

Today: Chemical weathering!

- Online labs start next week August 30th/31st
- If you can switch from Tuesday to Monday lab, please do.
- Homework #1 posted on Canvas – due next Mon/Tues on Canvas by 1:59pm (no late assignments accepted!)
- Hand lens needed by Sept 13 lab
- Department looking to hire drivers for fieldtrips. Contact Laurie.Marx@humboldt.edu if you are interested. DMV check, (short!) defensive driving training.

WELCOME!

Join us for a virtual GEOLOGY GATHERING

WHEN: Monday, August 30, 2021, from 5:00 to 6:00 PM

WHERE: Zoom – Meeting ID 87109314668 Password: RockOn

https://www.google.com/url?q=https://humboldtstate.zoom.us/j/87109314668&sa=D&source=calendar&ust=1630422453889888&usg=AOvVaw1FHSEwn_B2sX78HtaSMmdv

WHO: All Geology Majors, Minors, Grad Students,
and Faculty

WHY: Welcome! Welcome back! We hope to see many of you in labs and on field trips this term. For now, Zoom is the safest way for all of us to gather and pass on information of what is, or may be in store this academic year. Please tune in!!

WHAT: Announcements, updates from professors, the Geology Club, and the potential to win a gift card for randomly selected participants!



Wetting/Drying



Vermillion Cliffs



Giant
Desiccation
Cracks
Graham Co
Arizona

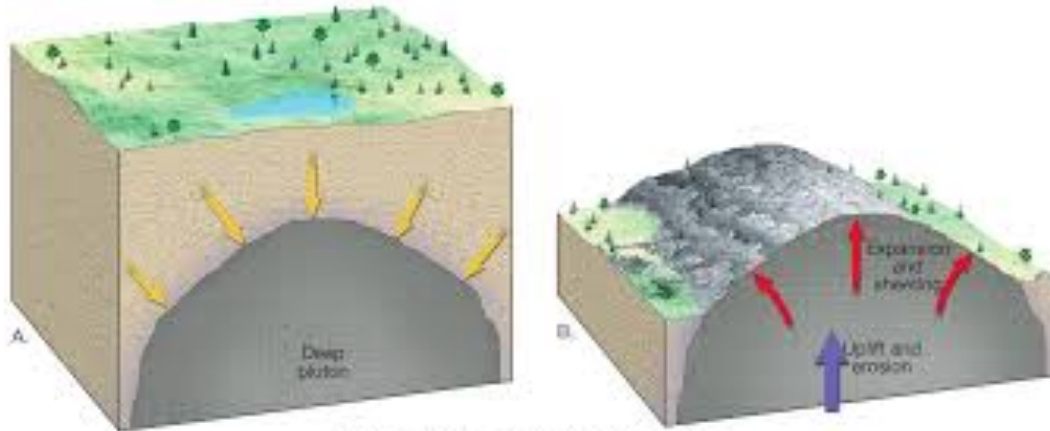


Wetting and Drying weathering



Mudcracks in the Badlands of South Dakota

Stress-release weathering



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Creates “sheeting” in rock

Salt weathering



Salt weathering (can create tafoni*)



Tafoni has been attributed to layers of algae/bacteria which shields the remainder of the rock from further weathering.

* not well understood!

Salt weathering (can create tafoni*)



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Weathering and erosion of silicate minerals

Goldich stability series

Mafic minerals (high Mg & Fe)

Salic minerals (high Si & Al)

