

All Sky Virtual Observatory

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Partners



Sponsors



NCRIS
National Research
Infrastructure for Australia

Motivation for building ASVO

- No point building bigger telescopes if you can't handle the data!
- Link theory and observations, and support multi-wavelength science
- Build Australian capacity in VO and Big Data
- Support different culture of software development



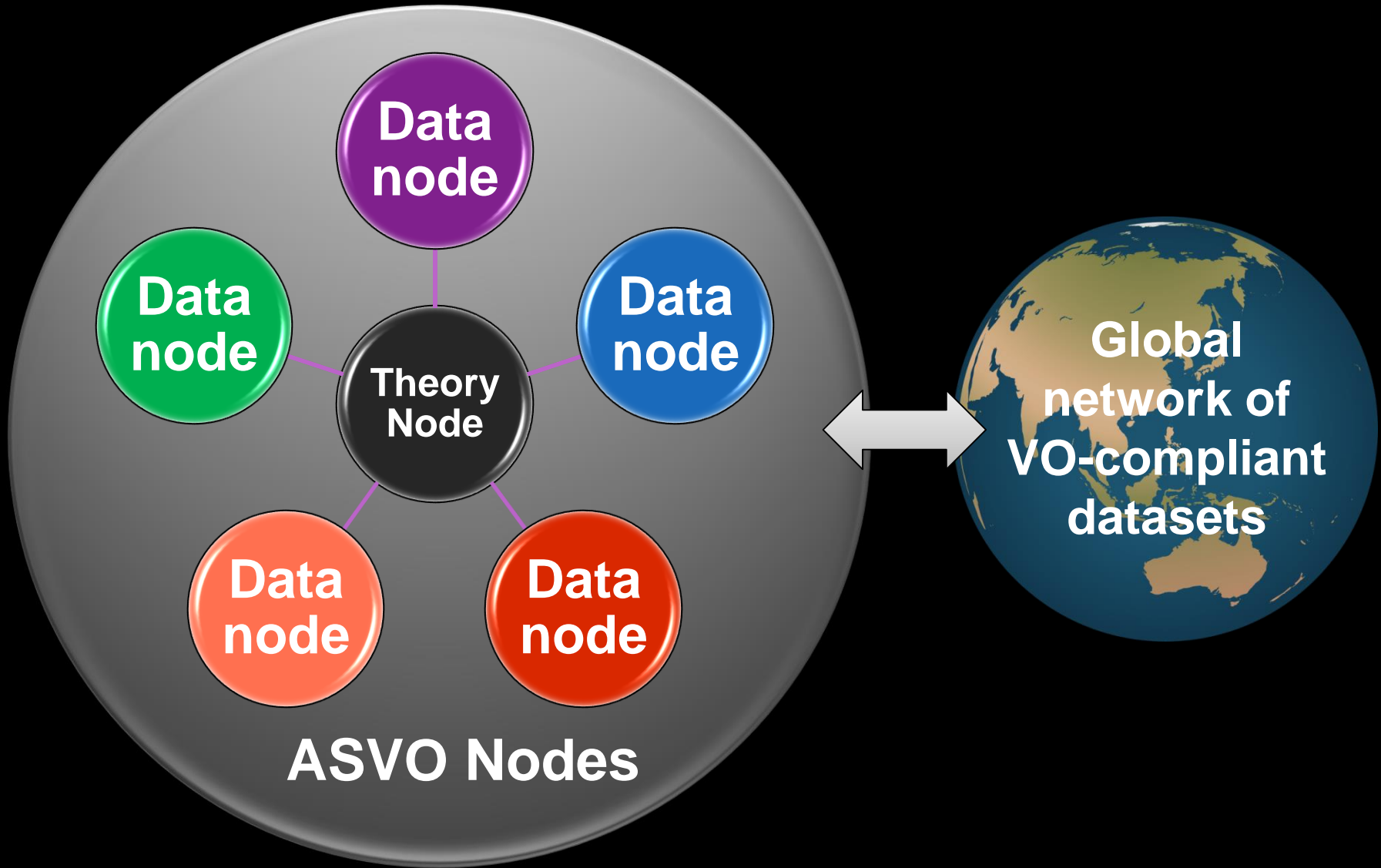
International Virtual Observatory

- International Virtual Observatory Alliance formed in 2002
- Community-driven initiative
- Sets standards for data formats, access protocols, registries, services, vocabularies
- Supports interoperability and multi-dataset, multi-wavelength science
- IVOA standards at different levels of maturity for different data types

