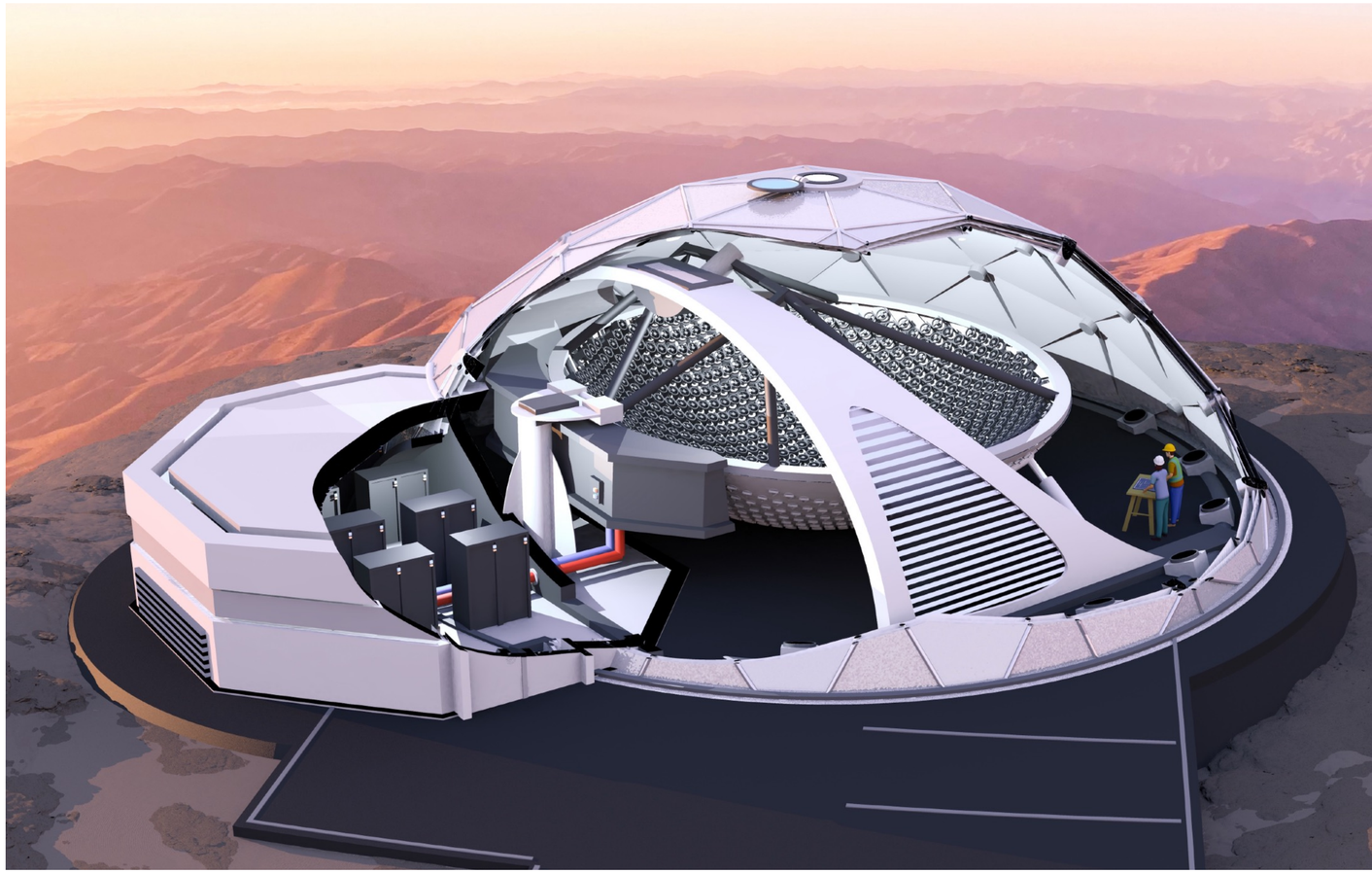
Argus Array

The Argus Array

Low- Cost Access to the Deep, High-Cadence Sky



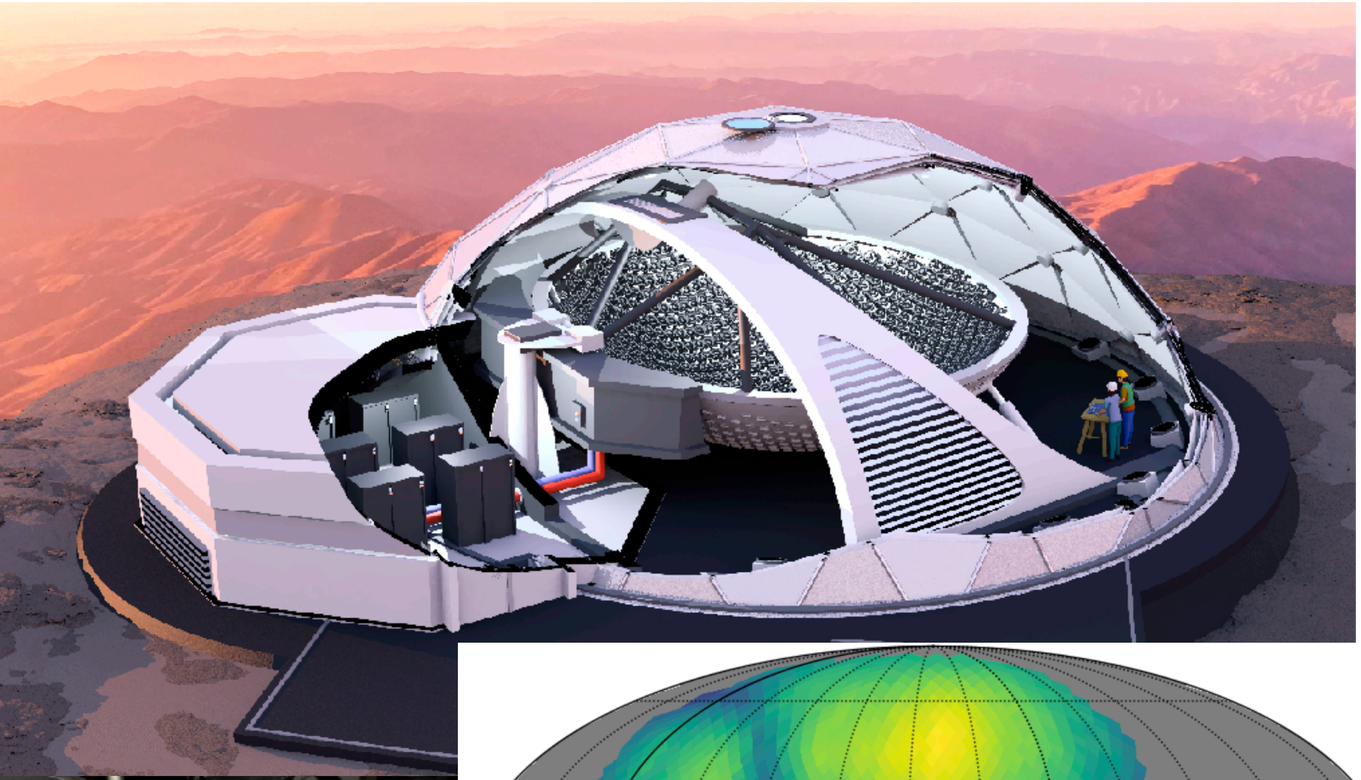
Hank Corbett, Survey Scientist
16 September 2024

