Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

AUSTRALIAN GEOSCIENCE TERTIARY EDUCATION PROFILE 2017

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Compiled by Associate Professor D.R. Cohen FRSN FAIG FAAG
For the Australian Geoscience Council
d.cohen@unsw.edu.au

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CONTENTS

SUMMARY

The Australian Geoscience Tertiary Education Profile 2017 (AGTEP 2017) summarises the results of a survey of geoscience departments at Australian universities spanning the period 2013–2017 and similar surveys conducted by the AGC in 2007 and 2012.

Twenty-one universities offer degrees or majors in geoscience at undergraduate and postgraduate levels. Most offer a BSc or equivalent degree with one or more majors in the fields of geology, environmental geoscience, geophysics and related areas. Some universities provide more specialised bachelor programs. All universities offer extensions to the basic undergraduate degree through provision of an additional Honours year (the 3+1 structure), embedded Honours in 4-year degrees, or articulated Masters programs (the 3+2 structure). All offer PhD programs.

Geoscience groups are located within various university structures. Some universities maintain dedicated geoscience departments whereas others combine geoscience with other cognate areas, such as physical geography, atmospheric science and oceanography to form broader earth science departments. Others locate geoscience within much larger departmental or faculty structures. Internally or externally funded research centres are contained within, or are closely associated with, many of the departments.

Undergraduate geoscience enrolments across the tertiary education sector increased to nearly 3,500 EFTSL in 2013; up from 1,500 in 2003. Enrolments have since declined to around 2,200 EFTSL in 2017. The enrolment patterns have not been consistent across the sector with some departments following the sector trend (typically the larger departments that dominate overall taught load), others showing little variation since 2003 and the remainder being relatively stable until 2012 followed by a decline. Two universities currently have an undergraduate load of over 250 EFTSL (Adelaide and Curtin), six are between 100 and 200 EFTSL (Monash, Sydney, UNSW, Melbourne, Macquarie, UQ) and the remainder below 100 EFTSL. Significant load (and income) is also generated by higher degree research cohorts. There is generally a higher proportion of students continuing from AQF level 7 (pass) undergraduate degrees to Honours or Masters in the non-mining states of Australia.

There were nearly 300 Honours and Masters completions in 2017, down from a peak of nearly 470 in 2012. Honours completions have followed the overall EFTSL trends (with a 3-year lag) but Masters coursework graduations have continued to climb from relatively low numbers in the early 2000s to over 120 per year, bolstered by a move to a “Bologna-style” model at Melbourne, UWA and Macquarie. PhD graduations declined to just 76 in 2011 but have subsequently increased to 154 in 2017.

The mineral exploration cycle is the dominant factor controlling overall geoscience enrolments. Undergraduate numbers follow this trend with a 2-year lag and PhD graduations with a 5-year lag. There is a close relationship between overall enrolments in science programs and the enrolments in first year geoscience subjects at most universities, and a relatively constant retention rate from first year through to Honours, irrespective of changes in the degree structures or majors offered.

The number of academic staff has largely followed the EFTSL trend, with some departments increasing substantially in size over the period 2008–2013. There were 492 FTE geoscience academic staff in 2017 compared with 419 FTE in 2012 and 354 in 2007. In 2017, 284 academics were classed as research-and-teaching or teaching-focussed and mainly funded through university operating budgets. The recent decline in enrolments has resulted in some positions recently vacated through completion of contracts or retirements remaining unfilled.

There have been marginal increases in the number of high school students undertaking "Earth and Environmental Science" themed subjects in Year 12. Support for the school education sector is provided through bodies such as TESEP, ESWA and science teacher associations, as well as geoscience outreach and educational support activities by most universities and the AGC.

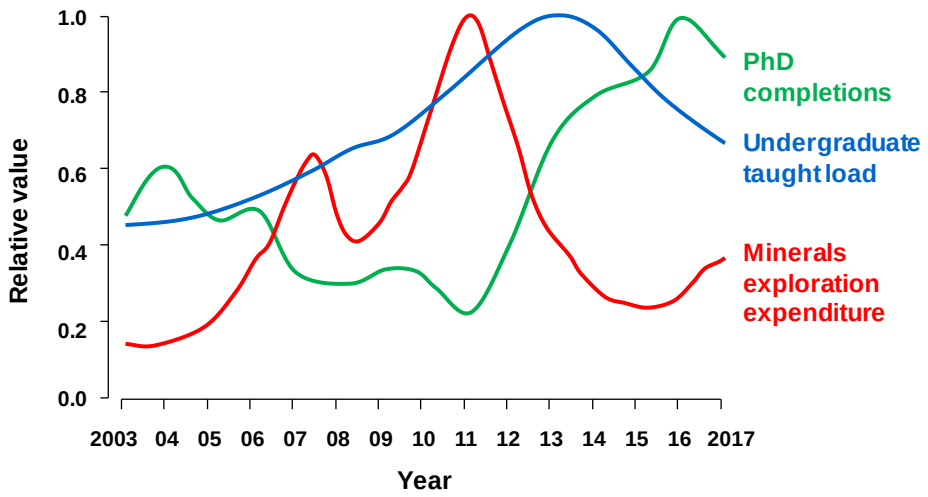
Substantial changes are being made to university geoscience programs syllabi and teaching strategies. There is increased focus on core and generic skills (within the geoscience context), field-based studies and opportunities for work-integrated learning in additions to research training, especially in the form of Honours or Masters theses. The Australian Universities Geosciences Educators Network (AUGEN) serves as a vehicle for disseminating good teaching practice and innovations. There is an increasing proportion of teaching-focussed positions in many university departments.

University budgets are complex, with substantial cross-subsidisation of the sciences by business and engineering, research by teaching and smaller departments by larger departments. Substantial cross-subsidisation of geoscience occurs in most universities and reflects the strong research performance in geoscience relative to other sciences, and a variety of strategic decisions by university management.

Australian universities continue to rank highly in the "earth sciences" and sub-disciplines under various national and international ranking systems such as the ARC Excellence in Research Australia and the QS rankings. ARC funding has increased slightly for the "earth sciences" since 2003, partly reflecting growth in staff and especially those in research-focussed positions. Whereas some major research centres no longer receive external funding from the ARC or CRC programs, a new Centres of Excellence (Climate Extremes and Australian Biodiversity and Heritage) has been recently funded, and a new CRC (MinEx) is commencing in 2018.

Snapshot of Geoscience in the Australian Tertiary Sector 2003–2017

	2007	2012	2017
Undergraduate EFTSL	1926	3099	2158
Honours graduations	150	227	182
PhD graduations	71	90	121
Academic staff (FTE)	354	418	482



INTRODUCTION

This report summarises the results of the third Australian Geoscience Tertiary Education Profile (AGTEP), based on the five-yearly survey of Australian geoscience departments[1]. It follows from the 2007 and 2012 surveys (Powell, 2008 & 2013)[2]. This survey is primarily aimed at extending the existing database on geoscience degrees, majors and subject offerings, academic staff numbers and appointment types, student enrolments and graduations, and the fields of research undertaken by universities.

Geoscience continues to be a major contributor to Australia's reputation in scientific research and to contribute to public debate on issues ranging from resources to climate change. Geoscience underpins the resources sector which is critical for the Australian economy. The place of geoscience in the university sector has, however, been less secure than the other fundamental sciences (physics, chemistry and biology) and mathematics due to various factors.

The first AGTEP survey covered the period 2003-2007. It was initiated by the AGC to evaluate the health of the sector following a severe drop in undergraduate geoscience student numbers and associated risks of department closures and loss of academic staff (AAS, 2003)[3]. The first year of the survey (2003) coincided with the bottom of the minerals exploration cycle. The second AGTEP survey, for the period 2008-2012, spanned both the Global Financial Crisis and the peak of the minerals boom. The boom generated substantial increases in exploration expenditure across a range of commodities but also resulted in skills shortages and increased reliance on 457 Visas to attract geoscience professionals to Australia.

The previous AGTEP reports noted:

- Large increases in geoscience enrolments from 2003 to 2012, partly linked to the upswing in the minerals cycle, with the rate of growth higher in the larger departments.
- Slight growth in the number of departments delivering geoscience majors and in academic staff numbers.
- On-going syllabus revisions to meet the needs of industry and the specific and generic skills deemed necessary in new graduates.
- Static numbers of students undertaking PhDs, a drop in Masters by research but an increase in Masters by coursework.

The third AGTEP survey is based on data for the period 2013-2017. This coincided with a dramatic decline in both exploration expenditure and employment prospects (AIG, 2017)[4], especially for new graduates. The bottom of the minerals exploration cycle appears to have been reached in late 2016 (ABS, 2018)[5]. The AGC now has data from three contiguous surveys spanning a full minerals exploration cycle. This provides opportunity to evaluate the extent to which the fortunes of geoscience departments are still tied to the minerals cycle. The report also provides opportunity for the university sector, industry and the professional bodies to reflect on the trends and consider the implications for longer term planning by universities and others.

[1] The term "department" is used to cover all formal geoscience teaching and research units within universities and may include stand-alone departments or school, or entities within larger administrative or organisational units.

[2] Powell TG, 2008 and 2013. Australian Geoscience Tertiary Education Profile 2008 and 2013. Report to the Australian Geoscience Council. www.agc.org.au/reports..

[3] AAS, 2003. National Strategic Plan for the Geosciences. Australian Academy of Science. Canberra.

[4] AIG, 2017. Australian Geoscientist Employment Surveys (2009–2017). Australian Institute of Geoscientists. https://www.aig.org.au/blog/category/employment-2/.

[5] ABS, 2018. 8412.0 – Mineral and Petroleum Exploration, Australia. www.abs.gov.au/ausstats/abs@.nsf/mf/8412.0.

METHODS

Data collection and report development

A questionnaire, based on the 2007 and 2012 surveys, was distributed to the heads of departments or directors of teaching of 23 university departments in July 2017 (Appendix 2). Twenty-two departments responded by April 2018. The universities were selected on the basis of having previously completed AGTEP surveys, membership of AUGEN or other indications that geoscience majors were being offered. The surveys included both quantitative data and comments by departments on the source of the data, factors affecting changes in the data from previous surveys and some more open-ended questions. No data was received from UTS, Flinders or RMIT.

With various geoscience groups or departments part of broader “earth science” schools or larger administrative or operations entities, and a variety of interpretations on the definition of “geoscience”, arbitrary decisions were taken by survey respondents as to which subjects, majors, degrees and staff needed to be included in their submissions. Some included aspects of physical geography, GIS and remote sensing, oceanic and atmospheric sciences and others did not. This was partly dictated by the classifications under the Earth Sciences division of the Australian and New Zealand Standard Research Classification (FOR codes) (ABS 2008).

As far as possible, respondents attempted to maintain consistency with the approach taken in compilation of previous AGTEP surveys. The data were then combined with that of previous surveys and confirmed with respondents in July 2018. A draft of the report was distributed to the respondents in October 2017 to allow comments on the interpretation of the results.

Terminology

"Geoscience"	is defined for the purposes of this survey as incorporating subject material that would allow graduates to gain membership of umbrella learnéd or professional societies such as the Geological Society of Australia, the Australian Institute of Geoscientists or the Australasian Institute of Mining and Metallurgy.
"Subject"	denotes a specific discipline offering such as "Introduction to Mineralogy" and is equivalent to the terms "course" or “unit” used in some institutions.
“Level”	is the academic level of a subject, typically ranging from 1 (introductory) to 4 (advanced or Honours). Levels typically coincide with the year of a degree.
"Major"	denotes a set of cognate subjects leading to a specific disciplinary naming such as "Geology" or "Earth Sciences" within a degree. It is equivalent to the term "specialisation" or "stream" in some institutions. It may be the name of the Honours program.
"Degree"	carries the normal meaning, but the studies leading to the award may be referred to as a "program" in some institutions.
“EFTSL”	is the effective full-time student load. It is based on the definitions of normal full-time study for students and forms the basis for payment to universities by the government and students.
“AQF”	is the Australian Qualifications Framework (AQF), which differentiates degrees between bachelors (AQF level 7), Honours degrees requiring an additional year or embedded in four-year program (AQF 8), coursework and research Masters (AQF 9) and Doctorates (AQF 10).

For ease of reference the following institutional abbreviations have been used:

Adelaide	University of Adelaide (incl. Australian School of Petroleum)
ANU	Australian National University
Canberra	University of Canberra
Curtin	Curtin University
Fed	Federation University (formerly University of Ballarat)
Flinders	Flinders University
JCU	James Cook University
La Trobe	La Trobe University
Macquarie or MacQ	Macquarie University
Melbourne or Melb	University of Melbourne
Monash	Monash University
QUT	Queensland University of Technology
RMIT	RMIT University
Sydney	University of Sydney
UN	University of Newcastle
UNE	University of New England
UNSW	University of New South Wales
UoW	University of Wollongong
UQ	University of Queensland
UTas	University of Tasmania
UTS	University of Technology Sydney
UWA	University of Western Australia

Data verification and pre-processing

Data were checked against previous surveys for internal consistency and continuity. Some respondents were asked to modify their submissions to correct errors or ambiguities such as providing head counts rather than EFTSL. Unless otherwise indicated, subject head counts (if reported) were converted to EFTSL by applying a factor of 0.125, as most universities operate a two-semester model with four subjects taken each semester. The Honours year was counted as 1.0 EFTSL and Masters graduations as 1.5 to 2 EFTSL based on the normal length of candidatures.

In cases of missing data, gaps were filled by interpolation of other data from the institution to reduce bias in the reporting of national data and interpretation of trends. Missing data for BSc graduations in 2003-2007 were calculated on the basis of typical ratios of year 3 enrolments to graduations. The data for each respondent are presented in Appendix 1.

As in previous years, the results of the questionnaire were supplemented by examination of the various university web sites of the school structures, staffing and course options available to students.

Given some issues with data completeness and other factors, it must be emphasised that the data presented should be considered indicative rather than authoritative.

RESULTS AND COMMENTS

University structures

There is significant diversity in university organisational structures in which geoscience staff are located, and from which geoscience majors and graduate programs are delivered. A few universities maintain separate geoscience departments or schools and these are typically placed within "science" faculties. A majority of institutions have combined geology with one or more of the disciplines of geography, environmental science and even oceanography or atmospheric science, into broader "earth science" departments. This is indicated in Appendix 1. Some geoscience groups are part of very large multi-disciplinary departments or faculties that span other physical and/or biological sciences (e.g. UNSW and UTas).

Over the last five years there have been amalgamations of disciplines into larger units at some universities and separation into component disciplines at others – analogues of the tectonic supercycle. Amalgamations have the advantage of reducing administrative costs and enhancing integration between geoscience and related fields, but also present a risk of dilution of core geoscience disciplines relevant to the demands of traditional geoscience graduate employers. Many departments contain, or sit alongside, internally or externally funded research centres that contribute to the viability of those departments.

As noted in previous reports, geoscience is contained within separate departments at ANU, Curtin, Macquarie, Monash, Queensland and Adelaide. At Melbourne the school is named "Earth Sciences" but includes ocean and atmospheric sciences. At Sydney, the school is named "Geosciences" but includes geography and environmental sciences. In most cases, geoscience constitutes a component within schools of earth, geography and environmental science that are variously linked to the ecological biological sciences such as is the case at Flinders, JCU, Newcastle, UNSW, Wollongong and QUT. Some universities retain multiple geoscience schools or divide the earth sciences between schools. Adelaide has the School of Earth and Environmental Science and the Australian School of Petroleum; Curtin has the departments of Applied Geology and of Exploration Geophysics.

Undergraduate degree offerings

At least twenty universities deliver undergraduate programs that focus on geoscience or contain geoscience majors. This is an increase of two over the 2012 survey. All offer Masters by coursework and/or research and PhD programs (Table 1). Other universities offer aspects of geoscience as part of broader majors such as environmental science or ecology. A further two universities offer geoscience subjects but not majors as part of a general science or environmental degree (e.g. La Trobe). The most common host for geoscience majors is the traditional three-year BSc, with the option to undertake an Honours year involving completion of a research thesis and variable amounts of coursework.

The overall trend from 2003 to 2017 has been simplification of available options. The main cost to schools is delivery of subjects rather than programs, and the same set of subjects may serve a variety of majors through permutations and combinations. The larger departments and universities are generally able to offer a wider range of majors.

Some universities offer embedded Honours as part of "named" four-year degrees that typically have little substantial difference from the content of the 3+1 BSc+BSc(Hons) structure, but which are typically offered to attract additional students. There is on-going debate within universities about the balance between creating and maintaining named degrees as opposed just offering a

range of majors in generic structures such as the "BSc" as the best vehicle to attract students. While named degrees may have the benefit of attracting a few more students, this probably comes at a cost in terms of additional teaching loads, administrative overheads and program review requirements under the HESF[6]. Questions to staff at university open days or careers markets indicate the nuanced differences between degrees and majors are generally lost on high school students and their advisors.

Melbourne, Macquarie, Adelaide and UWA have moved all or in part towards a Bologna-style model[7] of a 3-year undergraduate + 2-year Masters ± 3-year PhD. Others will continue to offer the classic (Scottish) Honours model of 3-year undergraduate + 1-year Honours or the equivalent 4-year model containing embedded Honours. Macquarie offers a BPhil year 1 and MRes year 2 in place of Honours. Rather than an Honours year, many universities are encouraging students to undertake a Masters, such as the 18-month MPhil or MRes containing coursework and an externally examined thesis, and which can attract RTP funding. Such decisions are partly based on preferred educational models but have proven risky due to the vagaries of federal funding arrangements and agreements over Commonwealth Supported Places (CSP).

Composition and curriculum in undergraduate programs

As geoscience has evolved so too has the content, delivery and character of geoscience programs. Part of the evolution relates to the nature of the science itself and the need for integration of teaching and research and part to the rise of new technologies, the contraction of teaching staff numbers in some universities and the need to broaden the range of elective subjects that students can draw upon to complete their geoscience degrees.

Several universities have taken specific steps in the last few years (or are planning) to better meet the needs or expectations of potential employers and to reflect ongoing developments in pedagogic methods in the digital age. Feedback on the Australian Geoscience Council's Recommendations on a General Syllabus for an Undergraduate Degree in Geoscience[8] indicated broad agreement on fundamental knowledge requirements (such as tectonics, mineralogy and sedimentology) and skills (handling spatial information, effective communications and general science literacy) necessary for a graduate to gain employment as a geoscientist. It was recognised that increased mathematical and computer skills (including coding) will be demanded of future graduates, given requirements to confidently and effectively manipulate, interrogate and interpret large datasets, and employ sophisticated computational and data visualisation methods.

In designing geoscience programs of the future some sacrifice of traditional content has been made to provide time to develop more generic skills and increase breadth within and beyond the earth sciences[9]. It is universally acknowledged by staff and students that high-cost field-based activities in undergraduate programs provide students with important, authentic, experiential learning opportunities and are a defining feature and major attraction of geoscience subjects to study and to teach.

Geoscience programs are generally designed around a major containing core and directed electives, that together comprise around 50% of the degree. There are additional requirements for

[6] The Australian Higher Education Standards Framework (HESF), administered through the Tertiary Education Quality and Standards Agency (TEQSA). www.teqsa.gov.au.

[7] www.coe.int/t/dg4/highereducation/EHEA2010/BolognaPedestrians_en.asp#P132_13851.

[8] Cohen DR, 2015. AGC Recommendations on the general syllabus for an undergraduate degree in the geosciences. The Australian Geologists. Geological Society of Australia, September, 2015.

[9] Cohen DR, 2017. Educating the next generation of geologists. *In:* Proceedings of the Tenth International Mining Geology Conference 2017. Australasian Institute of Mining and Metallurgy, Melbourne. 3–10.

up to 30% of other enabling sciences in the program such as mathematics and chemistry, but may include physics or biology depending on the flavour of the major.

Table 1 Degrees and geoscience majors at surveyed Australian universities.

	AQF 7 (Bachelors)						AQF 8 (Hons)		AQF 9 (Masters)	AQF 10 (PhD)
Adelaide	**BSc** *Geology*	*Geophys & Appl Geol*		**BSc (Miner. Geosci.)**			**BSc (Hons)** *Geology* *Env. Geosci.*	*Geophys* *Petrol Geol & Geophys*	Y	Y
ANU	**BSc** *Earth Sci.*	*Marine Sci.*	*Water Sci.*				**BSc (Hons)** *Earth & Marine Sci.*	*Physics of the Earth*	Y	Y
Canberra	**BSc** *Appl. Ecology*	*Earth Sci.*	*Water Sci.*	**BEnvSci** *Appl. Ecology*	*Earth Sci.*	*Water Sci.*			Y	Y
Curtin	**BSc (Appl. Geol.)** *Appl. Geol*	*Mining Geol*	*Petrol. Geol*	**BSc (Geophys)**			**BSc (Hons)** *Appl. Geol*	*Geophys*	Y	Y
Federation	**BSc** *Earth Materials*	*Env. Geosci.*		**BGeosci**					Y	Y
JCU	**BSc** *Geology*			**BGeol**			**BSc (Hons)** *Geology*		Y	Y
LaTrobe	**BSc** *Env. Geosci.*	*Env. and Marine GeoSci.*							Y	Y
Macquarie	**BSc** *Geology*	*Geophys*							Y	Y
Melbourne	**BSc (Earth Sci.)** *Geology*	*Climate and Weather*	*Env. Sci.*				**BSc (Hons)** *Geology*		Y	Y
Monash	**BSc** *Generic*						**BSc (Hons)**		Y	Y
QUT	**BSc** *Earth Sci.*						**BSc (Hons)** *Earth Sci.*		Y	Y
Sydney	**BSc** *Geol. & Geophys*	*Geog (Physical)*					**BSc (Hons)** *Geology* *Geog (Physical)*	*Geophys*	Y	Y
UN	**BSc** *Earth Sci.*			**BEnvSci & Mgmt** *Earth Systems*			**BSc (Hons)** *Earth Sci.*		Y	Y
UNE	**BSc** *Geosci.*			**BGeosci**			**BSc (Hons)** *Geosci.*		Y	Y
UniSA	**BSc** *Geosci.*								Y	Y
UNSW	**BSc** *Climate Sci.*	*Geology*	*Earth Sci.*				**BSc (Hons)** *Geology*	**BAdvSci (Hons)** *Earth Sci.* *Climate Sci.*	Y	Y
UoW	**BSc** *Geology*	*Geosci*					**BSc (Hons)** *Geology*		Y	Y
UQ	**BSc** *Geological Sci.* *Geograph Sci.*						**BSc (Hons)** *Geograph Sci.* *Geology* *Expor. Geophys.*	**BAdvSci (Hons)** *Geograph Sci.* *Geological Sci.*	Y	Y
UTas	**BSc** *Geology*						**BSc (Hons)** *Geology*		Y	Y
UWA	**BSc** *Geology*						**BSc (Hons)** *Geology*		Y	Y

Free elective space is included in the majority of programs. Most students chose to apply free elective space to geoscience or cognate fields, while others will undertake some economics or languages to add strings to their bows. A few universities require compulsory breadth components outside the field of education (FOE) codes, such as the general education requirements at UNSW and the “People and Place” requirements at Macquarie. Where students want to undertake a

substantial amount of study outside the sciences, universities offer a wide range of double degrees with discounts on the total units of credit required outside the majors to make such combinations tractable.

Since 2003 there has been an overall increase in environmental geoscience options (commonly delivered jointly by geoscience and other departments), maintenance of the traditional and solid earth geoscience areas such as petrology, structural geology, tectonics and ore deposits, but contraction in geophysics, sedimentology and palaeontology. Such trends are not uniform across the sector. Some universities are reducing overall specific geoscience subject requirements in favour of more generic skills, including data analysis and IT, or expanded opportunities to undertake research.

The coursework component in the Honours year varies from 0% to around 50%. There is a small amount of movement of Honours students between universities to pursue specialist areas for which there is no supervisor available at their current university, under the normal systems of credit transfer. It is noted that the AQF designates the Honours year as a separate degree (AQF 8) to the preceding three-year bachelors.

Ongoing changes to degree structures, including the Honours year and replacement of Honours by Masters, have resulted in some reduction in the amount of subject sharing or substitution through the Sydney Universities Consortium of Teaching Geology and Geophysics (SUCOGG) and the Victorian Institute of Earth and Planetary Sciences Honours Program (VIEPS). VIEPS has continued to function largely as originally created two decades ago. SUCOGG has contracted activities and offerings, due to the loss of geoscience from UTS and changes to the Honours program requirements at UNSW, but continues to support common field-based activities.

Whereas institutional collaboration in research has many obvious advantages, the benefits of collaboration on the teaching front are less clear. Suggestions stemming from the response to the crisis in geoscience in the early 2000s for universities to reduce staff costs by specialising or sharing courses or staff, or even reducing the number of geoscience departments to increase the viability of the remnant, are based on the myth that students are (i) highly mobile and (ii) select a university based primarily on the disciplines or sub-disciplines offered. The proportion of domestic students drawn from the same city or surrounding region in which their university is situated is probably the highest in the western world.

Market analysis and surveys within institutions indicate students make choices at the University and general degree level. Choices are rarely made at the disciplinary level, though this may be more common in WA due to the prominence of the resources sector in that state. If geoscience is not offered at the institution of choice, students are more likely to change disciplines rather than change institutions.

The Minerals Geoscience Honours program, underwritten by the Minerals Tertiary Education Council (MTEC), ceased operations in 2015 (MTEC, 2016)[10]. Some aspects have carried over to the Adelaide-hosted and MTEC-funded National Exploration Undercover School (NExUS) that provides opportunity for senior undergraduate students across Australia to participate. There is also the ANZIC-funded marine geoscience master classes and related educational programs (ANZIC 2017)[11].

[10] MTEC, 2016. Key Performance Measures Report 2016. Minerals Tertiary Education Council. www.minerals.org.au/mca/mtec.

[11] ANZIC, 2017. The Australian and New Zealand International Ocean Discovery Program Committee. iodp.org.au/for-scientists/for-junior-scientists.

