

NCI
AUSTRALIA

NCI Astronomy overview

Who are we?

The National Computational Infrastructure

- Funded to provide leading-edge high-performance computing (HPC), data storage and associated infrastructure to Australian researchers
- These are high-end services which researchers need, but for which there is no commercial business case
- We operate the nation's fastest supercomputer, highest-performance research cloud, fastest filesystems and largest repository of managed, high-performance research data.
- This infrastructure, and the extensive services built on top of it, are delivered by a team of over 60 staff, know nationally and internationally for their expertise.



Our Collaboration

Over two thirds of our funding comes from partners, who co-invest in return for a share of resources

- The majority of our partners are publicly-funded research organisations, supporting staff and their collaborators who have requirements that can't be met by the market.

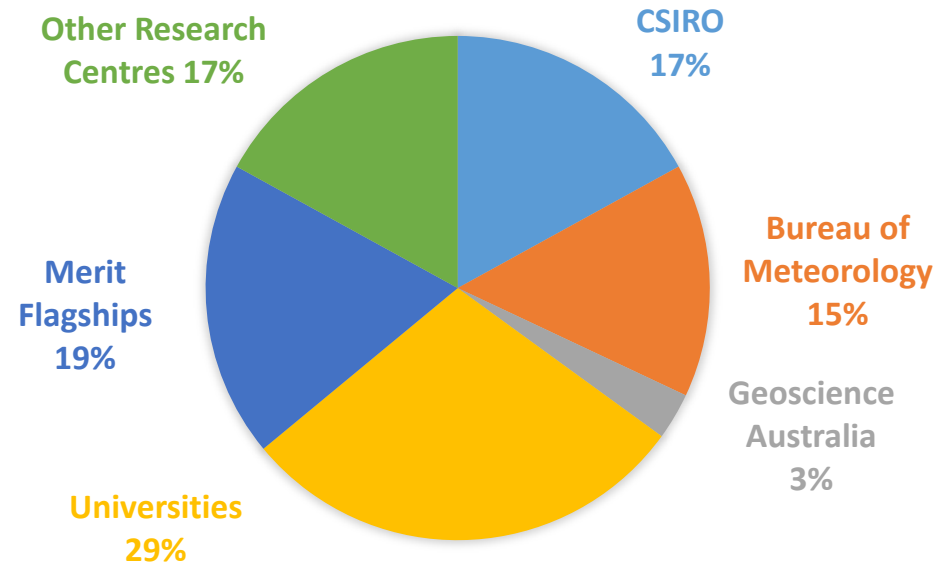


- We also have a few industry users, accessing resources on a fee-for-service basis.

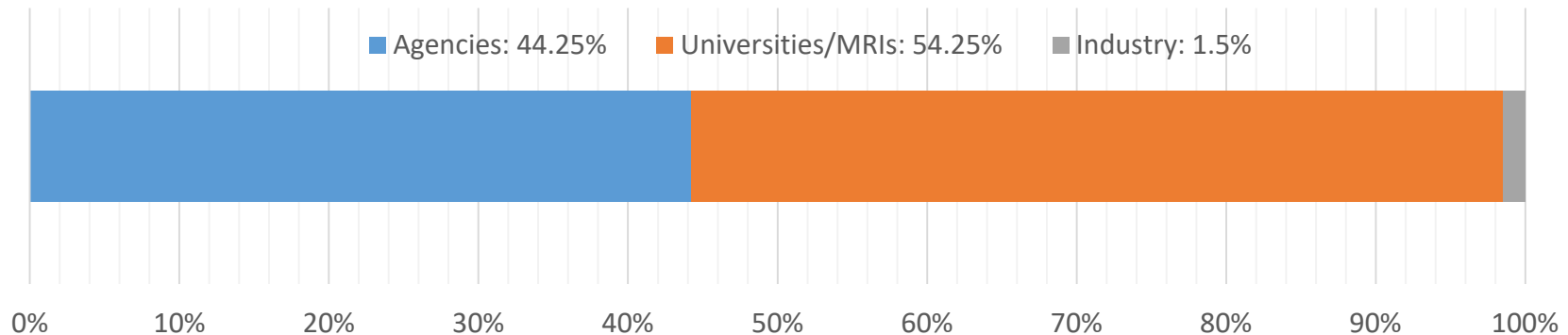


HPC resource usage at NCI

Distribution by Research Organisation



Distribution by Organisation Type





fundamental

- Physics
- Chemistry
- Mathematics
- Astronomy
- ARC and NHMRC Centres of Excellence