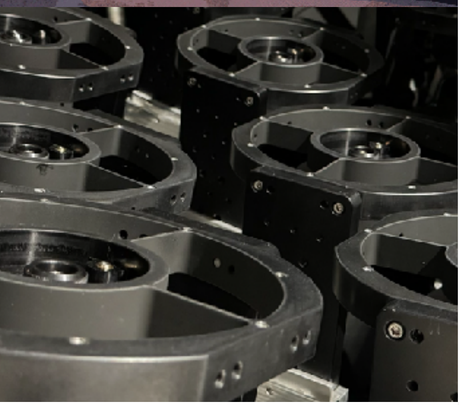
3rd Astro-COLIBRI
Multi-Messenger
Astrophysics Workshop

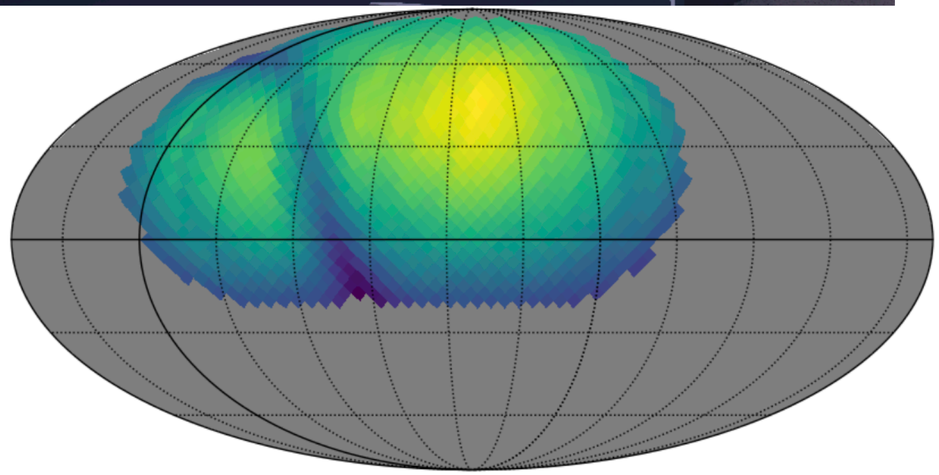
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

