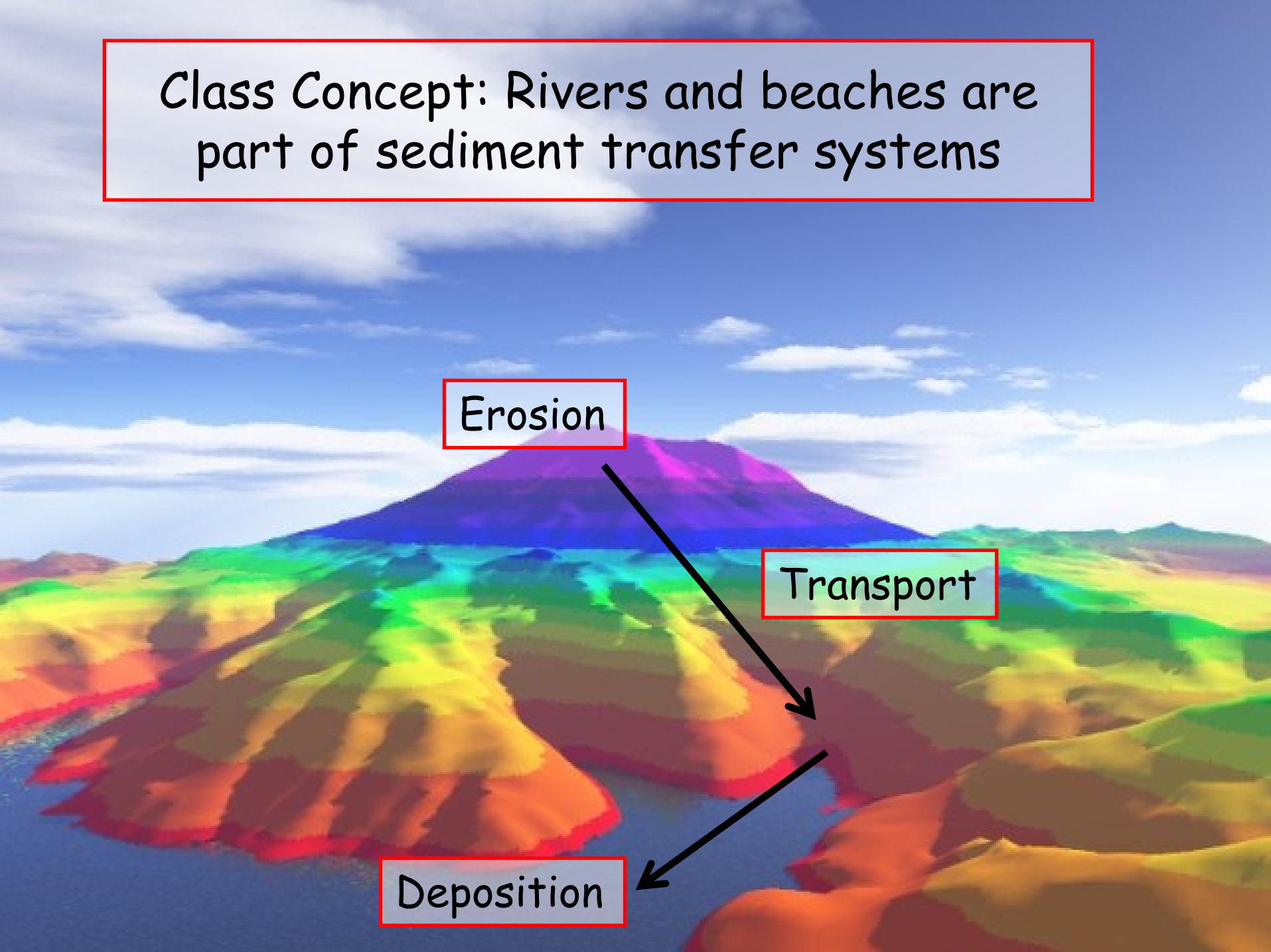
Transport

Class Concept: Rivers and beaches are part of sediment transfer systems

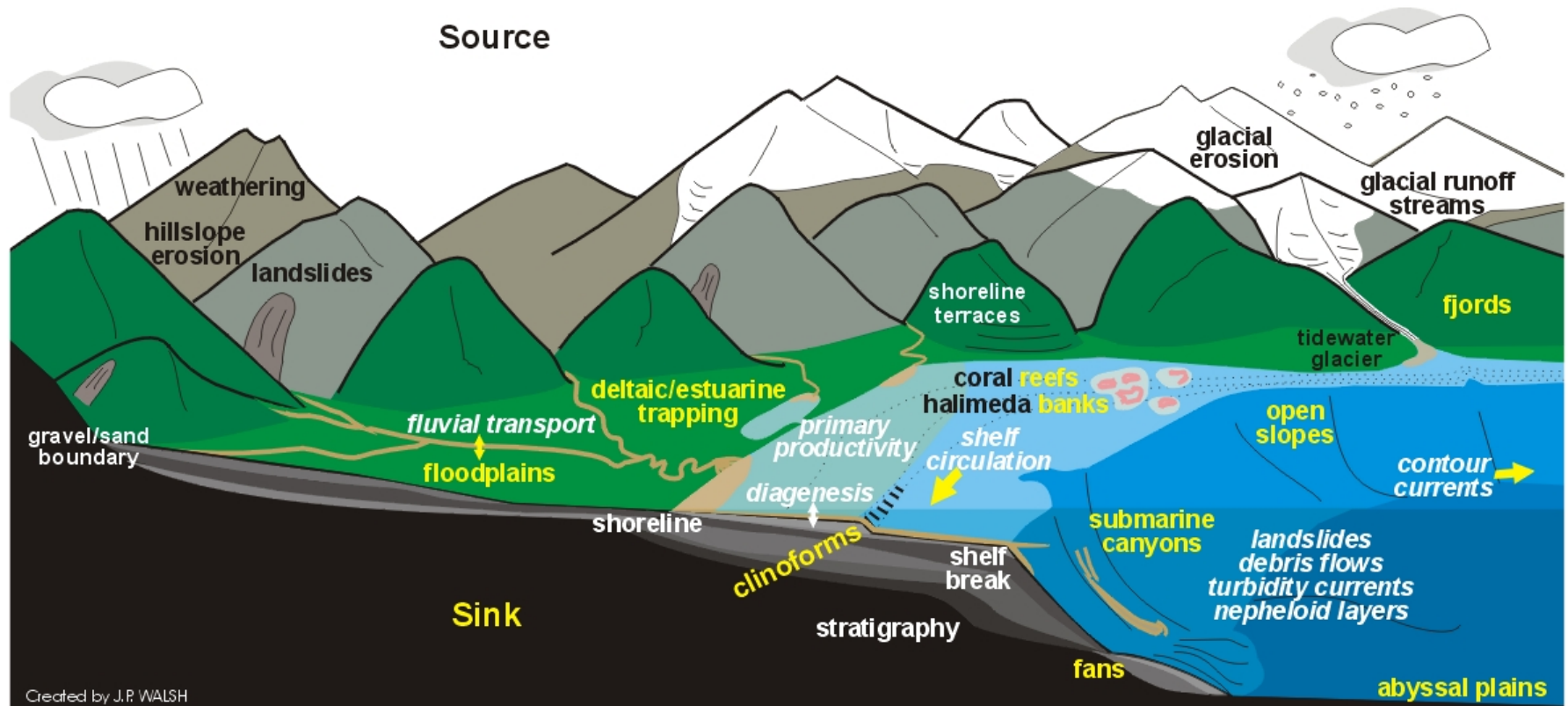
Erosion

Transport

Deposition



Framework: Dynamic Earth Surface Processes Produce, Transport, and Store Sediment



