MONASH University

MONASH
EARTH, ATMOSPHERE AND ENVIRONMENT

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GROUP OF EIGHT AUSTRALIA

WELCOME TO THE **SCHOOL OF EARTH, ATMOSPHERE AND ENVIRONMENT**

Our living planet is now more at risk than at any time in our history due to human activity; climate change, overpopulation and the destruction of ecosystems.

Prof Andrew Mackintosh
Head of School

The School of Earth, Atmosphere and Environment (EAE) is educating the next generation of scientists to provide the solutions urgently required to address the United Nations Sustainable Development Goals: understanding climate impacts, providing the mineral resources for a green energy revolution, and protecting our ecosystems through the sustainable management of soils, water and coastal environments.

Our discovery science reveals the processes that have shaped the Earth since its formation and which pose an ever-present risk to life through natural hazards such as earthquakes, volcanic eruptions, and the progressive impact of sea level rise. Australia's capability in space science is growing, and our researchers investigate the surface of Mars and other planets of our solar system.

We have a thriving international community of academics and students with an outstanding reputation of excellence in research and education, and for influencing governments to respond to global challenges. We have one of the highest concentrations of Intergovernmental Panel for Climate Change (IPCC) Lead Authors in the world, we co-host one of the world's premier Antarctic research programmes, Securing Antarctica's Environmental Future (SAEF), and we are a major node of the Australian Research Council Centre of Excellence in Climate Extremes.

Our educators are passionate and bring their research discoveries into the classroom, and we are focussed on teaching skills that will lead to rewarding and transformative careers addressing the most pressing issues in research, industry, business, government and non-governmental organisations.

We invite you to be a part of our team. In this brochure you will find out about what we do, how you can study the Earth, Atmosphere and Environment of our planet, and how you can use that information to make your impact in the world.

RESEARCH AT THE SCHOOL OF EARTH, ATMOSPHERE AND ENVIRONMENT

Active research

The school is one of the leading institutions in a wide range of research activities around the globe. Our research is based on and combines all aspects of classical science disciplines – mathematics, physics, biology and chemistry to better understand our complex planet. Earth scientists in our school are leading experts in weather and climate research, environmental science and physical geography, and fundamental geology and future resources.

Our research mission

The goal of our research is to address challenges of our modern world and our imminent future: understanding the driving forces and impacts of climate change, securing an environmentally sustainable future, and discovering how our planet operates. Our focus is solving real-world problems with an applied and innovative approach.

Modern technology meets nature

Being a researcher in the School of Earth, Atmosphere and Environment means being a teacher, a techspert, and an explorer. Sustainability is at our heart and we study the atmosphere, oceans and ice sheets to predict climate change impacts and sea level rise, and soils, water, coasts and deserts to plan for a sustainable future. Our work takes us to ancient rocks in remote deserts, mountain ranges, the deepest ocean basins and the surface of other planets. Our school has world-class research facilities to study the micro-cosmos of rocks and water, to simulate Earth's climate system, deep interior, and to image and simulate the Earth's surface in unprecedented detail.

Your place in research

Students are an integrated part of our research, be it in the laboratory, in the field or during stimulating research discussion. With your passion for science, nature and STEM, you will discover new career options, will gain hands-on experience in real science application and be rewarded with being part of a world-class research program.

WHAT DO YOU WANT TO BE WHEN YOU GROW UP?

Studying in the School of Earth, Atmosphere and Environment will open the door to many exciting careers. The jobs on this page are just a snapshot of the varied careers our graduates enjoy.

We have our eye on your future and we work collaboratively with industry so our students develop an early link with real-world problems. Earth and Environmental Scientists earn some of the highest graduate salaries, even higher than Medicine, Law and Economics.

