NCI AUSTRALIA

ANNUAL REPORT

2018
2019

WORLD-CLASS HIGH-END COMPUTING SERVICES FOR AUSTRALIAN RESEARCH AND INNOVATION

The report is also accessible from the NCI website at www.nci.org.au

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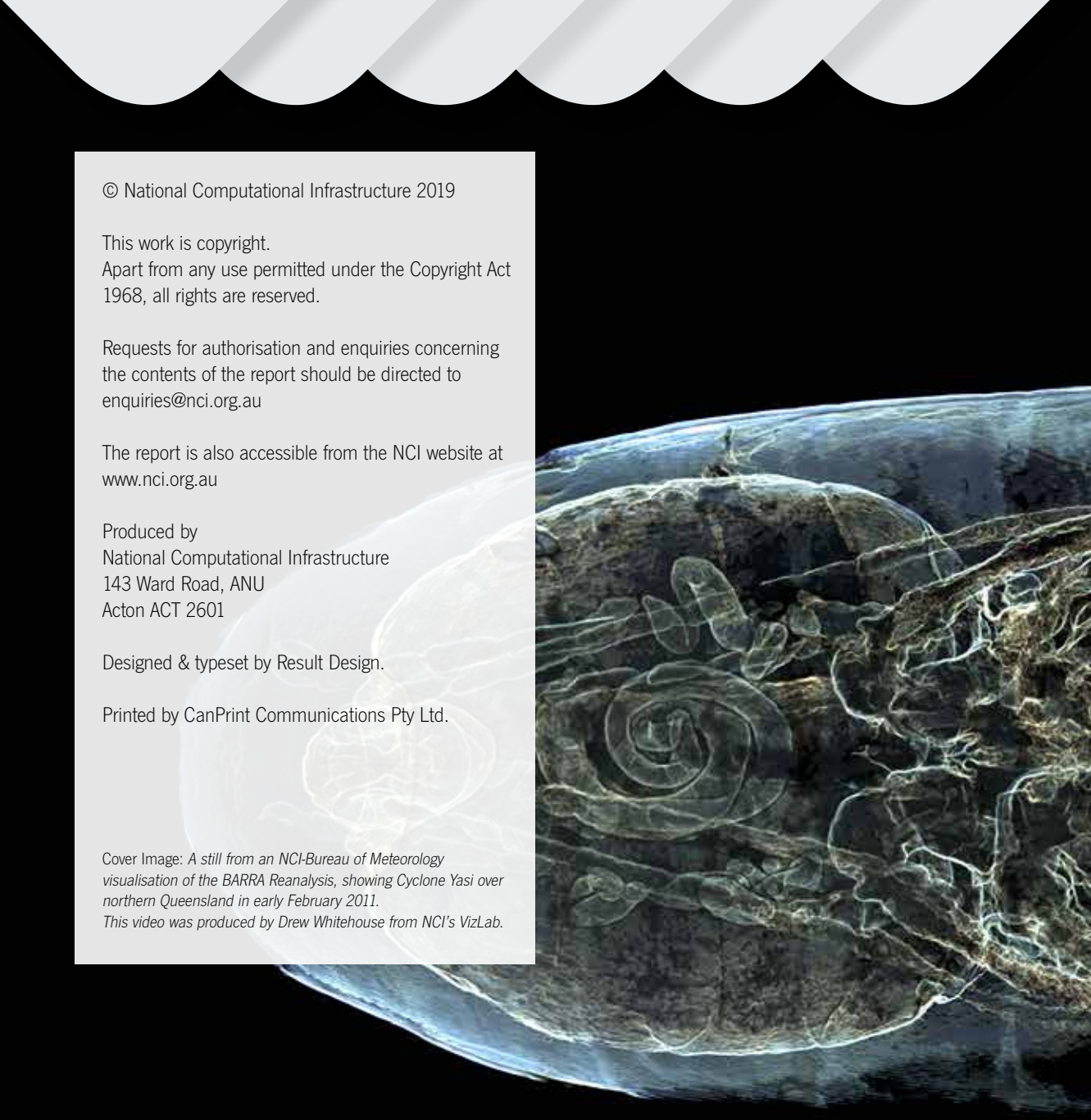
Cover Image: *A still from an NCI-Bureau of Meteorology visualisation of the BARRA Reanalysis, showing Cyclone Yasi over northern Queensland in early February 2011.*
This video was produced by Drew Whitehouse from NCI's VizLab.



Erica Seccombe, Metamorphosis of a fly pupa, detail from a 4D Micro-CT animation rendered in Drishti. The bluebottle fly, Calliphora vicina, is one of the most widely used forensic indicators as it is able to detect and colonise a cadaver just minutes after death.

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About NCI

The National Computational Infrastructure (NCI) is Australia's leading high-performance data, storage and computing organisation, providing expert services to benefit all domains of science, government and industry.

NCI brings the Australian Government and the Australian research sector together through a broad collaboration involving the largest national science agencies, universities, industry partners and the Australian Research Council.

As the home of the high-performance computational science of so many research organisations around the country, our highly integrated scientific computing facility provides world-class services to thousands of researchers every year. NCI's combination of data services and supercomputing expertise enables groundbreaking scientific outcomes; new, advanced technologies; and critical insights that inform and benefit public policy. NCI facilitates high-impact research and innovation that is otherwise impossible to undertake.

Alongside and in support of Australia's premier research funding bodies, NCI supports an internationally competitive research environment that attracts and retains leading researchers in Australia.

Custodians of the nation's most powerful supercomputer, its highest performance research cloud, some of its fastest filesystems, its largest national research data repository, and its leading data services stack, the NCI technical staff are renowned nationally and internationally for their expertise. Locally, in a reflection of their passion for their roles, they are known for their constant dedication to maintaining NCI's services at all times.

Our Mission

NCI's mission is to deliver to the Australian research sector the computational capability and enhanced services it needs to achieve transformational outcomes benefiting Australia's industry, environment, research sector, public policy formulation and Australian society more broadly.

- NCI is research and outcomes driven, innovating and evolving our services portfolio to deliver on researchers' requirements, institutional research needs, and national research priorities.
- NCI delivers national benefits by enabling and enhancing the outcomes of research projects undertaken by government, science agencies, universities and industry across the country.
- NCI's research-driven agenda is underpinned by deep engagement with a broad range of research organisations, centres and communities across Australia and the world, which drives the relevance, agility and value of our services.
- NCI's infrastructure, expertise and experience deliver transformational outcomes that are world-leading.

As Australian research becomes ever more reliant on computational methods, a reliable and innovative high-performance computing platform is required. That is why NCI is pushing the boundaries of what a high-performance computing and high-performance data facility can offer. The colocation and integration of petabyte-scale data storage with a multi-petaflop supercomputer through innovative and powerful new data services is critical to making data science innovation possible for Australian research.

INTRODUCTION

NCI is a highly integrated, advanced computing facility, dedicated to enabling research that benefits Australia and its national science priorities. By providing high-performance computing, data storage and data services under one roof, NCI brings an all-in-one resource for compute and data-intensive research to the Australian community.

Chair's Report

It is my pleasure to introduce NCI's Annual Report for 2018–19, a landmark year in NCI's history. In July of this year, we announced that Fujitsu Australia had won the tender to supply NCI's new supercomputer. I would like to thank the Federal Government for their investment of $70 million through the Department of Education's National Collaborative Research Infrastructure Strategy. I am confident that they have received excellent value for their investment on behalf of the nation.

The new supercomputer, named Gadi or "to search for" in the language of the Ngunnawal people, the traditional owners of the Canberra region, will bring the latest high-performance computing (HPC) technologies to the Australian research community. It will deliver up to a six-fold increase in compute power over NCI's current supercomputer.

The Gadi procurement was a great effort by both NCI and The Australian National University (ANU), leading to a great result for the Australian research community. Meanwhile, the NCI team has also continued to deliver their high quality HPC and HPD (high-performance data) services to the community. As NCI Chair, I would like to commend and thank all involved.

As we celebrate a significant increase in NCI's compute capability, it is important to recognise that delivering compute cycles is only part of the value we deliver to Australian research. Much of this value derives from a tight coupling of HPC, HPD and technical skills. Indeed, NCI is Australia's most significant repository for research datasets of national utilisation, significance and scale. In the year ahead, we need to continue to strengthen strategic collaboration between NCI and the wider e-research community. Compute and data can no longer be treated as distinct elements.

Fujitsu's success in winning a very competitive tender continues a long history of collaboration between Fujitsu and Australian HPC that dates back to 1987, when NCI's precursor organisation, the ANU Supercomputing Facility acquired a Fujitsu VP50 supercomputer, closely followed by a VP100. Those machines, some of the earliest research supercomputers in Australia, were more than 10 million times less powerful than Gadi.

Collaboration is at the heart of NCI. In particular, the Board is pleased with the strong collaboration that NCI and the Pawsey Supercomputing Centre in Perth have developed. This relationship covers, in June, the first meeting of the two boards and, in the coming November, the inaugural Australasian Leadership Computing Symposium. I would like to commend the two directors, Sean Smith and Mark Stickells, on the way the facilities are working together.

The past year has also seen the renewal of the Collaboration Agreement that governs the operations of NCI. The agreement outlines the roles and responsibilities of our 'Foundation Collaborators'–CSIRO, ANU, the Bureau of Meteorology and Geoscience Australia–and the increasing number of other research organisations that see value in a strategic collaboration with NCI.

At Board level, 2018–19 saw a number of changes, including the retirement of Foundation Collaborator-nominated directors Professor Margaret Harding (ANU) and Dr Sue Barrell (Bureau of Meteorology) as well as one of our independent directors, Dr Thomas Barlow. I would like to thank them and all current directors for their support of NCI and their commitment to our vision to be Australia's leading and most integrated high-performance computing and data facility, enabling globally competitive outcomes from Australian research.

Emeritus Professor Michael Barber AO FAA FTSE, Chair, NCI Board

Director's Report

The past year has seen NCI take major strides in reshaping our infrastructure, our business and our governance models to position ourself for the next generation in our provision of high-performance compute and data services for the national research sector.

This year's major activity has been the procurement of the national peak supercomputing facility, Gadi, funded under the Department of Education's National Collaborative Research Infrastructure Scheme (NCRIS). This was a collaborative undertaking involving technical and executive input from NCI's collaborating government agencies and our fellow NCRIS-supported HPC centre, the Pawsey Supercomputing Centre. Echoing the Chair's comments, I express my thanks to all those involved in achieving a tremendous outcome.

NCI's experience with our supercomputer procurement is now assisting the Pawsey Centre as they negotiate their own independent procurement. Sharing experience and operational insights at the technical and management levels – as well as emerging engagement between the respective boards – has enhanced the strong collaboration between Australia's two national supercomputing facilities.

In concert with the procurement, NCI and our Advisory Board have re-envisaged and reframed our governance agreement to reflect the expanding and evolving national research environment. This will afford NCI greater flexibility for delivering world-class capabilities and services to a wider range of research organisations in the big compute and data domains.

HIGHLIGHTS OF OUR YEAR

2018

JULY

NCI Associate Director (Research Engagement and Initiatives) Dr Ben Evans awarded the American Geophysical Union 2018 Leptoukh Lecture for Earth and Space Sciences Informatics.

SEPTEMBER

NCI launches its GSKY data service, simplifying geospatial analysis workflows for Geoscience Australia and the whole community.

NOVEMBER

AUGUST

Artist and long-time NCI user Dr Erica Seccombe wins 2018 Waterhouse Natural Science Art Prize, Australia's premier prize for art reflecting natural science.

OCTOBER

DECEMBER

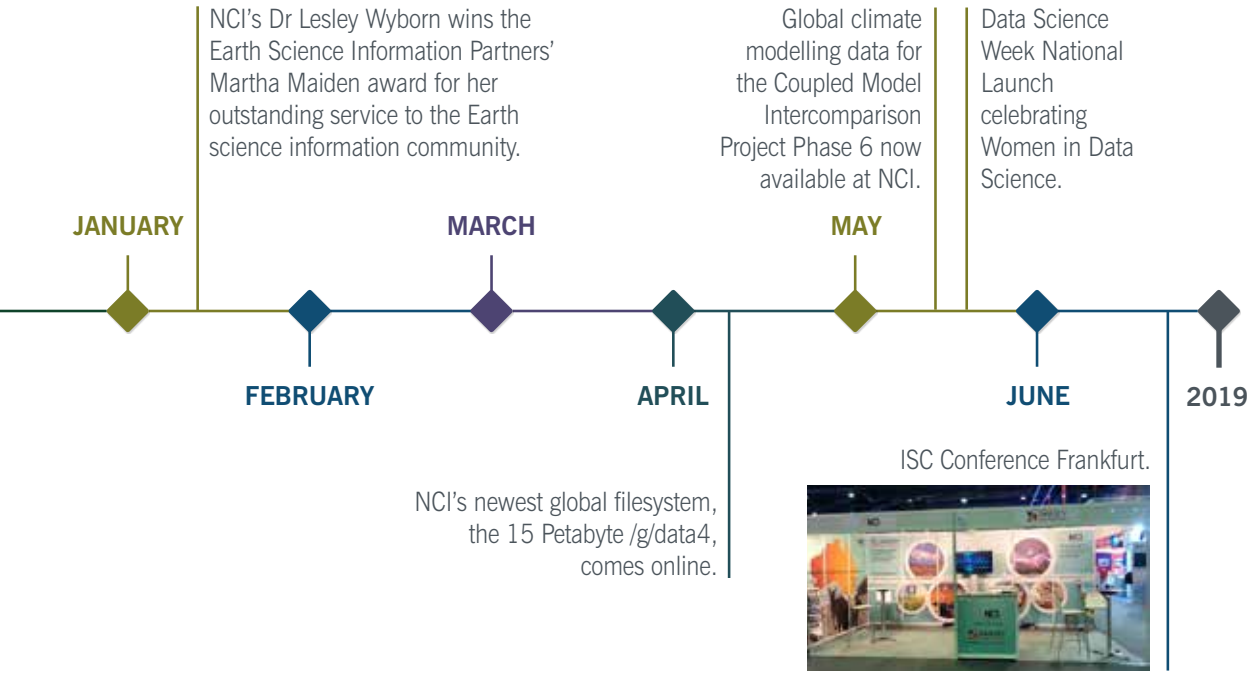
SC Conference Dallas.

Big data analytics continues to gain strength as a key enabler and driver across modern research, government, business and society. As a leading facility offering advanced big data capabilities, we need to support the use of these capabilities in our own clients, and this means more flexible business models that can underwrite the big compute and the big data sides of NCI's services. Thus, NCI also evolved our business model to strengthen our leadership position in providing big data capabilities for the Australian research sector. We look forward to deepening our collaborations with our fellow stakeholders in the national research infrastructure sector, including the Australian Research Data Commons, the Pawsey Supercomputing Centre and BioPlatforms Australia.

On the international stage, we have strengthened and extended our engagement and collaborations with overseas supercomputing facilities. This includes growing bilaterial collaborations with centres such as Singapore's NSCC and Japan's RIKEN RCC, as well as technical collaborations within international consortia such as the Accelerated Data Analytics and Computing Institute jointly hosted by the world's number one facility ORNL, Japan's TiTech facility and Switzerland's CSCS.

Presenting at an international workshop at the Leibniz Computing Centre in Munich this year, I was floored by a glowing endorsement, from one of the audience during question time, of NCI's world-leading role in petascale geospatial data, working alongside Geoscience Australia. It was a timely reminder of NCI's recent collaborative achievements, and what we may achieve in the coming years through the intensive collaborations that our new governance arrangements, business model and infrastructure enable.

Professor Sean Smith, FAAAS
Director, NCI



Research Outcomes and Impact

1

National Benefits

NCI's unique infrastructure and highly valued staff expertise are essential components in the national research landscape, contributing to an ever growing number of downstream societal benefits. From ever-improving prediction systems for climate and extreme weather events, to data analysis for better understanding of the geophysical environment, and ground-breaking discoveries in drug design and genomics, this research reaches across a wide range of scientific fields.

NCI enables complex, long-running collaborative research endeavours spanning multiple institutions, alongside specific projects belonging to individual researchers. Additionally, early-career researchers have the opportunity to access NCI resources, allowing them to advance their careers using world-class infrastructure that would otherwise be out of their reach.

NCI provides the collaborative environment needed for the research and development of the Australian Community Climate and Earth System Simulator (ACCESS) modelling software, which is used by our national science agencies and research communities for weather forecasts and climate predictions. The ongoing improvements in the model are available across these diverse groups and can be readily implemented by the Australian Bureau of Meteorology into national operations, as well as for climate research used by CSIRO, the ARC Centre of Excellence in Climate Extremes (CLEX) and the broader research community.

The ACCESS model data is shared and made available through NCI platforms and data services that are accessible internationally, and which are then deeply integrated into recognised scientifically robust review processes. The ability to share these insights and more easily integrate into other international research infrastructures has flow-on benefits to many different communities in Australia and around the world, including research colleagues from organisations in the United Kingdom, New Zealand, India and South Africa.

NCI's advances in managing national environmental datasets are being used in the Digital Earth Australia program led by Geoscience Australia, and lead to improved national outcomes on understanding the state of the environment and translation to agriculture, land and water management. Furthermore, the collaborative approach that generated these high-performance data advances has now been adopted internationally through sister programs in Africa and Asia, and through collaborations in the United States and Europe.

NCI's work enabling key scientific research is carried out through thousands of projects across health, environment, industry, and science and technology innovation, and provides innumerable benefits to Australia's community and to its economy. Direct and indirect use of NCI's capabilities realises hundreds of millions of dollars of research investment by the Australian Government through the Australian Research Council, the National Health and Medical Research Council and the Department of Education's National Collaborative Research Infrastructure Strategy (NCRIS) program. The links between projects at NCI and government portfolios are described in full in the Appendix on page 96.

New materials for future technologies

Materials scientists working at the cutting edge of chemistry and physics need to drill down to the atomic level to properly understand the compounds they are dealing with. Materials scientists used to go straight to the lab to test out various plausible materials, now they start by modelling their prototype molecules on a supercomputer.

Dr Ravichandar Babarao from RMIT works on a whole field of interesting materials called Metal-Organic Frameworks (MOFs). By combining particular metals like zinc or cobalt with other carefully selected elements, he creates a lattice-shaped material with the capacity to store or filter large amounts of gases inside its hollow pores.

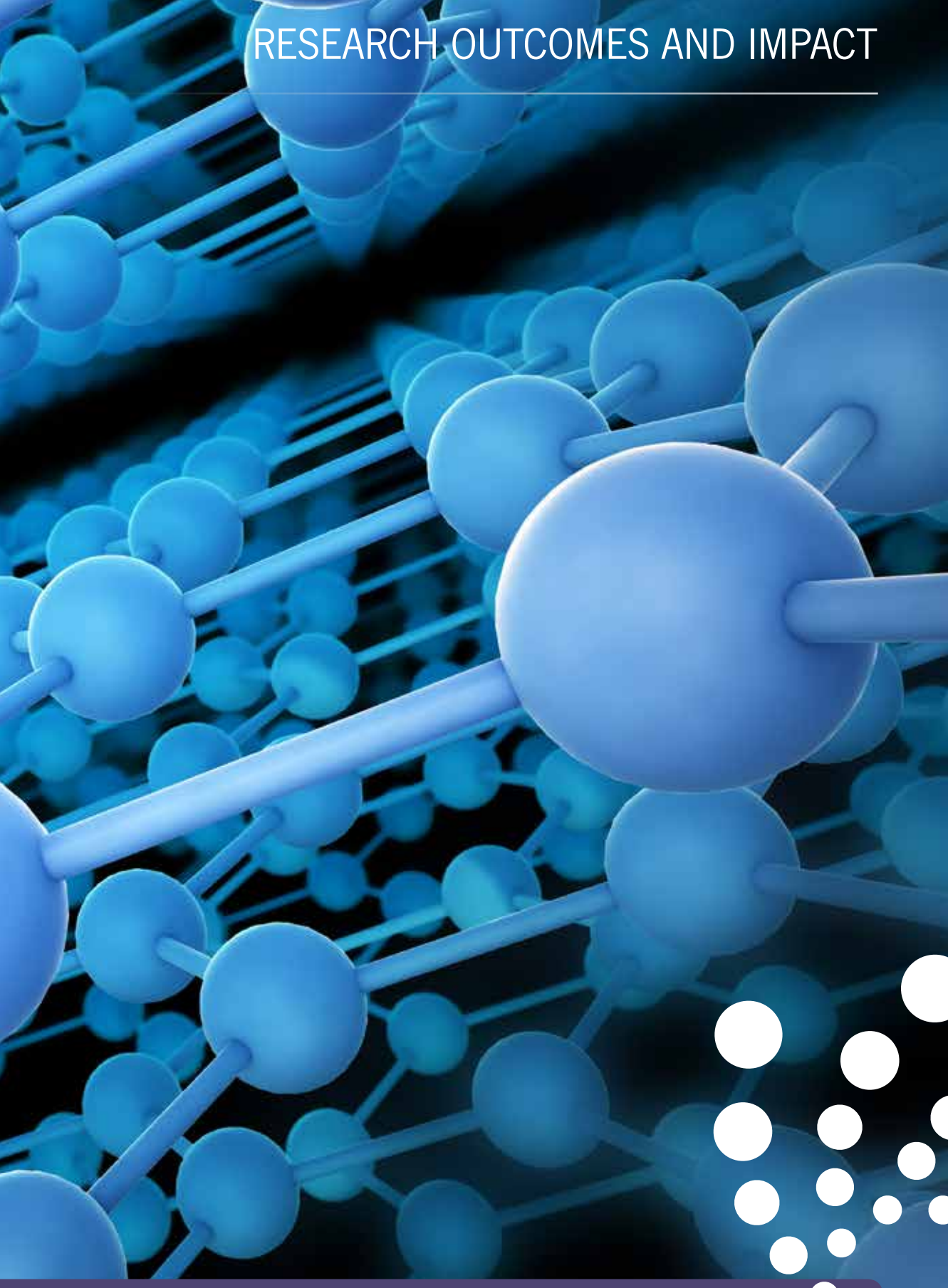
The specific combination of elements and the shapes they are formed into determines exactly which gases get trapped most effectively. The applications of such a material are exciting and practical: CSIRO is hoping that MOFs will provide a cheap and effective way of capturing carbon dioxide from the air to produce dry ice, a compound used in many different industries. Other possible applications include filters inside industrial gas masks, gas separation for the purification of hydrocarbon gases and long-term carbon storage.

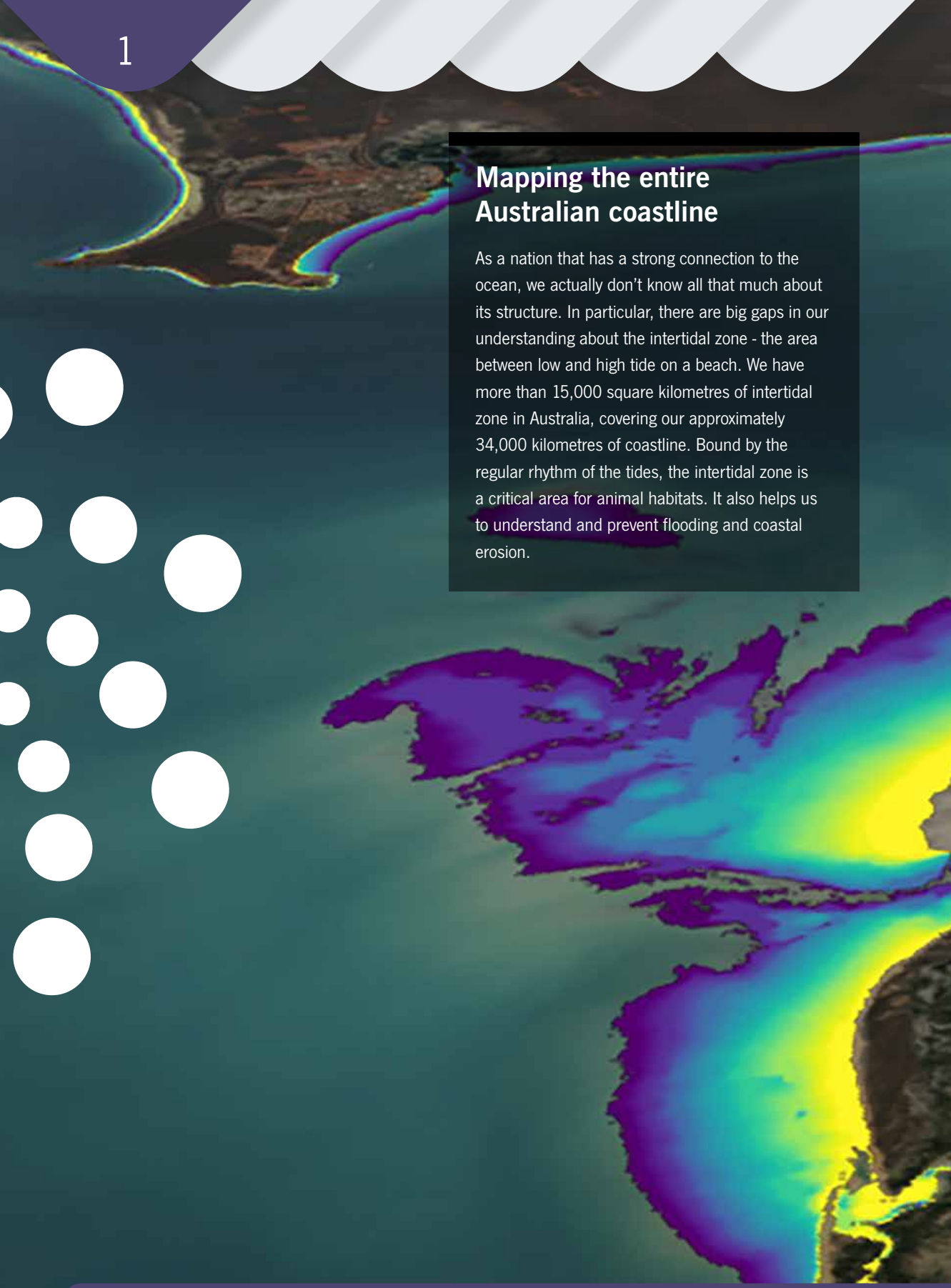
Conventional methods for doing these things are generally energy intensive and limited in scale. MOFs go beyond those traditional methods and allow simple and scalable solutions instead. But getting there requires detailed characterising of exactly what is going on inside the MOFs, and how the target molecules are interacting with them.