*Water is the driver of
Nature.*

- Leonardo da Vinci

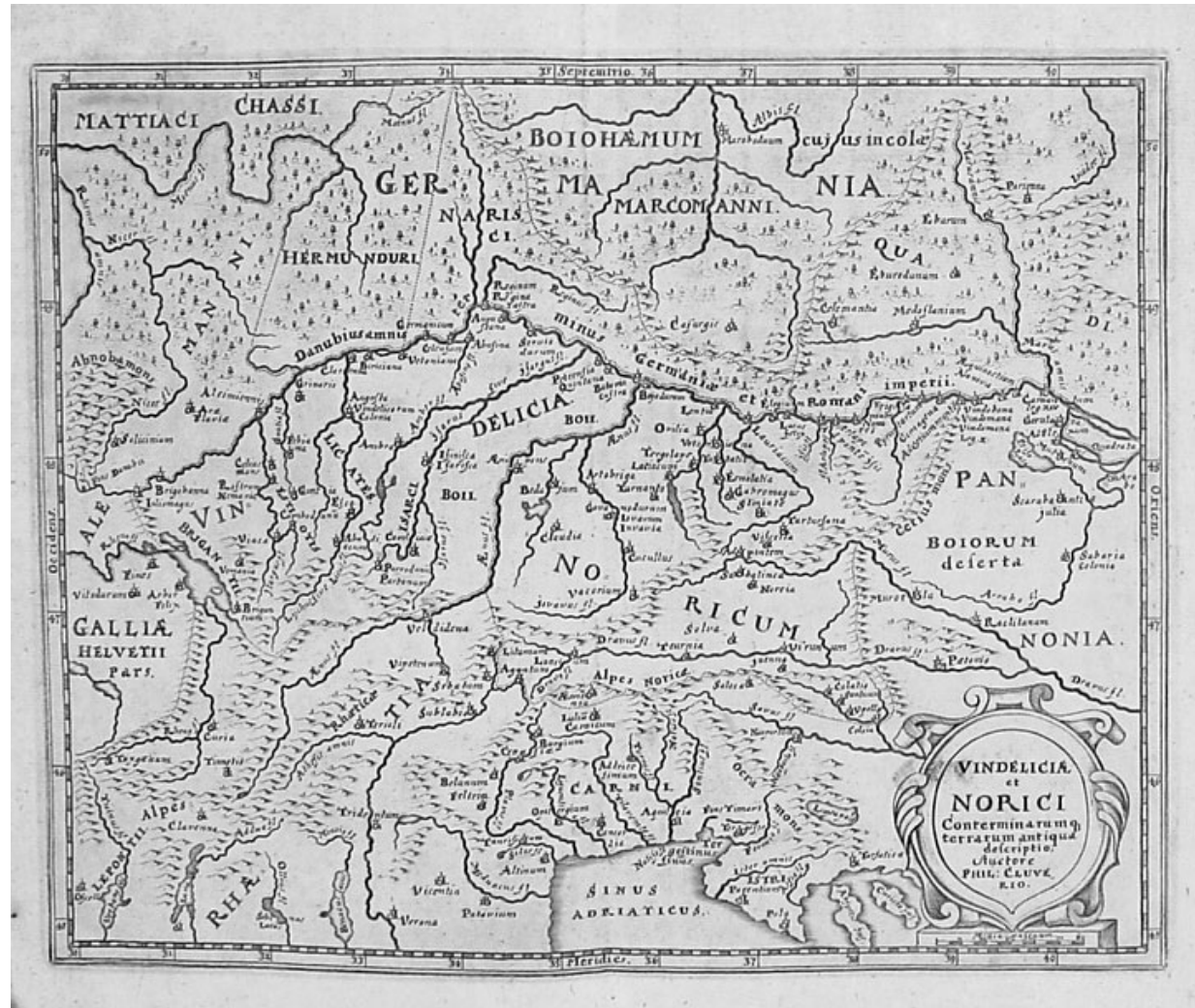
Leonardo da Vinci studied the topography of the Arno River basin, drew the first contour map of a whole river basin, and believed that rivers carved their valleys and shaped topography.