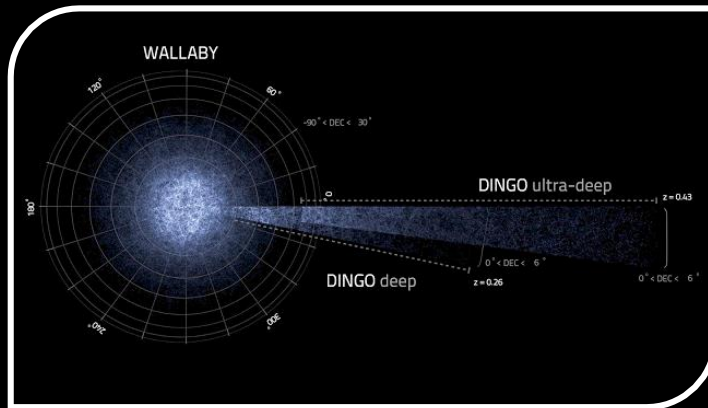


ASVO aims to be IVOA-compliant wherever possible, and help develop new data protocols if necessary

ASVO structure



Current status



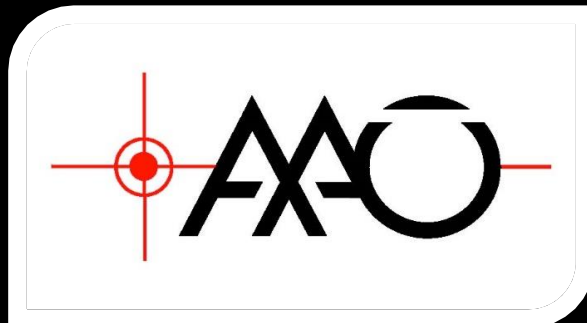
Theoretical Astrophysical Observatory

V1: March 2014
V2: September 2015



SkyMapper Node

V1: April 2014 (with test data)
V2: May 2016 (Early Data Release)