Both high-throughput screening and molecular modelling of the atomic structure of MOFs on NCI's supercomputer allows Dr Babarao to investigate their behaviour at different conditions which are hard to measure in labs. This allows him to design new MOFs using the modelling data, rather than by experimental trial and error in the lab. There are already more than 85,000 different experimentally synthesised MOF structures outlined in a global research database; you need a fast screening method to look through all of them for the properties you want.

Materials science developments to improve our future industrial and technological processes require large-scale high-performance computing facilities. They allow us to move beyond the typical processes of experimental synthesis, testing and validation. By understanding the fundamental behaviours of our future materials before we get to the complexity of physical production, we save time, produce better results and open up new possibilities that we may never have otherwise considered.

RESEARCH OUTCOMES AND IMPACT





Mapping the entire Australian coastline

As a nation that has a strong connection to the ocean, we actually don't know all that much about its structure. In particular, there are big gaps in our understanding about the intertidal zone - the area between low and high tide on a beach. We have more than 15,000 square kilometres of intertidal zone in Australia, covering our approximately 34,000 kilometres of coastline. Bound by the regular rhythm of the tides, the intertidal zone is a critical area for animal habitats. It also helps us to understand and prevent flooding and coastal erosion.

RESEARCH OUTCOMES AND IMPACT

Research by Geoscience Australia this year led to the first continental-scale dataset of intertidal elevation, essentially forming a three-dimensional map of the Australian coastline. The National Intertidal Digital Elevation Model (NIDEM) took 30 years of satellite images of the Australian coast and processed them using NCI's supercomputer and cloud systems to find the exact location of the shoreline across a range of tide heights.

Lead researcher Dr Robbi Bishop-Taylor said: "It has been fascinating to see how an incredibly simple environmental process like the rise and fall of the tide can be analysed using big data and supercomputing to reveal something fundamental about the world: the physical shape of our coastline."

Prototyping through NCI's Virtual Desktop Infrastructure allowed the research team to rapidly develop and test the models, while running on the Raijin supercomputer allowed them to efficiently process more than 2.5 terabytes of satellite data covering Australia's immense intertidal zone. The data is now stored at NCI and is easily accessible by coastal researchers and land managers through National Map.

This model is another element in the mapping resource developed by Geoscience Australia for the national research community. Geoscience Australia anticipates that the new continental-scale data will be used to map the habitats of threatened coastal species, identify areas of coastal erosion, plan for extreme events such as storm surges and flooding, and improve models of how sea level rise will affect the Australian coastline.

Tidal flats of Roebuck Bay, on the coast of the Kimberley region of Western Australia, visualised using NIDEM intertidal elevation data.

Impactful Science

NCI enables scientists to reach ambitious goals that benefit and advance Australian society. Thousands of researchers every year run computations and analyse data at NCI, using the systems available to advance their work across every field of science. Our user base includes universities, government agencies, medical research institutes and industry groups, all of which rely on NCI's high-performance computing (HPC) and data-intensive research platforms and services.

We are a key part of the research capability of the university sector. Recipients of hundreds of Australian Research Council and National Health and Medical Research Council grants require access to NCI's high performance services to advance their scientific work. Hundreds of millions of dollars each year in science funding relies on NCI's large-scale, highly integrated HPC-Big Data infrastructure to produce ground-breaking discoveries. The case studies on the following pages highlight some of the advances our collaborators have made this year through the innovative use of satellite earth observations and genomics datasets that NCI stores and makes ready for processing and analysis.

NCI makes more than 800 million hours of computing time available to researchers every year on our Raijin supercomputer, a number set to grow with the launch of our next-generation supercomputer later in 2019. This year, NCI received a 3-year, $4 million grant from the Australian Research Council's Linkage Infrastructure, Equipment and Facilities fund, allowing us to support the work of many more researchers.

The ARC Centres of Excellence supported at NCI cover theoretical physics through to materials science, astrophysics and climate science. These are the Centres of Excellence for Climate Extremes, All-Sky Astrophysics in 3D, Nanoscale BioPhotonics, Future Low-Energy Electronics Technologies and Exciton Science, and the Basin Genesis Industrial Transformation Research Hub. They share in 25 million compute hours on NCI's high-performance computing (HPC) systems.

We allocate around 110 million hours of NCI's total compute time through the National Computational Merit Allocation Scheme (NCMAS). This nationwide scheme offers researchers from any publicly funded research organisation in the country the opportunity to apply for computational resources on the country's HPC platforms, including NCI, the Pawsey Supercomputing Centre, and smaller, specialised systems including Monash University's MASSIVE and the University of Queensland's FlashLite. NCI's contribution to the scheme is more than half the total resource allocation. A total of 137 projects, including seven led by early-career researchers, received an allocation at NCI for 2019. NCI also provides training and user support so that the next generation of scientists will be better prepared for future scientific discovery using computation and data techniques.

By broadening the applications of our services and data through collaboration in critical science domains, we are producing a growing list of significant science outcomes that benefit the community. In the nationally important fields of climate and weather, earth observation, geoscience and genomics. NCI's transdisciplinary approach exploits our data capabilities to improve the usability of data collections stored on site. More accessible research data, new tools and creative visualisations help generate scientific insights that translate directly to policymakers.

Predicting vegetation condition using satellite water measurements

Satellite data is central to so much of modern life, including many of our environmental monitoring programs. From satellites, you can get data about vegetation, water and so much more. In fact, the instruments on board three different satellites – the MODIS, GRACE, and SMOS missions – can give you specific data about water on the surface, water in the uppermost few centimetres of soil, and total water column respectively.

If you want to try and figure out how soil moisture affects plant growth around the world, you can take those three streams of satellite data, feed them into a state-of-the-art water model and run the whole thing on a powerful supercomputer. That's what researchers from the Fenner School of Environment and Society's Centre for Water and Landscape Dynamics at The Australian National University have done, using NCI Australia's integrated supercomputer and data analysis facilities.

Dr Siyuan Tian, the lead researcher of this study, says, “Combining satellite observations with a hydrological model in this way has not been done before, and would have been impossible without the easy access to NCI’s computing and data services. We are actually using today’s water data to help us understand plant growth in the coming months.”

In the past, environmental models were limited by the amount of data they could effectively handle. Now, the challenge is combining disparate datasets in a way that a model can easily understand says Dr Luigi Renzullo, a co-author on the study.

“Another important outcome of the research is the development of mathematical methods, so-called data assimilation methods, that combine the satellite data into the water model in a way that maximises the respective strengths of each data source. This results in improved model predictions that are beyond the accuracy provided by any one source. Access to the NCI computing resources was key to the success of this work, allowing us to experiment with many different formulations of data assimilation methods.”

From there, the model produced a remarkably accurate global forecast of vegetation response to available water, up to three months into the future. For arid landscapes in particular, water availability is the biggest and most important variable to understand. This new capability produces much more detailed environmental data for farmers and land managers to use for important seasonal decision-making.

While the model currently runs at 25-kilometre resolution globally, the plan is to scale it down to a useful land management scale of around 25-metre resolution for Australia. At that level, the data and computational needs of the model increase massively, but the improved detail provides directly useable information straight to the farmers who need it. Especially during a period of drought, knowing how much water is available to your crops and what their growth response might be can help inform a multitude of decisions around planting and harvesting.

Identifying the many genetic causes of complex human disease

Auto-immune diseases, such as lupus, are frequently genetically complex and can be caused by different mutations in many different genes, making it hard to identify the pathway that leads to these diseases. Correctly identifying the genetic cause of lupus in an individual is important when choosing a precision therapy for them. When diseases that develop in different ways have very similar symptoms, yet have very different treatments, how do doctors decide how to proceed? New research from an international collaboration of medical researchers, clinicians and bioinformaticians at the Centre for Personalised Immunology, headquartered at The Australian National University, has identified rare variants in two genes that cause a particular form of lupus, which reveals exactly how it should be treated.

The team has collected genome data from individuals that suffer from systemic lupus erythrematosis to build the largest dataset of its type for this disease in Australia. Within the group of lupus sufferers, they identified rare mutations in lupus-associated genes, mutations which have been shown to increase the patterns of inflammation typical of this disease. A key part of this research conducted by the Centre for Personalised Immunology was the collection and sequencing of over 4000 patient genomes.

Processing and analysis of this significant dataset was accomplished using NCI's computing and data expertise. Access to the computational resources of NCI was an essential factor that allowed the team to make their findings.

Bioinformatician Dr Dan Andrews from the John Curtin School of Medical Research says, "Having access to NCI's world-class supercomputing and data storage simplifies so much of the research process. We can do so much more scientific work by fully making use of the amazing capacities available to us just across the road.

"NCI solves so many problems for us that other research teams just have to deal with themselves. We have stored and processed over 4000 human genomes, and haven't even scratched the surface of what we can learn from them yet."

The research team is now working on finding other genes and variants that lead to diseases like lupus. Given the complexity of both the disease and the human genome, the more supercomputing power they can put behind the project the better.

A major international award for NCI Associate Director

At the 2018 American Geophysical Union (AGU) Fall Meeting in Washington, D.C., NCI Associate Director (Research Engagement and Initiatives) Dr Ben Evans was recognised for his leadership in the field of Earth and Space Science Informatics with his presentation of the annual Leptoukh award. The award is named after Dr Greg Leptoukh, who was considered a pioneer in informatics: a field that combines computer science, information technology, human-computer interaction and statistics. Every year since 2012, the Leptoukh lecture provides an opportunity for AGU attendees to hear about advances in computation, instrumentation, and data handling, as well as the accomplishments of individual scientists.

At the invited lecture, Dr Evans discussed the transformation and challenges ahead for data-intensive computational science, including the ways NCI has connected high-performance computing and Earth systems data. He described how we will need to further evolve into the future to take advantage of additional technical innovation and meet the advancing needs of research.

Dr Evans has a long history of supporting NCI's geoscience community through management and development of software, improvements in modelling and simulation, data analysis methods and an ongoing commitment to making data available to researchers and other scientific data users. He helped develop NCI's high-performance data management expertise, which curates and optimises nationally and internationally significant reference datasets, making them FAIR (Findable, Accessible, Interoperable and Reusable) and thus suitable for data-intensive analysis within NCI as well as through virtual research environments across many communities.

He is involved with geoscience at a global level, collaborating with other major institutes on projects of international significance. Arguably the most significant of these is NCI's long-term participation in climate data management, including its governance and establishing NCI as an international Tier-1 node in the Earth Systems Grid Federation with peer organisations from the United States, Europe and the United Kingdom. The ESGF is one of the highest profile international collaborations for sharing and distributing the data that powers most global climate change research, information that underpins international government decision-makers.

This work extends through the overlapping disciplines of climate science, earth observation, weather forecasting and geophysical exploration. He drove the development of GSKY, NCI's high-performance data service, for accessing and analysing large, disparate streams of satellite observations. GSKY is now enabling new discovery through Geoscience Australia's Digital Earth Australia program.

As the data requirements of our research communities grow, NCI continues to provide new ways to understand and process data. Unique virtual environments now bring all the tools that communities need together with the data, software and computing power that lets them pursue new and exciting avenues of research.

The climate, geoscience, marine and astrophysics communities all benefit from the increased potential of their own virtual laboratories, while also making it easier for new researchers to get an introduction to computational methods in science.

Recognition from the American Geophysical Union of the leadership and innovation that Dr Evans and the NCI team have demonstrated over many years highlights the high regard in which this work is viewed around the world. Solving some of the biggest challenges of environmental management, climate change, resource exploration and much more builds on the infrastructure, platforms, tools and underpinning technologies that we have helped develop.

Growth in the NCI Collaboration

The NCI Collaboration plays an essential role in providing nationally integrated high-performance data, storage and computing services to Australian science, government and industry. This partnership brings together The Australian National University, CSIRO, the Bureau of Meteorology and Geoscience Australia, as well as most of the research-intensive Australian universities and the Australian Research Council (ARC). Collaborative development ensures that the NCI platform is designed from the ground up to enable nationally significant research for the priorities of our community, and to provide the ongoing innovation necessary to meet future demand.

The continuing growth in the NCI Collaboration reflects the high quality, reliability and reputation of the NCI services throughout the scientific research sector. The most significant new Collaborator to join NCI this year was the University of Melbourne, one of the leading research universities in Australia.

NCI supports an ever-growing mix of computational science and research collaborations, with more than 30 national science research organisations and several start-up businesses making up well over 6000 researchers directly using the highly integrated infrastructure within NCI. An even larger community benefits from the data collections and data analysis capabilities (See Data-Intensive Services on page 40).

Our investment in fostering staff with hybrid scientific and technical expertise in computational and data science makes NCI an essential component to the success of research outcomes and additional collaborations. By combining with the complementary skills of the research community, we can address the nation's most challenging and pressing research questions and accelerate the research process.

NCI has been accepted into the Earth Science Information Partners (ESIP) as a Type-II member. ESIP is a broad-based, distributed community of data and information technology practitioners, and includes peer organisations such as NASA, NOAA and NCSA, several divisions from the US DOE. More recently, NCI has been joined by several other Australian research organisations in its membership, which includes AuScope, CSIRO, IMOS, and TERN. NCI has also been part of the formation of an Australian chapter of ESIP, called the Earth and Environment Science Information Partners, thanks to the growing interest in having a local community of practice.

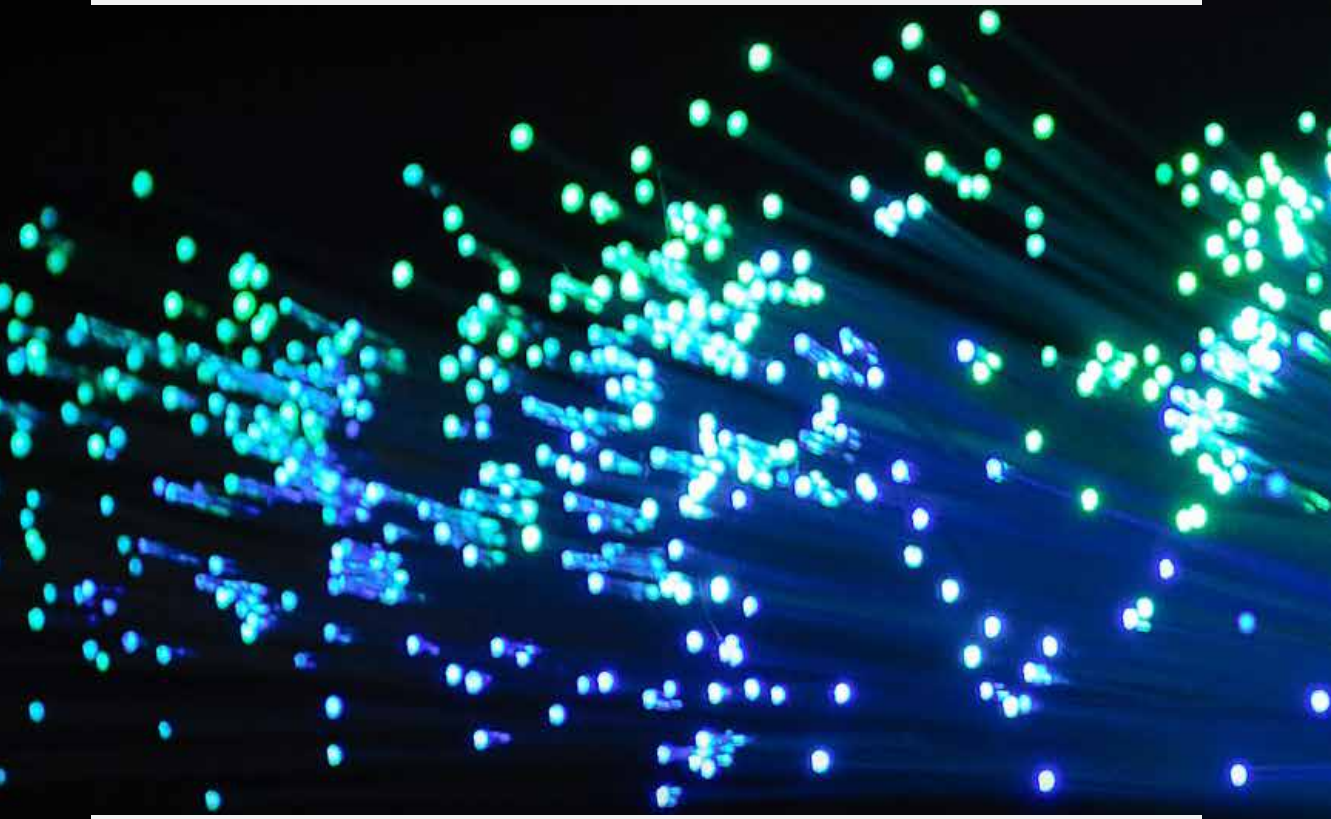
NCI is building strong connections with other HPC centres around the world, including through the Accelerated Data Analytics and Computing Institute alongside the Oak Ridge National Laboratory in the US, RIKEN and the Tokyo Institute of Technology in Japan, and the Swiss National Supercomputing Centre. NCI's collaboration with neighbouring centres includes the Pawsey Supercomputing Centre in Perth, with whom we work on exchanges of information and mutual development of provision of systems infrastructure. Other regional collaborators including NSCC in Singapore, NeSI and NIWA in New Zealand, and RIKEN in Japan.

The annual growth of the NCI Collaboration, combined with NCRIS investments and the support of the Federal Government, highlight the importance of the NCI facility to all facets of Australian research. The major refresh of supercomputer capability due in Q4 2019, coupled with the broadening of NCI's scalable data capability, will ensure we continue to meet the needs and growth of our client research communities. This expansion will build upon NCI's continual focus on improvement, and hence accommodate the rapid growth in demand for leading computing and data analysis.

A collaboration of Australian and US biologists, including NCI staff, used the NCI-developed technology, Drishti, to investigate Burmese weevil fossils. This image shows a 100 million year old fossilised weevil trapped in amber, turned into a three-dimensional model using a CT scanner and NCI's Drishti technology.

New international collaborations

NCI joined together with four other international supercomputing facilities at this year's SuperComputing Asia conference (SCAsia), held in Singapore in March, to conduct the inaugural Data Mover Challenge. Five teams from the USA and two teams from Japan competed to transfer a two terabyte dataset between each of the facilities as fast as possible.



Preparation for this event started at the 2018 SuperComputing conference (SC18), where NCI and our partner facilities used the high-performance conference network to evaluate the tools and techniques needed to efficiently transfer massive research datasets over the 100 gigabit networks the Challenge competitors would use.

Deployed by the likes of AARNet (Australia's Academic and Research Network), 100 gigabit networks such as these facilitate high-speed data transfers and communications between universities and research institutions around the world. For researchers accessing multiple terabytes or even petabytes of data collections at NCI, a high-speed research network connecting the data collections to the outside world is a must.

During SC18, NCI staff used a variety of data transfer tools and network tuning techniques

to determine the baseline performance of disk-to-disk transfers between the Challenge participants. The Challenge organisers also investigated the common and unique tuning recipes they would later use to compare the effectiveness of the Challenge contestants' various solutions. Finally, they evaluated the security and performance impacts of containers for data transfer use cases.

The Data Mover Challenge took place over the two months leading up to SCAsia. During that time, the teams competed to transfer a two terabyte dataset between HPC facilities in Australia (NCI), Korea (KISTI), Japan (NICT), Singapore (NSCC) and the USA (StarLight/International Center for Advanced Internet Research).

In the end, Zettar and the International Center for Advanced Internet Research each received prizes as, respectively, the overall winner and the most innovative solution. Containers, a technology used in high-performance computing for providing secure, virtual environments to users, are now solving a variety of challenges for transferring the increasingly large datasets used by contemporary researchers. These new and emerging technologies are now allowing HPC facilities like NCI to provide a secure, agile and performant set of tools suited to big data movement, thereby supporting data intensive research nationally and internationally.

Innovations Enabling New Science

2

System Enhancements

NCI's mission of providing leading high-performance computing services to the Australian research community was bolstered in 2018–19 as we prepared for the launch of our next-generation supercomputer facility. Following an extremely rigorous selection process, Fujitsu Australia Limited were selected to provide NCI and the Australian research community with the supercomputer, Gadi, to take us forward in the coming years.

With the new capability due for launch in November 2019, this year's work in preparing for the change has created a strong foundation for our growing user base. The new 3200-node system, comprising the latest generation Cascade Lake Intel Xeon CPUs and V100 NVIDIA GPUs, promises to radically enhance the leading workloads from our partner organisations.

This year we also added a significant interim boost of new computational performance to Raijin in the form of 384 new Intel Skylake CPUs. These powerful processors, installed in early 2019, provide an up-to-date computational platform for our users in the lead up to the new machine being installed. After its installation, these new CPUs will remain available within NCI's compute systems.

We also conducted significant upgrades to our data storage systems this year, doubling our oldest filesystem's capacity with a brand-new replacement. The new /g/data4 filesystem brings NCI's overall storage capacity to more than 55 petabytes. This increase in storage capacity is required to meet the growth in demand for data and data products coming out of almost every field of computational science. In particular, NCI is seeing growth in Earth observation, climate modelling and human genomics as the three biggest contributors to our researchers' growing data collections at NCI.

How NCI is commissioning its new supercomputer

There are a lot of moving parts when it comes time to commission a $70 million supercomputer. From the moment a contract is signed, it's full speed ahead for a whole sequence of tightly choreographed steps that end with a fully operational supercomputer.

Choosing a vendor capable of supplying the right research platform is just the first step in getting Gadi, NCI's new supercomputer, ready for researchers by Q4 2019. Once the choice of hardware has been determined, the preparation work can begin by ensuring the underlying infrastructure and building fabric is ready. For Gadi, a direct liquid cooled computer, NCI will need to install new water pipes with cooling units to ensure water purity and quality, a new floor to support the increased weight of the system, and new electrical distribution boards within the data hall, all while trying to maintain full operations on our existing supercomputer.

While all the infrastructure works are taking place, Gadi's significant storage systems will start coming in as early as August. More than 8,000 hard drives need to be installed inside brand new racks filling even more of our data hall. Up to 20 Petabytes of scratch storage capacity accompanies Gadi's computational performance, supporting the unique data-intensive compute workflows that our users love to run. With their own set of racks, power supplies and verification process, the storage systems need to be ready to connect to Gadi when the time comes.

Following the storage and infrastructure installations, the compute components themselves can start arriving. Laid out in a meticulously planned grid on a specially reinforced flooring system, the compute racks are arranged into two long pods. The servers then all need to be slid into place, connected to power, water and the all-important data network before they can be switched on, booted up and configured.

The last step in the process is installing the operating system and the hundreds of pieces of research software that our users will need on Gadi. A performance benchmark and acceptance test will then be run as part of the final testing and verification processes before researchers can be given their first access to the new system. They will have access to both Raijin and Gadi in parallel, giving them the chance to migrate any data and workflows they might need.

This multi-step process is the culmination of many years of preparation from the NCI team. The physical set up and configuration of the new system requires careful planning and expertise, all of which comes together to provide the supercomputer that will support leading Australian data- and compute-intensive research for the years to come.

Computational Science

NCI's high-performance computing expertise is highlighted by our role in the development of computational science at the largest scales. We are uniquely suited to addressing some of the most significant scientific challenges – challenges that require the full capability of our HPC environments.

Our work in computational science aims to transform leading scientific applications by modifying and optimising their code, making it possible for them to make the most of HPC resources when running at large scales. Focusing on the most computationally and data-intensive codes, this work aims to continually improve the HPC readiness of scientific software. This lets our user community focus on their research while simultaneously experiencing the benefits of new generations of hardware. Such improvements can range from increasing modelling resolutions to enabling more efficient uses of data for processing, assimilation or analysis.

These improvements are possible due to decades of deep expertise and engagement alongside the ongoing investment in the latest high-performance computing technologies. Ongoing efforts to improve software, algorithms and numerical methods are essential for meeting current and future needs.

In 2018–19, NCI continues to work with the weather and climate modelling community with a focus on contributions for the World Climate Research Program (WCRP) Coupled Model Intercomparison Project Phase 6 (see Case Study on page 42). These models are based on the UK Meteorological Office's Unified Model and the Modular Ocean Model from NOAA's Geophysics Fluid Dynamics Laboratory (GFDL), which are then coupled for uniquely Australian models. The ACCESS models and submodel systems such as COSIMA are used in various national applications including near-real-time storm surge predictions, the ACCESS Climate model (ACCESS-CM2), CSIRO's Earth System Model (ACCESS-ESM1.5), Ocean Maps model (ACCESS-OM2), and the Bureau of Meteorology's high-resolution BARRA reanalysis and Bluelink model.

NCI has also been collaborating with geoscientists from AuScope, Australian universities, CSIRO, Geoscience Australia and state geological agencies to create new shared and end-to-end data processing and computationally intensive inversions needed for the Magnetotellurics domain (See Case Studies on pages 33 and 38). The code and data improvements in the Magnetotellurics space are a testament to NCI's computational science capabilities.

An image of Lake Disappointment in Western Australia, captured by the European Space Agency's Copernicus Sentinel 2A satellite on 1 April 2017.

Building better performing geoscience software

NCI supports the research community through our code optimisation expertise, modifying the software to enable more efficient running at the large scales of our supercomputer. Recent work has focused on a piece of geology research software, ModEM3D, which is used in particular for Magnetotellurics (MT), the study of electric and magnetic fields deep within the earth's crust. Developed by researchers at Oregon State University, ModEM3D provides the software required for processing large grids of data captured by transmitters in the field.