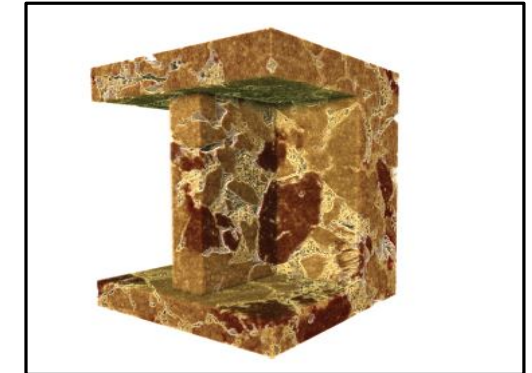
strategic

- Environmental science
- Medical research
- Geoscience
- Agriculture
- Materials science



applied

- Weather forecasting
- Extreme weather
- Disaster management/mitigation



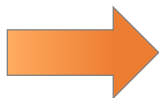
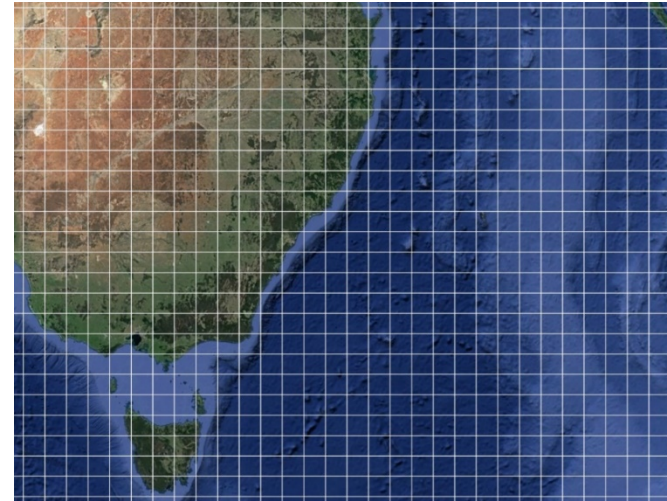
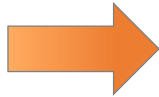
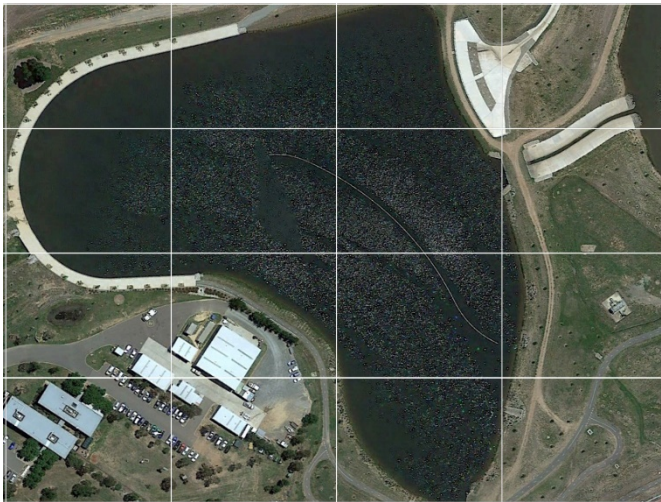
industry

- Victor Chang Cardiac Research Institute
- DHI: hydrological modelling

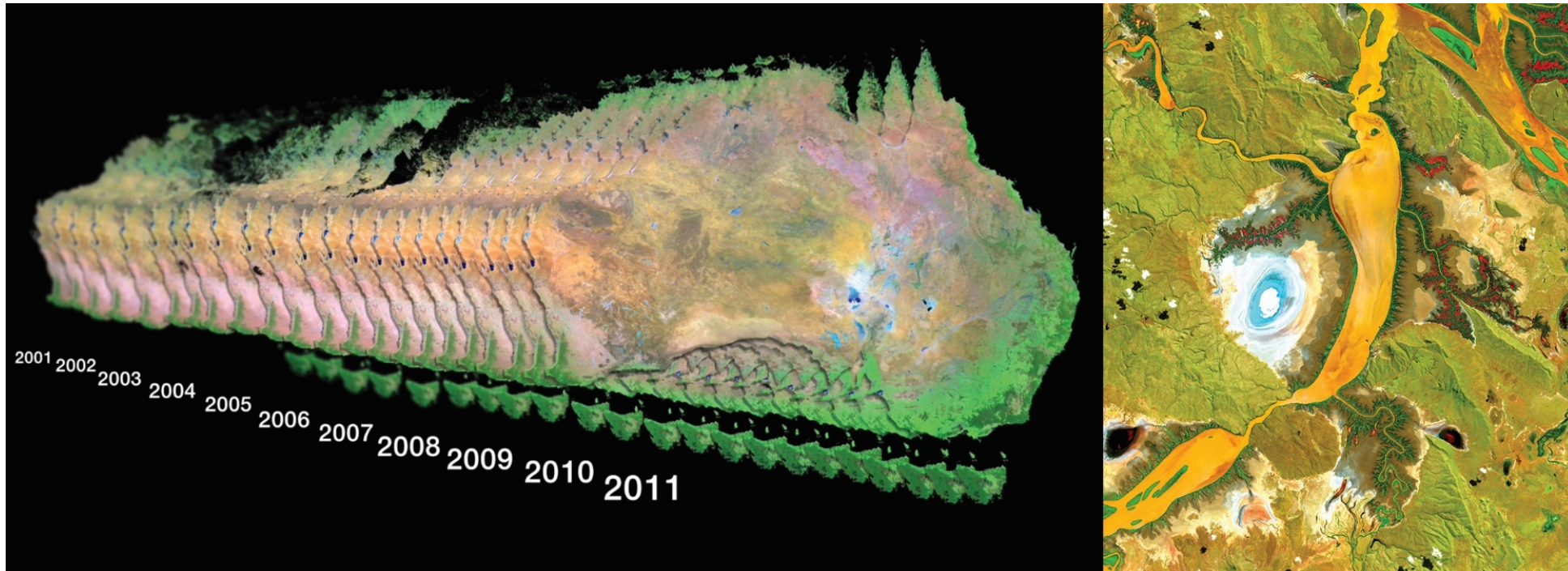
Excellence, Impact and National Benefits