Anglo-Australian Telescope Node
In Development



Murchison Widefield Array Node
Design Study Completed in 2015

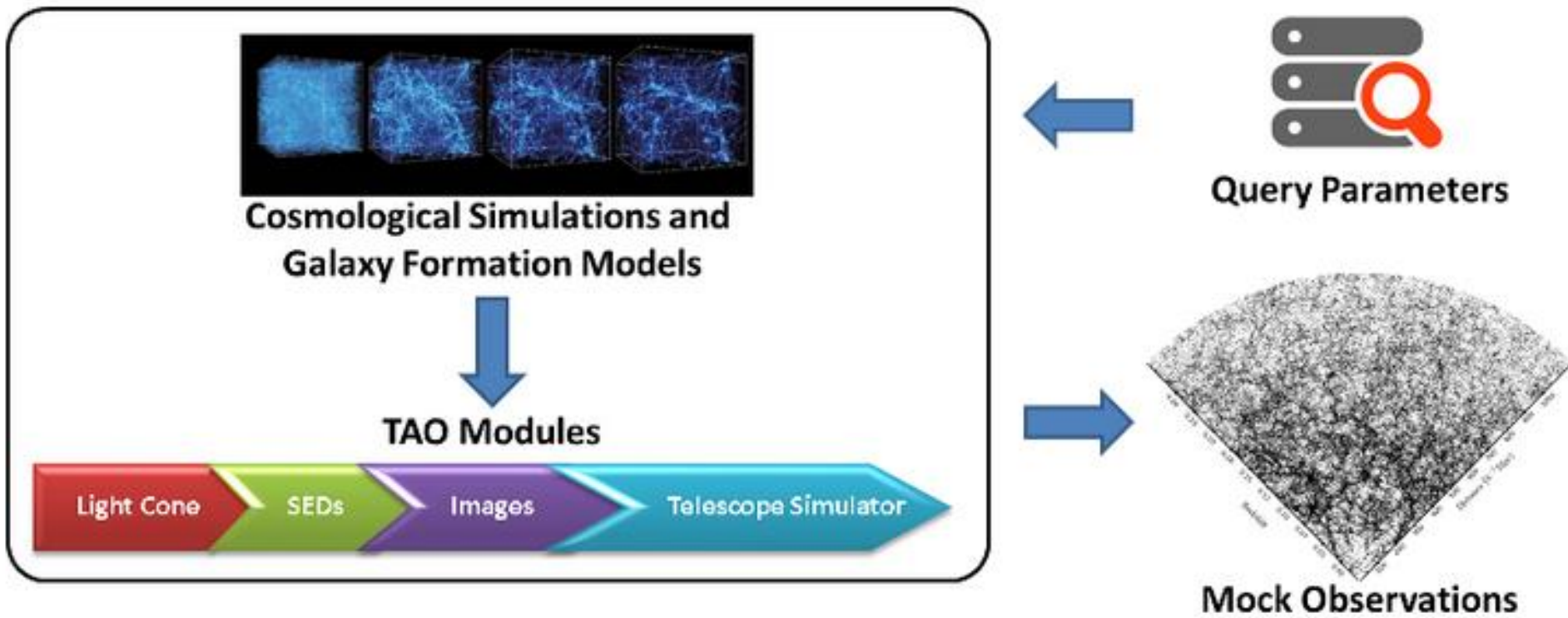
Theoretical Astrophysical Observatory

Developed and operated by Swinburne University

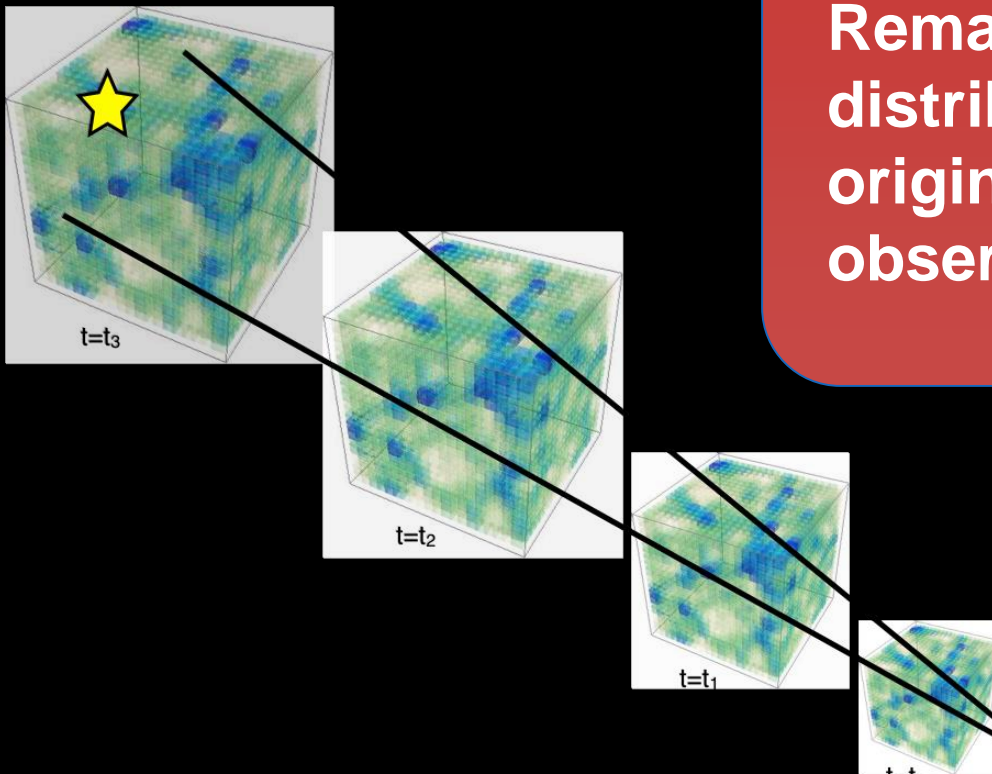
The ASKAP HI All-Sky Survey [WALLABY]
will probe the mass and dynamics of galaxies
visible across the **entire Southern hemisphere.**

Credit: Duffy et al. ICRAR 2012

Theoretical Astrophysical Observatory



Theoretical Astrophysical Observatory



Remap spatial and temporal distribution of galaxies in the original simulation box into observable light-cone.



Theoretical Astrophysical Observatory

Queryable Data from multiple popular cosmological simulations and galaxy formation models **which can be funneled through higher-level modules to build custom mock galaxy catalogues and images.**



DATA



QUERY



MODULES



MOCK

Home > Mock Galaxy Factory

New Catalogue



START



GENERAL
PROPERTIES



SPECTRAL
ENERGY
DISTRIBUTION



SELECTION



OUTPUT
FORMAT



SUMMARY
AND
SUBMIT



BUILD
NEW CATALOGUE



RECREATE
OLD CATALOGUE



LOAD SURVEY
OR
TELESCOPE PRESETS



PREMADE
CATALOGUE

NOTE: Required fields are marked with an asterisk



Data Selection

Catalogue Type *

Dark Matter Simulation *

Galaxy Model *

Box Size (Mpc/h) *

Redshift *

Output Properties

Output Properties *

Available

Galaxy Masses

- Total Stellar Mass
- Bulge Stellar Mass
- Black Hole Mass
- Cold Gas Mass
- Hot Gas Mass
- Ejected Gas Mass

Selected

Cosmological Parameters

$\Omega_m = 0.27$, $\Omega_\Lambda = 0.73$, $\Omega_b = 0.0469$, $\sigma_8 = 0.82$, $h = 0.70$, $n = 0.95$

Box Size

250 Mpc/h

Mass Resolution

$1.35 \times 10^8 M_{\text{sun}}/h$

Force Resolution

1 kpc/h

Paper

Klypin, Trujillo-Gomez & Primack 2011

External Link

[The Bolshoi cosmological simulation](#)

Selected Galaxy Model Details

[SAGE](#)

The Semi-Analytic Galaxy Evolution (SAGE) model used in this work is a publicly available codebase that runs on the dark matter halo trees of a cosmological N-body simulation.