The Argus Optical Array

Argus Array







Multi-Band Optical Survey

5m-class collecting area

55 GPix mosaic camera

8,000 sq. deg. FoV

1.4 arcsec per pixel

m_g~16.1 every second

or

m_g~19.6 every minute

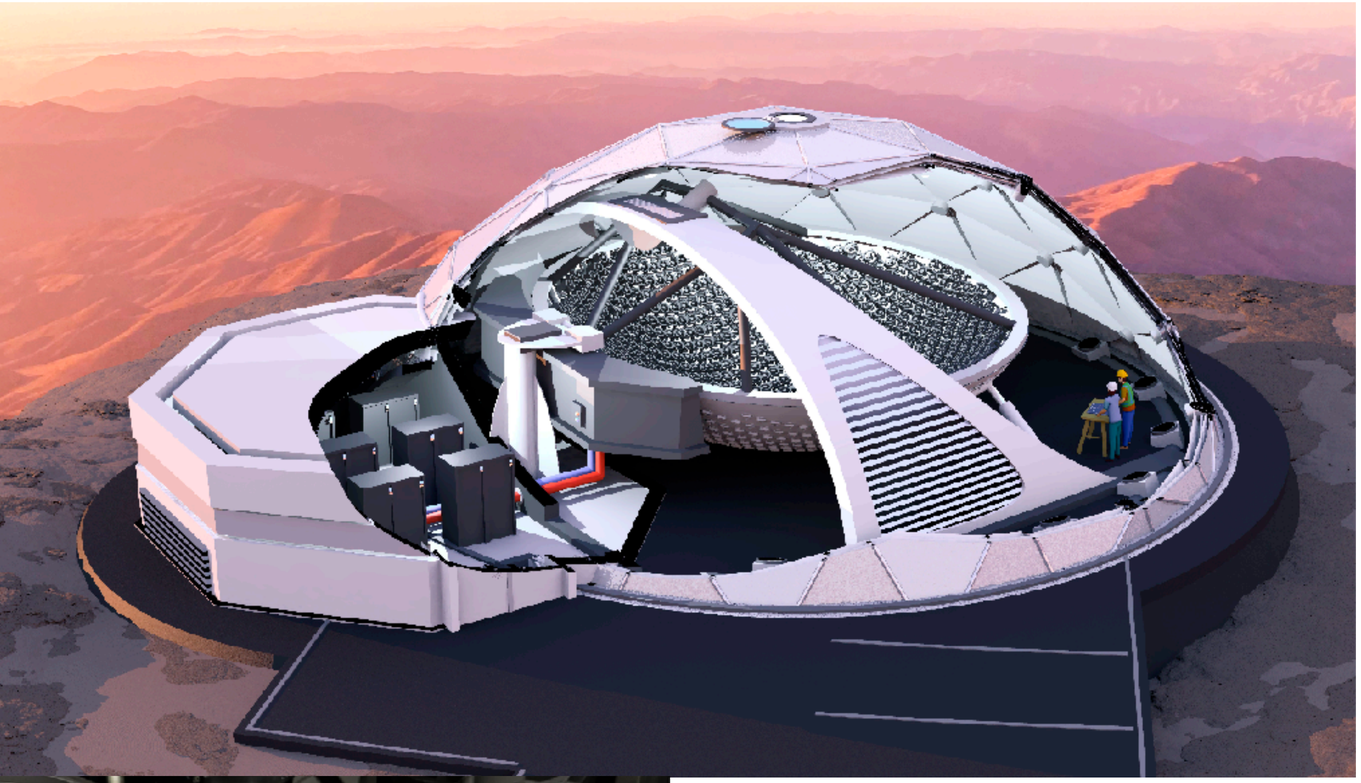
↳**m_g~23.6** every week

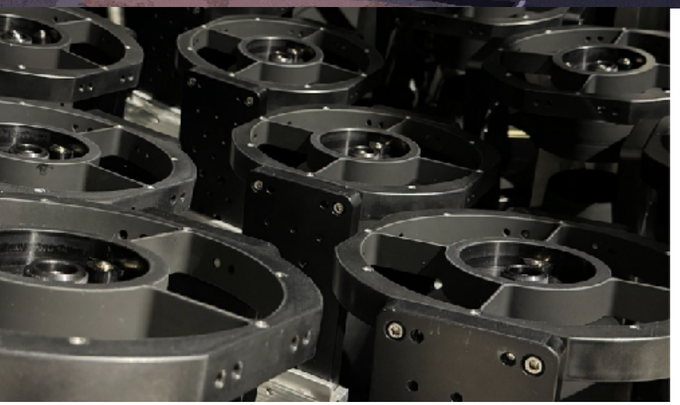
4.3 PB per night

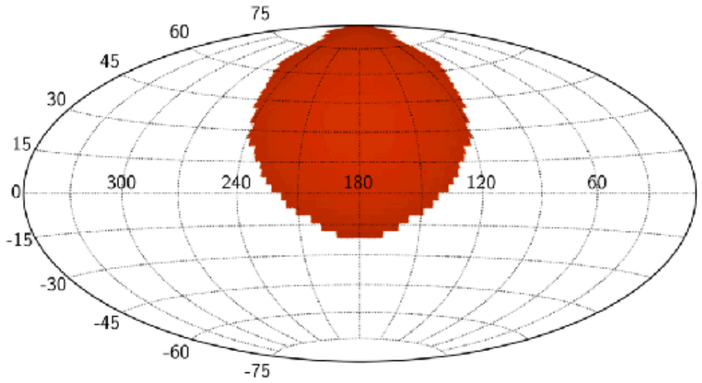
(only 145 TB at 30s cadence)

The Argus Optical Array

Argus Array







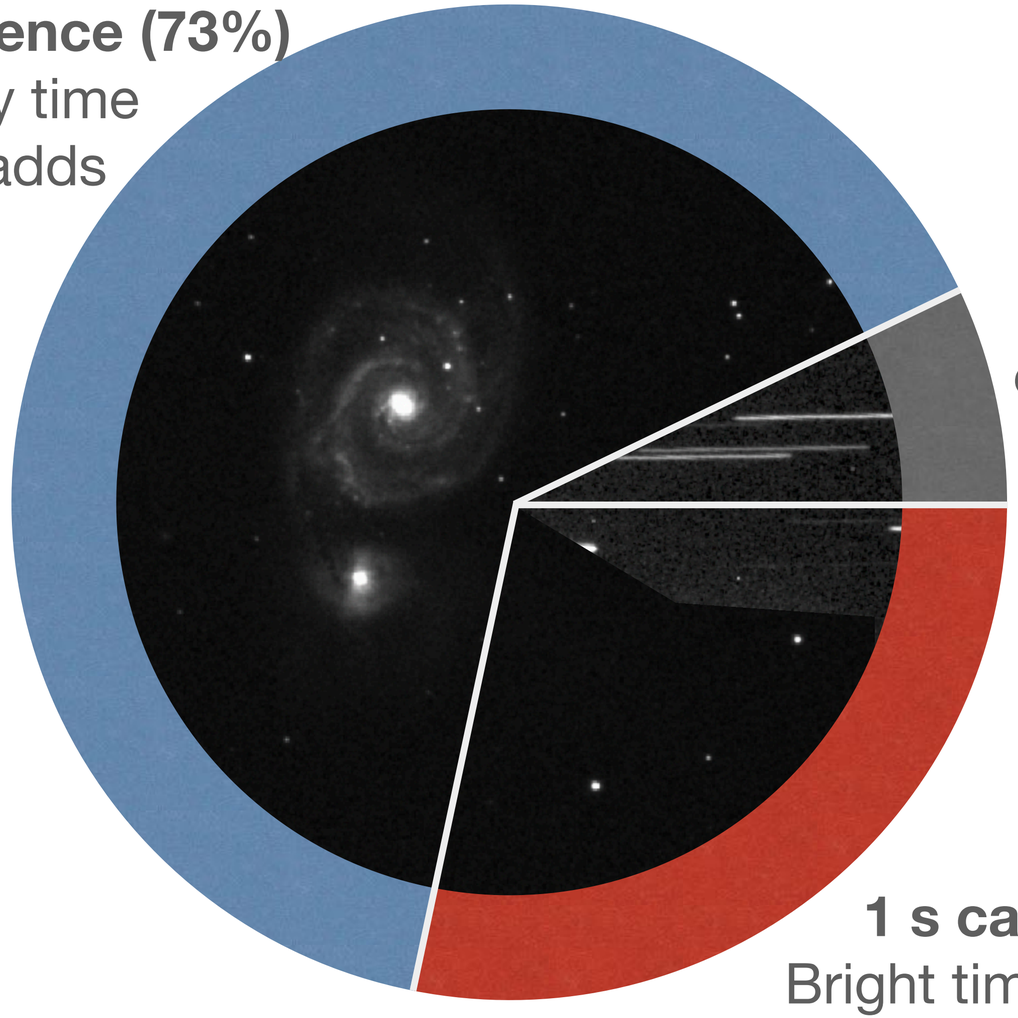
5m-class collecting area
55 GPix mosaic camera
7,916 sq. deg. FoV
1.4 arcsec per pixel

Fully funded for construction!

