GEOS206

Marine Depositional Environments

S1 Day 2016

Dept of Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
Kelsie Dadd
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AHH 2.657

Credit points
3

Prerequisites
GEOS125 or GEOS126

Corequisites

Co-badged status

Unit description
This unit builds the skills needed to understand geological processes and products in modern and ancient marine environments. The unit examines sedimentary and volcanic processes and their products; evidence of present day hydrothermal alteration and metamorphism of the oceanic lithosphere; and the formation of ore deposits in marine rocks. Emphasis is placed on reconstruction of ancient environments using lithological, geometrical and palaeontological data. There is a five day field trip to the New South Wales south coast.

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:

Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
Understand erosional processes operating on passive margins and volcanic islands.
Understand sedimentary processes and environments on passive margins and volcanic

islands

Understand igneous processes (both volcanic and intrusive) that build volcanic islands.

Understand how climate can influence sediment type.

Understand how hydrocarbon resources form and the environments they form in

Understand how the modern can be used as a tool for interpreting ancient environments

Understand how to recognize trace fossils and several of the major fossil groups

Understand how to construct a bathymetric profile, a graphic sedimentary log, a well-labelled and detailed outcrop sketch, and a block diagram.

Understand how to apply geoscientific principles to understanding the world around you.

Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.

Understand how to access, use and synthesise appropriate information

Develop effective team work skills

Understand how to present ideas clearly with supporting evidence in a number of formats.

Assessment Tasks

Name	Weighting	Due
Research project 1	15%	4/04/2016
Research Project 2	15%	23/05/2016
Quizzes	6%	Weekly
Fieldwork	14%	22/04/2016
Practical Exam	10%	7/06/2016
Final Exam	40%	Exam period

Research project 1

Due: **4/04/2016**
Weighting: **15%**

In this project you will examine a chain of volcanic islands and samples of rocks dredged on some of the hummocks around the islands. You will determine the type of volcanoes in the chain, how they grew from the sea floor and their plate tectonic setting, describe the rocks from the hummocks and determine how they formed, describe the erosional and sedimentary processes that occur on and around the islands, and examine the chemistry of some of the volcanic rocks. You will also construct a bathymetric profile and estimate the volume of material in islands in the

chain, illustrate the rock chemistry using appropriate graphs and summarise all this information in a brief report.

On successful completion you will be able to:

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
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- Understand igneous processes (both volcanic and intrusive) that build volcanic islands.
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- Understand how to apply geoscientific principles to understanding the world around you.
- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.
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Research Project 2

Due: **23/05/2016**
Weighting: **15%**

In this report you will examine sedimentary environments found on passive margins, in particular those surrounding the Antarctic continent in the Southern Ocean, and how these may change as basins evolve. You will also describe the processes involved in the formation of oil and gas deposits. These sediments and environments will be used as a model to better understand the Permian sedimentary rocks of the NSW south coast and southern Sydney Basin.

On successful completion you will be able to:

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic

setting of ancient environments.
- Understand erosional processes operating on passive margins and volcanic islands.
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- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.
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Quizzes

Due: **Weekly**
Weighting: **6%**

The weekly quiz will begin in week 2 and will be completed and marked online. The quiz will examine the lecture, practical topics and text readings of the previous week as well as the research projects.

On successful completion you will be able to:
- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
- Understand erosional processes operating on passive margins and volcanic islands.
- Understand sedimentary processes and environments on passive margins and volcanic islands
- Understand igneous processes (both volcanic and intrusive) that build volcanic islands.

- Understand how climate can influence sediment type.
- Understand how hydrocarbon resources form and the environments they form in
- Understand how the modern can be used as a tool for interpreting ancient environments
- Understand how to recognize trace fossils and several of the major fossil groups

Fieldwork

Due: **22/04/2016**
Weighting: **14%**

During this unit of study you will be required to participate in an extended field trip to the NSW South Coast. Fieldwork will be done from Monday 18 April to Friday 22 April, and is a vital part of the unit; attendance is therefore compulsory. A range of marine depositional environments, both modern and ancient, will be studied in the field.

The assessment for the trip includes the field note book, to be handed in at the end of the field trip, and a participation mark.

