SkyMapper

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Outline

- 1, The SkyMapper Telescope
- 2, Southern Sky Survey Design
- 3, Science Goals

1, The SkyMapper Telescope

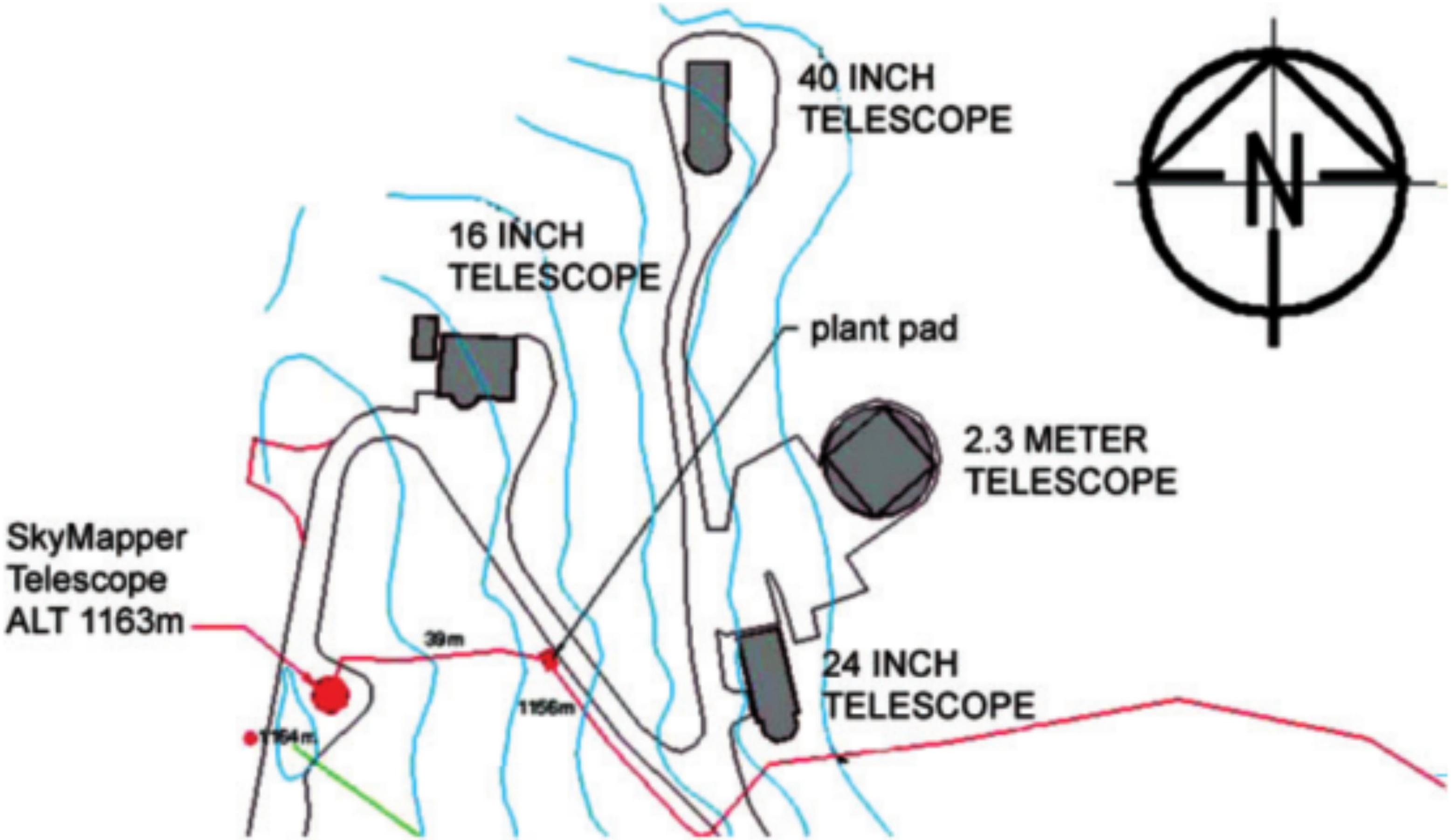


Figure 1 Plan of the SkyMapper site on Siding Spring Mountain.