First light in ~2027

Observing Strategy

Argus Array



30 s cadence (73%)
Dark/grey time
Deep coadds

10 ms cadence (7%)

1 s cadence (20%)
Bright time

All-sky FoV means ~1 pointing is observable

Exposure time set to background limit in dark time (~30 s)

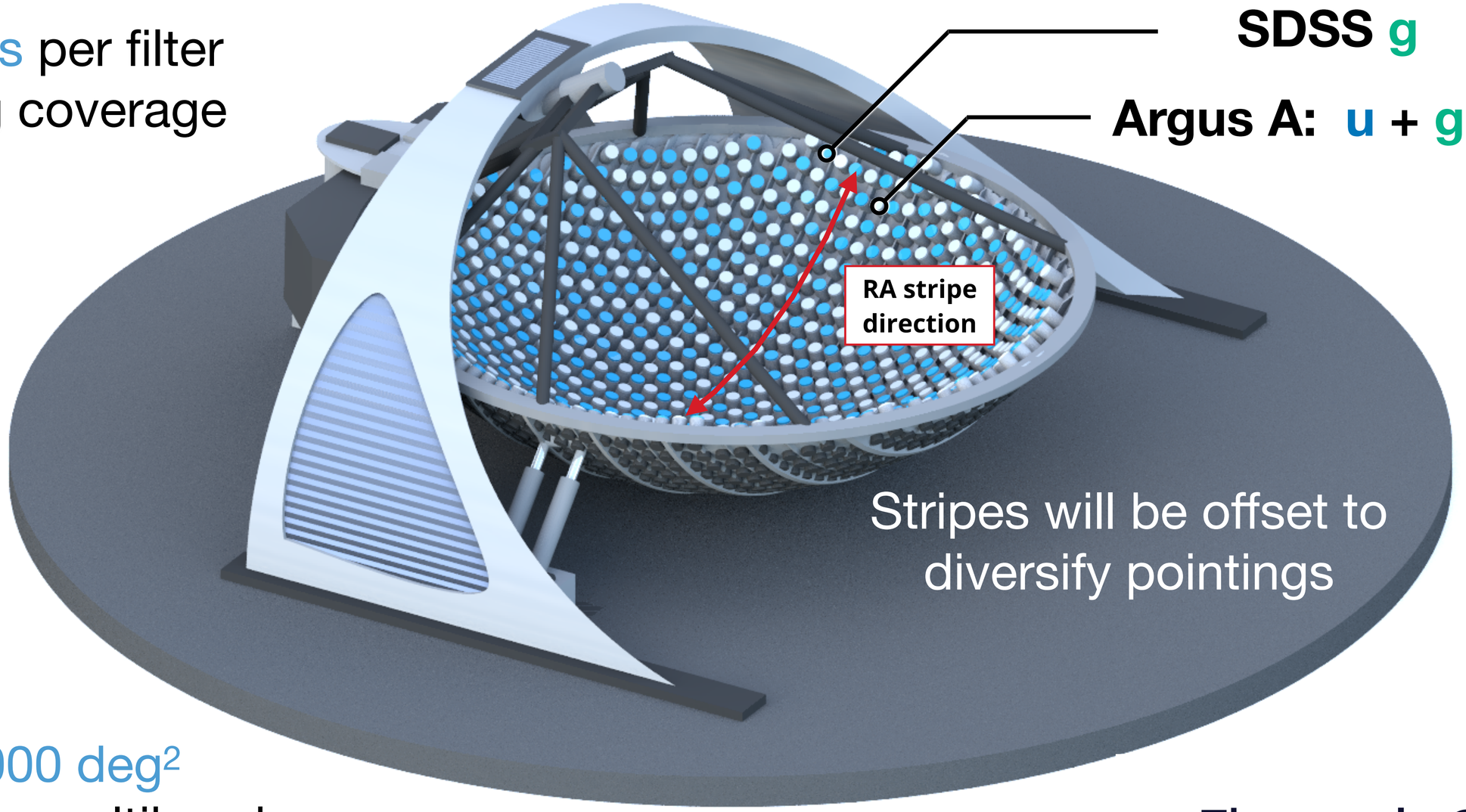
High-speed mode in bright time (1s)

Anti-sidereal exposures during slew back for 10 ms sensitivity (m_g~10, depending on duty cycle)