Paper

[Croton et al. 2016](#)

External Link

[Semi-Analytic Galaxy Evolution](#)

Theoretical Astrophysical Observatory



Galactic Merger Trees - cs.washington.edu

- Retrieve star formation and metallicity histories for each galaxy
- Apply user-selected stellar population synthesis and dust model to get individual spectra.
- Convolve the spectra with set of filters to compute apparent and absolute magnitudes.

Apply Spectral Energy Distribution

Model

Single Stellar Population Model ^{*}

Bruzual & Charlot (2003), Chabrier IMF ▾

Output Magnitudes

Band Pass Filters (Maximum 25 Filters)

Filter

Available

CFHTLS

CFHTLS Megacam u' (Absolute)
CFHTLS Megacam u' (Apparent)
CFHTLS Megacam g' (Absolute)
CFHTLS Megacam g' (Apparent)
CFHTLS Megacam r' (Absolute)
CFHTLS Megacam r' (Apparent)



Selected

Dust Filter

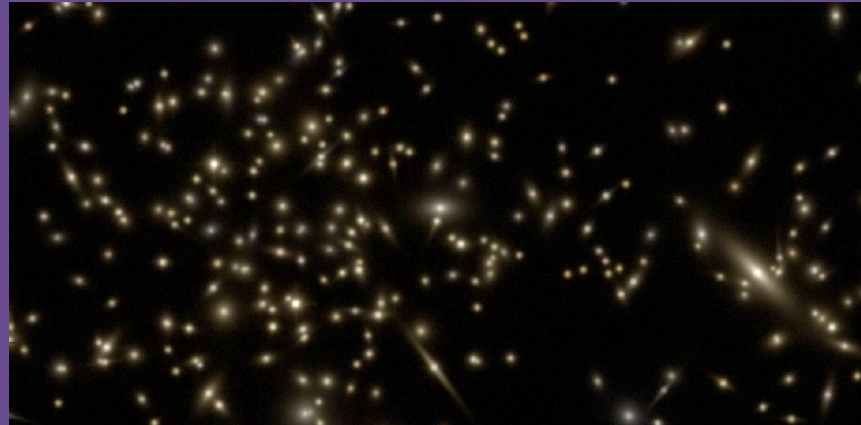
Apply Dust

improve performance

- All magnitudes assume the simulation little h value from General Properties
- Magnitudes are calculated in the AB system

Additional information is available from the [SED Module documentation](#).

Theoretical Astrophysical Observatory



Takes output of both light-cone and SED modules to construct a user defined mock images.

YOU ARE HERE > NEW CATALOGUE

NEW CATALOGUE




**BUILD
 NEW CATALOGUE**


**RECREATE
 OLD CATALOGUE**


**LOAD SURVEY
 TELESCOPE PRESETS**


**PREMADE
 CATALOGUE**

NOTE: Required fields are marked with an asterisk

INFOBAR ▼

**SELECTED SURVEY
 TELESCOPE PRESETS**
CANDELS - Mock Cone

DATASET
Millenium / SAGE

RA	DEC	REDSHIFT
0.3°	0.3°	0 ≤ z ≤ 9

LOAD SURVEY TELESCOPE PRESETS

CANDELS - Mock Cone

DEEP z - Mock Cone

SDSS - Mock Cone

GAMA - Mock Cone

SKYMAPPER - Mock Cone

LOAD PRESET

Home > History > 528

Viewing Catalogue 528

[DELETE](#)

[REQUEST DOI](#)

OPTIONAL DESCRIPTION

[CLICK TO EDIT](#) 

D20 test1

SUMMARY

STATUS

Disk Usage 3MB 

Number of Galaxies

Status Completed

GENERAL PROPERTIES

Catalogue Geometry Light-cone

INFOBAR



DOWNLOAD



summary.txt



images_528.tar.gz
3MB



params.xml
3kB



tao_528.0.csv.gz
70kB

DOWNLOAD AS SINGLE FILE



Recommended



All in one

TA version 3.0

- Incorporating DARK hydrodynamical simulations
- Detailed distribution of bound and diffuse gas, metals
- Science drivers:
 - reionization of the early universe
 - diffuse cosmic gas and gas in galaxies
 - dynamics of supernovae and AGN feedback
- V3 to be released ~Oct 2016 with light-cone functionality for hydro data. SED & image modules to follow

