

# DECam Status and Future

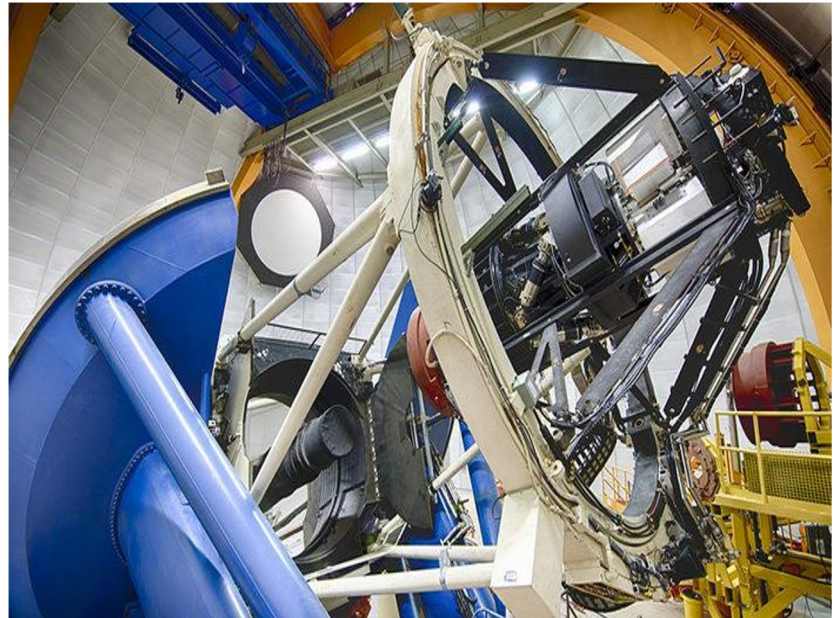
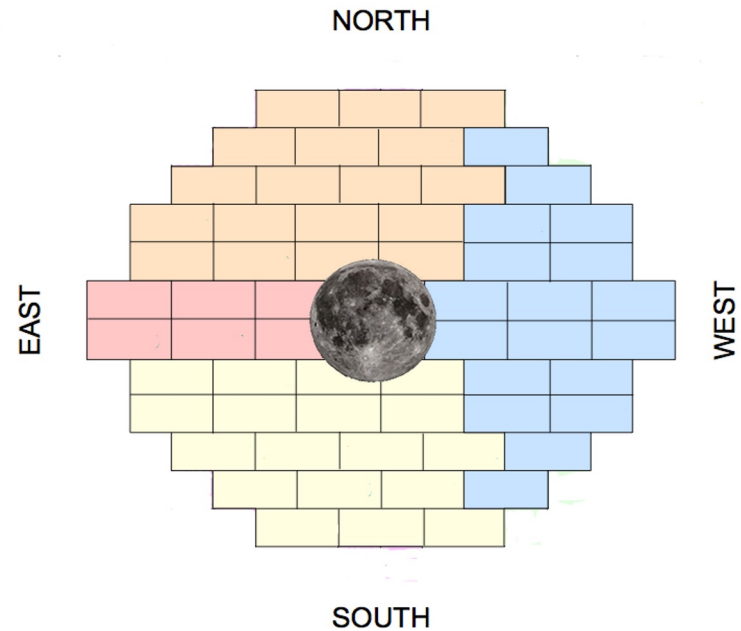
Alistair Walker

DECam Instrument Scientist

NOIRLab/MSO/CTIO

# Dark Energy Camera

- 570 Mpixels
- 62 science CCDs, red optimized
- 8 AOS CCDs, 4 Guide CCDs
- 0".263 per pixel
- FOV: 2.2 deg, 3 deg<sup>2</sup>
- Blanco 4m telescope
- 8 filters mounted
- Active Optics System
- LN2 closed-cycle cooling
- Monsoon Controllers