Observing Strategy

Argus Array

15-minutes per filter
alternating coverage



Up to 1000 deg^2
simultaneous multiband

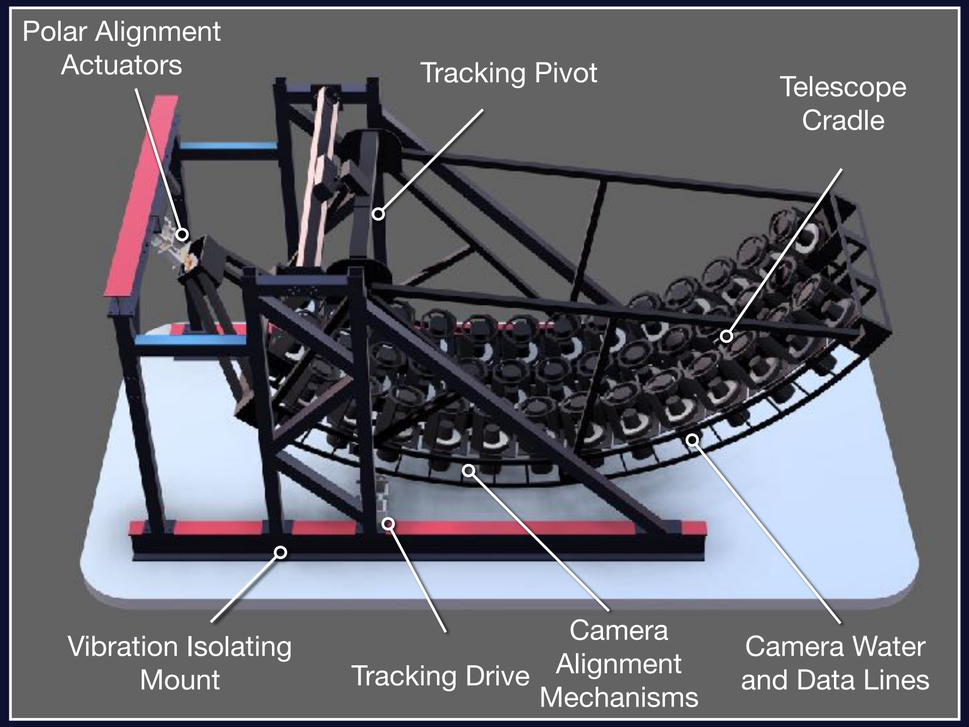
Three color?
g*, r*, i*

Phased Prototyping of the Argus Array

Argus Array

Evryscope South
24x 61cm
DSLR lenses

Argus Pathfinder
38x Planewave Argus-8
Commissioning

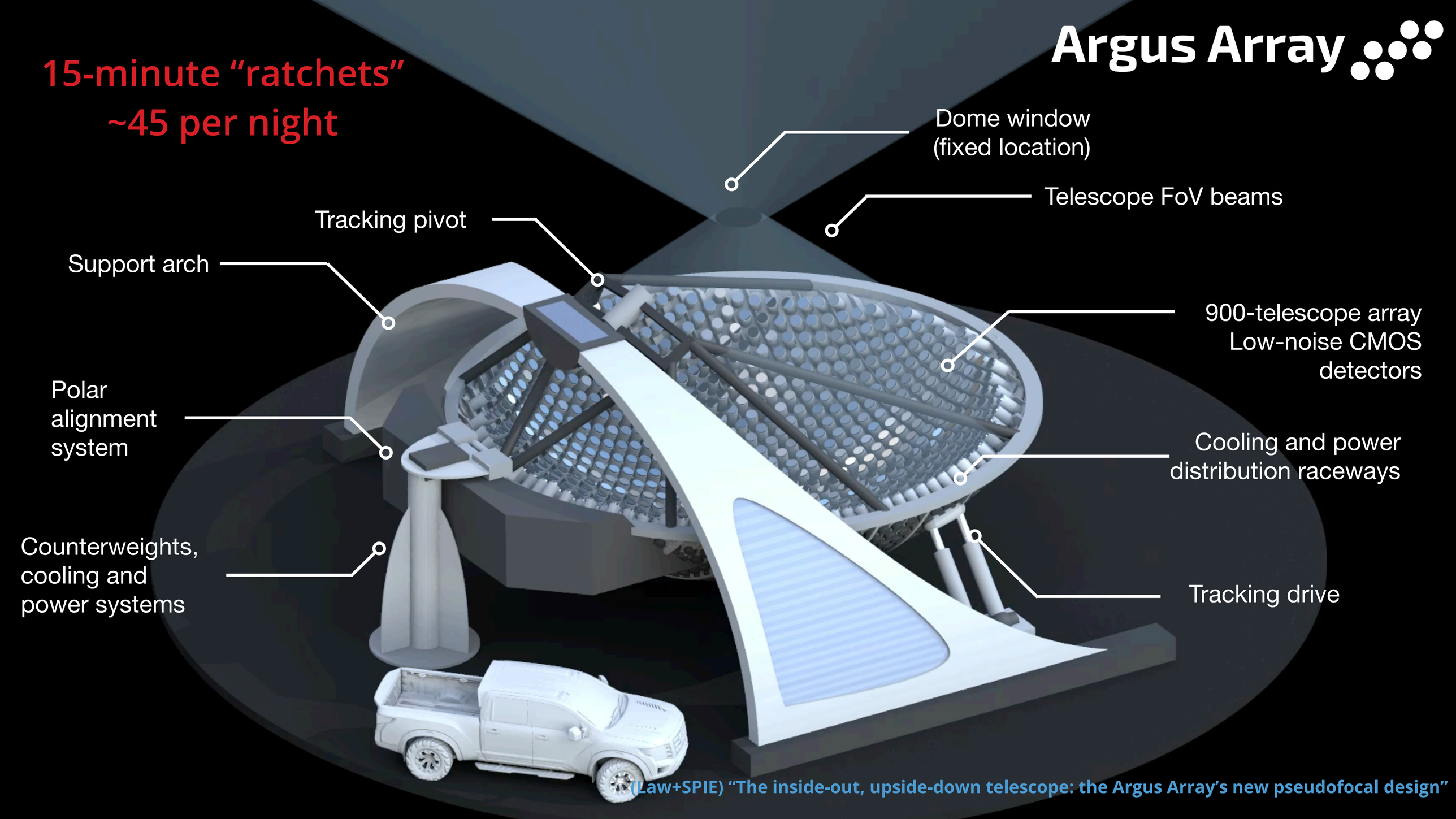


Argus Technology Demonstrator

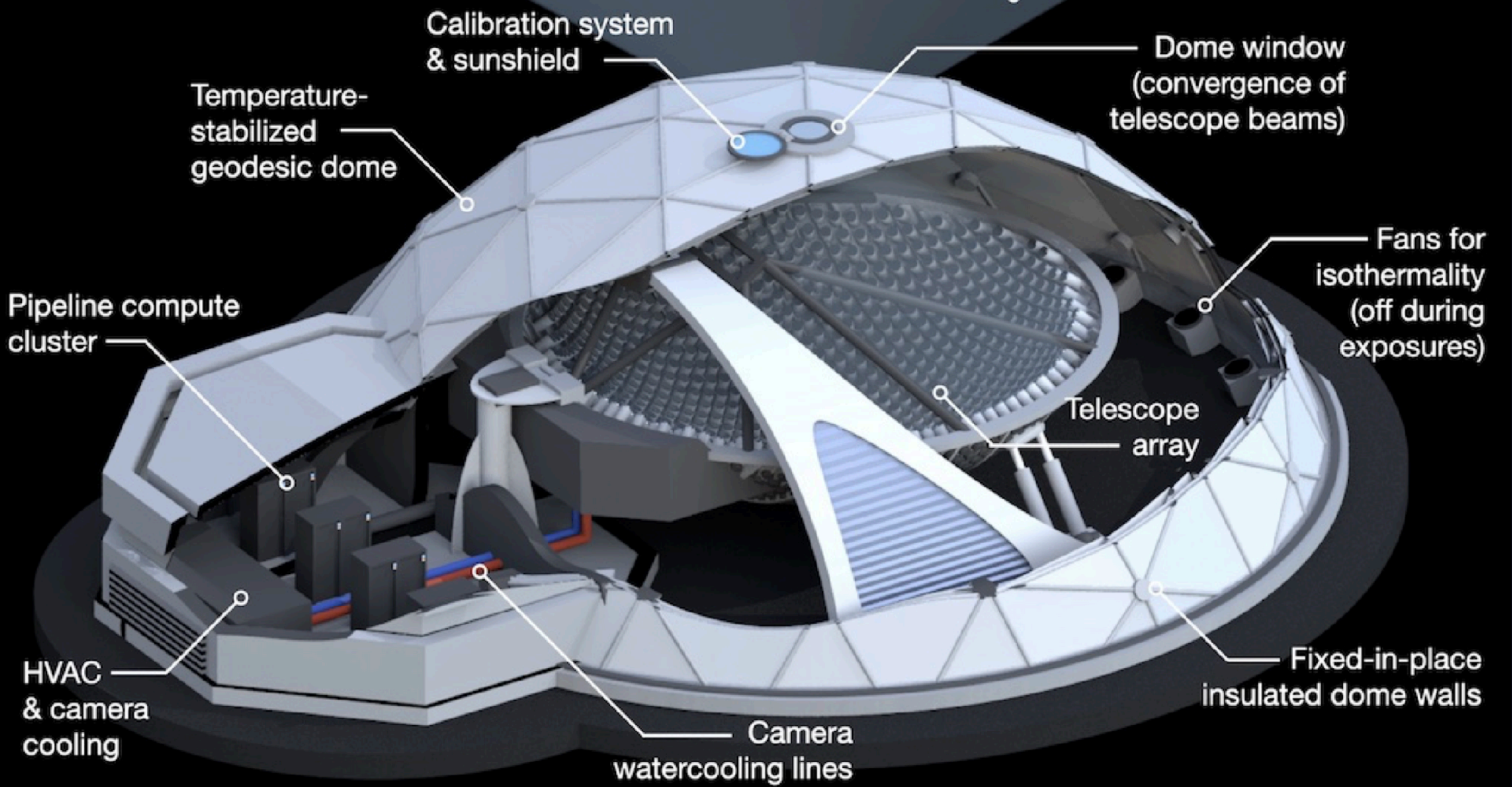
9x Celestron RASA8

Argus Array

