ENVS301

Climate Change, Coasts and Oceans

S2 Day 2016

Dept of Environmental Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Level 2 AHH

Lecturer
Shari Gallop
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Level 2 A

Credit points
3

Prerequisites
39cp including (ENVE216(P) or ENVS216(P) or GEOS216(P))

Corequisites

Co-badged status

Unit description
Our oceans regulate and drive climate change, whilst the coastal and shelf environments experience some of the greatest impacts of climate change. This unit provides students with a comprehensive understanding of these interactions and impacts on a range of scales (ocean basin to regional coast) and time scales (past millennia to future decades). The unit is taught in four modules: ocean basin climate; palaeoclimatology and palaeoceanography of ocean basins; shelf oceanography; and near-shore and coastal climate change.
Module 1 is based on coupled ocean-atmosphere processes and investigates the changes in the thermohaline circulation, sea-surface temperatures, ocean gyres and eddies, surface wind-fields, marine clouds and precipitation, and storm tracks.
Module 2 investigates the past circulation of the ocean and atmosphere, including: palaeo wind-fields; palaeo sea-level changes; palaeo sea-surface temperature and salinity; and palaeo changes in climate modes such as ENSO.
Module 3 focuses on the ocean basin boundary currents, and wave climate change, with a strong focus on the eastern margin of Australia.
Module 4 examines large-scale coastal behaviour in response to climate change, such as wave climate change, sea-level change, coastal winds, coastal precipitation, and freshwater discharge and their alteration of sediment transport paths.

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:

Build on the prior knowledge on the climate system from ENVS216, and develop a new level of knowledge on how oceanic climate changes

Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,

Investigate marine climate change using the archive of paleoclimate data, instrumental observations and modelled projections

Understand the use of climate models to explore ocean-atmosphere change

Explore the internal variability of our marine climate system,

Develop an understanding of marine weather and observational data,

Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes

Identify and attribute the causes of coastal change

Explore the mechanisms of sea-level change and impacts on regional coasts

Analyse wave climate data and determine the impact of extreme vs modal wave climate change on coasts

Synthesise the impacts of marine climate change on the range of spatial-temporal scales

General Assessment Information

Details and specific requirements of each assignment will be given in the lectures, practicals and posted on the ENVS301 website.

ASSIGNMENT DEADLINES, RULES AND ADVICE

Assignments must be completed and submitted, on time and in full, in order to receive credit. Penalties for late assignments will be a minimum of 10% per day or part thereof, beginning at 0900, not at some time later in the day.

These are real deadlines and penalties will be imposed for late submission. Allowing some students to hand in assignments late is unfair to those who met the deadline.

The deadlines for assignments are not negotiable. Only a medical certificate or a letter with appropriate supporting documents outlining other serious, extenuating circumstances can be used to submit an assignment after the due date without penalty. Vague medical certificates are unconvincing – they must indicate how the illness impacted your ability to perform the assignment on time. Such permission must be sought before the due date unless this is absolutely impossible. Let us know of problems in advance or as soon as possible, not after the event: we are likely to be much more sympathetic and flexible in our requirements if you follow this advice.

All applications for extensions of deadlines for Assignments must be submitted to A/Prof Ian Goodwin.

Please note the policy on word limits for these assignments

- Penalties apply for excessive length (10% for every 200 words exceeding the limit).

- Diagrams, figures, reference lists and footnotes don’t count in the word tally.

- Inclusion of the chart used by the lecturer in setting the question doesn't count in the word tally.

While not as important as content, the stylistics and presentation of your written work are still

significant. You must express your ideas clearly and succinctly. ***Word limits will be enforced*** (see policy above), so you must take care to stick to the point. Leave plenty of space for comments: wide margins all round (3 cm is fine), and 1.5 line-space your work.

If you experience difficulty achieving a good standard in your written presentations, please talk with your course convenor directly. The University offers excellent writing courses and resources designed to help you deal with what could potentially become a career-limiting problem if you lapse into denial about it.