SOME CAREER OPTIONS INCLUDE:

- > ENVIRONMENTAL CONSULTANT
- > WEATHER FORECASTER
- > CLIMATE CHANGE RISK MANAGER
- > POLICY ANALYST OR ADVISOR
- > SURVEY GEOLOGIST
- > ENVIRONMENTAL IMPACT ASSESSESSOR
- > SCIENCE COMMUNICATOR OR EDUCATOR
- > GEOSPATIAL (GIS) DATA ANALYST
- > EXPLORATION GEOLOGIST
- > WATER & LAND MANAGER
- > GEOSCIENCE CONSULTANT
- > PUBLIC SERVANT
- > RESEARCHER
- > GEOTECHNICAL ENGINEER

source: www.graduatecareers.com.au

EARTH, ATMOSPHERE AND ENVIRONMENT

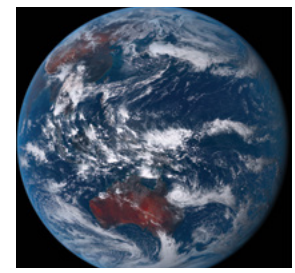
YOUR FIRST YEAR

Did you attend the School Strike 4 Climate and would now like to really make a difference? Are you fascinated by our coastlines, deserts, mountains and ecosystems and would like to understand and protect them? Have you always dreamed of being a volcanologist? Are the Mars rovers not just interesting but exciting to you? Do you enjoy maths, physics, chemistry or biology, but are looking for a real-world application? If you answered yes to any of these questions then our school is for you!

Understanding how our planet works has never been more important. Society, governments and industry need more people than ever who can address these challenges. Beyond that, there is an increasing need for experts in other areas to have a basic understanding of the earth system, so our future engineers, policymakers, health professionals, teachers and communicators are coming to us to add this knowledge to their skillset.

Your first year studies in the School of Earth, Atmosphere and Environment provide you with an overview of the major forces that shape our planet. You will gain the skills and knowledge which will allow you to pursue a career in an earth science field, or to support your studies in other areas of study.

We do not have any prerequisites for our first year units, and students from all backgrounds are welcome to study with us. For those new to the area, we do not assume any related VCE studies. For those with some related background, you will find that the scope and application of our first year units develops and extends your understanding.

Course unit	What you can study in first year	
Earth Atmosphere and Environment 1 EAE1011	Introduce yourself to the science involved in studying the Earth, including explanations of how and why our planet has changed over its 4.56 billion year history. You will study the formation and anatomy of the Earth and the processes that drive change within our planet and its environmental systems; from its core to its crust, to the systems driving and sustaining the planet's living surface, to the forces and processes involved in the development of mountains, ice sheets and oceans, and our changing atmosphere and climate.	
Earth Atmosphere and Environment 2 EAE1022	Expand your knowledge of the environmental, geological and atmospheric processes that create the unique physical environment in which we live, and learn how these processes influence our lives and affect the society in which we live. You will examine how and why the Earth's surface, atmosphere, ice sheets and oceans have changed in the past, and are predicted to change in the future, as a result of human influences such as deforestation, agricultural practices and human-induced climate change.	
Extreme Earth ATS1310	Focus on the catastrophes of our world today, such as droughts, earthquakes, epidemics, fires, floods, hurricanes, landslides, tsunamis and weather extremes. You will seek to understand the mechanics and dynamics of these environmental phenomena and how they interact with the social contexts in which these disasters occur. You will also investigate the role of international aid and risk management using local and international case studies.	
Climate Change: From Science to Society SCI1300	Follow the story of our changing climate from a global perspective. Starting from the basic principles and processes that define and govern the Earth's climate, this unit explores how the different parts of the Earth interact to produce the rich past and current variability of climate in space and time, and how human influences are shaping the future of the Earth's climate. This unit investigates what options humankind has to respond to the economic, ethical and political challenges of climate change, including global and national governance models required to mitigate and adapt to its effects. This unit will provide you with the foundation and knowledge to respond to climate change challenges throughout their career, independent of their specific discipline.	

AREAS OF STUDY IN EARTH, ATMOSPHERE AND ENVIRONMENT

GEOSCIENCE

Geologists understand that the Earth, its continents and oceans are always changing and that nothing ever stays the same. How the Earth changes with time is recorded in the rocks that we see at the surface.

Understanding geology is vital to better predict geological hazards, find the many resources that humanity needs, and to manage and protect the Earth.

By studying geosciences, you will learn how to read Earth's history from rocks, how geological processes such as plate tectonics are continuously shaping our planet by creating new mountains and new oceans. Volcanoes, earthquakes, landslides and tsunamis are all expressions of these processes and they also form the critical mineral resources needed for our renewable energy future.