Many departments are undertaking curriculum reviews triggered by the normal five to seven cycle required by TEQSA[12] or in response to industry expectations, internal restructuring, and changing staffing profiles. The current curriculum review at ANU will place a stronger focus on experiential learning and student employability, including the "core skills" required when formulating large-scale economic evaluations of geological systems.

The critical role of field-based studies in the quality of graduates, the student undergraduate experience and relevance of degrees to employers, is recognised across the sector. The cost of delivery is high. While recognising the moral and legislative requirements surrounding health and safety, such requirements are a major factor contributing to the cost of fieldwork.

In previous generations it was assumed that students would gain work experience through vacation employment and/or industry-based Honours projects. Many universities are now incorporating work-integrated learning (WIL) and even internships into programs for academic credit including ANU, Canberra, JCU, QUT, UQ and UWA. Macquarie has a compulsory WIL program called PACE in which each student must complete one unit.

Greater resources are being provided by universities for educational development of staff and subject design, especially in the development of high-quality digital components to supplement other teaching resources or allow fully on-line subjects. Significant development is being undertaken by members of the Australasian Universities Geoscience Educators Network (AUGEN) with access provided to member organisations.

Postgraduate degree offerings

As observed in previous surveys, most institutions offer a Masters (MRes, MPhil or MSc) by research. Unless underpinned by a Bologna model, coursework Masters are rarely cost or time effective for staff to deliver. A Masters cannot be largely delivered as a series of co-badged senior undergraduate subjects, as TEQSA regulations require Masters courses to contain material (lectures, laboratories) and assessment that is substantial different or extends beyond material offered to undergraduates. It is permissible for undergraduates to complete Masters-level subjects.

MTEC no longer coordinates the Minerals Geoscience Masters Program that was offered through JCU, UTas and UWA. The School of Petroleum at Adelaide, however, retains its strong industry backing and offers a range of courses tailored for entry into the petroleum industry. Curtin has a wide variety of post-graduate course options. The National Centre for Groundwater Research and Teaching played an important role in postgraduate training in groundwater, but this has been declining due to the wind-up of federal funding.

Research Masters are being increasingly offered as an alternative to Honours, as they provide a stronger pathway into PhDs and are more recognised qualifications outside Australia (Honours being additional high-level undergraduate study in Australia but just a form of accolade to high performing students in most other countries).

A number of universities offer geoscience coursework Masters programs. In some cases these are designed to provide direct pathways into industry such as the MSc in Groundwater Hydrology at UWA, the MSc in Petroleum Geoscience at Adelaide, the Master of Mineral Resources (Exploration Geology) at UQ, and the geophysics major in the MSc at Curtin. Many such programs have a large proportion of international student enrolments.

[12] TEQSA, 2015. Higher Education Standards Framework (Threshold Standards). Tertiary Education Quality and Standards Agency (TEQSA), Canberra. www.legislation.gov.au/Details/F2015L01639.

Continuing professional development and micro-credentials

In the past, many graduates were offered professional practice programs with companies. Contraction in the resources sector has reduced the availability of such graduate programs for newly-minted geos, although there is some evidence that these programs are expanding again.

Most professions are ramping up the requirements for continuing professional development (CPD) to retain membership of professional associations or even retain the right to practice. This provides great opportunity for universities to partner with the professional and technical associations or directly with companies in the design and delivery of postgraduate and professional training, including on-line courses.

Linked to CPD is the concept of "micro-credentialling" through which individuals can obtain independent confirmation of specific skills, knowledge or experience. There is minimal regulation of micro-credentials or "digital badges". They can be issued by universities, professional associations and commercial education providers. A digital badge might be awarded by a university or in partnership with a professional institute (e.g. AIG or AusIMM) or other entities.

While there is a market for stacking such credentials to obtain credit against subsequent formal qualifications or to meet CPD demands, experience in the business and engineering sectors indicate value is largely just in the micro-credential itself and the advantage this will bring in industry recognition for the recipient. In the long run, micro-credentialling systems may supersede the traditional coursework masters, where such programs are used to extend professional skills rather than as a pre-requisite for employment.

Undergraduate student numbers

Total annual EFTSL for the universities surveyed for the period 2003–2017[13] is presented in Figure 1. Trends for individual departments are provided in Appendix 1. It is again emphasised that the definition of "geoscience" varies between institutions and that some adjustment of the raw data and interpolation was necessary to provide a common basis for calculating taught load and continuity of the data from 2003 to 2017. It is also noted that the data relate to all geoscience subject enrolments, including those undertaking or intending to undertake geoscience majors and those undertaking geoscience subjects as free electives, but have generally excluded specific servicing subjects offered in other non-science degrees.

The total EFTSL for the sector and contribution from each level display an exponential rise from 2003 to 2012, with a more than doubling of undergraduate enrolments from around 1,500 to around 3,500. This was followed by a rapid decrease between 2014 and 2017. The 2012 enrolments were the highest in some upper level undergraduate subjects since the 1970's nickel boom or even for all time. One university reported for the first time the need to place an upper limit on enrolments in a field mapping subject.

The pattern of taught load nationally is nearly identical to that of expenditure on mineral exploration in Australia over the period (ABS 2017), but with a two-year lag. There was only weak temporal correlation with petroleum expenditure (though this has more impact on Masters enrolments). While the data emphasise the traditional link between the health of the main employer of graduate geoscientists and university enrolments, the 2012–2017 data is less correlated with the mineral expenditure (showing a slower decline in enrolments than in exploration expenditure) than for the 2003 to 2012 growth curve. This is partly attributed to

[13] Some universities first reported data in the 2017 survey.

universities integrating geoscience into other programs and attracting students in other science or non-science programs to take some geoscience subjects.

Of all the sciences, geoscience typically displays the highest ratios of students continuing from first year into upper level geoscience subjects or majors. This is probably a function of the low proportion of students completing level 1 geoscience subjects to fulfil core requirements in non-geoscience degrees compared with mathematics, chemistry or physics.

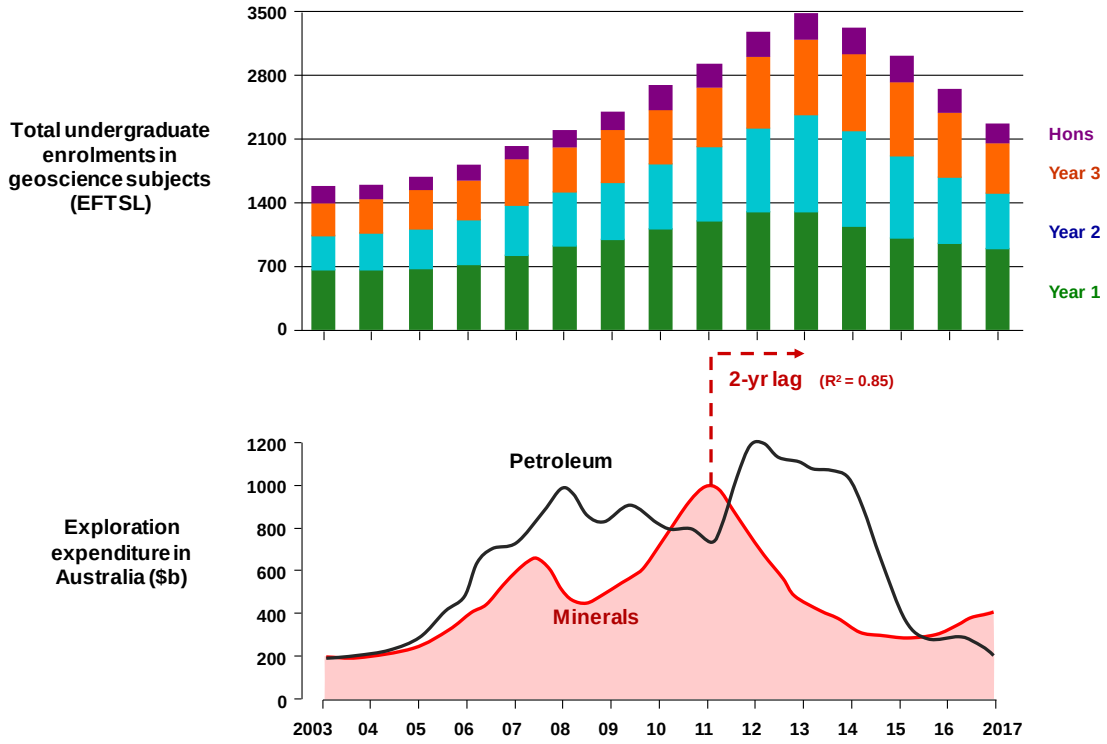


Figure 1. Comparison between total undergraduate enrolments (by level) in geoscience subjects in surveyed Australian universities and expenditure on minerals and petroleum exploration in Australia 2003–2017.

The enrolment trends are not uniform across the universities surveyed. Departments can be divided into four groups (Figure 2). The first follow the overall national trend with peak values around 2012/2013 and subsequent significant drops (e.g. Adelaide, UWA and Curtin). The second had significant growth to 2012 but a more gradual subsequent decline (e.g. Monash, QUT and UNE) and the third had minimal net change between 2003 and 2017 (e.g. Melbourne and Sydney). The last group had slight changes between 2003 and 2013 followed by declines to enrolment numbers at or below the 2003 benchmark (e.g. UTas and UoW). In such groupings there is no relationship to the size of the institution, but some differences between the mining and non-mining states.

Adelaide and Curtin have the largest enrolments, with the total EFTSL just under 300 in 2017 – around 13% of the national total each. This is followed by Monash, Sydney, UNSW, Melbourne, Macquarie and UQ reporting over 100 EFTSL (Figure 3). While the study did not survey the specific disciplines in which students completed Honour or Masters, the proportion undertaking geophysics is significantly lower than other disciplines such as geology or geochemistry.

There is a significant pipeline effect in enrolments from level 1 to upper level (partly exacerbated by the number of students undertaking part-time degrees these days). This does not mitigate against swings but delays the response in student numbers to changes in external environment and in university intake profiles.

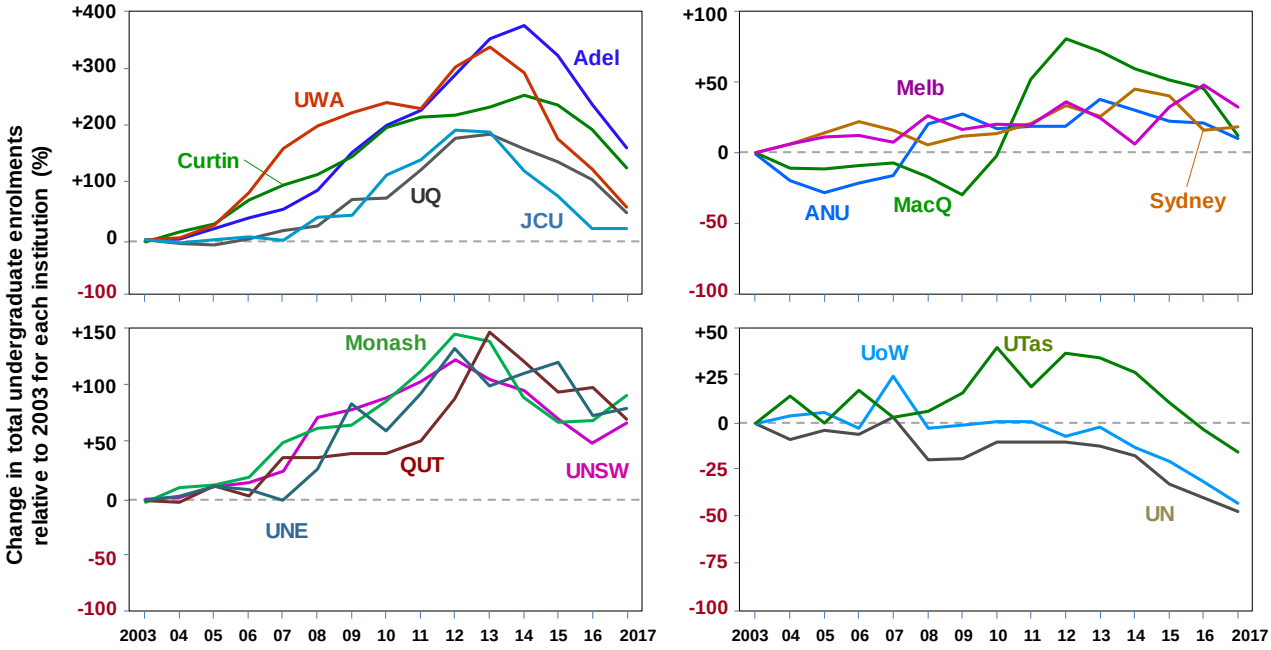


Figure 2. Relative changes in geoscience undergraduate enrolments from 2003–2017 for surveyed universities relative to 2003 enrolments. Note that data for Melbourne, UWA and MacQ have been adjusted to account for the progressive change from Honours to a 3+2 degree model.

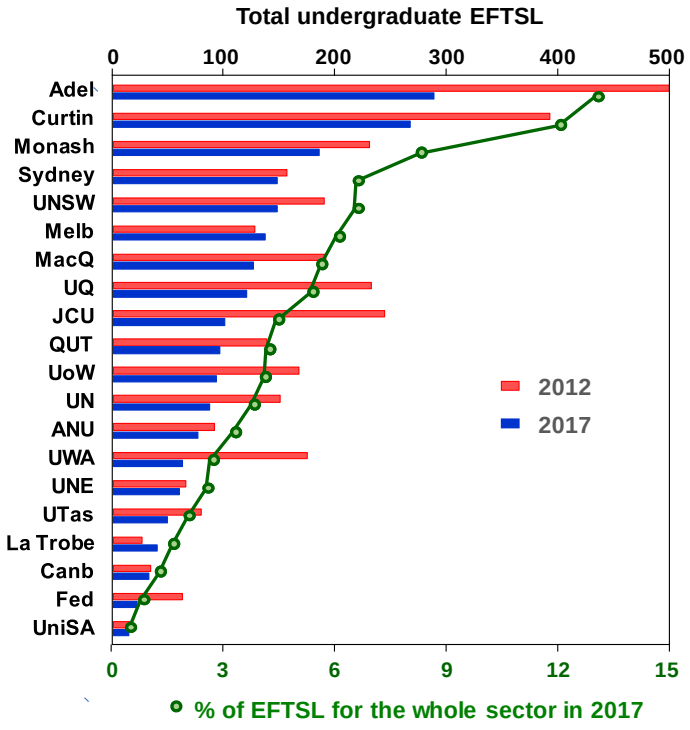


Figure 3. Geoscience undergraduate enrolments (EFTSL) and the proportion of the national total in various Australian universities in 2012 and in 2017.

Retention rates

Retention rates are difficult to determine in the first two years. Unless individual students are tracked, simple analysis of average class sizes will provide quite misleading indications of retention rates from first year through to Honours, given the large enrolments of students not undertaking geoscience majors and increasing availability of geoscience subjects in other degrees or majors.

Across the sector, the average ratio of level 3 to level 2 EFTSL is 83±25% and Honours to level 3 is 54±42%. This has not varied significantly since 2003. Universities reporting the lowest progression from level 3 to Honours (or contiguous Masters) are losing a higher proportion to environmental sciences or other Honours programs. In some of the mining states many students obtain jobs in industry rather than continuing to Honours.

Along with biology, geoscience has traditionally had a high proportion of students going onto Honours than other sciences. This has been strongly pushed by departments by emphasising to third year students the need to building up field or laboratory experience, project management and communication skills, to improve employment prospects or provide the pathway into research higher degrees.

Degrees awarded

Taught load relating to students intending to practice as geoscientists is generally indicated by Honours and Masters graduations (Figure 4), though it is again noted that in the mining states a higher proportion of students leave university with just the undergraduate degree. In 2017, approximately 325 BSc (Honours) and MSc coursework degrees were awarded, compared with just 180 in 2003. The patterns are less consistent for the individual universities than for the sector (Figure 5) with some showing large growth over the period (e.g. UQ and Macquarie) and others showing fairly stable numbers of completions (e.g. Sydney, ANU and Melbourne). These are closely related to undergraduate enrolments at levels 1 to 3 in most universities, but in a few cases (e.g. Curtin), a significant driver has been overseas enrolments in Masters programs.

PhD completions reached a low of 74 in 2011 but have since grown to around 170. Given a PhD in geoscience typically takes four years to complete, the pattern in Figure 4 can be linked at a national level to both Honours completions and the minerals cycles (downswings generating “recession PhDs”). Although the patterns across the various institutions are erratic, there is some correlation with Honours graduations and changes in the number of research-and-teaching or research-focussed academic staff numbers (Figure 6).

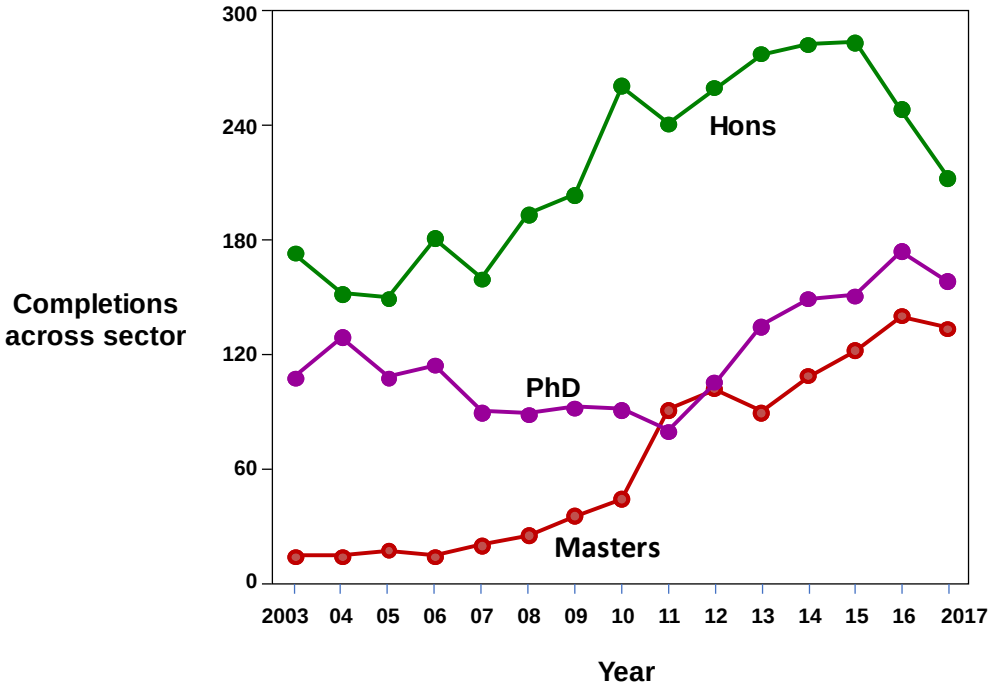


Figure 4. Honours plus coursework Masters and PhD completions from 2003–2017 across the sector.

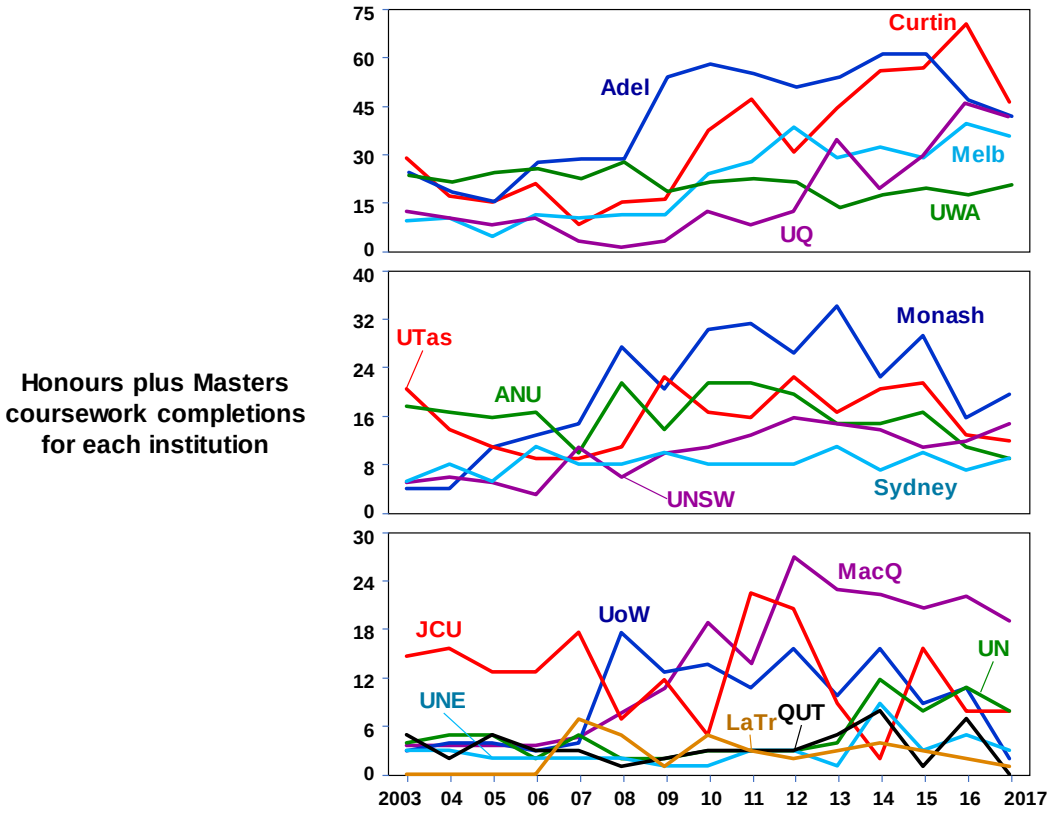


Figure 5. Honours and coursework Masters completions from 2003–2017 for individual surveyed Australian universities.

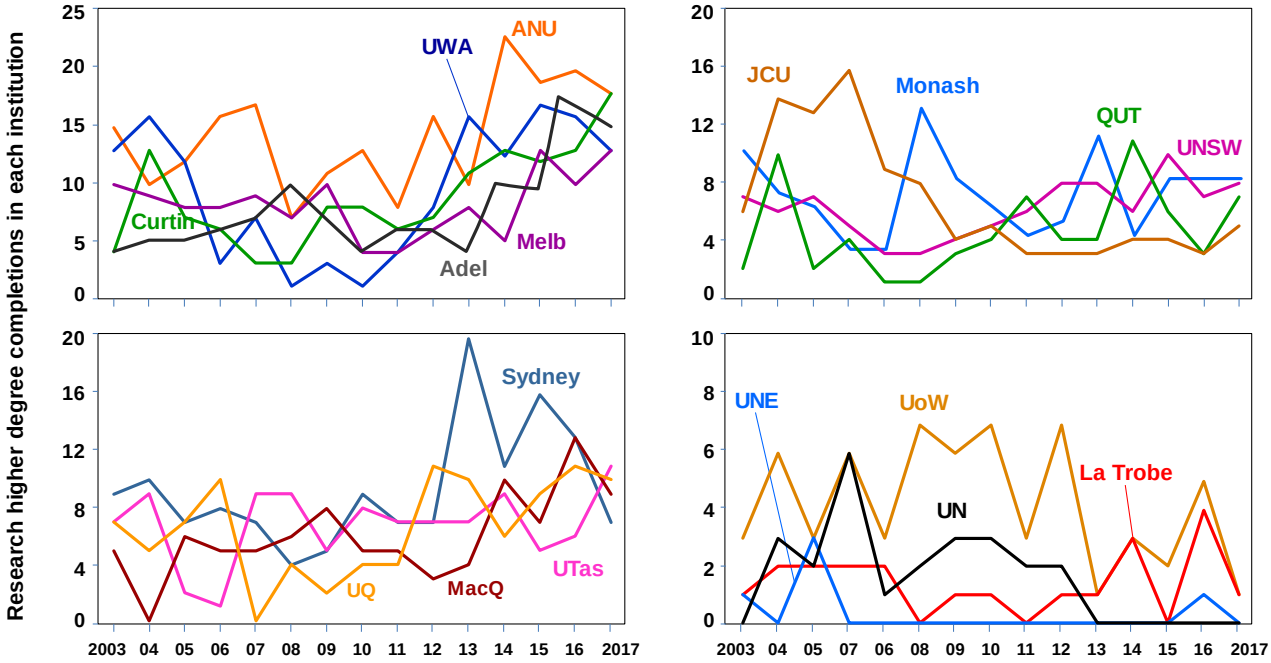


Figure 6. Research higher degree completions from 2003–2017 for surveyed Australian universities.

Staffing profiles

Academic staff generally divide into the traditional research-and-teaching or teaching-focussed groups that are primarily funded from university operating budgets, and research-focussed[14] staff that are typically funded externally. Research-focussed staff include those with continuing positions that have obtained externally funded fellowships via the ARC or secondments to CRCs, and those with contract positions (postdocs and research associates) that are mainly funded through external grants to staff or those who hold fellowships in the own right (such as ARC DECRAs). Some universities have internally-funded research-focussed positions. The survey requested data on these various divisions. It is noted that there are significant inconsistencies in the reporting of staffing numbers between the various surveys which may reflect differences in interpretation of who was a "geoscience" staff member and whether short term contract positions (such as postdocs) were included.

In 2017, there were 485 FTE in academic staff, which is significantly up on the 418 employed in 2012 and 354 in 2007 (Figure 7). Of the 485 staff, 220 were involved in teaching and 205 just in research (or with minimal teaching responsibilities outside Honours supervision). Some of the staff changes reflect on-going department mergers but broadening of the definitions of "geoscience". In some cases, mergers of departments have resulted in large increases in the number of "geoscience" staff in one department (e.g. merging atmospheric science and physical geography with geoscience at Monash, and the Climate Change Research Centre coming under the School of Biological, Earth and Environmental Sciences at UNSW).

Many universities are instituting formal teaching-focussed positions to lead educational development and lighten the teaching loads for high performing researchers. There is greater opportunity for staff to move into research-focussed roles using internal strategic funds, where previously such positions were linked to external fellowships. In effect, universities are moving

[14] Nearly all so-called "research-only" academics above level B undertake honours supervision and some teaching.

towards a continuous spectrum from teaching-focussed to research-focussed academics as best fits the needs of a department, and the specific interests and opportunities for staff.