15-minute “ratchets”
~45 per night

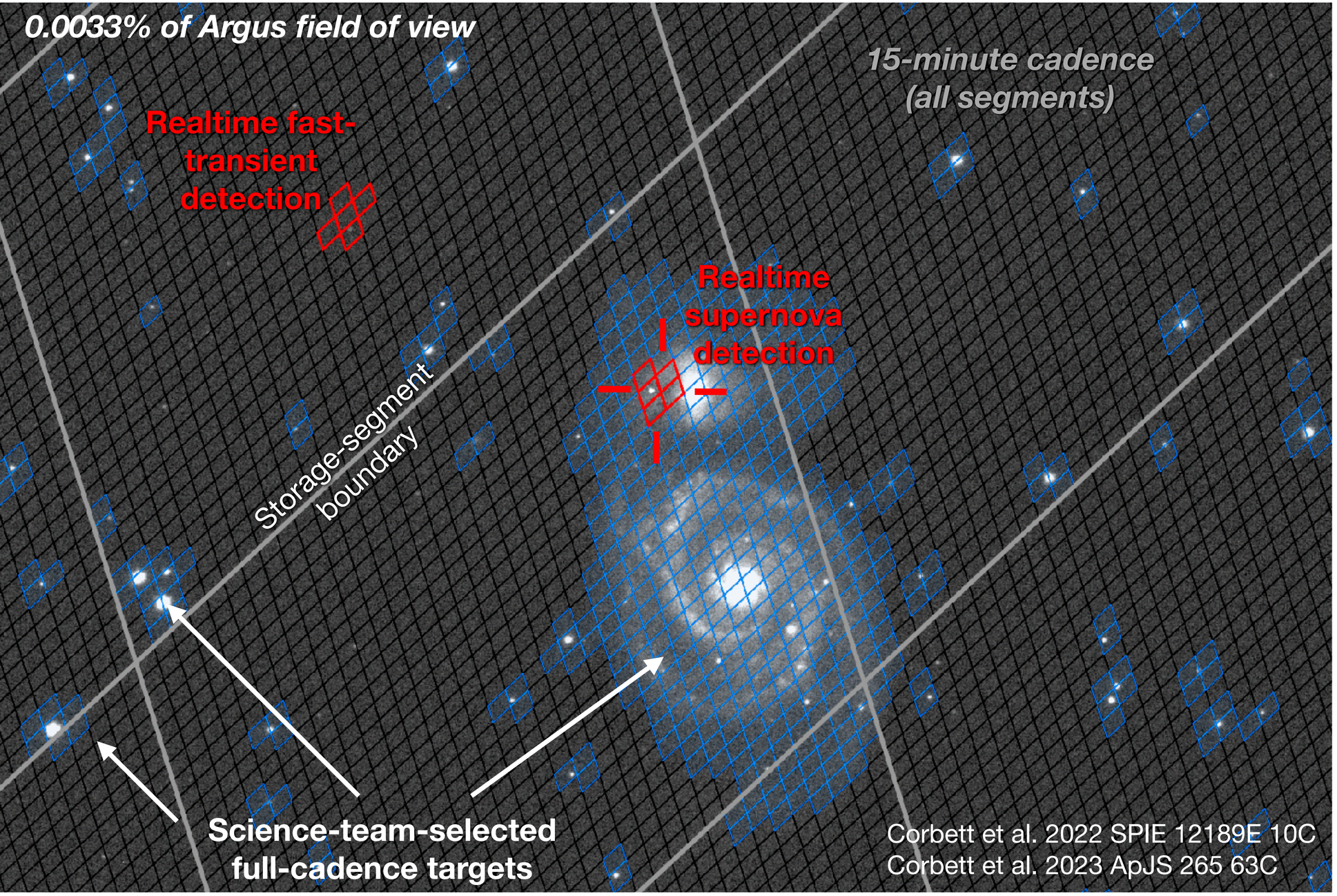


(Law+SPIE) “The inside-out, upside-down telescope: the Argus Array’s new pseudofocal design”


Calibration system
& sunshield
Dome window
(convergence of
telescope beams)
Temperature-
stabilized
geodesic dome
Fans for
isothermality
(off during
exposures)
Pipeline compute
cluster
Telescope
array
HVAC
& camera
cooling
Camera
watercooling lines
Fixed-in-place
insulated dome walls

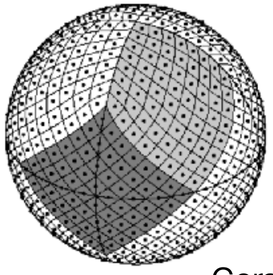