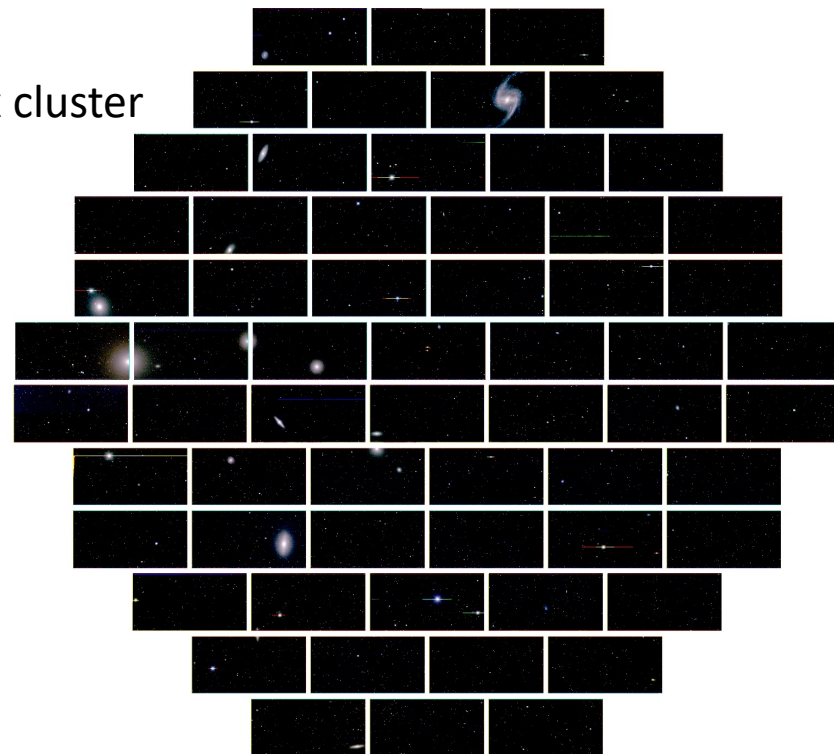
# DECam at 10 years (Exactly!)

- On-sky commissioning began the night of September 11 2012
- Since then we have taken a million exposures (on sky + calibrations)
- Approx 2 years of shutter-open time

filter | total exposure (hr)

filter	total exposure (hr)
all	16842.15
g	3393.94
i	3177.24
r	3140.43
z	2979.86
VR	1426.94
u	886.29
Y	748.20
N964	361.04
N662	226.93
N673	169.66
N540	144.55
N708	89.11
N501	52.79
N419	42.08

