

Which field trip are you going on?

A) For SE O'ahu, Sat March 1
RSVP to scott@soest.hawaii.edu

B) For Big Island, March 7-9
Give $75 deposit to Geology Club by January 31

C) For Maui, March 20-23
RSVP to sinton@hawaii.edu

D) For Waihe'e Tunnel, Wed April 16
RSVP to engels@hawaii.edu

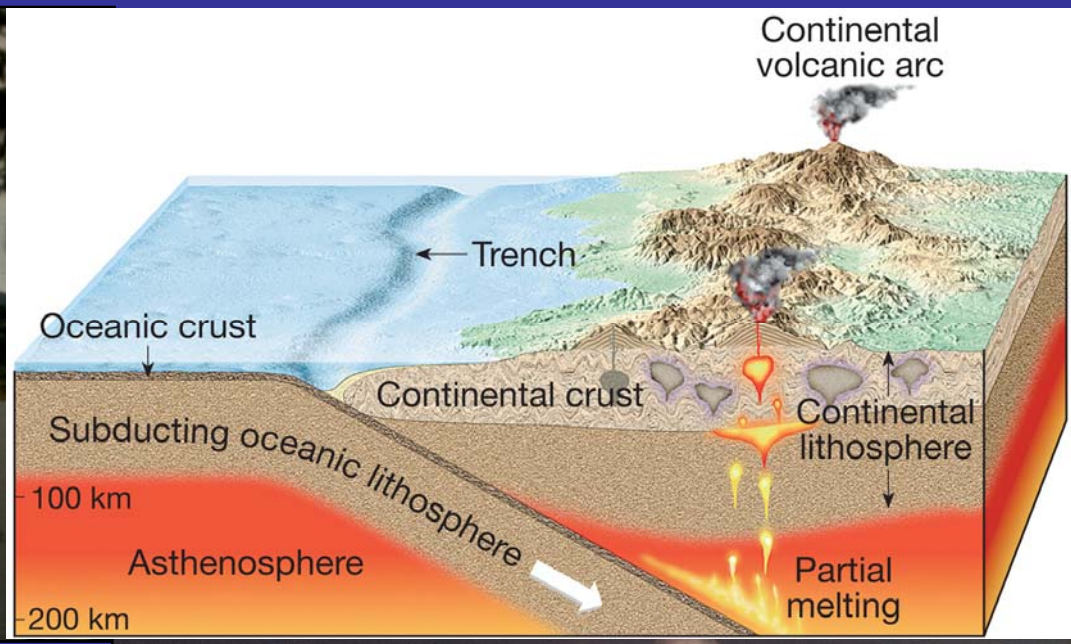
E) For Central O'ahu, Sat April 19
RSVP to scott@soest.hawaii.edu

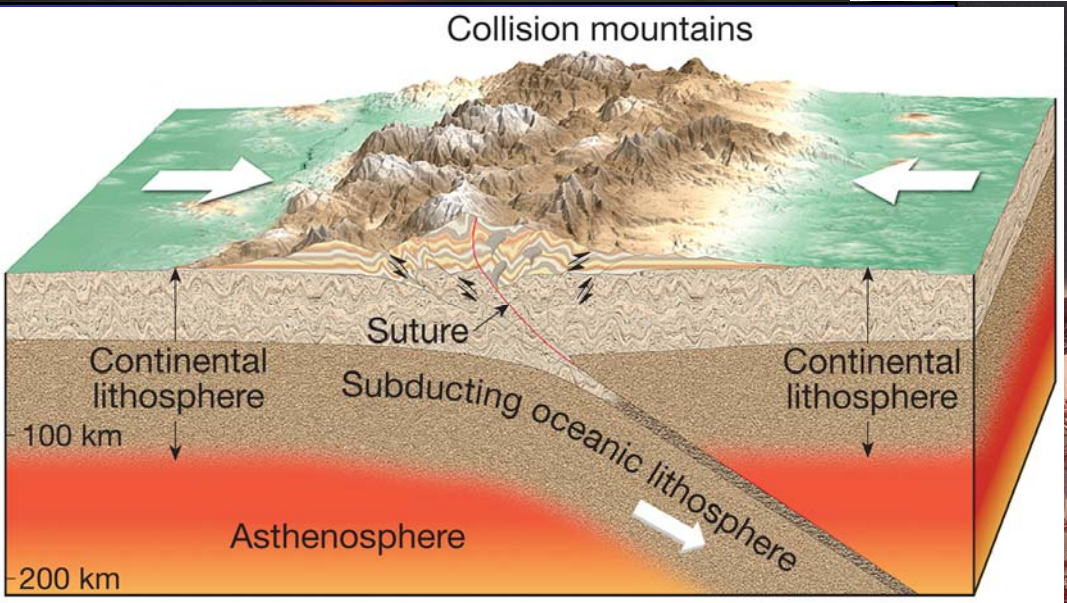
What processes cause mountain-building?








Continental volcanic arc
Trench
Oceanic crust
Continental crust
Continental lithosphere
Subducting oceanic lithosphere
100 km
Asthenosphere
Partial melting
200 km


Collision mountains
Suture
Continental lithosphere
Subducting oceanic lithosphere
Continental lithosphere
100 km
Asthenosphere
200 km











What processes cause mountain destruction?





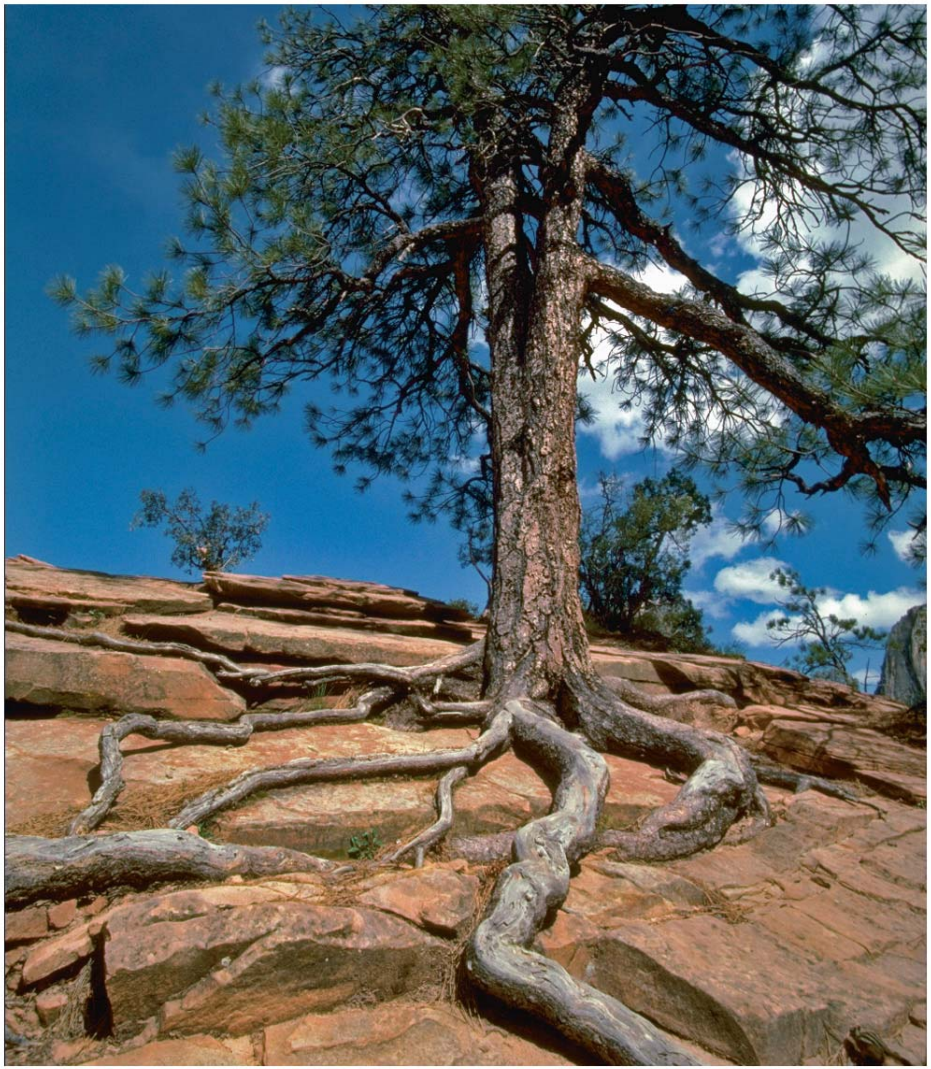


Weathering – **disintegration** and **decomposition** of rocks at or near Earth's surface