olivine

Ca plagioclase

augite

hornblende

Na-Ca plagioclase

biotite

Na-plagioclase

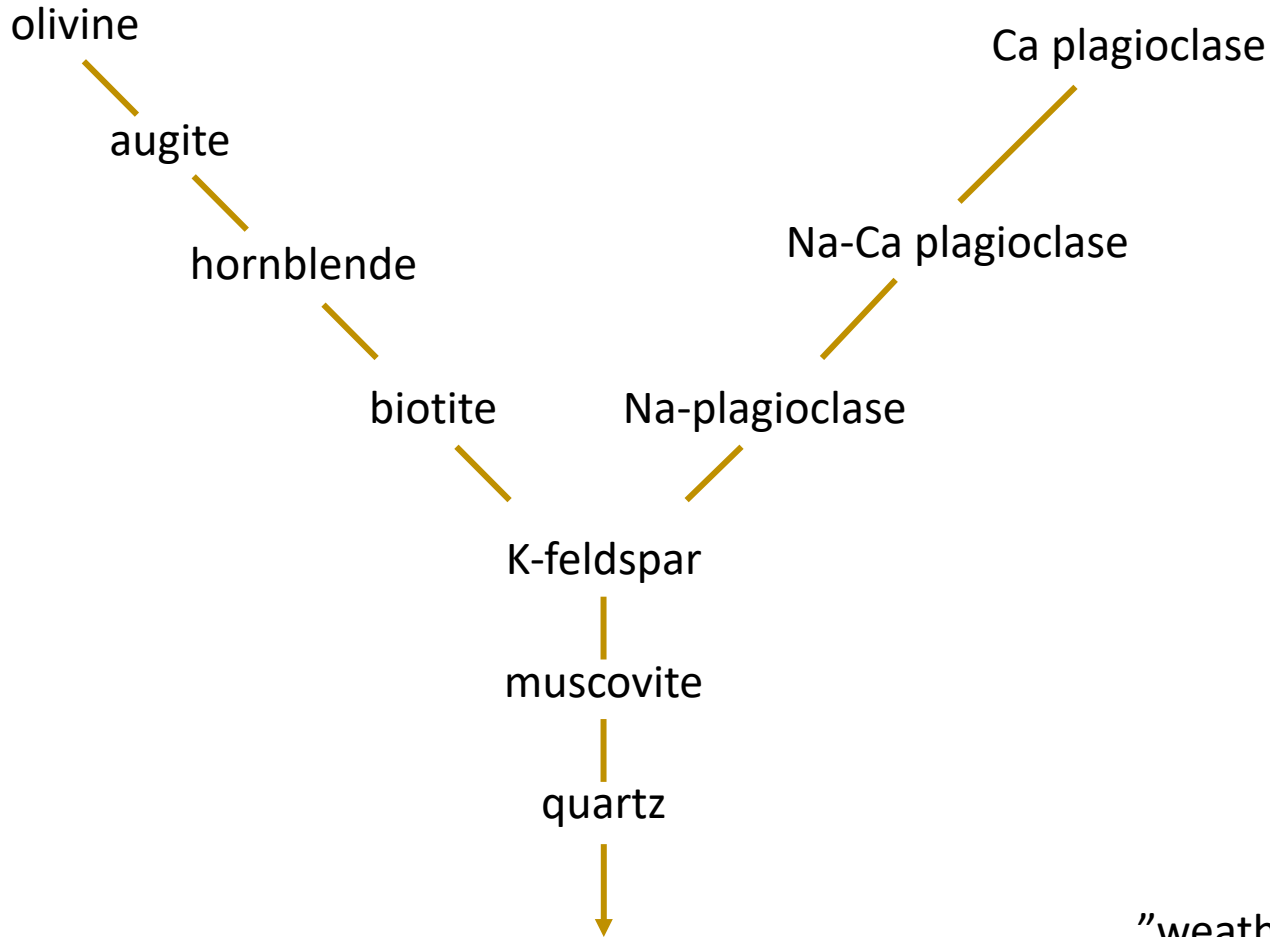
K-feldspar

muscovite

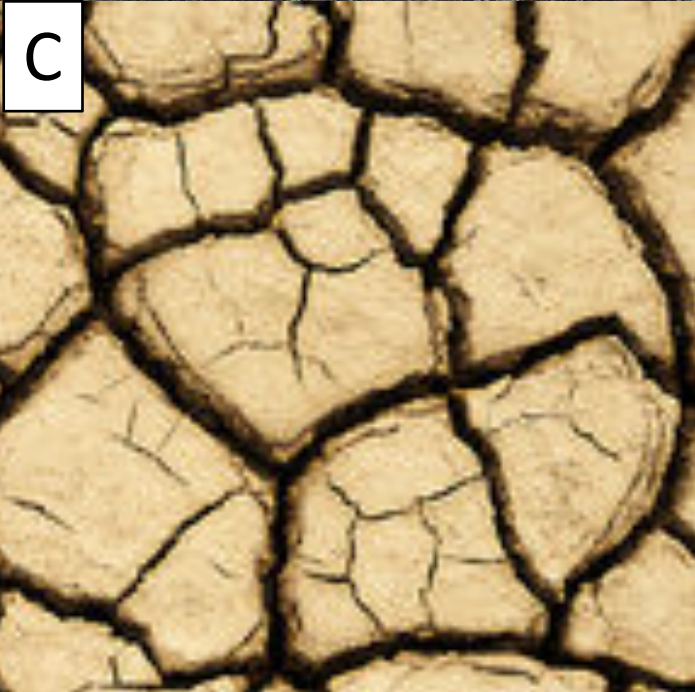
