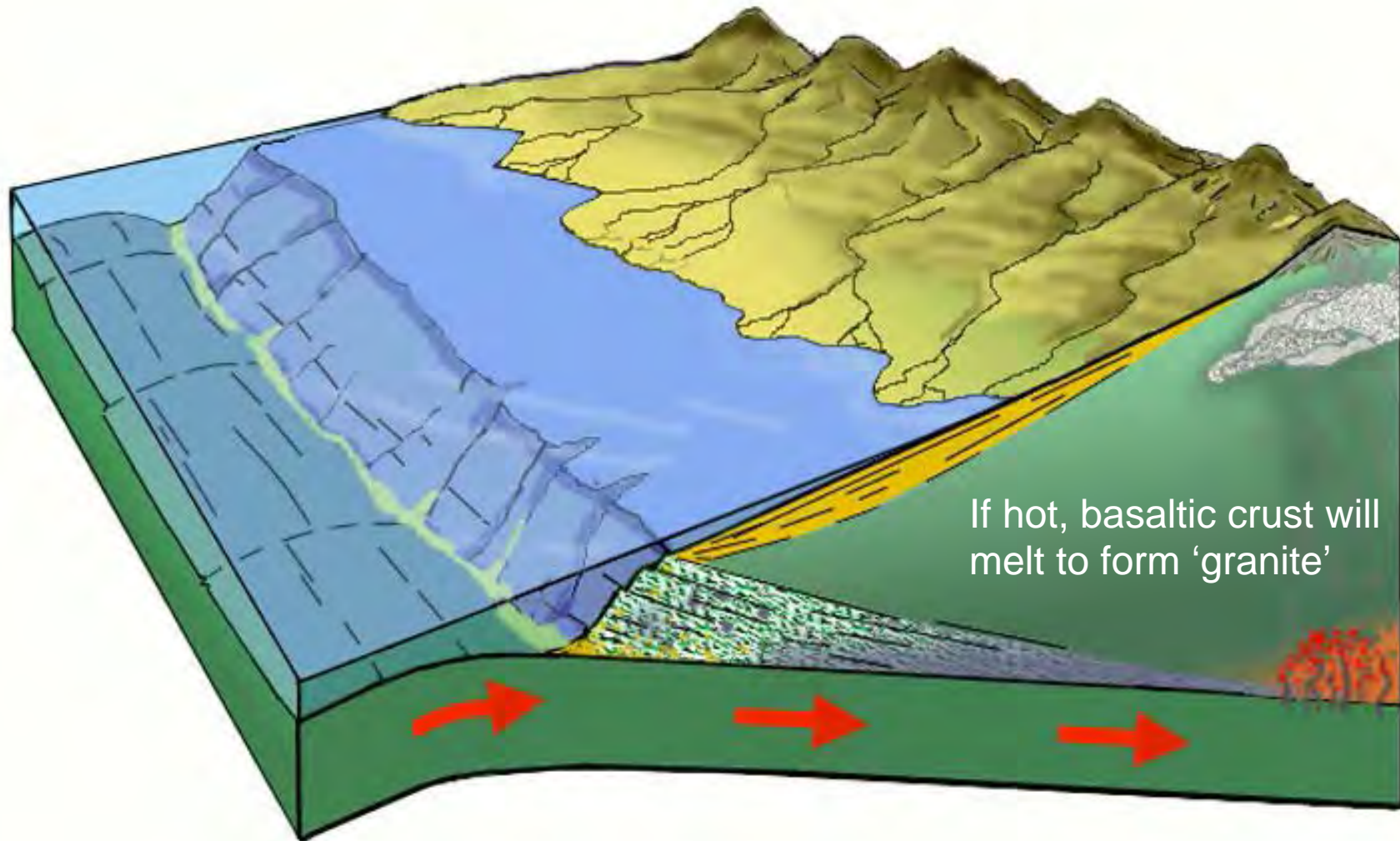


# Crustal genesis: at least a two-step process

- Hot subduction zones create 'granites'
- Weathering & seafloor alteration: removal of some elements to mantle
- Recycling of lower crust