Assessment of assignments will be based on the Macquarie University scale as set out in the Handbook of Undergraduate Studies (the “Calendar”): *High Distinction (HD), Distinction (D), Credit (Cr), Pass (P), Fail (Fail)*. The markers may choose to further refine these grades by appending “+” or “-” to indicate work towards the top or the bottom of each grade’s band of marks. Feedback will also come in the form of written comments on each student’s assignments, as well as general comments directed to the entire class after all marked assignments have been returned (typically in class or via the online *Discussion Forum*). Assignments are generally marked and returned with a two-week turnaround (except if they are submitted late).

Citing and Referencing

NB: *References should ideally be restricted to peer-reviewed literature, government policies and official publications.* The use of web sites MUST be restricted to government departments or peer-reviewed scientific information. The referencing of blogs, special interest groups, media is rarely suitable, nor is the use of popular books. If in doubt, please check with the academic staff.

There are several systems of acknowledging your sources and other relevant work. The main requirements are clarity, consistency and the provision of all relevant bibliographic information so that someone else can easily find the source you are citing. Select a style and be consist with your usage of it. A good system widely adopted in the physical and environmental sciences is the “Harvard” or “author-date” method, where a brief reference to the source is given in the main text. Four examples of within-text referencing are;

- The sun is hot (Smith, 1978, pp. 4-5).
- According to Smith (1978, pp. 4-5), the sun is hot.
- Others have contested that the sun was hot, citing a lack of detailed information (Jones & Bloggs 1979).

Where there are **more than two authors**, you can abbreviate their names with a handy bit of Latin, "*et alia*" or "*et al.*" (literally meaning "and others"). And being Latin, we should *italicize* the

font;

- Smith *et al*. (1981), in their reply to Jones and Bloggs (1979), presented additional data confirming that the sun is indeed hot.

Notice that I used an ampersand ("&") within brackets only (c.f. Jones & Bloggs) but not in the running text.

Full bibliographic details of all sources cited must be listed in a "Reference List", in alphabetic order of authors, at the end of the report. There, you should include details of the author(s), year of publication and specific pages (if required). Examples of how to construct a Reference List include;

For a **book** give: author(s), year of publication, title, publisher, and place of publication.

- Smith, K. 1994. *The Geography of Environment*. Jones Books, London.

For a **journal article** give: author(s), article title, journal name, volume number, issue number (in parentheses) and pages.

- Smith, K. and Jones, I. 1995. The Australian environment. *Geographical Review* 68(5), 99-111.

For a **chapter in an edited book**, give the following details:

- Smith, K. 1996. Seeing the Australian environment. In Jones, E. (editor) *Global Environment*. University Publishers, Melbourne, pp. 100-112.

Don't use "*et al*." in a reference list; spell out all authors. Our preference is also to include full journal names, not abbreviations.

To reference a **lecture** (which is not generally encouraged because ENVE301 assignments are supposed to stretch you beyond the lectures), you might use the following format:

- Flannery, T., ENVS301 lecture, 6th November, 2008, Macquarie University.

For a **web source** we have to ensure that - (a) authors get credit where it is due, and (b) sufficient detail is given for readers to be able to visit the site. For example, a reference to a Department of Environment and Conservation website in the text would be "DEC (2006)", and in

the reference list this would expand to;

- DECC (NSW Department of Environment and Climate Change) 2008. NSW Department of Environment and Climate Change, incorporating Environment Protection Authority.

http://www.environment.nsw.gov.au/home.htm (accessed 05 August 2008).

This gives the author (in this case a corporate entity) credit for their web page, the date of their most recent update to their site, the name/title of the web site, the full URL location of their web site, and finally, the date on which you accessed their web site.

Submission of Assignments

Assignments must be submitted electronically to the Turnitin Link for your unit. All assignments are to be submitted by 5.00pm on the date specified.