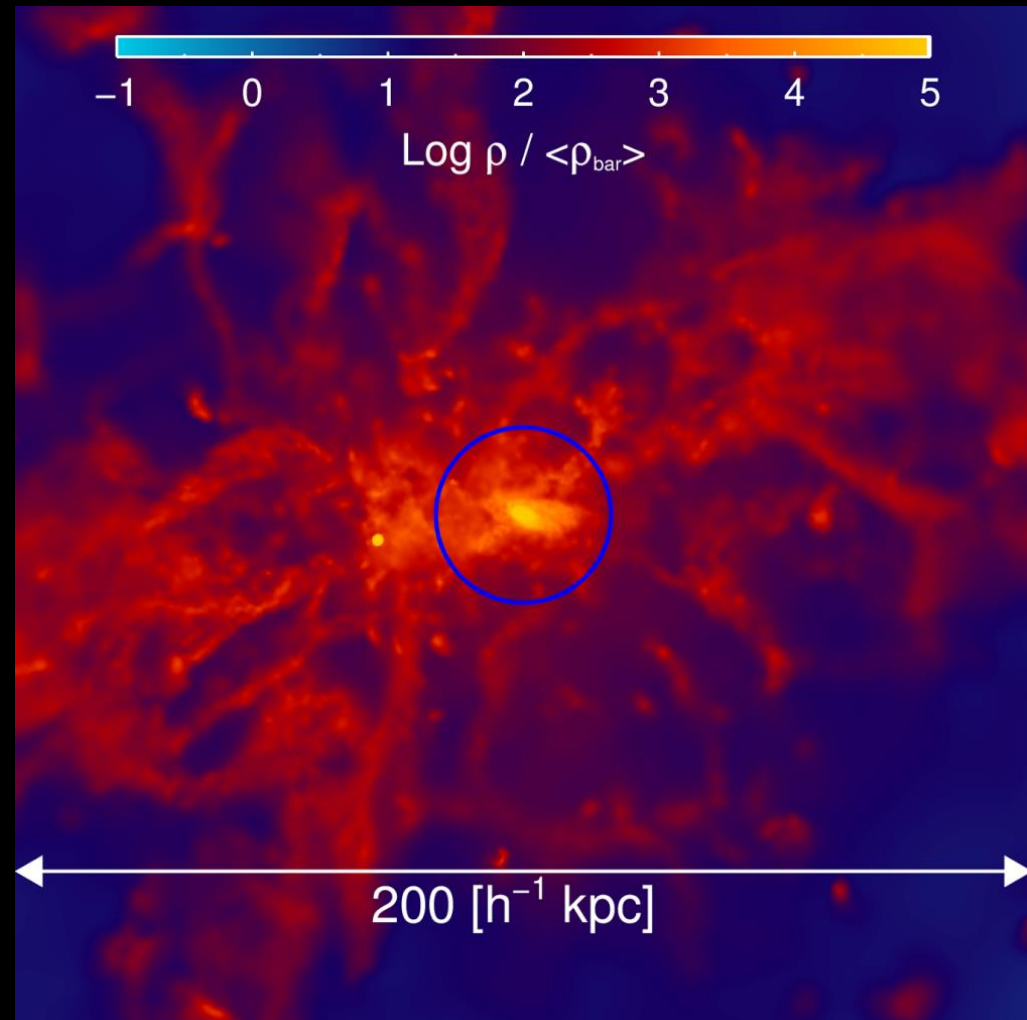


Image credit: Bourke, Crain and Duffy & iVEC@UWA

SkyMapper Node

- Project led by ANU RSAA
- Infrastructure hosted at ANU's National Computational Infrastructure (NCI) supercomputing facility

(Chris Wolf's talk yesterday)



ASVO-SkyMapper Node

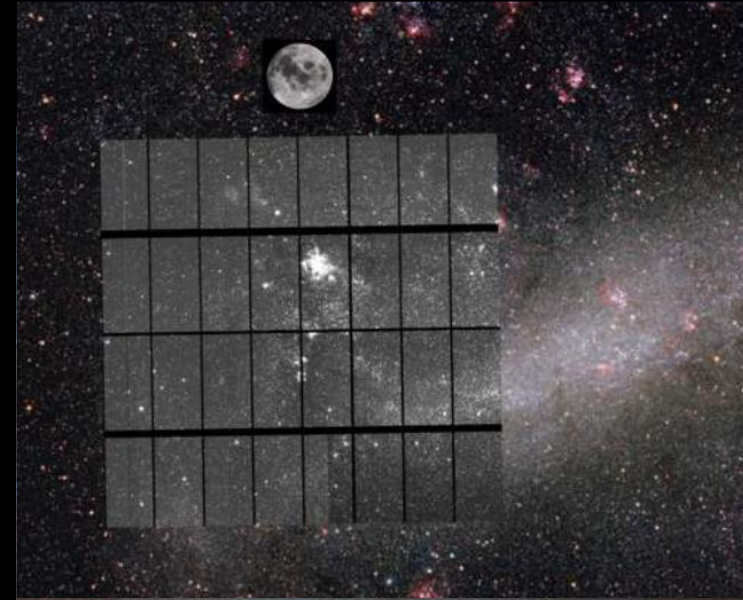
Data Archive:

- **Images:**

- SkyMapper's 268-million pixel imaging camera can photograph 5.7 square degrees of sky
- Coverage of entire southern sky in 6 wavelength bands, over multiple epochs
- ~1.5 PB total (~600MB per raw image, ~1.7GB per calibrated image)

