GEOS920

Palaeoenvironments and Biogeochemistry

S2 Day 2018

Dept of Earth and Planetary Sciences

Contents

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Credit points
4

Prerequisites
(Admission to MGeoSc or GradDipGeoSc) and GEOS309

Corequisites

Co-badged status

Unit description
This unit will provide masters students with the foundations of palaeoenvironmental analysis as applied to some key geoscience problems. The unit will have a problem-based approach that focuses on understanding important processes, especially with examples from the Neoproterozoic, Cretaceous and the modern day. We will introduce the fundamentals of ocean circulation, nutrient supply and the carbon cycle. Students will assess the veracity of biogeochemical oceanographic signals, especially with respect to diagenetic overprinting. Box models will be introduced as a means for understanding geochemical and isotopic signals. The unit will cover co-evolution of life and its environment, the effect of bioturbation on sediments, especially across the Precambrian-Cambrian boundary, and the geochemical record of life as expressed through biomarkers. The pros and cons of various proxies used for the reconstruction of palaeoenvironments will be evaluated. The unit will build knowledge about important techniques and methods such as stable and radiogenic isotopes, organic geochemistry and microscopic techniques for assessing sediments and sedimentary rocks. Assignments will build skills in practical and industry applications of this area, including in the energy industry.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles

The ability to select and critically evaluate appropriate proxies to obtain information on past environments

A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic

An advanced knowledge of the principles and concepts of organic geochemistry

Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Assessment Tasks

Name	Weighting	Hurdle	Due
Tutorial summaries/questions	20%	No	3/8, 14/9, 5/10 2018
Assignment 1	30%	No	6th September 2018

Name	Weighting	Hurdle	Due
Assignment 2	30%	No	11th October 2018
Oral presentation	20%	No	9th November 2018

Tutorial summaries/questions

Due: **3/8, 14/9, 5/10 2018**
Weighting: **20%**

Tutorial summaries/questions: in weeks 1, 7 and 8, there will be 3 x 15 minute "last 15 tests", to be completed before leaving the room. Week 1, 5%. Week 7, 2 x 5%. Week 8, 5%.

On successful completion you will be able to:

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- The ability to select and critically evaluate appropriate proxies to obtain information on past environments

Assignment 1

Due: **6th September 2018**
Weighting: **30%**

Assignment 1: The Paleocene–Eocene Thermal Maxima (PETM)

On successful completion you will be able to:

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Assignment 2

Due: **11th October 2018**
Weighting: **30%**

Paper review: Understanding past Earth events

On successful completion you will be able to:

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- An advanced knowledge of the principles and concepts of organic geochemistry
- Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Oral presentation

Due: **9th November 2018**
Weighting: **20%**

Oral Presentations by everyone in the class on individually allocated topics

On successful completion you will be able to:

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry
- Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Delivery and Resources

GEOS920 Palaeoenvironments and biogeochemistry (session 2, 2018)

This unit will provide masters students with the foundations of palaeoenvironmental analysis as applied to some key geoscience problems. The unit will have a problem-based approach and will focus on understanding important processes, especially with examples from the Neoproterozoic, Cretaceous and the modern day. Fundamentals of ocean circulation, nutrient supply and the carbon cycle will be introduced. The veracity of biogeochemical oceanographic signals will be assessed, especially with respect to diagenetic overprinting. Box models will be introduced as a means for understanding geochemical and isotopic signals. The unit will cover co-evolution of life and its environment, the effect of bioturbation on sediments, especially across the Precambrian-Cambrian boundary, and the geochemical record of life as expressed through biomarkers. The pros and cons of various proxies used for the reconstruction of palaeotemperatures will be assessed. The unit will build knowledge about important techniques and methods such as stable and radiogenic isotopes, organic geochemistry and microscopic techniques for assessing sediments and sedimentary rocks. Assignments will be designed to build high level research skills in this area.

This unit is co-taught with GEOS710 Records of palaeoenvironments: life and geochemistry (Master of Research). The lectures are the same, but the assignments differ slightly due to different learning outcomes. There is only one iLearn site for both units.

Web pages and electronic resources

The main unit web page will be on iLearn: https://ilearn.mq.edu.au/login/MQ/

iLearn is Macquarie's learning management system. Assignments, hand-outs, and reading material will be available here.

Classes: There will be 13 compulsory lectures/tutorials to introduce the unit and give you a grounding in the theory behind some of the techniques. It is important that you attend these sessions every week, as they include discussion sections, and also problem solving on hard copy handouts. These sessions will not be audio recorded. and will be in 12 Wally's Walk (E7A) 127, Friday 10:00-12:00.

Unit Schedule

tbc

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and

decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry
- Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Assessment tasks

- Tutorial summaries/questions
- Assignment 1
- Assignment 2
- Oral presentation

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry
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Assessment tasks

- Tutorial summaries/questions
- Assignment 1

- Assignment 2
- Oral presentation

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- An advanced knowledge of the principles and concepts of biogeochemistry, basic modelling and element cycles
- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry

Assessment tasks

- Tutorial summaries/questions
- Assignment 1
- Assignment 2
- Oral presentation

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry

Assessment tasks

- Tutorial summaries/questions
- Assignment 1
- Assignment 2
- Oral presentation

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- The ability to select and critically evaluate appropriate proxies to obtain information on past environments
- A knowledge of oceanic anoxic events, and the impact of life on element cycles, with a focus on the Cretaceous and Neoproterozoic
- An advanced knowledge of the principles and concepts of organic geochemistry
- Demonstrated ability to communicate about biogeochemistry and palaeo-environments to a wider audience through masters level writing and oral presentation

Assessment tasks

- Tutorial summaries/questions
- Assignment 1
- Assignment 2
- Oral presentation

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- An advanced knowledge of the principles and concepts of biogeochemistry, basic

modelling and element cycles

Assessment tasks

- Assignment 1
- Assignment 2
- Oral presentation

Changes from Previous Offering

No change since 2017