Argus segmented data analysis

Argus Array



Early calibration and image segmentation used for:

1. Storage downselect (~99% reduction)
   a. ‘Minipix’ flagged by AST or Pipeline
2. Analysis unit of work
   a. Image subtraction
   b. Photometry
   c. Coaddition

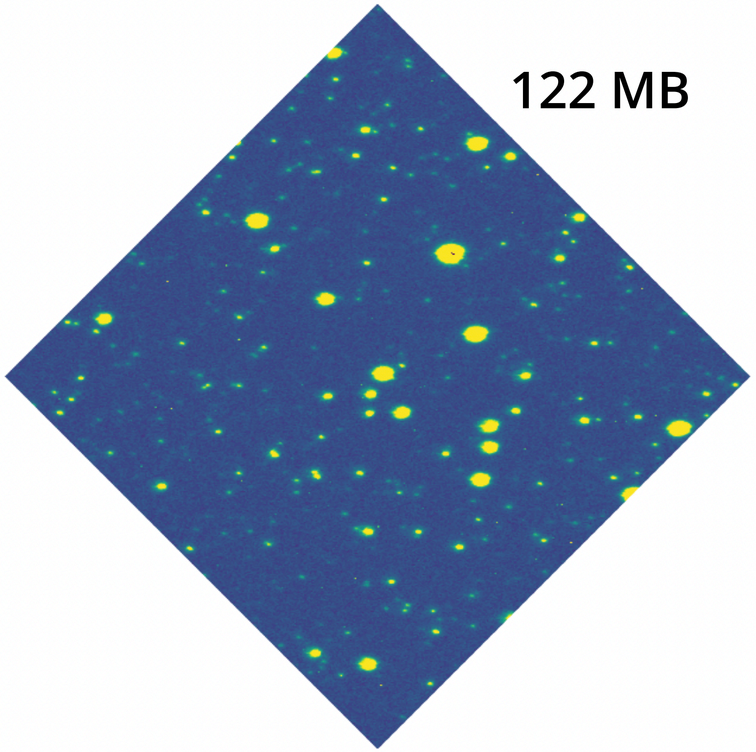


Gorski+2005

Compression Rates from Stamping

Argus Array

Segmented
Full-Resolution Image

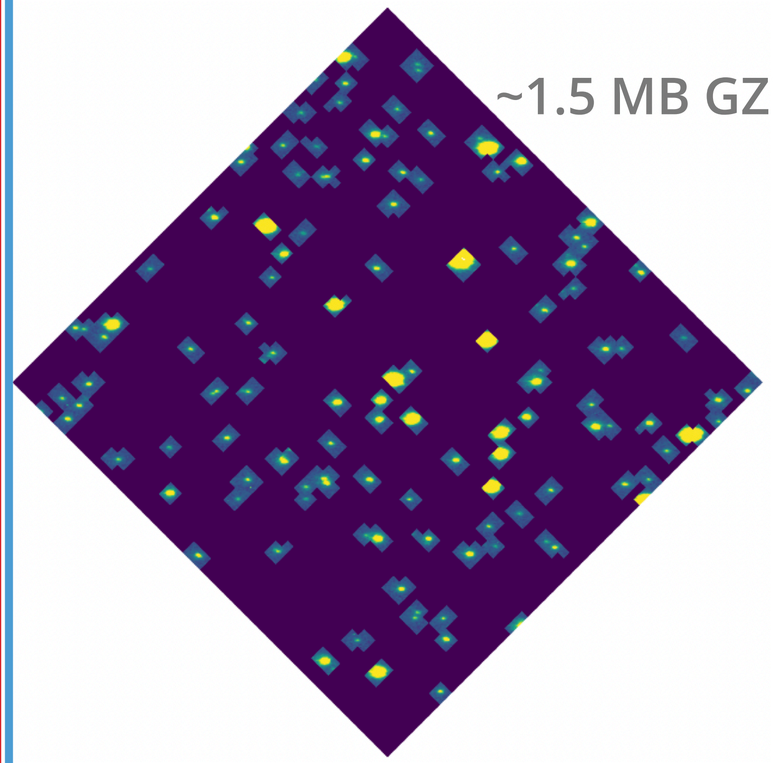


122 MB

Local cache (~5 days)