Mass Wasting – the transfer of rock and soil downslope under the influence of gravity

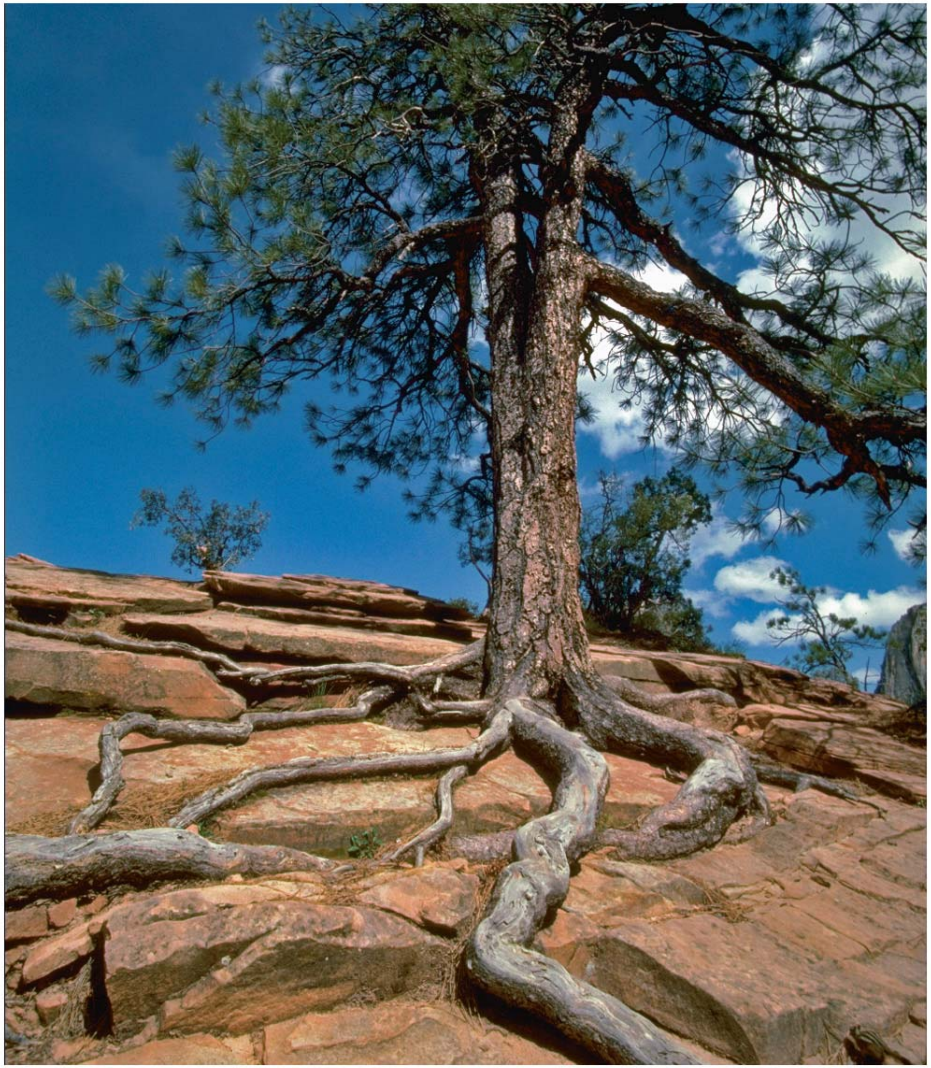
Erosion – the physical removal of material by mobile agents such as water, wind, or ice

physical breakdown **chemical alteration**





Mechanical
physical breakdown



Chemical
chemical alteration



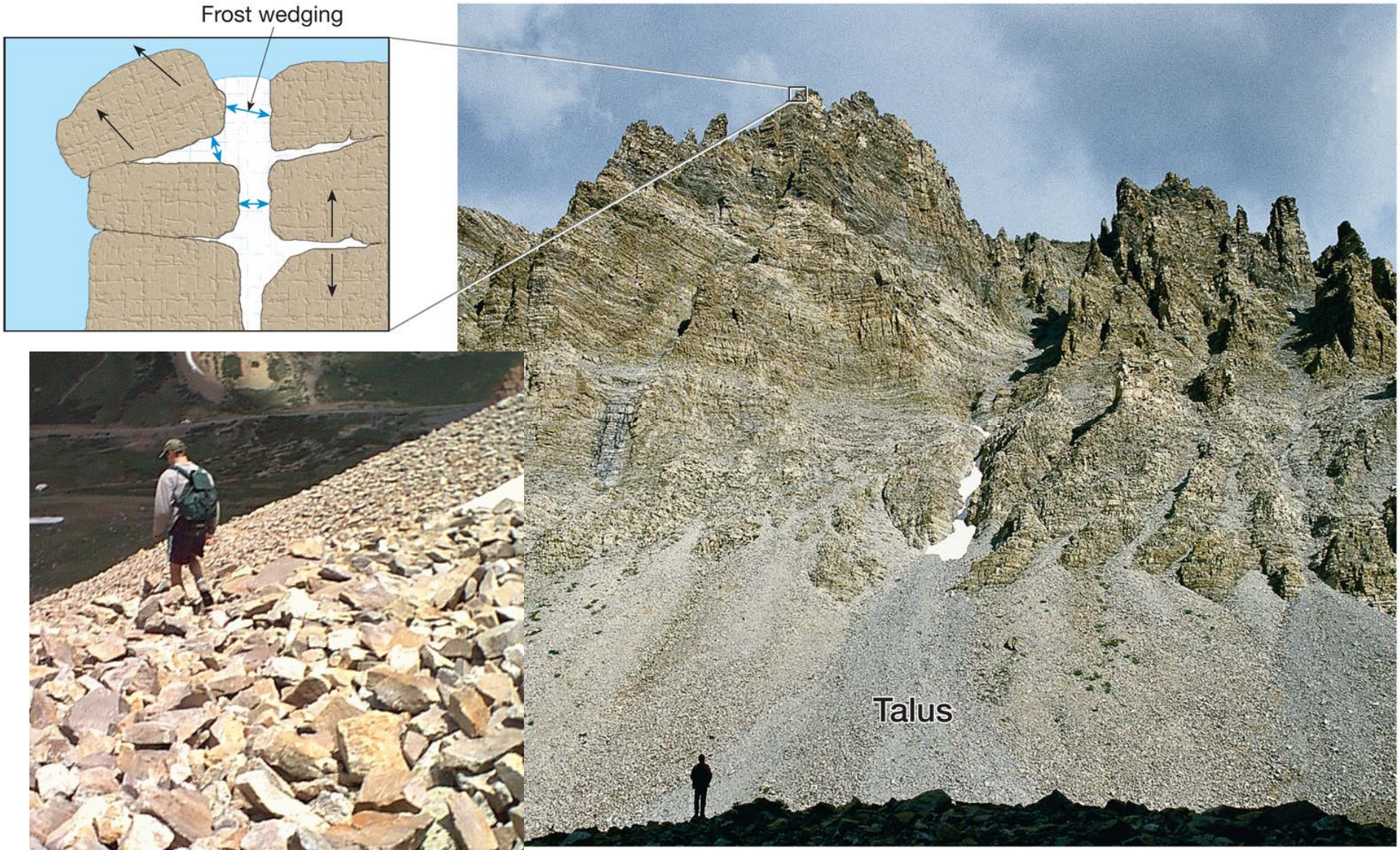
What is unique about the solid form of water?