On successful completion you will be able to:

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
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- Understand erosional processes operating on passive margins and volcanic islands.
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- Understand how to access, use and synthesise appropriate information
- Develop effective team work skills

Practical Exam

Due: **7/06/2016**
Weighting: **10%**

You will be asked to identify six rock samples and to indicate why you decided on the name.

On successful completion you will be able to:

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.

Final Exam

Due: **Exam period**
Weighting: **40%**

The final exam will cover material from the lectures, field trip, class exercises and research project reports. Questions will draw on information and ideas from different areas to give an integrated view of the unit. The exam will include questions that ask you to apply your knowledge to interpret and solve problems.

On successful completion you will be able to:

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
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- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
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- Understand how to construct a bathymetric profile, a graphic sedimentary log, a well-labelled and detailed outcrop sketch, and a block diagram.
- Understand how to apply geoscientific principles to understanding the world around you.

- Understand how to access, use and synthesise appropriate information
- Understand how to present ideas clearly with supporting evidence in a number of formats.

Delivery and Resources

Teaching sessions include lectures, practical sessions, research project workshops, and an excursion to the NSW south coast during the break. We aim to provide an integrated learning environment bringing together the background information and practical skills needed for the interpretation of both modern and ancient marine depositional environments. There are a number of research projects that include a group work component.

Unit Schedule

Week	Date	Lecture/ Assignment (C5A room 226)	Practical / Research Project (E5A room 210)	Required reading Nichols, 2009 (see also papers given each week)
Module 1 Methods of analysis				
1	Tuesday 1 March	Introduction to GEOS206 and methods of analysis	Sedimentary structures	Chapters 1, 2, 4, 5
2	Tuesday 8 March	Sub-aqueous volcanism	Sedimentary core logging and facies descriptions	Chapters 17, 18 and revise 1 and 5
Module 2 **Growth and destruction of oceanic volcanoes**				

3	Tuesday 15 March	Products of silicic volcanism	Research Project 1 introduction; Minerals and Igneous Rocks – basalt and andesite; Reconstruction of past environments using trace fossils	Chapter 3 and revise 17
4	Tuesday 22 March	Sedimentary processes at ocean island volcanoes	Introduction to carbonate sediments and rocks. Research Project 1; Minerals and Igneous Rocks – dacite and rhyolite	Chapter 15 and revise 17
5	Tuesday 29 March	Carbonates	Carbonates under the microscope. Research project 1; Chemical Data	Revise chapters 3 and 15
Module 3 Processes at passive margins				
6	Tuesday 5 April	What are passive margins? **Research Project 1 due**	Research Project 2 introduction; Palaeo-geographic reconstructions from graphic logs	Chapters 6, 9, 23 and revise 5
		Mid-semester break Excursion 18-22 April		
7	Tuesday 26 April	Oil and gas in passive margin settings	No class	Chapter 18
8	Tuesday 3 May	Clastic shorelines	Volcaniclastic rocks under the microscope. Introduction to block diagrams.	Chapters 12, 13 and 20; revise minerals in chapter 2
9	Tuesday 10 May	Continental shelf, slope and rise	The Ordovician of the Lachlan Fold Belt, metasedimentary and metavolcanic rocks	Chapters 14, 16 and revise 17
Module 4 **Deep ocean processes**				

10	Tuesday 17 May	Ophiolites as past oceanic crust	Hydrothermal systems in marine environments and ore deposits	Revise chapter 16
11	Tuesday 24 May	Isotopes **Research Project 2 due**	Research Project 2; Minerals and Igneous Rocks – ophiolites and serpentinites associated with deep marine sedimentary rocks	Chapter 21 and revise 16
12	Tuesday 31 May	Deep water sedimentation (past and present)	Modern and ancient deep marine sediments and POSTER ASSESSMENT	Revise chapter 16
13	Tuesday 7 June	*Practical examination*	Information about the exam plus TBA	Revise chapters 2 and 3

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
- Understand how the modern can be used as a tool for interpreting ancient environments
- Understand how to construct a bathymetric profile, a graphic sedimentary log, a well-labelled and detailed outcrop sketch, and a block diagram.
- Understand how to apply geoscientific principles to understanding the world around you.
- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.
- Understand how to access, use and synthesise appropriate information
- Develop effective team work skills
- Understand how to present ideas clearly with supporting evidence in a number of formats.

Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
- Understand how the modern can be used as a tool for interpreting ancient environments
- Understand how to apply geoscientific principles to understanding the world around you.

- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.
- Develop effective team work skills
- Understand how to present ideas clearly with supporting evidence in a number of formats.

Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork
- Final Exam

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Understand how climate can influence sediment type.
- Understand how the modern can be used as a tool for interpreting ancient environments
- Understand how to apply geoscientific principles to understanding the world around you.

Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
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- Understand sedimentary processes and environments on passive margins and volcanic islands
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- Understand how climate can influence sediment type.
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- Understand how the modern can be used as a tool for interpreting ancient environments
- Understand how to recognize trace fossils and several of the major fossil groups
- Understand how to construct a bathymetric profile, a graphic sedimentary log, a well-labelled and detailed outcrop sketch, and a block diagram.
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- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.

Assessment tasks

- Research project 1
- Research Project 2
- Quizzes
- Fieldwork
- Practical Exam
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
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Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Understand the key characteristics of sedimentary particles and how these are used to

name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
- Understand plate tectonic processes and how to determine the probable plate tectonic setting of ancient environments.
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- Develop effective team work skills
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Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Understand the key characteristics of sedimentary particles and how these are used to name and describe sedimentary rocks.
- Understand the physical properties of common rock forming minerals and how these can be used with rock microstructure and chemical composition to name igneous rocks.
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- Understand how to access, use and synthesise appropriate information
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- Understand how to present ideas clearly with supporting evidence in a number of formats.

Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork
- Practical Exam
- Final Exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Understand how climate can influence sediment type.
- Understand how hydrocarbon resources form and the environments they form in
- Understand how to apply geoscientific principles to understanding the world around you.
- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.

Assessment tasks

- Research project 1
- Research Project 2
- Fieldwork

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and

country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Understand erosional processes operating on passive margins and volcanic islands.
- Understand sedimentary processes and environments on passive margins and volcanic islands
- Understand igneous processes (both volcanic and intrusive) that build volcanic islands.
- Understand how climate can influence sediment type.
- Understand how hydrocarbon resources form and the environments they form in
- Understand how to apply geoscientific principles to understanding the world around you.
- Understand how to employ appropriate knowledge and geoscientific tools to solve problems and to interpret the results.

Assessment tasks

- Research Project 2
- Fieldwork

Excursion

During this unit of study you will be required to participate in an extended field trip to the NSW South Coast. Fieldwork will be done from Monday 18 April to Friday 22 April, and is a vital part of the unit; attendance is therefore compulsory. A range of marine depositional environments, both modern and ancient, will be studied in the field.

Each student is required to pay with the accommodation payment form to the Cashier, Macquarie University by Tuesday 15 March the full amount of accommodation (excluding food) costs as a non-returnable deposit. An official University receipt will be issued.

Details of the trip and cost will be given out separately.

Referencing

All submitted work must include clear and correct referencing. The extent and quality of your referencing will be included within the communication portion of the marks awarded to each report.

Quotations should be used only if the point being made is vital to your argument and if you could

not express it better yourself. If you paraphrase, you must acknowledge your authority as you would when quoting directly -- after the paraphrased section or quotation, i.e. (Smith, 1981, p.132). Make sure you document this reference in your list of References. Remember, **plagiarism is cheating!**

All references must be clearly documented at the end of your report. For a book, the information expected is: Author(s), year of publication, title, edition (if not 1st), publisher, place of publication.

e.g. Skinner, B.J. and Porter, S.C., 2000. The Dynamic Earth. J. Wiley & Sons, Inc., New York. (4th edition)

For a journal article, give: author(s), year of publication, title, name of journal, volume number, page numbers.

e.g. Gaul, O.F., Griffin, W.L., O'Reilly, S.Y. and Pearson, N.J., 2000. Mapping olivine composition in the lithospheric mantle. Earth and Planetary Sciences 182, 223-235.

For a journal article on the WWW give: author, year, 'article title', name of journal, volume number, viewed Day Month Year, <URL>.

For a web document give: author/editor or compiler, year of the most recent version, title, version number (if applicable), description of document (if applicable), name and place of the sponsor of the source, viewed Day Month Year, <URL either full location details or just the main site details>.

For more details on referencing of material from the www see:

< http://www.usq.edu.au/library/help/ehelp/ref_guides/harvardonline.htm >