Italian and French hydraulic engineers developed the study of rivers in the late 17th century to address flooding problems along rivers draining the Alps.

Della Natura de' Fiumi

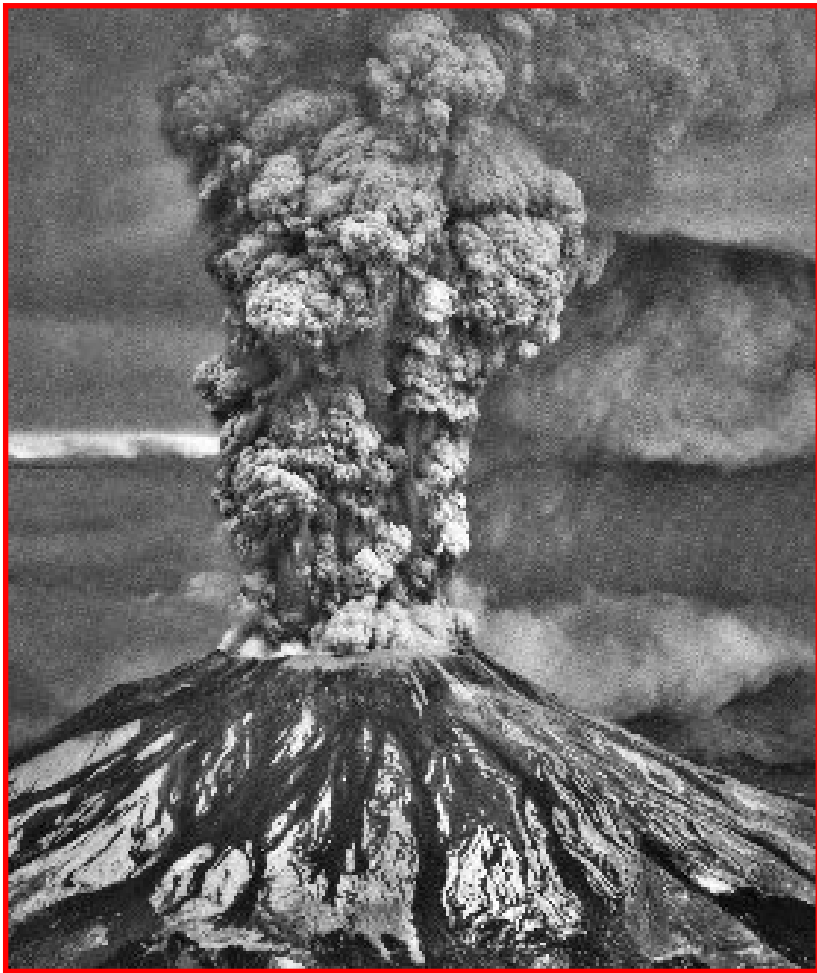
First Book on Rivers was published by Domenico Guglielmini in 1697.



"Nature has formed such a connection between mountains and rivers, that in describing one, we are unavoidably led to speak of the other."