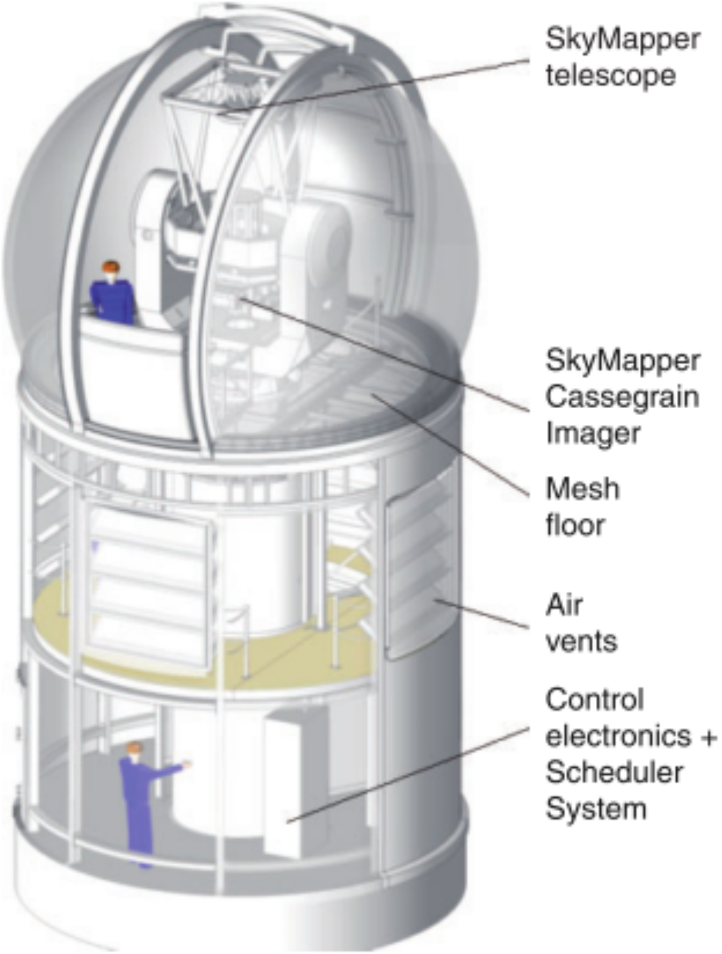


Figure 2 The SkyMapper enclosure.

6.5m in diameter
11m high
3 internal levels

The weather show little seasonal variation.
2110 hours of the time useable per year.
68% of the time the seeing is less than 1.75 arcsec.

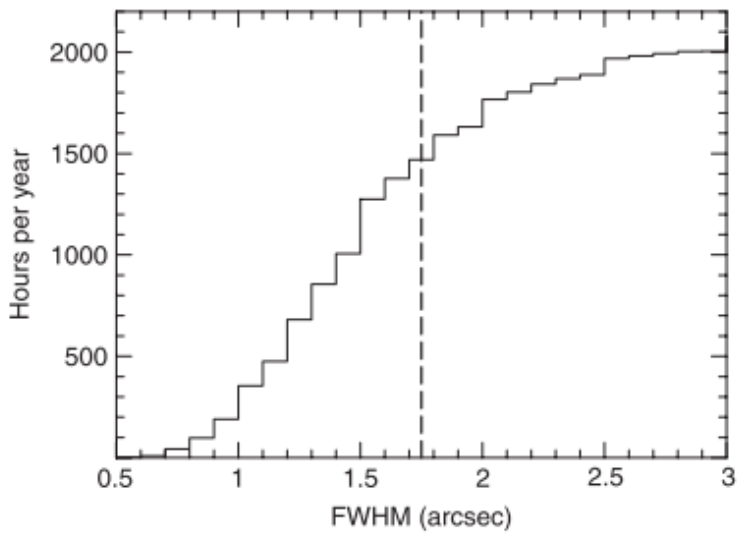


Figure 3 Seeing at Siding Spring derived from logs of the AAT.