# Hot subduction creates granite

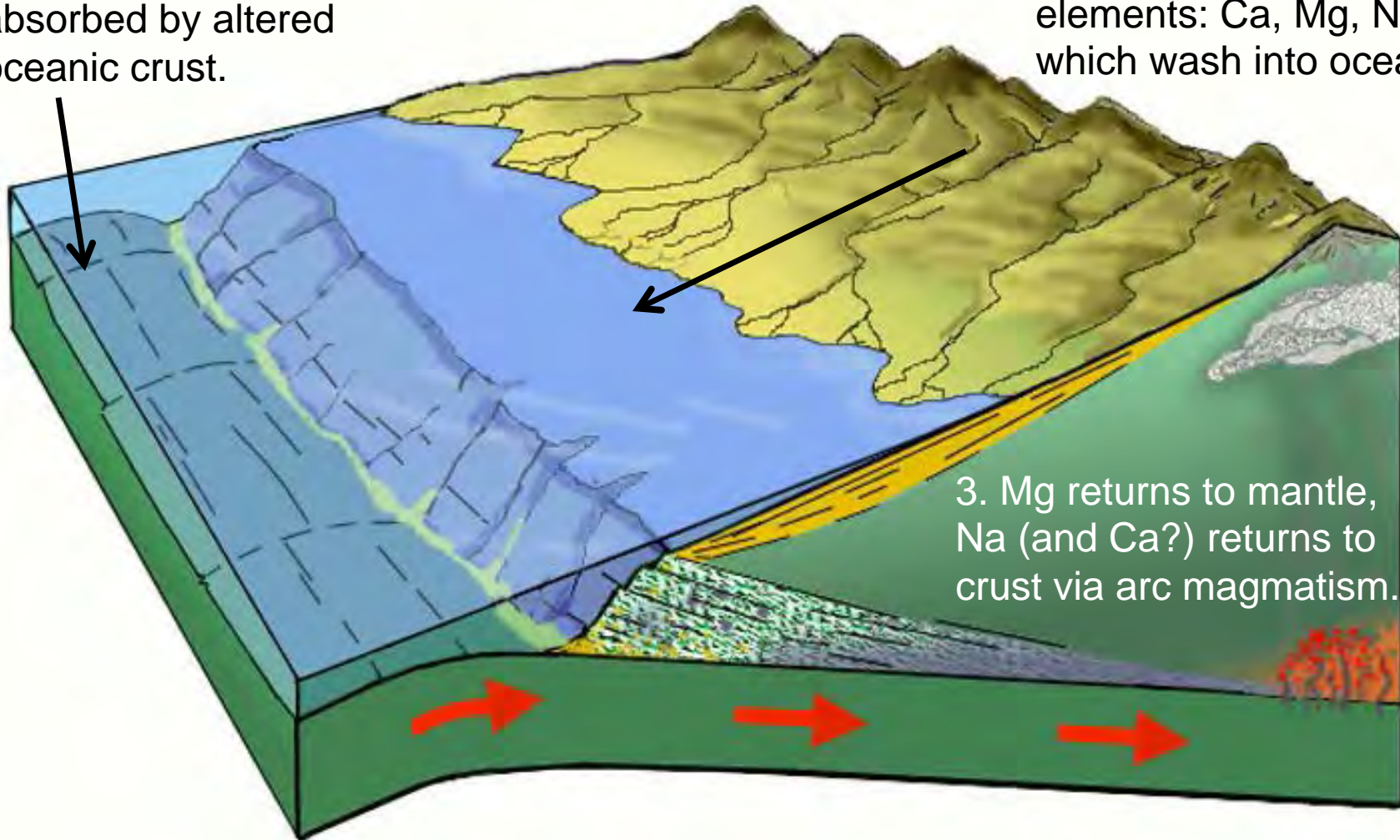


# Weathering: Loss of magnesium

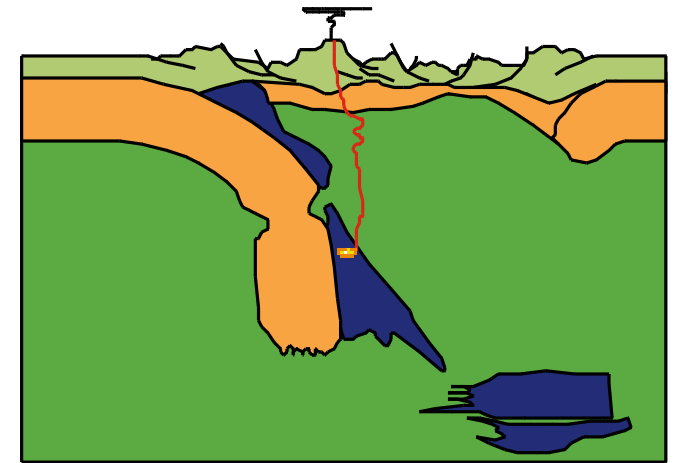