There are five departments with <10 academic staff, six with 10-20 staff, five with 20-40 staff and four with >40 staff (ANU, Curtin, UQ and UWA). The greatest single increase has been in level B teaching positions (lecturers), but there has been a significant overall increase in continuing positions, which is critical to the ongoing viability of geoscience programs.

The question asked in AGTEP 2007 remains highly pertinent: *"What is the minimum economic department size that is sustainable in the longer run*?". This should be linked to the question "*What is the minimum number and disciplinary spread of academic staff required to deliver a coherent geoscience program*?". The first question is difficult to answer as university budgets are more complicated than Harrison's Chronometer and the relationship between income to the university and support for departments is distinctly non-linear. The second depends on the way programs are structured and the balance between core geoscience disciplines (e.g. mineralogy, structural geology, geochemistry and geophysics), areas of specialisation or abandonment by departments, and the design implications on the upper level subjects offered. There has been increased incorporation of subjects outside the traditional definition of geoscience in both core and electives (e.g. GIS, remote sensing, statistics). The days of having four continuing research-and-teaching petrologists on deck are distant memories for most departments.

Whereas enrolments are a significant driver in budgets, this mostly affects continuing staff appointments. Contract appointments (e.g. postdoctoral researchers and ARC fellows) depend on success in obtaining research funding from the various sources available. Some departments made contract appointments during the recent boom to handle the increased teaching loads.

Unlike mining engineering, it has been difficult for geoscience departments to secure industry-funded chairs.

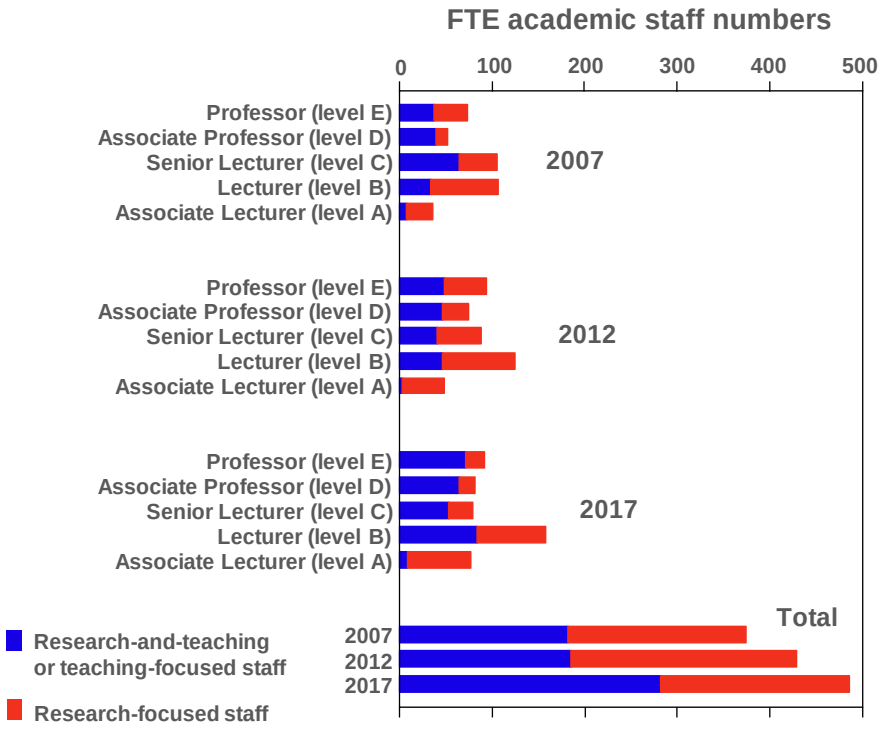


Figure 7. Academic staff numbers in Australian universities earth science departments in 2007, 2012 and 2017, divided into research and teaching or teaching-focussed staff and research-only staff.

Most departments indicate problems making appointments into vacant continuing positions due to declining EFTSL. Possibly as a protection against further Federal funding cuts, many universities are reducing department-based professional support staff in favour of more centralised positions.

As a consequence of complexities in the budgetary drivers for staff appointments and various strategic considerations in the determination of staffing profiles, there is only weak correlation between undergraduate EFTSL and staff numbers (Figure 8). ANU and UWA sit off the main trend due to high research-focussed staff numbers and Monash and Adelaide carry high student loads for their reported staff numbers.

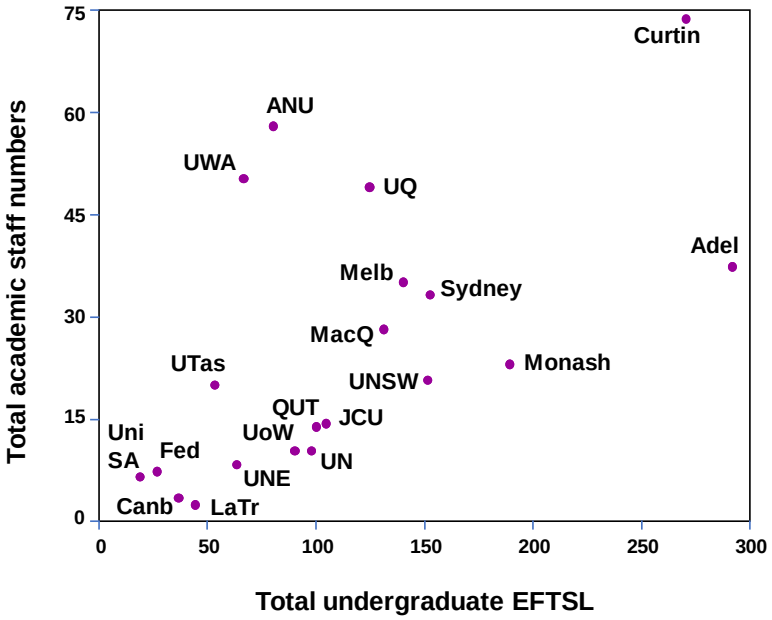


Figure 8. Correlation between undergraduate teaching EFTSL and FTE academic staff.

Teaching load expectations vary, with the research-intensive universities typically having smaller face-to-face teaching workloads but higher postgraduate supervision loads than the smaller teaching-intensive universities (partly a function of the number of staff versus the syllabus that needs to be covered). Some departments place a proportion of upper level subjects onto a two-year rotation to maintain sufficient class sizes.

The schools sector (K-12)

In 2007 the lack of awareness of geoscience in our secondary schools was considered an issue. This was seen in the context of the dearth of science teachers and other problems in the STEM disciplines. A lack of scientific literacy in the general population does not serve the development of science policy, or assist the sector in encouraging support for higher education and research in geoscience.

Based on recommendations of the Australian Curriculum, Assessment and Reporting Authority (ACARA), the earth sciences are now more firmly ensconced in the K–10 national curriculum. ACARA has promulgated an agreed (but only indicative) curriculum for use with year 11–12 Earth ± Environmental Science subjects (Table 2)[15].

[15] ACARA, 2017. Earth and Environmental Science. Australian Curriculum, Assessment and Reporting Authority. www.australiancurriculum.edu.au/senior-secondary-curriculum/science/earth-and-environmental-science.

Table 2. Earth and Environmental Science syllabus proposed by ACARA (2017).

Unit 1: Introduction to Earth systems	**Unit 2: Earth processes – energy transfers and transformations**	**Unit 3: Living on Earth – extracting, using and managing Earth resources**	**Unit 4: The changing Earth – the cause and impact of Earth hazards**
Examples in context:	*Examples in context:*	*Examples in context:*	*Examples in context:*
• Changing views on the age of Earth	• Biological soil crusts and nutrient cycling in Australian rangelands	• Carbon pricing	• Should scientists be held responsible for evaluation of earthquake risk?
• Evidence for a 'sixth extinction'	• Climate change and the global ocean conveyor	• Coal seam gas extraction in Australia	• Salinity in Australia
• Evidence for changes to the Australian environment over time	• Closed ecosystem models	• Food security and protecting agricultural biodiversity	• Urban development planning for severe weather events
• Water and the search for life on other planets	• Development of plate tectonic theory	• Locating and assessing resources for extraction	• Anthropogenic climate change – what's the evidence?
• Modern processes as analogues for ancient processes	• Geothermal energy	• Maximum sustainable yield models and fisheries	• Predicting future climate change and identifying action
• Monitoring Earth's atmosphere	• Marine primary production	• Putting a dollar value on ecosystem services	• Uncertainty and climate change science
• Understanding the interior of Earth	• Measuring plate movement		
• Evidence for the origin of life	• Predicting the weather		

In Years 11 and 12, Queensland and South Australia offer an Earth Science course. NSW, the ACT and WA offer the slightly broader Earth and Environmental Sciences courses. Environmental Science offered in Victoria and Tasmania contains some earth science components but is biology-dominated. Most states report gradual increases in the number of schools offering ES or E&ES subjects over the period of the AGTEP surveys although typically <20% of schools offer them. This is partly related to availability of suitably qualified or interested teaching staff or likely student demand.

The geoscience community has been helping teachers with the earth sciences, by developing new teaching resources and associated training, in a number of states. Universities and the AGC have continued to provide some support for Earth Sciences WA (ESWA)[16] and the Teacher Earth Science Education Program (TESEP)[17], as well as the earth science Olympiad teams[18].

Most departments maintain a range of outreach activities – visiting school, inviting school students on campus, interacting with secondary school teachers, running field trips and hosting work experience students. Some are organised at university or faculty level, others at department level and the rest left to the decision of individual staff.

TESEP continues to provide a large number of workshops in urban and rural centres, with nearly 1,500 teacher attendances. The program is delivered by professional teachers under the auspices of the Australian Science Teachers Association. Many departments are involved in TESEP or state-bases science teacher associations in provision of teaching materials and assistance with case studies or examples (lab and field) for use against the syllabus requirements or learning outcomes.

[16] www.earthsciencewa.com.au

[17] www.tesep.org.au

[18] www.asi.edu.au/programs/australian-science-olympiads/

Attracting students into geoscience

There is no evidence of a strong correlation between Year 12 ES or E&ES candidature and enrolments in first year geoscience courses at universities. As per long-standing tradition, many students take level 1 geoscience subjects as their "fourth option" to complete their breadth requirements or avoid the more numerically-challenging disciplines.

Whereas the earth and environmental sciences are embedded in the national K–10 syllabuses, in senior secondary, E&ES enrolments are very low compared with other sciences and mathematics (Figure 9). Efforts to achieve a major lift in student enrolments in geoscience, by marketing to high schools, have had little overall demonstrated effect. Geoscience enrolments are strong in Victoria despite having no E&ES subject at senior high school.

Little rigorous scientific investigation of the decision-making process in school-leavers has been conducted. Consensus is, however, that students are guided more by overall university reputation (and the "cost" in ATARs to get admission). This is followed by a general desire to study in a broad field such as "science", with some influence exerted by parents and schoolmates, rather than some innate desire to become a geologist following a Damascus Road experience in a school E&ES class. It is likely that the prominence of the resources sector in WA is a stronger influence on school leavers nominating geoscience as their preferred program than in other states.

This is not to say that geoscience departments should not expend significant efforts in marketing "science" and trying to attract high performing students to strengthen future undergraduate and PhD cohorts. There is benefit in publicising great geoscience stories in the media and elsewhere, given the effects this can have on general university reputations, the disposition of governments to funding education and research, and improvements in geoscience literacy in the agora. Many geoscience departments have staff who are brilliant at such external engagement – and have exciting material to work with. The fight to attract top students is almost as important as building up overall student numbers.

University funding

While research funding generates a proportional block grant from the Federal Government to help defray the true cost of undertaking research, most university income is derived from teaching. Most expenditure is on staff. Geoscience (the "earth sciences"), along with most other sciences and engineering, are in the high cost clusters for CSP (Table 3). Universities currently receive ~$27,000 per geoscience EFTSL per year. After central and faculty overheads, departments typically receive 35 to 45% of the income generated.

Universities do not largely fund departments in direct proportion to income generated, though some do. This has benefitted science and medicine who typically receive significant cross-subsidisation from engineering and business faculties to reflect their high cost of delivery, the hidden costs of research and the importance of science and medicine in establishing a university's research reputation. Geoscience is generally cross-subsidised by other sciences and mathematics. Part of the justification for this has been the strong research performance of the earth sciences. At the discipline level, departments cross-subsidise most upper level courses with the income from the large first year enrolments.

While most university budget models are designed to mitigate against short-term swings in student demand, there is an inevitable trend to rewarding disciplines displaying growing demand with additional staff numbers and the opposite for waning fields. For most universities, the financial breakeven in the sciences is around 35 students in a class.

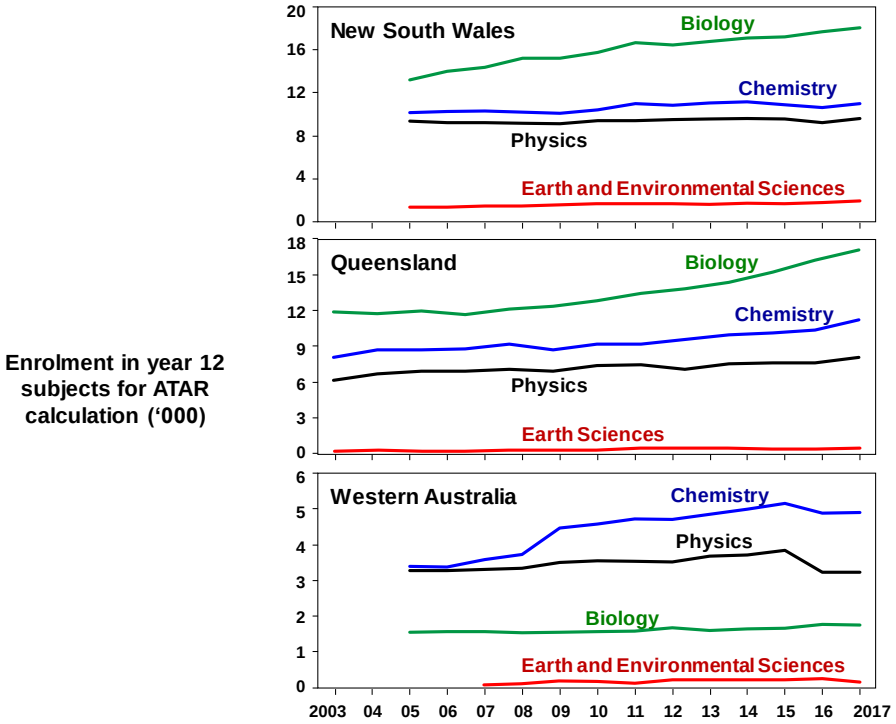


Figure 9. Year 12 enrolments in biology, chemistry, physics and earth & environmental sciences in NSW, Queensland and WA 2003-2017 (NESA, QCAA and WACC, 2006–2018)[19,20,21].

Table 3. Funding clusters, Commonwealth Government funding (CSP places) and student contribution bands according to field of education codes (DET 2017)[22].

Fields	Max. student contribution	Commonwealth contribution	Total maximum funding
Humanities	$6,349	$5,809	$12,158
Law; business; economics	$10,596	$2,089	$12,685
Behavioural science; social studies	$6,349	$10,278	$16,627
Education	$6,349	$10,695	$17,044
Clinical psychology; foreign languages; visual and performing arts	$6,349	$12,641	$18,990
Mathematics; statistics; computing; built environment; other health	$9,050	$10,278	$19,328
Nursing	$6,349	$14,113	$20,462
Allied health	$9,050	$12,641	$21,691
Engineering; science (incl. Earth Sciences); surveying	**$9,050**	**$17,971**	**$27,021**
Agriculture; environmental studies	$9,050	$22,809	$31,859
Dentistry; medicine; veterinary science	$10,596	$22,809	$33,405

[19] NESA, 2003–2017. HSC Facts and Figures. Series of reports. educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/about-HSC/.

[20] QCAA, 2003–2017. Subject enrolments and levels of achievement. Queensland Curriculum and Assessment Authority. Series of reports. www.qcaa.qld.edu.au/publications/statistics.

[21] WACC, 2006–2017, Senior Secondary Education Statistics, Curriculum Council, Perth. Series of annual reports. https://www.scsa.wa.edu.au/publications/reports/statistical-reports/secondary-education-statistics.

[22] DET, 2017. Allocation of units of study to funding clusters and student contribution bands according to field of education codes. Australian Government Department of Education and Training.

The move to a demand-driven undergraduate model by the Federal Government in 2012 saw a massive increase in overall enrolments in 2012 (up 9.6% on 2011) but this has settled back to ~1.5%. The growth was not even. The current Federal Government has since abandoned the demand-driven system and made cuts to university funding. Compared with engineering and business, geoscience does not generate significant international student load at the undergraduate level, but some departments do at postgraduate level.

Education is Australia's second largest export industry after minerals and energy, delivering over $22b[23] of exports in 2017. The dominant market is China. The main beneficiaries of overseas student growth have been engineering and business, particularly in the eastern states. Secondary benefits have accrued directly to mathematics, chemistry and physics through service teaching, and indirectly to geoscience through the flow of funds into science faculties.

Research fields

The distribution of research capabilities generally follows the teaching profile. Most universities surveyed indicated they can supervise research students (implying staff are working themselves in such fields) across most of the field of research codes (FORC) under 04 Earth Sciences (Figure 10). 0402 Geochemistry, 0403 Geology and 0406 Physical Geography and Environmental Geoscience are well-supported across the sector, whereas 0404 Geophysics has fewer departments with capabilities in more than one or two sub-fields. Some important disciplines, such as hydrogeology, are distributed across other disciplinary groups.

There are some discrepancies between the span of disciplines indicated by the various departments and the fields where there were sufficient research outputs to be evaluated as part of the ARC ERA exercise in 2015 (Appendix 4).

Research funding

The principal sources of funding for geoscience research are ARC grants (Discovery, Linkage, LIEF, Centres of Excellence, and various fellowship schemes) and the Cooperative Research Centres program. Mineral and water resources have been a priority areas for funding at various times. Nearly every university that maintains a geoscience department or group and delivers geoscience teaching programs has participated in one or more of the ARC CoEs or CRCs.

Science accounts for ~50% of the ARC grants (Figure 11). Within science, geoscience accounts for ~12% of the grants and of this ~80% goes to geology, geochemistry and atmospheric sciences. There has been a slight growth in the proportion of funding going to geoscience, but this appears to simply reflect increased academic staff numbers. With 5% of overall ARC funding (excluding DECRAs), significant income from other National Competitive Grants Schemes and other funding sources, geoscience is a major contributor to university research productivity and reputations. Most universities are therefore willing to underwrite the cost of delivery of geoscience programs and infrastructure via cross-subsidies.

The ARC Centres of Excellence (CoE) program has continued to boost high quality research, research training and some senior undergraduate teaching. During the last five years, funding for the CoE for Climate Extremes and the CoE for Australian Biodiversity and Heritage commenced. ARC support for the National Centre for Groundwater Research and Training (NCGRT), the CoE for Climate Systems Science and CoE for Core to Crust Fluid Systems (CCFS) finished.

[23] dfat.gov.au/trade/resources/trade-at-a-glance/Pages/top-goods-services.aspx

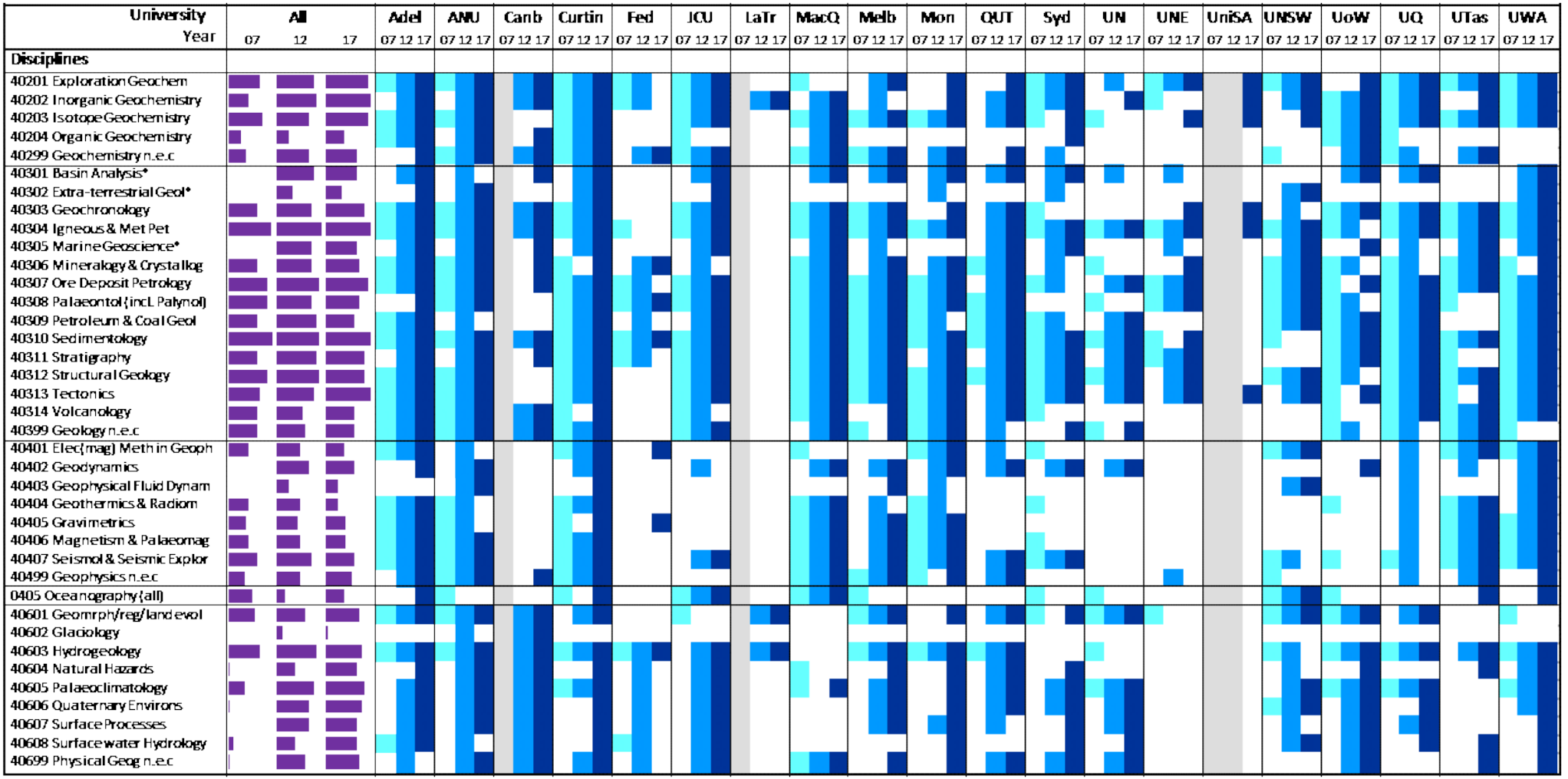


*Figure 10. Profile of capability at surveyed Australian universities to supervise geoscience theses in the 2007, 2012 and this survey. *indicates not listed in 2007 FORC. Grey columns indicated no data.*

University-supported research centres such as GEMOC (Macquarie), the Institute for Geoscience Research (Curtin) and the Centre for Exploration Targeting (UWA) have also generated significant research momentum, even after the majority of the external core funding ceased, as is the case with the Centre of Excellence in Ore Deposits (CODES) based at UTas.

The CRCs for Coal in Sustainable Development, Greenhouse Gas Technologies (CO_2CRC), Landscape Environments and Mineral Exploration, and Predictive Mineral Discovery have ceased. The MinEx CRC will be funded from 2018-2027 with $90M cash and over $165M in-kind support from industry and government partners. The Uncover initiative will feature prominently in the Australian Academy of Science Decadal Plan for the Earth Sciences (AAS, 2018)[24].

A number of Linkage Infrastructure, Equipment and Facilities (LIEF) grants have been awarded to consortia of geoscience groups from a number of universities, including the $10m LIEF grant to fund the Australian and New Zealand IODP Committee (ANZIC) membership of the International Ocean Discovery Program. It has also funded major analytical instruments and facilities at UQ, Melbourne, UoW and elsewhere. In addition, most geoscience departments receive substantial direct industry and government support for research, further improving their financial viability.

University rankings

Universities are very protective of their reputations and international rankings. This influences the choice of staff and students (especially international) whether to come to a university. Many international students will not enrol in a university unless it is ranked in the top 100.

There is a growing array of university quality and reputation ranking systems, including QS, ARWU, Times Higher Education, Excellence in Research Australia (ERA) and the Leiden. These tend to be research-dominated. Universities are becoming more concerned with educational rankings and performance including the Quality Indicators for Learning and Teaching student evaluation surveys, course experience surveys, graduate outcomes and various internal university evaluation systems. In most cases, geoscience is grouped within larger physical sciences clusters.

Although only half of the Australian universities had sufficient research outputs in 04 Earth Sciences to be evaluated by the 2015 ARC ERA assessment[25], 14 of the 20 universities were determined to be above world standard, one well above, and none below world standard (Figure 12). Some geoscience is incorporated into the environmental science cluster.

In the 2017 QS rankings (Table 4), Australia performed very well in the earth and marine sciences with 12 in the top 100 world-wide, led by ANU (13th), Melb (36th), UNSW (42nd), UWA (43rd) and UTas (49th) and JCU, UQ, MacQ, Curtin, Sydney, Adelaide and Monash grouped 51–100th. This is a spectacular result for the earth sciences when compared with other science disciplines.

S, 2018. *Our Planet, Australia's Future:* Strategic plan for a decade of transition in Earth Science. Being prepared by the National Committee for Earth Sciences, Australian Academy of Science, Canberra.

[25] ARC, 2015. Outcomes of the 2015 ERA (Excellence in Research Australia). Australian Research Council, Canberra. www.arc.gov.au/era-outcomes-2015.