quartz

Increasing stability

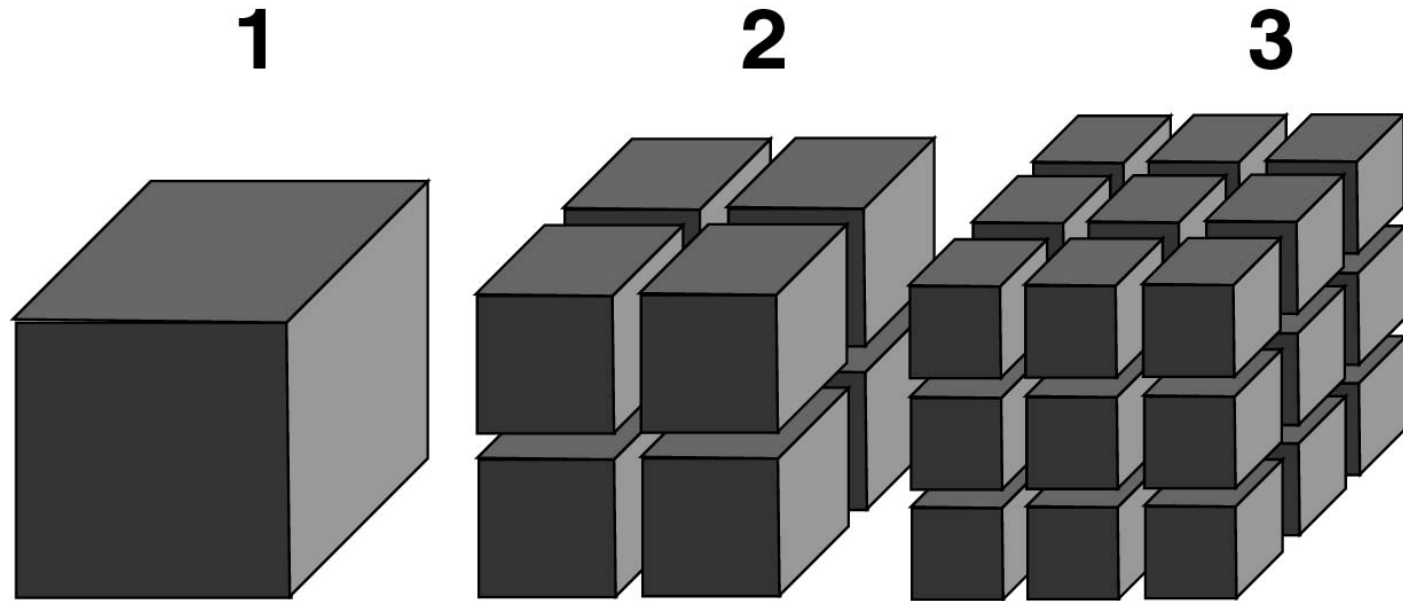
"weatherability" of
common igneous
silicate minerals



Type of physical weathering?