If you need to hand in your work after the date in which the rest of the assignments have been returned to students, you may be set a different assignment, even if you have completed the original one. If you know that you are going to hand in an assignment late, you must contact the course convenor beforehand to obtain an extension. Unless there is the appropriate documentation, late assignments will be penalised or not marked.

Obtaining Your Marked Assignment

Assignments will be returned within two teaching weeks of the submission date in the normally scheduled practical classes.

Assessment Tasks

Name	Weighting	Due
Practical Reports	40%	1 week after class
Research Assignment	20%	8th September, 2016
Exam	40%	Examination Period

Practical Reports

Due: **1 week after class**
Weighting: **40%**

Satisfactory Completion of all Practical Exercises

5 Practical Reports are assessable (Pracs 2, 3, 6, 8, 9) each worth 8 marks

Variety of research, data analysis and computer-based tasks

On successful completion you will be able to:

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- Synthesise the impacts of marine climate change on the range of spatial-temporal scales

Research Assignment

Due: **8th September, 2016**
Weighting: **20%**

Marine Climate Change - Literature review, paper syntheses, critical thinking, essay writing

Due Week 6

On successful completion you will be able to:

- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
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- Explore the internal variability of our marine climate system,
- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal

configuration changes
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Exam

Due: **Examination Period**
Weighting: **40%**

Exam 2 hour

Material drawn from all lectures, tutorials, practicals and assignments

On successful completion you will be able to:

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Delivery and Resources

Lectures - There is one lecture each week. These are: Thursday 9 am to 11 am C5A 310.

N.B. You are required to attend lectures and take notes during the live lectures. Illustrative material from the lectures will be made available from the ENVS301 web site: www.learn.mq.edu.au

Practicals / Tutorials - There is ONE practical / tutorial each week: Thursday 1 pm - 4 pm E5A 270 PC Lab

These 2-3-hour “hands-on” classes will be in the computer laboratory (E5A 270). The practicals / tutorials are compulsory and are designed to help you work towards the assessable assignments, to allow you to build on lectures, reading and other material, and to develop some valuable generic skills.

The University expects that you devote at least 9 hours per week, in total, to a 3 credit point unit like ENVS301 - anything less will put you at a distinct disadvantage in terms of final grade. You must complete all practicals, tutorials and both assignments in order to be eligible to sit the final examination and complete the unit successfully.

Suggested Workload Proportion

Course Component	Suggested Workload Hours
Lecture Attendance	26 hours
Weekly Reading	26 hours
Practicals – on campus, and reporting	36 hours
Research Assignments	40 hours

Unit Schedule

ENVS301 Diary 2016

Week	Lecture Date	Lecturer	Lecture Topic	Practical Topic	Assessment
Module 1 – Marine Climate and Ocean Basin Climate Change					