*- Jeremy Belknap
(History of New Hampshire, 1792, p. 55)*

Source

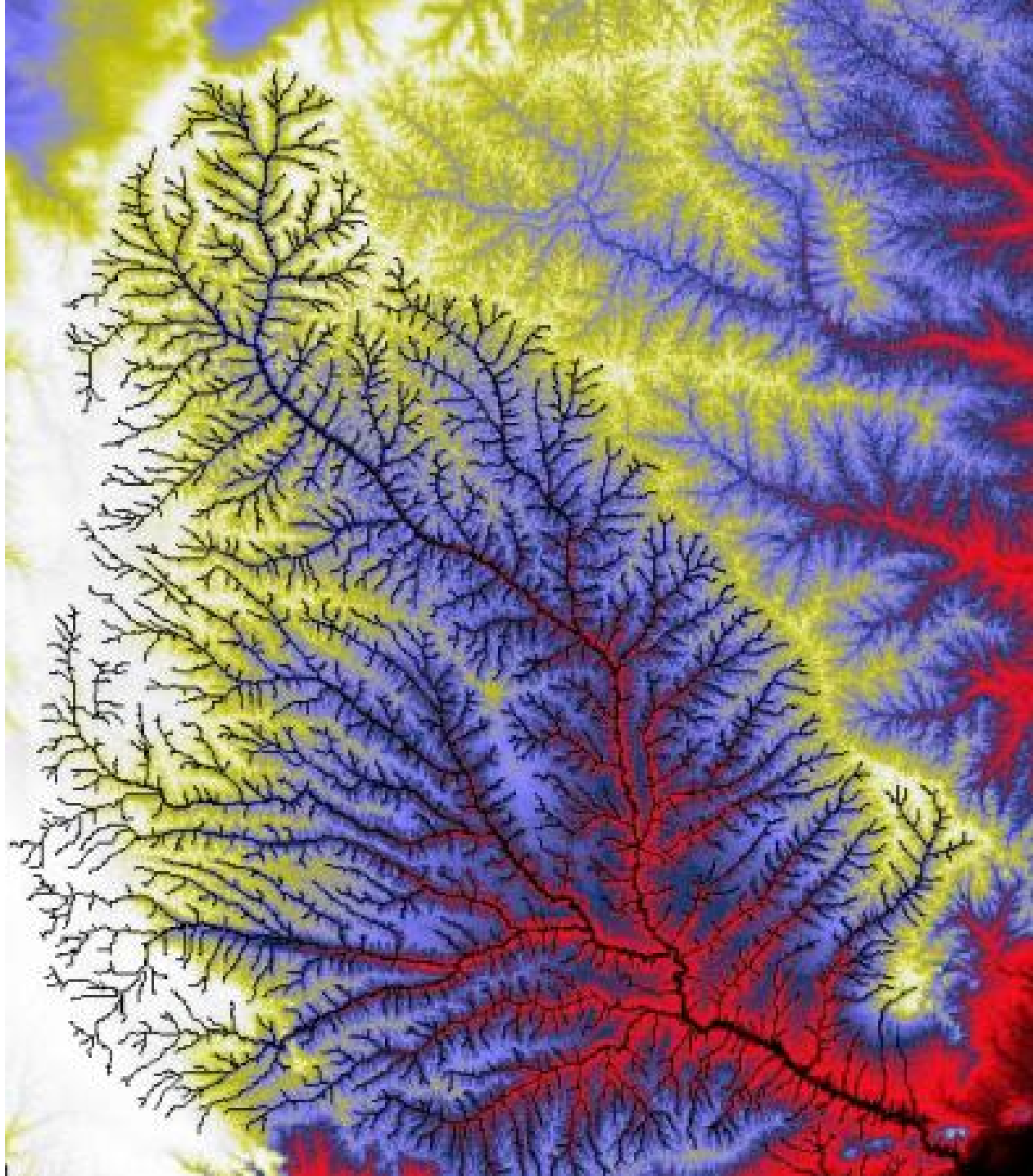


Source



Rivers are the circulatory system of landscapes.

They carry away runoff and sediment eroded from hillslopes.



Rivers and beaches are part of sediment transfer systems.

- What forms them?
- What are the processes that maintain them?
- Why are there different types of rivers and beaches?
- What are they, what controls their distribution across Earth, and how are they related?

We'll use 1 equation in this class

$$I - O = \Delta S$$

Input minus output equals change in storage.

