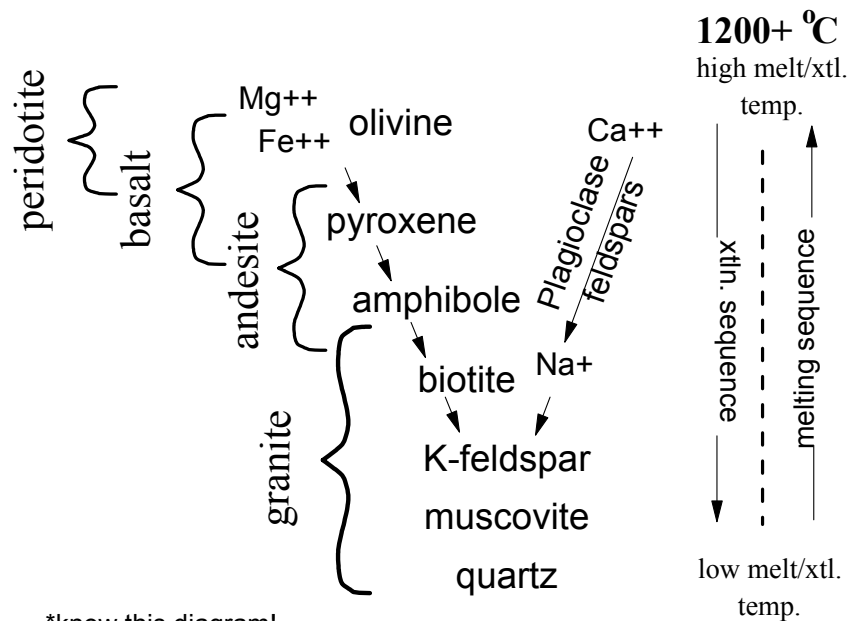


Question: How can a granitic (felsic) crust form if the (ultramafic) mantle is the original parent rock for all crustal igneous rocks?

Assumption: The mantle formed very early in the Earth's history and was the source for the magma that formed the crust. (This is supported by observations of meteorites and other planets in our solar system.)

**\*BOWEN'S RXN SERIES & PARTIAL MELTING**



\*know this diagram!

D? According to this diagram, what is the composition of an andesite?

D? What is the order of mineral xtlztn. in a granite?

VOLC-8

Key concepts: pressure relief vs. partial melting

PRESSURE-RELIEF MELTING

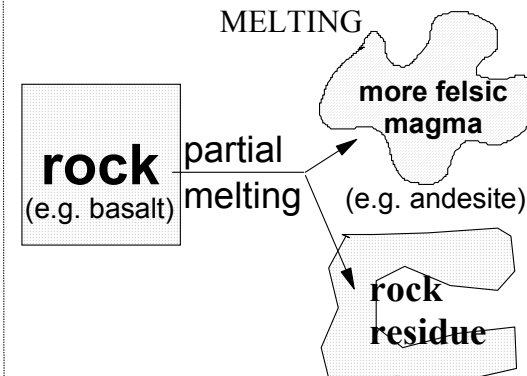


decreasing pressure  
decreasing melting pt.  
temperature



(mechanism)

PARTIAL MELTING



(effect)

D? Pressure-relief melting occurs because a drop in pressure lowers the rock's melting point. What else can lower the melting temperature of rock?

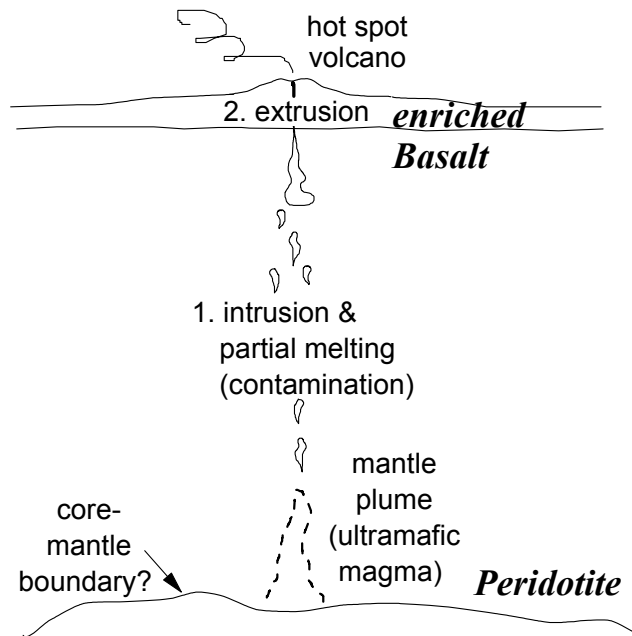
D? In what plate tectonic setting might these controls on melting pt. be significant?