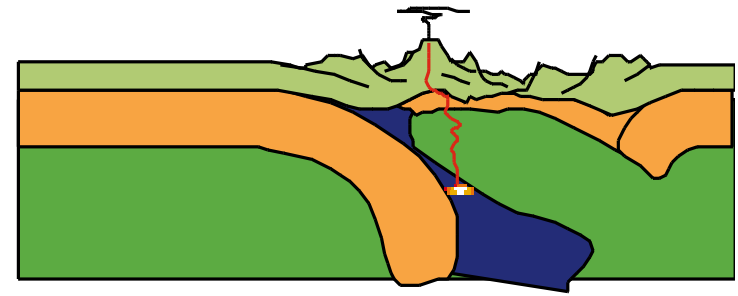
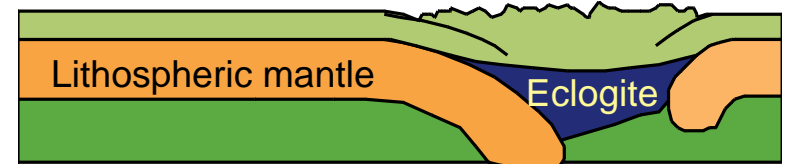
1. Chemical weathering releases soluble elements: Ca, Mg, Na, which wash into oceans