A) Temperature, B) Density, C) Volume, D) Pressure, E) Color

Antarctica

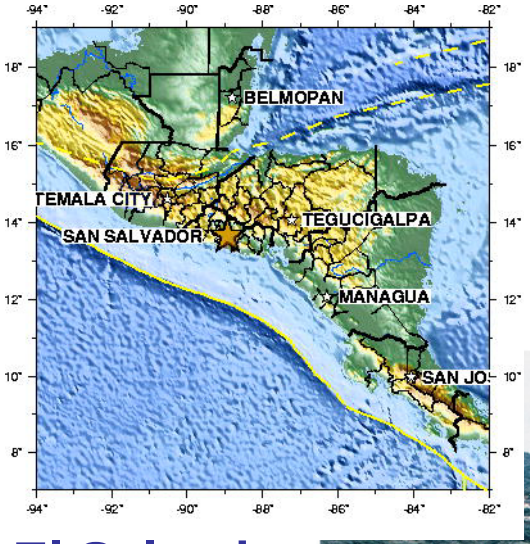




Frost wedging

What process caused loss of life during this landslide?

A) Weathering, B) Mass wasting, C) Erosion

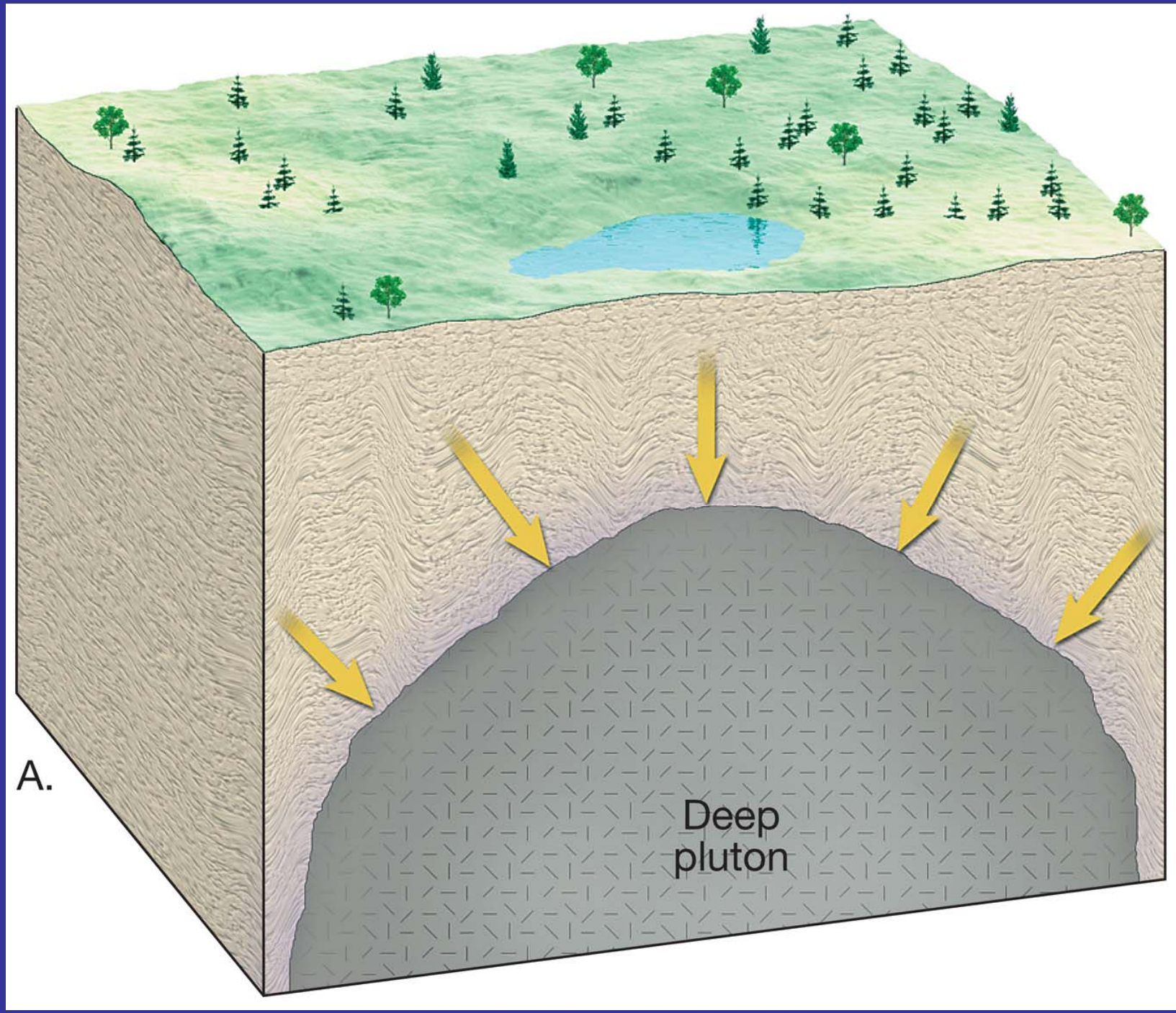


El Salvador
2001
844
deaths

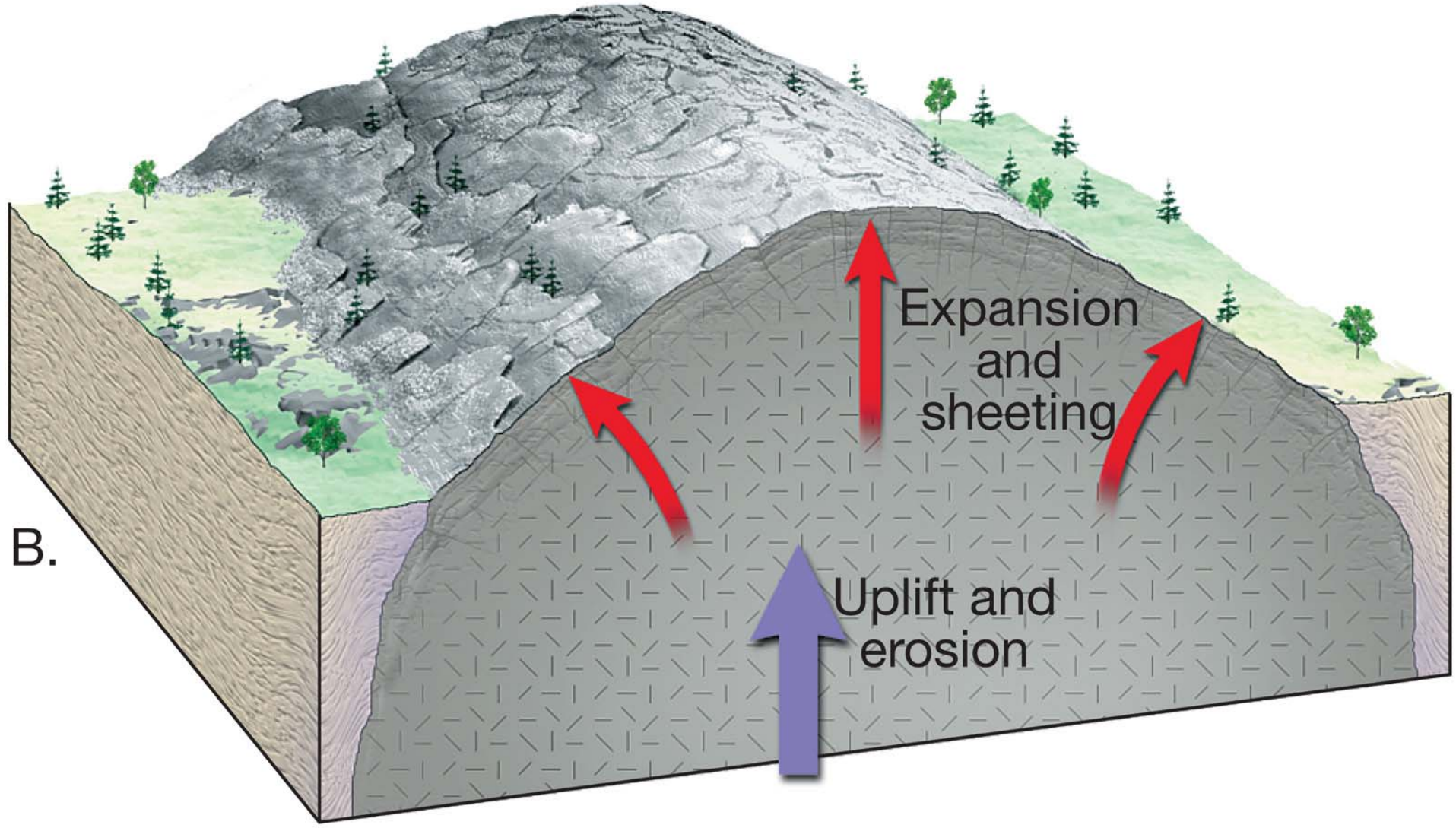







A.
Deep
pluton

Unloading















Mechanical weathering (physical breakdown)