Also known as conservation of mass

(Δ means change in something)

Inputs to Rivers

- Soil production
 - Soil creep and erosion by runoff
 - Landsliding
 - Sediment eroded by glaciers
 - Sediment transferred from upstream rivers
-

Outputs from Rivers

- Water
 - Sediment
 - Dissolved constituents
 - Organic material (wood and other dead stuff)
-

Inputs to Beaches

- Sediment delivered to the coast by rivers
 - Coastal erosion
 - Wave action
-

Outputs from Beaches

- Sediment moved offshore by wave action
 - Sediment moved along shore by wave action
-

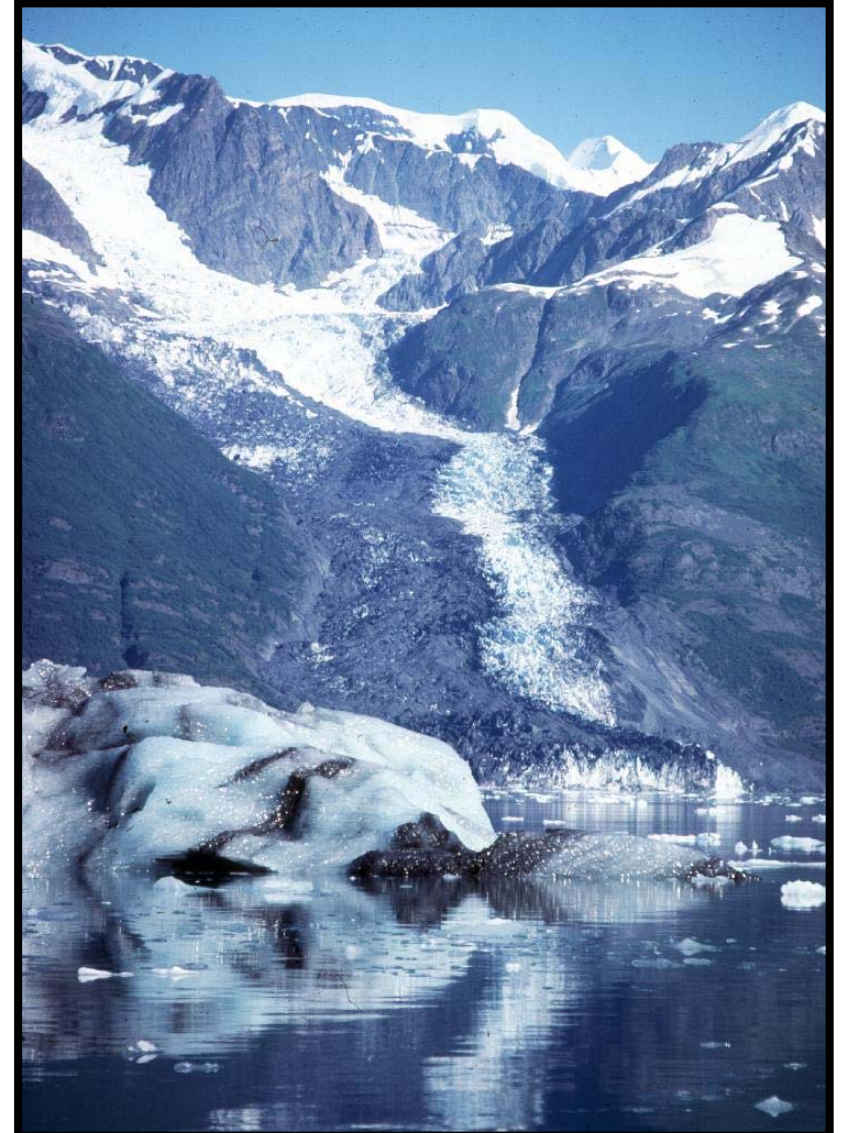
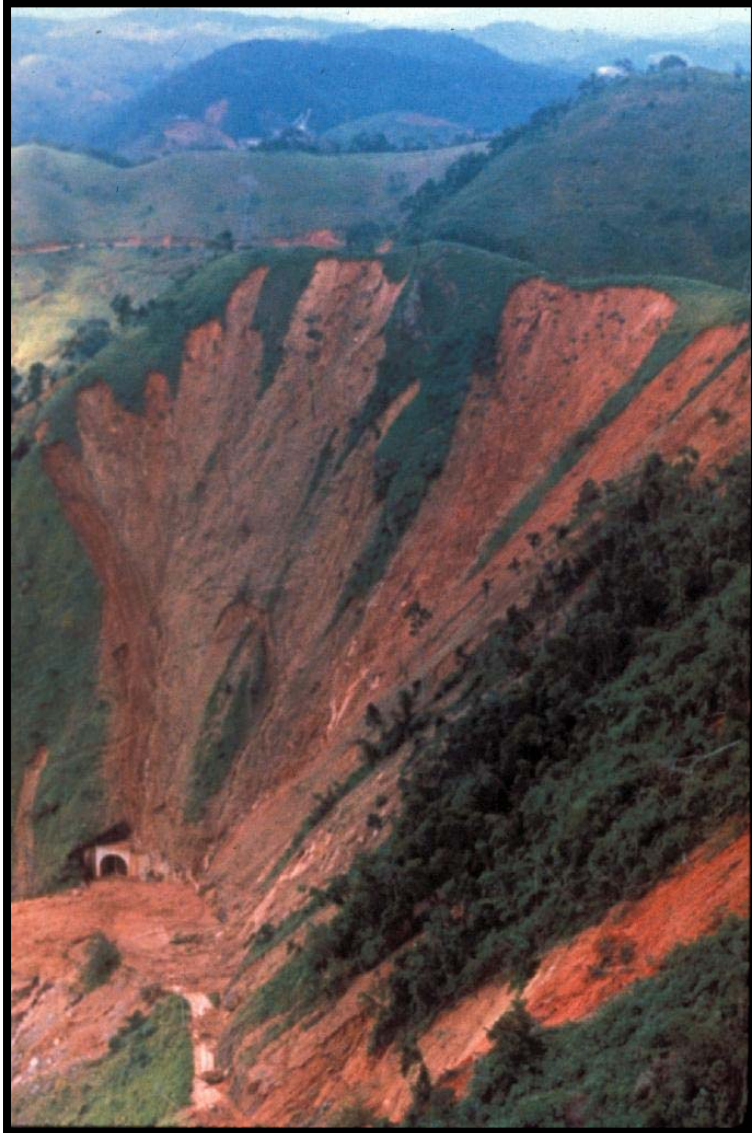
The Big Picture = The Rock Cycle