2. Mg (and Na, Ca?) absorbed by altered oceanic crust.

3. Mg returns to mantle, Na (and Ca?) returns to crust via arc magmatism.



# Lower Crustal Removal through density foundering



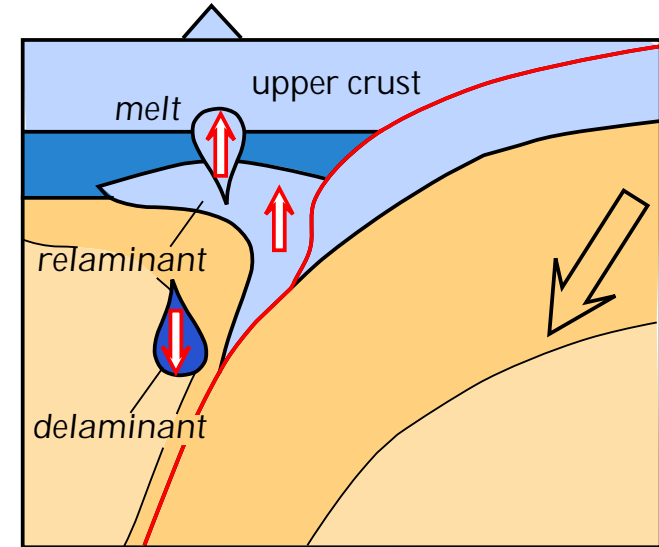
*From Laubcher*

*Example from the Alps?*





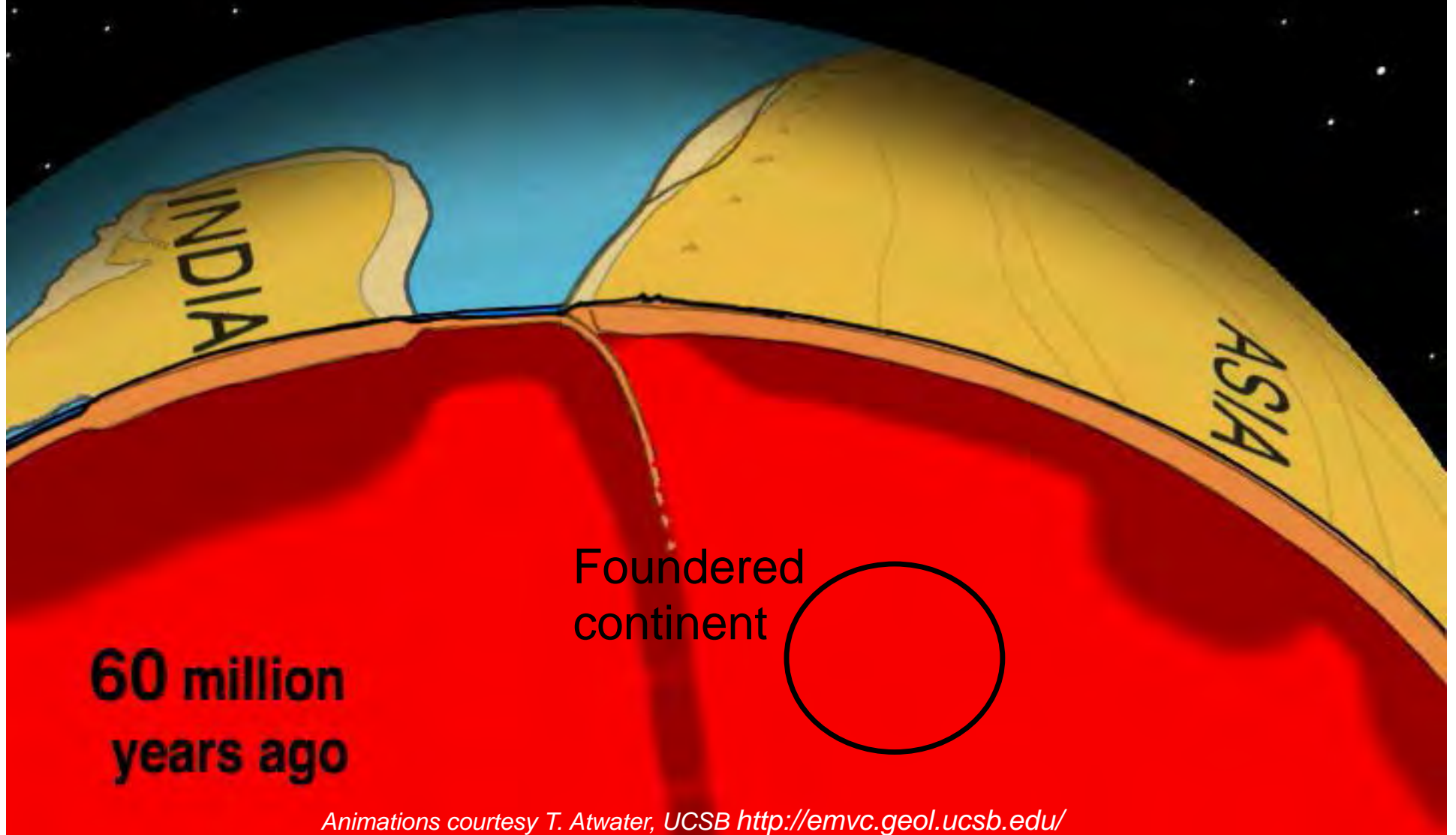
# Lower Crustal Removal through 'relamination'