1. Frost wedging

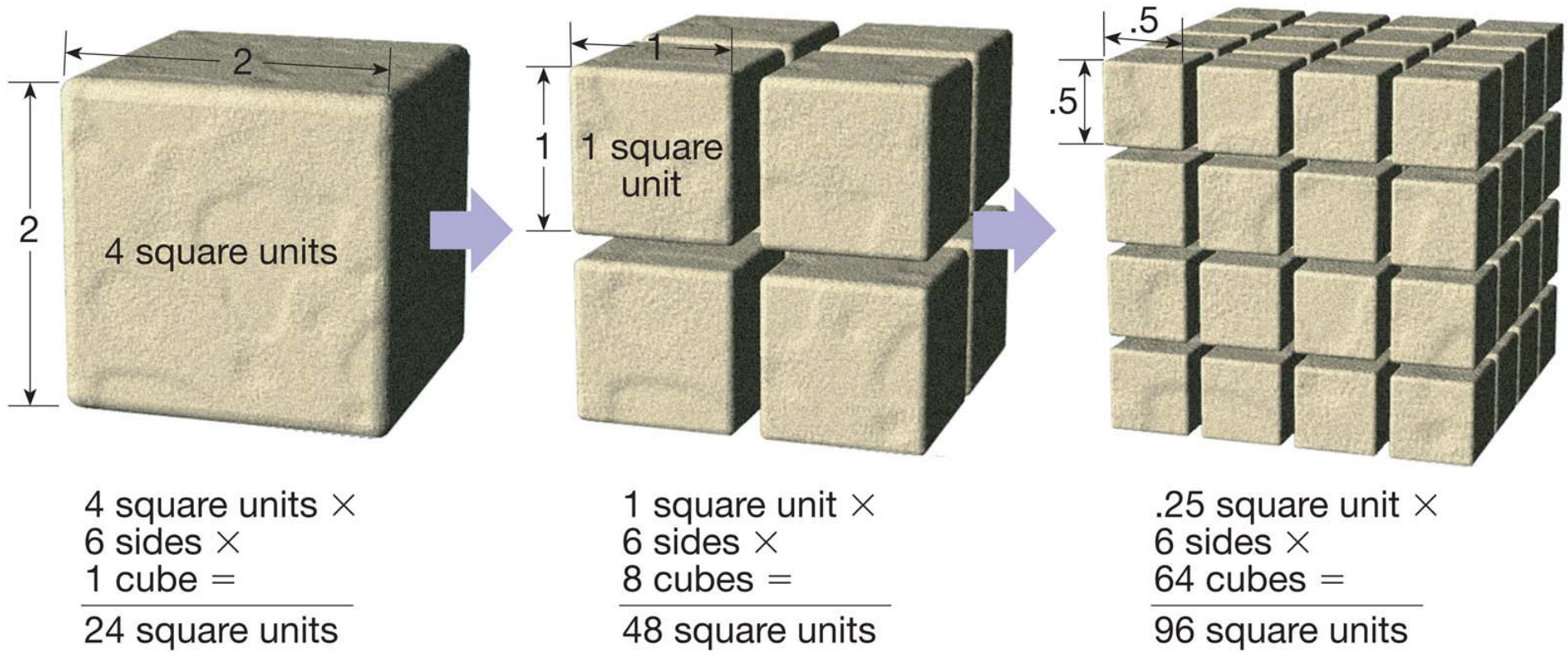


How do these change the exposed surface area?

