

Papers read during Fall 2010 with questions for Petrology

Goals

- Give the students an understanding of current avenues of research in petrology
- Introduce the students to reading primary literature with relatively interesting, comprehensible papers
- Move away from pure lecture towards more discussion during class

Format

- pdfs of papers posted early in the week on Moodle along with reflection questions
- Answers to the questions were due back to the instructor (typed) at least 30 minutes before the start of class on discussion day
- Responses used by instructor to start the discussion, which attempted to involve all of the students
- Discussions varied from a short 15 min to the full 50 minutes available depending on student interest (more short than long, though)

Choosing papers

- Took the topic being discussed that week in lecture and attempted to find a <5 yr old paper about it either in Geology or another fairly reader-friendly journal
- Covered 2-3 topics per week between lecture and lab, so not all topics also had a paper related to them

Successes & Pitfalls

- Some papers just couldn't drum up any student interest
- Metamorphic petrology doesn't currently have many papers in recent the Geology archives (not a problem for igneous petrology)
- Over the course the semester, the students asked more & more intelligent questions about how various studies were conducted and the methods employed
- The methodology varied quite a bit from paper to paper and gave me a chance to discuss a wider range of techniques used in geology than the students had been exposed to in mineralogy
- The questions I posed were often too open and did not cause the students to single out enough points for discussion; in the future, I would direct the reading more
- If I had the time back from week 2-4, I would have inserted at least a hotspot and subduction-related paper

1st week: survey

Each student chose a paper to read from the September 2010 index for Geology

- asked to simply read & circle / underline terms and concepts that were confusing
- goal was to hand the papers back to the students at the end of the semester to give them an idea of how much they had learned over the course of the term

2nd to 4th week: no papers due needing all of the class lecture time to cover some mineralogy material**5th week: igneous chemistry I**

Martin et al. (2010) – Using the Sr isotope compositions of feldspars and glass to distinguish magma system components and dynamics

- what types of data are being used by the authors?
- why did they choose these types of data?
- what interpretations were derived specifically from which pieces of data?

6th week: igneous chemistry II / magma generation

Dufek & Bachmann (2010) – Quantum magmatism: Magmatic compositional gaps generated by melt-crystal dynamics

- what is their data comprised of?
- how do their interpretations relate back to the data?
- are all of the diagrams in the paper needed?
- would you want another diagram or two?

7th week: igneous chemistry III / magma differentiation

Watts et al. (2010) – Supereruptions of the Snake River Plain: Two-stage derivation of low $\delta^{18}\text{O}$ rhyolites from normal $\delta^{18}\text{O}$ crust as constrained by Archean xenoliths

- what is their data comprised of?
- how do their interpretations relate back to the data?
- diagrams work for you?
- can you think of another area to apply this technique to? why did you choose that region?

8th week: mineral reactions / contact metamorphism / calc-silicates

Müller et al. (2004) – Metastable prograde mineral reactions in contact aureoles

- what is their data comprised of?
- how do their interpretations relate back to the data?
- diagrams work for you?
- can you think of another area to apply this technique to? why did you choose that region?

9th week: mineral reactions / pelitic

Carmichael (1969) – On the Mechanism of Prograde Metamorphic Reactions in Quartz-Bearing Pelitic Rocks

- what data is Carmichael's work based on?
- what kind of evidence does Carmichael use to derive his conclusions?
- how does this paper relate to the Mueller et al paper we read last week?
- what implications might this study have if you were to determine you wanted to examine a suite of metamorphic rocks for a research project?
- (this paper is from ConMinPet and is very, very LONG – gave students an extra week to read)

10th week: metamorphic fluids / calc-silicates

Nabelek (2007) – Fluid evolution and kinetics of metamorphic reactions in calc-silicate contact aureoles – From H₂O to CO₂ and back

- write a ~half page summary of how the papers relate to lecture and whether or not they agree with everything in your textbook (citing pages) & if not, why?

11th week: MOR

Barker et al. (2010) – Direct observation of a fossil high-temperature, fault-hosted, hydrothermal upflow zone in crust formed at the East Pacific Rise

- write a ~half page summary of how the papers relate to lecture and whether or not they agree with everything in your textbook (citing pages) & if not, why?

12th week: convergent margins – island arcs

Lee & King (2010) – Why are high Mg# andesites widespread in the western Aleutians? A numerical model approach

- write a ~half page summary of how the papers relate to lecture and whether or not they agree with everything in your textbook (citing pages) & if not, why?

13th week: convergent margins – continental arcs

Berman et al. (2007) – Collisional Snowbird tectonic zone resurrected: Growth of Laurentia during the 1.9 Ga accretionary phase of the Hudsonian orogeny

- write a ~half page summary of how the papers relate to lecture and whether or not they agree with everything in your textbook (citing pages) & if not, why?