*From Hacker et al., 2014*

*Example from the  
Pamir & Tibetan  
Plateau?*

# Recycling of Deep Lithosphere



Animations courtesy T. Atwater, UCSB <http://emvc.geol.ucsb.edu/>

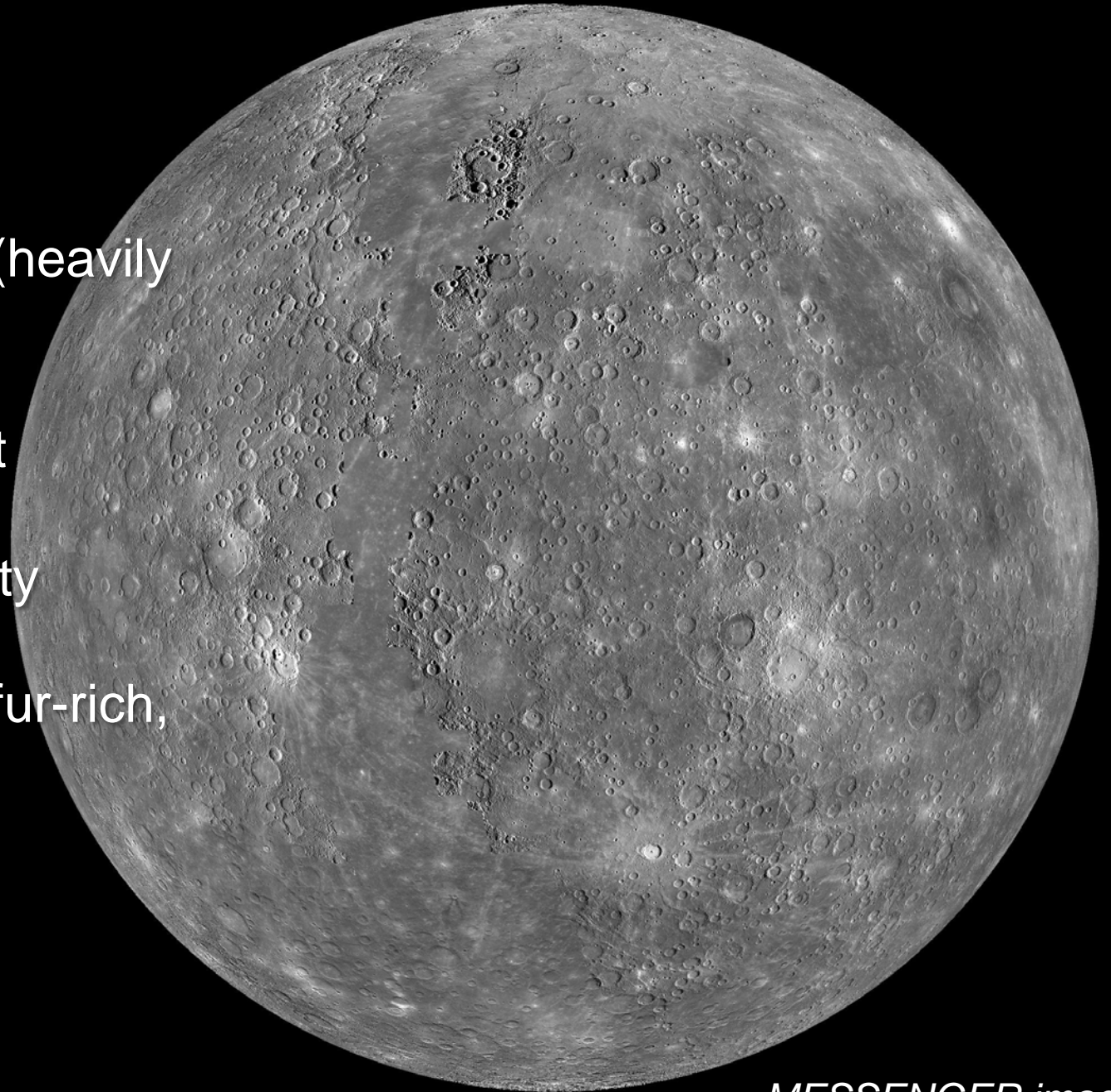
# Plate Tectonics is essential for continental crust genesis

- Growth from magmas in subduction zones (and at hot spots)
- Removal of basaltic parts (weathering & subduction, deep crustal recycling)

