

ROCKS

Introduction

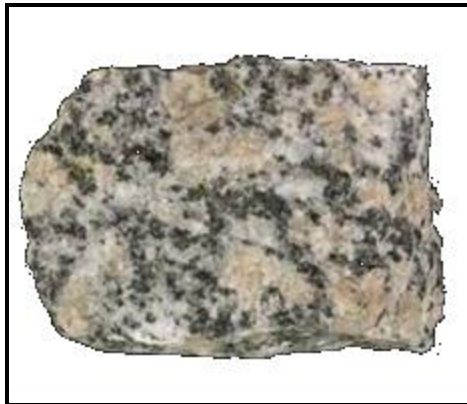


★ What is a rock?

A Rock is

1. a natural substance
2. solid
3. an aggregate of mineral matter (see exceptions below)

Mineral



www.beg.utexas.edu

Granite

Non-mineral



www.geology.com

Obsidian (volcanic glass)

Non-mineral



Coal

★ Why study rocks?

1. To understand the **origin and evolution of the Earth and other objects of our solar system** (and validate models predicting the future of Earth's global environment and sea level change)
2. To find and extract **economically importance resources** (oil, coal, mineral ores) on Earth, and perhaps soon elsewhere too!
3. To solve **environmental problems** (storage of radioactive substances, CO₂, and diffusion of pollutants)
4. To find and extract **groundwater**

★ Properties of rocks

1. Color



2. Texture

1. Size (coarse vs. fine)
 2. Shape
 3. arrangement
- } of crystals
or grains



3. Composition

1. Nature of constituents (mineral crystals, fossils, rock fragments)
2. Mineralogical composition (nature of minerals)
3. Chemical composition (relative abundance of chemical compounds like H_2O or elements like Fe, Ti...)



4. Physical properties (magnetic, electrical, mechanical, thermal...)

★ The three families of rocks

1. Igneous rocks

- Solidification of molten rock (magma/lava)

Examples: basalt, granite



2. Sedimentary rocks

- Accumulation of sediments (grains or minerals)

Examples: sandstone, reef limestone, evaporite



3. Metamorphic rocks

- Transformation of preexisting solid rock under high pressure / temperature or in contact with hot –hydrothermal– fluids

Examples: gneiss, schist, marble



Distribution of rocks controlled by plates tectonics

INGNEOUS ROCKS

Crystallisation of magma

Slow cooling

Earth's **interior**

Intrusive rocks

Coarse-grained

e.g. Granite

Rapid cooling

Earth's **surface**

Extrusive rocks

Fine-grained

e.g. Basalt

Plate boundaries

Hot spots

SEDIMENTARY ROCKS

Accumulation of sediments

Siliciclastic sediments

Chemical sediments

Biological sediments

Ocean basins

METAMORPHIC ROCKS

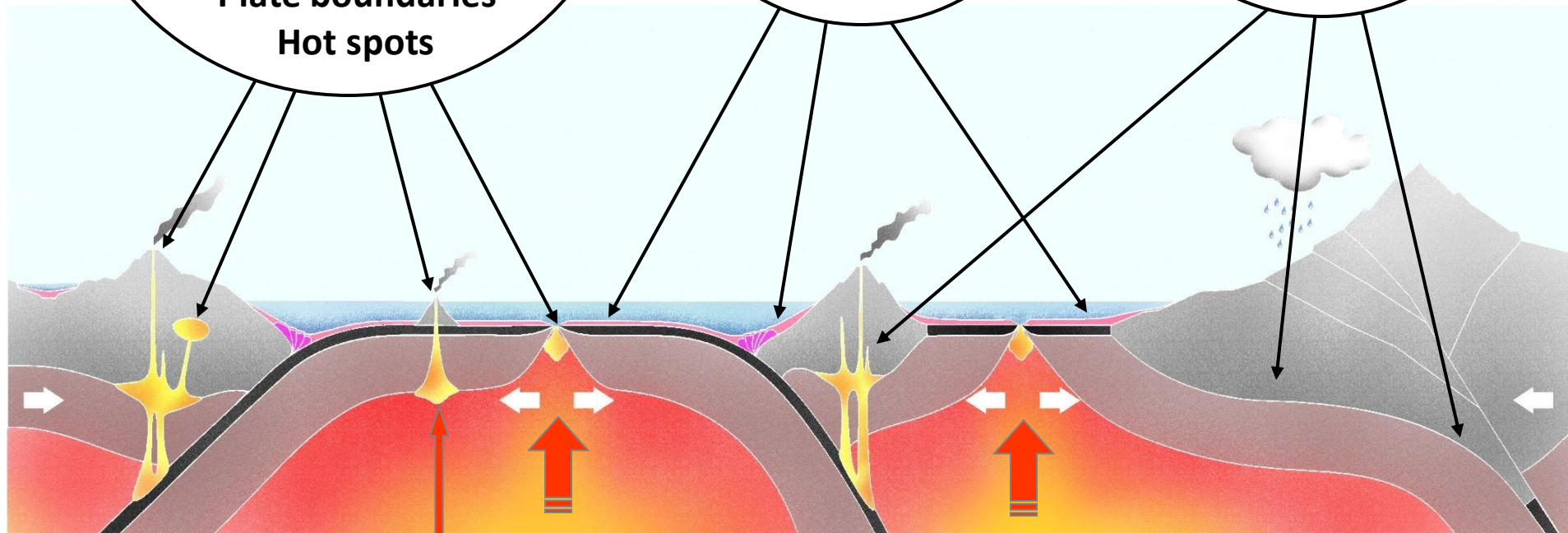
Transformation of rocks in a solid state by P, T, hot fluids