SkyMapper Optical Design

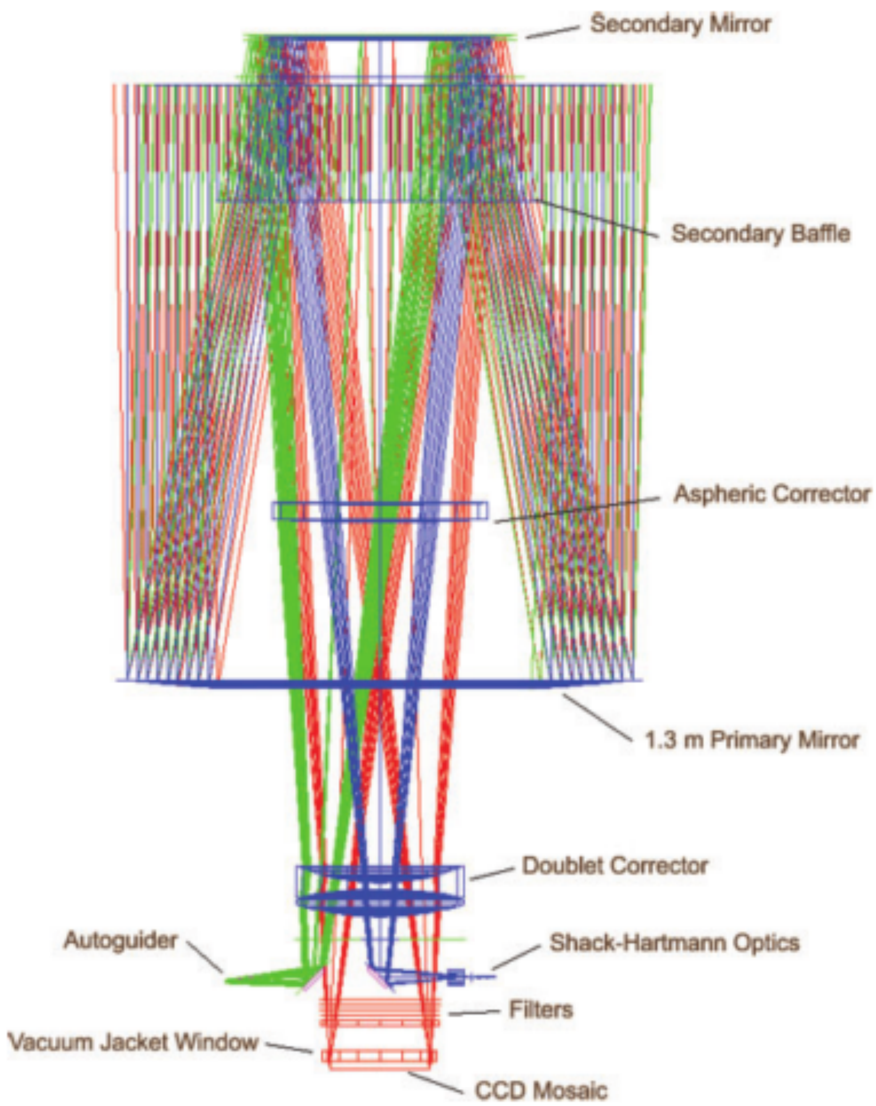


Figure 4 SkyMapper optics.

1.33m primary mirror
0.69m secondary mirror
an unobstructed aperture of 1.13m

The telescope is a modified Cassegrain design, optimized for wide-field operation between 340 and 1000 nm.

The SkyMapper Imager

Table 1. SkyMapper Imager parameters

Telescope working *f*-ratio	*f*/4.7878
Telescope focal plane scale	0.0302 mm $arcsec^{-1}$
Detector pixel projection	0.5 arcsec pix^{-1}
Number of pixels in mosaic	268 435 456
Mosaic dimensions	256.34 × 258.75 mm
Mosaic field of view	2.373° × 2.395°
Mosaic fill factor	91.05%
Sky coverage w. fill factor	5.68 deg^2