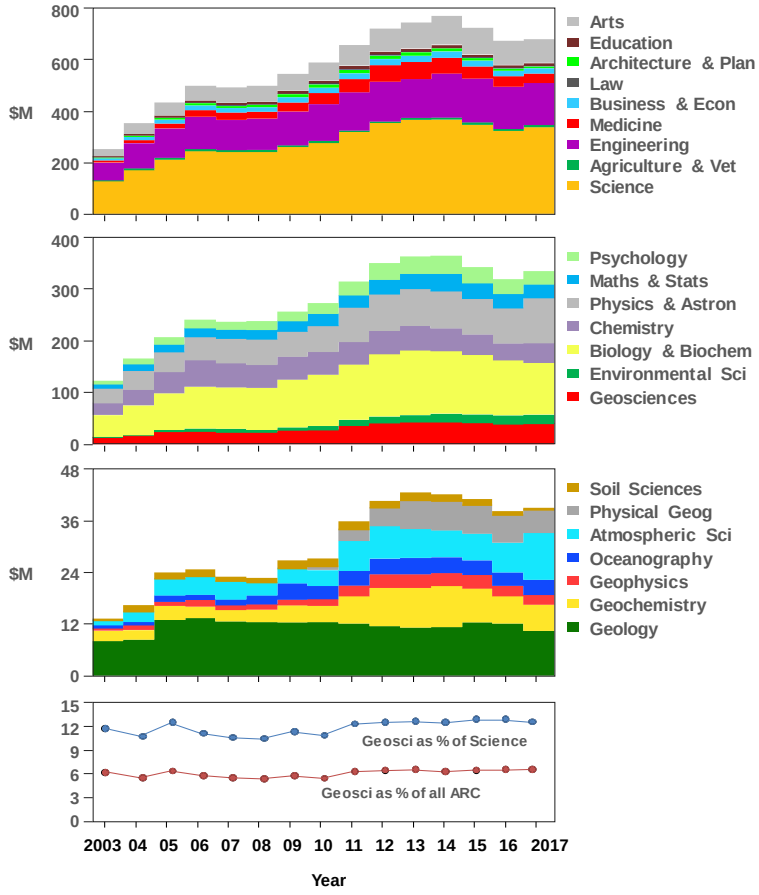


Figure 11. Changes in ARC funding for Discovery, Linkage and Centres of Excellence programs for the period 2003–2017 by main disciplinary clusters, two-digit and four-digit (geoscience) FOR codes, and relative portion of funding for the earth sciences.[26] Hydrogeology funding is distributed within other categories.

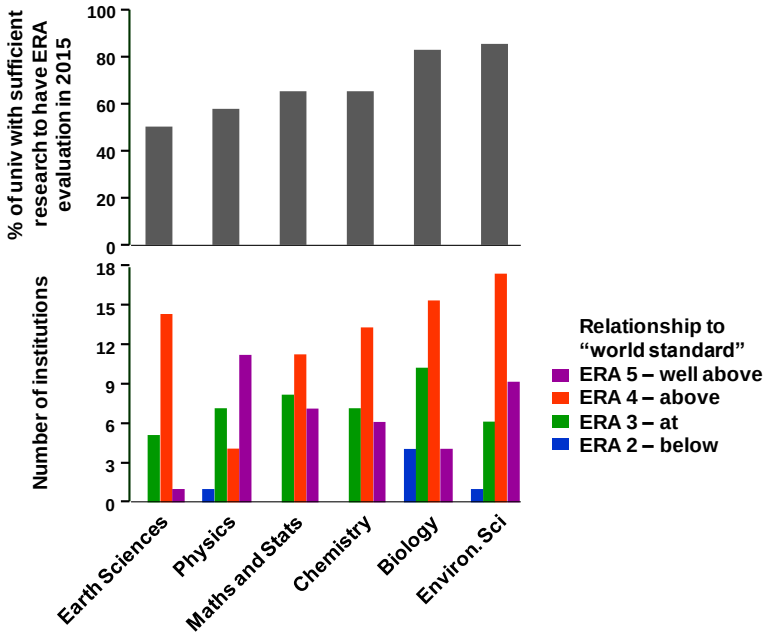


Figure 12. ERA ratings for science disciplines in the 2015 evaluation by the ARC (ERA, 2015).

[26] ARC, 2003–2018. Research funding outcomes for the ARC National Competitive Grants Scheme. Australian Research Council, Canberra. www.arc.gov.au/grants-dataset.

Table 4. QS World university rankings for earth and marine sciences for selected leading universities, and those Australian universities in the top 100 by the QS ratings system (QS, 2017)[27].

QS rank	University	Overall	Acad rep	Cites /paper	Employer rep
1	ETH Zurich	95.0	100.0	93.2	81.2
2	Harvard	94.7	92.4	94.6	100.0
3=	UC Berkeley	94.5	94.2	94.0	92.0
3=	Oxford	94.5	93.8	94.8	96.3
5	MIT	93.7	97.1	91.0	95.2
6	Cambridge	93.2	94.7	90.4	96.6
13	ANU	89.0	90.4	91.0	81.3
14	Toronto	88.9	83.8	95.4	86.7
15	Tokyo	88.6	89.8	86.8	83.2
33	Peking	84.2	79.4	85.9	92.6
34	McGill	84.0	81.3	89.4	82.2
36	Melbourne	83.6	82.5	88.7	76.7
42	UNSW	82.2	76.1	87.5	87.4
43	UWA	82.1	78.8	86.4	77.1
49	Tasmania	81.9	83.0	89.0	61.0
51-100	James Cook		86.0	86.9	52.2
	Univ. Qld		80.8	82.1	81.9
	Macquarie		78.7	91.4	62.4
	Curtin		75.6	87.3	77.5
	Sydney		75.2	88.4	83.9
	Adelaide		74.3	83.3	76.9
	Monash		71.8	88.4	84.0

AGC strategic plan

As the peak body representing eight professional and technical associations with a total of over 8,000 members, the AGC has a general role in coordination and support for geoscience matters nationally. The AGC has created an education committee to help develop and implement the geoscience education pillar of its new Strategic Plan (Figure 13) (GeoEdLink, 2017)[28]. Funding for support of education initiatives, include Kent Street Senior High School CoRE program, ESWA, TESEP, AUGEN and Australian Science Olympiads, has been provided through funds generated by the 34th International Geological Congress.

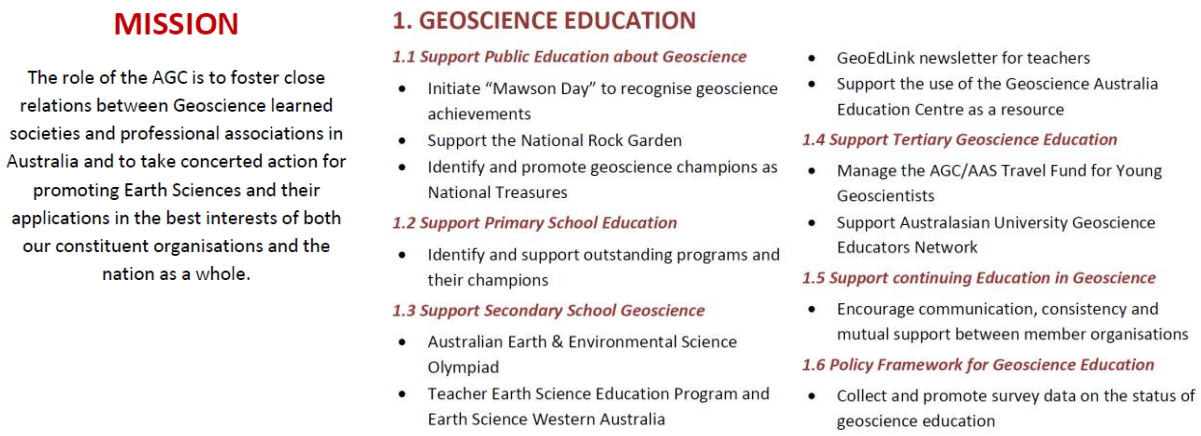


Figure 13. The geoscience education pillar of the AGC Strategic Plan.

[27] QS, 2017. The QS World University Rankings. https://www.topuniversities.com/university-rankings/world-university-rankings/2016.

[28] GeoEdLink, 2017. Australian Geoscience Council newsletter. www.geoed.com.au/AGCnletter/AGC_GeoEdLink_Feb17_edition.html#PR2

CONCLUSION

The principal purpose of this report has been to highlight the key data and trends in geoscience over the last 15 years obtained from surveys of participating universities and other information relevant to the tertiary education sector.

During the amalgamation-dominated phase for university departments in the 2000's, linked to the downturn in the minerals industry, many predicted there would be major contractions or eventual loss of geoscience from a number of universities. This has not eventuated, nor are there any indications that the more recent minerals industry slump will generate further substantial loss of continuing staff positions in the short term.

University structures appear less important to the health of geoscience than simply having a critical mass of collaborative and active geoscience staff, under capable leadership, and sufficient research productivity and student numbers to justify their existence.

Taught load has followed the minerals cycle since 2003, but there appears to be some decoupling of that link since 2012, especially in the non-mining states. Geoscience continues to establish itself as a fundamental science, capable of addressing a wide variety of scientific and societal challenges, beyond just resource discovery and exploitation. This is progressively translating into a wider pool of students that can be attracted into geoscience – some to follow a career in the geoscience professions and others taking a few subjects out of pure interest in the field. Time will tell whether the traditional degree models currently on offer, or even the centuries-old university structures themselves, will survive the disruptions of the digital age.

Whereas funding of departments is linked (to varying degrees) with student enrolments, research performance and the capacity of disciplines to enhance university reputation is growing as a factor in allocating budgets in this age of global metrification of performance (you are your H-index and QS ranking). Universities appear to be more cognisant of the need to engage in longer-term strategy – employing high quality staff with prospects of being able to build up large research teams over time and protected from the vagaries of student enrolment patterns.

While there are many reasons to engage in a wide variety of outreach activities as advocates of our disciplines and good citizens – from support of teachers in high schools to media appearances – these appear to have little direct effect on the intake to first year geoscience subjects. The rate-determining steps in most universities are a strong enrolment in first year across the sciences and provision of a great student experience in that first year to encourage students to continue onto a geoscience major. To this end, universities are becoming as keen to employ great educators as they are to attract top researchers.

Within university geoscience programs (degrees and majors) recent revisions to curricula are addressing the professional skills that will be required by new graduates in a progressively less predictable world (the resources industry included). This includes enhancing basic geoscience skills and knowledge through development of more effective teaching methods, a digital uplift for courses, more time devoted to field-based studies and work-integrated learning. While training of future professional geoscientists and researchers must remain a priority in program design, geoscience is entering into more pedagogical partnerships with other disciplines from environmental science and beyond to promote better integration across the sciences in teaching and collaboration in research.

Acknowledgements

The AGC is appreciative of the respondents for the time and effort they have put into the survey and in responding to an earlier draft. Without their cooperation this comprehensive survey would not have been possible:

Adelaide	Prof Graham Heinson and Dr Mark Bunch
ANU	Prof David Heslop
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Curtin	Prof Ian Fitzsimons
Fed	Dr Stephen Carey
JCU	Dr Jan Marten Huizenga and A/Prof Eric Roberts
La Trobe	A/Prof John Webb
Macquarie	A/Prof Nathan Daczko
Melbourne	Prof David Phillips
Monash	Prof Sandy Cruden
QUT	Dr Luke Nothdurft
Sydney	A/Prof Derek Wyman
UN	Prof Bill Landenberger
UNE	Prof John Paterson and Dr Luke Milan
UniSA	Dr Justin Payne
UNSW	A/Prof David Cohen
UoW	A/Prof Chris Fergusson
UQ	Dr Kevin Walsh and Ms Lara Atzeni
UTas	Dr Michael Roach
UWA	Prof Annette George

The AGC is indebted to Dr Trevor Powell, author of the two previous survey reports. Many of the observations in those previous reports remain valid and have been carried across to this report.

Ms Misha Pavelkova assisted with the data compilation.

The Author: David Cohen is President of the UNSW Academic Board and a member of the National Committee of Chairs of Academic Boards and Senates (CoCABS). He was Head of the School of Biological, Earth and Environmental Sciences at UNSW from 2008–2016. He is a Past-President of the Association of Applied Geochemists and has represented the AAG on the Australian Geoscience Council since 2010. He is chair of the AGC Education Committee and President-elect of the AGC for 2019.

Appendix 1: Data dashboards for university schools or departments based on the AGC questionnaire responses.

2017 Tertiary Education Survey Data Summary

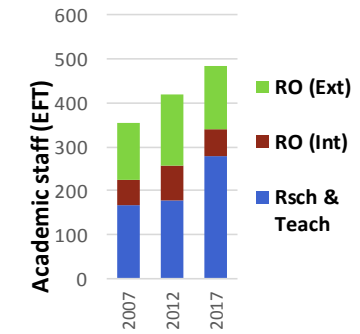
The Whole Sector

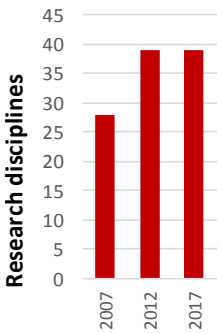
All Departments and Schools of Geosciences

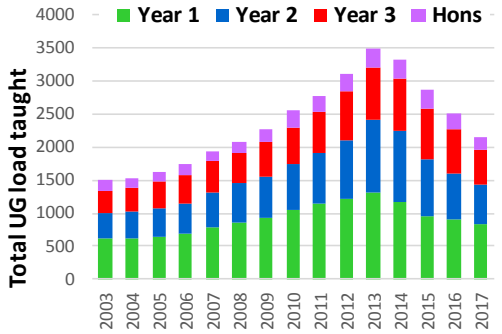
Degree and majors

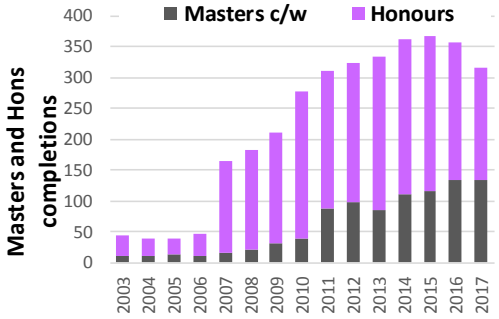
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic 40305 Marine Geoscience 40306 Mineralogy and 40307 Ore Deposit Petrology 40308 Palaeontology (incl. 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			









Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**67.0**	29.2	2.5	21.3	14.0	**90.8**	42.6	3.0	24.2	21.0	**90.8**	64.6	6.2	14.2	5.8
	Associate Professor (level D)	**46.1**	32.7	1.0	2.0	10.4	**70.5**	43.5	0.0	13.5	13.5	**79.9**	56.0	8.0	6.8	9.2
	Senior Lecturer (level C)	**104.3**	60.1	2.5	12.5	29.2	**85.4**	38.3	1.5	11.0	34.6	**78.2**	45.9	6.6	8.2	17.6
	Lecturer (level B)	**100.0**	28.2	5.5	14.9	51.5	**125.0**	38.1	8.0	22.5	56.4	**156.1**	56.2	25.1	18.7	56.0
	Associate Lecturer (level A)	**36.7**	4.9	2.3	4.5	25.0	**45.9**	2.1	1.0	6.5	36.3	**77.8**	6.5	2.0	13.5	55.8
	Total	**354.0**	**155.1**	**13.8**	**55.2**	**130.0**	**417.5**	**164.6**	**13.5**	**77.7**	**161.7**	**482.7**	**229.2**	**47.9**	**61.3**	**144.3**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	617	621	632	682	779	868	933	1051	1135	1219	1309	1160	954	894	836	50
	Year 2	374	396	436	470	535	581	611	684	777	876	1109	1083	863	701	590	114
	Year 3	343	363	401	412	468	454	537	556	614	744	793	802	761	667	523	176
	Honours	178	148	143	167	144	184	198	260	241	260	274	279	280	244	209	54
	Total	**1512**	**1528**	**1612**	**1731**	**1926**	**2087**	**2279**	**2551**	**2767**	**3099**	**3485**	**3324**	**2858**	**2507**	**2158**	**394**
Graduations from geoscience UG majors or Honours	BSc - geosci major	20	21	22	26	324	342	384	414	460	571	547	575	619	556	477	
	BSc (Hons)	34	30	26	38	150	163	179	239	225	227	249	251	250	223	182	
Graduations from PG programs.	Masters by research	22	33	22	21	15	12	9	13	14	11	24	26	27	40	33	
	Masters by csework	10	10	13	10	16	21	31	40	87	98	86	111	117	134	135	
	PhD	82	92	82	89	71	73	79	74	62	90	105	115	117	118	113	

2017 Tertiary Education Survey Data Summary

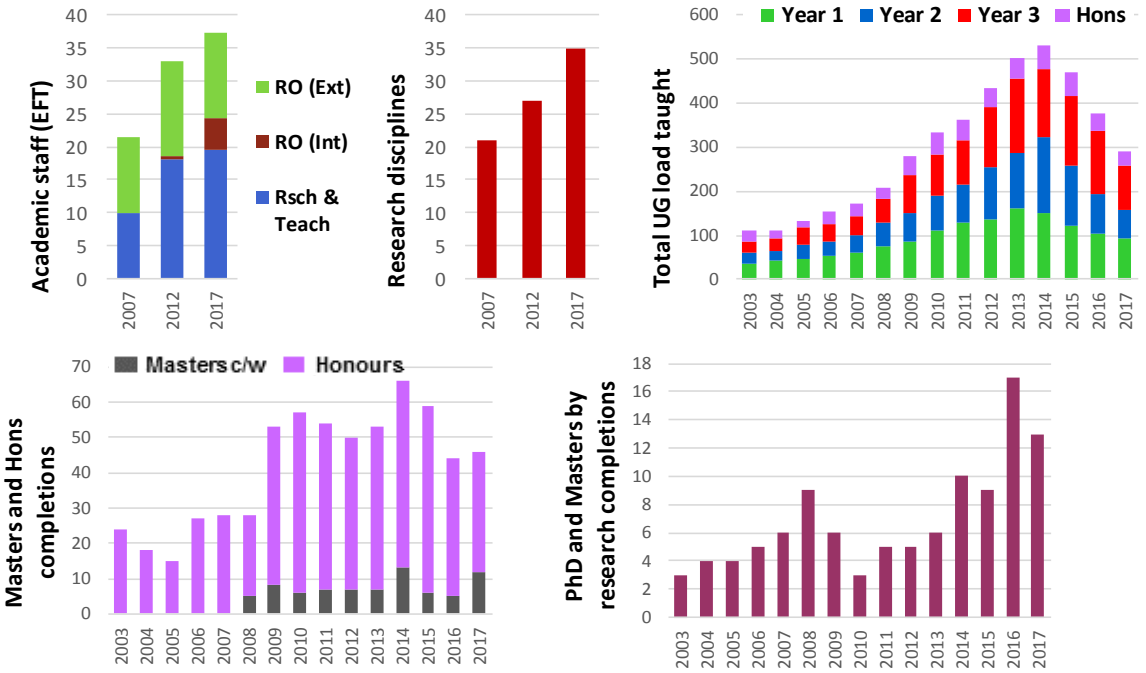
University of Adelaide (incl. ASP)

Department of Earth Sciences & Australian School of Petroleum

Degree and majors					
BSc	Geology	Geophysics and Applied Geology		
BSc (Mineral Geoscience)				
BSc (Honours)	Geology	Geophysics	Environmental Geoscience	Petroleum Geology & Geophysics

AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic 40305 Marine Geoscience 40306 Mineralogy and 40307 Ore Deposit Petrology 40308 Palaeontology (incl. 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			



Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**4.4**	1.4	1.0		2.0	**9.0**	5.2	1.0		2.8	**4.8**	4.2	0.2	0.2	0.2
	Associate Professor (level D)	**4.5**	2.5			2.0	**2.0**	2.0				**5.0**	2.0	1.0	1.0	1.0
	Senior Lecturer (level C)	**2.5**	2.5				**7.4**	3.8			3.6	**7.4**	2.6	1.6	1.6	1.6
	Lecturer (level B)	**4.5**	2.0			2.5	**6.5**	2.0	3.0	0.5	1.0	**16.0**	4.0	2.0	1.0	9.0
	Associate Lecturer (level A)	**5.5**	0.5			5.0	**8.0**	1.0			7.0	**4.0**	1.0	1.0	1.0	1.0
	Total	**21.4**	**8.9**	**1.0**	**0.0**	**11.5**	**32.9**	**14.0**	**4.0**	**0.5**	**14.4**	**37.2**	**13.8**	**5.8**	**4.8**	**12.8**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	34	41	48	55	61	74	84	110	130	136	160	152	120	104	92	2
	Year 2	27	23	31	30	40	53	66	79	85	117	128	170	136	90	64	4
	Year 3	26	30	38	41	41	57	86	94	101	137	168	154	160	142	100	7
	Honours	24	18	15	27	28	23	45	51	47	43	47	53	55	39	34	2
	Total	**111**	**112**	**132**	**153**	**170**	**207**	**281**	**334**	**363**	**433**	**503**	**529**	**471**	**375**	**290**	**15**
Graduations from geoscience UG majors or Honours	BSc - geosci major											72	59	58	70	51	
	BSc (Hons)	24	18	15	27	28	23	45	51	47	43	46	53	53	39	34	
Graduations from PG programs.	Masters by research	0	0	1	1	1	3	0	0	0	0	0	0	0	0	0	
	Masters by csework	0	0	0	0	0	5	8	6	7	7	7	13	6	5	12	
	PhD	3	4	3	4	5	6	6	3	5	5	6	10	9	17	13	

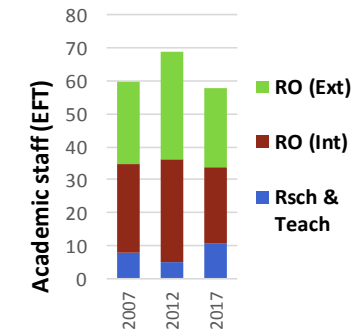
2017 Tertiary Education Survey Data Summary

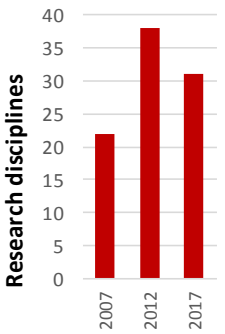
Australian National University — *Research School of Earth Sciences*

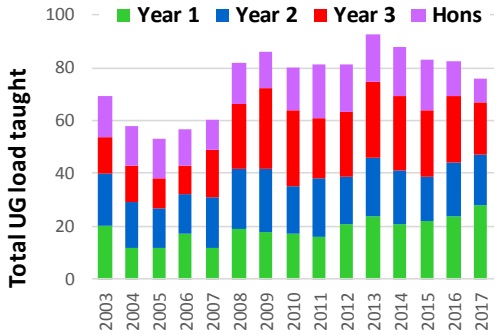
Degree and majors					
BSc	Earth Science	Marine Science	Water Science		
BSc(Hons)	Earth & Marine Science	Physics of the Earth			

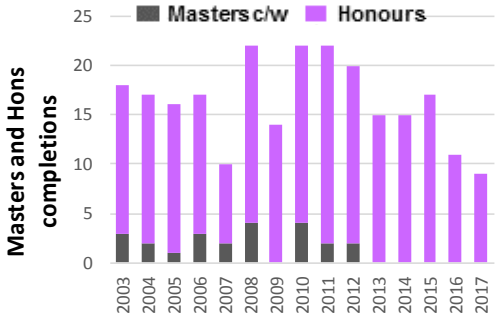
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

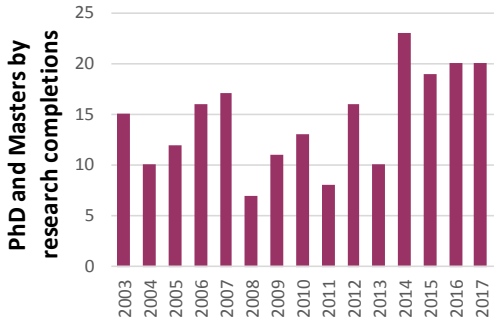
Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic			
	40305 Marine Geoscience			
	40306 Mineralogy and			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl.			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			











Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**21.3**	3.5		15.8	2.0	**15.0**			14.0	1.0	**14.0**	12.0	2.0	0.0	0.0
	Associate Professor (level D)	**1.8**	1.0			0.8	**20.0**	2.0		11.0	7.0	**10.0**	5.0	5.0	0.0	0.0
	Senior Lecturer (level C)	**15.4**	2.0		7.0	6.4	**13.0**	1.0		4.0	8.0	**11.0**	7.0	4.0	0.0	0.0
	Lecturer (level B)	**12.5**	0.5	1.0	3.5	7.5	**11.0**		1.0	2.0	8.0	**21.0**	7.0	14.0	0.0	0.0
	Associate Lecturer (level A)	**9.0**			0.7	8.3	**10.0**		1.0		9.0	**0.0**	0.0	0.0	0.0	0.0
	Total	**59.9**	**7.0**	**1.0**	**27.0**	**25.0**	**69.0**	**3.0**	**2.0**	**31.0**	**33.0**	**56.0**	**31.0**	**25.0**	**0.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	20	12	12	17	12	19	18	17	16	21	24	21	22	24	28	2
	Year 2	20	17	15	15	19	23	24	18	22	18	22	20	17	20	19	6
	Year 3	14	14	11	11	18	24	30	29	23	24	29	28	25	25	20	13
	Honours	15	15	15	14	11	16	14	16	20	18	18	19	19	13	9	2
	Total	**69**	**58**	**53**	**57**	**60**	**82**	**86**	**80**	**81**	**81**	**92**	**88**	**83**	**82**	**76**	**23**
Graduations from geoscience UG majors or Honours	BSc - geosci major					7	4	7	4	4	4	10	19	32	35	35	
	BSc (Hons)					8	18	14	18	20	18	15	15	17	11	9	
Graduations from PG programs.	Masters by research	2	3	3	4	4	1	1	1	0	0	0	0	0	4	4	
	Masters by csework	3	2	1	3	2	4		4	2	2						
	PhD	13	7	9	12	13	6	10	12	8	16	10	23	19	16	16	