Regional metamorphism

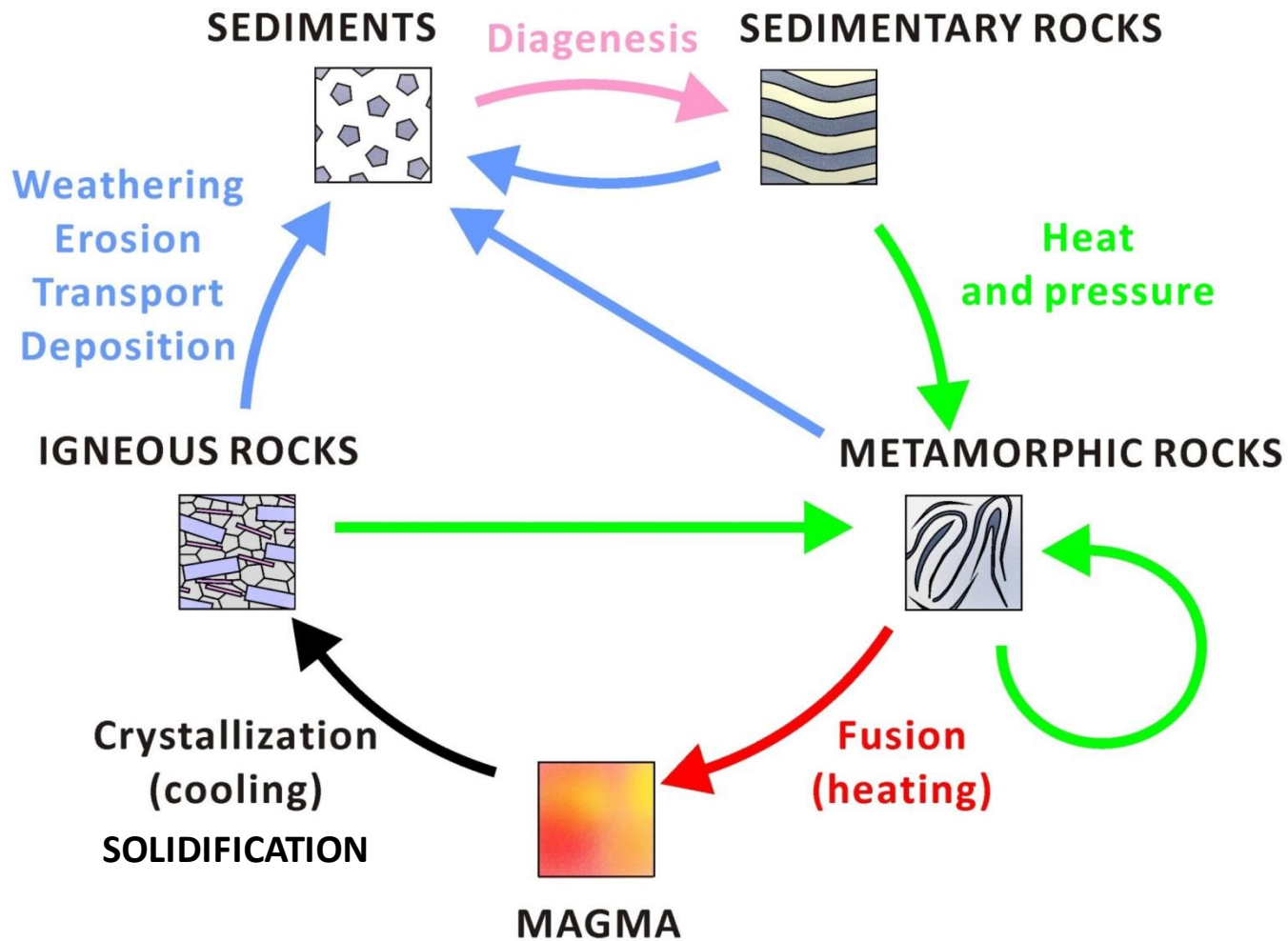
Contact metamorphism...