Processing these large arrays of data requires intense computation to turn the electric and magnetic field measurements into a three-dimensional representation of the underground geology. Building this map of underground structures and ore bodies requires thousands of data points at a time and a complex series of calculations to get to the final product. Originally developed for smaller computing platforms, the ModEM3D code now comes up against some limitations when used on dozens of processors at once.

The NCI scaling and optimisation team have analysed and engineered the code to remove certain critical bottlenecks and make it functional at these large scales. A major issue was around memory constraints: much of the computing takes place across many parallel processes running over multiple compute nodes, but each worker process sends its calculated figures to a master process for storage. When that process exceeds its memory limit, the entire calculation will crash.

To get around the problem, NCI implemented a memory management scheme where the calculated figures are temporarily stored on Raijin's high performance filesystems before being retrieved. In this way, the memory requirements of the code are dramatically reduced.

A hybrid parallelisation was also introduced to improve the scalability of time-consuming functions. By enabling multithreading for key processes, the code can use more CPU cores than ever. Optimising that parallel process removes some of the slowdowns that take place with each calculation, leading to an overall faster and smoother performance. Certain functions in the code reduced their execution time by more than half, with improvements visible in almost every function.

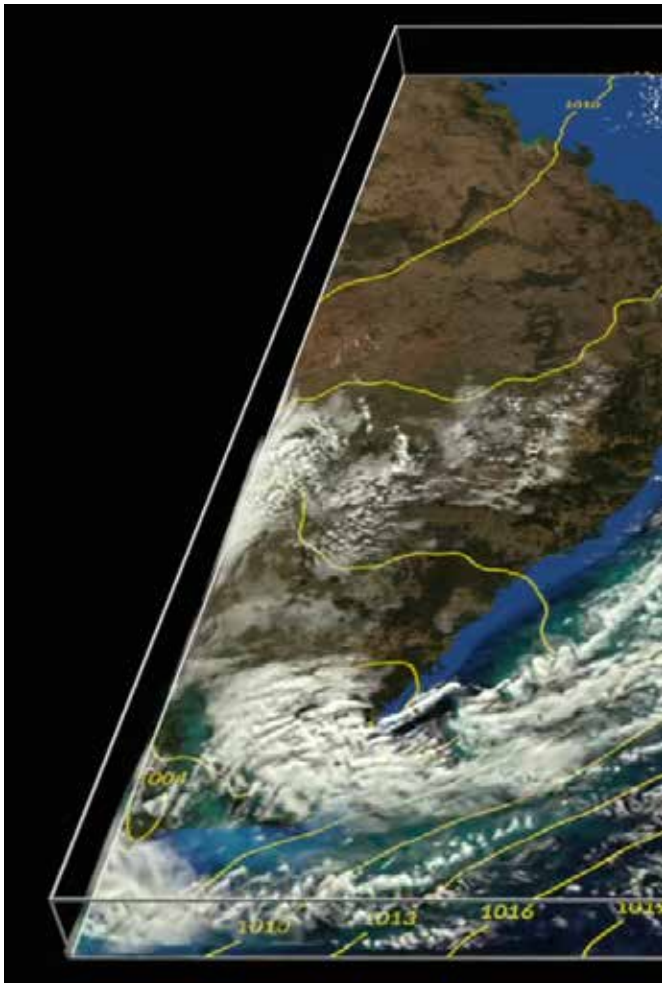
Overall, the optimisations that NCI has engineered in the ModEM3D code make it much more capable of handling large datasets at supercomputer scales. As the improvements gain acceptance across the research community, each of the small improvements together compound to make for a more seamless research experience.

Data Science

NCI has an established role within the research community providing new platforms to address data-intensive science research. We are constantly building new and better ways to extract information from data by continuing to deeply apply the FAIR data principles (Findable, Accessible, Interoperable, Reusable). The growth of data science as an underpinning feature of much of the research community requires similar improvements in the quality and organisation of their data.

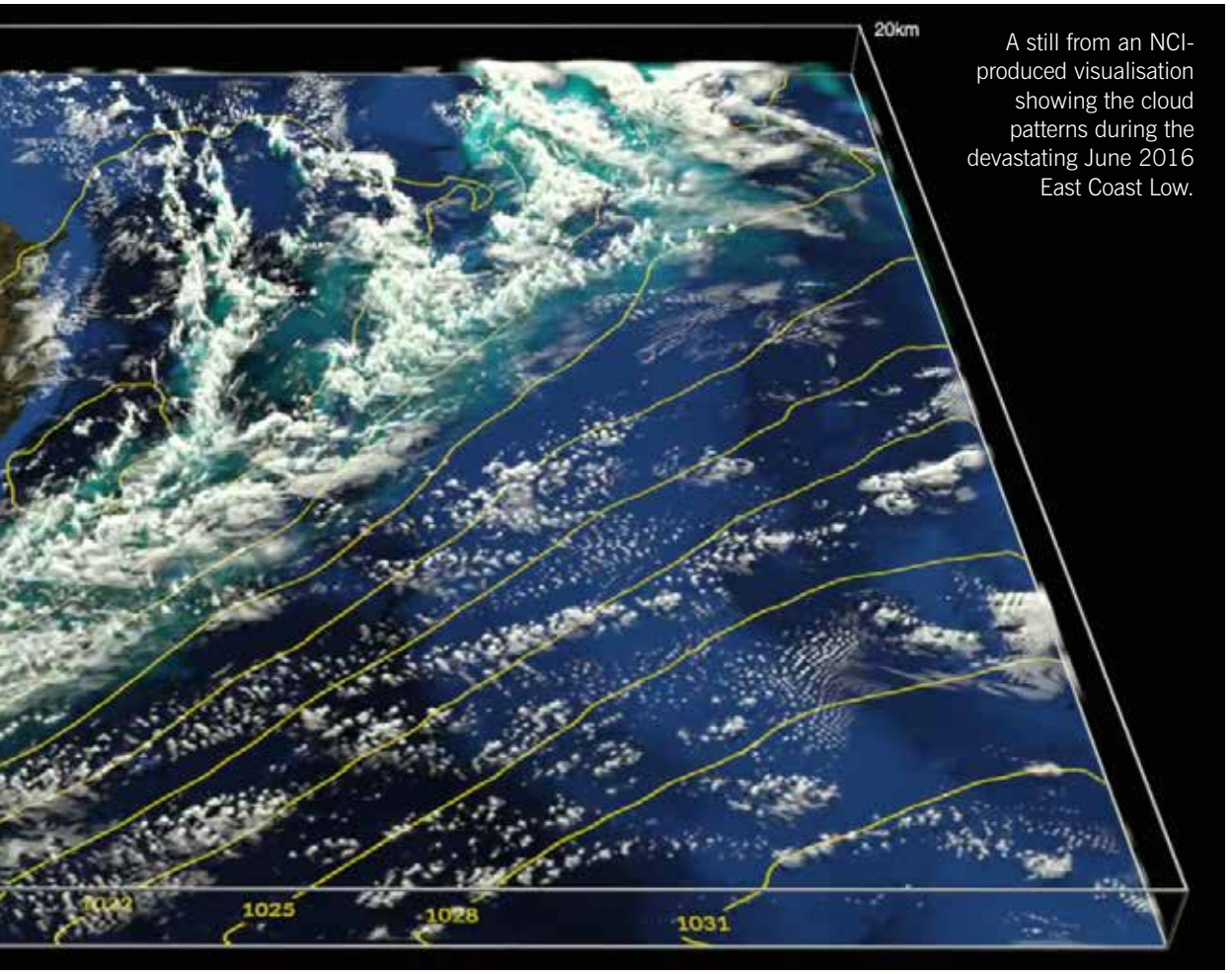
As such, the datasets on NCI are used in a diverse range of data-intensive analysis enabled by high-performance infrastructure and cutting-edge data science methods. The datasets are enabled for digital environments across a broad range of priority Australian research – particularly in climate, weather, environmental science and geophysics. This approach enables deeper and faster insights into this complex data as users extract information, compare with their own results and other reference data, and use a range of scientific software, new methods and the latest algorithms in areas such as machine learning and artificial intelligence.

Our efforts to provide easier access to research-ready data are enabling new approaches to scientific problems, and continue to lead the way in innovative data-intensive research. NCI is home to a range of digital environments that make it easier for researchers to dig into data with software and analysis tools. We host both general access and discipline-specific virtual research environments that underpin this new mode of data analysis and access. NCI's Virtual Desktop Infrastructure, the Climate Data-Enhanced Virtual Laboratory, the Virtual Geophysics Laboratory, the All-Sky Virtual Laboratory and a range of shared Jupyter notebooks for analysing data are just some examples of these widely used platforms.



Sophisticated visualisation is an important enabler for communicating the scientific research that is hidden within the data: it can allow improved understanding of complex numerical outputs, moving beyond raw datasets to the scientific findings they contain. It provides the ability to view trends based on many moving phenomena, and delivers transformative modes for communication of these results in a scientifically valid manner.

In the past year, NCI's scientific visualisations have strongly featured in communicating many aspects of Australian research for our



A still from an NCI-produced visualisation showing the cloud patterns during the devastating June 2016 East Coast Low.

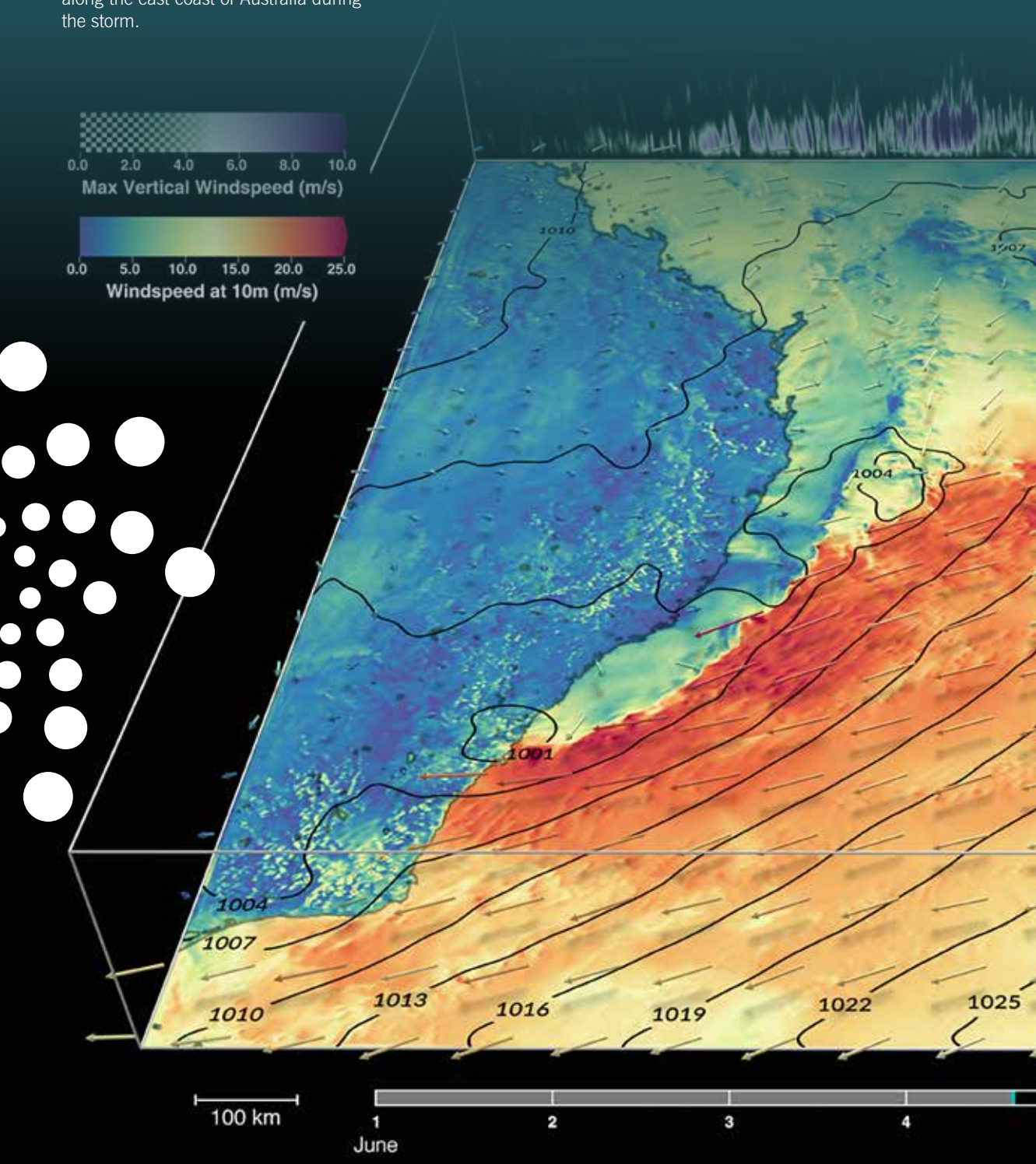
collaborators, particularly in climate and weather, geosciences, environmental sciences and remote sensing.

A stunning 6-year time-lapse of a high-resolution reanalysis, showing intensive weather patterns and cloud formation over Australia, created with the Bureau of Meteorology, showcased just how effectively a visualisation can highlight the complexity of both experimental and simulation data.

A snapshot from that time-lapse visualisation is featured on the cover of this Annual Report.

NCI has further integrated the use of virtual reality (VR) to extend the visualisation capabilities in ways that allow researchers to explore data in previously unimaginable ways. Many scientists are starting to see the possibilities of investigating their spatial datasets in a three-dimensional virtual reality world.

A still from the NCI-produced scientific visualisation showing strong winds along the east coast of Australia during the storm.



An in-depth look at a devastating storm

If we want to understand how devastating storms form and evolve, and how a changing climate might affect them, we need to go beyond the measurements that come from weather stations and sensors in satellites. Those measurements provide a lot of localised detail for some specific variables, but storms that travel from one end of the country to the other - covering hundreds of kilometres - require continuous coverage of physically consistent variables at very high resolutions.

So we use high-resolution weather models to represent physical processes in the atmosphere and simulate the development and evolution of variables such as rainfall, air pressure and wind that come together to create the storms we experience. Drs Alejandro Di Luca and Jason Evans, researchers from the Climate Change Research Centre at the University of New South Wales, study storms in exactly this way.

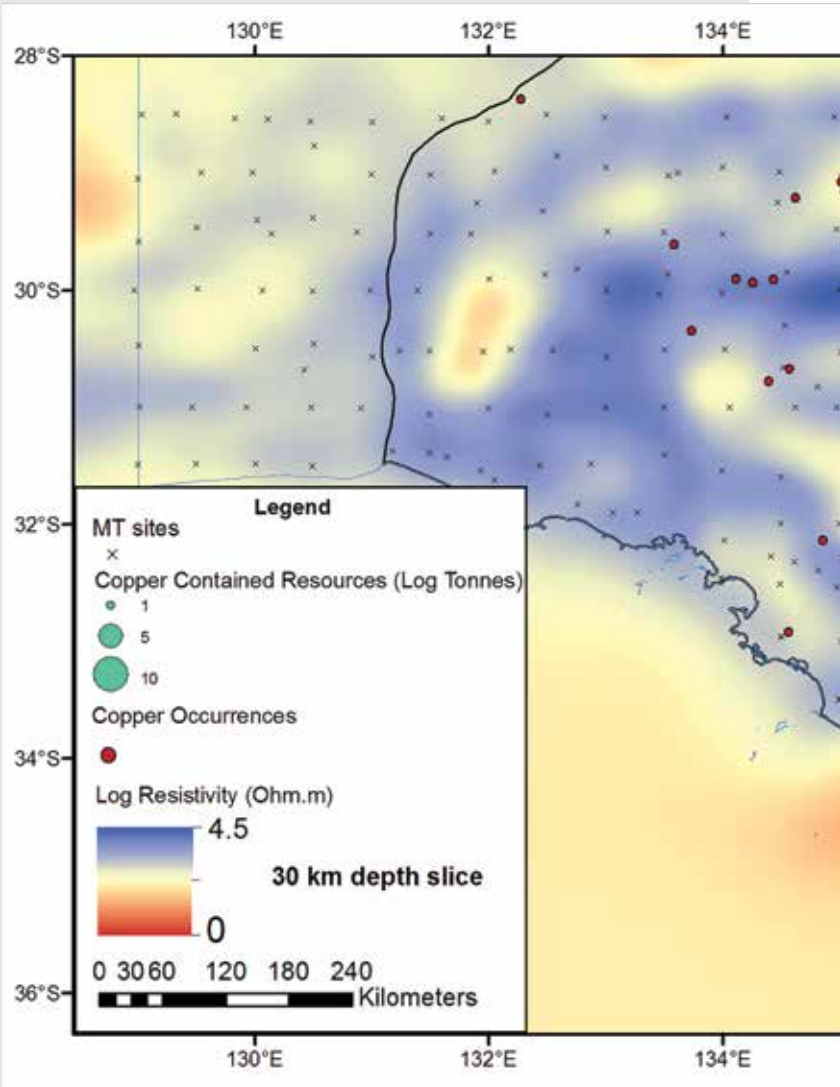
Dr Di Luca said, "This kind of modelling work really requires a supercomputer like NCI's. Having access to so much computing power lets us push the boundaries and discover new things about how our weather systems work."

One regular weather phenomenon that they study, the so-called East-Coast Low, comes about almost every year on the east coast of Australia, creating storms with hugely destructive potential. In June 2016, a particularly fierce East-Coast Low caused major flooding and damage to southern Queensland, the New South Wales coast, Sydney and Tasmania.

Armed with their high-resolution model replication of that storm, the researchers worked with NCI's scientific visualisation team to turn the data from it into a beautiful and scientifically robust video. Transforming the numerical data from the model into striking imagery highlighted critical aspects of the storm, very clearly showing the extremely localised rainfall occurring while the storm was taking place. Presented at scientific conferences alongside a discussion of the research findings, a visualisation like this makes it much easier to share ideas and collaborate with colleagues in similar fields. The visualisation adds significant value to the modelling work, making it more accessible and revealing previously hidden or invisible detail.

The researchers are also sharing their findings with the New South Wales Office of Environment and Heritage, helping them understand the storms that so frequently cause damage and impact on society. In this way, land managers are already getting actionable information out of the research to help them plan for the future.

Magnetotellurics Data Rescue – Raised from the Depths of the Earth, Enabled for the Virtual World

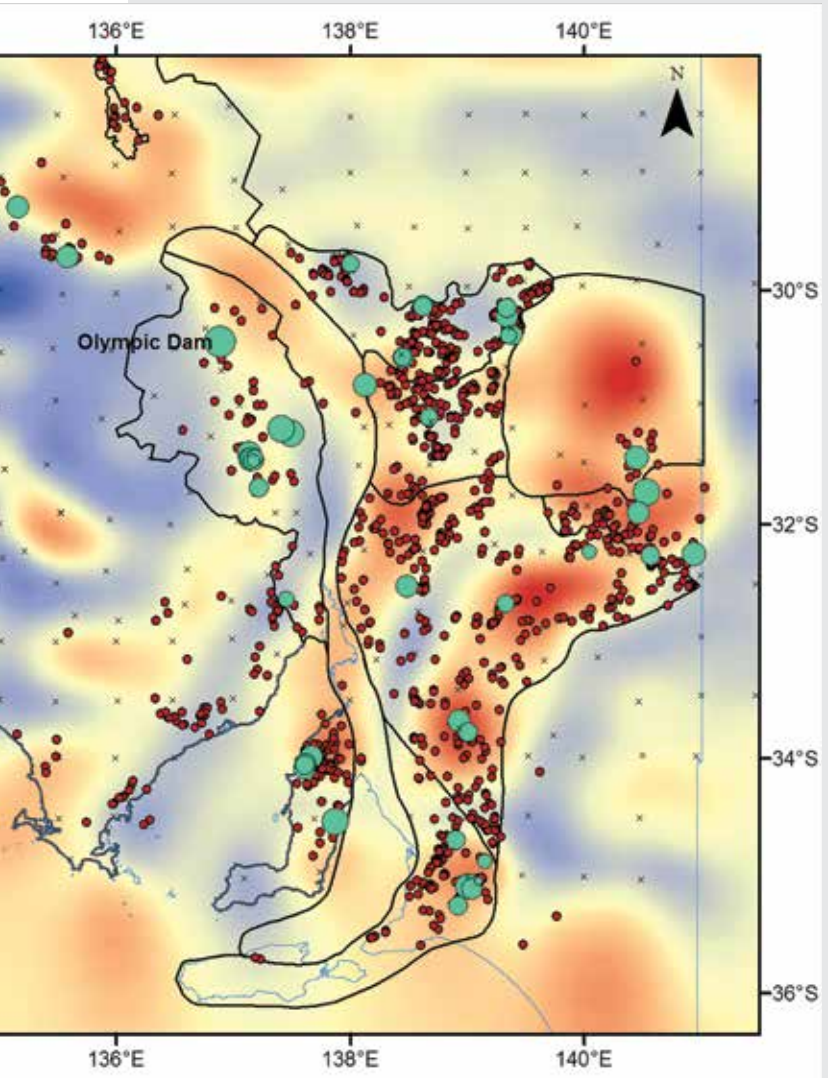


Decades of data that once languished in desk drawers in offices around Australia is now available at NCI through a concerted data rescue effort. The geophysical data in question are Magnetotelluric (MT): natural geomagnetic and geoelectric field variations at the Earth's surface which are used to infer subsurface electrical conductivity. This information has a wide range of applications, including mineral exploration, environmental monitoring, hydrocarbon exploration and crustal, oceanic and mantle research.

Supported by the Australian Research Data Commons through the Geoscience Data Enhanced Virtual Laboratory (GeoDEVL), NCI has started down the path of making MT data easily available to the research community, particularly for the raw, less-processed data. Historically, researchers directly collected their own small MT dataset or, if they knew of other data that might exist, they would contact another researcher who had created a dataset and request a copy be sent to them by mail. In either case, the valuable raw data stored in poorly archived hard drives was virtually inaccessible. The data was then not released due to lack of infrastructure for data management and sharing. As part of the GeoDEVL, NCI has worked with the University of Adelaide to store their raw MT time-series data and associated products within NCI's high-performance data collections. Safely catalogued with searchable metadata and a persistent identifier for each dataset, that data can now be used by researchers around the country much more easily. Importantly,

researchers can now bring disparate datasets together to leverage the increased coverage for large-scale studies that would have been practically impossible before this.

Bringing research data into repositories like NCI's also enables deeper use cases. Sitting alongside a powerful supercomputer, this data now benefits from analysis and processing conducted with highly optimised software running on NCI's high-performance hardware (see Case Study on page 33). When research data is made Findable, Accessible, Interoperable, and Reusable (FAIR) in machine actionable formats, it opens up new research possibilities and avenues of investigation. It also makes it possible to extract new information from old data, reanalysing it with modern technologies to learn as much as possible.



NCI's efforts to rescue and refresh the data for HPC and data analysis needs are making previously hard-to-find or disconnected datasets usable. By leveraging the community collaborations and our data science expertise, we transform nationally significant datasets to suit the modern world. This is vital for bringing valuable scientific resources back to the fore, enabling both a deeper and wider research community.

Electrical resistivity at 30 km depth from the South Australian AusLAMP magnetotelluric data. The image highlights the lithospheric controls of mineral systems, showing the correlation of lower crustal conductors with surface locations of copper occurrences. Image from Dr Kate Robertson, Geological Survey of South Australia.

Data-Intensive Services

In 2018–19, NCI has maintained our focus on delivering the tools and services that allow researchers to get the most out of their data. We aim to increase the value and reach of research-ready datasets by providing users with high-quality and high-performance data-intensive services.

NCI's data services allow users, data portals and external science cloud environments to access, interact with and extract value from our data collections. Our approach to data services is focused on working with data as a living and connected resource, developing software, and providing portals and network protocols for accessing data.

Our high-performance data service, GSKY, launched last year, has been extended to enable both larger and higher resolution datasets and has enabled new cross-disciplinary access to highly valued national reference data collections for both intensive usage on site and remote access via web services. As a result, researchers have markedly increased their use of national large-scale time-series datasets from satellite data such as Landsat and Sentinel, with a 23% increase in downloaded data from last year. (See Data Access Table on Page 84). These are collections that have previously only been accessible to a more limited set of highly specialised data scientists.

GSKY aims to increase the high-performance accessibility and utility of these complex datasets so as to be more easily and usefully analysed in a number of important areas of analysis of the Australian environment. Conforming to the globally recognised standards ensures that important data collections are easily discoverable through national and international data discovery portals.

