



ENVS804

Climate Change and The Climate System

S1 External 2016

Dept of Environmental Sciences

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	3
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	6
<u>Unit Schedule</u>	7
<u>Learning and Teaching Activities</u>	8
<u>Policies and Procedures</u>	8
<u>Graduate Capabilities</u>	10

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff

Stuart Browning

stuart.browning@mq.edu.au

Contact via stuart.browning@mq.edu.au

Level 2, AHH Building

Anytime (email for appointment)

Kevin Cheung

kevin.cheung@mq.edu.au

Contact via kevin.cheung@mq.edu.au

Level 2, AHH Building

Email for appointment

Credit points

4

Prerequisites

Admission to MClimCh or MEnv or PGDipEnv or PGCertEnv or GradDipEnv or GradCertEnv or MWldMgt or PGDipWldMgt or PGCertWldMgt or MSc in Biodiversity Conservation or PGDipSc in Biodiversity Conservation or PGCertSc in Biodiversity Conservation or MConsBiol or GradDipConsBiol or MMarScMgt or MSusDev or GradDipSusDev or GradCertSusDev

Corequisites

Co-badged status

Unit description

Global climate change is one of the important issues facing humanity in the 21st century; the ability to mitigate or adapt to projected climate changes depends on developing an integrated perspective on the physical, biological, biogeochemical, socio-economic and cultural factors that influence the climate system. This unit focuses on the scientific framework for understanding the mechanisms of climate change, and covers (a) the physics of the climate system, (b) the multiple drivers of climate change, (c) the role of physical and biogeochemical feedbacks in the climate system, (d) climate change projections and (e) how socio-economic, biophysical and biogeochemical feedbacks could modulate future changes. It will provide students with the background to critically evaluate current understanding of the complex interactions that determine climate trajectories and the reliability of the tools used to make climate-change and climate-impact projections. The course is taught by a team of internationally renowned experts drawn from the University's Concentration of Research Excellence (CORE) in Climate Futures.

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:

Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.

Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.

Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.

Able to apply climate change theory to novel situations in order to diagnose and solve problems.

Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment Tasks

Name	Weighting	Due
On-line test	10%	18/3/2016
Research report	40%	27/5/2016

Name	Weighting	Due
<u>Final examination</u>	50%	S1 exam period - TBC

On-line test

Due: **18/3/2016**

Weighting: **10%**

The test will require you to interpret data in the light on information covered in the first 3 weeks of lectures and tutorial readings.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Research report

Due: **27/5/2016**

Weighting: **40%**

The major assignment for ENV5804 is to write a review article suitable for submission to the journal *Nature Climate Change*.

Nature Climate Change is the most widely read peer-reviewed journal in the environmental sciences (impact factor of 14.472) and covers all aspects of research on global warming.

Many articles on global warming appearing in popular press, such as “*Surf’s down: climate change likely to bring fewer big waves*” (Sydney Morning Herald 9-3-2014), are based on peer reviewed research published in journals such as *Nature Climate Change*.

Your task is to select a weather or climatic phenomenon—this can be a type of extreme weather event such as tropical cyclones, or a large-scale phenomenon such as El Niño Southern Oscillation—and write a review article suitable for submission to *Nature Climate Change*.

Author guidelines for a review article can be found on the *Nature Climate Change* website (For Authors>Guide to Authors>Content types>1.2 Review Article).

Prior to selecting your topic you should read some existing review articles to gain an appreciation of the type and standard of article expected: a good example would be:

Turner, A. G. & Annamalai, H. Climate change and the South Asian summer monsoon. *Nature Publishing Group* **2**, 587–595 (2012).

In your article you should:

- address current knowledge and uncertainties surrounding your selected phenomenon
- detail how your selected phenomenon is expected to change (including uncertainties) over the next 100-years with reference to current research and the latest IPCC report
- focus on the implications to the environment, society and to the economy
- discuss the viability of any proposed mitigation or adaptation policies.

You may use previously published figures where appropriate; however, at least one of your figures must be produced by you, using data obtained from a reliable source. An example would be plotting cyclone frequency over the past ~100-years from the Australian Bureau of Meteorology tropical cyclone database.

Your article—including word length, number of figures and citation style—must conform to the *Nature Climate Change* Author Guidelines for a Review Article.