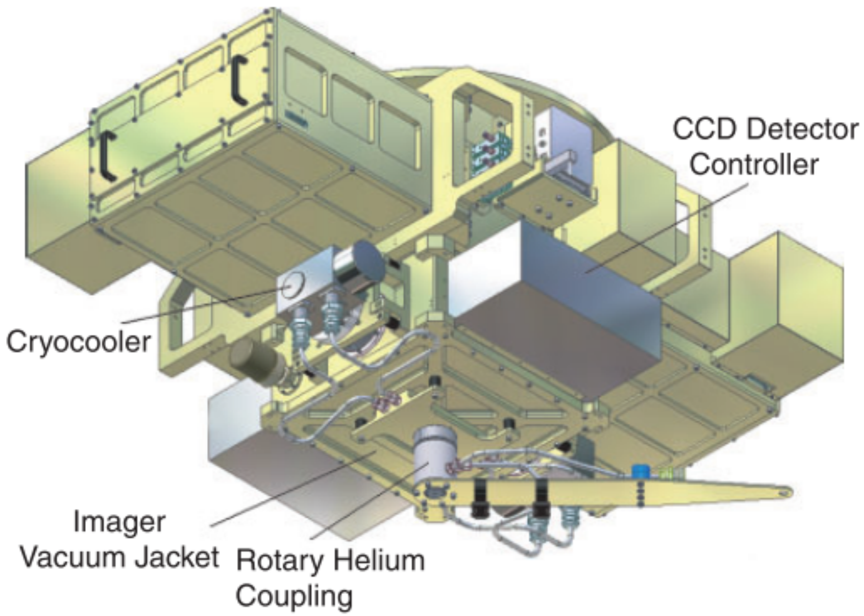


Figure 6 The SkyMapper Cassegrain Imager as seen from below.

4×8 array of E2V CCD 44-82 detectors.

Each detector has $2048 \times 4096, 15um^2$ pixels.

Excellent quantum efficiency from 350 to 950 nm, near-perfect cosmetics and low-read noise.

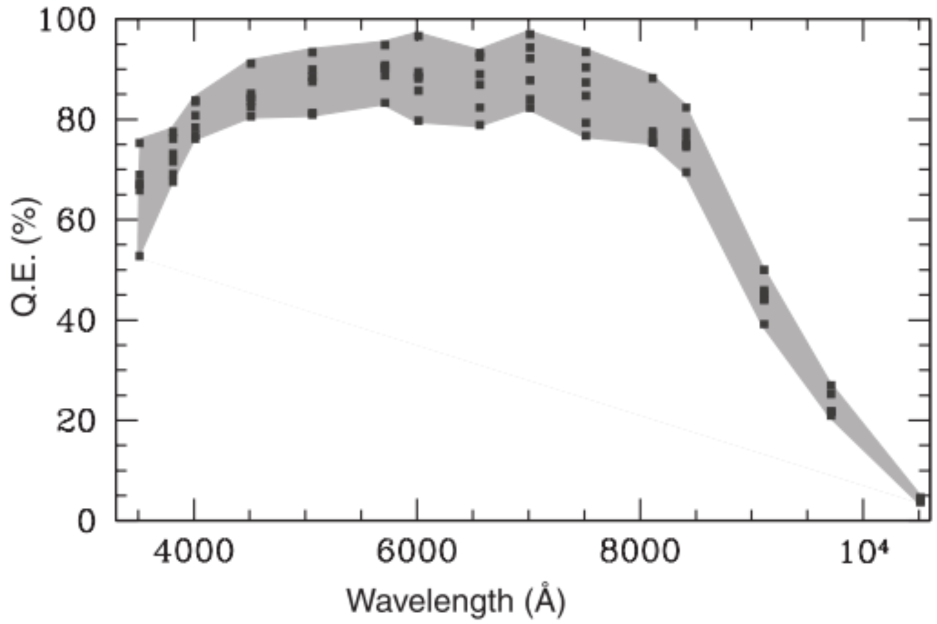


Figure 8 The spectral response of SkyMapper science CCDs. The shaded area encloses the minimum and maximum measured response for a set of six devices.