Increased physical weathering leads to increased chemical weathering

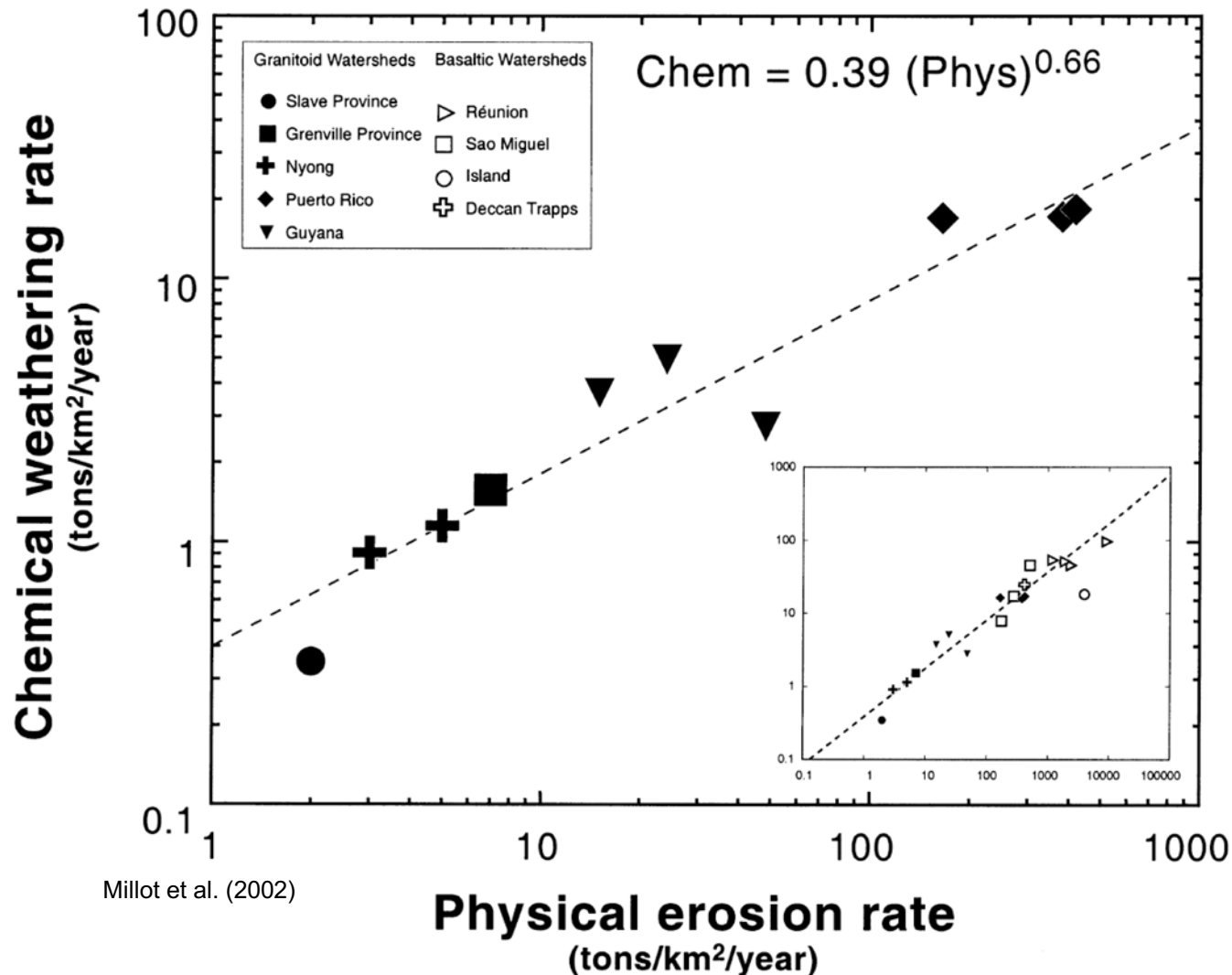


SA (surface area) = # blocks x SA of each block

Physical weathering →

Physical weathering breaks down bedrock and creates more surface area on which chemical weathering can act

Erosion and chemical weathering are correlated



- Fresh surface created by erosion have more potential for weathering
- Weathering weakens rocks that are as such more easily eroded

What is chemical weathering?

