



# 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.**



GET STARTED

\* TAO is accessible from anywhere you can access the internet.

## ACKNOWLEDGEMENTS

TAO is part of the All-Sky Virtual Observatory (ASVO) and is funded and supported by Astronomy Australia Limited, Swinburne University of Technology and the

Australian Government. The latter is provided through the Commonwealth's Education Investment Fund and National Collaborative Research Infrastructure

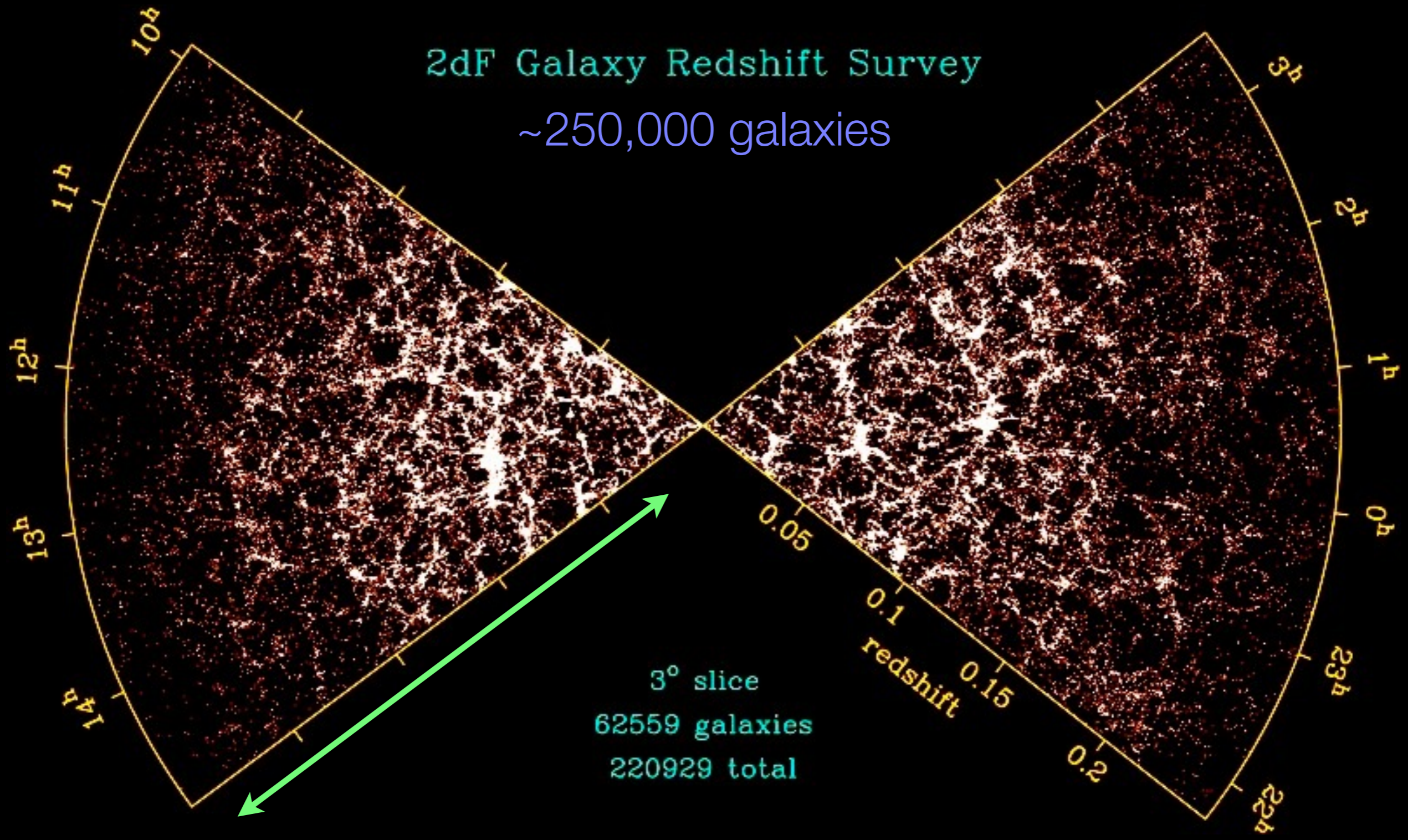
Strategy, particularly the National eResearch Collaboration Tools and Resources (NeCTAR) and the Australian National Data Service Projects.