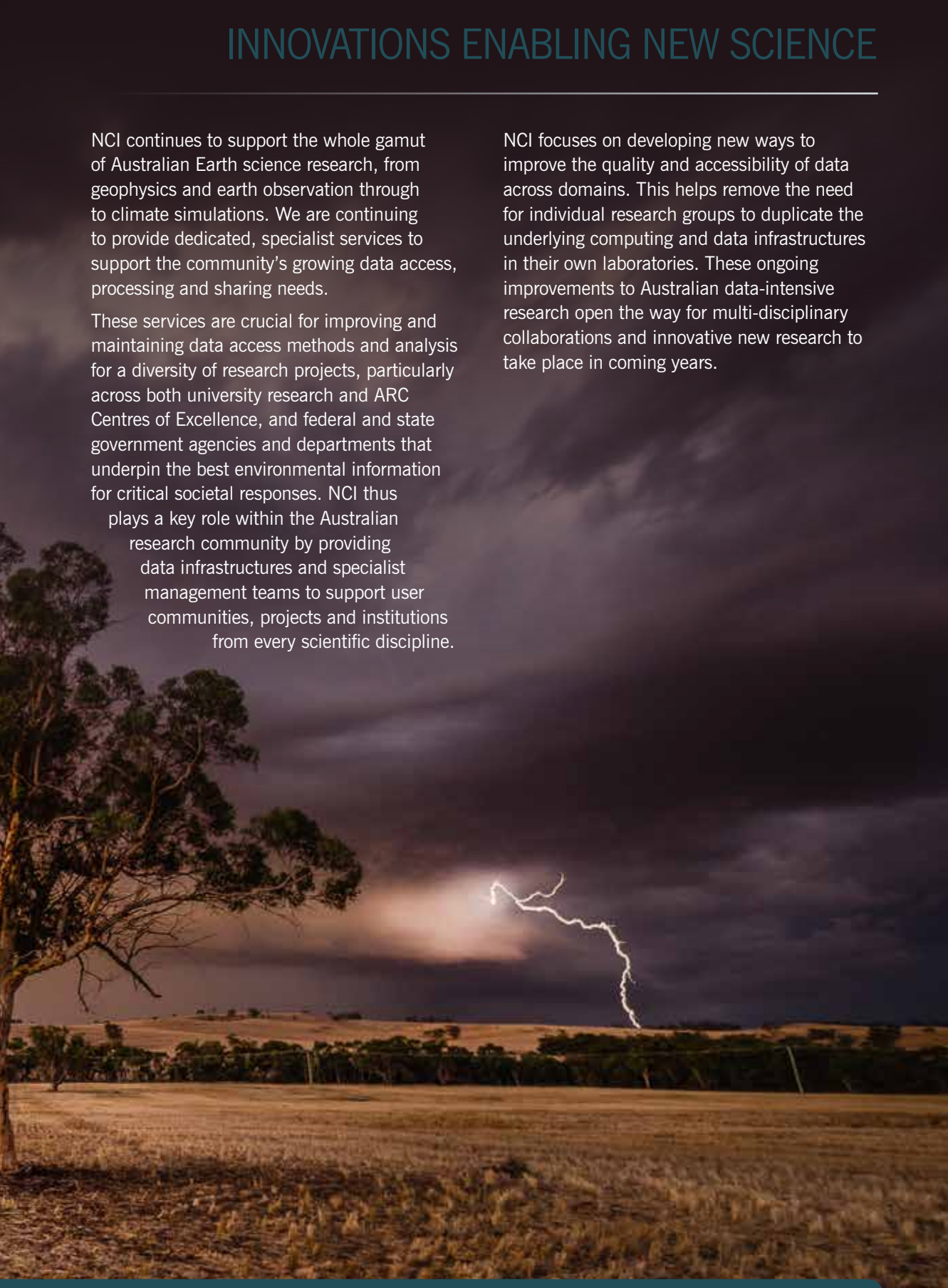
NCI collaborates with its key stakeholders to develop and maintain a high quality of data services designed to take advantage of the large body of data managed on site. The combination of modern data standards and state-of-the-art data analysis software working with the data ensures that it can be readily re-used by the broadest set of users and workflows. This includes NCI's work in the international Earth Systems Grid Federation (ESGF) for managing Climate CMIP data, and the Australian Regional Copernicus Hub.

INNOVATIONS ENABLING NEW SCIENCE

NCI continues to support the whole gamut of Australian Earth science research, from geophysics and earth observation through to climate simulations. We are continuing to provide dedicated, specialist services to support the community's growing data access, processing and sharing needs.

These services are crucial for improving and maintaining data access methods and analysis for a diversity of research projects, particularly across both university research and ARC Centres of Excellence, and federal and state government agencies and departments that underpin the best environmental information for critical societal responses. NCI thus plays a key role within the Australian research community by providing data infrastructures and specialist management teams to support user communities, projects and institutions from every scientific discipline.

NCI focuses on developing new ways to improve the quality and accessibility of data across domains. This helps remove the need for individual research groups to duplicate the underlying computing and data infrastructures in their own laboratories. These ongoing improvements to Australian data-intensive research open the way for multi-disciplinary collaborations and innovative new research to take place in coming years.



Preparing for the incredible scale of global climate data

NCI has spent the past year getting ready for the influx of multiple petabytes of global climate modelling data. As a Tier-1 data node of the international Earth System Grid Federation (ESGF), NCI will manage a significant portion of the data from the World Climate Research Programme Coupled Model Intercomparison Project Phase 6 (CMIP6). CMIP6 is an internationally coordinated research activity that provides climate model output from a series of carefully designed and targeted experiments. The analysis of CMIP6 data will form the basis for assessments by the Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC-AR6) and inform policy- and decision-makers in Australia and around the world.

CMIP6 is the largest collection of climate data ever produced. The data at NCI will include the Australian contribution to CMIP6 from the Australian Community Climate and Earth System Simulator (ACCESS) model projections as well as selected international datasets. Building on our data management expertise and experience hosting the previous CMIP5 datasets, NCI is now ready for this next wave of climate modelling data. Whereas all the CMIP5 data worldwide made up around two petabytes of data (two million gigabytes), CMIP6 is another order of magnitude bigger: when all is said and done, the estimate is for CMIP6 to be 20 petabytes in size globally.

Of those 20 petabytes, NCI will be storing around a quarter, making the uniquely large and complex datasets available to Australian climate researchers at NCI as well as for the broader community of users in the Australasian/Oceania region. Of course, managing and storing the data is just the start of what's required to support Australia's CMIP6 research.

NCI has worked with the community to develop new and upgraded data services for improved discovery and data access for data-intensive analysis. In particular, NCI's Metadata Attribute Service (MAS) uses metadata within the millions of files in the CMIP data collection to make searching the entire dataset much quicker and more powerful. The MAS underpins a community developed tool that provides an easy interface to search the large collection of published data to find matches for their specified requirements. Researchers can now pinpoint the data they need from specific experiments or regarding specific variables.

The climate data at NCI is provided using the principles of FAIR, which is core to NCI's Data Quality Strategy. Providing a FAIR data service for such a large and complex data collection exposes significant data management challenges but our work, and ongoing collaboration with the local and international community, ensures data is available in standardised and interdisciplinary ways, enabling new and varied climate research use cases. The outcome of this work is streamlined access and analysis of CMIP6 data, enabling efficient state-of-the-art climate science research to be undertaken.

Supported in part by the Climate Data-Enhanced Virtual Laboratory involving NCI, CSIRO, the Bureau of Meteorology, the ARC Centre for Climate Extremes and the Australian Research Data Commons, NCI's vision and support for this major international data project is enabling Australia's contribution on the world stage.

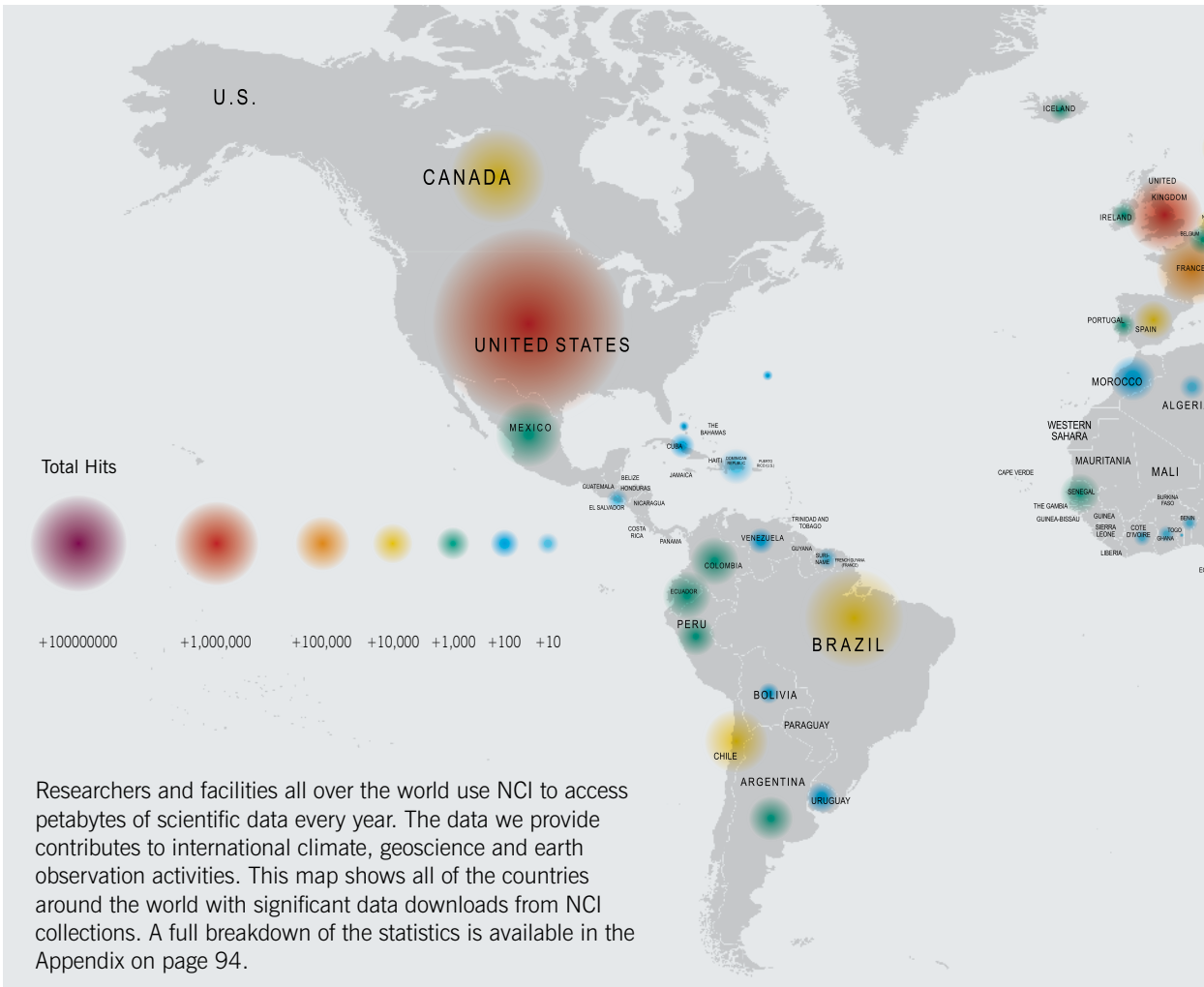
Leadership and Engagements

3

National and International Collaborations

NCI maintains close relationships with computational science and high-performance computing organisations around the world. Developing hardware and software solutions to new science problems involves collaborating with a variety of renowned international bodies. Some of the key organisations we work with include the Accelerated Data Analytics and Computing Institute, NASA, the UK Meteorological Office and the European Space Agency.

Collaboration is especially important when it comes to managing and improving our data collections: the acquisition and distribution of the latest satellite data, climate models and weather observations require international cooperation. NCI participates in these global networks, in particular as a key node of the Earth Systems Grid Federation, and actively contributes to the development of the data collections and the underlying data management processes.



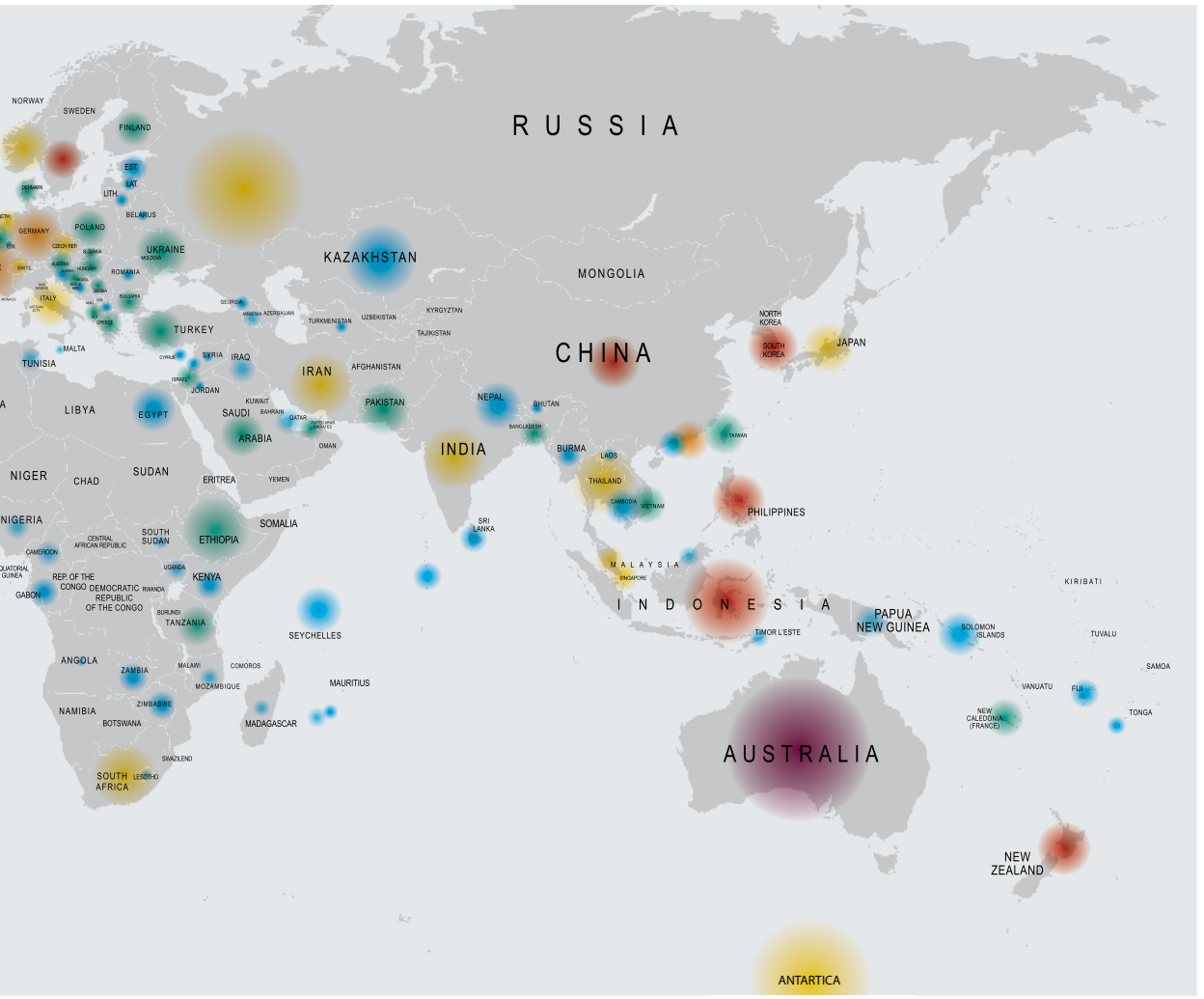
Researchers and facilities all over the world use NCI to access petabytes of scientific data every year. The data we provide contributes to international climate, geoscience and earth observation activities. This map shows all of the countries around the world with significant data downloads from NCI collections. A full breakdown of the statistics is available in the Appendix on page 94.

These collaborative efforts make NCI a key location for researchers wanting to access some of the most valuable and scientifically important datasets, such as global climate modelling and high-resolution satellite imagery. International and national traffic to NCI's data portals show the level of interest that our data collections are generating (see map below and on following page).

Engagement with international partners provides a key service for Australian research by making new data, new tools and new hardware available to scientists.

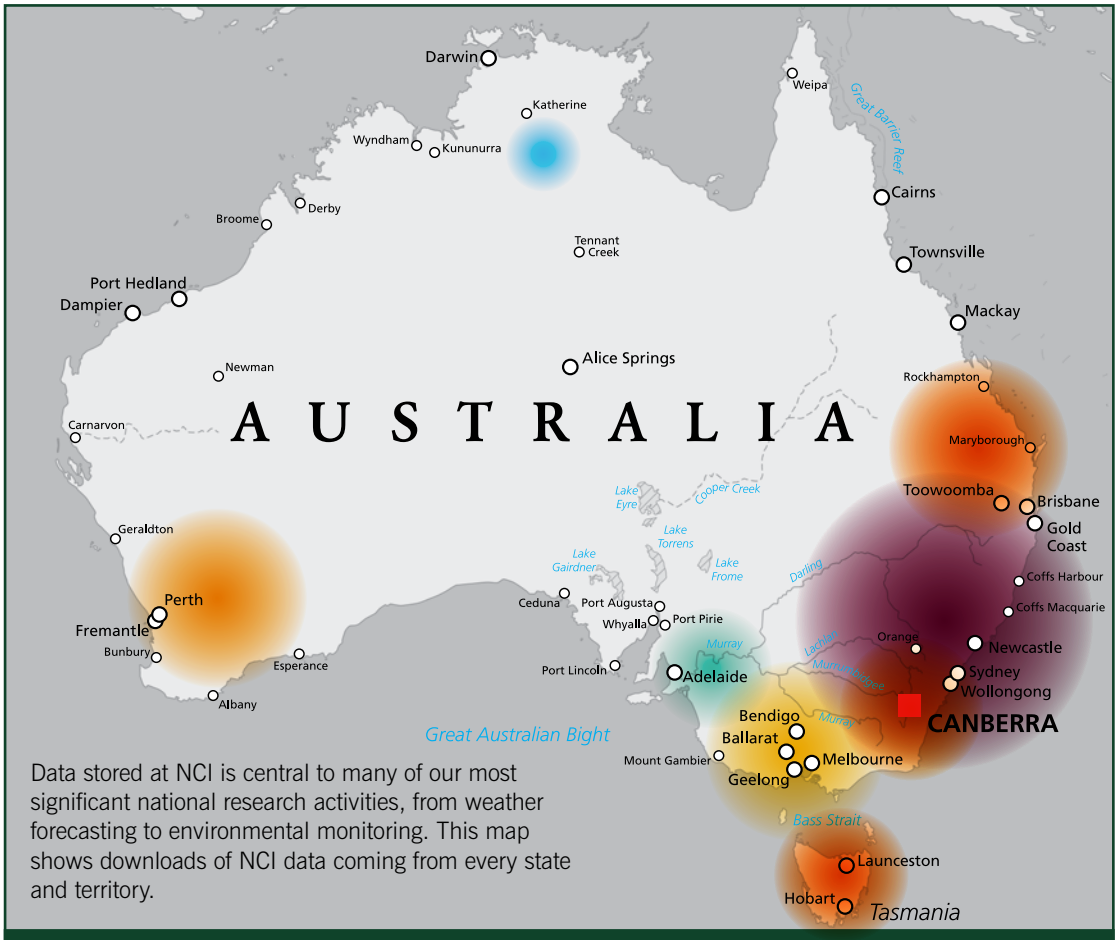
This keeps NCI users at the cutting edge of current and future developments in the supercomputing space.

Similarly, our engagement with vendors for proof-of-concept testing around next-generation machines positions NCI as a leading centre for high-performance computing infrastructure and expertise. NCI continues to build our expertise and understanding of new and emerging computational platforms. These close relationships lead to improved hardware performance, contributing directly to a better experience for researchers.



Our Users

NCI supports the work of more than 6,000 Australian researchers using supercomputing, data services, virtual research environments, scientific visualisation, code optimisation and more to advance their science.



Data stored at NCI is central to many of our most significant national research activities, from weather forecasting to environmental monitoring. This map shows downloads of NCI data coming from every state and territory.

Region	Total Users	Total Hits	Download (MB)
New South Wales	6,108	77,622,582	3,205,323,288
Australian Capital Territory	2,885	29,215,508	16,574,260
Queensland	2,576	3,292,094	15,530,589
Tasmania	597	545,327	12,616,014
Western Australia	1,315	1,674,894	9,547,617
Victoria	3,280	2,046,018	6,291,923
South Australia	893	565,090	1,529,624
Northern Territory	117	64,804	118,928
Unknown	11	27,188	109,783
Grand Total	**17,784**	**115,055,322**	**3,267,642,028**

Our Collaborations

The NCI Collaboration

NCI AUSTRALIA

Supported by

Australian Government
Department of Education

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

Major Collaborators

Australian National University

CSIRO

Australian Government
Bureau of Meteorology

Australian Government
Geoscience Australia

Collaborators

ACE CRC
Antarctic Climate & Ecosystems Cooperative Research Centre

DEAKIN UNIVERSITY AUSTRALIA
Worldly

Garvan Institute of Medical Research

qcif

UTS
University of Technology, Sydney

University of Wollongong Australia

RMIT University

Other Contracts

Australian Government
Australian Research Council

INTERSECT
Research Faster

Macquarie University

Monash University

NSW Planning, Industry & Environment

The University of Adelaide

The University of Melbourne

UNSW Australia

The University Of Queensland
Australia

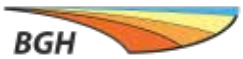
The University of Sydney

Victor Chang
Cardiac Research Institute

Commercial Partners

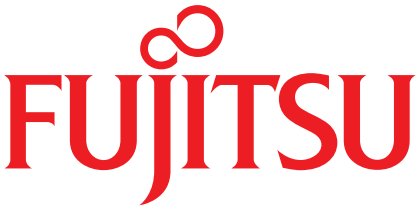
Commercial Collaborators

Merit Flagships



Other Affiliates

Our Vendors


FUJITSU


Lenovo


XENON
High Performance Computing


DELL


Hewlett Packard
Enterprise


IBM


CRAY


DDN
STORAGE


NetApp


SPECTRA
SpectraLogic.com


intel


NVIDIA


Mellanox
TECHNOLOGIES


APC
by Schneider Electric


Altair

Outreach

4

As a leader in the advanced computing and big data community in Australia, NCI provides more than just cutting-edge systems and services. We also conduct a large amount of outreach and engagement with our community and scientific audiences every year. Outreach secures NCI's role in the global computational science community, as well as the Australian political and social landscape.

You can see a full list of all major Outreach activities for 2018–19 on page 98.

Educational Outreach

From high-school students to scientists in training, NCI regularly welcomes groups keen to learn about the facility and everything that our high-performance computing and data facilities enable. For many students coming through our doors, this is their first look behind the scenes of where the biggest scientific discoveries begin. We aim to foster an interest in the benefits and opportunities that supercomputing will provide them in the future. This year, NCI met with high-school and university students from all over the country, including high-school science students at the Women in Engineering and Computer Science day, more than 60 college students from the National Youth Science Forum and hundreds of young, local scientists at the 2018 National Science Week Science in ACTion event.

NCI and the Pawsey Supercomputing Centre shared a booth at the SuperComputing 18 conference in Dallas, Texas.

NCI hosted local politicians for a tour of the facility, including ACT Deputy Chief Minister Yvette Berry MLA.

Corporate Outreach

NCI took part in numerous high-profile science events in 2018–19, including the annual Collaborative Conference on Computational and Data Intensive Science and eResearch Australasia Conference. We also hosted the Science and Technology Australia Executive for their annual Board Meeting. These events are an opportunity to introduce supercomputing to important stakeholders, and develop relationships with potential collaborators, ministers, science leaders and industry representatives.

Students from the University of Tokyo and the ANU Research School of Earth Sciences visited NCI this year.

Training

In 2018–19, NCI ran training sessions and workshops across Australia, with the aim of giving more researchers the skills they need to make best use of the supercomputing and data resources available to them. Training courses held on the campuses of various NCI Collaborators helped to make sure that as many users as possible had access to the latest information on using NCI's services. These sessions are an important way of developing the skillset of NCI's users and keeping them up to date on the latest technologies available to them.

National and International Engagements

As a global leader in high-performance computing and data, NCI is part of many international working groups, networks and collaborations. NCI staff play important roles in organisations including the Earth System Grid

The Executive Meeting of Science and Technology Australia took place at NCI in June 2019.

Federation, Earth and Environment Science Information Partners, and the American Geophysical Union. Being involved in these key bodies gives NCI the opportunity to contribute to the global development of data management standards and international data sharing activities.

Presentations and Publications

NCI is an active participant in many of the world's biggest open data and supercomputing conferences and journals. Over the course of 2018–19, NCI staff presented talks at more than 35 conferences. Highlights included the publication of a major paper about FAIR data in the journal *Nature*, and an invited presentation at the American Geophysical Union Fall Meeting.

Governance

5

The NCI Advisory Board

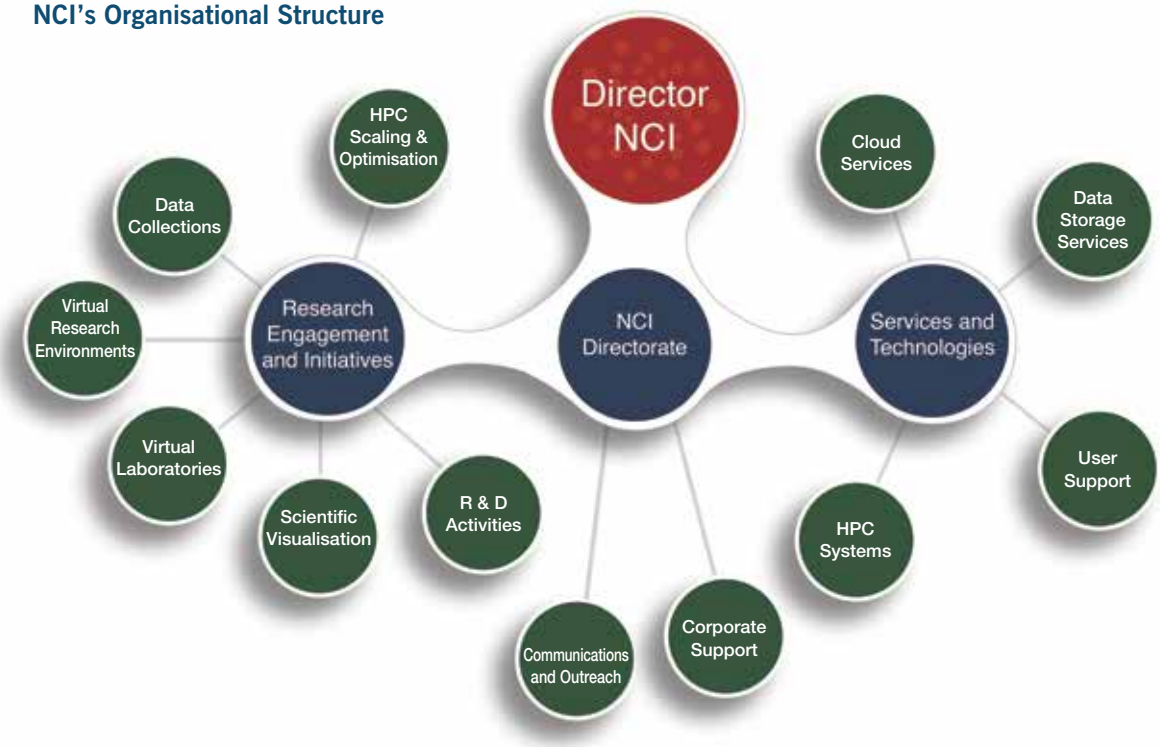
NCI is governed by The Australian National University on the advice of the NCI Advisory Board, which comprises:

- an independent Chair appointed by the Advisory Board
- the Director, NCI
- one member appointed by each of the Major Collaborators
- additional independent board members appointed for two-year terms by the NCI Advisory Board on the basis of their expertise

The Advisory Board is advised by:

- the Nominations Committee
- the Finance, Audit, Risk and Management Committee.