2017 Tertiary Education Survey Data Summary

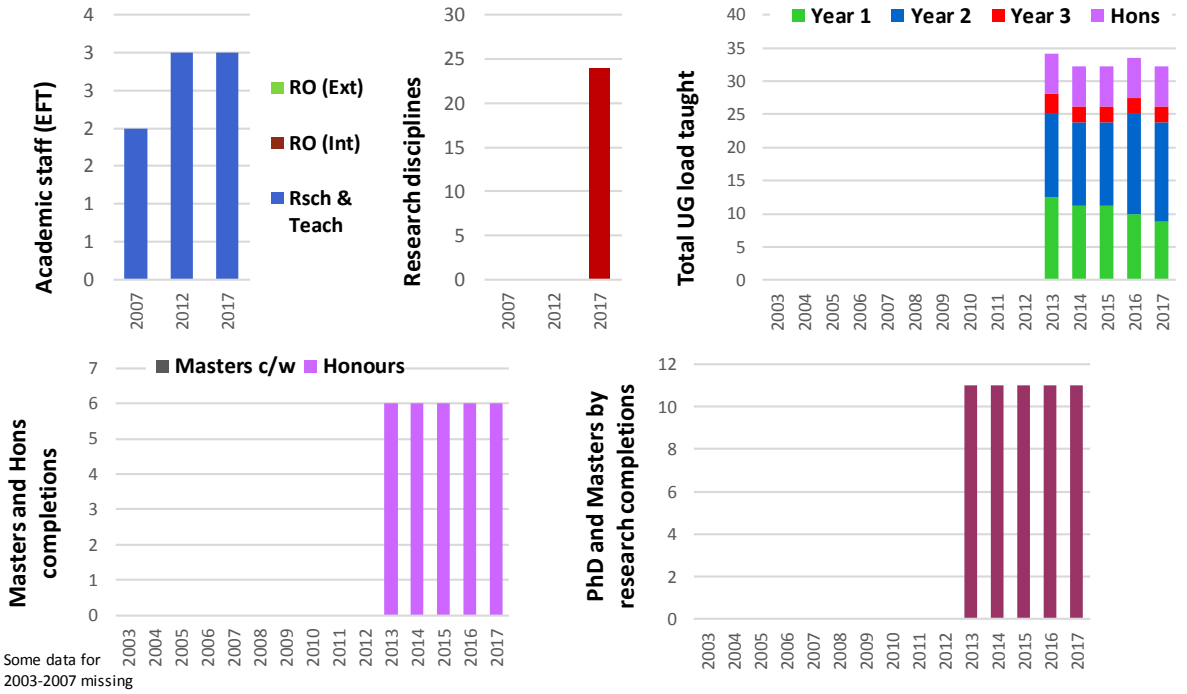
University of Canberra

Faculty of Science and Technology

Degree and majors					
B.Env.Sci	Earth Science	Water Science	Applied Ecology		
BSc	Earth Science	Water Science	Applied Ecology		

AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic Pet 40305 Marine Geoscience 40306 Mineralogy and Crystallography 40307 Ore Deposit Petrology 40308 Palaeontology (incl. Palynology) 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and Radiometrics 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			



Some data for 2003-2007 missing

Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**0.0**					**1.0**	1.0				**0.0**	0.0	0.0	0.0	0.0
	Associate Professor (level D)	**1.0**	1.0				**1.0**	1.0				**3.0**	3.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**1.0**	1.0				**1.0**	1.0				**0.0**	0.0	0.0	0.0	0.0
	Lecturer (level B)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Total	**2.0**	**2.0**	**0.0**	**0.0**	**0.0**	**3.0**	**3.0**	**0.0**	**0.0**	**0.0**	**3.0**	**3.0**	**0.0**	**0.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1											13	11	11	10	9	1
	Year 2											13	13	13	15	15	2
	Year 3											3	3	3	3	3	1
	Honours											6	6	6	6	6	1
	Total											**34**	**32**	**32**	**34**	**32**	**5**
Graduations from geoscience UG majors or Honours	BSc - geosci major											22	16	13	10	10	
	BSc (Hons)											6	6	6	6	6	
Graduations from PG programs.	Masters by research											4	4	4	4	4	
	Masters by csework											0	0	0	0	0	
	PhD											7	7	7	7	7	

2017 Tertiary Education Survey Data Summary

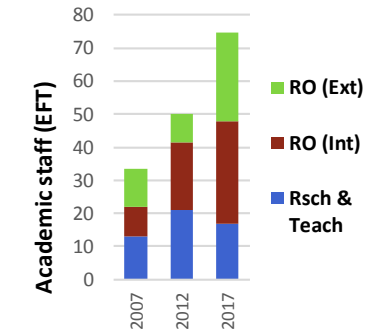
Curtin University

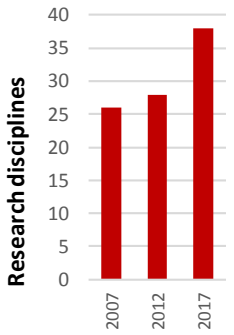
Departments of Applied Geology and of Exploration Geophysics

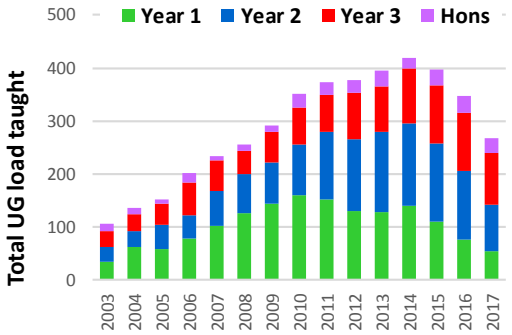
Degree and majors				
BSc (Appl. Geol.)	Applied Geology	Mining Geology	Petroleum Geology	
BSc (Geophysics)				
BSc (Hons) (Appl. Geol.)	BSc (Hons) (Geophysics)			

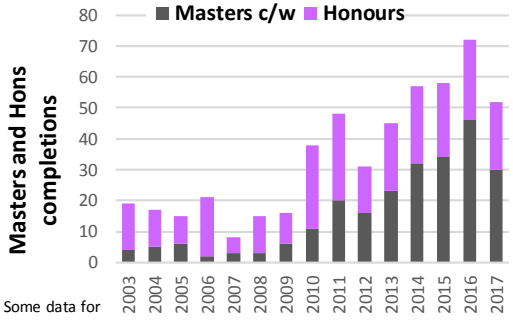
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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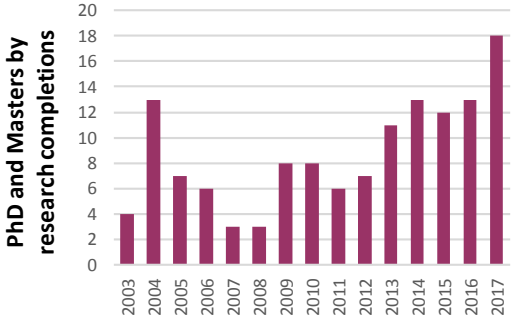


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**6.0**	1.5		3.0	1.5	**9.0**	7.0		0.5	1.5	**18.0**	4.0	1.0	8.7	4.3
	Associate Professor (level D)	**7.0**	4.4		1.0	1.6	**8.0**	8.0				**9.0**	3.0	1.0	2.8	2.3
	Senior Lecturer (level C)	**5.5**	4.0		0.5	1.0	**10.0**	2.0		4.0	4.0	**13.8**	7.0	0.0	4.6	2.3
	Lecturer (level B)	**13.1**	3.2		4.4	5.6	**20.0**	4.0		13.0	3.0	**20.7**	1.0	0.0	9.6	10.1
	Associate Lecturer (level A)	**2.0**				2.0	**3.0**			3.0		**13.1**	0.0	0.0	5.3	7.9
	Total	**33.6**	**13.1**	**0.0**	**8.9**	**11.7**	**50.0**	**21.0**	**0.0**	**20.5**	**8.5**	**74.6**	**15.0**	**2.0**	**30.8**	**26.8**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	34	63	58	78	102	126	144	161	152	131	129	140	109	76	55	6
	Year 2	28	29	46	45	67	74	78	95	128	134	151	155	149	130	86	12
	Year 3	30	33	40	60	57	43	57	69	69	88	86	104	109	109	99	16
	Honours	15	12	9	19	8	12	13	27	24	25	28	20	30	32	28	9
	Total	**107**	**137**	**153**	**202**	**234**	**255**	**292**	**352**	**373**	**378**	**394**	**419**	**397**	**348**	**268**	**43**
Graduations from geoscience UG majors or Honours	BSc - geosci major	25	28	30	40	39	35	48	73	67	94	95	106	120	124	129	
	BSc (Hons)	15	12	9	19	5	12	10	27	28	15	22	25	24	26	22	
Graduations from PG programs.	Masters by research	0	6	1	0	0	0	2	3	3	1	1	1	2	3	1	
	Masters by csework	4	5	6	2	3	3	6	11	20	16	23	32	34	46	30	
	PhD	4	7	6	6	3	3	6	5	3	6	10	12	10	10	17	

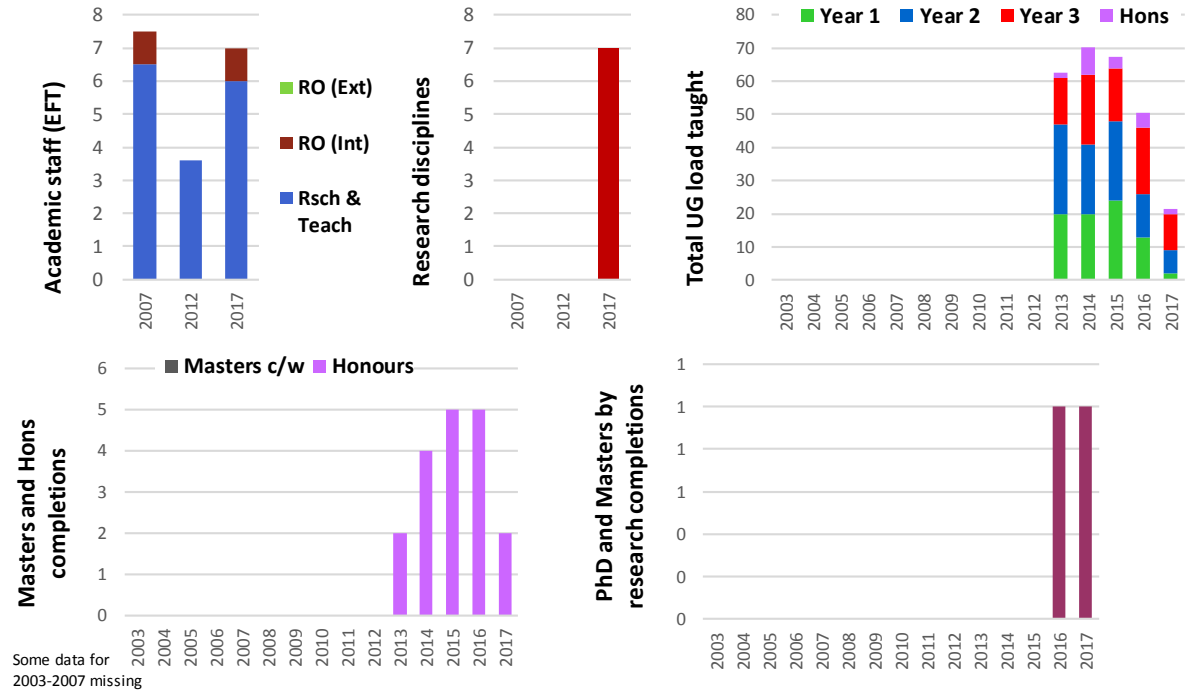
2017 Tertiary Education Survey Data Summary

Federation University (formerly Univ Ballarat) *School of Applied and Biomedical Sciences*

Degree and majors					
BGeosci.					
BSc	Environmental Geoscience	Earth Materials			

AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic Pet 40305 Marine Geoscience 40306 Mineralogy and Crystallography 40307 Ore Deposit Petrology 40308 Palaeontology (incl. Palynology) 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and Radiometrics 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			



Some data for 2003-2007 missing

Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Associate Professor (level D)	**0.5**	0.5				**0.0**					**2.0**	1.0	0.0	1.0	0.0
	Senior Lecturer (level C)	**2.0**	2.0				**1.6**	1.6				**0.0**	0.0	0.0	0.0	0.0
	Lecturer (level B)	**5.0**	2.0	2.0	1.0		**2.0**	2.0				**4.0**	4.0	0.0	0.0	0.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**1.0**	1.0	0.0	0.0	0.0
	Total	**7.5**	**4.5**	**2.0**	**1.0**	**0.0**	**3.6**	**3.6**	**0.0**	**0.0**	**0.0**	**7.0**	**6.0**	**0.0**	**1.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1											20	20	24	13	2	4
	Year 2											27	21	24	13	7	7
	Year 3											14	21	16	20	11	6
	Honours											2	8	3	5	2	4
	Total											**63**	**70**	**67**	**51**	**22**	**21**
Graduations from geoscience UG majors or Honours	BSc - geosci major											14	10	23	23	14	
	BSc (Hons)											2	4	5	5	2	
Graduations from PG programs.	Masters by research											0	0	0	0	0	
	Masters by csework											0	0	0	0	0	
	PhD											0	0	0	1	1	

2017 Tertiary Education Survey Data Summary

James Cook University

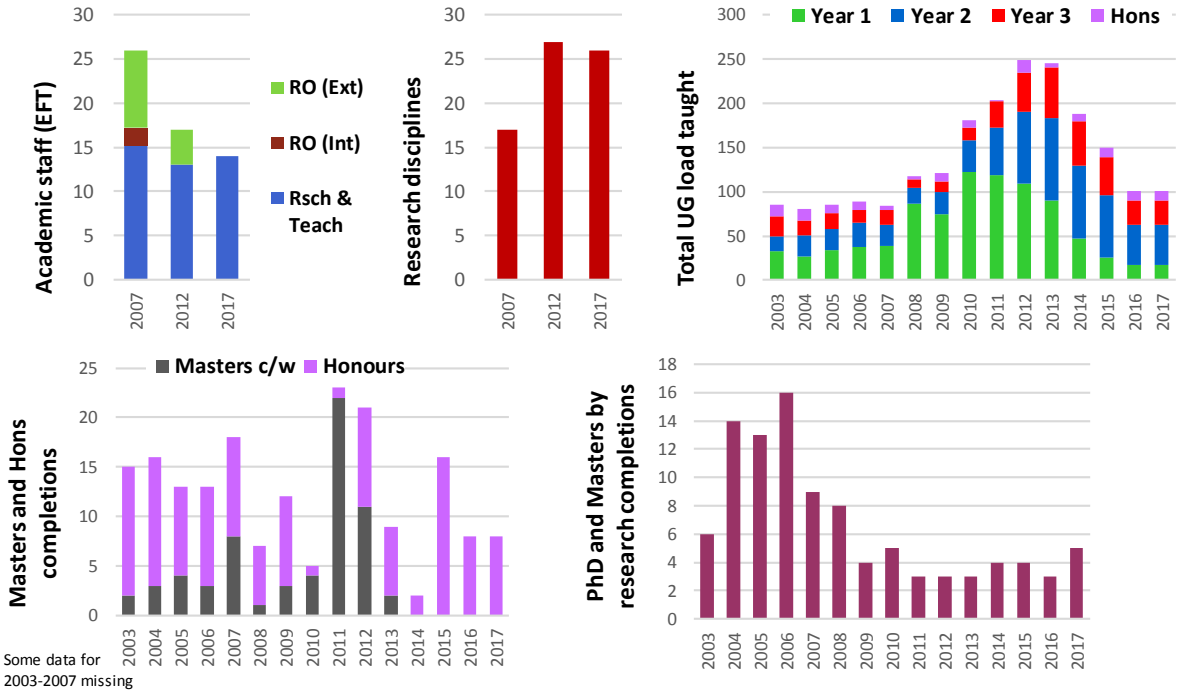
Geoscience, College of Science and Engineering

AGC

Degree and majors				
BSc	Geology	Environmental and Marine Geosciences		
Bgeol				
BSc (Hons)	Geology			

AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			



Some data for 2003-2007 missing

Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**3.0**	2.0		1.0		**3.0**	3.0				**2.0**	2.0	0.0	0.0	0.0
	Associate Professor (level D)	**1.0**	1.0				**2.0**	1.0			1.0	**3.0**	3.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**9.0**	6.5	0.5		2.0	**8.0**	5.0			3.0	**2.0**	2.0	0.0	0.0	0.0
	Lecturer (level B)	**11.3**	2.5	1.5	1.0	6.3	**4.0**	4.0				**7.0**	3.0	4.0	0.0	0.0
	Associate Lecturer (level A)	**1.7**	1.2			0.5	**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Total	**26.0**	**13.2**	**2.0**	**2.0**	**8.8**	**17.0**	**13.0**	**0.0**	**0.0**	**4.0**	**14.0**	**10.0**	**4.0**	**0.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	33	27	34	38	39	86	75	122	119	109	90	48	25	17	17	2
	Year 2	17	24	24	27	23	18	25	36	53	81	93	81	71	45	45	8
	Year 3	22	16	18	14	17	10	12	14	30	45	58	50	44	28	28	11
	Honours	13	13	9	10	5	4	9	9	2	14	5	8	10	11	11	4
	Total	**85**	**80**	**85**	**89**	**84**	**118**	**121**	**181**	**204**	**249**	**246**	**188**	**149**	**101**	**101**	**25**
Graduations from geoscience UG majors or Honours	BSc - geosci major	10	10	10	10	15	10	10	10	13	24	35	26	23	11	11	
	BSc (Hons)	13	13	9	10	10	6	9	1	1	10	7	2	16	8	8	
Graduations from PG programs.	Masters by research	3	4	1	0	0	0	1	1			0	0	0	0	0	
	Masters by csework	2	3	4	3	8	1	3	4	22	11	2	0	0	0	0	
	PhD	3	10	12	16	9	8	3	4	3	3	3	4	4	3	5	

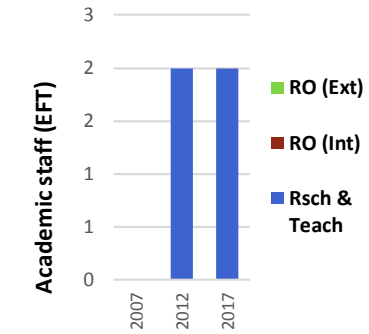
2017 Tertiary Education Survey Data Summary

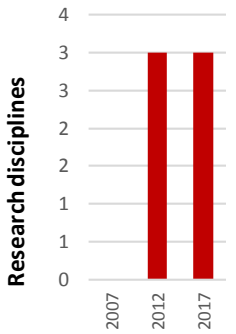
La Trobe University — *Department of Ecology, Environment and Evolution*

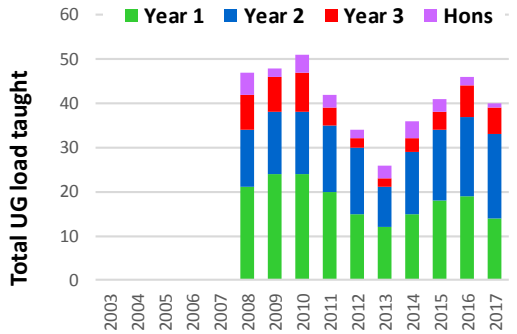
Degree and majors					
BSc	Environmental Geoscience				

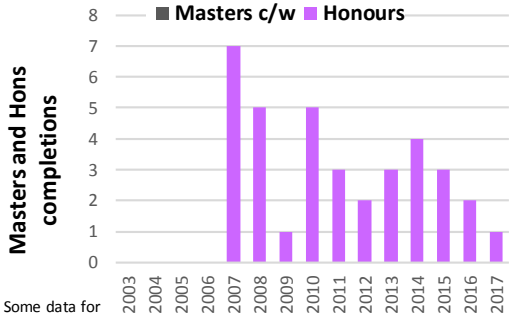
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic Pet 40305 Marine Geoscience 40306 Mineralogy and Crystallography 40307 Ore Deposit Petrology 40308 Palaeontology (incl. Palynology) 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and Radiometrics 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			









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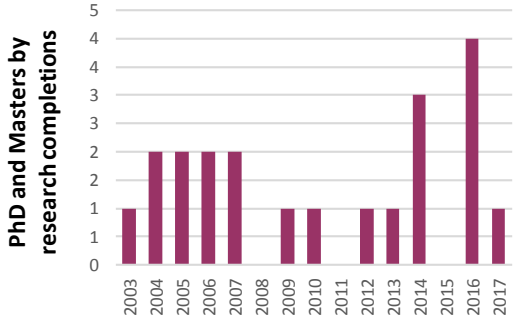


Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Associate Professor (level D)	**0.0**					**1.0**	1.0				**1.0**	1.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Lecturer (level B)	**0.0**					**1.0**	1.0				**0.0**	0.0	0.0	0.0	0.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**1.0**	1.0	0.0	0.0	0.0
	Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**	**0.0**	**0.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1						21	24	24	20	15	12	15	18	19	14	1
	Year 2						13	14	14	15	15	9	14	16	18	19	3
	Year 3						8	8	9	4	2	2	3	4	7	6	3
	Honours						5	2	4	3	2	3	4	3	2	1	1
	Total						**47**	**48**	**51**	**42**	**34**	**26**	**36**	**41**	**46**	**40**	**8**
Graduations from geoscience UG majors or Honours	BSc - geosci major						18	18	18	9	6						
	BSc (Hons)						5	1	5	3	2	3	4	3	2	1	
Graduations from PG programs.	Masters by research											0	0	0	0	0	
	Masters by csework											0	0	0	0	0	
	PhD	1	2	2	2	2	0	1	1	0	1	1	3	0	4	1	

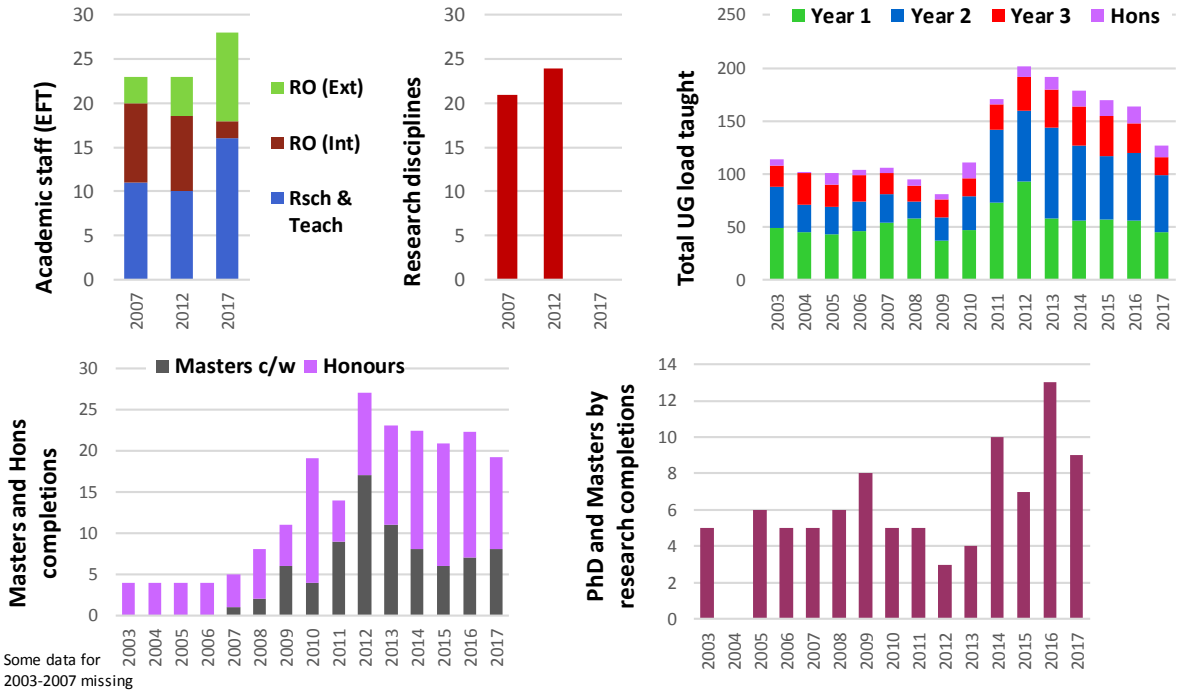
2017 Tertiary Education Survey Data Summary

Macquarie University — *Department of Earth and Planetary Sciences*

Degree and majors	BSc	Geology	Geophysics		

AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			



Some data for 2003-2007 missing

Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**4.0**	2.0			2.0	**8.0**	1.0		3.0	4.0	**7.0**	6.0	0.0	1.0	0.0
	Associate Professor (level D)	**1.0**			1.0		**5.0**	4.0		0.5	0.5	**6.0**	4.0	0.0	1.0	1.0
	Senior Lecturer (level C)	**9.0**	7.0		2.0		**7.0**	5.0		2.0		**5.0**	3.0	0.0	0.0	2.0
	Lecturer (level B)	**6.0**	2.0		3.0	1.0	**3.0**			3.0		**3.0**	3.0	0.0	0.0	0.0
	Associate Lecturer (level A)	**3.0**			3.0		**0.0**					**7.0**	0.0	0.0	0.0	7.0
	Total	**23.0**	**11.0**	**0.0**	**9.0**	**3.0**	**23.0**	**10.0**	**0.0**	**8.5**	**4.5**	**28.0**	**16.0**	**0.0**	**2.0**	**10.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	49	45	43	46	54	58	37	47	73	93	58	56	57	56	45	3
	Year 2	39	26	26	28	27	16	22	32	69	67	86	71	60	64	54	7
	Year 3	20	30	21	25	20	15	17	17	24	32	36	37	38	28	17	10
	Honours	6	1	11	5	5	6	5	15	5	10	12	14	15	15	11	0
	Total	**114**	**102**	**101**	**104**	**106**	**95**	**81**	**111**	**171**	**202**	**192**	**178**	**170**	**163**	**127**	**20**
Graduations from geoscience UG majors or Honours	BSc - geosci major	8	7	7	8	12	13	9	11	18	22	45	55	48	32	32	
	BSc (Hons)	4	4	4	4	4	6	5	15	5	10	12	14	15	15	11	
Graduations from PG programs.	Masters by research	2		1		1						0	4	2	4	3	
	Masters by csework					1	2	6	4	9	17	11	8	6	7	8	
	PhD	3		5	5	4	6	8	5	5	3	4	6	5	9	6	