In order for there to be mountains rocks must be uplifted above sea level.



If uplift continued unopposed there would be no limit to how high mountain ranges can get.

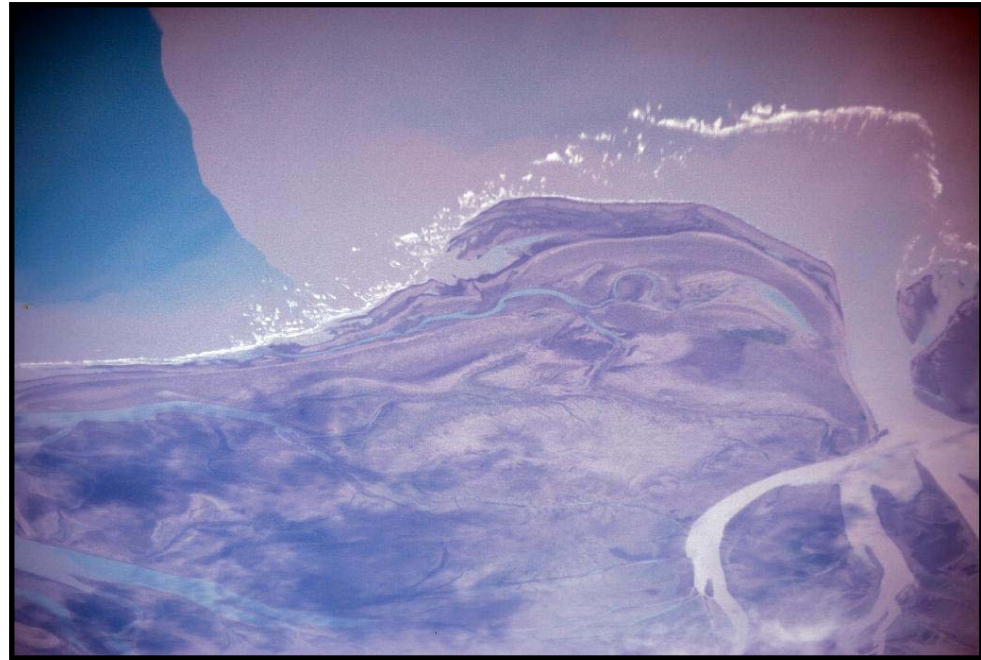