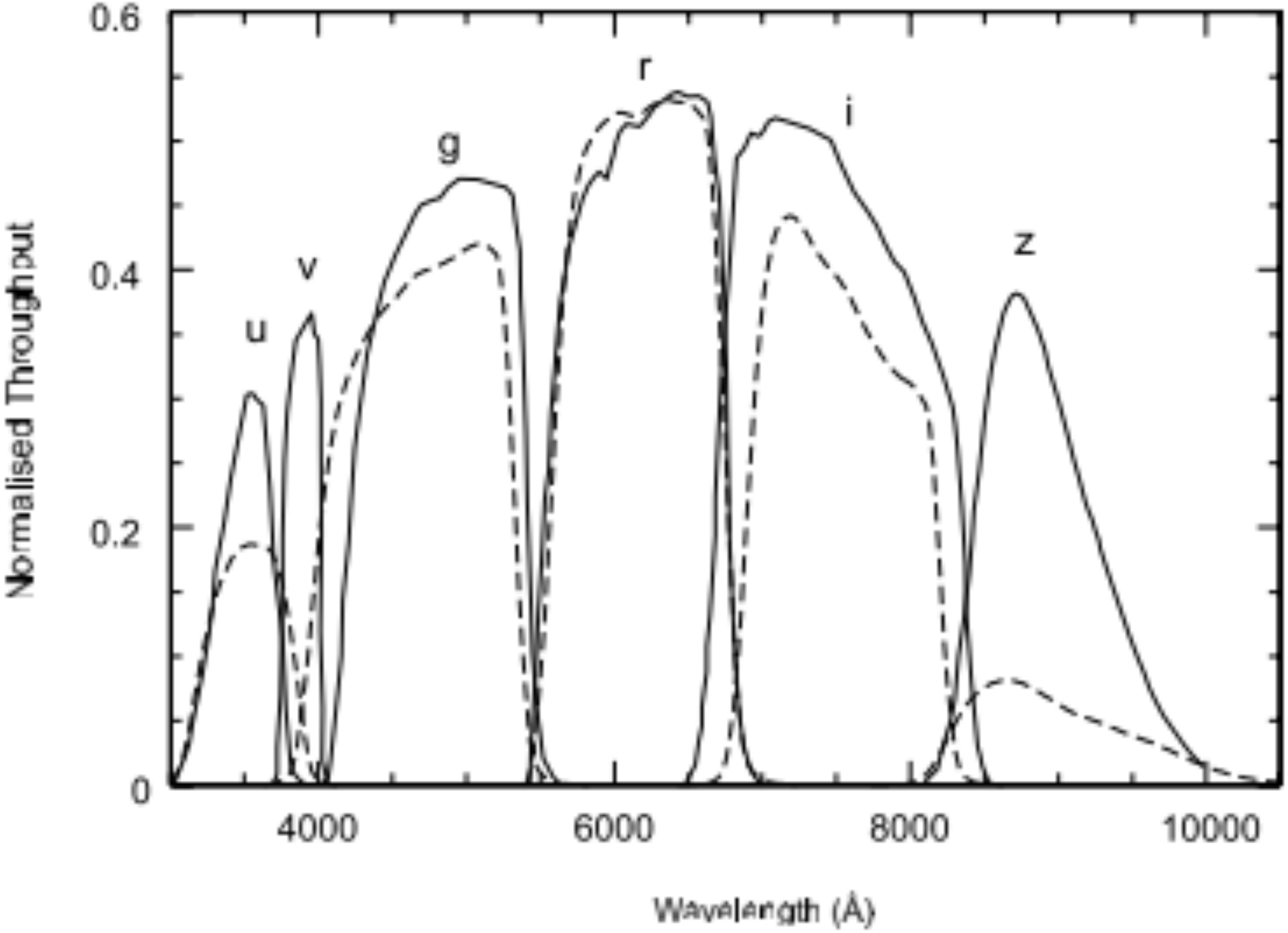
2, Southern Sky Survey Design

- The primary scientific goal is to perform the Southern Sky Survey, a six-colour and multi-epoch photometric survey of southerly 2π steradian. (2014-2019)

Table 4. SkyMapper filter pass bands

Filter	50% Cut-on edge (Å)	50% Cut-off edge (Å)	FWHM (Å)
u	3250	3680	430
v	3670	3980	310
g	4170	5630	1460
r	5550	7030	1480
i	7030	8430	1400
z	8520	9690[A]	1170[A]

[A] *z* filter is unblocked at red end, the red edge is limited by the CCD sensitivity cut off in the near-IR.



0.6
0.4
0.2
0
Normalised Throughput
u
v
g
r
i
z
4000
6000
8000
10000
Wavelength (Å)