<https://tao.asvo.org.au>

# 2dF Galaxy Redshift Survey

~250,000 galaxies



3° slice  
62559 galaxies  
220929 total

~3 billion light years

# TAO

Telescope simulator

Image generation

SEDs + Filters

Light cone generation

Web form data query

Simulation database

# Traditional

SQL data query

Simulation database



**Developer: Makes a simple, intuitive UI**



**Users**

Home > Mock Galaxy Factory

# New Catalogue



< PREVIOUS

NEXT >

## Data Selection

Catalogue type \*

Box

Simulation

Millennium

Galaxy Model

SAGE

Version

2016

Box size (Mpc/h) \*

500

Redshift \*

0.0000

## Output properties \*

Available

- TYPE TO FILTER
- Galaxy Masses
  - Total Stellar Mass
  - Bulge Stellar Mass
  - Black Hole Mass
  - Cold Gas Mass
  - Hot Gas Mass
  - Ejected Gas Mass
  - Intracluster Stars Mass
  - Metals Total Stellar Mass
  - Metals Bulge Mass
  - Metals Cold Gas Mass



Selected

- TYPE TO FILTER

### INFOBAR

Selected simulation details

[Millennium](#)

Cosmology

[WMAP-1](#)

Cosmological parameters

$\Omega_m = 0.25, \Omega_\Lambda = 0.75, \Omega_b = 0.045, \sigma_8 = 0.9, h = 0.73, n = 1$

Box size

[500 Mpc/h](#)

Mass resolution

[8.6x10<sup>8</sup> Msun/h](#)

Force resolution

[5 kpc/h](#)

Paper

[Springel et al. 2005](#)

External link

[The German Astrophysical Virtual Observatory](#)

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

# Viewing Catalogue 3262

- DELETE
- IMAGE CONE
- REQUEST DOI
- LOAD AS TEMPLATE

SUMMARY

STATUS

<b>Disk Usage</b>	783MB
<b>Number of Galaxies</b>	1394191
<b>Status</b>	Completed

Description

CLICK TO EDIT

SDSS preset cone

Projects >>

GENERAL PROPERTIES

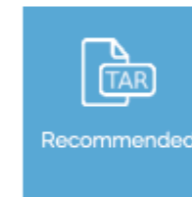
<b>Catalogue Geometry</b>	Light-Cone
<b>Dataset</b>	Millennium / SAGE / 2016 >>
<b>Dimensions</b>	0° < RA < 90° 0° < Dec < 60° Redshift: 0 ≤ z ≤ 0.15
<b>Number of Light-Cones</b>	1 random light-cone
<b>Output Properties</b>	52 properties selected >>