- **Catalogues:**

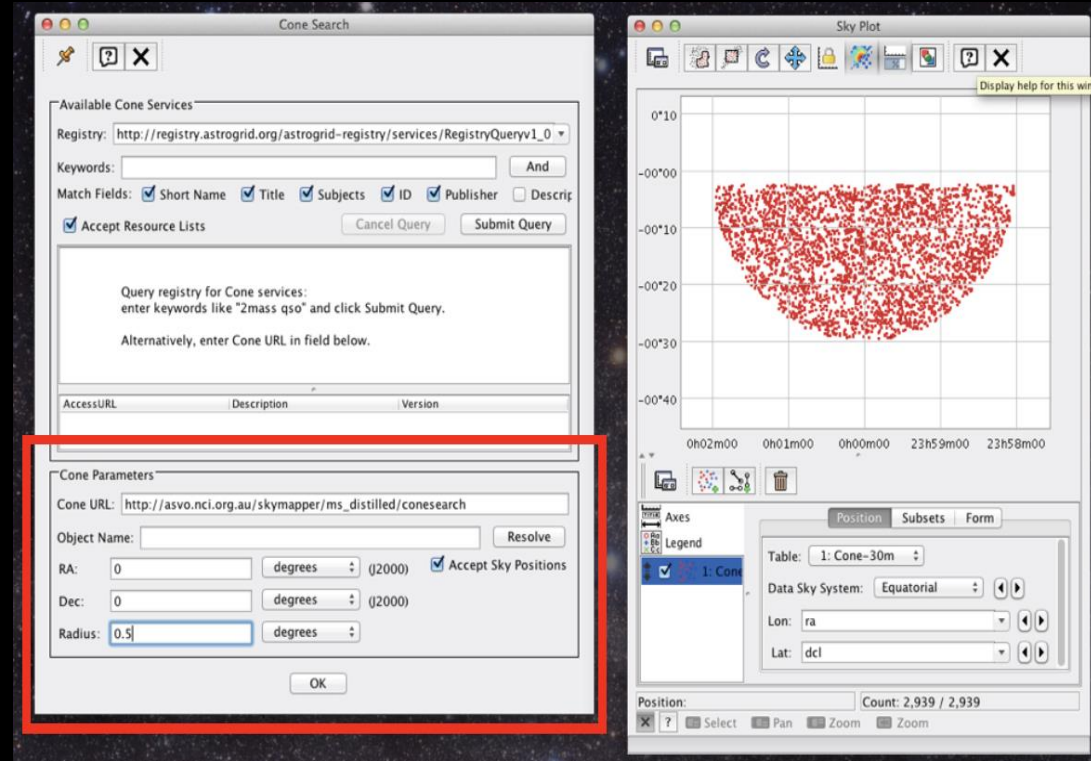
- Metadata tabulated for up to 5 billion objects
- ~200 TB of catalogue data
- Internal DB, Public Release DB, and Australian-only Release DB



ASVO-SkyMapper Node

Data access:

- IVOA-compatible services:
 - Cone search on tabular data
 - Simple Image Access on image data
 - Table Access Protocol, allowing complex, custom SQL-like queries
- Above services available through 3rd party tools like TOPCAT



Cone search using TOPCAT

- Web interface:
 - For quick, simple queries & interactive pan & zoom Sky Viewer

Full Catalogue Search

This page allows arbitrary queries against the TDR database tables using the Virtual Observatory **Table Access Protocol** (TAP), and is only suitable for relatively simple, fast (synchronous) requests. For more complex work requiring asynchronous access and stored results, please use a tool such as TOPCAT with the asynchronous TAP service, as described on the [how to access](#) page.

Queries are made to this service using the **Astronomical Data Query Language** (ADQL), similar to SQL used by relational databases such as MySQL. If you are unfamiliar with ADQL, you can find further information and tutorials [here](#), [here](#) and [here](#).

▶ Example ADQL Queries

Click on an example to show it in the ADQL Query box.

[Get full table](#) | [Get certain columns](#) | [Filter column values](#) | [Box selection](#) | [Cone Search with constraints](#) | [Aggregating rows](#) | [Grouping rows](#) | [Joining tables](#) | [Cross-match two tables](#) | [Sub-queries](#) | [A final example](#)

ADQL Query

To aid in constructing queries, [click here](#) to browse the table and column metadata in a new window.

ADQL Request:

```

1
2 SELECT
3   object_id,ra,decl,r_psf,i_psf,a/b
4 FROM
5   public.master
6 WHERE
7   1=CONTAINS(POINT('ICRS', ra, decl),
8              CIRCLE('ICRS', 206.0, -16.0, 0.5 ))
9   AND g_psf-r_psf > 0.8
10  AND class_stellar>0.9
  
```

Refresh page if query editor does not load

Position L10C11 to L10C24: Unknown column "class_stellar" !