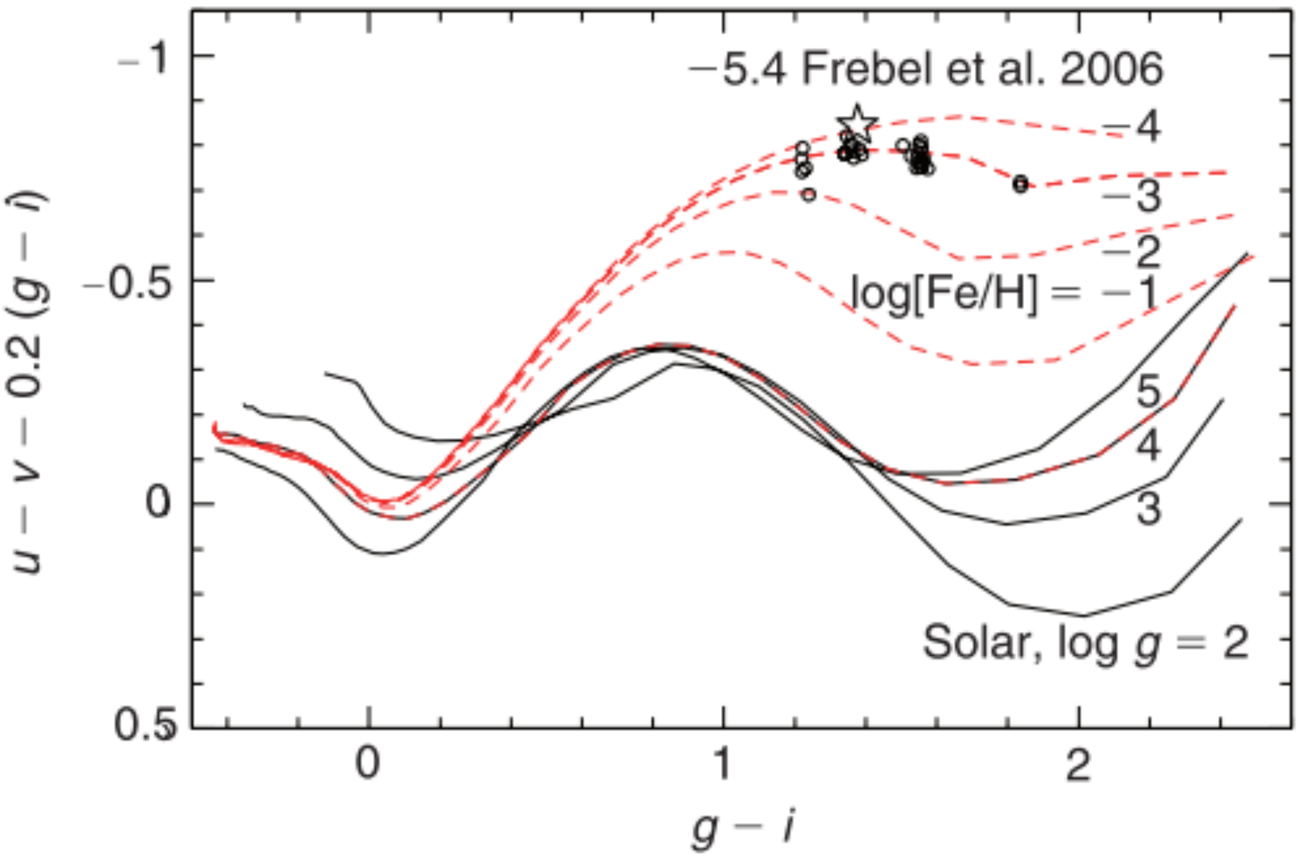