Geology also provides an understanding of past climates that can be used to predict the impacts of anthropogenic climate change. You will have lecturers that have carried out expeditions to some of the most remote parts of the continents and oceans, and they will take you on field trips to some of the best geological locations in Victoria and beyond. At the end of your education you will be in a position to better understand what shapes the Earth and what is under our feet.

This is the basis for careers ranging from engineering to environmental work, including mineral exploration and hazard mitigation.

You can study these topics in the Geoscience stream of the Earth Science Major.

MEET OUR GRADUATE: KRISTEN ISBEL

Kristen is an Environmental Consultant at Aurecon Group working in the contaminated land division. Kristen completed her Earth Science major focussing on the Geoscience stream in 2019, with a particular passion for Hydrogeology and analysis and protection of contaminated waterways.

As a contaminated land consultant, Kristen uses many of her skills from her degree. She visits contaminated sites (like this one) and collects samples to analyse at the lab. She then writes reports recommending how these sites can be protected or improved. The biggest perk of her position is the places she gets to go: all around Australia.

The highlight of Kristen's degree was the hands-on analysis: getting out in the field and taking samples was fun, but she got most excited about understanding the contamination and toxicity of those samples.

MEET OUR RESEARCHER: PROFESSOR PETE BETTS

Pete is passionate about interpreting and modelling the rock signals of the Earth's magnetic and gravity field to understand how continents and tectonic plates interact, and change over millions and billions of years. His research is focused on the Red Sea, India, New Zealand, and Australia.

Scan the code to hear more from Pete.

AREAS OF STUDY IN EARTH, ATMOSPHERE AND ENVIRONMENT

PHYSICAL GEOGRAPHY

Do you want to save the world? Developing sustainable solutions to maintain Earth's natural environment, combat environmental degradation, alleviate the impacts of climate change, and to ensure food and water security requires wide-ranging expertise in the physical environmental sciences, examined through the lens of human influence.

Our physical geography program fosters global change-makers for environmental problems by examining these problems through a geographic lens. Through our program, you will develop the knowledge and skills required to contribute to creating and maintaining a sustainable environmental future.

Physical geography at Monash allows you to explore the geographical and environmental processes that control our natural environment, and how these are shaped by complex human interactions. You will examine how our land, oceans, biosphere and atmosphere work together to create Earth's diverse and unique landscapes and ecosystems; from frozen Antarctic deserts to equatorial tropical rainforests. You will discover how these processes shape the world in which we live and how we, in turn, have shaped and changed our natural world.

Our units focus on understanding the Earth's environments and how they change across space and time, examining the landscapes and climates in which we live, the soils we need to grow our food, and the water that we drink. We combine solid foundations in key knowledge in classroom and laboratory settings with real-world experiences of fieldwork in both Australian and international settings.

All our units build problem-solving, critical thinking and technical skills for developing effective, evidenced-based strategies to contribute to solutions for today's most pressing environmental challenges. Our graduates are job-ready and excel in careers in consulting, natural resource management, government, research, non-profit, agriculture and education sectors.

You can study these topics in the Geographical Science major and the Earth's Physical Environment stream of the Earth Science Major.

MEET OUR RESEARCHER: ASSOCIATE PROFESSOR VANESSA WONG

Vanessa loves studying soil. Without soil, we wouldn't have food to eat, clothes to wear or a filter for clean water. Vanessa's research focuses on how human activities affect the soils that support society, their potential to store carbon and how to remediate them after degrading activities like mining.

MEET OUR GRADUATE: KELLY LAING

Kelly Laing is an Associate Health, Safety and Environment (HSE) Consultant at Prensa. She finished her Bachelor of Science in 2020, with majors in both Geographical Science and Earth Science so that she could study as many physical geography units as possible. Kelly particularly enjoyed units which provided a mix of different learning methods and environments, including field trips and labs where she could apply the knowledge learnt throughout the unit in a practical way.

As an HSE consultant, Kelly visits sites, collects environmental data, makes observations and reports on those observations - skills she refined in her time in the School of Earth, Atmosphere and Environment. Kelly particularly enjoys the variety of this work: working with different people, complex challenges and cool places all around Australia.