Maximum number of rows to return:

Override by specifying your own 'TOP nnn' value in your ADQL query. There is a return limit of 2000 objects for queries made from this page.

- Home
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- Full Catalogue Search
- Table Metadata
- Sky Viewer **BETA**
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- Policies

Southern Sky Viewer

Rectangular Snip

The Sky Viewer currently shows r-band images from the earlier SkyMapper Test Data Release (TDR). We are working on an updated, colour viewer using newly processed images from the upcoming DR1.

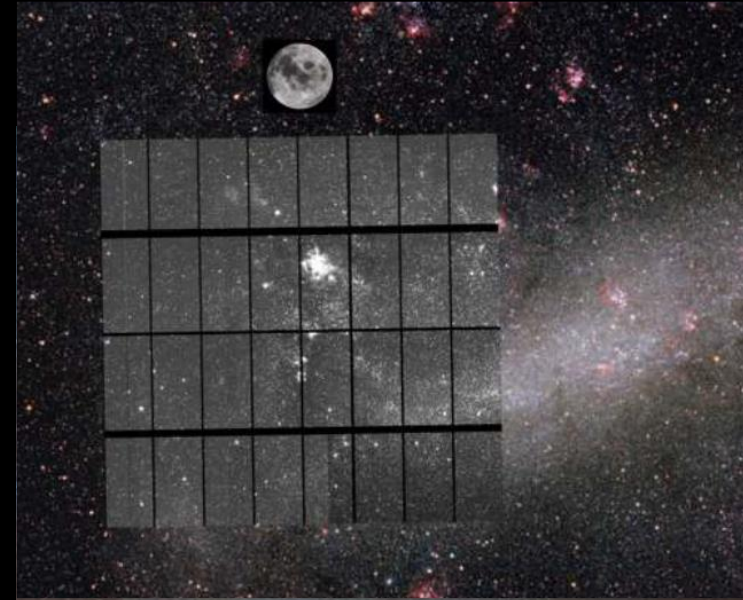
This viewer was constructed using the Hierarchical Progressive Survey format (**HiPS**) used by **Aladin-Lite**. Navigate and zoom in/out using your mouse or the controls provided. You can search for coordinates or objects and change the displayed image layer to show other all-sky surveys using the icons in the top left, and maximise the viewer using the arrows in the top right.



ASVO-SkyMapper Node

Status:

- V2.0: First fully calibrated early data release in May 2016
- Workshop 25-26 August 2016
- V3.0 in development & will include:
 - Co-hosting of spectral data and pre-computed cross-matched tables
 - Improved image cut-outs
 - RGB images
 - Improved Sky Viewer



Anglo-Australian Telescope Node

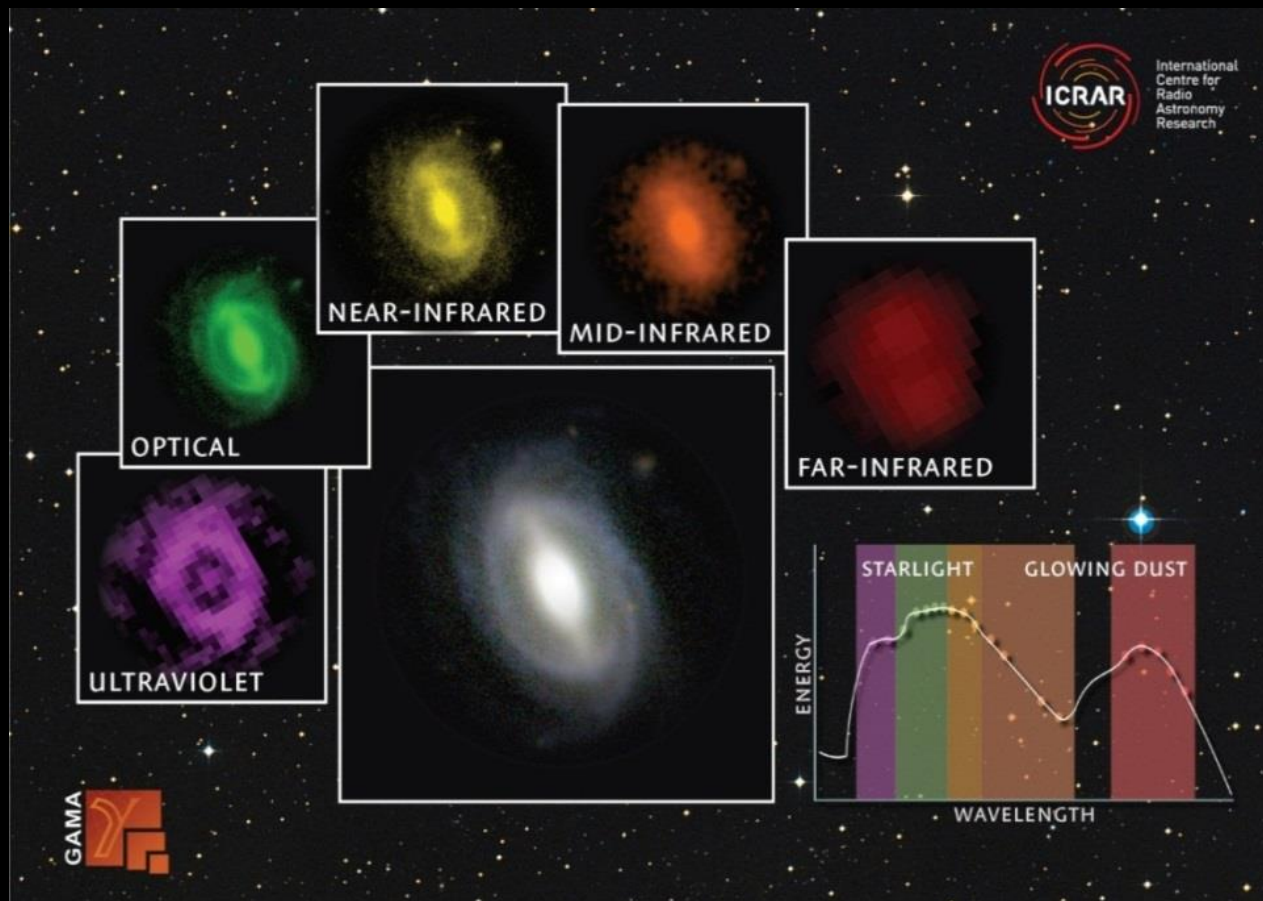
In development at Australian Astronomical Observatory
(see *Andrew Hopkins' talk up next...*)