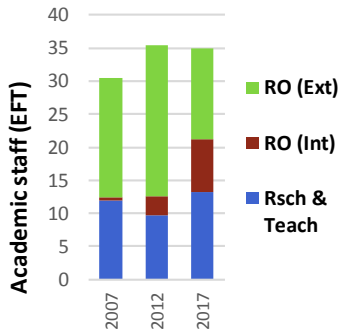
2017 Tertiary Education Survey Data Summary

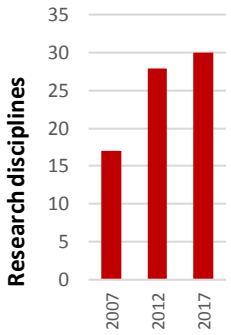
University of Melbourne — *School of Earth Sciences*

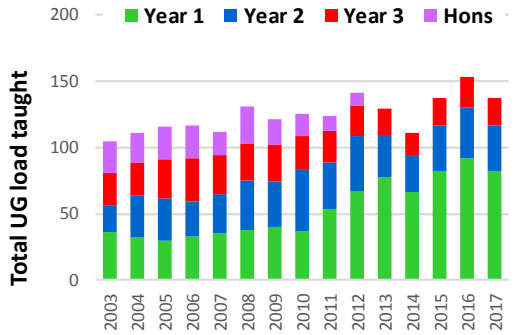
Degree and majors				
BSc (Earth Sci)	Geology	Climate and Weather	Environmental Science	
BSc (Honours)	Geology	Climate and Weather		

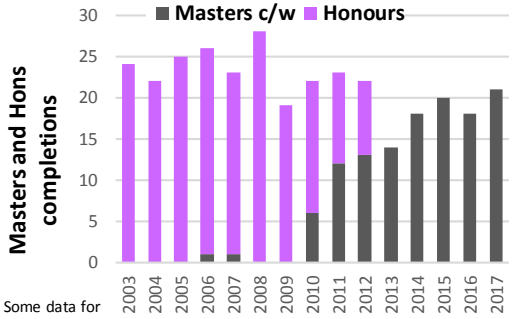
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**6.0**	3.0		0.5	2.5	**9.9**	4.0		1.9	4.0	**6.6**	5.0	0.0	1.3	0.3
	Associate Professor (level D)	**6.0**	4.0			2.0	**3.0**	3.0			0.0	**3.5**	3.0	0.0	0.0	0.5
	Senior Lecturer (level C)	**3.3**	2.3			1.0	**1.3**	0.3			1.0	**5.0**	2.0	0.3	0.0	2.7
	Lecturer (level B)	**10.5**	1.0	1.0		8.5	**10.5**	2.0		1.0	7.5	**9.1**	1.0	2.0	2.8	3.3
	Associate Lecturer (level A)	**4.8**	0.8			4.0	**10.8**	0.5			10.3	**10.8**	0.0	0.0	3.8	7.0
	Total	**30.5**	**11.0**	**1.0**	**0.5**	**18.0**	**35.4**	**9.8**	**0.0**	**2.9**	**22.8**	**35.0**	**11.0**	**2.3**	**7.9**	**13.8**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	36	32	30	33	35	38	40	37	54	67	77	67	82	92	82	2
	Year 2	20	32	32	26	30	37	34	46	35	42	32	28	34	38	34	5
	Year 3	25	25	29	33	29	28	28	26	24	23	19	17	21	23	21	9
	Honours	24	22	25	25	18	28	19	16	11	9	0	0	0	0	0	0
	Total	**105**	**111**	**116**	**117**	**112**	**131**	**121**	**125**	**124**	**141**	**129**	**111**	**137**	**153**	**137**	**16**
Graduations from geoscience UG majors or Honours	BSc - geosci major					42	42	45	32	34	32	0	0	0	0	0	
	BSc (Hons)	24	22	25	25	22	28	19	16	11	9	0	0	0	0	0	
Graduations from PG programs.	Masters by research											0	0	0	0	0	
	Masters by csework				1	1			6	12	13	14	18	20	18	21	
	PhD	10	9	8	8	9	7	10	4	4	6	4	3	7	5	2	

2017 Tertiary Education Survey Data Summary

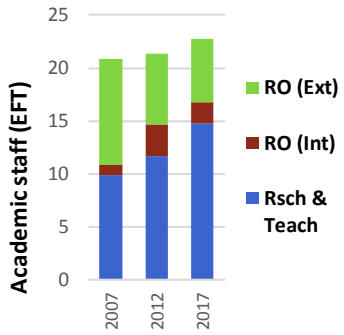
Monash University — *School of Earth, Atmosphere and Environment*

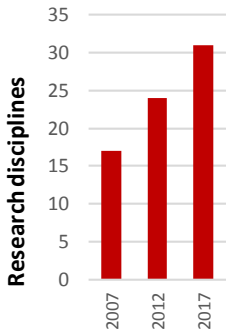
AGC

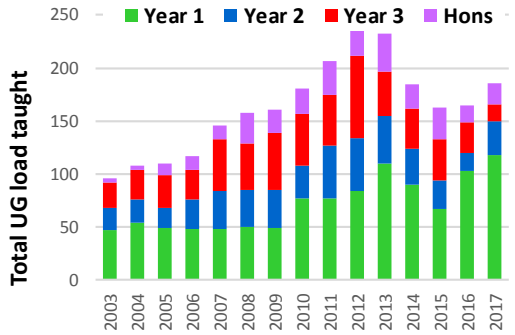
Degree and majors					
BSc	Generic				
BSc (Hons)					

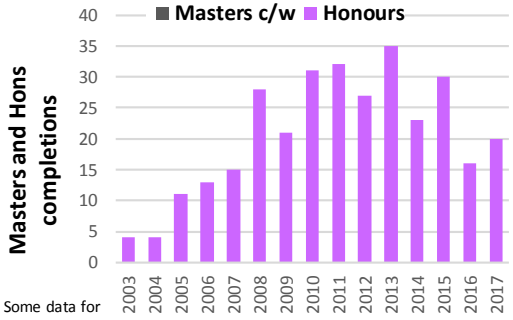
AQF 9 (Masters) offered	N
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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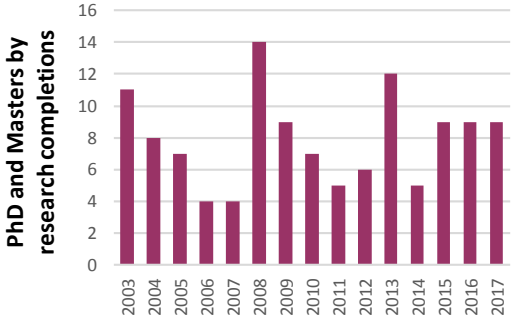


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**4.3**	2.3			2.0	**2.9**	2.7			0.2	**6.0**	5.0	0.0	0.0	1.0
	Associate Professor (level D)	**3.5**	3.5				**4.0**	3.0			1.0	**5.0**	3.0	0.0	1.0	1.0
	Senior Lecturer (level C)	**3.0**		1.0		2.0	**1.5**	1.0			0.5	**5.5**	3.5	0.0	0.0	2.0
	Lecturer (level B)	**10.0**	3.0		1.0	6.0	**9.0**	5.0		1.0	3.0	**2.0**	1.0	0.0	0.0	1.0
	Associate Lecturer (level A)	**0.0**					**4.0**			2.0	2.0	**4.3**	2.3	0.0	1.0	1.0
	Total	**20.8**	**8.8**	**1.0**	**1.0**	**10.0**	**21.4**	**11.7**	**0.0**	**3.0**	**6.7**	**22.8**	**14.8**	**0.0**	**2.0**	**6.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	47	54	49	48	48	50	49	77	77	84	110	90	67	103	118	2
	Year 2	21	22	19	28	36	35	36	31	50	50	45	35	27	17	32	2
	Year 3	24	28	31	28	49	44	54	49	48	77	42	37	39	30	16	9
	Honours	4	4	11	13	13	29	22	24	32	27	35	23	30	16	20	2
	Total	**96**	**108**	**110**	**117**	**146**	**158**	**161**	**181**	**207**	**238**	**232**	**185**	**163**	**165**	**186**	**15**
Graduations from geoscience UG majors or Honours	BSc - geosci major	12	14	16	14	25	22	27	25	24	39	21	19	20	15	8	
	BSc (Hons)	4	4	11	13	15	28	21	31	32	27	35	23	30	16	20	
Graduations from PG programs.	Masters by research	3	3	2	2	2	4	2	2	2	1	4	1	0	1	2	
	Masters by csework											0	0	0	0	0	
	PhD	8	5	5	2	2	10	7	5	3	5	8	4	9	8	7	

2017 Tertiary Education Survey Data Summary

Queensland University of Technology

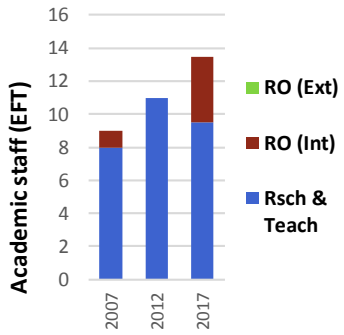
School of Earth Environmental and Biological Science

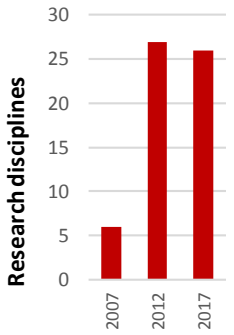
AGC

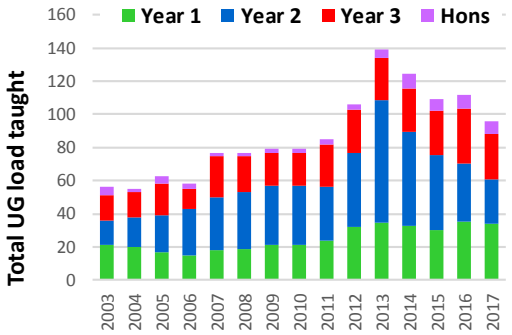
Degree and majors					
BSc	Earth Science				
BSc (Hons)	Earth Science				

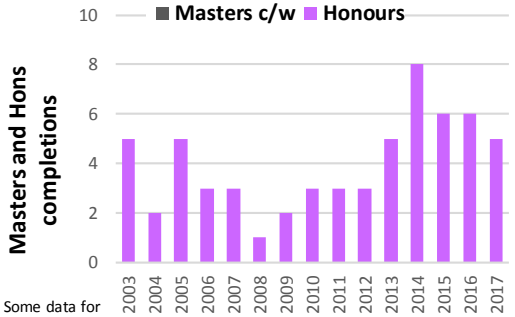
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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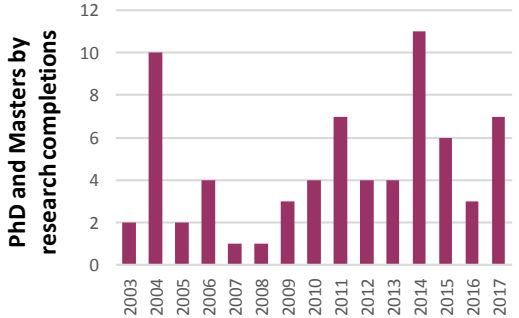


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**1.0**			1.0		**3.0**	3.0				**1.0**	1.0	0.0	0.0	0.0
	Associate Professor (level D)	**2.0**	2.0				**0.0**	0.0				**1.0**	1.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**2.0**	2.0				**3.0**	3.0				**5.0**	4.0	0.0	1.0	0.0
	Lecturer (level B)	**2.0**	2.0				**5.0**	5.0				**5.5**	3.5	0.0	2.0	0.0
	Associate Lecturer (level A)	**2.0**	1.7	0.3			**0.0**					**1.0**	0.0	0.0	1.0	0.0
	Total	**9.0**	**7.7**	**0.3**	**1.0**	**0.0**	**11.0**	**11.0**	**0.0**	**0.0**	**0.0**	**13.5**	**9.5**	**0.0**	**4.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	21	20	17	15	18	19	21	21	24	32	34	33	30	35	34	2
	Year 2	15	18	22	28	32	34	36	36	32	45	74	57	45	35	27	6
	Year 3	15	15	19	12	25	22	20	20	26	26	25	26	27	33	27	7
	Honours	5	2	5	3	2	2	2	2	3	3	5	9	7	8	8	6
	Total	**56**	**55**	**63**	**58**	**77**	**77**	**79**	**79**	**85**	**106**	**139**	**125**	**109**	**112**	**96**	**21**
Graduations from geoscience UG majors or Honours	BSc - geosci major	16	16	18	15	21	13	11	27	15	22	28	18	36	27	1	
	BSc (Hons)	5	2	5	3	3	1	2	3	3	3	5	8	6	6	5	
Graduations from PG programs.	Masters by research	2	5	1	2			1	2	3	2	0	4	2	3	3	
	Masters by csework											0	0	0	0	0	
	PhD	0	5	1	2	1	1	2	2	4	2	4	7	4	0	4	

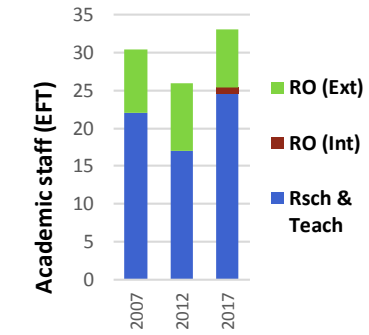
2017 Tertiary Education Survey Data Summary

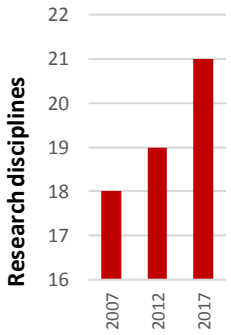
University of Sydney — *School of Geosciences*

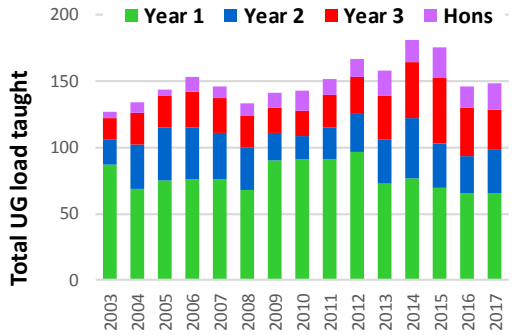
Degree and majors					
BSc	Geology & Geophys.	Geography (Phys.)		
BSc (Hons)	Geology	Geophysics	Geography (Phys.)	

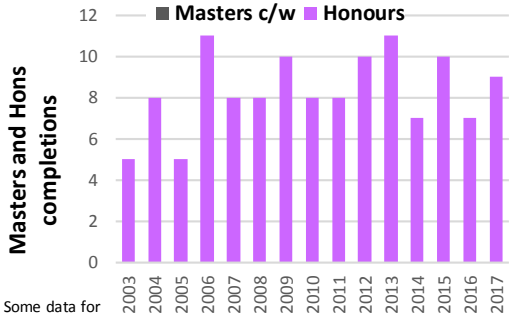
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			

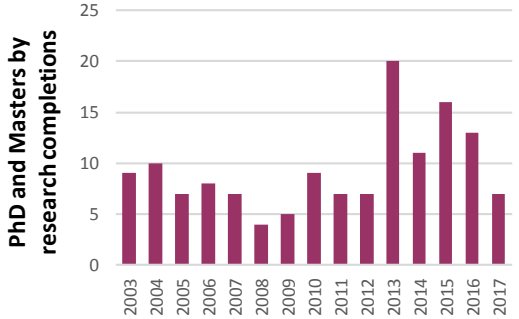








Some data for 2003-2007 missing



Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**7.0**	5.0	1.0		1.0	**3.0**	2.0			1.0	**6.4**	5.4	1.0	0.0	0.0
	Associate Professor (level D)	**7.0**	4.0			3.0	**6.0**	4.0			2.0	**7.0**	7.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**11.0**	10.0			1.0	**10.0**	4.0			6.0	**3.6**	3.6	0.0	0.0	0.0
	Lecturer (level B)	**2.5**	2.0			0.5	**4.0**	4.0				**11.1**	5.0	1.6	0.8	3.7
	Associate Lecturer (level A)	**3.0**				3.0	**3.0**	3.0				**5.0**	0.0	1.0	0.0	4.0
	Total	**30.5**	**21.0**	**1.0**	**0.0**	**8.5**	**26.0**	**17.0**	**0.0**	**0.0**	**9.0**	**33.1**	**21.0**	**3.6**	**0.8**	**7.7**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	87	69	75	76	76	68	90	91	91	97	72	76	70	66	65	4
	Year 2	19	33	40	39	35	32	21	18	24	28	34	45	34	28	33	8
	Year 3	16	24	24	27	26	24	19	19	25	28	33	43	49	37	30	13
	Honours	5	8	5	11	9	9	11	15	12	14	19	17	23	16	20	3
	Total	**127**	**134**	**144**	**153**	**146**	**133**	**141**	**143**	**152**	**167**	**158**	**181**	**175**	**146**	**149**	**28**
Graduations from geoscience UG majors or Honours	BSc - geosci major	11	11	11	11	12	11	14	14	14	18	24	38	45	42	35	
	BSc (Hons)	5	8	5	11	8	8	10	8	8	10	11	7	10	7	9	
Graduations from PG programs.	Masters by research	4	3	3	2	3	3	2	2	2	2	1	2	3	1	0	
	Masters by csework											0	0	0	0	0	
	PhD	5	7	4	6	4	1	3	7	5	5	19	9	13	12	7	

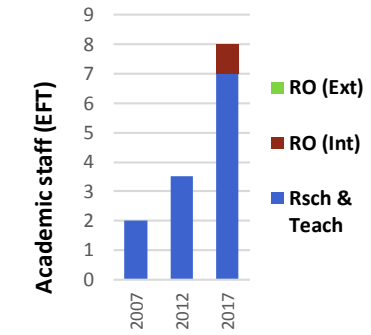
2017 Tertiary Education Survey Data Summary

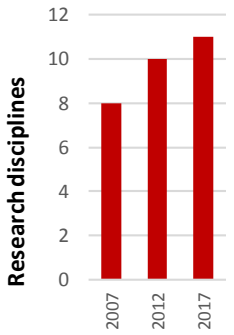
University of New England — *Earth Sciences, School of Environmental & Rural Science*

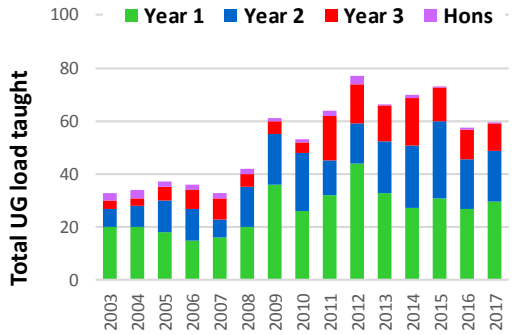
Degree and majors					
Bgeosci					
BSc	Geoscience				
BSc (Hons)	Geoscience				

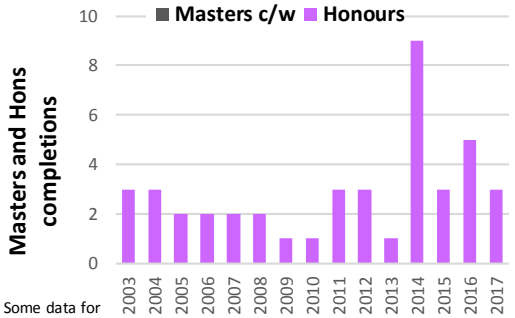
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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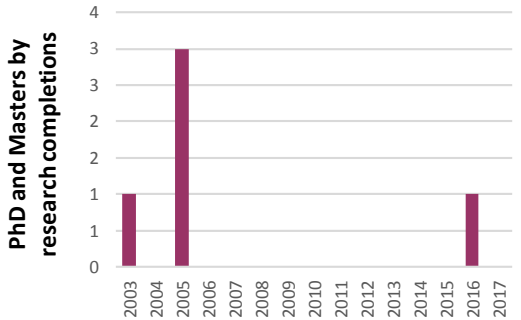


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**0.0**					**0.0**					**1.0**	1.0	0.0	0.0	0.0
	Associate Professor (level D)	**1.0**	1.0				**1.0**	1.0				**0.0**	0.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Lecturer (level B)	**1.0**	1.0				**2.5**	2.5				**6.0**	6.0	0.0	0.0	0.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**1.0**	0.0	0.0	1.0	0.0
	Total	**2.0**	**2.0**	**0.0**	**0.0**	**0.0**	**3.5**	**3.5**	**0.0**	**0.0**	**0.0**	**8.0**	**7.0**	**0.0**	**1.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	20	20	18	15	16	20	36	26	32	44	33	27	31	27	30	3
	Year 2	7	8	12	12	7	15	19	22	13	15	20	23	29	18	19	5
	Year 3	3	3	5	7	8	5	5	4	17	15	14	18	13	12	11	7
	Honours	3	3	2	2	2	2	1	1	2	3	0	1	0	1	0	1
	Total	**33**	**34**	**37**	**36**	**33**	**42**	**61**	**53**	**64**	**77**	**66**	**70**	**73**	**58**	**60**	**16**
Graduations from geoscience UG majors or Honours	BSc - geosci major					7	5	5	4	12	11	4	9	7	13	10	
	BSc (Hons)	3	3	2	2	2	2	1	1	3	3	1	9	3	5	3	
Graduations from PG programs.	Masters by research											0	0	0	0	0	
	Masters by csework											0	0	0	0	0	
	PhD	1		3								0	0	0	1	0	

2017 Tertiary Education Survey Data Summary

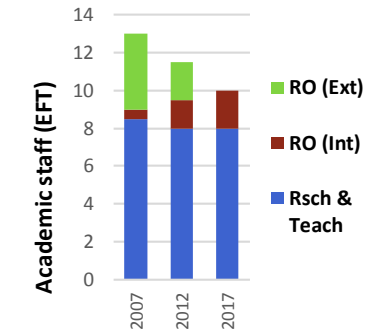
University of Newcastle — *Discipline of Earth Sciences, School of Environmental & Life Sciences*

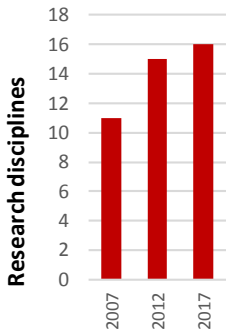
AGC

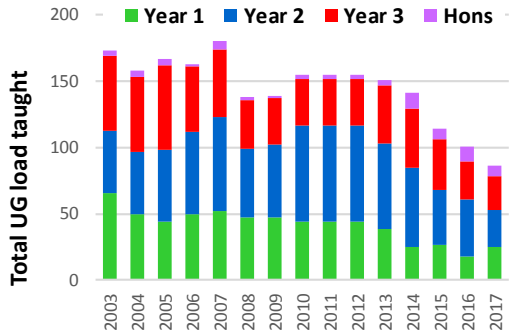
Degree and majors				
BSc	Earth Science			
BEnvSci	Earth Systems			
BSc (Hons)	Earth Science			

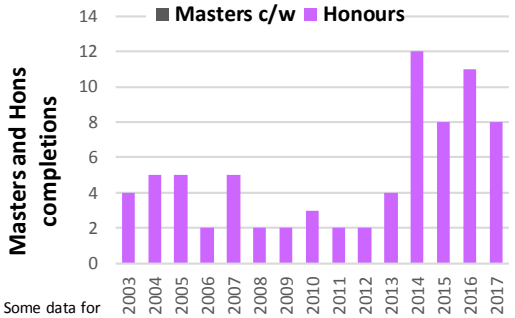
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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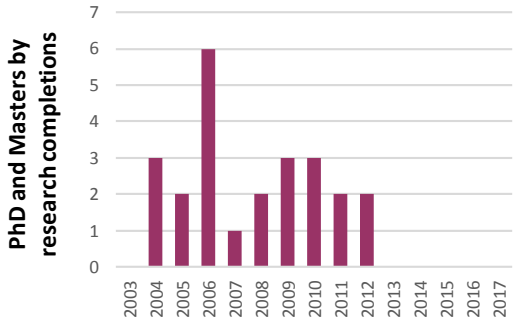


Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**0.0**					**1.0**	1.0				**0.0**	0.0	0.0	0.0	0.0
	Associate Professor (level D)	**1.0**	1.0				**2.0**	2.0				**3.0**	3.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**4.0**	4.0				**1.0**	1.0				**1.0**	1.0	0.0	0.0	0.0
	Lecturer (level B)	**7.5**	3.5			4.0	**7.0**	4.0		1.0	2.0	**5.5**	3.0	1.0	1.5	0.0
	Associate Lecturer (level A)	**0.5**			0.5		**0.5**			0.5		**0.5**	0.0	0.0	0.5	0.0
	Total	**13.0**	**8.5**	**0.0**	**0.5**	**4.0**	**11.5**	**8.0**	**0.0**	**1.5**	**2.0**	**10.0**	**7.0**	**1.0**	**2.0**	**0.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	66	50	44	50	52	47	47	44	44	44	38	25	27	18	25	2
	Year 2	47	47	54	62	71	52	55	73	73	73	65	59	42	43	28	6
	Year 3	56	56	64	49	51	37	35	35	35	35	44	45	38	29	26	9
	Honours	4	5	5	2	6	2	2	3	3	3	4	12	8	11	8	1
	Total	**173**	**158**	**167**	**163**	**180**	**138**	**139**	**155**	**155**	**155**	**151**	**142**	**114**	**101**	**87**	**18**
Graduations from geoscience UG majors or Honours	BSc - geosci major	28	28	32	27	31	21	16	14	9	9	0	0	0	0	0	
	BSc (Hons)	4	5	5	2	5	2	2	3	2	2	4	12	8	11	8	
Graduations from PG programs.	Masters by research																
	Masters by csework																
	PhD	0	3	2	6	1	2	3	3	2	2	0	0	0	0	0	