NCI's Organisational Structure



Board Members

Emeritus Professor Michael Barber
AO FAA FTSE
Chair

Professor Sean Smith
FAAAS
NCI Director

Professor Keith Nugent
FAA
The Australian National University, Deputy Vice-Chancellor (Research and Innovation)

Dr David Williams
CSIRO, Executive Director, National Facilities and Collections

Dr Gilbert Brunet
AO FAA FTSE
Bureau of Meteorology, Chief Scientist and Group Executive (Science and Innovation)

Dr James Johnson
Geoscience Australia, Chief Executive Officer

Dr Simone Richter
Independent Member, Australian Nuclear Science and Technology Organisation, Group Executive (Nuclear Science & Technology and Landmark Infrastructure)

Ms Susan Wilson
Independent Member, Founder and Managing Director, Bounce Partners

Emeritus Professor Robin Stanton
Independent Member and Deputy Chair

Financial Report

Preamble

NCI is an organisational unit of The Australian National University. The ANU, as represented by NCI, administers numerous funding contracts that support the operations of NCI. In the interests of providing a comprehensive picture of the NCI operation, a financial report consolidating these funding contracts is presented.

Each funding contract is accounted for in a distinct account within the University ledger, and the University facilitates, and where appropriate, acts on, the NCI Advisory Board's directions and resolutions on NCI matters insofar as they are consistent with the relevant funding contract and not contrary to University Statutes and policies.

NCI Collaboration Income

The NCI Collaboration Agreement enables many of Australia's leading research intensive universities and science agencies to collectively fund a capability beyond the capacity of any single institution. Together, these institutions (including ANU, CSIRO, BoM, Geoscience Australia, the ARC, and a range of other research intensive universities and consortia) fund a significant proportion of NCI's operating costs. A small but growing proportion of NCI Collaboration income comes from the commercial sector.

NCI also administers a number of grants and contracts outside of the NCI Collaboration accounts. These special purpose arrangements fund clearly defined projects, infrastructure and services that provide synergistic benefits to the NCI Collaboration.

Included in the opening balance of NCI's accounts is $69.2m (of the $70million) from the Australian Government's NCRIS Program for NCI's new supercomputer.

Expenses

NCI, as Australia's national research computing service, provides world-class, high-end services to Australia's researchers. In order to do this, NCI invests significant amounts of money in its expert team of staff and high-performance computing infrastructure. To maintain service quality, NCI has, where possible, invested in extending the useful life of its existing infrastructure through the renewal of maintenance contracts. With funding received to procure NCI's Gadi supercomputer, major capital expenditure will occur in the second half of 2019, as the data centre plant is upgraded and NCI's new supercomputer is installed and commissioned. NCI will continue to work to secure funding for the replacement of other critical assets approaching end of life, including significant parts of NCI's storage infrastructure.

Review/Audit

Each funding contract held by the ANU as represented by NCI has specific financial reporting and auditing requirements, and NCI in conjunction with the University's Finance and Business Services Division and Corporate Governance and Risk Office acquit individual project funds in accordance with these requirements.

This consolidated statement has been reviewed by ANU's Finance and Business Services Division. The Chief Financial Officer certifies that:

The statement accurately summarises the financial records of these grants and that these records have been properly maintained so as to accurately record the Income and Expenditure of these grants.

STATEMENT OF INCOME AND EXPENDITURE

For the period 01 July 2018 to 30 June 2019

For the NCI collaboration and associated project accounts

	2018/19 $
Balance as at 1 July 2018	**86,319,493**
Add	
NCI Collaboration Income	13,224,130
Other grant income	10,661,995
Investment income	2,067,237
Total Income	**25,953,362**
Total Available Funds Before Expenditure	**112,272,855**
Less	
Salaries & Related Costs	7,149,711
Equipment - Capital	6,219,991
Equipment - Non-Capital	458,675
Utilities & Maintenance	5,519,540
Travel, Field & Survey Expenses	486,859
Expendable Research Materials	1,323
Contributions	43,000
Consultancies	432,547
Consumables	778,698
Internal Purchases	740
Other Expenses	185,032
Transfers to other	654,282
Total Expenditure	**21,930,398**
Unspent Balance as at 30 June 2019	**90,342,457**

Appendix

6

Infrastructure

Data

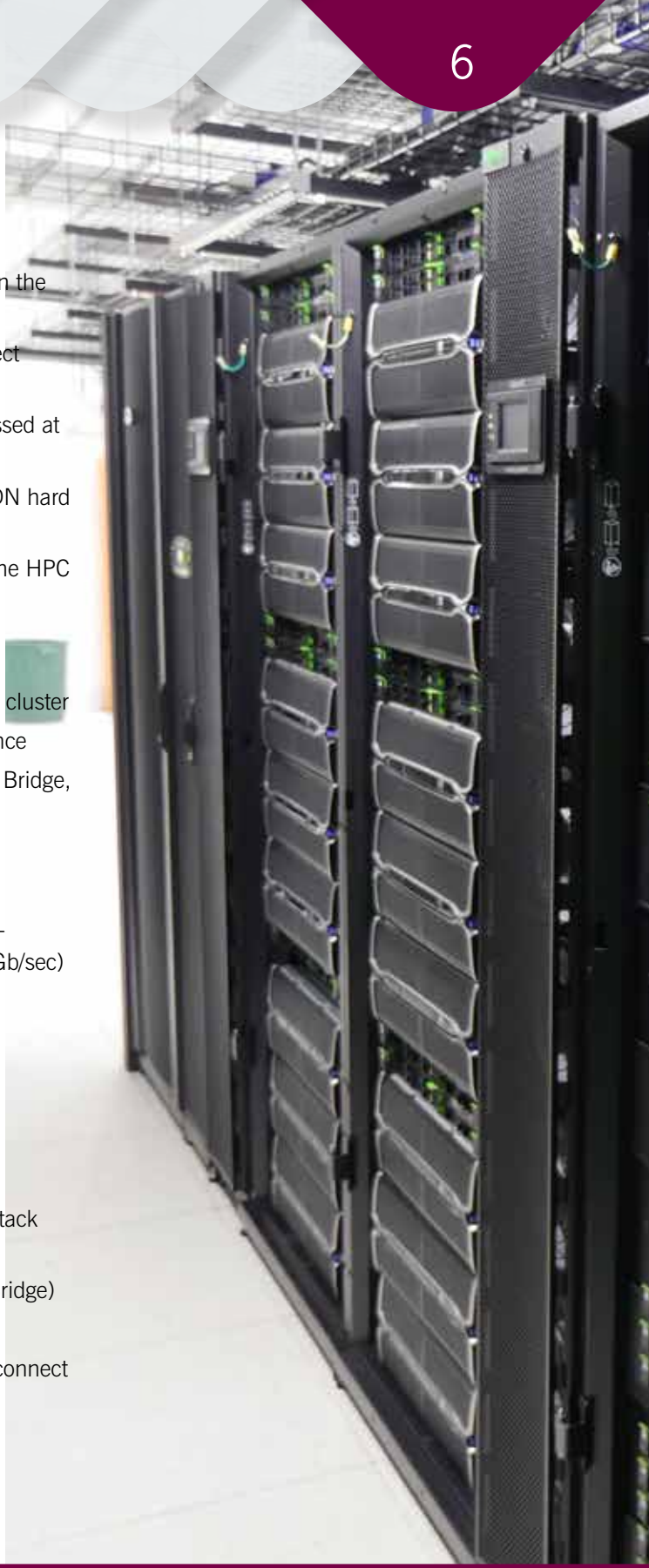
- 7.6 Petabytes scratch filesystem storage on the supercomputer accessed at 150 GB/sec
- 54 Petabytes active Lustre filesystem project storage accessed at up to 140 GB/sec
- 40 Petabytes archived data capacity accessed at up to 140 MB/sec
- Around 15,000 Fujitsu/Net-App, HPE, DDN hard drives
- 6 global Lustre filesystems accessible by the HPC and cloud systems

HPC

- Hybrid Fujitsu Primergy/Lenovo NeXtScale cluster
- 3.12 Petaflops aggregated peak performance
- 90,380 Intel Xeon Cores (2.6 GHz Sandy Bridge, Broadwell, Skylake, Xeon Phi)
- 4,691 compute nodes
- 128 NVIDIA Tesla GPUs (P100, K80)
- Hybrid FDR-EDR Mellanox Infiniband non-blocking fat-tree interconnect (up to 100 Gb/sec)
- 300 Terabytes of main memory
- 8 Petabytes of operational disk storage
- Over 740 million core hours per year
- 310 software packages

Cloud

- 75 Teraflop peak performance Dell OpenStack cloud
- 3,200 Intel Xeon cores (2.6 GHz Sandy Bridge)
- 200 nodes
- FDR Mellanox Infiniband full fat-tree interconnect (56 Gb/sec)
- 50 Terabytes main memory
- 320 Terabytes of disk storage



APPENDIX

Usage

Compute projects supported by NCI in 2018–19

Thousands of scientists every year use NCI to perform their research. They can access the computational resources through either the National Computational Merit Allocation Scheme (NCMAS), a Collaborator Share or a Merit Flagship Allocation. Compute allocations are measured in thousands of Service Units (kSU). A Service Unit is equivalent to the work done by one of Raijin's original compute cores in one hour.

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Peter Steinle, Bureau of Meteorology	53,400	53,400	-	Strategic Radar Enhancement Project
Dr Amanda Barnard, CSIRO	45,558	45,558	-	AI-Driven Materials Design
Dr Daohua Bi, CSIRO	38,340	38,340	-	ACCESS - AOGCM
Dr Andrew Hogg, Australian National University	32,540	17,000	-	The Dynamics of the Southern Ocean
		11,640	-	Extratropical Variability
		3,900	3,900	The Dynamics of the Southern Ocean
Prof Evatt Hawkes, University of NSW	21,317	15,909	1,750	Direct Numerical Simulations of Turbulent Combustion
		5,408	-	Direct Numerical Simulations of Turbulent Combustion
Prof Martin Asplund, Australian National University	19,750	19,750	6,750	3D magneto-hydrodynamical stellar modelling and 3D non-equilibrium radiative transfer
Dr Christoph Federrath, Australian National University	17,450	17,450	2,500	Modelling the Formation of the First Stars in the Universe, Magnetized Clouds, Supernova Explosions, and Binary Star Formation
Dr Terry OKane, CSIRO	16,570	16,570	-	The AUStralian community ocean model ReAnalysis project (AURA)
Prof Dietmar Mueller, University of Sydney	16,235	16,235	2,700	Geodynamics and evolution of sedimentary systems
Dr Ravichandar Babarao, CSIRO	15,458	15,258	-	CO2 conversion in catalytic MOFs
		200	-	Porous materials for the capture and release of oxygen
Prof Derek Leinweber, University of Adelaide	15,241	13,241	3,750	Electromagnetic Structure of Matter
		2,000	-	Electromagnetic Structure of Matter - e31 Ancillary Project
Prof Matthew England, University of NSW	14,730	14,730	8,700	Past, present and future climate variability and change in the Southern Hemisphere
Dr Michael Naughton, Bureau of Meteorology	14,700	14,700	-	BoM ESM research at NCI
A/Prof Ben Corry, Australian National University	12,500	12,500	1,000	Simulation studies of biological and synthetic channels
Dr Stefan Zieger, Bureau of Meteorology	11,000	11,000	-	BoM-Industry Project
Dr Aurel Moise, Bureau of Meteorology	10,900	10,900	-	Climate Change Science and Processes
Emeritus Prof Jill Gready, Australian National University	10,000	10,000	-	Simulation and Phylogenetics to decipher Rubisco structure, function and evolution

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Prof Salvy Russo, Royal Melbourne Institute of Technology	9,908	4,400	-	ARC Centre of Excellence in Exciton Science
		3,600	-	CoE Exciton Science
		1,602	300	Prediction of the Properties of Materials and Nanomaterials
		160	-	RMIT Discretionary and Startup Allocations
		146	-	Quantum Modelling of Photo-Electrode Materials
Dr Manolo Per, CSIRO	9,885	9,885	-	Development and Application of Quantum Monte Carlo methods
Prof Jason Evans, University of NSW	9,208	6,233	-	Regional climate modelling
		1,424	950	Regional Climate Modelling in South-east Australia
		1,117	-	Wind, hail and lightning over Sydney
		434	-	Heatwaves
Prof Catherine Stampfl, University of Sydney	8,914	7,664	2,260	First-Principles Investigations of Processes and Properties in Catalysis, Coatings, and Devices
		1,250	-	First-Principles Investigations of Processes and Properties in Catalysis, Coatings, and Devices
Prof Sean Li, University of NSW	8,736	8,736	540	Accelerate Functional Material Designs Using Artificial Inetelligence
Dr Angus Gray-Weale, Bureau of Meteorology	8,000	8,000	-	Data assimilation for seasonal prediction
Prof Toby Allen, Royal Melbourne Institute of Technology	7,625	7,625	475	Mechanisms of ion channel function and modulation.
Dr Chantal Donnelly, Bureau of Meteorology	7,500	7,500	-	Water Information Services
Emeritus Prof Ross Griffiths, Australian National University	7,500	7,500	-	The role of convection and turbulence in ocean circulation
Prof Michelle Coote, Australian National University	7,500	4,500	-	Computer-aided Chemical Design of Catalysts and Control Agents
		3,000	3,000	Computer-aided Chemical Design of Catalysts and Control Agents
A/Prof Michelle Spencer, Royal Melbourne Institute of Technology	7,260	5,350	1,750	Theoretical Investigation of novel materials for industrial and biomedical applications
		1,910	380	Modelling Nanoscale Materials for Sensing and Device Applications
Dr Harvey Ye, Bureau of Meteorology	7,000	7,000	-	Weather and Environmental Prediction Specialised Forecasting Systems (WEPSFS)
Dr Justin Freeman, Bureau of Meteorology	6,500	6,500	-	Ensemble Ocean Forecasting
Dr Benjamin Galton-Fenzi, Australian Antarctic Division	6,464	2,091	-	Research, development and production computing for Antarctic Climate & Ecosystems CRC under the ACE-CRC/AGP/AAD-NCI partnership
		1,920	-	Research, development and production computing for the Australian Antarctic Division under the ACE-CRC/AGP/AAD-NCI partnership
		1,653	-	Research, development and production computing for the Antarctic Gateway Project under the ACE-CRC/AGP/AAD-NCI partnership
		800	800	Modelling of the interaction between Antarctica and the Southern Ocean
A/Prof Megan O'Mara, Australian National University	6,375	6,375	1,375	Investigating membrane protein dynamics, regulation and substrate recognition

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Claudio Cazorla, University of NSW	6,257	5,019	-	Rational design of novel multiferroic materials for energy harvesting and energy efficiency
		1,238	462	Nano-structured multifunctional materials for solid-state cooling (continuation project)
Prof Geoffrey Bicknell, Australian National University	6,256	6,256	756	Astrophysical Jets and Winds and their Interactions with the Ambient Medium
Prof Sean Smith, Australian National University	6,002	4,000	-	Materials for Sustainable Energy Applications
		2,002	2,000	Computational Nanomaterials Science and Engineering
Dr Oliver Hofmann, University of Melbourne	6,000	6,000	-	VCCC Pilot Project
Prof Mark Krumholz, Australian National University	5,800	5,800	2,250	Star Formation and Feedback in a Turbulent Interstellar Medium
A/Prof Chris Power, University of Western Australia	5,750	4,000	-	GADGET3 Porting, Scalability and Production Computing on Raijin
		1,750	1,750	Tests of Dark Matter and Galaxy Formation in Next-Generation Galaxy Surveys
Prof Mike Ford, University of Technology, Sydney	5,713	5,103	-	Designing and Building Novel 2D Hybrid Materials
		610	610	Nanostructured Materials for Energy Efficiency Applications
NCI Internal (System, Training, Development)	5,673	5,673		NCI Internal Projects
Dr Gary Brassington, Bureau of Meteorology	5,550	5,550	-	BLUElink3 - Bureau
Dr Rhodri Davies, Australian National University	5,500	5,500	900	Earth's Intra-Plate Volcanic Engine
Dr Marcus Thatcher, CSIRO	5,475	5,475	-	High-resolution Downscaled Climate Runs
A/Prof Nikhil Medhekar, Monash University	5,262	4,000	-	CoE FLEET
		1,262	800	Enabling Functional Properties of Nanoscale Materials using Atomistic Simulations
A/Prof Vincent Wheatley, University of Queensland	4,715	4,715	2,475	Scramjet-based Access-to-Space and Planetary Entry
Mr Simon Oliver, Geoscience Australia	4,550	3,450	-	DEA Operations and code repositories (Public and private)
		800	-	DEA Development and Science (GA internal)
		300	-	Copernicus Partners Testing and Development
Prof Alan Mark, University of Queensland	4,520	4,520	2,125	From molecules to cells Understanding the structural and dynamic properties of cellular components at an atomic level.
Dr Deborah Abbs, CSIRO	4,440	4,440	-	Regional-Scale Seasonal Prediction Over Eastern Australia and the Coral Sea
Dr Emlyn Jones, CSIRO	4,170	4,170	-	Coastal Ocean Data Assimilation
Prof Katrin Meissner, University of NSW	4,008	4,008	912	Abrupt climate change events in the past, present and future
Prof Jingming Duan, Geoscience Australia	3,800	3,800	-	Magnetotelluric and Electrical data inversion
Prof Brian Smith, La Trobe University	3,750	3,750	-	Biomolecular modelling

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Judy Hart, University of NSW	3,444	2,296	250	Design and development of new inexpensive photoactive materials for efficient hydrogen production and biomedical applications
		897	-	Materials for energy conversion and storage
		251	-	DFT study of doping effects in Tetragonal Zirconia Polycrystalline (TZP)
Dr Junming Ho, University of NSW	3,411	2,159	475	Accelerating the Design of Novel Catalysts and Drugs through Computational Chemistry
		1,252	-	Accelerating the Design of Novel Catalysts and Drugs through Computational Chemistry
A/Prof Ben Thornber, University of Sydney	3,356	3,356	750	Variable Density Compressible Turbulent Mixing
Dr Timothy Trudgian, UNSW Canberra	3,209	3,209	125	Verifying the Riemann hypothesis to a new record height
Dr Michael Breedon, CSIRO	3,020	3,020	-	The adsorption of molecules onto surfaces found in energy storage devices
NCI Fujitsu Collaboration	3,000	3,000	-	ACCESS Model Scaling and Optimisation
Prof Julio Soria, Monash University	2,981	2,981	1,250	Investigations of transitional and turbulent shear flows using direct numerical simulations and large eddy simulations
A/Prof Serdar Kuyucak, University of Sydney	2,879	1,820	-	Molecular Dynamics Simulations of Ion Channels and Transporters
		1,059	125	Free Energy Simulations of Ion Channels and Transporters
A/Prof Ekaterina Pas, Monash University	2,794	2,794	1,175	Fully ab initio large-scale calculations for the prediction of physiochemical properties of condensed systems, polymers and proteins.
Dr Alain Protat, Bureau of Meteorology	2,700	2,700	-	Radar Science and Nowcasting
Dr Robin Wedd, Bureau of Meteorology	2,700	2,700	-	ACCESS-Seasonal
Mr Griffith Young, Bureau of Meteorology	2,700	2,700	-	Seasonal Prediction Systems and Science
Prof Debra Bernhardt, University of Queensland	2,665	2,665	1,150	New materials and fluids for catalysis, battery technologies and sensors.
Prof Suresh Bhatia, University of Queensland	2,660	2,660	1,590	Interfacial Barriers for the Transport of Nanoconfined Fluids
Dr Alister Page, University of Newcastle	2,580	2,200	-	Quantum Chemical Simulation of Interfacial Chemical Phenomena
		380	380	Quantum Chemical Modelling of Nanoscale Chemical Processes
Dr Warren Kaplan, Garvan Institute of Medical Research	2,536	1,580	-	Garvan - Genomic Cancer Medicine - David Thomas
		386	-	Garvan Genome Pilot
		180	-	Garvan - Human Comparative and Prostate Cancer Genomics - Vanessa Hayes
		120	-	Garvan - KCCG MGRB
		80	-	Garvan - KCCG Research
		80	-	Garvan - Immmunogenomics - Chris Goodnow
		80	-	Garvan - RNA Biology and Plasticity - John Mattick
		30	-	ACPC
Dr Adrian Pudsey, Royal Melbourne Institute of Technology	2,525	2,525	125	Aerothermodynamics of Hypersonic Flight and Enabling Technologies

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Mr Steven Wilson, Victor Chang Cardiac Research Institute	2,465	1,280	-	VC Dunwoodie
		520	-	VC Suter
		300	-	VC Stocker
		160	-	VC HO
		80	-	VC - Graham
		60	-	VC Giannoulatou
		40	-	VC Harvey
		25	-	VC Fatkin
Dr Adrian Sheppard, Australian National University	2,440	1,900	-	Understanding petrophysical and multiphase flow properties of rock through experiment, 3D imaging and modelling
		540	540	Probing the structure and properties of complex and hierarchical materials
Mr Asger Gronnow, University of Sydney	2,418	2,418	-	The effect of the Galactic halo magnetic field on gas condensation and accretion
Prof Leo Radom, University of Sydney	2,352	1,927	1,475	Structural and Mechanistic Chemistry
		425	-	Structural and Mechanistic Chemistry
Dr Ming Zhao, University of Western Sydney	2,350	2,350	-	Investigation of fluid-structure interaction in offshore engineering using computational fluid dynamics
Dr Leonard Hamey, Macquarie University	2,345	1,280	-	Analysis of prostate MRI
		280	-	Affect Recognition from Video
		185	-	3D Medical Image Segmentation
		160	-	Malware Detection in an Adversarial Environment
		150	-	Multi-modal machine learning for clinical decision support
		130	-	Data Analytics for Malware Using Machine Learning
		80	-	Recognition of Signal Emitters
		80	-	Medical Image Analysis for Dementia Diagnosis
Dr Daniel Chung, University of Melbourne	2,200	2,200	1,150	Direct numerical simulation of wall-bounded and buoyancy-driven turbulent flows
Prof Christoph Arns, University of NSW	2,139	2,086	306	Integration of conventional and digital core analysis
		53	-	Multi-scale multi-physics analysis of porous media
Prof Tiffany Walsh, Deakin University	2,080	1,080	-	Molecular simulation of carbon fibre composites
		1,000	1,000	Development and application of bio/nano interfacial simulations
Prof Simon Ringer, University of Sydney	2,010	2,010	500	Exploring structure-property correlations in advanced materials: Nexus between computational simulation and atomic resolution microscopy
Prof Allen Rodrigo, Biological Sciences Computer Unit, Research School of Biology, College of Medicine, Biology and Environment, Australian National University	2,000	2,000	-	Evolutionary analyses using short-read sequences from pooled samples of anonymous, genetically-variable individuals.
Prof Alexander Heger, Monash University	1,970	1,970	1,200	Exploring the Diversity of Core-Collapse Supernova Explosions
Dr Yuan Mei, CSIRO	1,932	1,932	-	Deep Earth Imaging: molecular simulation of the mineral systems

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Cheong Xin Chan, University of Queensland	1,885	1,885	900	Comparative and Evolutionary Genomics of Microbes from Diverse Environments
Prof Jared Cole, Royal Melbourne Institute of Technology	1,860	1,860	360	The materials science of transport and decoherence in quantum devices.
A/Prof Zhe Liu, University of Melbourne	1,850	1,850	1,350	Integrated Computational Materials Engineering for Alloy Design
Prof Simon Easteal, Australian National University	1,850	1,850	500	The National Centre for Indigenous Genomics
Mr Leon Majewski, Bureau of Meteorology	1,800	1,800	-	Remotely sensed observations for Earth system modelling
Dr Seojeong Lee, University of NSW	1,796	1,796	-	Joint Labour Supply and Retirement of Australian Couples
Dr Babak Hejrani, Geoscience Australia	1,790	1,750	-	Tomography Data Processing
		40	-	Geophysical Data Not for Release
Dr Ivo Seitenzahl, UNSW Canberra	1,763	1,763	650	Hydrodynamical explosion simulations and radiative transfer for thermonuclear and core-collapse supernovae
Dr Xuebin Zhang, CSIRO	1,745	1,000	-	Downscaling future climate change from CMIP5 climate models with an eddy-resolving ocean model
		745	-	Constructing a Coupled Economic-Climate System Model
Dr Edward Obbard, University of NSW	1,720	1,720	-	Atomic scale modelling of nano-solute-vacancy clusters in reactor pressure vessel steel
Dr Terry Frankcombe, UNSW Canberra	1,714	1,714	-	Efficient chemical dynamics in gas phase, solid phase and heterogeneous systems
Dr Alison Kirkby, Geoscience Australia	1,700	1,700	-	Magnetotelluric inversions for AusLAMP
Prof Kevin Walsh, University of Melbourne	1,698	1,698	1,400	South Pacific High-resolution Climate Model Simulations
Prof Aijun Du, Queensland University of Technology	1,675	1,675	1,675	Nanomaterials for Energy, Nanoelectronics and Environmental Applications: Contribution from Modelling towards Rational Design
Dr Patrick Burr, University of NSW	1,650	1,650	260	Energy materials degradation
Prof Orsola De Marco, Macquarie University	1,650	1,650	-	Common envelope interaction and stellar outbursts in the era of time-domain Astrophysics
Prof Mark Thompson, Monash University	1,640	1,640	1,000	Transition, stability and control of bluff body flows
Prof Geraint Lewis, University of Sydney	1,612	1,510	-	Cosmological Probes of Evolving Dark Energy
		102	-	SSimPL-ACS The Survey Simulation PipeLine - Alternative Cosmologies Study
Prof Malcolm Sambridge, Australian National University	1,560	1,560	560	Unleashing the power of data: the next generation of geophysical inference
Dr Robyn Schofield, University of Melbourne	1,550	1,550	700	Atmosphere-Ocean Coupled Chemistry Climate Modelling of Ozone and Aerosols
Prof Justin Borevitz, Australian National University	1,550	1,550	-	Linking Genotype, Phenotype and Landscape to improve Plant Energy
Dr Haibo Yu, University of Wollongong	1,522	1,522	780	Molecular Simulations of Enzymatic Catalysis and Computer-Aided Molecular Design
Prof Michael Ferry, University of NSW	1,514	1,514	-	bulk metallic glasses
Dr Bishakhdatta Gayen, Australian National University	1,500	1,500	1,500	The role of convection and turbulent mixing in ocean circulation
Dr Trevor Allen, Geoscience Australia	1,500	1,500	-	EQRM