INFOBAR

DOWNLOAD



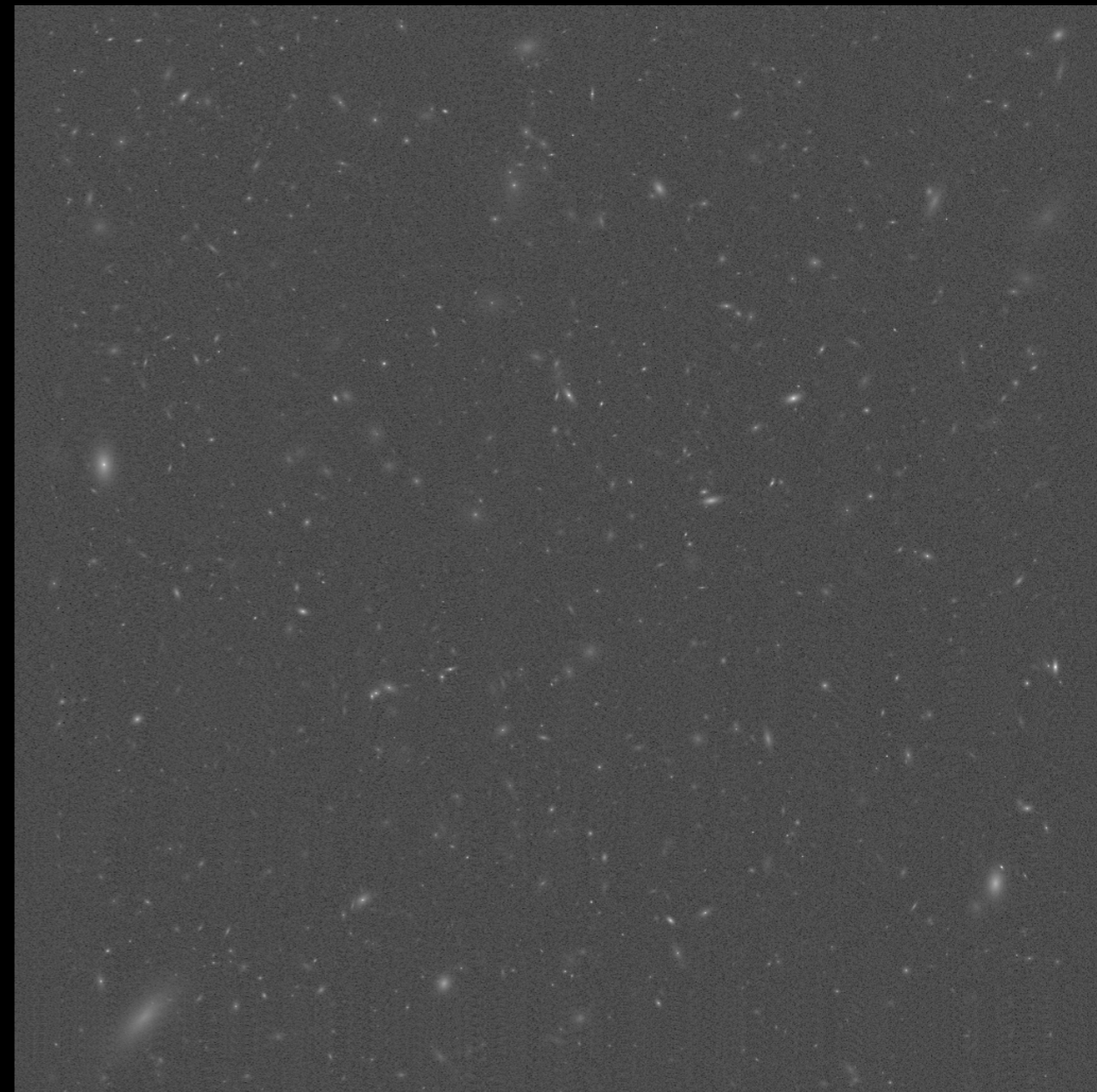
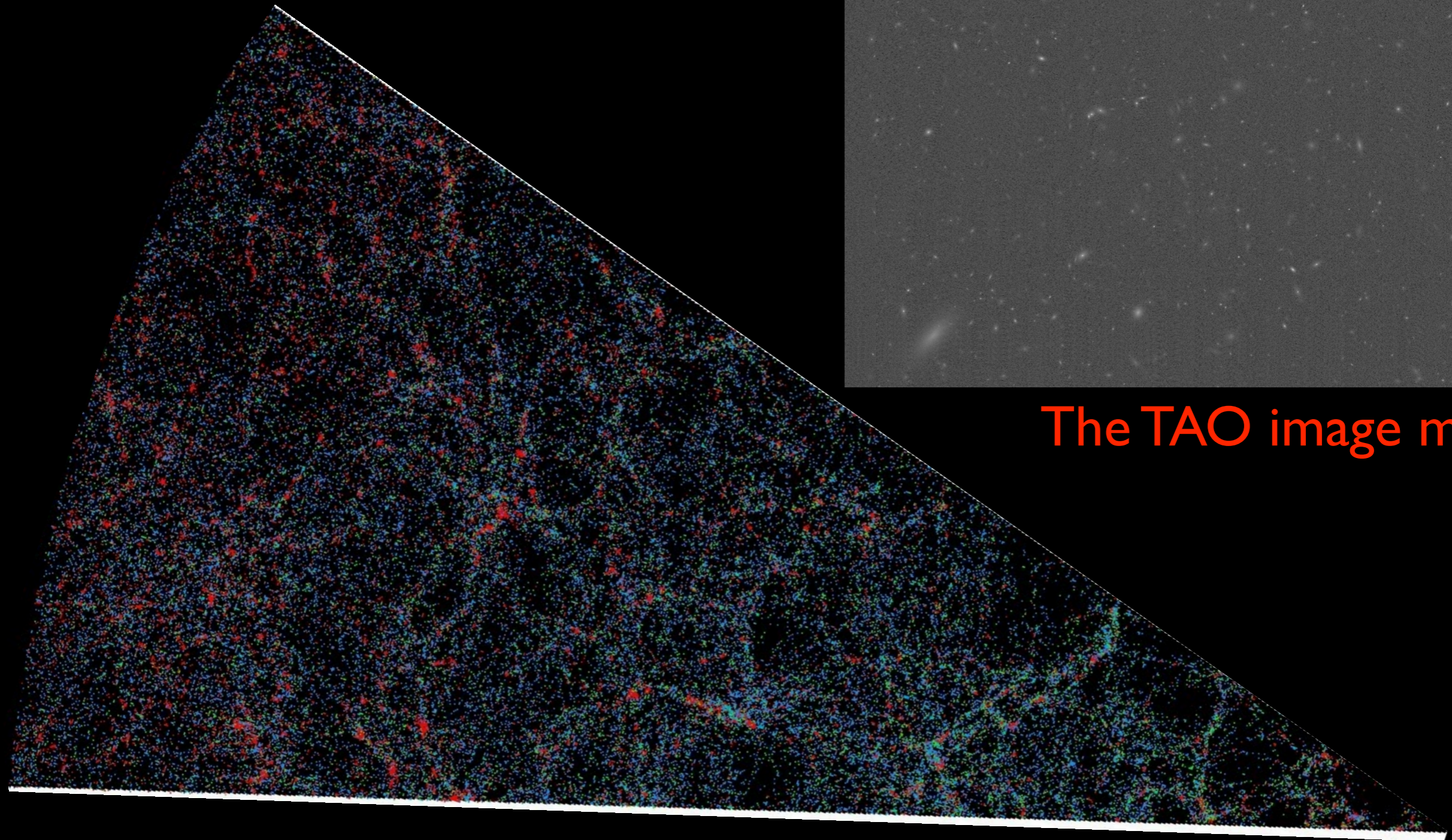
DOWNLOAD AS SINGLE FILE



