



# ENVS704

## Climate Change and the Climate System

S1 Day 2019

*Dept of Environmental Sciences*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Unit convenor and lecturer

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Stuart Browning

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Credit points

4

Prerequisites

Admission to MRes

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.

## 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 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	Hurdle	Due
<a href="#">Practical reports</a>	40%	No	Week 12
<a href="#">Online Quiz 1</a>	5%	Yes	22/03/2019
<a href="#">Online Quiz 2</a>	5%	Yes	12/04/2019
<a href="#">Research Report</a>	50%	No	31/05/2019

### Practical reports

Due: **Week 12**

Weighting: **40%**

There will be tutorial sessions from week 1-12, in each of them you are required to submit a short report on what you have performed in the tutorial. The 10 reports with the highest marks will contribute to 40% (i.e., 4% for each report) of the course total mark. Therefore, you are recommended to attend all the tutorial sessions.

The skills developed in these tutorials will be useful to develop your research report, which is the major assessment of this unit.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change 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

## Online Quiz 1

Due: **22/03/2019**

Weighting: **5%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will require you to understand the material and interpret data in the light of information covered in the first 4 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 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

## Online Quiz 2

Due: **12/04/2019**

Weighting: **5%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will require you to understand the material and interpret data in the light of information covered in the weeks 5-7 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 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

## Research Report

Due: **31/05/2019**

Weighting: **50%**

The major assessment for this unit is to write a research/review article suitable for submission to a professional journal in climate science, such as **Nature Climate Change**, which is one of the most widely read peer-reviewed journals in environmental sciences (5-year impact factor 22.363) and covers all aspects of research on climate change.

Your task is to select a weather or climatic phenomenon, which can be a type of extreme weather event such as tropical cyclones or a large-scale phenomenon such as El Nino Southern Oscillation, and write a review article critically summarising recent research on a topic related to that phenomenon.

Author guidelines for a review article can be found at the Nature Climate Change website:

<http://www.nature.com/nclimate/authors/gta/content-type/index.html>

Prior to selecting your topic you should read some existing review articles to gain an appreciation of the type and standard of article expected.

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 and/or adaptation policies

You may use previously published figures where appropriate. **However, at least one section of your article should contain results from your own original data analysis, using data obtained from reliable sources. You should describe in details the data sources and your methodology of data analysis. The supporting figures in that section must be your own production making use of skills you learn from the tutorial sessions.** Examples would be plotting storm frequency over the past 100 years from the Australian Bureau of Meteorology tropical cyclone database, or plotting historical rainfall maps based on the Bureau's climate data archive.

**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 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 I 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 details, read the individual chapters from the WG1 report. These documents can be downloaded from the IPCC website:

<http://www.ipcc.ch/report/ar5/wg1/>

### Delivery:

Lecture: Monday 10:00 am to 11:00 am at 2 Innovation Road (previously known as EMC2) G220

Tutorial: Monday 11:00 am to 1:00 pm at 2 Innovation Road (previously known as EMC2) G220

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/practicals 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 Unit Convenor or lecturers 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\\_to\\_studies.html](http://studentadmin.mq.edu.au/disruption_to_studies.html)

You must notify the University if 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/practicals. Students enrolled in "external mode" are expected to contribute to online discussions and tutorials sessions. Please notify the Unit Convenor for any queries related to attendance.

## **Unit Schedule**

### **Lecture / Tutorial Schedule:**

WEEK 1 (25 February) - Atmospheric Composition and Climate / Climate Data in Giovanni (KC)

WEEK 2 (4 March) - Timescales and Patterns of Climate Variability / Introduction to Matlab (KC)

WEEK 3 (11 March) - The Climate System: Atmospheric Circulation / Introduction to netCDF file format (KC)

WEEK 4 (18 March) - The Climate System: Ocean Circulation / Reanalysis Datasets (KC)

### **Friday 22 March - Assessment 2 Online Quiz 1 Due**

WEEK 5 (25 March) - Climate Modelling and Climate Change / Correlation Analysis (KC)

WEEK 6 (1 April) - Evaluation of Model Uncertainty / Analysing CMIP5 data (KC)

WEEK 7 (8 April) - Future Climate Forcings: Projections and Uncertainties / Analysing PMIP data (KC)

### **Friday 12 April - Assessment 3 Online Quiz 2 Due**

### **\*\* Semester Break \*\***

WEEK 8 (29 April) - Projections of Climate Changes in the 21st Century / Trend Analysis (SB)

WEEK 9 (6 May) - Projections of Changes in Water Balance and Hydrology / Southern Australian Streamflow (SB)

WEEK 10 (13 May) - Projections of Sea-level and Oceanic Changes / Ocean Change Analysis (SB)

WEEK 11 (20 May) - Projections of Extremes: Catastrophic Events, Tipping Points and Climate Surprises / Analysing Climate Data from BoM (SB)

### **Friday 31 May - Assessment 4 Research Report Due**

WEEK 12 (27 May) - The NARCLiM Project / Future Extremes Events in NSW (KC)

WEEK 13 (3 June) - Unit Summary and Revision (KC)

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Lecturers: KC = Dr Kevin Cheung, SB = Dr Stuart Browning

## 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) (<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) (<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) (<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 published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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](http://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](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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/](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

- 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

### Assessment tasks

- Online Quiz 1

- Online Quiz 2
- Research Report

## 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 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

- Practical reports
- Online Quiz 1
- Online Quiz 2
- Research Report

## 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 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**

- Practical reports
- Online Quiz 1
- Online Quiz 2
- Research Report

## **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 from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to apply climate change theory to novel situations in order to diagnose and solve problems

## **Assessment tasks**

- Practical reports
- Research Report

## **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 outcome**

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

## **Assessment tasks**

- Practical reports
- Research Report

## **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**

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

## **Assessment tasks**

- Online Quiz 1
- Online Quiz 2
- Research Report

## **Changes from Previous Offering**

Assessment task associated with the tutorial sessions has been introduced this year.

Written examination, which was one of the assessment tasks in previous offerings, has been removed.