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Prof Anthony Weiss, University of Sydney	1,481	1,160	-	Temperature-Dependent Dimerisation of Tropoelastin
		321	321	Mechanisms of tropoelastin-integrin interactions
Mr John Wilford, Geoscience Australia	1,460	1,460	-	Data mining and geostatistical modelling for geoscience applications
Dr Kenji Shimizu, Commercial organisations	1,450	1,450	-	RPS Group Computing
Prof Ivan Cole, Royal Melbourne Institute of Technology	1,450	1,450	-	Study on the airflow phenomena on the respiratory system
Prof Hugh Blackburn, Monash University	1,432	1,432	1,040	High-Order Methods for Transitional and Turbulent Flows
Dr Elizabeth Krenske, University of Queensland	1,430	1,430	250	Theoretical Modelling of Molecular Structure and Reactivity
Dr Martin Jucker, University of NSW	1,430	1,430	-	Atmospheric and oceanic processes and dynamics
Prof Steven Sherwood, University of NSW	1,429	1,429	1,300	Rethinking atmospheric physics to resolve climate enigmas
A/Prof Gregory Sheard, Monash University	1,337	1,337	735	Seeking the ultimate regimes of heat transport in horizontally driven natural convection
Prof Clive McAlpine, University of Queensland	1,320	1,320	750	The capacity of forests to protect regional climate under global warming: science and policy implications
A/Prof Amir Karton, University of Western Australia	1,300	1,300	1,300	High-level quantum chemistry: From theory to thermochemical and biochemical application
Prof Carola Vinuesa, Australian National University	1,300	1,300	-	Computational identification of medically-relevant, personal genetic variation from the largest volumes of human genome sequences.
Prof Nathan Bindoff, University of Tasmania	1,300	1,300	800	Turbulence and mixing in the Southern Ocean
Dr Shayne McGregor, Monash University	1,286	1,286	775	Predicting and understanding Australia's regional rainfall distribution in a changing climate
Ms Mun Hua Tan, Deakin University	1,240	1,240	-	Fish/Invertebrate Genomics
Prof Kerry Hourigan, Monash University	1,231	1,231	750	Advanced Modelling of Fluid-Structure Interactions
Dr Diego Molla-Aliod, Macquarie University	1,200	1,200	-	Deep learning experiments for text summarisation
A/Prof Jason Sharples, University of NSW	1,179	1,179	720	Modelling and simulation of dynamic bushifre propagation
Dr Mohsen Talei, University of Melbourne	1,150	1,150	250	Developing predictive tools for cleaner combustion
Prof Julian Gale, Curtin University of Technology	1,150	1,150	1,150	Atomistic Simulation for Geochemistry and Nanoscience
Bernadette Sloyan, CSIRO	1,135	1,135	-	CSHOR Indo-Pacific Interbasin Exchange
Dr Dietmar Dommenget, Monash University	1,100	1,100	-	Global scale decadal climate variability in a ACCESS hierarchy of climate models
Prof Elizabeth Ritchie-Tyo, UNSW Canberra	1,089	1,089	250	Tropical Cyclone Studies
Prof Russell Boyce, UNSW Canberra	1,081	1,081	700	Physics of the interactions between high-speed craft and their environment
Prof Ian Dance, University of NSW	1,073	1,073	-	Computational Bio-inorganic and Supramolecular Chemistry
Dr Nicole Kessissoglou, University of NSW	1,061	1,061	-	Aeroacoustic analysis of a finite wall-mounted airfoil
Dr Hongtao Zhu, University of Wollongong	1,053	1,053	250	Polycrystal Plasticity FEM Simulation of Severe Plastic Deformation (SPD) Techniques

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Prof Richard Sandberg, University of Melbourne	1,033	1,033	700	High-fidelity simulations of turbomachinery applications
Dr Christina Magill, Macquarie University	1,020	1,020	-	Volcano loss modelling - agriculture
Dr Rob Womersley, University of NSW	1,018	1,018	-	Computation and optimization of energy, packing, covering and worst case error for point configurations on manifolds
Dr Martin Cope, CSIRO	1,002	1,002	-	Future Air Quality Projection
Dr Simon Campbell, Monash University	1,002	1,002	-	Convective-Reactive Nucleosynthesis 3D: Novel Sources of Cosmic Elemental Production
Dr Alejandro Di Luca, University of NSW	1,000	1,000	175	The future intensity of extreme East Coast Lows
Mr Patrick Sunter, Bureau of Meteorology	1,000	1,000	-	Extended Hydrological Prediction modelling
Prof Peter Betts, Monash University	993	993	741	Subduction from top to toe.
Dr Gareth Vio, University of Sydney	975	975	-	Fluid-Structure Interaction using higher Order CFD
A/Prof John Young, UNSW Canberra	965	869	250	Fluid-Structure Interactions in Biological and Biomedical Systems
		96	-	Fluid â€" structure Interactions in Biological and Biomedical Flows
A/Prof Craig O'Neill, Macquarie University	950	800	-	dfss
		150	150	Tracking mantle slab dewatering using ASPECT
Dr Alberto Peruzzo, Royal Melbourne Institute of Technology	950	950	-	RMIT Node, ARC Centre of Excellence for Quantum Computation and Communication Technology
Dr Matthew Perugini, La Trobe University	949	949	-	Molecular Dynamics of Protein Targets Linked to Infectious, Diabetic and Age-Related Diseases
Dr Abhnil Prasad, University of NSW	890	890	-	The effects of tropical convection on Australia's climate
Prof Graham Heinson, University of Adelaide	880	880	425	3D Geophysical Imaging for the Australian Lithospheric Architecture Magnetotelluric Project (AusLAMP)
Dr Fangbao Tian, UNSW Canberra	875	875	100	Dynamics, learning and control of fast gait transitions in fish swimming using deep reinforcement learning
Dr Nicolas Flament, University of Wollongong	860	860	650	Dynamic Earth models for frontier diamond exploration
Dr Anthony George, University of Technology, Sydney	850	850	-	Role of dominant motions in the catalytic mechanism of cathepsin L protease.
Dr Callum Shakespeare, Australian National University	850	850	250	Wave-eddy-mean flow dynamics
Dr Daniel Lester, Royal Melbourne Institute of Technology	820	820	-	The Tensorial Rheology of Strong Colloidal Gels
Dr Jay Larson, Australian National University	820	820	-	Unified Model porting
Mr Richard Miller, Macquarie University	820	240	-	Piloting Environment. Faculty of Science and Engineering, Macquarie University
		160	-	Machine Translation
		160	-	Hyper Spectral TEM Image Classification
		120	-	Random Forests Machine Learning
		100	-	Novel Microwave Antennas and EM Structures
		40	-	Hyperspectral unmixing

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Dr Catia Domingues, University of Tasmania	813	813	813	Ocean heat uptake processes: implications for global and regional sea level change in the ACCESS model
Mr Nick Horspool, Geoscience Australia	800	800	-	Severe Wind and Coastal Inundation Modelling
Prof David Thomas, Garvan Institute of Medical Research	800	800	-	A whole genome study to map heritable risk in sarcoma
Dr Susanna Guatelli, University of Wollongong	796	457	-	Development of new physics models in Geant4 for nanomedicine applications in the fight against cancer
		339	-	Monte Carlo based studies to improve radiotherapy treatment and associated Quality Assurance Instrumentation in the fight against cancer
Prof Richard Yang, University of Western Sydney	790	790	-	Multiscale modelling of Advanced Engineering Materials and Structures
Dr Cheng Chin, University of Adelaide	780	780	375	Numerical simulations of rough wall turbulence: A control's approach
Dr Nicholas Williamson, University of Sydney	775	775	-	Stratified boundary layers in riverine environments: Modification of flow stability by lateral circulation
Dr Yan Jiao, University of Adelaide	766	766	300	Materials Design for Clean Energy Conversion Reactions by DFT Computations
Prof Marc Parlange, Monash University	764	764	675	Large-Eddy Simulation of Canopy Flows in Complex Terrain
Dr Yun Wang, Griffith University	758	758	282	Understanding the properties of the electrode/solution interface in the electrochemical cell
Dr Khandis Blake, University of NSW	751	751	-	Understanding hate speech on social media platforms: Implications for gendered violence
Dr Ashley Ruiter, UNSW Canberra	741	741	450	Testing binary star evolution models: thermonuclear supernova progenitors
Dr Michael Rezny, Monash University	723	723	-	Terrestrial modelling within the Centre of Excellence regionalizing land surface processes
Dr Dave Stegman, Overseas University	711	711	525	4-D Numerical Models of Plate Tectonics Subduction with an Upper Plate
Prof Joseph Lai, UNSW Canberra	706	706	-	Disc Brake Squeal
Prof Peter Visscher, University of Queensland	700	700	350	Deciphering the genetic control of diseases
Dr Andrew Neely, UNSW Canberra	692	692	160	Fluid-thermal-structural interactions for high-speed flight and propulsion
Prof Kiet Tieu, University of Wollongong	689	689	-	Density Functional Theory and First-Principle Molecular Dynamics Simulation of Tribochemical Reactions between Solid Lubricants and Steel Substrates at High Temperature
Prof Robert Stranger, Australian National University	670	365	-	DFT and TD-DFT Studies of Organometallic and Metal Cluster Systems
		305	225	Computational Studies of the Mn/Ca Cluster in Photosystem II
Prof Tracie Barber, University of NSW	660	660	-	CFDMECH
Prof Susan Clark, Garvan Institute of Medical Research	659	425	225	Creating and Mapping Personal Epigenomes
		190	180	Setting up 3D Epigenomes of endocrine resistance breast cancer
		44	-	Garvan - Epigenetics Research - Susan Clark
A/Prof David Huang, University of Adelaide	655	655	312	Multi-scale modelling of soft condensed matter in functional materials
Dr Boris Beranger, University of NSW	644	644	-	Spatial Extremes
Dr Flora Salim, Royal Melbourne Institute of Technology	640	640	-	Deep learning of time-series and spatio-temporal data

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Dr Jong-Leng Liow, UNSW Canberra	640	528	-	Study of xanthan gum behaviour through computational fluid dynamics and molecular simulation
		112	112	Modelling of hydrocyclone behaviour
Dr Thi Ta, University of Wollongong	639	639	-	Molecular Dynamics Simulation of Thin Film Lubrication of Rough Surfaces in Metal Forming Applications
Dr Matthew Chamberlain, CSIRO	632	632	-	ACCSP Dynamical Ocean Downscaling of Climate Change Projections
Dr Thomas Plantard, University of Wollongong	627	627	-	Security Analysis of Lattice-based Cryptosystems
A/Prof Nicole Stanford, University of South Australia	625	625	625	A first principles approach to understanding interfaces and chemical bonding in real engineering materials
Prof Stephen Bartlett, University of Sydney	625	625	-	Quantum error correction simulation
A/Prof Michael Kirkpatrick, University of Sydney	620	420	-	Surface driven mixing of thermally stratified riverine flows
		200	-	Surface driven mixing of thermally stratified riverine flows
Dr Jonathan Tran, Royal Melbourne Institute of Technology	620	620	-	Modelling and Design of Boron Carbide Based Superhard Materials
Dr Kai Qin, Royal Melbourne Institute of Technology	620	620	-	Collaborative Learning and Optimisation
Dr Chenghua Sun, Swinburne University of Technology	610	610	610	Computer-Aided Materials Design for Clean Energy
Dr Lars Goerigk, University of Melbourne	610	610	520	Theoretical and Computational Quantum Chemistry Including Development of Computational Methods and Computational Materials Science
Dr Jade Powell, Swinburne University of Technology	600	600	-	Simulations of the explosion of an 18 solar mass star
Dr Ming Feng, CSIRO	600	600	-	CSHOR Coupled dynamics of the warm pool
Dr Paul Tregoning, Australian National University	600	600	-	Earth deformation and mass transport
Prof Mark Johnson, Macquarie University	600	600	-	Deep Learning for Natural Language Processing
Prof Hans De Sterck, Monash University	591	591	375	Advanced simulation methods for the coupled solar interior and atmosphere
Prof Xiao Hua Wang, UNSW Canberra	583	583	-	Oceanic Nepheloid Layers and Their Role in Coastal Oceanography
Dr Wei Wen, University of NSW	579	479	-	Joint Analysis of Imaging and Genomic Data to Study the Structure and Function of Human Brain
		100	-	Image Processing for An International Consortium on Cerebral White Matter Lesions
Dr Louis Moresi, University of Melbourne	575	575	575	Instabilities in the convecting mantle and lithosphere
Assoc Prof Todd Lane, University of Melbourne	570	570	300	High resolution simulation of storms, clouds, and atmospheric turbulence, with applications to rainfall variability, planetary-scale feedbacks and aviation
Prof Con Doolan, University of NSW	568	568	-	Aeroacoustics of low and high Mach number flows
Dr David Gunawan, University of NSW	559	559	-	Efficient Bayesian Inference for Intractable Likelihood Problems

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Dr Christian Wolf, Mount Stromlo Observatory, Research School of Astronomy and Astrophysics, College of Physical and Mathematical Sciences, Australian National University	550	550	-	SkyMapper and the Southern Sky Survey
Dr Alejandro Montoya, University of Sydney	542	520	-	Molecular Modelling of Reactive Materials
		22	-	Modelling of the Lithium Extraction from Aluminosilicates
Prof Jiankun Hu, University of NSW	532	532	-	Big Data Security
Dr Fiona Beck, Australian National University	530	500	-	Low-cost, high-efficiency solar hydrogen generation technologies
		30	-	Dual-scale plasmonic nanostructures for optoelectronic applications
Dr Hamid Valipour, University of NSW	530	530	-	Atomistic Simulations of Materials in Various Environmental Conditions
Prof LiangChi Zhang, University of NSW	523	523	125	An integral approach for the defect-free fabrication of high-integrity systems
Prof Joe Hope, Australian National University	520	500	-	Deep Quantum: an exploration of many-body quantum mechanics at the lower limits of temperature and energy
		20	-	Measurement and control of quantum chaos
Prof Klaus Regenauer-lieb, University of NSW	517	517	125	Tyree X-Ray Facility
Prof Peter Rayner, University of Melbourne	517	517	350	Multi-scale atmospheric composition: climate and chemistry (MSAC-CAC)
Dr David Burbidge, Geoscience Australia	500	500	-	Geohazard Modelling for the Asia-Pacific Region
Dr David Wilson, La Trobe University	500	250	-	Computational Study of Novel Molecular Properties
		250	250	Quantum Chemical Molecular Properties
Prof Craig Moritz, Australian National University	500	500	-	Inferring phylogeny and explaining diversity using genome-scale data: methods and applications
Prof Kefei Zhang, Royal Melbourne Institute of Technology	500	320	-	RMIT SPACE
		180	-	HPC-based data assimilation to forecast ionosphere and thermosphere
Dr Andrew Hung, Royal Melbourne Institute of Technology	480	480	250	Developing New Treatments for Pain
Dr Luming Shen, University of Sydney	475	475	250	Modelling high strain rate responses of unsaturated porous media
A/Prof Ting Liao, Queensland University of Technology	470	470	470	Theoretical Design of Oxides Based Materials for Energy Application
Dr Mohammednoor Altarawneh, Murdoch University	462	462	462	Fundamental Understanding of the Role of Singlet Molecular Oxygen in Spontaneous fires
Prof Albert Van Dijk, Australian National University	460	460	110	The next generation of environmental remote sensing, data assimilation and forecasting systems
Dr John Pye, Australian National University	455	455	-	Modelling of high-temperature concentrating solar thermal energy systems
Prof Maria Forsyth, Deakin University	455	455	125	Computational investigation of new selective transport materials
Dr Justin Leontini, Swinburne University of Technology	450	450	450	Oscillatory flows in complex geometries
Emeritus Prof Michael Crisp, Australian National University	450	450	-	Evolution of Australiaâ€™s globally unique hotspot of floral diversity: phylogenomic analysis of Myrtaceae

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Prof Lloyd Hollenberg, University of Melbourne	450	450	250	Multi-Million Atom Quantum Computer Device Simulations
Prof Andrew Ooi, University of Melbourne	447	447	180	Computational Fluid Dynamics Studies of Pulsatile Flows in Pipes and Arteries
Prof Ravi Jagadeeshan, Monash University	441	441	250	Sticky polymers in flow: Nexus between microscopic and macroscopic dynamics
Mr Andrew Driscoll, DHI	440	440	-	DHI-022
Dr Di Wu, University of NSW	434	434	-	Stochastic nonlinear analysis of topology composite structures
Ms Nicholas Hannah, Other Australian Research Organisation	420	420	-	Double Precision Pty Ltd
Prof Emanuele Viterbo, Monash University	420	348	260	Performance Simulations for 5G Communication Systems
		72	-	Waveform design for 5G wireless standard
Dr Frank Colberg, University of Tasmania	418	418	-	Coastal and ocean modelling for a current and future climate
Dr Daniel Duke, Monash University	414	338	250	Simulating turbulent multiphase flows in pressurised metered-dose inhalers
		76	-	HRMFoam scaling studies on Raijin
Dr Maely Gauthier, University of NSW	410	300	-	The role of the non-coding DNA and the oral microbiome in oral cavity squamous cell carcinoma
		110	-	Comprehensive investigation of noncoding biology in high-risk paediatric cancers.
Dr Martin Singh, Monash University	410	410	250	Understanding the behaviour of the tropical atmosphere in a changing climate using idealised atmospheric models
Dr Sang Lee, University of South Australia	410	260	260	Novel whole-genome approaches to capture the latent genetic architecture of complex traits
		150	-	Whole-genome approaches for dissecting (shared) genetic architecture of complex traits
Dr Rob Patterson, University of NSW	405	405	-	Materials discovery and theoretical development for photovoltaics and nanomaterials
Mr James Goodwin, Geoscience Australia	400	400	-	Geophysics
Dr Duncan Sutherland, UNSW Canberra	389	389	-	Physics based simulations of wild fire behaviour
Prof Mark Hoffman, University of NSW	389	389	-	Design using genetic algorithms
A/Prof Adam Trevitt, University of Wollongong	388	388	-	Computational Investigation of the Chemistry of Reactive Intermediates
Dr Liangzhi Kou, Queensland University of Technology	388	388	150	Two-dimensional multiferroics and coupling with topological insulators for next generation electronics
Prof David Edwards, University of Western Australia	388	388	388	Analysis of complex genomes
Dr Xue Feng Dong, University of Wollongong	382	263	-	A fundamental understanding of processing limits in blast furnace ironmaking leading to optimisation of productivity through innovative management of raw material quality
		119	-	Productivity and Campaign Life Improvements Through Development of Numerical Models of the Ironmaking Blast Furnace

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Dr Stephan Chalup, University of Newcastle	380	190	-	High-dimensional high-resolution data analysis
		190	-	Deep learning for improved real world object detection using synthetic image data that has been rendered using computer graphics techniques
Dr Joseph Horvat, University of Wollongong	370	370	250	Blue shift of terahertz absorption lines for molecular crystals
Dr Callum Atkinson, Monash University	366	366	250	Extending numerical simulation of turbulent flows via assimilation with experimental data
Dr Peter Daivis, Royal Melbourne Institute of Technology	361	361	-	Molecular Rheology of Freely Jointed Chain Model Polymer Melts
Prof Buyung Kosasih, University of Wollongong	360	360	-	Fluid dynamic phenomena affecting the liquid coating quality in the jet stripping line
Prof Steven Armfield, University of Sydney	355	355	-	Direct simulation of transition for natural convection flow in inclined differentially heated cavities
Dr Ha Bui, Monash University	352	352	240	Understanding the micromechanical origin of liquefaction in silty soils using advanced computational approach
A/Prof Hrvoje Tkalcic, Australian National University	350	350	-	Earth structure and seismic sources using seismology and mathematical geophysics
A/Prof Lexing Xie, Australian National University	350	350	-	Promoting Fairness in Online Attention
Dr Simon Mortensen, DHI	350	250	-	DHI-023
		100	-	DHI-026
Mr Neil Symington, Geoscience Australia	350	350	-	High-performance Computational Groundwater Science
Dr Ross Brodie, Geoscience Australia	338	338	-	Airborne Electromagnetics (AEM) Inversion
Prof Andrew Greentree, Royal Melbourne Institute of Technology	330	330	-	Atom-photon interactions in biologically relevant media
Prof Gavin Huttley, Australian National University	330	300	-	Statistical modelling of genetic variation
		30	-	Huttley lab project backups
Dr Marcus Doherty, Australian National University	325	325	-	First principles innovation of solid-state quantum technologies
Dr Robert Luke, Macquarie University	320	320	-	Binaural Listening
Dr Jingxian Yu, University of Adelaide	318	318	125	Peptronics: Understanding the Relationship between Structures and Properties
Dr Xuefei Liu, University of NSW	311	311	-	Optimisation of membrane module and separation processes in water/wastewater treatment process using numerical simulation approaches
Prof Cheng Lu, University of Wollongong	310	310	-	Deformation mechanism of â€˜gradientâ€™ materials
Prof Jeffrey Reimers, University of Technology, Sydney	306	256	125	Modelling of Chemical Systems Including Molecular Excited States, Photosynthesis, and Molecular Electronics Applications
		50	-	Application of quantum electronic-structure methods to protein crystallography and photosynthetic function
Dr Asaph Widmer-Cooper, University of Sydney	305	305	305	Interactions and self-assembly of colloidal nanoparticles: Establishing design rules for creating new nano-structured materials
Dr Mirela Tulbure, University of NSW	305	305	125	Multi-sensor integration for spatiotemporal quantification of trends in surface water extent dynamics with implications for water policy in a water scarce region

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Dr Reza Mahjoub, University of NSW	302	302	-	Interface control of ferroelectricity in ferroelectric superlattices
Dr Sebastian Kurscheid, Australian National University	301	250	-	biodev queue: Critical Assessment of Massive Data Analysis (CAMDA 2019) - contest participation - "Investigating transcriptomic changes at the level of individual breast cancer tumours"
		51	-	Critical Assessment of Massive Data Analysis (CAMDA 2019) - contest participation - "Investigating transcriptomic changes at the level of individual breast cancer tumours"
Dr Anil Kumar Gorle, Griffith University	300	300	-	Binding of antiangiogenic platinum with glycasaminoglycans(GAGs): A study of structure and dynamics of Platinum bound GAG fragments
Dr Colin Jackson, Australian National University	300	300	-	Computational Structural Biology and Protein Engineering
Dr Matthew Garthwaite, Geoscience Australia	300	300	-	InSAR research to measure surface deformation of the Australian continent
Dr Neha Gandhi, Queensland University of Technology	300	300	-	Molecular dynamics simulations of protein folding in solution and at surfaces/interfaces
Dr Zhengbiao Peng, University of Newcastle	300	300	-	Ice Nucleation Induced by External Alternate Pressure Field
Prof Andrew Blakers, Australian National University	300	300	-	Global atlas of off-river pumped hydro energy storage
Prof Barry Pogson, Australian National University	300	300	-	A computational approach to enable precision control of drought resilience
Doctor Meredith Jordan, University of Sydney	294	294	158	Molecular Interactions
Prof Xiaoke YI, University of Sydney	286	286	-	Integrated photonic simulation based on COMSOL
Dr Petra Heil, University of Tasmania	285	285	285	Tracking changes in Arctic and Antarctic sea-ice motion
Dr Fabio Luciani, University of NSW	282	282	-	Systems immunology at the single-cell level
Dr Linqing Pei, University of Wollongong	281	281	-	Molecular dynamics simulation of fracture behaviour in nanocrystalline fcc structures
Dr Tim Gould, Griffith University	275	275	125	A roadmap for the inclusion of dispersion forces in structural prediction
Prof Shanqing Wang, Griffith University	275	275	125	Design and Synthesis of Nanostructured materials for high performance batteries
Prof Malin Premaratne, Monash University	267	267	135	Computational framework for an Ab-initio Computer Model of an ultrafast SPASER
Dr Thomas Poulet, University of NSW	261	261	150	Multiphyisics geological simulations using MOOSE
Dr Leo Lymburner, Geoscience Australia	260	260	-	AGDC Experimental (External)
Dr Hyeuk Ryu, Geoscience Australia	257	257	-	Development of earthquake fragility model using OpenSees
Dr Evelyne Deplazes, University of Technology, Sydney	252	252	110	Tapping into nature's pharmacy cabinet - molecular simulations to facilitate peptide-derived pharmaceuticals
Dr Fabio Zambetta, Royal Melbourne Institute of Technology	252	211	-	Intrinsic Reward Schemes to Accelerate Learning in Sparse Reward Environments
		41	-	Apprenticeship Learning to mimic Players Behaviour in an Interactive Narrative
Ms Tracy Bailey, Other Australian Government Department	250	250	-	ARPANSA Pilot Project