*What do other planets look like?*

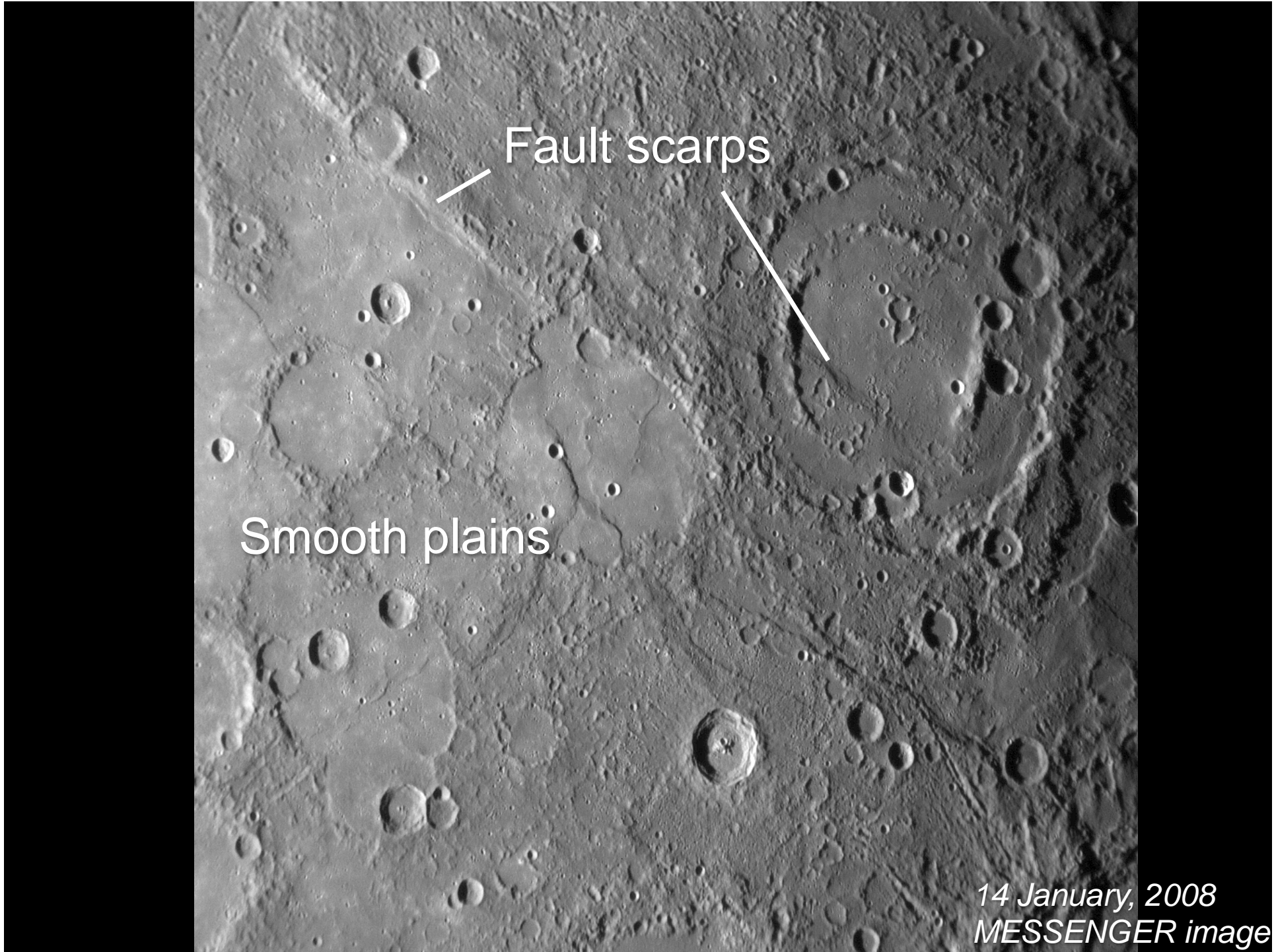
# Mercury

- Ancient crust (heavily cratered)
- Mg-rich Basalt
- Tectonic activity
- Surprises: sulfur-rich, polar water