2. Unloading



3. Biological Activity



4 square units ×
6 sides ×
1 cube =

24 square units

1 square unit ×
6 sides ×
8 cubes =

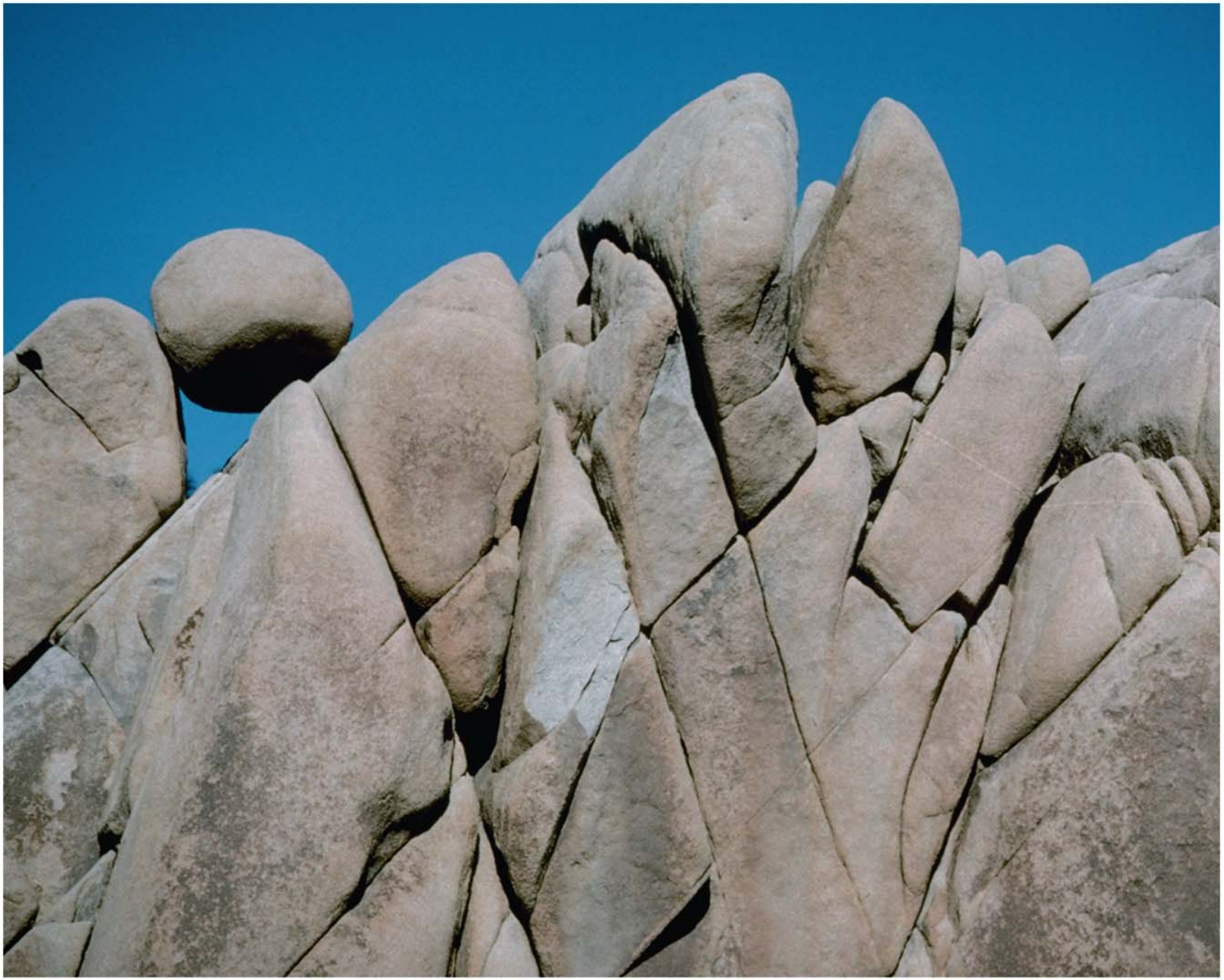
48 square units

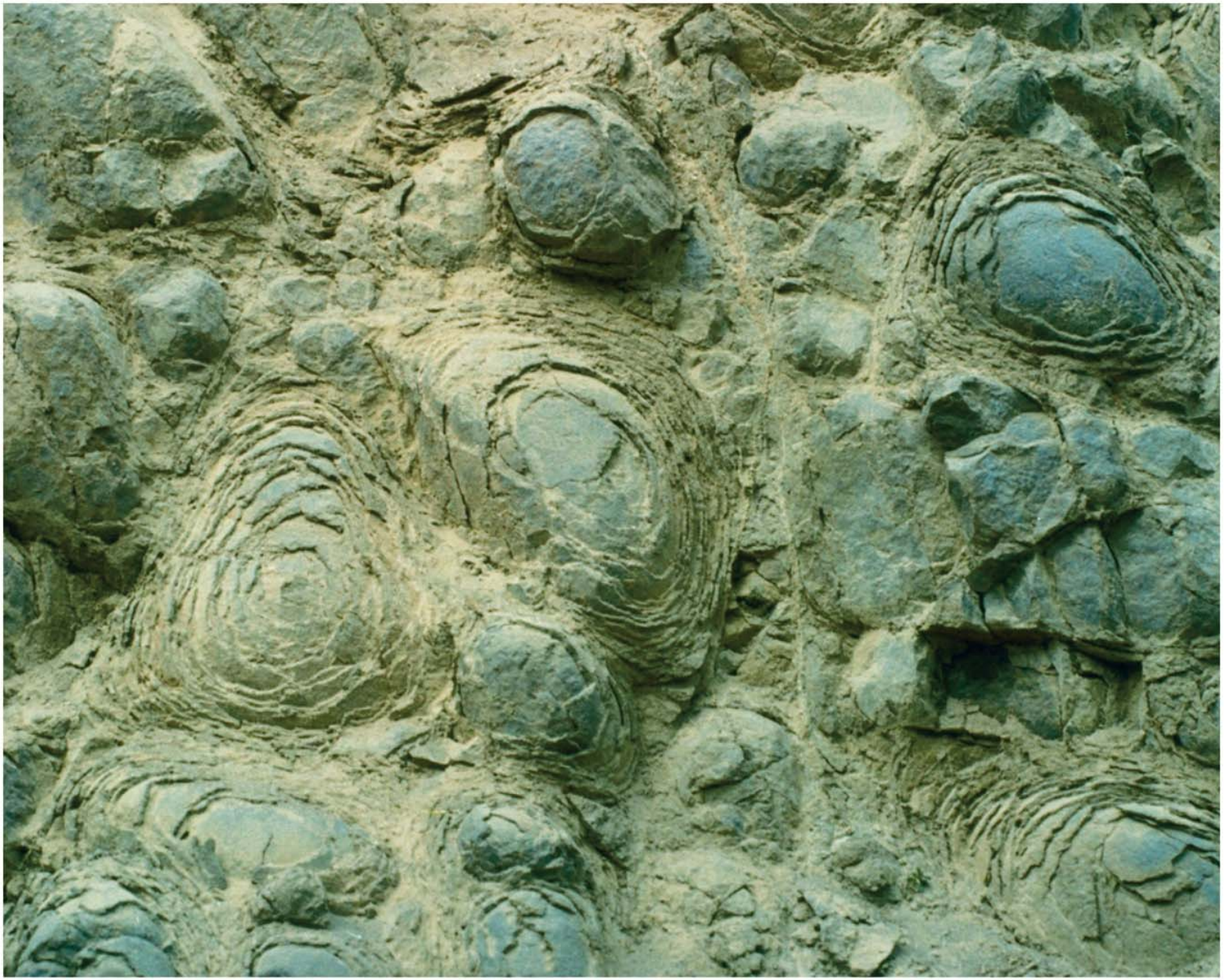
.25 square unit ×
6 sides ×
64 cubes =

96 square units

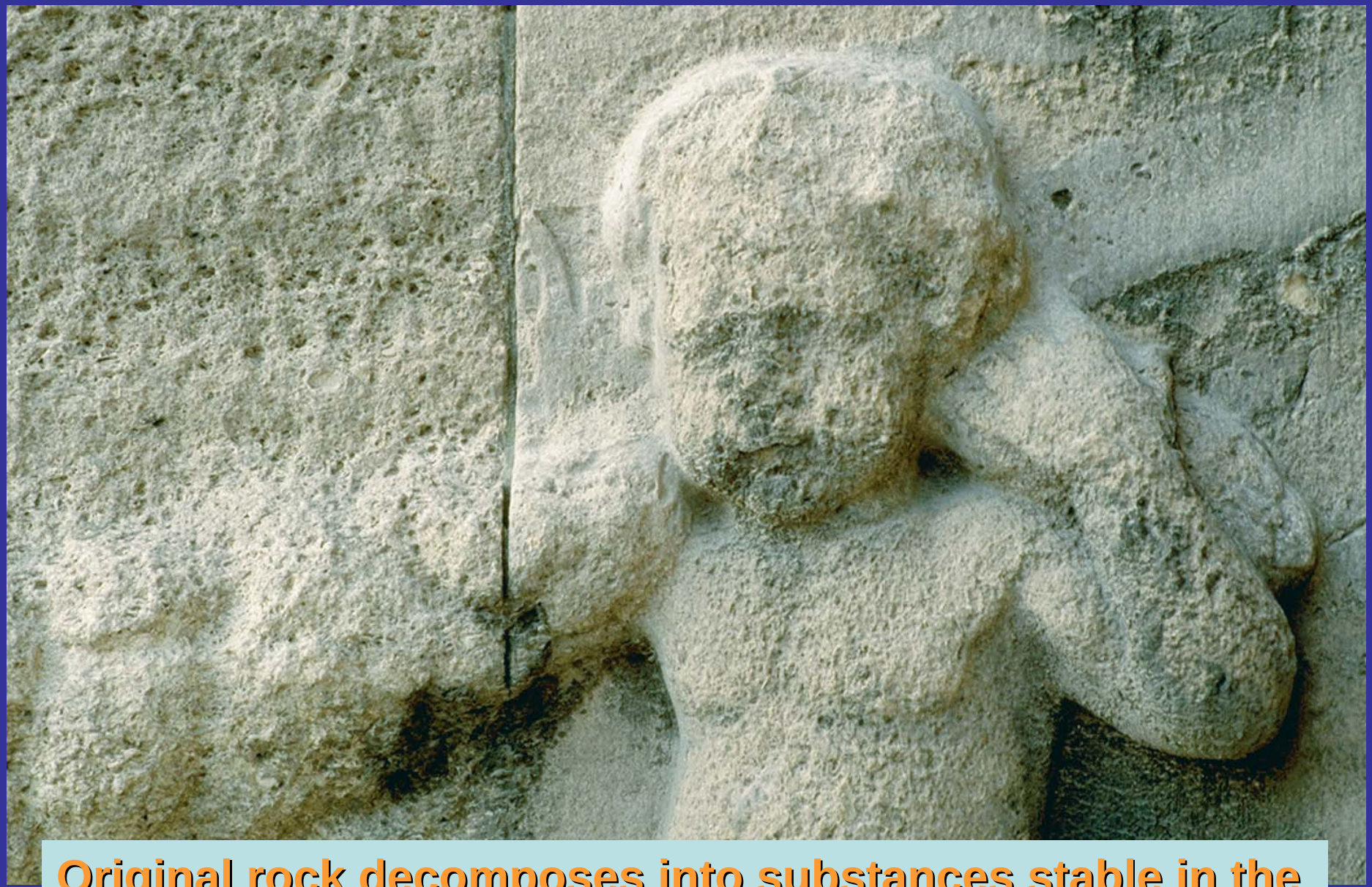
Surface area increased: ….x2……..x4

What part of cube is weakest?