1	Thurs 4th August		1. Introduction – Coupled Atmosphere-Ocean System in Time – Air –sea interaction, mixed layer, ocean basin heat and salt content and transport, sea-surface temperature, currents, tides, mean state and oscillation, sea level rise	No practical in week 1	
				Big Data Practicals	
2	Thurs 11th Aug	A/Prof Ian Goodwin	2. Marine Weather and Climate 1 Tropical –Subtropical Cells – Hadley Cell, Ocean basin windfields, ocean gyre circulation, ENSO, steric and dynamic sea-level, clouds and convergence zones SPCZ, Tropical Cyclones, future predictions	Practical 1 Introduction to Climate Data and Matlab	Satisfactory Completion
3	Thurs 18th Aug	A/Prof Ian Goodwin	3. Marine Weather and Climate 2 Mid-Latitude –Extratropical tropospheric planetary waves, maritime storm tracks, and oceanic fronts, ACC, Subtropical Storms, East Coast Lows, future predictions	Practical 2 Pacific Sea Surface Temperature and Salinity Data Analysis	Assessable (IG mark)
4	Thurs 25th Aug	A/Prof Ian Goodwin	4. Marine Weather and Climate 3 Ocean wave generation zones, propagation, wave climate data sources and extreme and modal wave climate analysis, Extreme Waves and Storm Surges, Wave Climate Change	Practical 3 Wave Climate Data Analysis	Assessable (IG mark)
Module 2 –Coastal, Shelf and Estuarine Processes					
				Instrumental Data Practicals	
5	Thurs 1tst Sept	A/Prof Ian Goodwin	5. Continental Shelf Oceanography Boundary currents, coastal winds, wind-driven shelf currents, and wave-driven shoreface currents, sea-level anomalies, deepwater wave transformation	Practical 4 IMOS Data and EAC, wave refraction	Satisfactory Completion
6	Thurs 8th Sept	Dr Shari Gallop	6. Shoreface and surf zone processes	Practical 5 Beach Monitoring Data	Assessable (SG Mark)
7	Thurs 15th Sept	Dr Shari Gallop	7. Estuarine processes	Practical 6 Coastal Modelling	Satisfactory Completion
Mid-semester break – two weeks					
8	Thurs 6th Oct	Dr Shari Gallop	8. Storm Surges, Coastal Flooding and Sea Level Rise	Practical 7 Storm Surge and Sea Level Rise	Satisfactory Completion
Module 3 – How to Determine Past and Future Long-Term Changes in Marine Climate and Coasts – Real World and Modelling Approaches					

				Interpretation Practicals	
9	Thurs 13th Oct	A/Prof Ian Goodwin	9. Determining Seasonal, Annual, Decadal and Centennial Modes of ocean-atmosphere variability and their predictability – The Pacific Ocean and Indian Ocean	Practical 8 Climate Mode Typing/ MATLAB Poama Forecasts	Assessable (IG mark)
10	Thurs 20th Oct	A/Prof Ian Goodwin	10. Evidence based vs modeling approaches to marine and coastal climate change impacts 1 (sea surface temperature and currents)	Practical 9 Group 1 Tutorial on researching historical and paleoceanographic data timeseries, interpreting climate models	Assessable (Group 1) (IG and SG Mark)
11	Thurs 27th Oct	A/Prof Ian Goodwin	11. Evidence based vs modeling approaches to marine and coastal climate change impacts 2 (sea-level change)	Practical 9 Group 2 Tutorial on researching historical and paleoceanographic data timeseries, interpreting climate models	Assessable (Group 2) (IG and SG Mark)
12	Thurs 3rd Nov	A/Prof Ian Goodwin	12. Evidence based vs modeling approaches to marine and coastal climate change impacts 3 (ocean winds and wave climate change, and sediment budget change)	Practical 9 Coastline Planform Geometry, Wave Direction and Stability Assessment	Satisfactory Completion
13	Thurs 10th Nov	A/Prof Ian Goodwin	13. Course summary lecture		

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

- Build on the prior knowledge on the climate system from ENVS216, and develop a new level of knowledge on how oceanic climate changes
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Assessment tasks

- Practical Reports
- Research Assignment

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

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Assessment tasks

- Practical Reports
- Research Assignment
- 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

- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
- Understand the use of climate models to explore ocean-atmosphere change
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Assessment tasks

- Research Assignment
- Exam

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

- Build on the prior knowledge on the climate system from ENVS216, and develop a new level of knowledge on how oceanic climate changes
- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
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Assessment tasks

- Practical Reports
- Research Assignment
- 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

- Build on the prior knowledge on the climate system from ENVS216, and develop a new level of knowledge on how oceanic climate changes
- Investigate marine climate change using the archive of paleoclimate data, instrumental observations and modelled projections
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Assessment tasks

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- 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

- Build on the prior knowledge on the climate system from ENVS216, and develop a new level of knowledge on how oceanic climate changes
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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

- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes
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Assessment tasks

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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

- Investigate marine climate change using the archive of paleoclimate data, instrumental observations and modelled projections
- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes
- Identify and attribute the causes of coastal change
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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

- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
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Changes since First Published

Date	Description
28/07/2016	changed week 8 and 9 content