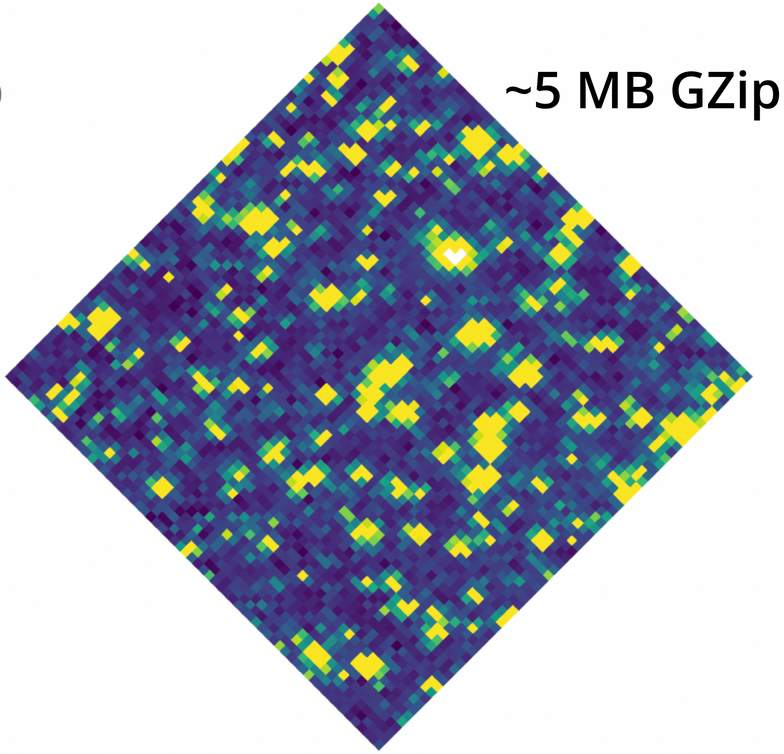
Science Team Access

Sparse
Full-Resolution Image



~1.5 MB GZip

Filled
Low-Resolution Image



~5 MB GZip

Long-term archiving and distribution (public!)

And full-resolution coadds (15-minutes+ cadence)

Public Data Release

Argus Array

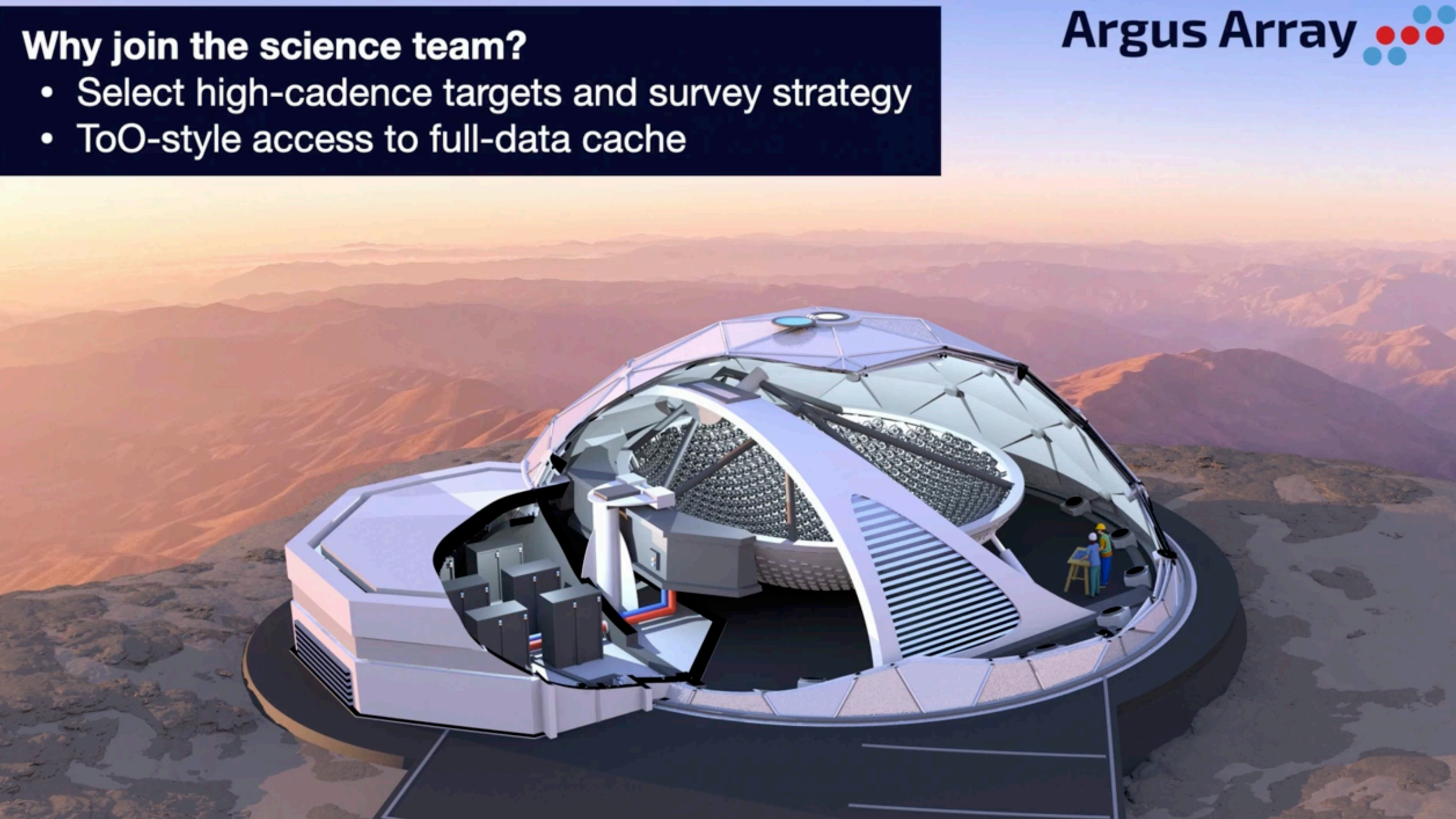
Argus mission: **public data infrastructure**

All long-term-storage Argus data products will be made public:

1. Transients and variables event stream (through community brokers)
2. 15-minute-cadence 8,000 sq. deg. images
3. Postage-stamp high-cadence targets
4. Light curves

Public accessibility via programmatic interface

Why join the science team?

- Select high-cadence targets and survey strategy
- ToO-style access to full-data cache

Argus Array