AREAS OF STUDY IN EARTH, ATMOSPHERE AND ENVIRONMENT

CLIMATE AND ATMOSPHERE SCIENCE

Climate and atmospheric science explores the structure and evolution of the climate system. It explains how the weather and climate system works, from a gust of wind to global-scale climate change as well as addressing how we forecast our weather and project future climate change.

It is an interdisciplinary science that can draw on the strengths of environmental science, applied mathematics and/or physical geography and applies concepts of physics and chemistry.

Climate and atmospheric science offers a balance of field work, data analysis, theoretical research, policy frameworks and numerical modelling that is taught by experts in each area and which is supported by state of the art facilities.

People who study climate and atmospheric science can expect to work in closely-aligned sectors such as the Bureau of Meteorology or consultancies that deal with weather and climate, advisory government or non-government organisation roles or in a broad range of industries such as risk management for banks and insurance companies.

You can study these topics in the Climate and Atmospheric Science major and the Earth's Climate stream of the Earth Science Major.

MEET OUR RESEARCHER: PROFESSOR JULIE ARBLASTER

Julie is a climate scientist. Using models based on our understanding of the climate system, Julie's research explains some of the most complex phenomena in our atmosphere, and predicts how our world might change in the future. Julie has worked for the Bureau of Meteorology and was a lead author on the IPCC AR5 Working Group I report, sharing her insights on the workings of our climate. Scan the code to hear more from Julie.

MEET OUR GRADUATE: DYLAN WREFORD

Dylan is a Graduate Meteorologist at the Bureau of Meteorology who completed a Bachelor of Science (Honours) in 2021 majoring in Atmospheric Science with minors in Mathematics and Physics. Throughout his Monash experience Dylan enjoyed the breadth of learning opportunities available in a general science degree but also the ability to specialise with a taste of research in the Atmospheric Science major through an honours degree. In his graduate role Dylan is completing further specialised education and training to perform as a Meteorologist within the BOM, excited about the opportunity of applying skills and knowledge learned from studying within the Earth Atmosphere and Environment faculty at Monash all around Australia.

AREAS OF STUDY IN EARTH, ATMOSPHERE AND ENVIRONMENT

MAJORS

CLIMATE AND ATMOSPHERIC SCIENCE

The Climate and Atmospheric Science major gives you a focussed specialisation in the dynamics and mechanisms driving variability and change within the atmosphere and climate system.

There are two streams available within this major: the "Weather and Climate stream" and the "Climate Change Science" stream.

Weather and Climate stream:
Do you want to know how a tornado or a tropical cyclone works? Ever wondered why we can make accurate weather forecasts? This stream examines the major physical forces that affect the behaviour of the atmosphere.

Climate Change Science stream:
What does the science say about human-induced climate change? How do we know what the climate has been in the past? Get familiar with policy frameworks concerning climate change and how we can respond to this urgent issue.

EARTH SCIENCES

Earth Sciences is a broad discipline that addresses the major processes that have shaped our planet over time and continue to pose natural hazards to society, and provide resources that we need to sustain a modern society.

The Earth Sciences major has three streams:

Geosciences stream:
You will learn about geological processes: plate tectonics, basin formation, volcanology, earthquakes, and formation of the critical mineral resources needed for our transition to a renewable energy future.

Earth's Physical Environment stream:
You will learn about the interaction of physical systems with the biosphere (rivers, groundwater, soils, landscapes).

Earth's Climate stream:
You will learn how to understand and predict natural and anthropogenic climate change and its impacts.

GEOGRAPHICAL SCIENCE

Geographical Science is the interdisciplinary study of understanding how natural and human processes affect our planet including soils, vegetation, water, landforms and climate throughout time. This is the study of how Earth Science interacts with us.

In this major, you will learn to analyse and synthesise complex environmental, economic, social and political information to enable a geographical understanding of humans, environments and the planet, and their management.

You don't need to choose a stream right away; in first year you will get a taste of everything, and you can make up your mind later!