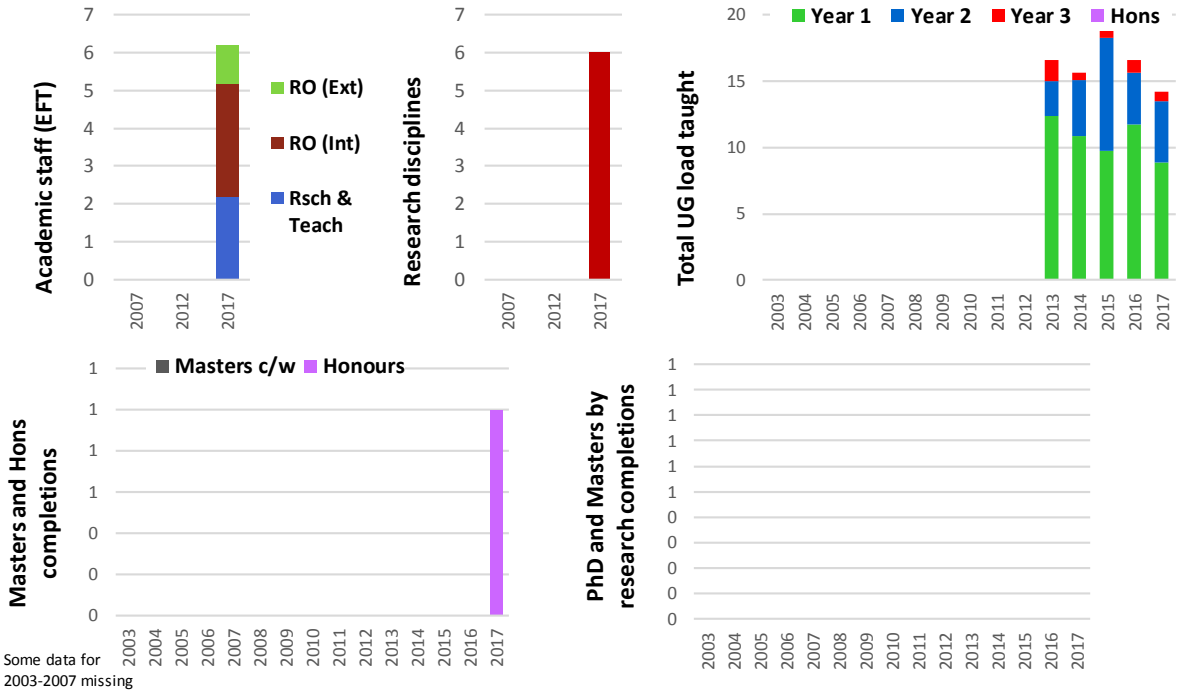
2017 Tertiary Education Survey Data Summary

University of South Australia — *School of Natural and Built Environments*

Degree and majors					
BSC	Geoscience				

AQF 9 (Masters) offered	N
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry 40202 Inorganic Geochemistry 40203 Isotope Geochemistry 40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis 40302 Extra-terrestrial Geology 40303 Geochronology 40304 Igneous and Metamorphic Pet 40305 Marine Geoscience 40306 Mineralogy and Crystallography 40307 Ore Deposit Petrology 40308 Palaeontology (incl. Palynology) 40309 Petroleum and Coal Geology 40310 Sedimentology 40311 Stratigraphy 40312 Structural Geology 40313 Tectonics 40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys 40402 Geodynamics 40403 Geophysical Fluid Dynamics 40404 Geothermics and Radiometrics 40405 Gravimetrics 40406 Magnetism and Palaeomag 40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol 40602 Glaciology 40603 Hydrogeology 40604 Natural Hazards 40605 Palaeoclimatology 40606 Quaternary Environments 40607 Surface Processes 40608 Surface water Hydrology			



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Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**0.0**					**0.0**					**1.0**	0.0	0.0	1.0	0.0
	Associate Professor (level D)	**0.0**					**0.0**					**1.0**	1.0	0.0	0.0	0.0
	Senior Lecturer (level C)	**0.0**					**0.0**					**2.0**	1.0	0.0	1.0	0.0
	Lecturer (level B)	**0.0**					**0.0**					**1.0**	0.0	0.0	1.0	0.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**1.2**	0.2	0.0	0.0	1.0
	Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.2**	**2.2**	**0.0**	**3.0**	**1.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1											12	11	10	12	9	1
	Year 2											3	4	9	4	5	1
	Year 3											2	1	1	1	1	1
	Honours											0	0	0	0	0	0
	Total											**17**	**16**	**19**	**17**	**14**	**3**
Graduations from geoscience UG majors or Honours	BSc - geosci major											0	0	2	3	2	
	BSc (Hons)											0	0	0	0	1	
Graduations from PG programs.	Masters by research											0	0	0	0	0	
	Masters by csework											0	0	0	0	0	
	PhD											0	0	0	0	0	

2017 Tertiary Education Survey Data Summary

University of New Souh Wales

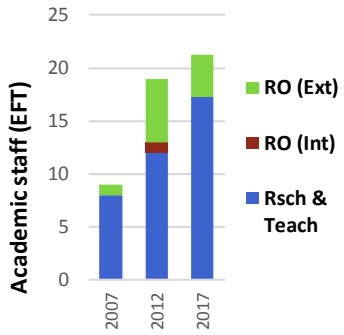
School of Biological, Earth and Environmental Sciences

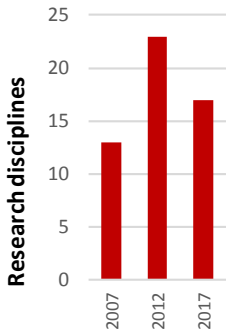
AGC

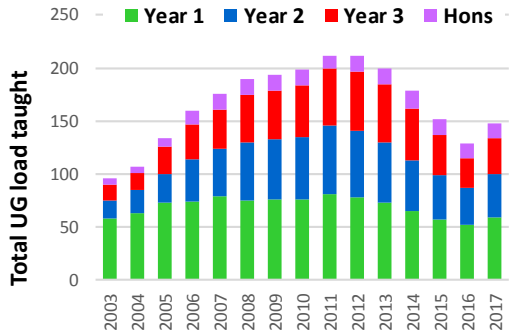
Degree and majors					
BSc	Earth Science				
BAdvSc (Hons)	Geology	Climate science	Geochemistry		
BSc (Hons)	Geology	Climate science			

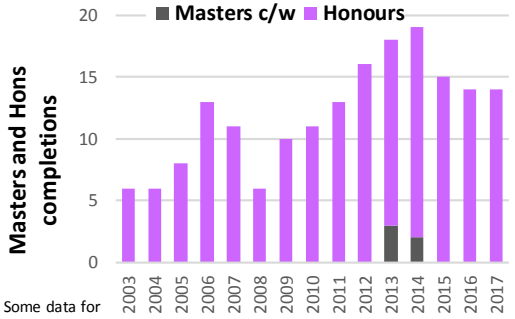
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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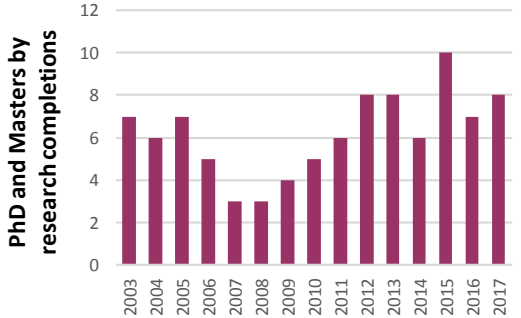


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**1.0**	0.5	0.5			**6.0**	3.0		1.0	2.0	**9.0**	5.0	2.0	0.0	2.0
	Associate Professor (level D)	**1.0**	1.0				**3.0**	3.0				**5.0**	4.0	0.0	0.0	1.0
	Senior Lecturer (level C)	**5.3**	5.3				**7.0**	4.0			3.0	**4.3**	3.3	0.0	0.0	1.0
	Lecturer (level B)	**0.0**					**3.0**	1.0	1.0		1.0	**2.0**	1.0	1.0	0.0	0.0
	Associate Lecturer (level A)	**1.8**	0.8			1.0	**0.0**	0.0				**1.0**	1.0	0.0	0.0	0.0
	Total	**9.0**	**7.5**	**0.5**	**0.0**	**1.0**	**19.0**	**11.0**	**1.0**	**1.0**	**6.0**	**21.3**	**14.3**	**3.0**	**0.0**	**4.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	58	63	73	74	79	75	76	76	81	78	73	65	57	52	59	3
	Year 2	17	22	27	40	45	55	56	59	65	63	57	48	42	35	41	6
	Year 3	15	16	26	33	37	45	46	48	53	56	55	49	38	28	34	13
	Honours	6	6	8	13	15	15	15	15	12	14	15	17	15	14	14	0
	Total	**96**	**107**	**134**	**160**	**175**	**190**	**194**	**199**	**211**	**211**	**200**	**179**	**152**	**129**	**148**	**22**
Graduations from geoscience UG majors or Honours	BSc - geosci major	9	10	10	11	11	14	15	15	16	18	11	13	12	10	10	
	BSc (Hons)	6	6	8	13	11	6	10	11	13	16	15	17	15	14	14	
Graduations from PG programs.	Masters by research	3	3	6	3					2	2	4	3	5	4	4	
	Masters by csework											3	2	0	0	0	
	PhD	4	3	1	2	3	3	4	5	4	6	4	3	5	3	4	

2017 Tertiary Education Survey Data Summary

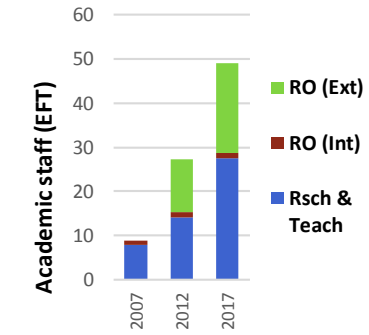
University of Queensland — *School of Earth and Environmental Sciences*

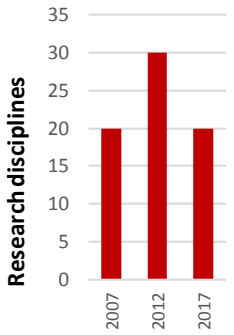
AGC

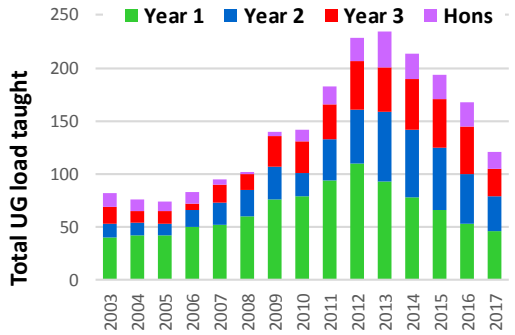
Degree and majors					
BSc	Geographical Sci	Geol Sci			
BAdvSc	Geographical Sci	Geol Sci			
BSc (Hons)	Geographical Sci	Geology	Explor. Geophys.		

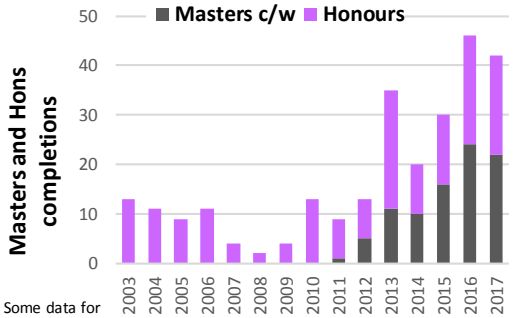
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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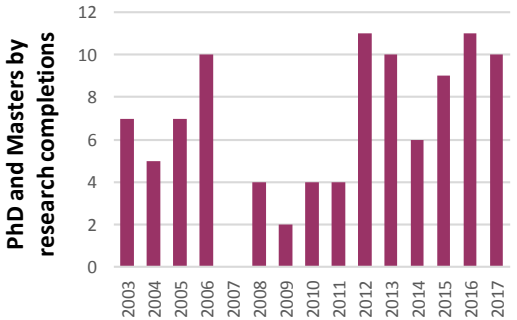


Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**1.0**	1.0				**5.0**	3.0	2.0			**11.0**	8.0	2.0	1.0	0.0
	Associate Professor (level D)	**2.8**	2.8				**4.0**	3.0			1.0	**6.4**	6.0	0.0	0.0	0.4
	Senior Lecturer (level C)	**2.6**	2.6				**1.6**	1.6				**3.0**	2.0	0.0	0.0	1.0
	Lecturer (level B)	**2.5**	1.5		1.0		**8.0**	3.0	1.0		4.0	**16.4**	9.1	0.5	0.0	6.8
	Associate Lecturer (level A)	**0.0**					**8.6**	0.6		1.0	7.0	**12.3**	0.0	0.0	0.0	12.3
	Total	**8.9**	**7.9**	**0.0**	**1.0**	**0.0**	**27.2**	**11.2**	**3.0**	**1.0**	**12.0**	**49.1**	**25.1**	**2.5**	**1.0**	**20.5**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	40	42	42	50	52	60	76	79	94	110	93	78	67	54	46	4
	Year 2	13	12	11	16	21	25	31	22	39	51	66	64	59	46	33	16
	Year 3	16	11	12	6	17	15	29	30	33	46	43	48	46	46	26	24
	Honours	13	11	9	11	5	2	4	11	17	21	33	23	23	23	16	11
	Total	**82**	**76**	**74**	**83**	**95**	**102**	**140**	**142**	**183**	**228**	**234**	**213**	**194**	**168**	**121**	**55**
Graduations from geoscience UG majors or Honours	BSc - geosci major					21	29	34	34	45	52	41	51	66	62	60	
	BSc (Hons)	13	11	9	11	4	2	4	13	8	8	24	10	14	22	20	
Graduations from PG programs.	Masters by research	2			4		1		1	0	0	3	2	3	5	4	
	Masters by csework					0	0	0	0	1	5	11	10	16	24	22	
	PhD	5	5	7	6	0	3	2	3	4	11	7	4	6	6	6	

2017 Tertiary Education Survey Data Summary

University of Tasmania

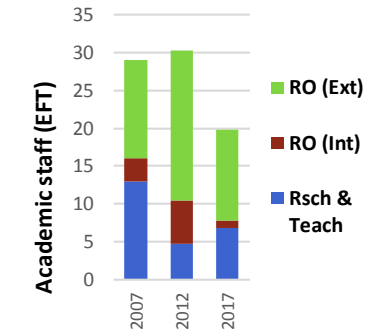
Earth Sciences (incl CODES)

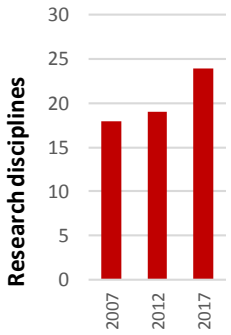
Degree and majors

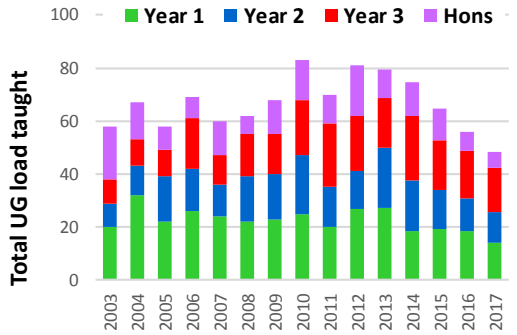
BSc (Hons)	Geology			

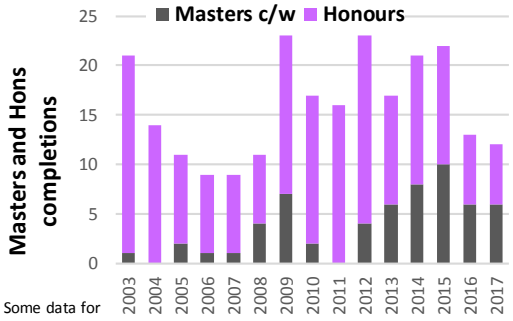
AQF 9 (Masters) offered	**Y**
AQF 10 (PhD) offered	**Y**

Disciplines		**2007**	**2012**	**2017**
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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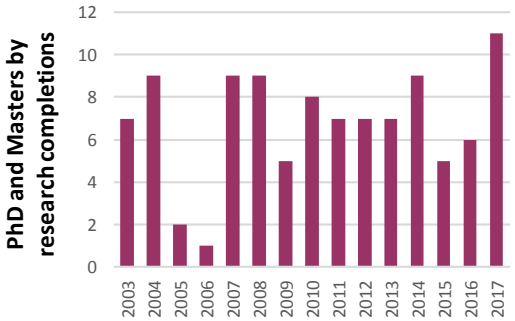


Staff		**2007**					**2012**					**2017**				
		Total	**R&T (Univ)**	**R&T (Ext)**	**RO (Univ)**	**RO (Ext)**	**Total**	**R&T (Univ)**	**R&T (Ext)**	**RO (Univ)**	**RO (Ext)**	**Total**	**R&T (Univ)**	**R&T (Ext)**	**RO (Univ)**	**RO (Ext)**
	Professor (level E)	**4.0**	4.0				**7.0**	1.7		3.8	1.5	**3.0**	2.0	0.0	1.0	0.0
	Associate Professor (level D)	**3.0**	3.0				**2.5**	0.5		2.0		**1.0**	0.0	1.0	0.0	0.0
	Senior Lecturer (level C)	**19.0**	5.0	1.0	3.0	10.0	**6.0**	2.0	0.5		3.5	**4.0**	2.3	0.7	0.0	1.0
	Lecturer (level B)	**3.0**				3.0	**14.9**				14.9	**11.8**	0.8	0.0	0.0	11.0
	Associate Lecturer (level A)	**0.0**					**0.0**					**0.0**	0.0	0.0	0.0	0.0
	Total	**29.0**	**12.0**	**1.0**	**3.0**	**13.0**	**30.4**	**4.2**	**0.5**	**5.8**	**19.9**	**19.8**	**5.1**	**1.7**	**1.0**	**12.0**

Enrolments		**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	***Subjects***
Undergraduate teaching load (EFTSL)	Year 1	20	32	22	26	24	22	23	25	20	27	27	19	19	18	14	2
	Year 2	9	11	17	16	12	17	17	22	15	14	22	19	15	12	12	4
	Year 3	9	10	10	19	11	16	15	21	24	21	19	24	19	18	17	9
	Honours	20	14	9	8	13	7	13	15	11	19	11	13	12	7	6	5
	Total	**58**	**67**	**58**	**69**	**60**	**62**	**68**	**83**	**70**	**81**	**80**	**75**	**65**	**56**	**49**	**20**
Graduations from geoscience UG majors or Honours	BSc - geosci major	7	8	8	17	9	14	13	19	22	19	20	22	18	15	14	
	BSc (Hons)	20	14	9	8	8	7	16	15	16	19	11	13	12	7	6	
Graduations from PG programs.	Masters by research					1	0	0	1	1	1	1	1	0	0	0	
	Masters by csework	1		2	1	1	4	7	2	0	4	6	8	10	6	6	
	PhD	7	9	2	1	8	9	5	7	6	6	6	8	5	6	11	

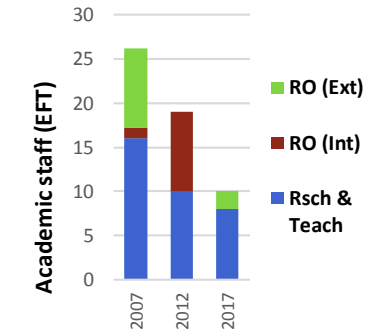
2017 Tertiary Education Survey Data Summary

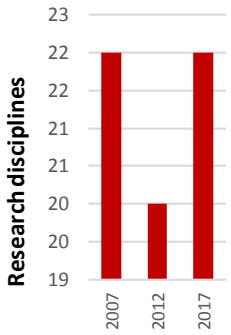
University of Wollongong — *School of Earth and Environmental Sciences*

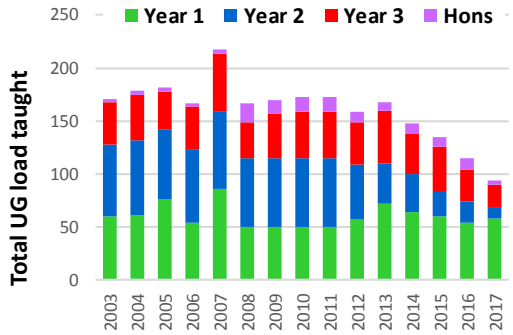
Degree and majors					
BSc	Geology	Geosciences			
BSc (Hons)	Geology	Geosciences			

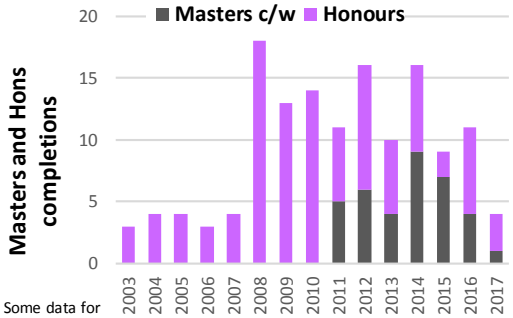
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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Staff		2007 Total	2007 R&T (Univ)	2007 R&T (Ext)	2007 RO (Univ)	2007 RO (Ext)	2012 Total	2012 R&T (Univ)	2012 R&T (Ext)	2012 RO (Univ)	2012 RO (Ext)	2017 Total	2017 R&T (Univ)	2017 R&T (Ext)	2017 RO (Univ)	2017 RO (Ext)
	Professor (level E)	**8.2**	6.0		1.2	1.0	**5.0**	4.0		1.0		**2.0**	2.0	0.0	0.0	0.0
	Associate Professor (level D)	**7.0**	6.0			1.0	**5.0**	3.0		2.0		**3.0**	2.0	0.0	0.0	1.0
	Senior Lecturer (level C)	**3.0**	3.0				**4.0**	2.0		2.0		**2.0**	2.0	0.0	0.0	0.0
	Lecturer (level B)	**8.0**	1.0			7.0	**2.0**	1.0		1.0		**3.0**	2.0	0.0	0.0	1.0
	Associate Lecturer (level A)	**0.0**					**3.0**	0.0		3.0		**0.0**	0.0	0.0	0.0	0.0
	Total	**26.2**	**16.0**	**0.0**	**1.2**	**9.0**	**19.0**	**10.0**	**0.0**	**9.0**	**0.0**	**10.0**	**8.0**	**0.0**	**0.0**	**2.0**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	60	61	76	54	86	50	50	50	50	57	72	64	60	54	58	2
	Year 2	68	71	66	69	73	65	65	65	65	52	38	36	24	20	10	3
	Year 3	40	43	36	41	54	34	42	44	44	40	50	38	42	30	22	3
	Honours	3	4	4	3	4	18	13	14	14	10	8	10	9	11	4	1
	Total	**171**	**179**	**182**	**167**	**217**	**167**	**170**	**173**	**173**	**159**	**168**	**148**	**135**	**115**	**94**	**9**
Graduations from geoscience UG majors or Honours	BSc - geosci major	34	35	32	34	40	31	35	36	36	34	35	37	36	29	23	
	BSc (Hons)	3	4	4	3	4	18	13	14	6	10	6	7	2	7	3	
Graduations from PG programs.	Masters by research											0	0	1	5	1	
	Masters by csework									5	6	4	9	7	4	1	
	PhD	3	6	3	6	3	7	6	7	3	7	1	3	1	0	0	

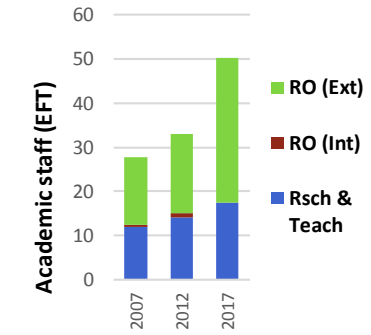
2017 Tertiary Education Survey Data Summary

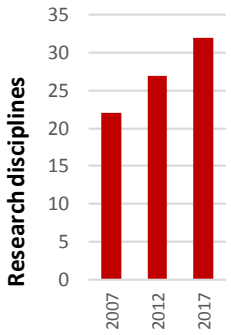
University of Western Australia — *School of Earth Sciences*

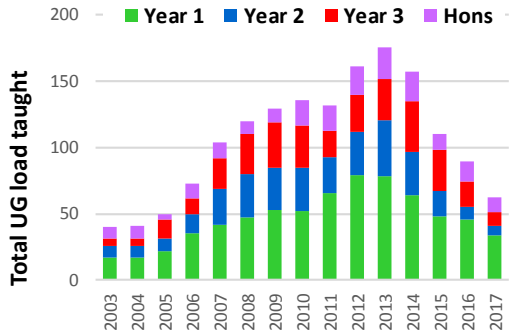
Degree and majors					
BSc	Geology				
BSc (Hons)	Geology				

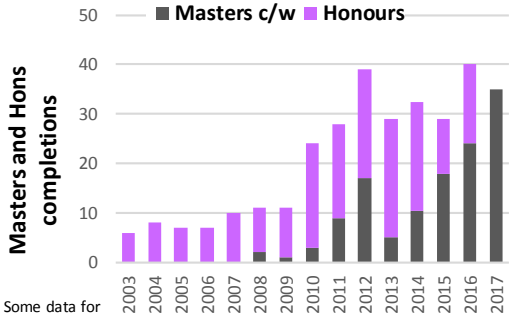
AQF 9 (Masters) offered	Y
AQF 10 (PhD) offered	Y