D? Is it possible to derive a granitic magma from a peridotite parent rock via partial melting? How/why?

D? How about a basaltic lava from a granitic parent rock? How/why?

VOLC-9

## Origin and character of intraplate (hot-spot) volcanism

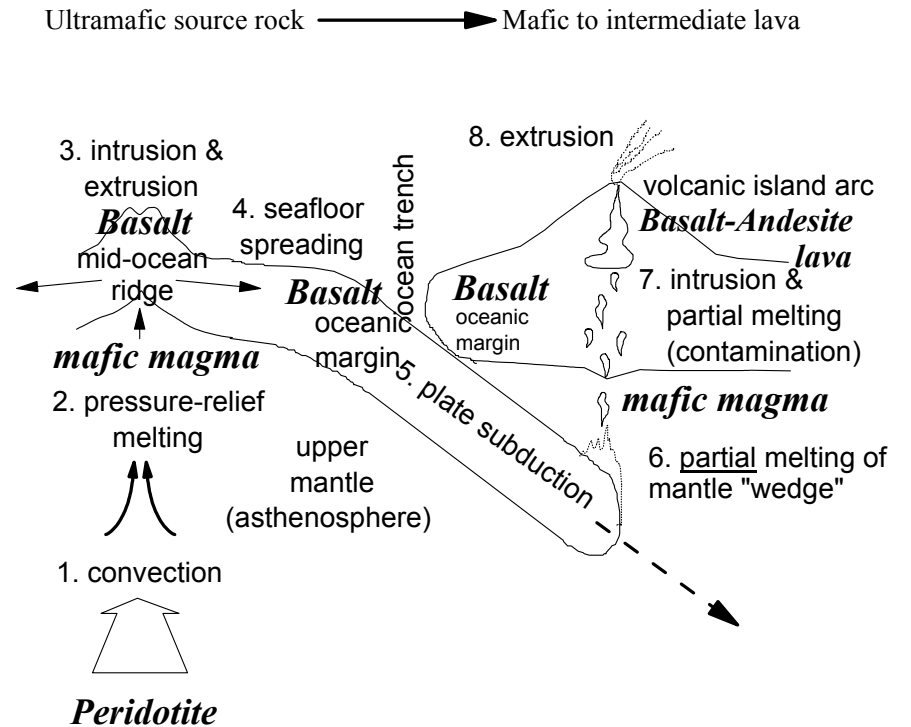


R? Why does an ultramafic source produce a mafic rock?

D? What is meant by the term "enriched basalt" -- enriched in what?