FIRST YEAR MAJOR UNITS		Climate and Atmospheric Science	Earth Sciences	Geographical Science
EAE1011	**Earth Atmosphere and Environment 1**	●	●	●
EAE1022	**Earth Atmosphere and Environment 2**	●	●	●
SCI1300	**Climate Change: From Science to Society**	●	●	●
ATS1310	**Extreme Earth**			●

● recommended elective

BEYOND THE CLASSROOM

The School of Earth, Atmosphere and Environment has an extensive and highly successful research program with research strengths in Atmosphere and Climate, Geography and Environment and Geoscience. You can become part of our vibrant research community and undertake an Honours, Masters or PhD, being mentored by some of Australia's leading scientists.

UNDERGRADUATE RESEARCH PROJECTS

An undergraduate research project in our school will give you hands-on experience of research in an area of your interest. Paired with one of our leading researchers, you will perform some original research and get a snapshot of life as a research scientist. You will experience all the steps in the research process, from researching your topic, to designing your experiment, performing your research and presenting your results.

FIELDWORK AND FIELD CAMPS

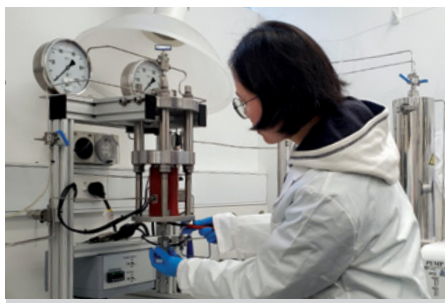
Your studies in Earth, Atmosphere and Environment aren't limited to the classroom! From the rugged Victorian coast to the vast Australian deserts, you will have opportunities to immerse yourself in the field.

We offer many different field trips at every level of study. Take a multi-day road trip, or a day trip just around the corner.You won't just learn about your environment; you'll learn IN your environment!

HONOURS DEGREES

A fourth year of study after your major can give you an Honours degree in your EAE specialisation will set you apart.

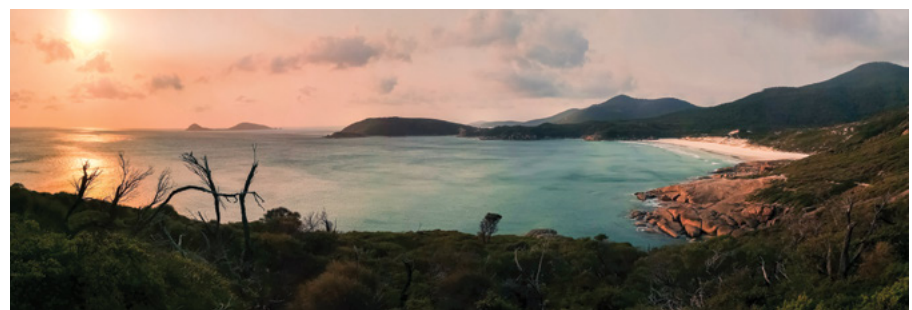
The Honours program represents the transition between undergraduate teachings to research-based learning. It is an ideal transition to any career, and a first class honours qualifies you for a professional research career. The EAE Honours program covers all our areas of study. Our Honours graduates are sought after by industry and government agencies and many continue to Doctor of Philosophy (PhD) studies to build research careers.



GRADUATE RESEARCH

Build on the knowledge and experience gained from your Honours degree or professional experience through our PhD and Master research programs. We have a large, diverse, and vibrant community of staff and students from a wide range of backgrounds, providing a productive scientific environment as well as an active social atmosphere.

Our postgraduate students research topics across the spectrum of the earth, atmospheric and environmental sciences, with emphasis on interdisciplinary research. We also actively collaborate with other universities, industry, and state and federal government agencies in Australia and overseas.