*MESSENGER image*



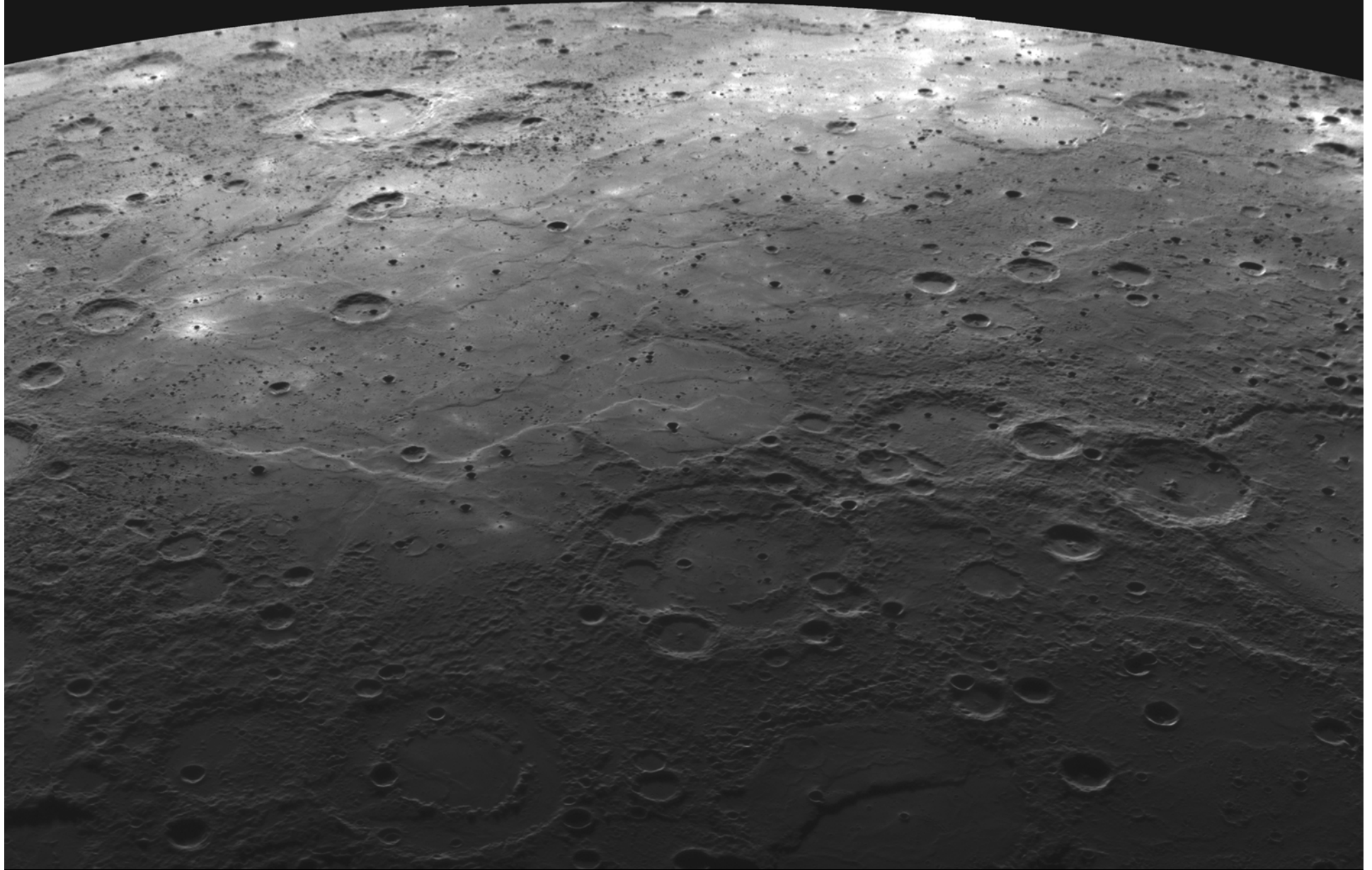


Fault scarps

Smooth plains

14 January, 2008  
MESSENGER image

# Smooth lava plains



*6 October, 2008 MESSENGER image*



# Mercury

- No continents
- No ocean basins
- No plate tectonics



*MESSENGER image*