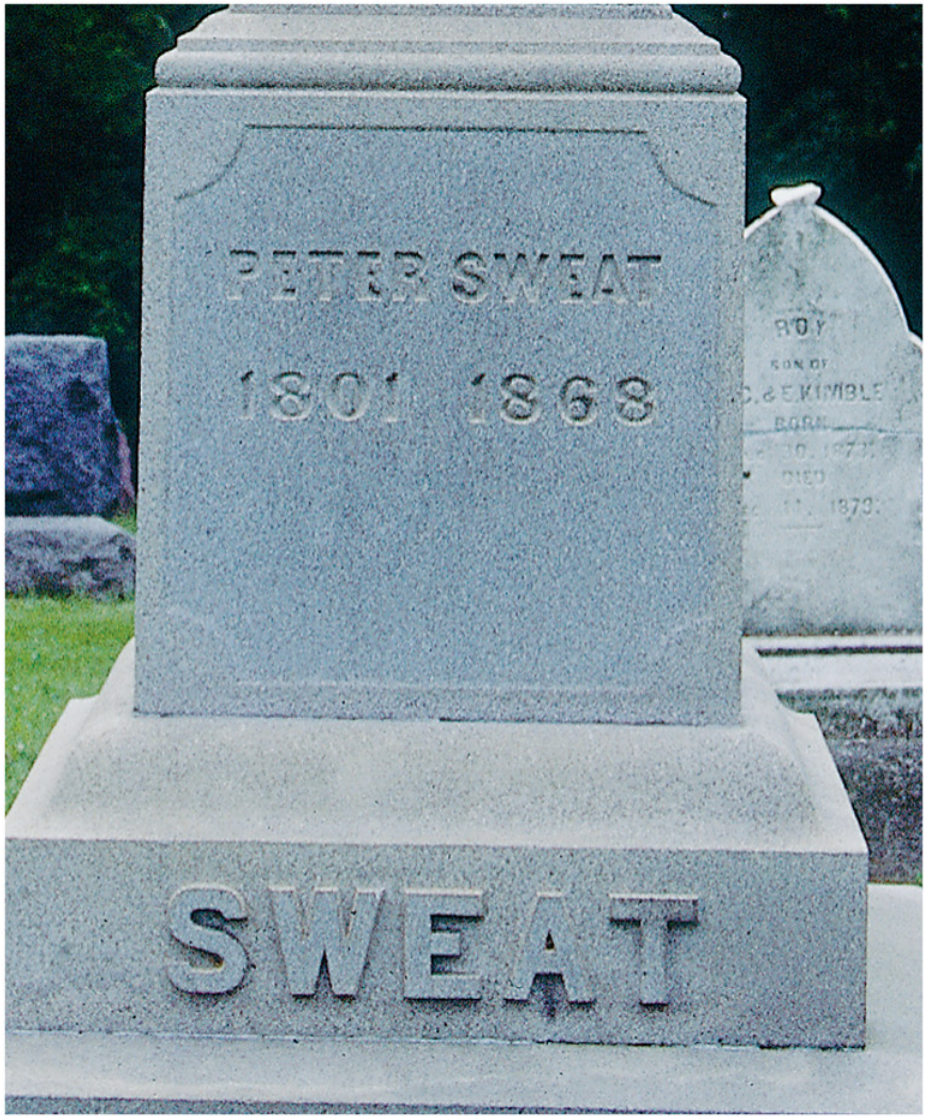




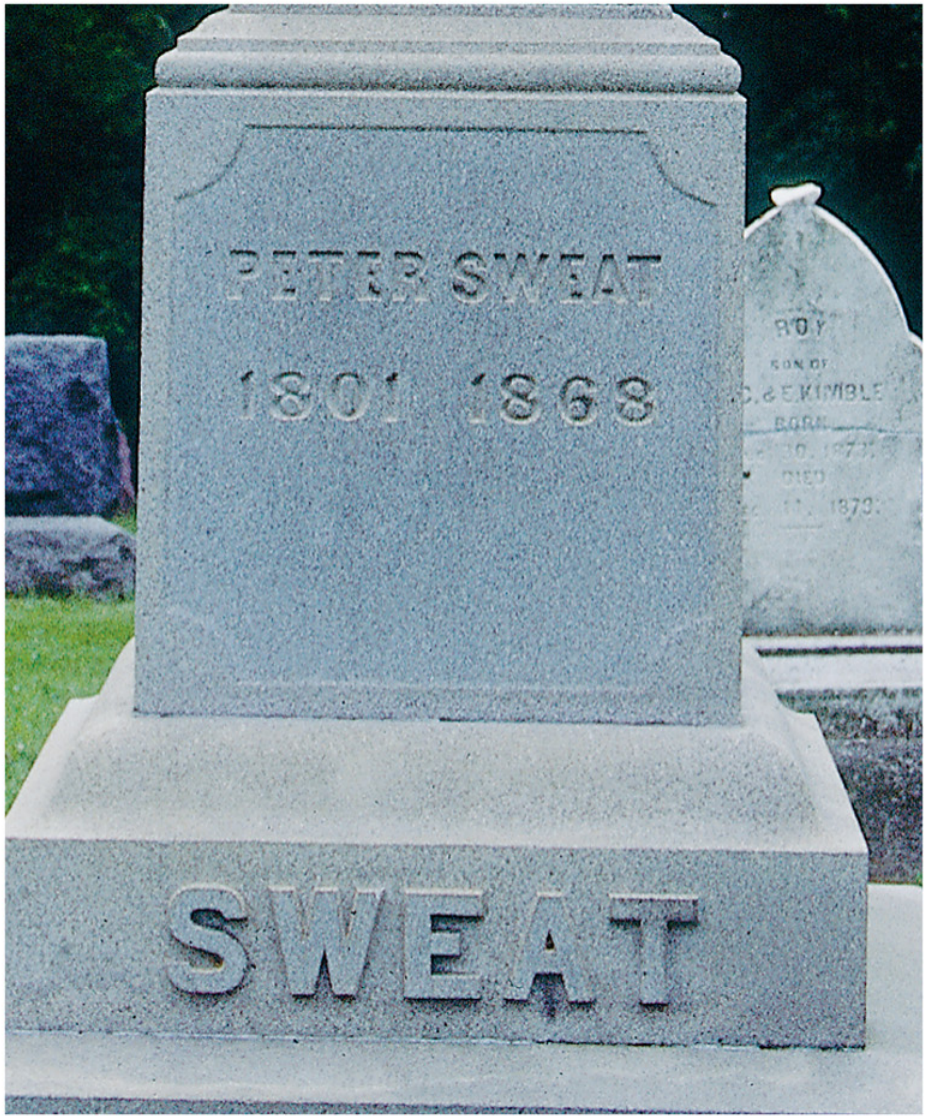
Chemical alteration



Original rock decomposes into substances stable in the surface environment.