COURSEWORK MASTERS

Master of Science in Earth Science

The Master of Science in Earth Science is an innovative, interdisciplinary two-year course that will equip you for a career in resource exploration or environmental earth science. Specialise in applied geoscience, remote sensing and spatial data science, or environmental earth science and gain skills in data analytics, advanced 3D geological modelling, remote sensing, spatial data science, GIS, drones and sensors. For more information visit:

monash.edu/science/master-of-science-in-earth-science

Master of Science in Atmospheric Science

The Master of Science in Atmospheric Science is a two-year course designed to provide the knowledge and skills necessary for a professional career in weather and climate science. Study statistics for climate dynamics, dynamical meteorology, general circulation, atmospheric modelling, atmospheric boundary layers and ocean circulation. For more information visit:

monash.edu/science/master-of-science-in-atmospheric-science

CASE STUDIES

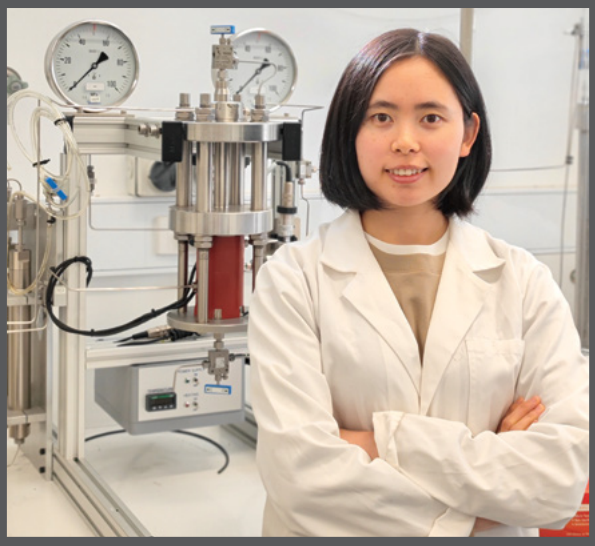
PROJECT: UNDERSTANDING ORE MINERAL REPLACEMENT REACTION MECHANISMS IN HYDROTHERMAL CONDITIONS

PHD CANDIDATE: Gan Duan

I study mineral fluid reactions in the deep earth. These reactions are components of the rock cycle and determine element redistribution, transportation and reprecipitation, forming large-scale ore deposits around the world.

I look at the effect of fluid chemistry on mineral alteration processes and microstructural changes within minerals by using different microscopes, such as scanning and transmission electron microscopes. My investigations include field, laboratory and thermodynamic modelling work.

My research has enabled me to develop a wide range of employability skills and pave a road for my career after graduation. Through my work we can have a better idea of the mineral-fluid reaction process in the real world. This will guide us to find the deep and potential deposits formed under earth based on the large-scale alteration minerals formed on earth surface.



"My PhD study can help to determine global mineral distributions by assessing mineral fluid reactions on micrometre and nanometre scales"

GAN DUAN

PROJECT: AN INVESTIGATION INTO THE DYNAMICS OF GASEOUS EXCHANGE AND BIOGEOMORPHOLOGY OF TEMPERATURE COASTAL WETLANDS

PHD CANDIDATE: Matthew Peck

I study how climate change and natural disturbance affects Victoria's coastline. My research investigates how changes to these ecosystems may affect the benefits they provide, including the storage of greenhouse gases, water availability and movement, and protection to human infrastructure. I look at how change is likely to occur within these environments, what affects this change, and at what rate this change is occurring.

I investigate these disturbance features through both field and laboratory work. For example, one aspect of my work allows me to utilise our world-class drone platfor m; where I am able to investigate coastal subsidence down to the millimetre scale across large wetland areas.

My research has enabled me to develop wide range of employability skills, preparing me for life after University.

Through this work I aim to improve our understanding as a society of the importance and fragile nature of coastal wetland ecosystems in Victoria. This will allow us to develop our knowledge base of how these systems shift with a changing climate, improving our understanding of what Victoria's coastline may look like in the future.

"My research has allowed me to conduct meaningful research across different aspects of the environment, providing me with the opportunity to explore Victoria's coastline whilst also completing my studies."

MATTHEW PECK

MONASH University

TO SHAPE OUR WORLD
FOR A SUSTAINABLE FUTURE,
WE NEED TO KNOW HOW
THE EARTH WORKS.

FURTHER INFORMATION

MONASH UNIVERSITY
monash.edu

FIND A COURSE
monash.edu/study

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Australian citizens, permanent residents and New Zealand citizens
w**International students**
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T +61 3 9903 4788 (outside Australia)
E study@monash.edu

MONASH EARTH, ATMOSPHERE AND ENVIRONMENT ONLINE

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MonashUniScience

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YOUR ESSENTIAL GUIDE TO MONASH SCIENCE