Erosion counter-balances rock uplift



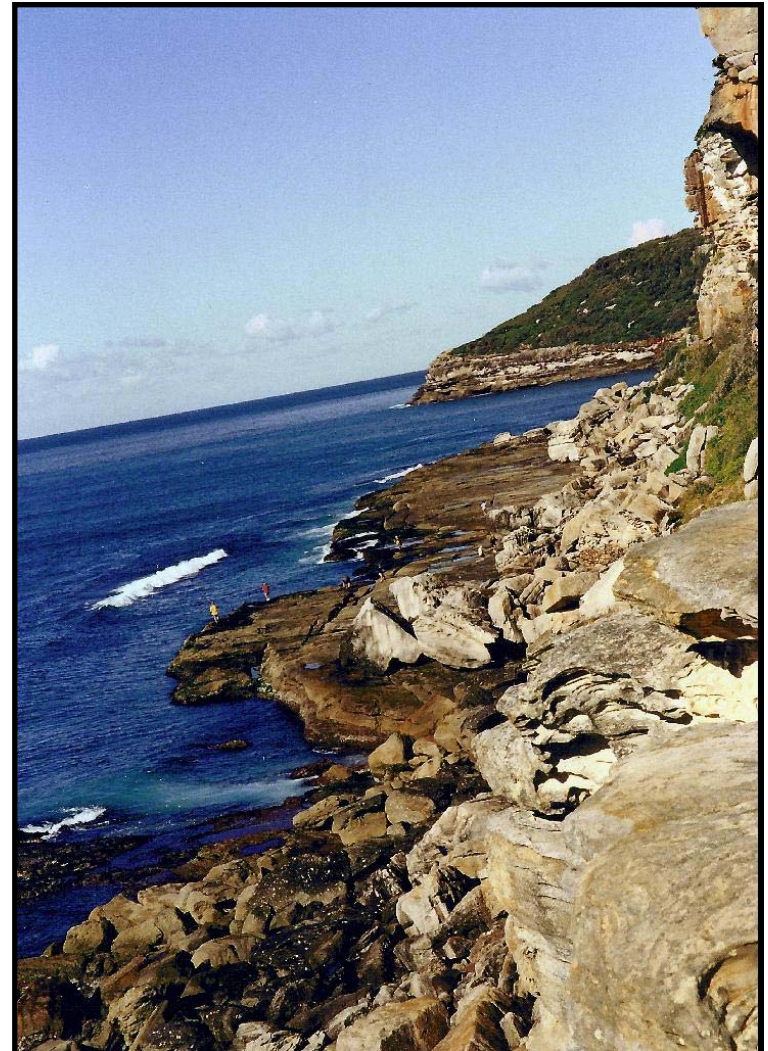
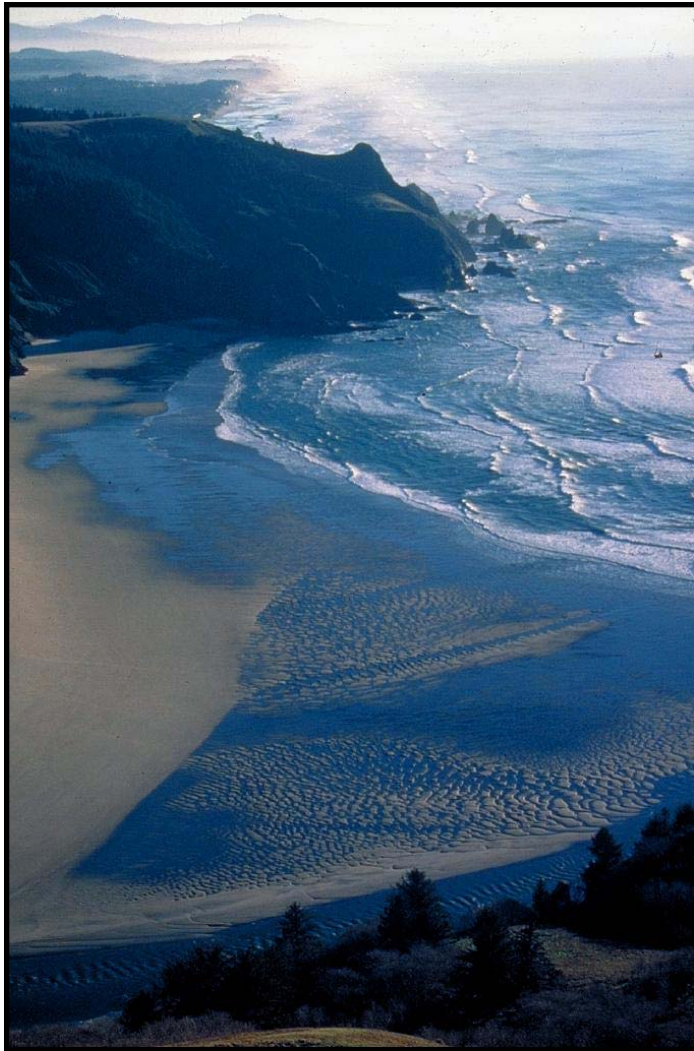
Mountain streams receive material from hillslopes and transport it to rivers



