Robert Nunes

G203 Lecture Notes

5-17-2010

Archean Continued:

Oldest evidence of life found in Archean

Banded iron formations appear

At end of Archean the oldest glacial deposits are found

Archean granitoids are felsic

- Continental crust
- Requires at least two episodes of melting

Archean granitoids are heavily metamorphosed

- Rocks that were altered at great depths
- Reached surface by uplift/erosion

Granitoid = not igneous

Greenstone belt mainly consists of green colored mafic and ultramafic vulcanized rocks and associated sedimentary rocks. The rocks appear green due to metamorphosing to greenshist facies.

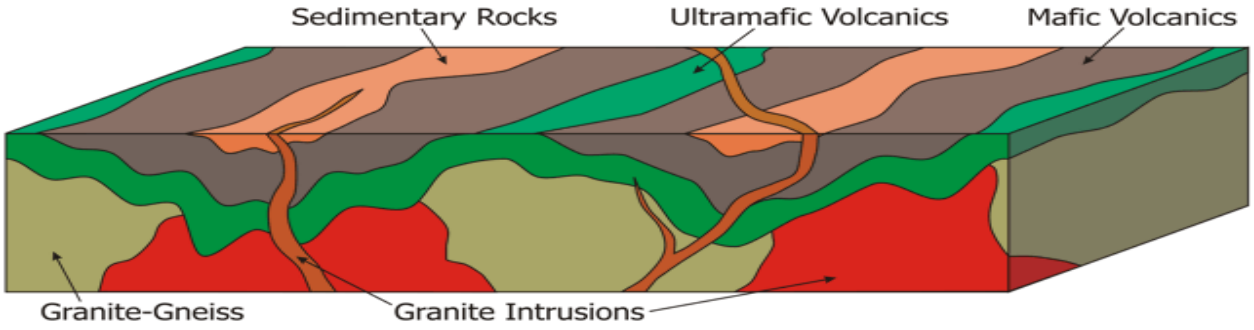

Image found at:
http://facweb.bhc.edu/academics/science/harwoodr/Geol102/Study/images/GreenstoneBelt.gif

Volcanic rocks of greenstone belt:

1. komatiite (ultramafic)

    Requires very high temperatures (~1500-1600c)

    Close to earth's surface

2. basalt (mafic)

    Similar to upper portion of modern oceanic crust

    Expected first generation melt from mantle

3. rhyolite tuff and volcanic breccias (felsic)

    Explosive volcanism

    Created today by melting continental crust

4. Andesite (minor amounts)

    Created today at subduction zones

Greenstone basalts and komatiites formed during underwater eruptions of magma at the earth's surface. Greenstones might be equivalent to today's mafic oceanic crust however,

1. no sheeted dykes structures or gabbro

2. no underlying peridiotite

There is some evidence of existence of land above sea level.

Paleosols – ancient preserved soil horizons

Greenstone belts lie uncomfortably on granitoids

We do not know how this happens.

We do agree that no plate tectonics happened in Archean

How did greenstone belts form? (Unclear)

Early atmosphere was rich in nitrogen and CO_2 and O was very low or absent.

O was below 1% compared to 21% of our atmosphere today.

Oldest banded iron formations occurred 3 b.y. ago

Most BIFs are found in Proterozoic (not Archean) and form between (1.8 and 2.5 b.y. ago).

What caused Oxygen (O) content in atmosphere to rise?

Photosynthetic organisms. The earliest of these were cyanobacteria.

Indirect evidence for live in Archean (Kerogen) a tar like substance.