Big Compute

Computationally-intensive science — weather/climate (big domains, long simulation)



- Data-intensive science
 - Digital Earth Australia— continental-scale earth observations from space
 - Decades of images from the US Landsat satellites
 - Daily images from EU, Japanese and US satellites are now accessible





NCI AUSTRALIA NCI's plant room – cooling, generators, electricity supply



Surveying the Southern Skies

NCI stores around two petabytes of data from the SkyMapper Southern Sky Survey, which includes more than 600,000 images of the entire southern sky, comprising over 1 billion objects. The integrated data and compute infrastructure at NCI allows researchers to securely share, view and analyse all the data they need without duplication or additional transfers.

ANU Research School of Astronomy and Astrophysics, AAO and seven other universities

The oldest star in the universe

SkyMapper data stored at NCI led researchers to the discovery of the oldest known star in the universe. Daily analysis of the previous night's images – up to 800 images, adding up to over 1 terabyte – on NCI's supercomputer, Raijin, allows researchers to process the flood of incoming data and continually calibrate their instruments for improved observations.

Dr Stefan Keller, ANU



Solving the Missing Stardust Problem

Theoretical models run on NCI's supercomputer are helping increase our understanding of the formation of stars. The research team has been able to assign an origin to stardust that we previously did not understand. The team brought together theoretical and experimental physicists using computational modelling alongside geochemical analysis of meteorites.

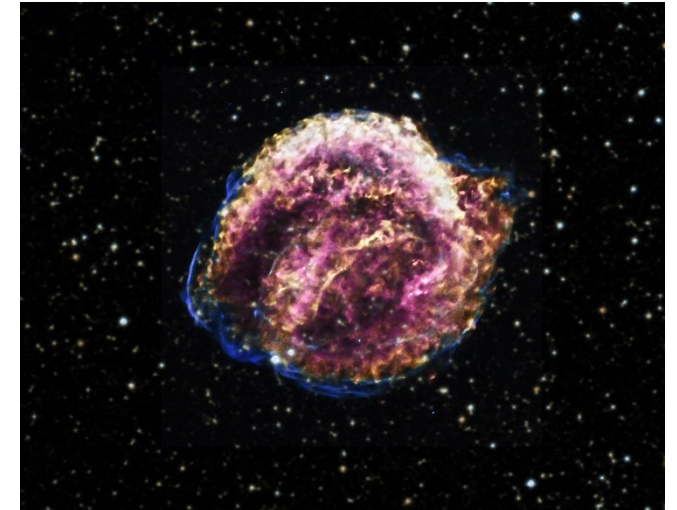
Dr Amanda Karakas, Monash University



A simulation of supernova formation

A research team made up of ANU and Queen's University Belfast scientists is using theory to simulate how Type Ia supernovae are formed. By following a supernova's thermonuclear explosion in three dimensions using NCI's computational and data storage platform, the researchers can predict many variables from the explosion including chemical element distribution and light curves, and compare them to actual observations.

Dr Ivo Seitenzahl, ANU



Where are we going?

- From little things grow big things: supercomputing is no longer about monolithic huge calculations, but rather about ***Impact, Integration and Scale***
- Collaborative data projects of institutional, national and global significance: making it work from the simple essentials to the complex bleeding edge.
- ***Enabling expertise*** at the interface between science, industry and large scale computing is more than ever in demand. NCI will be pivotal in providing this critical service for university, government and industry sectors as Australia's bridge to HPC/HPD.
- NCI and optical astronomy have good synergistic history: there is presently an opportunity to take this to the next level in the context of a national data centre for optical astronomy.