IMAGES FOR CATALOGUE 3262

ID	STATUS
3263	COMPLETED

The TAO  
light-cone module



The TAO image module

# General Statistics ...

- TAO has been live since 2014, lives on OzStar and GADI
- 15 different base catalogues build on 6 simulations
- 500+ total users, ~100 active users in the past 12 months producing 200+ mock catalogues
- 5TB total galaxy catalogues; 40TB total user generated data



# Data Visualisation with Vis3D

The screenshot displays a web browser window with the URL `tao.asvo.org.au/taodev/jobs/vis3d_job/3026/view/new`. The page header includes the ASVO TAO logo (Theoretical Astrophysical Observatory) and the user name 'darrencroton'. A navigation menu contains links for HOME, NEW CATALOGUE, PROJECTS, HISTORY, ADMIN, DOCUMENTATION, SUPPORT, and ASVO NODES. A breadcrumb trail reads 'Home > Jobs > Vis3d Job > 3026 > View > New'. Below the breadcrumb, there is a red 'Active' status indicator and two buttons: 'new' and 'End Session'. The main content area features a large 3D visualization of a complex, multi-colored (blue, cyan, purple) point cloud or particle distribution. On the right side, a vertical sidebar contains a list of controls: User Settings, File Info, Image Info, Interactivity, Render Settings, Filters, and Close Controls. The footer includes social media icons for Facebook, Email, and Twitter, along with a search input field. The page is identified as 'Theoretical Astrophysical Observatory (TAO) version 5.0 | About'.

# Data Visualisation with Vis3D

The screenshot displays the Vis3D web interface. At the top, the browser address bar shows the URL `tao.asvo.org.au/taodev/jobs/vis3d_job/3026/view/new`. The page header includes the ASVO and TAO logos, the user name "darrencroton", and a navigation menu with items like HOME, NEW CATALOGUE, PROJECTS, HISTORY, ADMIN, DOCUMENTATION, SUPPORT, and ASVO NODES. A breadcrumb trail indicates the current location: Home > Jobs > Vis3d Job > 3026 > View > New. Below the breadcrumb, there are two buttons: "new" and "End Session", with the word "Active" in red text above them. The main area features a large 3D visualization of a galaxy cluster, rendered with a color gradient from blue to red. On the right side, a control panel is open, showing various settings for the visualization. The panel includes sections for "User Settings", "File Info", "Image Info", "Interactivity", "Render Settings", "Filters", "Filtered Data", and "Create Filter". The "Create Filter" section is currently active, showing a "Type" dropdown set to "CLIP" and a "Field" dropdown set to "AGN\_Heating\_Rate". Below this, there is a "Filter 0" section with a "Type" dropdown set to "CLIP" and a "Field" dropdown set to "Mvir". The "Log10 Min&Max" section is also visible, with "Min" and "Max" values of 313.7 and 3137 respectively. The "Active" checkbox is checked, and the "Update" button is visible. At the bottom of the page, there are social media icons for Facebook, Email, and Twitter, along with a search bar. The footer text reads "Theoretical Astrophysical Observatory (TAO) version 5.0 | About".

# The Future



- Getting data in ...
- Bringing users in ...
- Connecting to other platforms ...
- Funding ... ?

The **TAO** project is part of the **ASVO** Virtual Laboratory, supported by Swinburne University, Astronomy Australia Limited, and the Commonwealth Government through **NeCTAR (ARDC)**, **NCRIS** and **EIF** funding.

<http://tao.asvo.org.au>

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