Disciplines		2007	2012	2017
0401 Atmospheric Sci (all)				
0402 Geochemistry	40201 Exploration Geochemistry			
	40202 Inorganic Geochemistry			
	40203 Isotope Geochemistry			
	40204 Organic Geochemistry			
0403 Geology	40301 Basin Analysis			
	40302 Extra-terrestrial Geology			
	40303 Geochronology			
	40304 Igneous and Metamorphic Pet			
	40305 Marine Geoscience			
	40306 Mineralogy and Crystallography			
	40307 Ore Deposit Petrology			
	40308 Palaeontology (incl. Palynology)			
	40309 Petroleum and Coal Geology			
	40310 Sedimentology			
	40311 Stratigraphy			
	40312 Structural Geology			
	40313 Tectonics			
	40314 Volcanology			
0404 Geophysics	40401 Elec(mag) Methods in Geophys			
	40402 Geodynamics			
	40403 Geophysical Fluid Dynamics			
	40404 Geothermics and Radiometrics			
	40405 Gravimetrics			
	40406 Magnetism and Palaeomag			
	40407 Seismology and Seismic Explor			
0405 Oceanography (all)				
0406 Physical Geog / Enviro Geosci	40601 Geomorph/regolith/landsc evol			
	40602 Glaciology			
	40603 Hydrogeology			
	40604 Natural Hazards			
	40605 Palaeoclimatology			
	40606 Quaternary Environments			
	40607 Surface Processes			
	40608 Surface water Hydrology			









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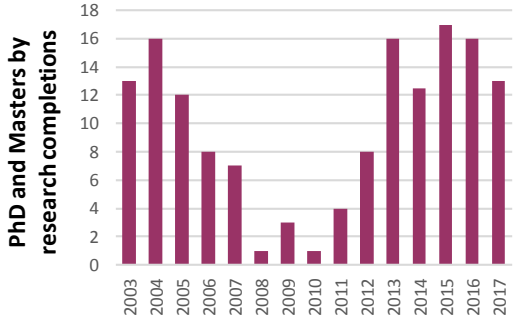


Staff		2007					2012					2017				
		Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)	Total	R&T (Univ)	R&T (Ext)	RO (Univ)	RO (Ext)
	Professor (level E)	**4.0**	3.0			1.0	**7.0**	4.0			3.0	**4.0**	4.0	0.0	0.0	0.0
	Associate Professor (level D)	**2.0**		1.0		1.0	**4.0**	3.0			1.0	**9.0**	6.0	0.0	0.0	3.0
	Senior Lecturer (level C)	**9.8**	4.0			5.8	**6.0**	2.0	1.0	1.0	2.0	**6.6**	2.6	0.0	0.0	4.0
	Lecturer (level B)	**8.6**	2.0			6.6	**15.0**	2.0	2.0		11.0	**16.0**	4.8	0.0	0.0	11.2
	Associate Lecturer (level A)	**3.5**		2.0	0.3	1.2	**1.0**	0.0			1.0	**14.6**	0.0	0.0	0.0	14.6
	Total	**27.9**	**9.0**	**3.0**	**0.3**	**15.6**	**33.0**	**11.0**	**3.0**	**1.0**	**18.0**	**50.2**	**17.4**	**0.0**	**0.0**	**32.8**

Enrolments		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	*Subjects*
Undergraduate teaching load (EFTSL)	Year 1	17	17	22	35	42	47	53	52	66	79	78	64	48	46	34	2
	Year 2	9	9	9	15	27	33	32	33	27	33	43	33	19	9	8	3
	Year 3	5	5	15	12	23	30	34	32	20	28	31	39	31	20	10	5
	Honours	9	10	4	11	12	10	10	19	19	21	24	22	12	15	11	1
	Total	**40**	**41**	**50**	**73**	**104**	**120**	**129**	**136**	**132**	**161**	**175**	**157**	**110**	**90**	**62**	**11**
Graduations from geoscience UG majors or Honours	BSc - geosci major	12	14	15	18	21	36	42	45	38	55	70	78	60	35	32	
	BSc (Hons)	6	8	7	7	10	9	10	21	19	22	24	22	11	16	0	
Graduations from PG programs.	Masters by research	1	6	3	3	3				1	2	6	4	5	6	7	
	Masters by csework						2	1	3	9	17	5	11	18	24	35	
	PhD	12	10	9	5	4	1	3	1	3	6	11	9	13	10	6	

Appendix 2: AGTEP survey questionnaire

Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

Australian Geoscience Tertiary Education Profile

Welcome to the Geoscience Tertiary Education Profile 2017

Thank you for participating in the 2017 AGC survey.

Your feedback is important.

The following questionnaire is designed to extend the Australian Geoscience Tertiary Education Profile as a health check on our national geoscience teaching capability and is the fourth such survey. The Australian Geoscience Council (AGC) conducted the first survey in 2007 because of concern about ability of the higher educational system to provide the appropriately trained geoscientists required by the economy and Australian society, and the capability to educate Australian society about the discipline of geoscience into the future. This third survey is intended to update these previous surveys and provide an updated and authoritative reference to geoscience trends in Australian Universities. The data may contribute to framing of the next AAS-AGC Decadal Plan for the Geosciences. The report of previous surveys can be found at:

www.agc.org.au

The purposes of the survey are to:

Obtain an overview of the issues confronting Tertiary geoscience education at the present time including the supply of geoscience graduates.

Determine where we stand regarding the various teaching departments or schools offering geosciences.

Ascertain where undergraduate majors and postgraduate programs are currently offered.

Determine what geoscience is being offered as part of a broader environmental or other science program.

As with previous AGC surveys, the results will be publically accessible through the AGC website.

Specific data provided by universities in Tab 2 (Qs 1 to 15) will be presented with the universities identified (unless individual universities request some or all of their institutional data be kept confidential, in which case the data will only form part of the summative data for the sector).

Information supplied in the open-ended responses in Tab 3 will be kept strictly confidential by AGC. The comments will not be attributed to you or your institution. The comments will only be used to help form a general overview of the sector and emerging issues.

Data collected in this survey will be added to the database similarly collected in 2007, 2010 and 2012 by the AGC.

The results of this survey will be included in a report by the AGC that will be distributed to all participating institutions, AGC members institutions and may be presented publically.

The survey does not involve collection of data relating to any individuals (staff or students).

Questions may be directed to A/Prof David Cohen, Chair of the AGC Education Committee at d.cohen@unsw.edu.au

Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

AGC

Australian Geoscience Tertiary Education Profile

Department /School and Institution:	
Person completing the survey:	

A. Current Geoscience Undergraduate Educational Offerings

Q1 Are you able to teach undergraduate (AQF level 7) and/or honours (AQF level 8) degree programs directed at or containing majors within the geosciences? (if no, go to Q. 2)

☐ Yes
☐ No

If there are specific majors, please indicate all degrees and contained majors.

Degree	Major #1	Major #2	Major #3

Notes on nomenclature:

"Subjects" denotes specific discipline offerings such as "Introduction to Mineralogy" and is equivalent to the term **"Courses"** in some institutions.

"Majors" denotes a set of subjects leading to a specific disciplinary naming such as "Geology" or "Earth Sciences" within a degree, and is equivalent to the terms **"Specialisation"** or **"Stream"** in some institutions. It may be the name of the honours program.

"Degree" should be taken as the normal meaning such as "BSc" or "BSc(Hons) ,and maybe referred to as a "Program" in some institutions.

"Geosciences" denotes areas of study that would **allow** graduates from a program to gain membership of umbrella geoscientific learnéd or professional societies such as the Geological Society of Australia, the Australian Institute of Geoscientists or the Australasian Institute of Mining and Metallurgy.

Q2 If geoscience subjects are offered as part of a more general science or other degree, please indicate the degrees on offer.

Degree

Q3 Please outline any formal arrangements with other institutions to jointly deliver geoscience majors or degrees.

Q4 Have any specific actions been taken in the last 3 years to address skills gaps (actual or perceived) in undergraduate majors or degrees in areas of geoscience related to industry and the work of public institutions?

Q5 Please indicate any changes that will or are likely to affect your undergraduate offerings (subjects through to degrees) in the next three years.

Q6 Does your school/department have an outreach or liaison program to stimulate interest in geoscience in the broader community and potential students in the geosciences?

☐ Yes
☐ No

If yes, briefly outline such programs

B. Current Geoscience Postgraduate Educational Offerings

Q7 Are you able to offer masters level (AQF 9) degrees in the geosciences?

☐ Yes
☐ No

If Masters degrees are offered, are there areas of specialisation? If so, please give titles.

Q8 Are you able to offer PhD (AQF 10) degrees in the geosciences?

☐ Yes
☐ No

If PhD degrees are offered, please indicate the ABS Research Classification Codes in which research can be undertaken (you may indicate more than 1).

☐	**0401**	**Atmospheric Sciences (all sub-disciplines)**
	0402	**Geochemistry**
☐	40201	Exploration Geochemistry
☐	40202	Inorganic Geochemistry
☐	40203	Isotope Geochemistry
☐	40204	Organic Geochemistry
☐	40299	Geochemistry not elsewhere classified
	0403	**Geology**
☐	40301	Basin Analysis
☐	40302	Extra-terrestrial Geology
☐	40303	Geochronology
☐	40304	Igneous and Metamorphic Petrology
☐	40305	Marine Geoscience
☐	40306	Mineralogy and Crystallography
☐	40307	Ore Deposit Petrology
☐	40308	Palaeontology (incl. Palynology)
☐	40309	Petroleum and Coal Geology
☐	40310	Sedimentology
☐	40311	Stratigraphy (incl. Biostratigraphy and Sequence Stratigraphy)
☐	40312	Structural Geology
☐	40313	Tectonics
☐	40314	Volcanology
☐	40399	Geology not elsewhere classified
	0404	**Geophysics**
☐	40401	Electrical and Electromagnetic Methods in Geophysics
☐	40402	Geodynamics
☐	40403	Geophysical Fluid Dynamics
☐	40404	Geothermics and Radiometrics
☐	40405	Gravimetrics
☐	40406	Magnetism and Palaeomagnetism
☐	40407	Seismology and Seismic Exploration
☐	40499	Geophysics not elsewhere classified
☐	**0405**	**Oceanography (all sub-disciplines)**
	0406	**Physical Geography and Environmental Geoscience**
☐	40601	Geomorphology and Regolith and Landscape Evolution
☐	40602	Glaciology
☐	40603	Hydrogeology
☐	40604	Natural Hazards
☐	40605	Palaeoclimatology
☐	40606	Quaternary Environments
☐	40607	Surface Processes
☐	40608	Surface water Hydrology
☐	40699	Physical Geography and Environmental Geoscience not elsewhere classified
☐	**0499**	**Other Earth Sciences**

C. Staffing Profiles and General Resourcing

Q9 Please provide data on your current staffing profile **in the geosciences.**

Note: In multi-disciplinary schools please attempt to allocate FTE derived from the geosciences part of the school where possible

(a) University and externally funded research and teaching positions (FTE)

	University Funded		Externally Funded		Total
	Continuing	*Contract*	*Continuing*	*Contract*	
Prof (level E)					0
A/Prof (level D)					0
Snr Lect (level C)					0
Lecturer (level B)					0
A/Lect (level A)					0

(b) University and externally funded research-only or research intensive positions (FTE)

	University Funded		Externally Funded		Total
	Continuing	*Contract*	*Continuing*	*Contract*	
Prof (level E)					0
A/Prof (level D)					0
Snr Lect (level C)					0
Lecturer (level B)					0
A/Lect (level A)					0

(c) University and externally funded teaching-focussed positions (FTE)

	University Funded		Externally Funded		Total
	Continuing	*Contract*	*Continuing*	*Contract*	
Prof (level E)					0
A/Prof (level D)					0
Snr Lect (level C)					0
Lecturer (level B)					0
A/Lect (level A)					0
Demonstrators					0

(d) University and externally-funded research support and administration positions (FTE)

	University Funded		Externally Funded		Total
	Continuing	*Contract*	*Continuing*	*Contract*	
Technical					0
Administrative					0

Q10 Outline any significant changes to your university-funded staffing profile over the past five years.

Q11 Outline any significant anticipated changes to your university-funded staffing profile over the next three years.

Q12 Comment on any significant changes in staff teaching loads over the past three years.

Q13 Comment on any significant changes in resources, support and any other initiatives that have affected or will affect the quality of the education experience for students (both positive and negative).

Q14 Outline any direct or in-kind support your department or school receives from industry or government agencies (excluding competitive grants schemes such as ARC LIEF or NCRIS) for equipment or other infrastructure

D. Geoscience Enrolments and Graduate Outcomes

Q15 Please complete the following tables to enable a national perspective on geoscience graduate trends. In order to provide comparable data between institutions we would appreciate if you could you could provide total students load (EFTSL) in geoscience subjects at each level.

Note: Where possible, exclude "servicing" subjects such as "Geology for Engineers". Numbers should include students taking geoscience majors, other science students completing geoscience subjects and students enrolled as part of general education or free electives from anywhere in your institution.

(a) Undergraduate teaching load (EFTSL)

	2013	2014	2015	2016	2017	2017
						No of subjects offered
Year 1						
Year 2						
Year 3						
Honours						

(b) Graduations from undergraduate geoscience majors or degrees (at BSc or BSc(Hons) levels).

	2013	2014	2015	2016	2017
BSc - geosci major					
BSc (Hons)					

(c) Graduations from postgraduate programs (if actual data are not accessible, then estimate by dividing enrolments by average length of time taken to complete degrees in FTE).

	2013	2014	2015	2016	2017
Masters by research					
Masters by coursework					
Other (eg GradDip)					
PhD					

Any comments on the basis of the above calculations or reporting (e.g. difficulty in separating earth science from physical geography majors)?

Thank you for completing this AGC survey

Australian Geoscience Council Inc.

The Council of Earth Science Societies in Australia

AGC

Australian Geoscience Tertiary Education Profile

Any further general comments you MAY wish to make about the delivery of geocience programs at your institution including areas where your department/school intends to specialise, infrastructure provisions, capacity to deliver programs, educational trends, etc

These comments will be kept strictly confidential by AGC. The comments will not be attributed to you or your institution. The comments will only be used to help form a general overview of the sector and emerging issues.

Additional comments:

Additional comments (ctd):

Appendix 3: Summary of key research output indicators for six-digit FOR codes for the earth sciences in the 2015 ERA assessment.

Earth Sciences is comprised of the following four–digit codes:

0401 Atmospheric Sciences

0402 Geochemistry

0403 Geology

0404 Geophysics

0405 Oceanography

0406 Physical Geography and Environmental Geoscience

0499 Other Earth Sciences

15 out of 20 two–digit UoEs and 54 out of 62 four–digit UoEs assessed were rated above world standard

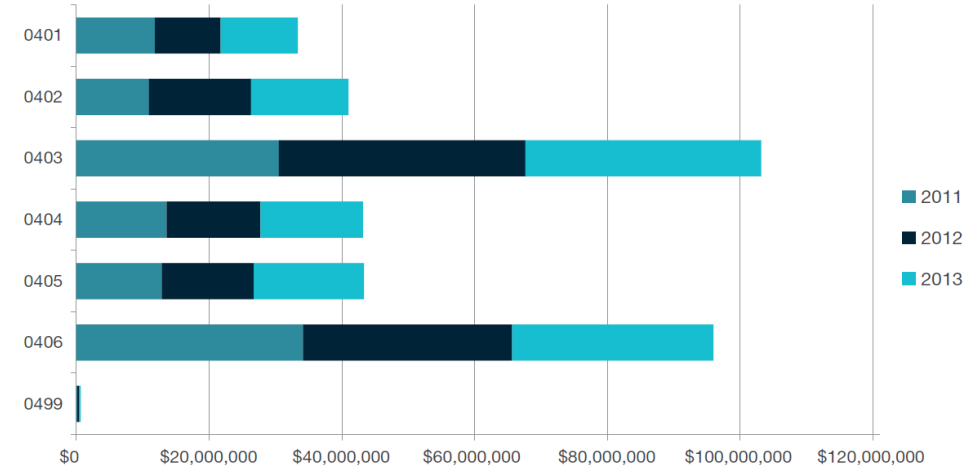
FoR Overview

Earth Sciences (04) accounted for approximately three per cent of the research outputs submitted to ERA 2015. Journal articles were the most common research output type in Earth Sciences. Geology (0403) had the highest number of research outputs, staffing levels and highest research income levels. Geochemistry (0402) had the highest research commercialisation income.

Indicator	No.
Research outputs	11,090.4
Research income	$360,562,621
FTEs	980.5
Esteem count	118.4
Patents	5.0
Research commercialisation income	$3,921,917

Rating	Distribution	
	Two–digit	Four–digit
5	1	30
4	14	24
3	5	8
2	0	0
1	0	0
Total	**20**	**62**

RESEARCH INCOME BY YEAR–ALL CATEGORIES ($)



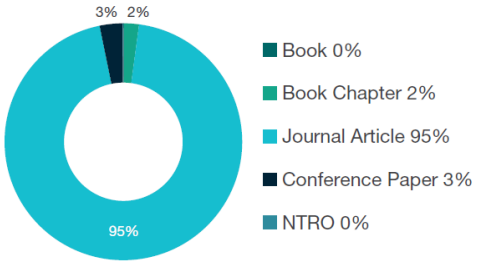
FoR code	2011 ($)	2012 ($)	2013 ($)	Total ($)
0401 Atmospheric Sciences	11,821,744	9,909,795	11,628,174	33,359,713
0402 Geochemistry	10,909,829	15,409,186	14,663,235	40,982,251
0403 Geology	30,501,278	37,138,420	35,530,071	103,169,768
0404 Geophysics	13,586,418	14,144,304	15,440,349	43,171,071
0405 Oceanography	12,810,030	13,902,603	16,585,131	43,297,764
0406 Physical Geography and Environmental Geoscience	34,126,806	31,527,237	30,311,904	95,965,947
0499 Other Earth Sciences	123,144	305,643	187,320	616,107
Total	**113,879,250**	**122,337,188**	**124,346,184**	**360,562,621**

0402 Geochemistry

Indicator	No.
Research outputs	1,453.1
Research income	$40,982,251
FTEs	141.3
Esteem count	23.4
Patents	2.0
Research commercialisation income	$2,596,226

Rating	Distribution
5	7
4	2
3	1
2	0
1	0
Total	**10**

RESEARCH OUTPUTS BY TYPE



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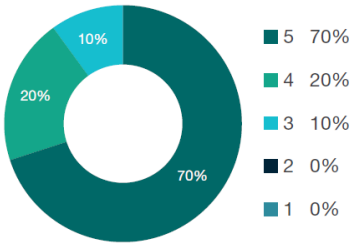
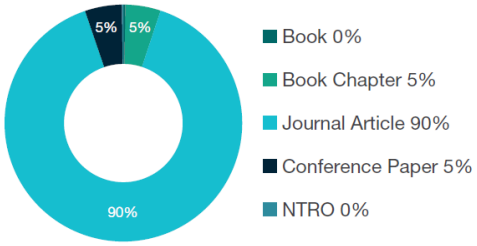


0403 Geology

Indicator	No.
Research outputs	3,165.8
Research income	$103,169,768
FTEs	251.0
Esteem count	40.0
Patents	3.0
Research commercialisation income	$340,393

Rating	Distribution
5	8
4	7
3	1
2	0
1	0
Total	**16**

RESEARCH OUTPUTS BY TYPE



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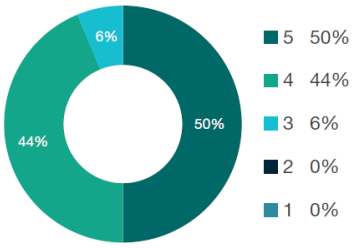
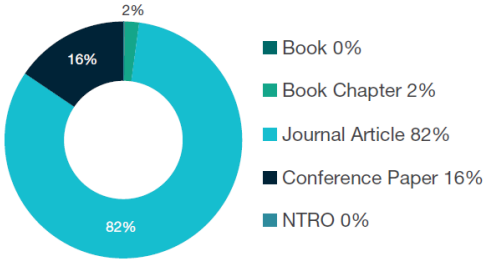


0404 Geophysics

Indicator	No.
Research outputs	1,168.5
Research income	$43,171,071
FTEs	96.8
Esteem count	8.7
Patents	0.0
Research commercialisation income	$5,444

Rating	Distribution
5	2
4	5
3	1
2	0
1	0
Total	**8**

RESEARCH OUTPUTS BY TYPE



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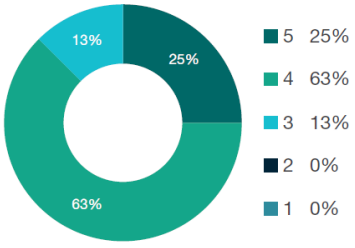
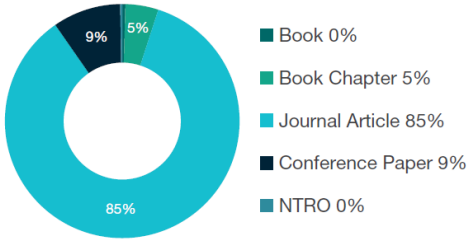


0401 Atmospheric Sciences

Indicator	No.
Research outputs	1,147.1
Research income	$33,359,713
FTEs	119.1
Esteem count	13.3
Patents	0.0
Research commercialisation income	$96,169

Rating	Distribution
5	5
4	0
3	1
2	0
1	0
Total	**6**

RESEARCH OUTPUTS BY TYPE



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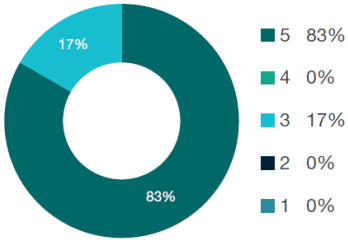
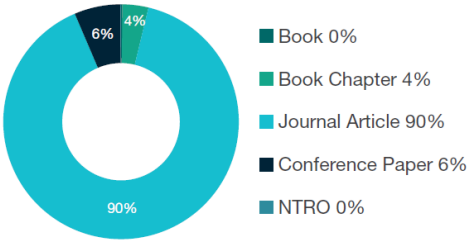


0405 Oceanography

Indicator	No.
Research outputs	1,227.2
Research income	$43,297,764
FTEs	108.2
Esteem count	17.6
Patents	0.0
Research commercialisation income	$24,871

Rating	Distribution
5	3
4	2
3	1
2	0
1	0
Total	**6**

RESEARCH OUTPUTS BY TYPE



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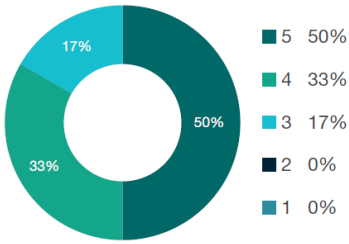
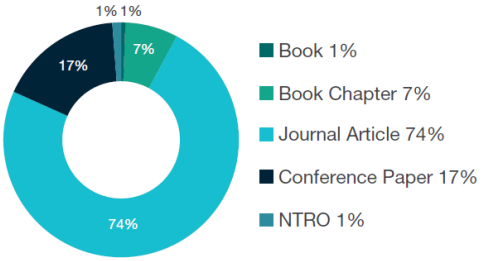


0406 Physical Geography and Environmental Geoscience

Indicator	No.
Research outputs	2,472.5
Research income	$95,965,947
FTEs	206.5
Esteem count	15.3
Patents	0.0
Research commercialisation income	$858,814

Rating	Distribution
5	5
4	8
3	3
2	0
1	0
Total	**16**

RESEARCH OUTPUTS BY TYPE



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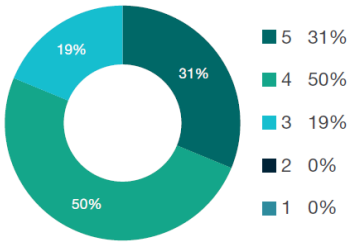

Appendix 4: ERA rankings for the 2-digit and 4-digit earth science FOR codes for all Australian Universities in the 2015 ERA assessment.

Institution	04 Earth Sciences	0401 Atmospheric Sciences	0402 Geochemistry	0403 Geology	0404 Geophysics	0405 Oceanography	0406 Physical Geography and Environmental Geoscience
University of New South Wales	5	5	n/a	4	n/a	4	5
Australian National University	4	5	5	4	4	5	4
Curtin University Tech	4	n/a	5	5	4	n/a	3
James Cook University	4	n/a	4	5	n/a	3	5
Macquarie University	4	5	4	4	4	n/a	5
Southern Cross University	4	n/a	5	n/a	n/a	5	n/a
University of Adelaide	4	n/a	5	5	4	n/a	n/a
University of Melbourne	4	5	5	4	n/a	n/a	4
University of New England	4	n/a	n/a	5	n/a	n/a	n/a
University of Newcastle	4	n/a	n/a	4	n/a	n/a	5
University of Queensland	4	n/a	5	4	n/a	n/a	4
University of Sydney	4	n/a	n/a	5	5	n/a	4
University of Tasmania	4	n/a	3	5	5	5	4
University of Western Australia	4	n/a	5	4	4	4	4
University of Wollongong	4	5	n/a	5	n/a	n/a	5
Federation University Australia	3	n/a	n/a	n/a	n/a	n/a	3
Flinders University	3	n/a	n/a	n/a	n/a	n/a	3
Griffith University	3	n/a	n/a	n/a	n/a	n/a	4
Monash University	3	3	n/a	3	3	n/a	4
Queensland University Tech	3	n/a	n/a	5	n/a	n/a	n/a
Total evaluated	**20**	**6**	**10**	**16**	**8**	**6**	**16**
	5	**Well above world standard**					
	4	**Above world standard**					
	3	**At world standard**					

Not ranked (insufficient outputs)

Australian Catholic University	La Trobe University	University of South Australia
Bond University	Murdoch University	University of Southern Queensland
Central Queensland University	RMIT University	University of Technology, Sydney
Charles Darwin University	Swinburne University of Technology	University of the Sunshine Coast
Charles Sturt University	University of Canberra	University of Western Sydney
Deakin University	University of Divinity	Victoria University
Edith Cowan University	University of Notre Dame Australia	