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A/Prof Matthew Hole, Australian National University	250	250	-	Computational Applications in Equilibrium and Instabilities of Advanced Plasma Confinement Geometries
Dr Aaron Ludlow, University of Western Australia	250	250	250	What is the Most Viable Solution to the Small Scale Crisis Facing Cold Dark Matter?
Dr Elena Pasternak, University of Western Australia	250	125	125	Instability and chaos in fault sliding due to asymmetric friction and negative stiffness
		125	125	Energy dissipation and wave propagation in fragmented materials under dynamic loading
Dr Jatin Kala, Murdoch University	250	250	250	Can land surface radiation management reduce the intensity of heat waves?
Dr Jimmy Philip, University of Melbourne	250	250	250	Numerical simulation of swirling flows with particles
Dr Stephen Gibson, Australian National University	250	250	-	Vibronic coupling in the ground state of vinylidene
Prof Allan Canty, University of Tasmania	250	250	250	Catalysis and Organometallic Chemistry
Prof Brian Yates, University of Tasmania	250	250	250	Designing Better Catalysts
Prof Igor Bray, Curtin University of Technology	250	250	250	Atomic Collision Theory
Mr Anastasios Eleftheriadis, Victoria University	243	110	-	Bush fire CRC Project 01
		50	-	Bushfire CRC PhD and MPhil Students
		21	-	Rahul W PhD Project
		21	-	Mahdi Ghiji Project 01
		21	-	Sesa R PhD Project
		20	-	Optimising Distributed and End-of-pipe Water Sensitive Urban Design Approaches for Implementation in Existing Developments
Dr Johnathan Kool, Geoscience Australia	240	120	-	Marine Operations and Processing
		80	-	Geoscience Australia Bathymetry and Backscatter Processing
		40	-	Australian Marine Video and Imagery Processing
Dr Serena Lee, Griffith University	240	240	-	Large-scale flexible mesh modelling (Australia, Pacific, Southern Ocean)
Prof Bradley Carter, University of Southern Queensland	240	240	-	Space Weather in Exoplanetary Systems
Dr Joachim Mai, University of NSW	237	136	-	Intersect Partnershare Management
		101	-	Intersect commercial 01
Dr Mehrtash Harandi, Monash University	233	233	-	Large-Scale Visual Recognition Using Riemannian Geometry
Mr Marcus Tree, DHI	230	230	-	DHI-025
Dr Merlinde Kay, University of NSW	229	229	-	Australian Solar Resource Assessment and Forecasting
Prof Qing-Hua Qin, Australian National University	225	225	-	Topology Optimisation of Mechanical Metamaterials and Multifunctional Materials
Prof Aibing Yu, Monash University	224	224	125	Simulation and Modelling of Particulate Systems
Dr Dan Andrews, Australian National University	220	170	-	Canberra Clinical Genomics; translating the latest research findings into personalised medicine
		50	-	Identification of mouse genetic variation to investigate causes of sepsis

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Prof Benjamin Powell, University of Queensland	220	220	150	Computational approaches to organic photonic and electronic materials: from strongly electronics to device engineering
Prof Zhengyi Jiang, University of Wollongong	220	220	-	Control Strategies of Surface Quality of Stainless Steels
Prof Marc Wilkins, University of NSW	218	218	-	High Performance Computing Analysis of Genome Sequences
Dr Alan Blair, University of NSW	216	129	125	Neuroevolution, Deep Learning and Reinforcement Learning
		87	-	Spiking Networks and Deep Learning for Speech, Language, Images and Games
Dr Xuhui Fan, University of NSW	215	215	-	Machine Learning project on Random Forest models
Dr Xingyong Wang, Intersect	215	215	125	Computational study on the molecular mechanisms of UV-induced DNA photodamage and photolyase-catalysed DNA photorepair
Dr Jeffrey Chan, Royal Melbourne Institute of Technology	211	211	-	Developing robust, distributed and efficient optimisation approaches using machine learning
Dr Kei-Wai Kevin Cheung, Macquarie University	210	210	-	Studies on High-impact Weather, Climate Variability and Systems Dynamics
Dr Alessandra Malaroda, University of Wollongong	205	205	-	Personalised dosimetry for molecular radiation therapy
Dr Aaron McDonough, Vendor Guest Accounts	203	203	-	General Share for User Code Development and Testing
Dr Yan Ding, Royal Melbourne Institute of Technology	202	202	-	Study on Atherosclerosis Progression â€“ Computational Modelling of Atherosclerotic Lesion Formation, Growth and Rupture
Mr Ray Seikel, Swinburne University of Technology	202	202	-	TAO development
Dr Hai Dong, Royal Melbourne Institute of Technology	201	201	-	Machine-learning driven Internet of Things trust assessment in multi-Mobile Edge Computing
Dr Jenny Fisher, University of Wollongong	201	201	150	The use of state-of-the-art 3-D chemical transport modelling to unravel the effects of atmospheric chemistry on climate
A/Prof Peter Strazdins, Australian National University	200	200	-	Performance Analysis and Optimization of Large-scale Scientific Simulations
Dr David Lescinsky, Geoscience Australia	200	100	-	GA-NCI development collaboration space
		80	-	Virtual Laboratories development environment
		20	-	Assessing geothermal energy potential for the Australian Continent
Dr Marlies Hankel, University of Queensland	200	200	-	Nanoporous membranes for energy applications
Dr Tu Le, Royal Melbourne Institute of Technology	200	200	-	DFT-based machine learning models for efficient RAFT monomer selection
Mr Patrick Yates, University of Tasmania	200	200	-	Radio jets in asymmetric environments
Prof Peter Gill, Australian National University	200	100	-	JOVE MP2: Developing a massively parallel computational chemistry method
		100	-	Development and application of new quantum chemistry algorithms
Prof Shin-Ho Chung, Australian National University	200	200	-	Action of Toxins from Venomous Animals on Biological Ion Channels Molecular Dynamics Studies
Prof Thomas Welberry, Australian National University	200	200	-	Computation of X-Ray Diffraction Patterns for 3D Model Systems

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Dr Hanna Suominen, Australian National University	182	60	-	Our Health in Our Hands: Big Data Program
		50	-	Affordable Early Detection of Parkinson's Disease through Statistical Machine Learning, Multi-modality Reduction, and Big Data Compression
		37	-	Natural Language Processing to Support Language Learning
		35	-	Support ANU students ability to speak a foreign language intelligibly using educational technologies
A/Prof Rongkun Zheng, University of Sydney	180	180	-	Low dimensional magnetism and supercondcutivity
Prof Steven Siems, Monash University	180	180	-	Simulations of wintertime storms across Southeast Australia, Tasmania and the Southern Ocean
Prof Terry Bossomaier, Charles Sturt University	180	180	-	Information flow in Vicsek Models
Prof Thomas Huber, Australian National University	180	180	180	protein structure calculation and design using limited experimental data
Dr Jiabao Yi, University of NSW	177	177	125	Diluted magnetic semiconductor based on 2D materials
Prof Evgeny Morozov, UNSW Canberra	175	175	-	Structural Performance Analysis of Damaged Composite Structures
Prof Mark Knackstedt, Australian National University	175	175	-	Training Centre for Multiscale 3D Imaging, Modelling and Manufacturing
Dr Lawrence Cavedon, Royal Melbourne Institute of Technology	173	173	-	Deep Learning for Complex Labeling Tasks
Dr Hua Ying, Australian National University	171	101	-	Sea anemone genomics, transcriptomics and epigenetic
		70	-	Coral genomics
Dr Mark Baird, CSIRO	170	170	-	eReefs Marine Modelling GBR1
Dr Shane Keating, University of NSW	170	170	-	Consequences of ocean wave modulation on fundamental air-sea turbulent fluxes
Mr Guillaume Jolly, Commercial organisations	170	170	-	Trampo CFD Pilot Project
A/Prof Balazs Csaba, Monash University	168	125	125	Analysing Beyond the Standard Model physics with NCI computing time
		43	-	Dark Matter Discovery
A/Prof Ahmad Jabbarzadeh, University of Sydney	160	160	-	Multiscale Simulations of Polymeric Systems
Dr Sammy Diasinos, Macquarie University	160	160	-	Automotive Aerodynamics
Prof Chennupati Jagadish, Australian National University	155	155	-	Nanostructured optoelectronic devices: new materials and applications
Prof Peter Harrowell, University of Sydney	155	155	125	Soft Modes, Amorphous Defects and the Mechanical Properties of Metallic Glasses
Dr Aman Kidanemariam, University of Melbourne	150	150	-	Direct numerical simulation of free-surface shallow flow over a rough bottom boundary
Dr Daniel Rosauer, Australian National University	150	150	-	Why are biodiversity hotspots found where they are?
Dr Juan Felipe Torres Alvarez, Australian National University	150	150	-	Modelling of heat and mass transfer in multicomponent mixtures
Dr Julian Berengut, University of NSW	150	150	-	Electronic spectra of superheavy elements and highly-charged ions
Dr Thanh Nguyen, Deakin University	150	150	-	Multiagent Deep Reinforcement Learning

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Prof Tom Gedeon, Australian National University	150	150	-	Deep learning from psychophysiological data
Dr Xiaotao Jiang, University of NSW	147	147	-	T4 Project for pregnant and baby gut microbiome
Dr Yi Du, University of Wollongong	144	144	-	Fundamental understanding of water splitting on TiO2 surface
Dr Md Anower Hossain, University of NSW	143	143	-	Modelling of Transition Metal Oxides as Hole-Selective Passivating Contacts of Silicon Solar Cells
Dr Seher Ata, University of NSW	143	143	-	Computational study of bubble coalescence of two capillary-held air bubbles using Volume of Fluid (VOF) method
Dr Pawel Swietojanski, University of NSW	141	141	125	Generating realistic multi-sensory data in virtual worlds
Dr Liqi Han, University of Queensland	140	140	-	Parallel QuasiMC - a High Performance Light Simulator for Virtual Agriculture
Prof Duong Do, University of Queensland	140	140	-	Novel Characterization of Porous Structure and Surface Chemistry of Carbon by means of Monte Carlo computer simulation
Dr Janice Fullerton, University of NSW	133	133	125	Neuroscience Research Australia Neurogenetics
Mr Masoud Abdi, Deakin University	130	130	-	Deep learning for Image Classification
Dr Torsten Thomas, University of NSW	127	127	125	Assembly of next-generation sequencing data for microbial metagenomes
A/Prof Ziqi Sun, Queensland University of Technology	125	125	125	Computational Design of Two-Dimensional Hybrids Based Nanomaterials for Sustainable Energy Application
Director of Endocrin Nikolai Petrovsky, Flinders University	125	125	125	Molecular modelling for design of more effective vaccine adjuvants
Dr David Gwyther, Antarctic Gateway Project	125	125	125	Assessing ice shelf-ocean interaction through intercomparison and validation
Dr Francisco Gomez Carrasco, Royal Melbourne Institute of Technology	125	125	125	Data-driven methods for turbulent flow control
Dr Iwan Jensen, Flinders University	125	125	125	Exact Enumerations in Statistical Mechanics and Combinatorics
Dr Marta Yebra, Australian National University	125	125	-	The Flammability Monitoring System
Dr Mitra Safavi-Naeini, Other Australian Government Department	125	125	125	Dose Quantification in Particle Therapy
Dr Nevena Todorova, Royal Melbourne Institute of Technology	125	125	125	Theoretical studies of bimolecular interactions under non-equilibrium conditions
Dr Simon Illingworth, University of Melbourne	125	125	125	Reduced-order models of wall-bounded turbulence
Dr Yu Lin, Australian National University	125	65	-	Metagenome Sequence Assembly and Analysis
		60	-	Large Graph Models and Analysis in Genome Assembly
Prof Alexander Babanin, University of Melbourne	125	125	125	Metocean projects, University of Melbourne
Prof John Miners, Flinders University	125	125	125	The structural basis for selective and cooperative ligand binding by human drug and chemical metabolising cytochrome P450 enzymes: Application of molecular dynamics
Prof Liang Cheng, University of Western Australia	125	125	125	On the prediction of extreme fluid loading and fluid-structure-seabed interaction
Dr Philip Nakashima, Monash University	124	124	-	Revealing the Electronic Structure of Materials using Quantitative Convergent-Beam Electron Diffraction

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Harish Vangala, Monash University	123	123	-	Polar Codes for NAND flash memory using parallelization techniques
Prof Lei Wang, University of Wollongong	123	123	-	Exploring National Treasure: Automatic Photo Search for the Large Collection of National Archives of Australia
Mr Timothy Womersley, DHI	121	121	-	DHI-024
Mr Othmar Korn, University of Queensland	120	120	-	Stemformatics Pilot Project
A/Prof Timothy Garoni, Monash University	120	120	-	Design, analysis and application of Monte Carlo methods in statistical mechanics
Dr Craig Harrison, Geoscience Australia	120	120	-	Least-squares adjustment of the national geodetic network
Dr Daniel Fabijanic, Deakin University	120	120	-	Invesitgation of hydrodynamics and heat transfer in a vacuum fluidized bed
Dr Fatemeh Salehi, Macquarie University	120	120	-	Particle dynamics
Mr Samuel Sauvage, Bureau of Meteorology	120	120	-	Australian Fire Danger Rating Prototype
Ms Shuping Shi, Macquarie University	120	120	-	Monitoring Financial Bubbles Using High-Frequency Data
Prof Hussein Abbass, UNSW Canberra	120	120	-	Trusted Autonomy Group
Mr Cameron Jack, Australian National University	118	59	-	ABC Jack
		59	-	ANU Bioinformatics Consultancy Playground
Dr Rose Andrew, University of New England	112	112	-	Woodland Eucalyptus Genomics
Dr Bernhard Mueller, Monash University	110	110	-	Core Collapse Supernovae and Radionuclides in the Solar System
Dr Dawei Su, University of Technology, Sydney	110	110	-	Materials architecture design for low-cost energy storage application
A/Prof Aaron Oakley, University of Wollongong	106	76	-	Dynamics of DNA clamps on DNA
		30	-	Dynamics of DNA Clamps and Clamp Loaders
Dr Steffen Bollmann, University of Queensland	105	105	-	Quantiative Susceptibility Mapping Inversion using Deep Learning
Dr Jed Burns, University of Queensland	100	100	-	Investigation of pathway bifurcations in organic reactions
Dr Marnie Shaw, Australian National University	100	100	-	Deep learning applied to MRI-based maps of the human cerebral cortex
Dr Qi Shao, University of Queensland	100	100	-	Large-scale 3D geophysical data inversion using finite element method based software esys-escript (2018-2019)
Dr Stephen Roberts, Australian National University	100	100	-	Investigation of techniques to improve the prediction of flood events
Dr Suelynn Choy, Royal Melbourne Institute of Technology	100	100	-	Satellite Delivery of Augmented Positioning Data for PPP and PPP-RTK Services in Australia and New Zealand
Dr Vanessa Robins, Australian National University	100	100	-	Persistent homology analysis of structural phase transitions
Mr Alexander Bray, Australian National University	100	100	-	Application of an optimised TDSE solver to resolve the quantum tunnelling time discrepancy
Mr Johannes Pottas, Australian National University	100	100	-	Structural and thermal modelling of components in concentrating solar power systems
Prof Anatoli Kheifets, Australian National University	100	100	-	Theory of multiple atomic ionization

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Prof Brendan McKay, Australian National University	100	100	-	Extremal graph theory and Ramsey theory
Tao Zou, Australian National University	99	99	-	Network Influence Analysis
Dr Yi Qin, CSIRO	99	99	-	Atmosphere remote sensing with new generation satellites
Dr Miaomiao Liu, Australian National University	99	50	-	Understanding and Predicting Human Pose in 3D in the Wild
		49	-	Efficient 3D scene understanding
Dr Alexander Mikheyev, Australian National University	98	74	-	From trillions to extinction: using museum genomics to uncover the fate of the Rocky Mountain locust
		24	-	Community structure of the honey bee microbiome (Honours Project)
Dr Ben Hui, University of NSW	96	96	-	Model-based evaluation of STI testing strategy for remote IndigenousÂ population
Dr Damian Moran, Macquarie University	96	96	-	Innovative Molecular Scaffolds by Design
Dr Murat Tahtali, UNSW Canberra	96	96	-	Imaging Through the Atmosphere, L-SPECT simulation and reconstruction
Dr Megan McDonald, Australian National University	95	52	-	GWAS of Zymoseptoria tritici
		43	-	Resequencing fungal plant pathogen genomes with the Oxford Nanopore MinIon
Prof Curt Wentrup, University of Queensland	95	95	-	Theoretical calculations on reactive molecules, intermediates and prebiotic chemistry pathways
Dr Gregory Wilson, CSIRO	94	94	-	Electronic Structure of Organic/Inorganic Dyes for Photovoltaic Applications
Dr Fatemeh Vafaee, University of NSW	92	92	-	Deep learning Genomics
Prof Babak Abbasi, Royal Melbourne Institute of Technology	91	91	-	Simulation - Optimisation
Dr Fabian Zander, University of Southern Queensland	90	90	-	TUSQ Hypersonic Facility Modelling
Dr Moeava Tehei, University of Wollongong	90	90	-	Investigations into the density of states in Lanthanum Manganite Nanoparticles
Dr Edward Simpson, Australian National University	88	88	-	Nuclear Reaction Cross Sections for Hadron Therapy
Dr Naomi Haworth, University of Sydney	85	85	-	How does insulin work?
Dr Sam Mallinson, University of NSW	85	85	-	Simulating bubbles in inkjet printer systems
Prof Marina Kennerson, University of Sydney	85	85	-	Investigating the role of structural variation (SV) for inherited peripheral neuropathies
Prof Eric Kennedy, University of Newcastle	82	55	-	Catalytic combustion of methane
		27	-	Thermal decomposition of halogenated compounds
Dr Benjamin Schwessinger, Australian National University	80	80	-	Identify, characterise, detect factors causing wheat disease epidemics
Dr Cedric Simenel, Australian National University	80	80	-	Microscopic and Macroscopic Studies for Nuclear Reactions
Dr Cormac Purcell, Macquarie University	80	80	-	Earthly Astro-biology: Classifying Marine Animals in Aerial Video Footage
Dr Rippei Hayashi, Australian National University	80	80	-	Deciphering splicing code during development
Dr Rosemarie Sadsad, University of Sydney	80	80	-	Sydney University Bioinformatics Testing and Development

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Tim Kahlke, University of Technology, Sydney	80	80	-	Bioinformatics
Dr Xiaodong Li, Royal Melbourne Institute of Technology	80	80	-	Solving real-world large scale black-box optimization problems
Dr David Henry, Murdoch University	75	75	-	Nanoscale materials and Nanoscale Interactions - From Catalysts through to Hydrophobic Soils
Dr Drew Parsons, Murdoch University	75	75	-	Subtle quantum mechanical forces of ions and structures.
Dr Jorg Schluter, Deakin University	75	75	-	Computational Fluid Dynamics
Dr Kejun Dong, University of Western Sydney	75	75	-	Particle-scale numerical study on screening processes (subproject from ARC Hub for Computational Particle Technology)
Dr Michael Dennis, Australian National University	75	75	-	Computational fluid analysis of co-flowing trans-sonic jets
Dr Oscar Branson, Australian National University	75	75	-	Mapping Reef Flat Environments from Satellite Imagery
Dr Thomas Wong, Australian National University	75	75	-	Efficient phylogenetic methods: managing the curse of genomic complexity
Dr Vigleik Angeltveit, Australian National University	75	75	-	Improved upper bounds on Ramsey numbers
Mr Takuya Iwanaga, Australian National University	75	75	-	Exploratory analysis of an integrated environmental model
Prof Gordon Lister, Australian National University	75	50	-	Numerical investigations in reconstructing subducted slab geometry
		25	-	Quantitative argon thermochronology
Prof Ted Maddess, Australian National University	75	75	-	Validating complex nonlinear system ID methods
Dr Lawrence Lee, University of NSW	74	74	-	Artificial synthesis of multi-subunit protein machines using synthetic DNA templates
Dr Matthew Arnold, University of Technology, Sydney	73	73	-	Optimization of plasmonic nanoantennas and metamaterials
Dr Simon Watt, UNSW Canberra	72	72	-	Modelling and simulation of overdominance in genetic variation
Dr Xiao Liang, University of Sydney	72	72	-	Elucidate the fundamental chemistry of biomass hydrothermal liquefaction
A/Prof Melih Ozlen, Royal Melbourne Institute of Technology	70	70	-	Fuel treatment planning maintaining habitat availability and connectivity for endangered species conservation
Dr Qing Wang, Australian National University	70	70	-	Shortest Path Distance Queries over Large-Scale Networks
Dr Tamar Greaves, Royal Melbourne Institute of Technology	70	70	-	A Molecular Dynamics exploration of ionic liquid properties and interactions with polymeric materials
Dr Yuguo Yu, University of NSW	70	70	-	Stochastic analysis on the durability of cementitious materials considering the influence of material and environmental uncertainties
Dr John Daniels, University of NSW	69	69	-	Modelling of electroceramic materials
Prof Ehsan Arabzadeh, Australian National University	67	67	-	Neural Coding in Sensory Cortex
Dr Lan Du, Monash University	67	67	-	Scalable Probabilistic Models for learning complex relational data with rich side information
Dr Salman Durrani, Australian National University	67	67	-	Machine Learning in wireless communication networks
Dr Shahram Karami, Monash University	67	67	-	Direct numerical simulation of particle-laden flows in a coaxial-jet

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Varghese Swamy, Monash University	67	67	-	First-Principles Modeling of Functional Titanium Dioxides and Hybrid Metalorganic Perovskites
Dr Giuseppe Barca, Australian National University	66	66	-	Development of quantum chemistry algorithms exploiting heterogeneous computing
Research Scientist Peter Oke, CSIRO	66	66	-	Bluelink developments
Dr Jayasinghe Jayasinghe, University of NSW	65	65	-	Higher order moments to attack random encryption countermeasures
Dr Sharifa Alghowinem, Australian National University	65	65	-	Multimodal Affect Recognation and Mood Detection Using Deep Learning
Prof Phoebe Chen, La Trobe University	65	65	-	LTU0014 - Bioinfomatics Management for Genome Data
Prof Guan Yeoh, University of NSW	64	64	-	Multiphysics simulations for interdisciplinary engineering applications
Dr Vincent Daria, Australian National University	63	63	-	Modelling biosensors based on metasurfaces
Dr Narjes Gorjizadeh, University of NSW	62	62	-	First-principle study of reaction between complex carbon-bearing materials and metallic phase towards a novel approach for recycling waste polymers for sustainable environment
Dr Tony Vo, Monash University	62	62	-	Influence of Thermal and Shear destabilisation in Duct Flows Subject to a Strong Transverse Magnetic Fields
Dr Vidhyasaharan Sethu, University of NSW	62	62	-	NN training - Speech
Mr Aaron Chuah, Australian National University	62	62	-	Biodev GIL
Dr Anastasios Polyzos, CSIRO	61	61	-	Calculation of Reaction Co-ordinate for New Catalytic C-H Activation
Dr Subhasish Mitra, University of Newcastle	61	61	-	Multi-scale simulation of flotation process for mineral separation
Ms Xiuwen Zhou, University of Queensland	61	61	-	Rational design of light-emitting plastics for next generation lighting and displays
Dr Alexander Swarbrick, Garvan Institute of Medical Research	60	60	-	Molecular characterisation of metastatic breast cancers
Dr Daniel Price, Monash University	60	60	-	What Regulates Star Formation?
Dr Michael Terkildsen, Bureau of Meteorology	60	60	-	Space weather modelling
Dr Ranjith Unnithan, University of Melbourne	60	60	-	DESIGN AND OPTIMISATION OF FAR INFRA-RED MULTISPECTRAL SENSORS
Dr Shankar Kalyanasundaram, Australian National University	60	60	-	Finite Element Modelling of Engineering Systems
Dr Timothee Bonnet, Australian National University	60	60	-	Quantitative genetics of evolutionary-demographic dynamics.
Dr Xiaodong Fan, Monash University	60	60	-	Estimating a human capital model with endogenous labor supply and retirement
Prof Peter Karuso, Macquarie University	60	60	-	Understanding fluorescence using DFT and ab initio methods
Dr Jaehyun Shin, Royal Melbourne Institute of Technology	59	59	-	User behavioural cloning for autonomous farming robot
Dr Susann Beier, University of NSW	58	58	-	Coronary Atlas
Mr Chelton Evans, Royal Melbourne Institute of Technology	58	58	-	Numthalgorithms
Dr Wei Peng, La Trobe University	57	57	-	Cognitive Computing Models on Visions and Texts in DAC