Rivers transport material to the coast



Near-shore processes redistribute sediment along beaches and coastlines



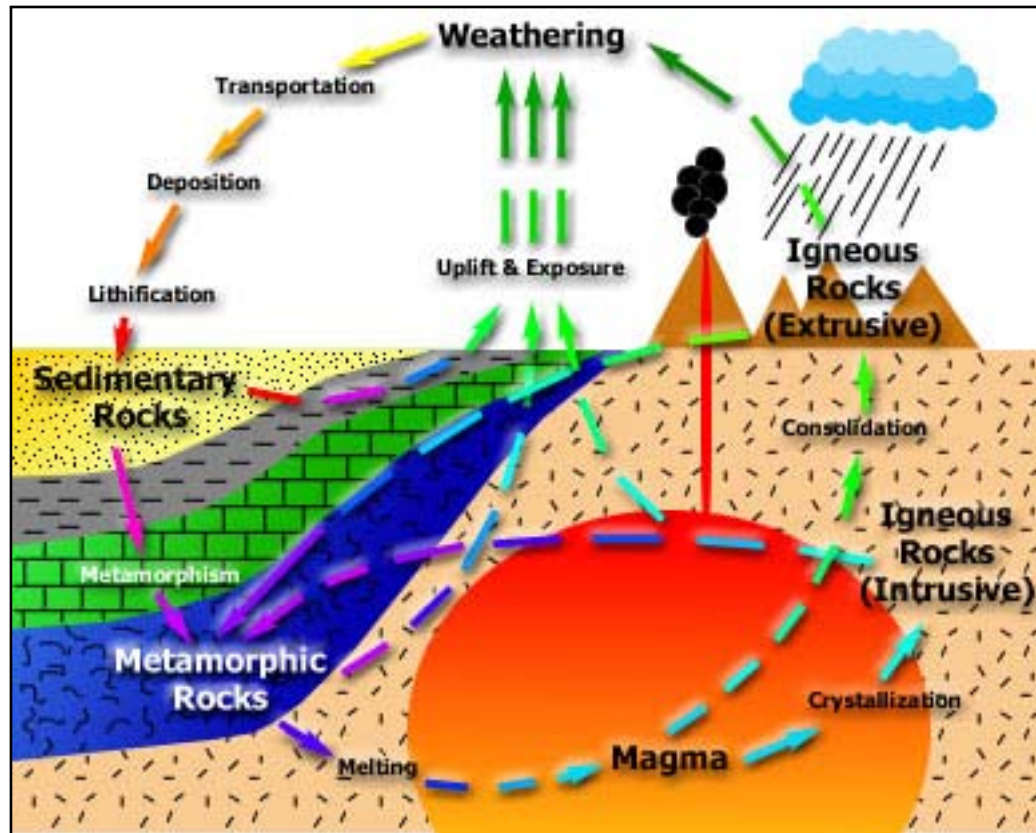
Types of beaches reflect differences in sediment sources and transport



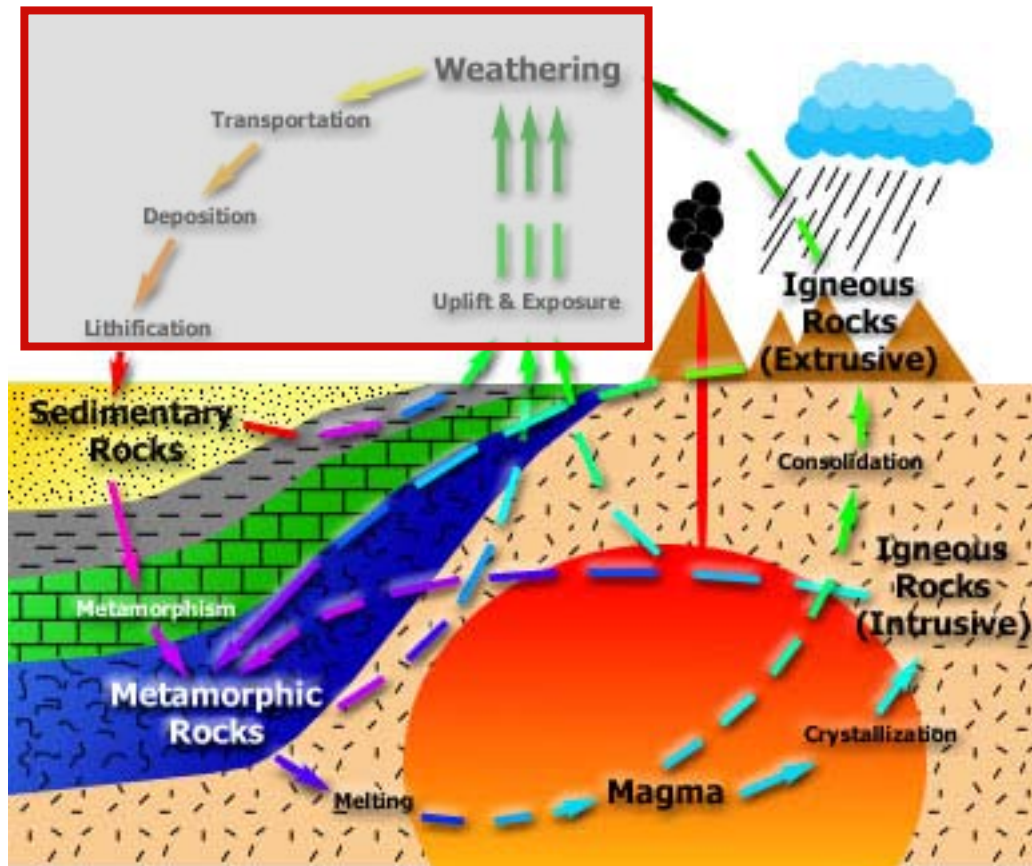
The Rock Cycle

Material eroded from mountains enters streams and rivers and is delivered to coastal environments, from where it is moved to deeper sedimentary basins that get shoved back into mountains through processes of rock uplift.

The Rock Cycle



Erosion in the Rock Cycle



What we see as rivers and beaches are rest stops for sediment moving through the eroding half of the rock cycle.

Framework for this Class

Rock uplift → Mountains

Mountains → Mountain Streams

Mountain Streams → Rivers

Rivers → Estuaries

Estuaries → Beaches

Beaches → Off-shore depositional basins

Off-shore depositional basins → Rock uplift.