Weathering that changes both the chemical and mineralogical composition of the rock.

Water and dissolved gasses interact with minerals causing some (or all) of the mineral to be dissolved and removed in solution.



Chemical weathering

- Since (some) water is present in every environment, chemical weathering is more important than physical weathering
- However due to low ($<30^{\circ}\text{C}$) environmental temperatures, chemical weathering occurs very slowly



Simple dissolution of limestone



Chemical solution of limestone- karst



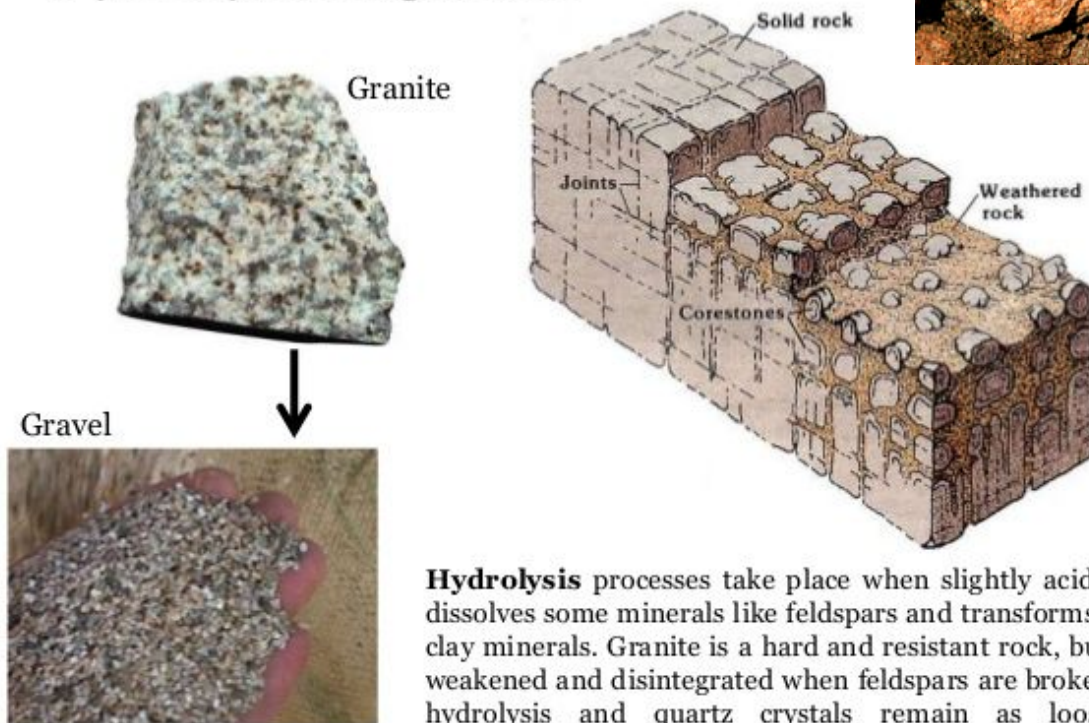
Hydrolysis weathers granitic pebbles into kaolin (clay)



Hydrolysis of granite



Hydrolysis of granite



Hydrolysis processes take place when slightly acid rainwater dissolves some minerals like feldspars and transforms them into clay minerals. Granite is a hard and resistant rock, but becomes weakened and disintegrated when feldspars are broken down by hydrolysis and quartz crystals remain as loose debris, unaffected.

Oxidation of Fe bearing minerals stains Uluru Rock



Oxidation of Fe-bearing minerals in shale



Climate has a large effect on weathering rates!

- Temperature (chem. weathering rate increases by a factor of 2 with each 10°C increase)
- Precipitation => runoff (provides water for weathering)
- Seasonality of precipitation (snow vs. rain)
- Acidity of precipitation (More acidic => increases chemical weathering)
- Vegetation (may increase mechanical weathering by roots, but decreases erosion rates)

For a good summary of Chemical weathering:

<https://opentextbc.ca/geology/chapter/5-2-chemical-weathering/>