EAS 6216 – Isotope Geochemistry

Fall 2004

MWF 2:05-2:55, EST L1116

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Goals:
Isotope geochemistry plays an increasingly important role in a wide variety of geological, biological, and environmental investigations. This course is designed to provide an introduction to the principles and applications of isotope geochemistry, and briefly summarize the analytical techniques used in the field. Homework problems will illustrate the applications of isotope geochemistry to real-world problems, while in-class student presentations will enable more in-depth study of a particular isotope system. The students' interests will help shape the material covered in the course, so the schedule of topics listed below is subject to change.

Recommended Textbooks (copies in EAS reading room):
Dickin, Alan. P. 1995. Radiogenic isotope geology. Cambridge University Press.
Hoefs, Jochen. 2004. Stable isotope geochemistry. Springer-Verlag.
Supplemental Textbook:
Skoog, D.A., Holler, F.J., & Nieman, T.A. 1997 Principles of Instrumental Analysis. 5th Edition. Brooks Cole.

Grading:
25% Homework
25% Midterm
25% Presentation
25% Final

Class Schedule:

DATE	**TOPIC**
8/16	Introduction
PART 1:	**RADIOGENIC ISOTOPES**
8/18	Nucleosynthesis
8/20	Physics of the nucleus, radioactive decay
8/23	Making Isotopic measurements – mass spectrometry
8/25	K-Ar and ^{40}Ar-^{39}Ar dating
8/27	Rb-Sr dating
8/30	Sm-Nd dating
9/1	U-Th-Pb dating I
9/3	U-Th-Pb dating II – the age of the Earth

9/6	NO CLASS (school holiday)
9/8, 9/10	NO CLASS
9/13	U-series disequilibrium I
9/15	U-series disequilibrium II
9/17	Fission track dating techniques
9/20	Cosmogenic isotopes
9/22	Radiocarbon dating
9/24	Radiocarbon as (bio)geochemical tracer
9/27	Extinct Radionuclides
9/29	Analytical methods and chemical separation
10/1	Isotope dilution and ICPMS
10/4	MIDTERM
PART II:	**STABLE ISOTOPES**
10/6	Physical fundamentals I
10/8	Physical fundamentals II
10/11	Stable isotope mass spectrometry
10/13	Water isotopes in the hydrosphere, atmosphere, and biosphere I
10/15	Water isotopes in the hydrosphere, atmosphere, and biosphere II
10/18	NO CLASS (Fall Recess)
10/20	Geothermometry and paleoclimate proxies I
10/22	Geothermometry and paleoclimate proxies II
10/25	Carbon isotopes in the biosphere
10/27	Carbon isotopes in the geologic record
10/29	Sulfur isotopes – sources and fractionation
11/1	Isotopes in seawater hydrothermal systems
11/3	Nitrogen isotopes and the biological pump
11/5	Thermal diffusion and ice core climate records
11/8	Boron isotopes and paleo-pH
11/10	Other systems I: Calcium and Lithium
11/12	Other systems II: Chlorine and Chromium
11/15	Student Presentations I
11/17	Student Presentations II
11/19	Student Presentations III
11/22	Student Presentations IV
11/24	Isotopic labelling in the biogeosciences I (or student's choice)
11/26	NO CLASS (Thanksgiving)
11/29	Isotopic labelling in the biogeosciences II (or student's choice)
12/1	Make-up and Review
12/3	Make-up and Review
12/6	FINAL EXAM WEEK