Conv. Boundaries

Mountains

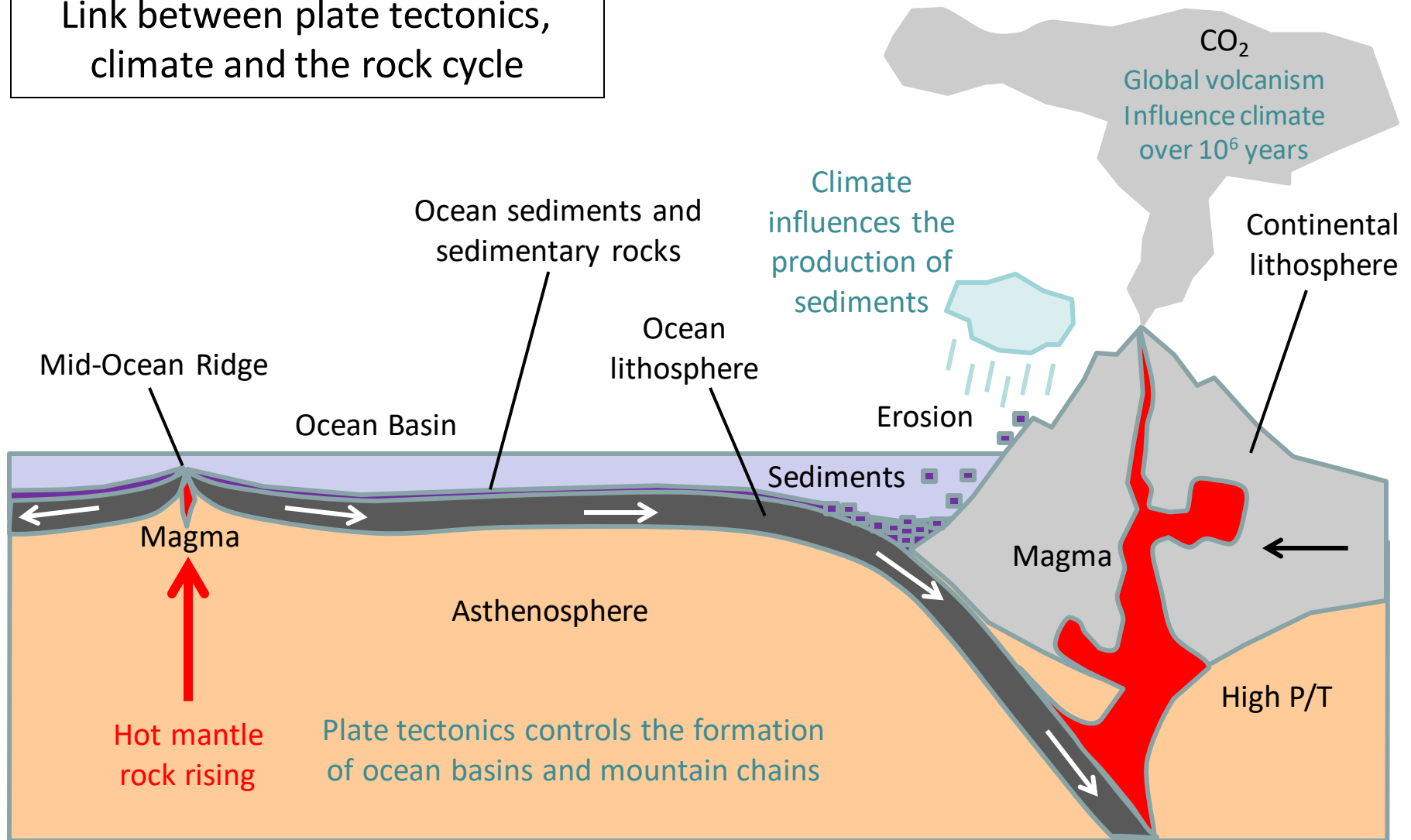


★ The rock cycle



Controlled by **plate tectonics** and **climate**

Link between plate tectonics, climate and the rock cycle



NB: Silicate weathering also influences the atmospheric concentration of CO₂ over 10⁶ years (see chapter on sedimentary rocks)