You must submit your assignment via Turnitin.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Final examination

Due: **S1 exam period - TBC**

Weighting: **50%**

The examination will consist of multiple choice, short answers and a choice of essay questions.

This will test your ability to appropriately use terminology, concepts and contemporary climate change issues learnt in lectures tutorials/practical, subject readings as well as materials that have been uploaded on the ENV5804 iLearn Discussion Forum.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Delivery and Resources

Resources:

The basic resource for this unit is the Working Group 1 contribution to the Fifth Assessment Report (AR5) for the Intergovernmental Panel on Climate Change (IPCC), particularly the Technical Summary and the Summary for Policy Makers. For more detail, read the individual chapters from the WG1 report. These documents can be downloaded from the IPCC webpage: <https://www.ipcc.ch/report/ar5/wg1/>

Delivery:

Lecture and tutorial:

- Wednesday 12:00pm to 2:00pm E3B 118

Lectures, readings and other supporting material will be available on iLearn. Email and iLearn will be the principle methods of communication in this unit. The lectures and tutorials/pracs will be recorded using the ECHO360 system.

<https://ilearn.mq.edu.au/login/index.php>

We expect you to use iLearn to:

- Regularly check subject announcements
- Read and contribute to the Discussion Forum
- Download lecture materials
- Download tutorial and practical materials and resources
- Download reference materials
- Check your grades

Assessment tasks:

It is your responsibility to ensure that you understand all the requirements for the assessment tasks. Contact the lecturers or Unit Convenor if you have any concern or query with the unit content or assessments.

No extensions will be granted on assessment tasks unless an application for "Disruption of Studies" has been submitted and approved.

<http://studentadmin.mq.edu.au/disruption%20to%20studies.html>

You must notify the University of any type of potential disruption to your studies via [Ask MQ](#).

Students who have not submitted an assessment task by the due date will be penalised 5% per day.

Attendance:

Students enrolled in "internal mode" for this unit are expected to attend all lectures and tutorials/pracs. Students enrolled in "external mode" are expected to contribute to online discussions and tutorial sessions. Please notify the Unit Convenor for any queries related to attendance.

Unit Schedule

WEEK 1: 2 March	Atmospheric composition and climate (Dr Stuart Browning)
WEEK 2: 9 March	Timescales and patterns of climate variability
WEEK 3: 16 March	The climate system: atmospheric circulations (Dr Kevin Cheung)
Friday 18 March ** Assessment 1: Online test due **	
WEEK 4: 23 March	The climate system: oceanic circulation (Dr Kevin Cheung)
WEEK 5: 30 March 2015	Modelling climate and climate change (Dr Kevin Cheung)
WEEK 6: 6 April 2015	Evaluation of model uncertainty (Dr Kevin Cheung)
WEEK 7: 27 April	Future climate change forcings: projections and uncertainties

WEEK 8: 4 May	Projections of climate changes in the 21st century
WEEK 9: 11 May	Projections of changes in water balance and hydrology (Dr Stuart Browning)
WEEK 10: 18 May	Projections of sea-level and oceanic changes (Dr Stuart Browning)
WEEK 11: 25 May	Projections of extremes: catastrophic events, tipping points and climate surprises (Dr Stuart Browning)
Friday 27 May ** Assessment 2: Research Report due **	
WEEK 12: 1 June	The NARClIM project
WEEK 13: 8 June	Unit Summary and revision
Session 1 exam period - date and time to be confirmed ** Assessment 3: FINAL EXAM **	

Learning and Teaching Activities

Tutorials and practicals

Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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

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

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- Research report
- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- On-line test
- Research report
- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.

- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- On-line test
- Research report
- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- On-line test
- Research report

- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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

- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- Research report
- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.

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 outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change causes from a range of sources.
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System.
- Able to apply climate change theory to novel situations in order to diagnose and solve problems.
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences.

Assessment tasks

- On-line test
- Research report
- Final examination

Learning and teaching activities

- Every lecture in ENV5804 is supported by a related tutorial or practical. These have been prepared and designed to provide students with specific skills in climate science research, data analysis and understanding contemporary debates and issues in this field. All students are expected to participate and contribute to these classes.