PETER SWEAT
1801 1868
SWEAT



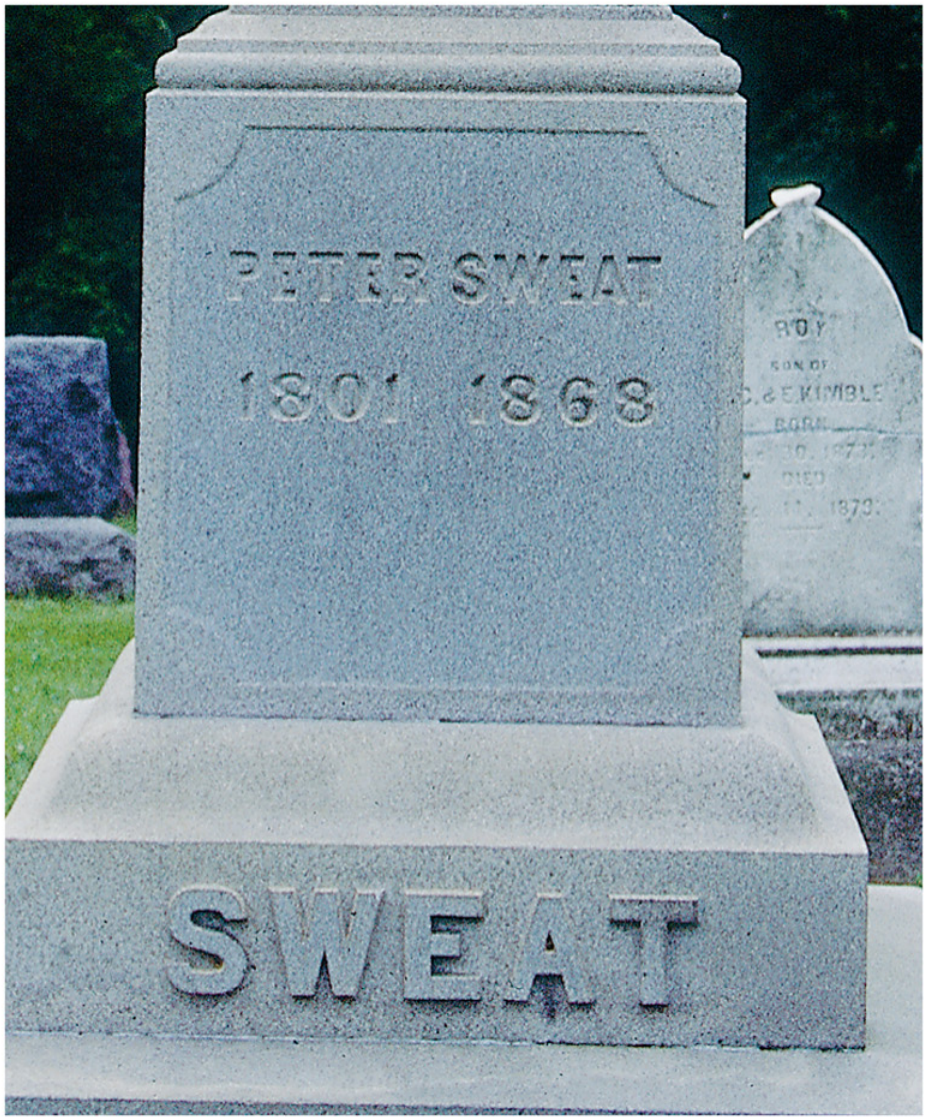




1868

1872

Different rocks weather at different rates





Granite

Marble

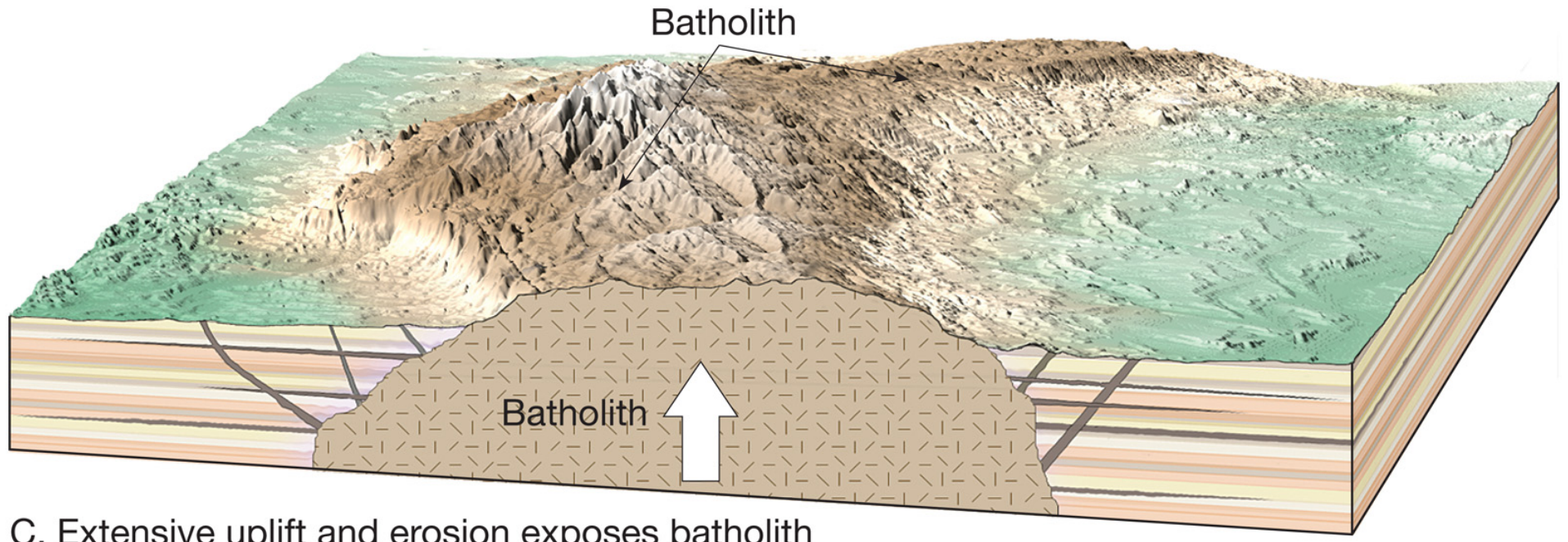


Monument Valley, Arizona

What is the most common continental rock type?



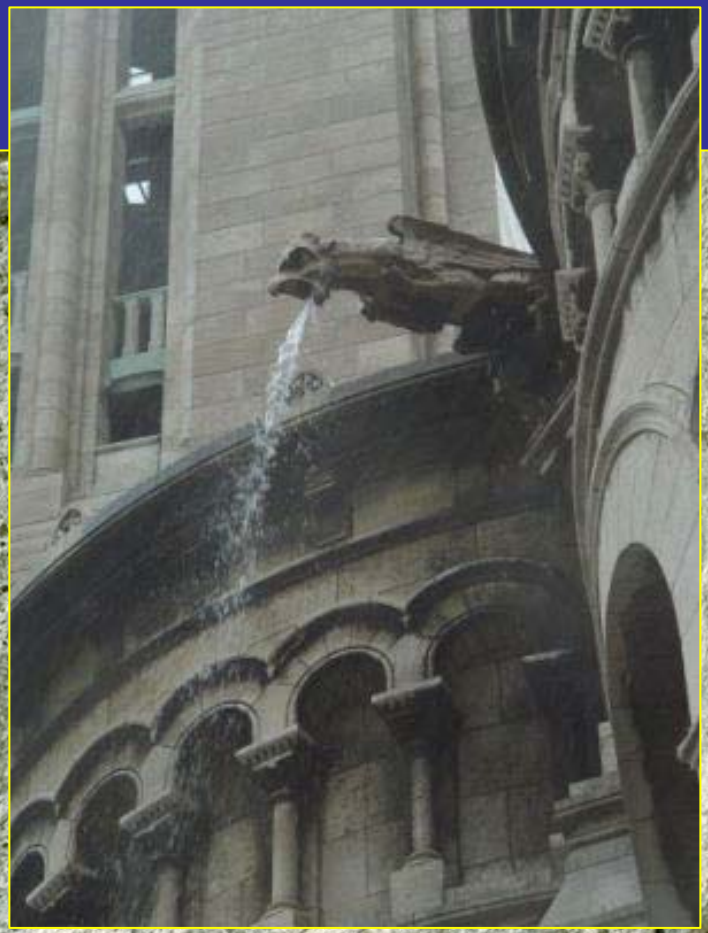
A) Basalt, B) Andesite, C) Diorite, D) Rhyolite, E) Granite