Anglo-Australian Telescope Node

- Will contain complex AAT data including images, spectra and 3D data cubes
- Two initial exemplar datasets...

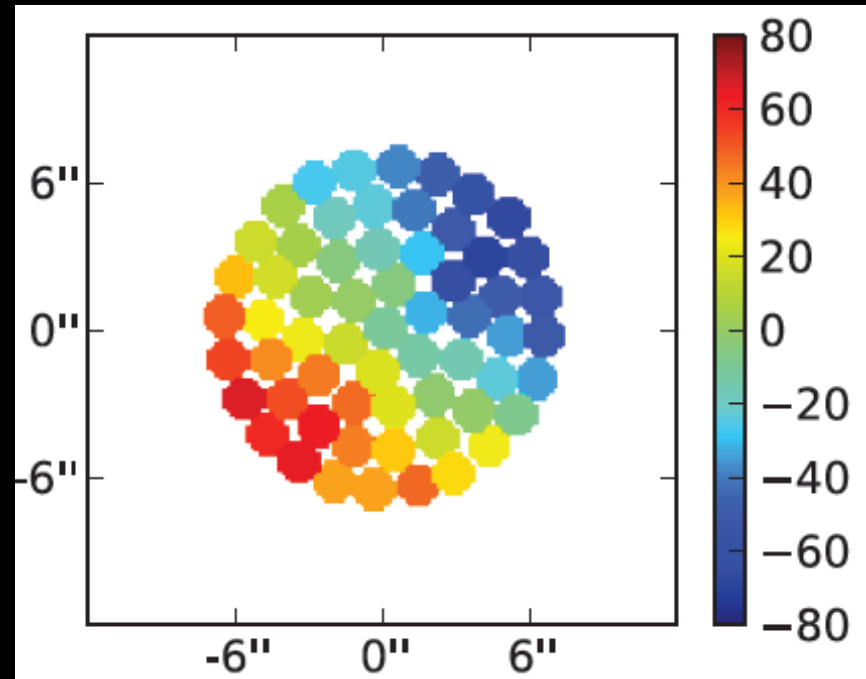
Anglo-Australian Telescope Node

Galaxy And Mass Assembly (GAMA) survey of >200,000 galaxies



Anglo-Australian Telescope Node

- Sydney-AAO Multi-object Integral-field (SAMI) spectrograph survey
- 13 fused hexabundles, each containing 61 fibres, covering a square-degree FoV
- Spatially-resolved data for 5000 galaxies



What's missing from ASVO?

- Radio node

Murchison Widefield Array Node

- SKA precursor at site of future SKA_LOW
- 10 petabytes of data collected and archived since 2013
- Will grow to ~20 petabytes in next few years
- Test-bed for SKA_LOW data flow systems
- AAL funded an ASVO-MWA design study completed in 2015
- AAL seeking funds to support improved MWA data access services



What's missing from ASVO?

- Radio node
- Better integration between nodes
- Advanced visualization & analysis
- Wider variety of data types
- Grass-roots development
- Use in education and citizen science
- Sustainable funding (short-term \$ tied to specific activities and restricted by sponsor objectives)

How to get involved?

- Hands-on training at 2016 ASA Annual Scientific Meeting
- Monthly videocons with the Australian VO community
- Feedback on improvements always welcome!



asvo.org.au