VOLC-10

## Origin and character of interplate (oceanic-oceanic) volcanism

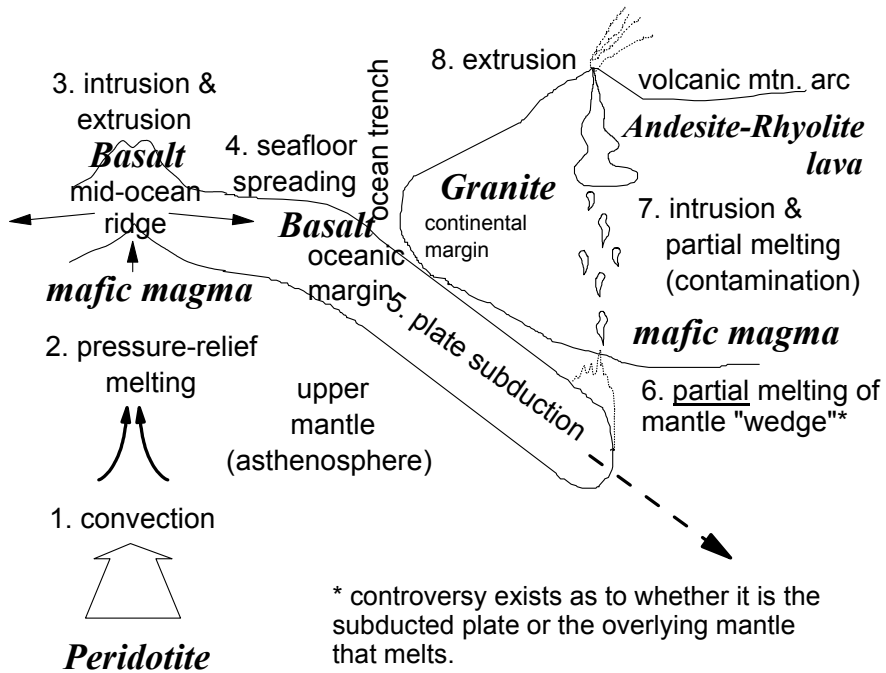


## Early Earth Model

VOLC-11

## Origin and character of interplate (oceanic-continental) volcanism

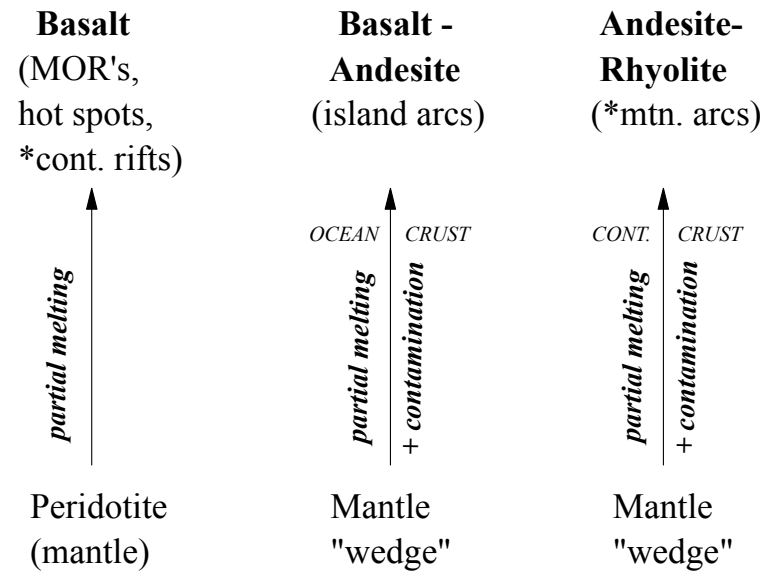
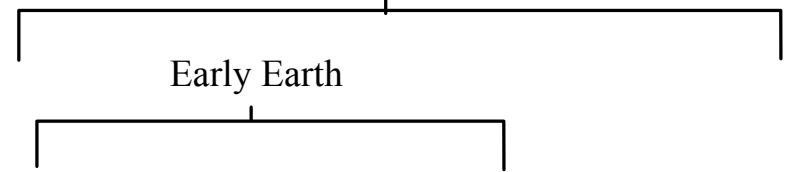
Ultramafic source rock → Intermediate to felsic lava



## Modern Earth Model

VOLC-12

## Modern Earth



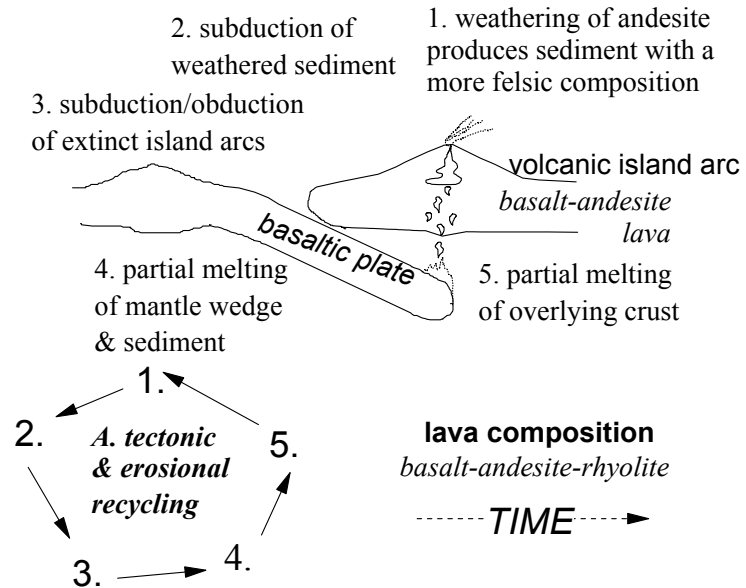
LAVA COMPOSITION VS. SOURCE COMPOSITION

VOLC-13

## ORIGIN OF THE CONTINENTS

- How can a granitic crust form if the (ultramafic) mantle is the original parent rock for all crustal igneous rocks?

Q. Via partial melting, mantle "wedges" (peridotite) can produce basaltic lavas. Contamination by partial melting of overlying basaltic crust produces andesitic lavas. However, how does an andesitic island arc become a granitic continent?



D? In your own words, how can a felsic crust form from an ultramafic parent material (the mantle)?