C. Extensive uplift and erosion exposes batholith



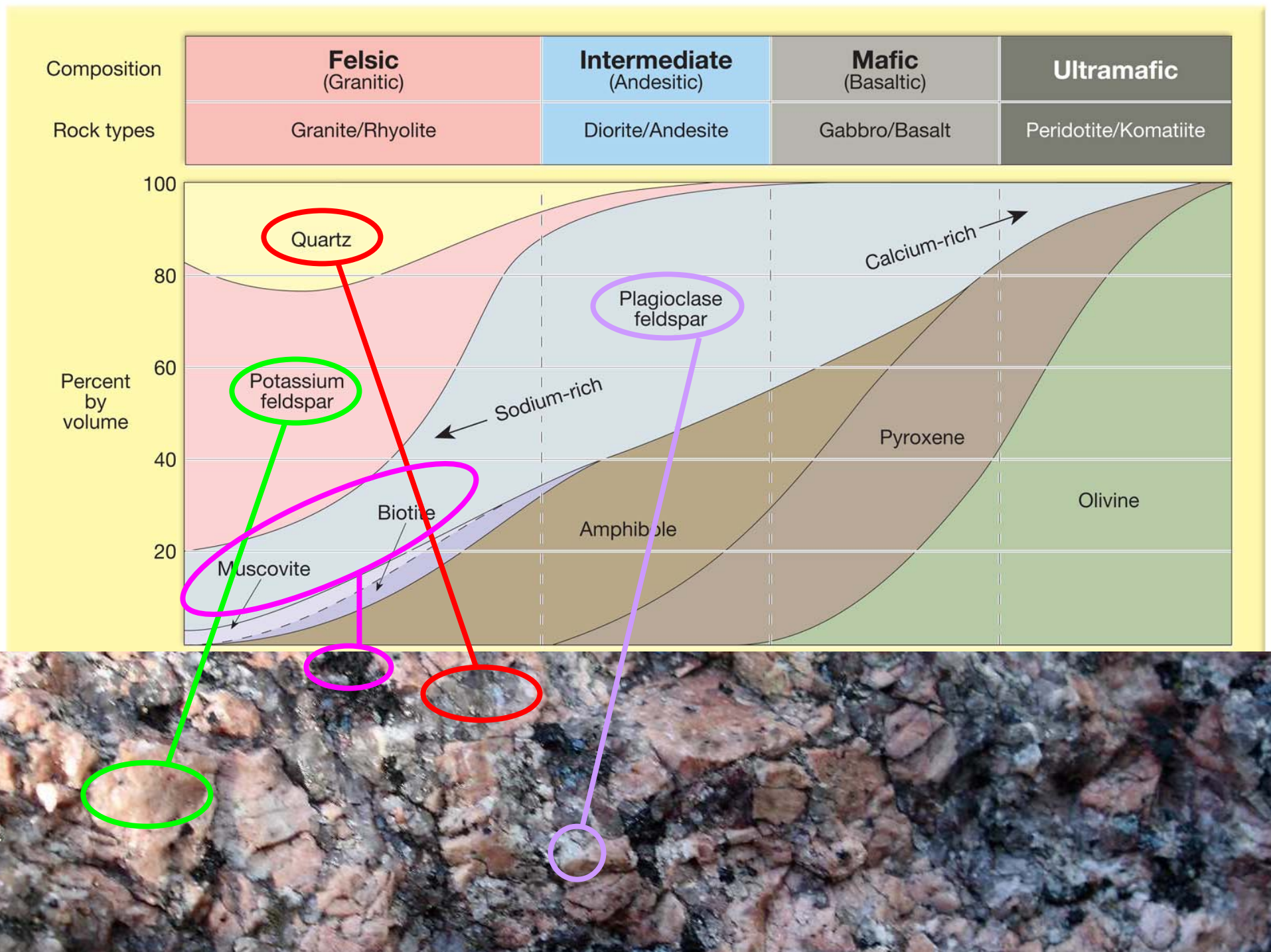
What is the weathering agent?





$$CO_2 + H_2O = H_2CO_3 \rightarrow H^+ + HC0_3^-$$

carbonic acid


Composition
Felsic
(Granitic)
Intermediate
(Andesitic)
Mafic
(Basaltic)
Ultramafic
Rock types
Granite/Rhyolite
Diorite/Andesite
Gabbro/Basalt
Peridotite/Komatiite
Percent by volume
100
80
60
40
20
Quartz
Potassium feldspar
Plagioclase feldspar
Sodium-rich
Calcium-rich
Biotite
Muscovite
Amphibole
Pyroxene
Olivine

$$2\,KAlSi_3O_8 + 2(H^+ + HCO_3^-) + H_20$$

potassium feldspar | carbonic acid | water

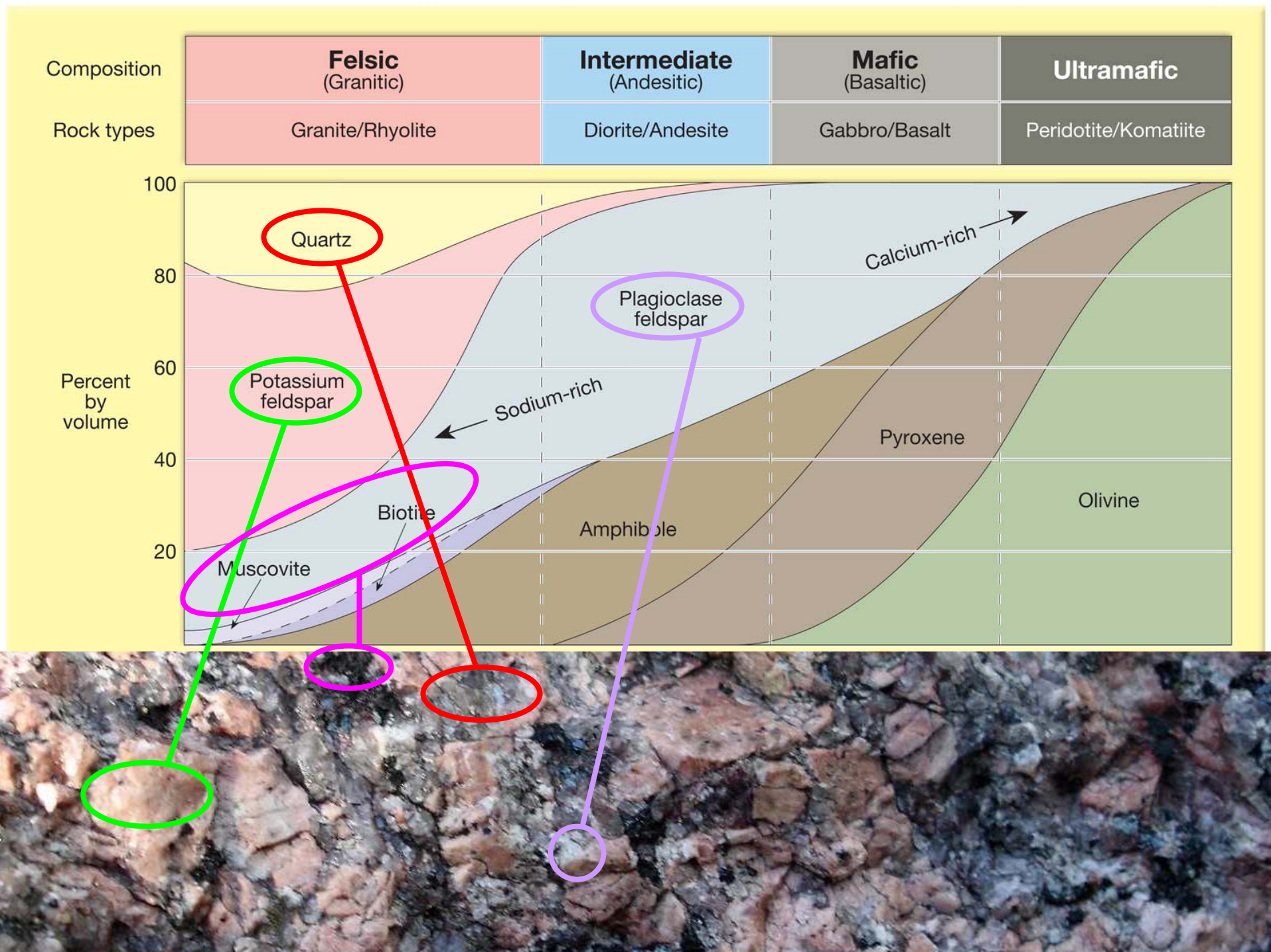
=

$$Al_2Si_2O_5(OH)_4 + 2K^+ + 2HCO_3^- + 4SiO_2$$

clay mineral | potassium ion | bicarbonate ion | silica ion

in solution




Composition
Felsic
(Granitic)
Intermediate
(Andesitic)
Mafic
(Basaltic)
Ultramafic
Rock types
Granite/Rhyolite
Diorite/Andesite
Gabbro/Basalt
Peridotite/Komatiite
Percent by volume
100
80
60
40
20
Quartz
Potassium feldspar
Plagioclase feldspar
Sodium-rich
Calcium-rich
Biotite
Muscovite
Amphibole
Pyroxene
Olivine





In each of these environments?



What type of weathering will dominate