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Dr Francisco Trujillo, University of NSW	56	56	-	Radio frequency electric fields (RFEF) processing modelling
Dr Jason Wong, University of NSW	56	56	-	Annotation of non-coding mutations in whole cancer genomes
Dr Josh Milthorpe, Australian National University	55	55	-	Improving performance of the Chapel language for high-performance computing
Dr Paulina Cetina Heredia, University of NSW	55	55	-	Lagrangian trajectories under climate scenarios
Mr Christopher Poulton, University of NSW	55	55	-	The Ross Study
Mr Yiheng Hu, Australian National University	55	55	-	Metagenomic analysis of next generation sequencing data for pathogen detection and microbiome analysis
Dr Guiyan Ni, University of New England	53	53	-	Genotype-covariate interaction effects of human cognitive performance
Dr Rajib Rahman, University of NSW	53	53	-	HPC guided design of two-qubit gates with dopant atoms in silicon
Prof Moninya Roughan, University of NSW	53	53	-	Advancing dynamical understanding in the East Australian Current Optimising the ocean observation and prediction effort
Dr Nicholas Deutscher, University of Wollongong	51	51	-	Trace gas retrievals from solar FTIR
Dr Roger Proctor, University of Tasmania	51	51	-	New Flagship-E Project 2018: Australian National Shelf-seas Reanalysis: initial data and software services
A/Prof Deanna D'Alessandro, University of Sydney	50	50	-	Towards Conducting Nanoporous Framework Materials
A/Prof Nicolas Cherbuin, Australian National University	50	50	-	Brain structure, cognition, and ageing a magnetic resonance imaging investigation
Associate Prof Nicholas Robins, Australian National University	50	50	-	Higher order interactions and lattice dynamics of Bose-Einstein condensates
Dr Anna Herring, Australian National University	50	50	-	Connected pathway flow vs. ganglion dynamics: understanding pore-scale displacement mechanisms using multiphase lattice-Boltzmann models
Dr Antonio Tricoli, Australian National University	50	50	-	Cerium doped manganese oxide
Dr Dean Cutajar, University of Wollongong	50	50	-	Monte Carlo Optimisation of Detector Systems for HDR Brachytherapy Quality Assurance
Dr Hongjun Chen, Australian National University	50	50	-	DFT calculation on NaxWO3
Dr Tianfang Wang, University of the Sunshine Coast	50	50	-	Bioinformatics, molecular dynamic simulation of biofunctional proteins and mass spectrometric fragmentation mechanisms
Mr Pawan Parajuli, Australian National University	50	50	-	Study of Bacteriophage acquired virulence in Shigella flexneri strains
Prof Antony Hosking, Australian National University	50	50	-	(Advanced Program Analysis for) Software Vulnerability Discovery and Mitigation
Prof Edith Sevick, Australian National University	50	50	-	Simulation of Block Copolymers which Incorporate Mechanical Bonds
Prof Gleb Beliakov, Deakin University	50	50	-	Large scale high accuracy computations for studies of Riemann's zeta function, as part of the 8th Hilbert problem
Prof Jian-Feng Nie, Monash University	50	50	-	Structures and stability of solute aggregate and segregation in advanced Mg alloys
Prof Paul Cally, Monash University	50	50	-	Numerical modelling of MHD and partial ionization effects in the solar atmosphere

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Prof William Foley, Australian National University	50	50	-	Whole genome analysis of Eucalyptus - Australia's foundation tree
Research Scientist Jing Huang, CSIRO	50	50	-	Hi-res mapping of renewable energy from meteorological records for Australia
Dr Stephen Dale, Australian National University	49	49	-	Dielectric tuning of the PCM model for linear HOMO-LUMO gaps in DFT.
Prof Bijan Samali, University of Western Sydney	47	47	-	Intersect adhoc proj 14
Dr Anthony Murphy, CSIRO	46	46	-	Modelling of the Plasma Production of Nanostructures
Dr Fiona Johnson, University of NSW	46	46	-	NPW flood project
Dr Robert Clark, Australian National University	46	46	-	Startup grant Robert Clark
Dr David Cortie, University of Wollongong	45	45	-	Density functional theory for the next-generation of electronic materials
Dr Jason Bragg, Other Australian	44	44	-	Genomics of Australian Plants: evolution and conservation
Dr Yan Zhu, Monash University	41	41	-	Deciphering polymyxin resistance in Klebsiella pneumoniae with lipidomics and molecular dynamics simulation
Dr Benjamin Kaehler, UNSW Canberra	41	41	-	Microbiome Analysis for Pathogen Detection
Dr Feng Chen, University of NSW	41	41	-	Point processes and their applications
Dr Kamyar Kildashti, University of Western Sydney	41	41	-	Numerical investigation on structural performance of permanent formwork system
Prof Dougal McCulloch, Royal Melbourne Institute of Technology	41	41	-	Electronic structure of boron nitride and other novel coating systems
Dr Jingming Duan, Geoscience Australia	40	40	-	GA Workshop
Dr Andrew Piggott, Macquarie University	40	40	-	DFT calculations to predict NMR spectra of natural products
Dr Erin Vaughn, Australian National University	40	40	-	Sycon capricorn genome assembly
Dr Seth Olsen, Monash University	40	40	-	Computational models of catalysis and mechanism in green and smart energetic materials
Dr Sophie Calabretto, Macquarie University	40	40	-	Absolute versus convective instabilites in three-dimensional boundary layers
Dr Stephen Hall, University of Queensland	40	40	-	Advanced Aerodynamic Simulation and Optimisation for High Performance Vehicles- Development
Dr Vanessa Haverd, CSIRO	40	40	-	The Australian Continental Carbon Budget
Mr Shuai Li, University of Wollongong	40	40	-	Automated recognition of daily activities
Prof Martin Leary, Royal Melbourne Institute of Technology	40	40	-	Additive Manufacture (AM) of Ti lattice structures
Prof Michael Hutchinson, Australian National University	40	40	-	Primary production in space and time
Prof Rick Franich, Royal Melbourne Institute of Technology	40	40	-	Medical Physics monte carlo Radiation Transport Simulation
Prof Yuantong Gu, Queensland University of Technology	40	40	-	Molecular dynamics simulations of protein folding in solution and at surfaces/interfaces
Researcher Michael Moore, Geoscience Australia	40	40	-	Mitigation of Site Specific Errors from Geodetic Time Series
Dr Wei Du, Australian National University	39	39	-	Investigation on surgical complications in NSW during 2001-14

Lead CI, Institution	Total Allocation in kSU	Project Allocation in kSU	NCMAS Allocation in kSU	Project Title
Dr Lucy Marshall, University of NSW	37	37	-	Bayesian ecohydrological modeling and uncertainty analysis
Dr Citsabehsan Devendran, Monash University	36	36	-	Piezoelectric-Acoustic Interactions within Acoustofluidic systems
Mr Frank Antolasic, Royal Melbourne Institute of Technology	36	36	-	Determination and comparison of theoretical vibrational spectra with experimantal data
Dr Kenneth Duru, Australian National University	35	35	-	WaveQLab3D: A peta-scale wave propagation and dynamic earthquake rupture solver
Dr Minh Bui, Australian National University	35	35	-	Phylogenetic inference for genome-scale data
Dr Christopher McAvaney, Deakin University	33	33	-	Systematic Paring Tube Design Tool To Enhance The Utility Of Centritherm
Mr Matt Paget, CSIRO	32	32	-	Data Cube Rangelands and Crop Mapping Applications
Dr Callie Little, University of New England	32	32	-	Exploring gene by environment interactions using a whole-genome approach
Dr John Smith, Royal Melbourne Institute of Technology	31	31	-	Numerical analysis of slope stabilization in South Gippsland
Dr Kiao Inthavong, Royal Melbourne Institute of Technology	31	31	-	Detailed analysis of fluid particle flows in the respiratory airway
Dr Timothy Duignan, University of Queensland	31	31	-	Predicting electrolyte solution properties through ion pairing calculations.
Prof Scott Sisson, University of NSW	31	31	-	Variational methods
Dr Geordie Zhang, Victoria University	30	30	-	Test form for applying to VU scheme
Dr Christopher Harris, Western Australia Research Institution not elsewhere defined	30	30	-	Pawsey Centre Development Project
Dr Matt Baker, University of NSW	30	30	-	Engineering Ancestral Molecular Motors
Prof Yun Liu, Australian National University	30	30	-	An application for ANU startup grant
Prof Kerrie McDonald, University of NSW	29	29	-	Individualising treatment for brain cancer patients
Dr Hamid Roshan, University of NSW	28	28	-	Multi-scale poromechanics
Dr Amin Heidarpour, Monash University	27	27	-	The Structural Behaviour of Hollow Fabricated Columns with High Strength Steel Tubes and Double Skin Concrete-Filled Columns with Corrugated Steel Skins
Dr Hanna Kurniawati, Australian National University	27	27	-	Robust Decision-making and Learning - evaluation
Dr Joslin Moore, Monash University	27	27	-	New multi-scale seed dispersal models for improved regional weed management
Dr Thalaiyasingam Ajanthan, Australian National University	27	27	-	Learning Lightweight Neural Networks: Pruning and Quantization
Dr Zongyan Zhou, Monash University	27	27	-	Multiscale modellng of Flow and Heat Transfer in Particulate Systems
Prof Lin Padgham, Royal Melbourne Institute of Technology	27	27	-	Simulation experimentation
Dr George Bacskay, University of Sydney	26	26	-	Spectroscopic and Thermochemical Properties of Small Molecules
Prof Pler Marzocca, Royal Melbourne Institute of Technology	26	26	-	Deep Reinforcement Learning controller for flight stability and adaptive manoeuvring in a photorealistic UAV simulator
Mr James Bennett, CSIRO	25	25	-	HydroFct

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Dr Marat Sibaev, Australian National University	25	25	-	Highly accurate energy calculations for finite uniform electron gases
Dr Mark Riley, University of Queensland	25	25	-	Magneto-Electronic structure in a Series of Mononuclear Lanthanide Complexes
Dr Sambasivam Periyannan, Australian National University	25	25	-	Enhancing resistance to wheat stripe rust disease
Dr Zhenchang Xing, Australian National University	25	25	-	UI Design to Code
Mr Alexander Ratcliffe, Australian National University	25	25	-	Two Qubit Gates For Trapped Ion Systems
Mr Siqi Liu, University of Sydney	25	25	-	Automatic 3D Neuron Reconstruction from Microscopic Images
Dr Edward King, CSIRO	24	24	-	National Remote Sensing Processing Facility
Dr Jeremy Davis, University of Wollongong	24	24	-	Geant4 Imaging and Medical Beam Line
Dr Shamila Haddad, University of NSW	23	23	-	Using WRF for urban climate simulations and heat island mitigation in Australia
Dr Xuesong Shen, University of NSW	23	23	-	Civil Deep Learning - Xuesong Shen
Ms Josephine Plested, Australian National University	23	23	-	Factors Affecting Transferability in Deep Neural Networks
Prof Eduardo Eyras, Australian National University	23	23	-	Identification of new therapeutic targets and molecular determinants of therapy failure in paediatric acute leukaemia
Dr Alban de Vaucorbeil, Monash University	22	22	-	Simulation of the wear resistance of ductile materials.
Dr Chris Escott, University of NSW	22	22	-	Silicon MOS quantum computation
Dr Chunguang Tang, Australian National University	22	22	-	Materials Design for Self-toughening Bulk Metallic Glasses
Prof Andy Pitman, University of NSW	22	22	-	Land Surface Science
Prof Robert Elliman, Australian National University	22	22	-	Modelling defect structures in ion irradiated graphene
Dr Elena Atroshchenko, University of NSW	21	21	-	Numerical methods in acoustics
Dr Laura McKemmish, University of NSW	21	21	-	Preliminary Calculations on Molecular Spectroscopy
Prof Heiko Timmers, University of NSW	21	21	-	Graphene Defects: Dynamics and Role of Interfaces
Dr Alice Richardson, Australian National University	20	20	-	Multiple imputation in multilevel models
Dr Jasmine Muir, Commercial organisations	20	20	-	Astron
Dr Luigi Renzullo, CSIRO	20	20	-	Soil Moisture and Satellite Rainfall products
Dr Yun Shi, Griffith University	20	20	-	Molecular dynamics simulations of neuraminidase-inhibitor interactions
Mr Ngoc Tran, University of Technology, Sydney	20	20	-	Himawari-8 EVI development in support of TERN Phenology product and forecasting.
Ms Stephanie Palmer, Australian National University	20	20	-	Genomic Data Management and Analysis
Prof Andreas Ernst, Monash University	20	20	-	Mine Planning Optimisation
Various Researchers	1,388	1,388	-	Small Allocations - Not Specified
Total Allocations	**856,193**	**118,335**	**118,335**	

International downloads of data stored at NCI in 2018–19

Researchers from all over the world come to NCI to access particular datasets that we store for the scientific community.

Europe	Hits	Download (MB)
United Kingdom	3,403,754	24,331,265
Germany	705,970	20,786,411
Belgium	11,299	6,660,267
France	905,195	6,653,907
Spain	24,919	3,894,455
Russian Federation	22,577	1,709,817
Czech Republic	28,200	1,174,662
Italy	84,593	1,051,749
Switzerland	10,333	957,955
Netherlands	19,968	623,937
Portugal	6,701	464,110
Norway	8,529	399,091
Greece	4,562	329,207
Austria	6,865	302,951
Sweden	191,326	259,098
Hungary	3,504	114,631
Denmark	6,574	95,890
Ireland	2,790	44,082
Estonia	2,374	18,511
Finland	4,274	8,047
Poland	4,668	3,040
Romania	1,239	916
Lithuania	408	461
Slovakia	1,191	429
Croatia	6,828	309
Ukraine	9,003	91
Slovenia	744	26
Serbia	2,003	14
Malta	54	12
Iceland	1,831	11
Bulgaria	386	6
Latvia	315	4
Albania	227	3
Bosnia and Herzegovina	449	2
Belarus	104	1
North Macedonia	100	1
Luxembourg	57	1
Other Countries	125	1
Total	**5,484,039**	**69,885,369**

North America	Hits	Download (MB)
United States	7,616,612	52,200,714
Canada	104,260	4,916,857
Mexico	5,836	2,284,591
Cuba	201	4,719
Bermuda	143	9
El Salvador	9	8
Dominican Republic	628	2
Bahamas	37	1
Other Countries	716	2
Total	**7,728,442**	**59,406,903**

South America	Hits	Download (MB)
Peru	11,447	4,767,345
Chile	54,963	3,094,526
Brazil	27,488	2,546,182
Colombia	2,936	46,410
Argentina	2,437	39,875
Suriname	18	13,487
Ecuador	2,046	6,711
Uruguay	182	2,539
Bolivia	174	35
Venezuela	124	1
Other Countries	95	1
Total	**101,910**	**10,517,111**

Oceania	Hits	Download (MB)
Australia	115,055,322	3,267,644,130
New Zealand	1,624,646	7,294,513
New Caledonia	12,122	3,990,973
Papua New Guinea	12	1,417
Fiji	181	783
French Polynesia	303	14
Solomon Islands	639	2
Tonga	38	1
Other Countries	13	1
Total	**116,693,276**	**3,278,931,833**

Asia	Hits	Download (MB)
Philippines	19,337,345	56,234,462
China	1,510,805	22,239,137
Korea, Republic of	1,573,200	18,421,747
Hong Kong	8,284	4,286,519
Japan	75,488	2,849,436
Thailand	60,284	2,608,057
India	36,240	1,830,740
Malaysia	15,455	1,223,325
Indonesia	4,469,151	887,769
Iran, Islamic Republic of	37,818	822,366
Israel	3,679	576,497
Taiwan, Province of China	7,904	451,062
Singapore	43,006	270,247
Pakistan	4,852	131,708
Macao	675	126,771
Saudi Arabia	3,717	50,689
Qatar	179	26,035
Vietnam	6,214	15,844
Myanmar	534	13,297
United Arab Emirates	2,995	12,835
Bangladesh	1,233	8,266
Cyprus	319	6,638
Sri Lanka	372	5,890
Turkey	3,366	4,858
Cambodia	962	3,154
Lebanon	90	2,242
Kazakhstan	949	1,966
Brunei Darussalam	9	681
Bhutan	25	402
Lao People's Democratic Republic	6	121
Iraq	290	19
Maldives	135	18
Nepal	874	15
Turkmenistan	35	10
Armenia	37	1
Syrian Arab Republic	33	1
Timor-Leste	6	1
Georgia	141	1
Jordan	70	1
Other Countries	617	1
Total	**27,207,394**	**113,112,828**

Africa	Hits	Download (MB)
South Africa	20,404	1,671,765
Tanzania, United Republic of	2,302	54,095
Zimbabwe	292	33,649
Zambia	249	25,723
Ethiopia	9,081	14,903
Reunion	103	2,046
Egypt	600	1,715
Senegal	2,082	550
Nigeria	198	262
Kenya	383	251
Mauritius	70	177
Mozambique	47	151
Morocco	555	54
Algeria	244	51
Tunisia	242	51
Angola	2	35
Gabon	401	25
Ghana	79	8
Seychelles	878	4
Benin	14	4
Uganda	59	3
Cameroon	82	2
Cote d'Ivoire	30	2
Madagascar	41	2
Togo	1	1
Lesotho	24	1
South Sudan	18	1
Other Countries	363	1
Total	**38,844**	**1,805,532**

Antarctica	Hits	Download (MB)
Antarctica	25,849	122
Total	**25,849**	**122**

Unknown	Hits	Download (MB)
Unknown	412,696	87,221
Total	**412,696**	**87,221**

	Hits	Download (MB)
Grand Total	**467,555,016**	**2,875,774,291**

NCI Links to Government Portfolios

Through our integrated big data and high-performance computing services, NCI enables research that directly impacts many areas of interest to the Federal Government. This table describes some of those key areas.

Government Department Impacted	Program/Agency Impacted	Activities/Projects supported by NCI
Education	Australian Research Council (ARC)	Dependencies from more than 530 projects funded by ARC's National Competitive Grant Programs (NCGP) underpinning in excess of $606m in research investment
	NCRIS	Support for services provided by numerous other NCRIS Capabilities
		Collaboration with Australian Research Data Commons
Industry, Science and Technology	CSIRO	Australian Community Climate and Earth System Simulator (ACCESS)
		Earth Systems and Climate Science (ESCC) Hub of the NESP
		Climate and Weather Science Data Enhanced Virtual Laboratory
		Marine Virtual Laboratory
		AuScope Virtual Research Environments Geoscience Data Enhanced Virtual Laboratory
		CMIP6 Climate Dataset
	CSIRO and the Australian Institute of Marine Science (AIMS)	eReefs
	Geoscience Australia (GA)	Digital Earth Australia
		Copernicus Data Hub
		National Reference Grid
		Exploring For The Future Initiative
		Water Observations from Space (WOfS)
		Australian Natural Hazards Data Archive
		AuScope Virtual Research Environments Geoscience Data Enhanced Virtual Laboratory
		AuScope Virtual Research Environments Geoscience Data Enhanced Virtual Laboratory

Government Department Impacted	Program/Agency Impacted	Activities/Projects supported by NCI
Environment	National Environmental Science Programme (NESP)	Earth Systems and Climate Science Hub
	Environmental policy development	eReefs
		Coupled model inter-comparison project (CMIP)
	Bureau of Meteorology	Australian Community Climate and Earth System Simulator (ACCESS)
		ESCC Hub of the NESP
		Climate and Weather Science Data Enhanced Virtual Laboratory
		Marine Virtual Laboratory
		BARRA Reanalysis
	Australian Antarctic Division	Antarctic Climate and Environment CRC (ACE-CRC) ACCESS Southern Ocean and cryosphere models
Health	National Health and Medical Research Council	Dependencies from more than 64 NHMRC funded projects and fellowships
		Australian Genomics Health Alliance (AGHA)
Agriculture and Water Resources	Policy development for the agricultural industry and water resources	Development and hosting of Digital Earth Australia Collaboration with GA and CSIRO
		Hosting and curation of WOfS data with GA
	Murray-Darling Basin Authority	Exploitation of Digital Earth Australia data
		Development of water-related Digital Earth Australia capabilities in collaboration with GA
Resources and Northern Australia	Geoscience Australia	Exploring for the Future Initiative
		AuScope Virtual Research Environments Geoscience Data Enhanced Virtual Laboratory
		Digital Earth Australia Collaboration with GA
Defence	Australian Geospatial Intelligence Organisation (AGIO)	Onshore topographic data and products provided by GA
	Australian Hydrographic Service (AHS)	Raw and processed bathymetric data collections provided by GA
Foreign Affairs; Trade, Tourism and Investment	Policy development for, and by, the tourism sector	eReefs (through CSIRO)
Infrastructure, Transport and Regional Development	Australian Marine Safety Authority (AMSA)	Managing risks to marine vessels in Australian waters (undertaken with consultant DHI)
	Aviation Programs	Development of specialist weather reporting products for the aviation industry (with BoM)
	Transport Infrastructure Programs	National Reference Grid

Outreach

Every year, NCI engages with research groups, educational visitors and official delegations to communicate with them about big data and high-performance computing. This includes public events, school tours, training workshops and high-profile visits. It also includes a large amount of academic engagement in the form of conference presentations and academic publications.

Tours and Events

Group	Date
Department of Education NCRIS Staff visit	1 August 2018
John Curtin School of Medical Research VIP Philanthropists visit	6 August 2018
National Science Week "Science in ACTion" Event	10–11 August 2018
ANU College of Engineering and Computer Science Winter School tour	17 August 2018
John Curtin School of Medical Research National Centre for Indigenous Genomics visit	30 August 2018
Geoscience Australia staff visit	4 September 2018
Monash University artist Sylvain Couzinet-Jacques visit	12 September 2018
Canberra Genomics group visit	20 September 2018
Brad Evans University of Sydney students visit	26 September 2018
Visit from Indonesian BMKG senior delegation	12 October 2018
Exhibit at eResearch Australasia Conference, Melbourne	17–19 October 2018
Visit from Indonesian BMKG and Phil Cummins	15 November 2018
Computing in the Pub at Smith's Alternative Bookshop	5 December 2018
OZEWEX Summer Institute students visit (20 students)	11 December 2018
ANU IT Staff visit	11 December 2018
National Youth Science Forum Session A visit (30 students)	8 January 2019
National Youth Science Forum Session C visit (30 students)	22 January 2019
ANU College of Engineering and Computer Science Summer School visit	29 January 2019
ACT Member of the Legislative Assembly Tara Cheyne visit	25 February 2019
Bioplatforms Australia visit	27 February 2019
ANU Research School of Earth Sciences and University of Tokyo Students visit	28 February 2019
ANU Autonomy, Agency and Assurance Innovation Institute student visit	20 March 2019
Women in Engineering and Computer Science Expo Day	4 April 2019
ACT Member of the Legislative Assembly and Deputy Chief Minister Yvette Berry visit	10 April 2019
Visit from Geoscience Australia staff and graduates	11 April 2019

Group	Date
Exhibit at Collaborative Conference on Computational and Data Intensive Science, Canberra	6–8 May 2019
ANU Student Recruitment staff visit	28 May 2019
AusTrade Film Fly Experience Australia Winners student visit	29 May 2019
Big Day In ANU Computer Science Expo	30 May 2019
Science and Technology Australia Executive Meeting	3 June 2019
Pawsey Supercomputing Centre Board Meeting	5 June 2019
Exhibit at International Supercomputing Conference 2019, Frankfurt	17–19 June 2019
Australian Research Council Centre of Excellence in Future Low-Energy Electronic Technology Director Nikhil Medhekar visit	19 June 2019
Autumn Session HPC Training and Visit to NCI	9–13 April 2018
Singaporean Teachers Visit	9 April 2018
Visit from JW Saputro from Indonesian National Science Foundation	17 April 2018
ANU Research Capabilities Expo	2 May 2018
Visit from ANU COMP Class	16 May 2018
Introduction to HPC Workshop at C3DIS	28 May 2018
Visit from Skaidrite Darius, ANU's first female computer programmer	4 June 2018
Deakin University Training	19 June 2018
ISC2018 in Frankfurt, Germany	25–28 June 2018
ARC CSS Climate Showcase at Old Parliament House	27 June 2018
CECS Girls in STEM visit	28 June 2018
Training visit from Centre of Excellence for Climate Extremes	29 June 2018

Presentations and Publications

Date	Event/Conference/Meeting	Location
August 2018	Australian Copernicus Hub Meeting	Canberra, Australia
August 2018	24th Electromagnetic Induction Workshop	Helsingor, Denmark
August 2018	Gaussian Workshop	Tokyo, Japan
September 2018	Centre of Excellence in Simulation of Weather and Climate in Europe Workshop	Brussels, Belgium
September 2018	Accelerated Computing for Innovation Conference	Sydney, Australia
September 2018	Computational Chemistry Workshops	Shanghai, China
September 2018	Lustre Administrator and Developers Conference	Paris, France
October 2018	Australian Geoscience Council Convention	Adelaide, Australia
October 2018	EPIC AU-EU Digital Science and International Cooperation Workshop	Melbourne, Australia
October 2018	eResearch Australasia 2018	Melbourne, Australia
October 2018	CSIRO Digital Disruption in Mineral Exploration Symposium	Perth, Australia
October 2018	Australian Meteorological and Oceanographic Society Annual Workshop	Melbourne, Australia
November 2018	12th Research Data Alliance Plenary and International Data Week	Gaborone, Botswana
November 2018	Bureau of Meteorology Annual Research & Development Conference	Melbourne, Australia
December 2018	Earth System Grid Federation Face to Face Conference	Washington, USA
December 2018	National MT Workshop and AusLAMP South Australia Release Day	Adelaide, South Australia
December 2018	American Geophysics Union Fall Meeting	Washington, USA
December 2018	Methods and Algorithms in Quantum Chemistry	Aarhus, Denmark
January 2019	IS-ENES3 Kick-off Meeting	Paris, France
January 2019	Earth Systems Information Partners Winter Meeting	Bethesda, USA
January 2019	PIDapalooza – Open Festival of Persistent Identifiers in Research	Dublin, Ireland
March 2019	Tomography for Scientific Advancement Conference	Gainesville, USA
April 2019	13th Research Data Alliance Plenary	Philadelphia, USA
April 2019	European Geosciences Union General Assembly	Vienna, Austria
June 2019	Collaborative Conference on Computational and Data Intensive Science (C3DIS 2019)	Canberra, Australia
May 2019	NASA Special Workshop on Data and Deep Learning	Greenbelt, USA
May 2019	ACCESS Science Day	Canberra, Australia
June 2019	Leibniz-Rechenzentrum Presentation	Munich, Germany

Date	Event/Conference/Meeting	Location
June 2019	Australasian Meteorological and Oceanographic Society Annual Meeting	Darwin, Australia
May 2018	PRACEdays18 Conference	Ljubljana, Slovenia
May 2018	Collaborative Conference on Computational and Data Intensive Science (C3DIS 2018)	Melbourne, Australia
June 2018	TERENA Networking Conference (TNC18)	Trondheim, Norway
June 2018	6th Accelerated Data Analytics and Computing Workshop	Zurich, Switzerland
June 2018	International Industry Supercomputing Workshop	Frankfurt, Germany
June 2018	DMF (Data Management Framework) User Group	Brisbane, Australia