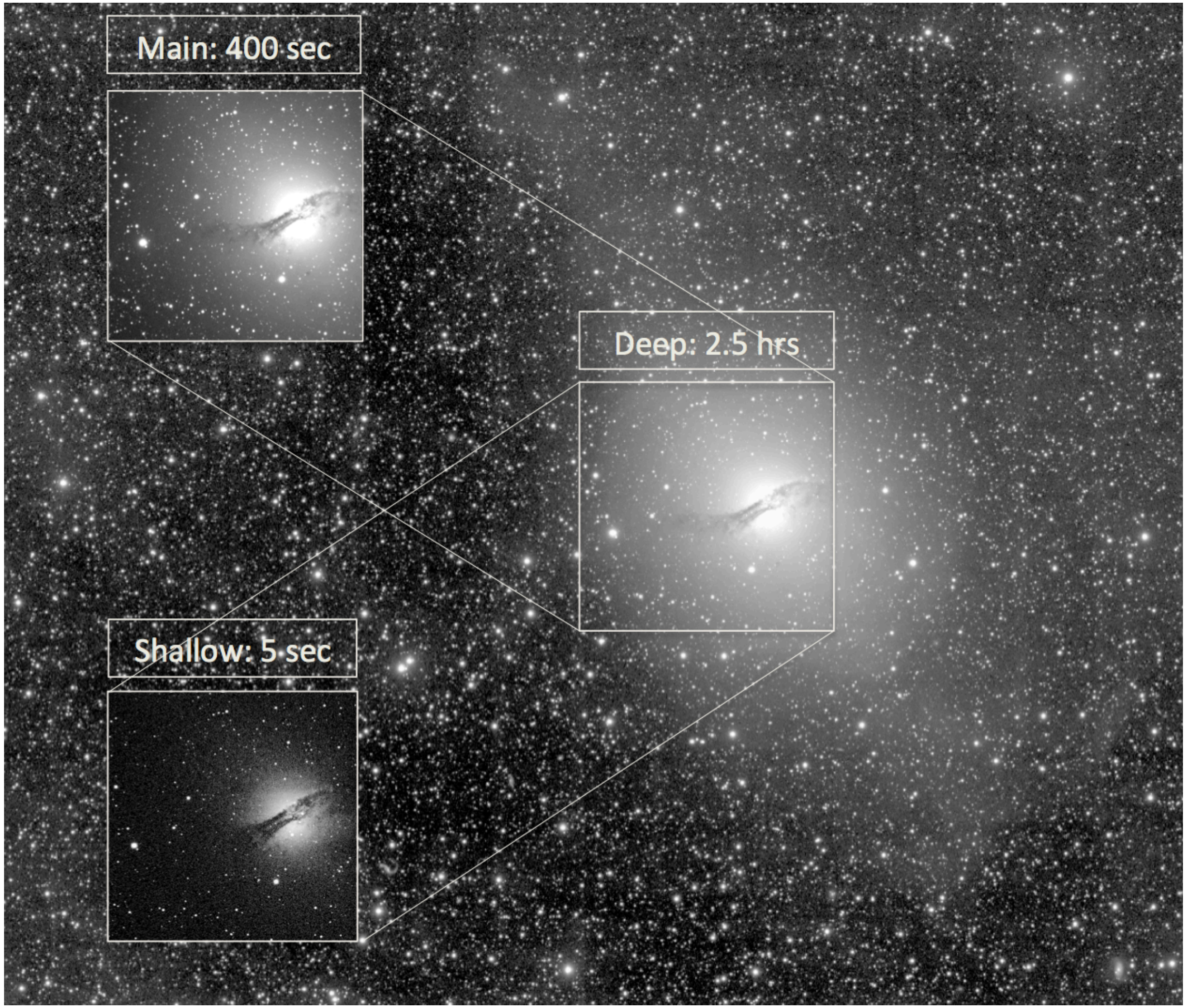


Figure 13 $v - g$ vs. $g - i$ for stars of solar metallicity and a range of surface gravity (solid lines) and for $\log g = 4$ and metallicities to $[Fe/H] = -4$. Overlaid are the computed colours of HE1327–2326 (Frebel et al. 2005) and the sample of extremely metal-poor stars from Cayrel et al. (2004).

- Shallow Survey with a short exposure time
- Main Survey with longer exposures.

This *g*-band image in the field of the nearby galaxy Centaurus A shows how sensitivity changes from the Shallow Survey (5 sec exposure) over the Main Survey (4x100 sec exposure) to deeper data dedicated to specific work.

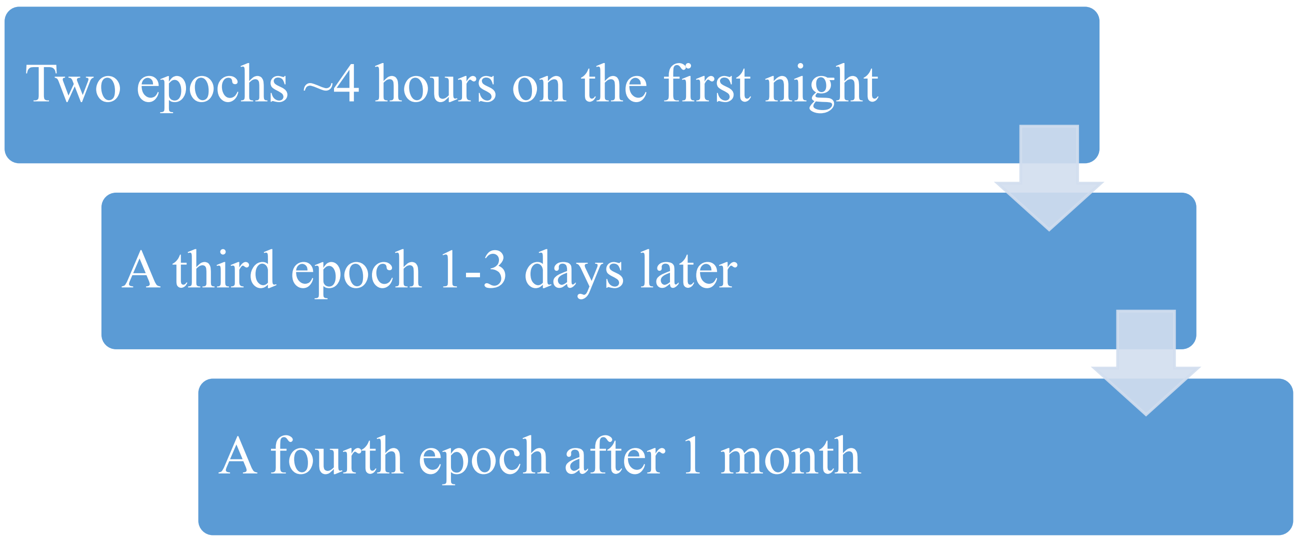


3, Science Goals

3.1, What Is the Distribution of Solar System Objects Beyond Neptune?

---- quiescent comet-like objects

---- Trans-Neptunian Object (TNO)



3.2, What Is the History of the Youngest Stars in the Solar Neighbourhood?

- Unobscured and close to the Sun,
- High resolution imaging of protoplanetary disks with Spitzer, SOFIA…
- How stars and planetary systems form.

3.3, What Is the Shape and Extent of the Dark-Matter Halo of Our Galaxy?

- Visible dynamical tracers: RR Lyrae stars

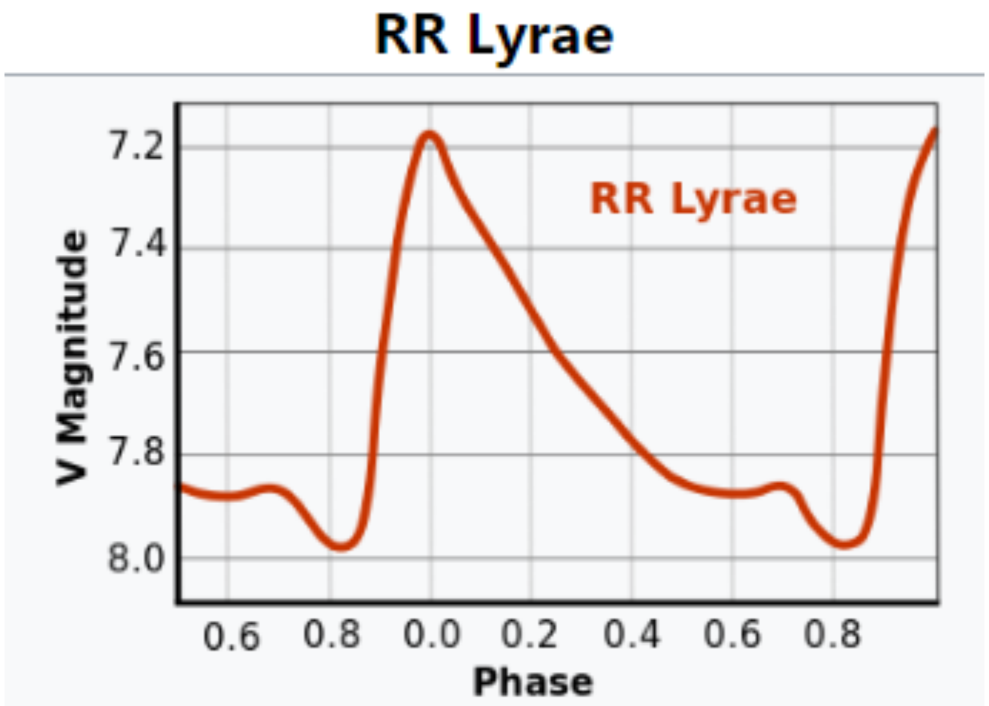


Illustration of the typical light curve for RR Lyrae.

3.4, Extremely Metal-Poor Stars: How Did Our Galaxy Evolve?

- Using metallicity as a proxy for age, the most metal-poor stars are candidates for the first generation of stars.

3.5, High-Redshift QSOs: When Did the First Stars in the Universe Form

3.6, Non-Survey Science

- Planetary transits:

- Supernovae: use time that does not meet the survey's seeing.

  ---- Coverage 1250 deg^2 of sky

  ---- 100 SN Ia to z<0.085 per year

Latest Data Release

DR1.1

Jun 6, 2017
Updated Dec 13, 2017

20,200 deg^2
285,159,194 objects
66,840 exposures
2.1 billion detections
Matched against 2MASS, AllWISE, APASS, Gaia, GALEX, Pan-STARRS1, and UCAC4

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