Fornax cluster

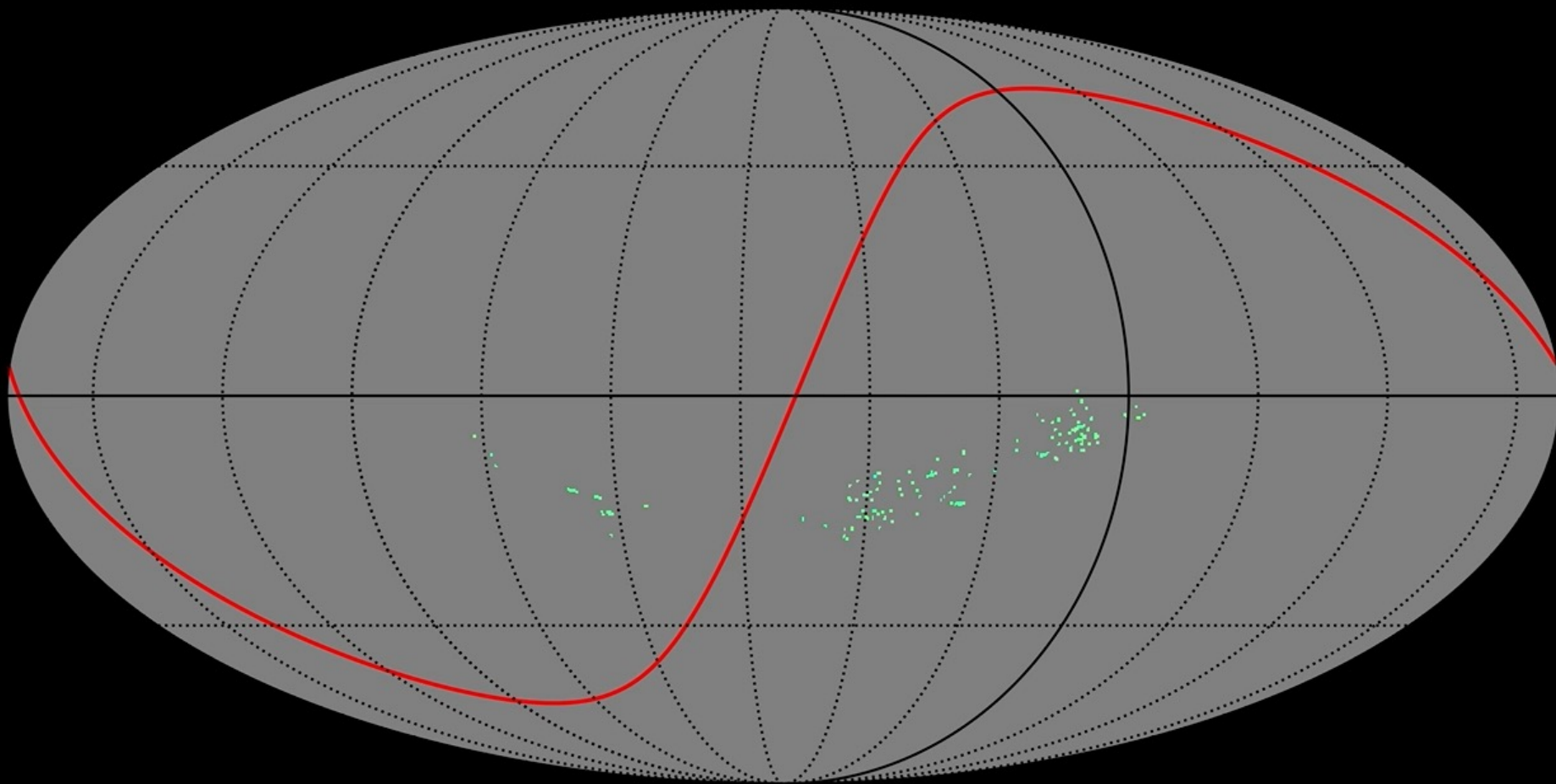




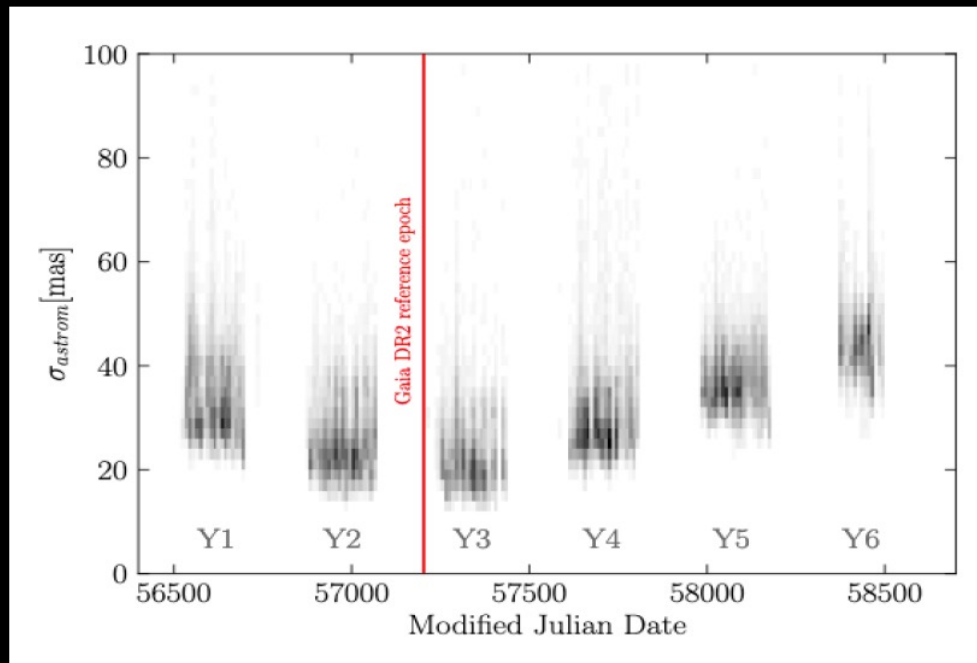
By Marcelle Soares-Santos & Huan Li

# NOIRLab Source Catalog

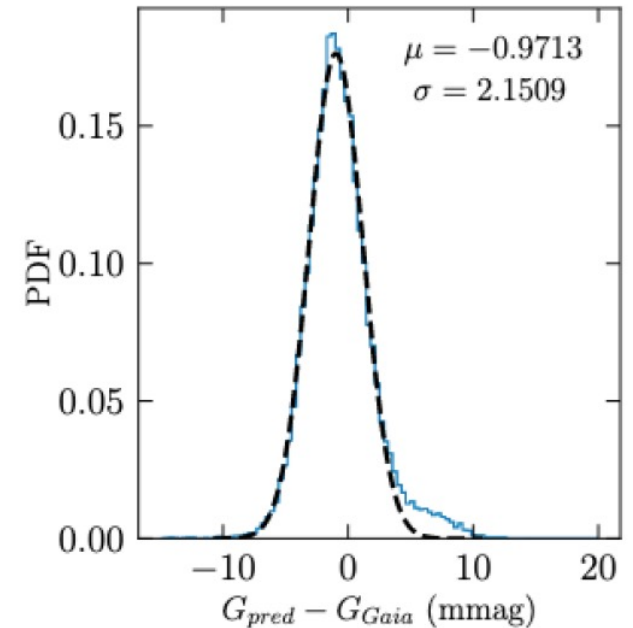
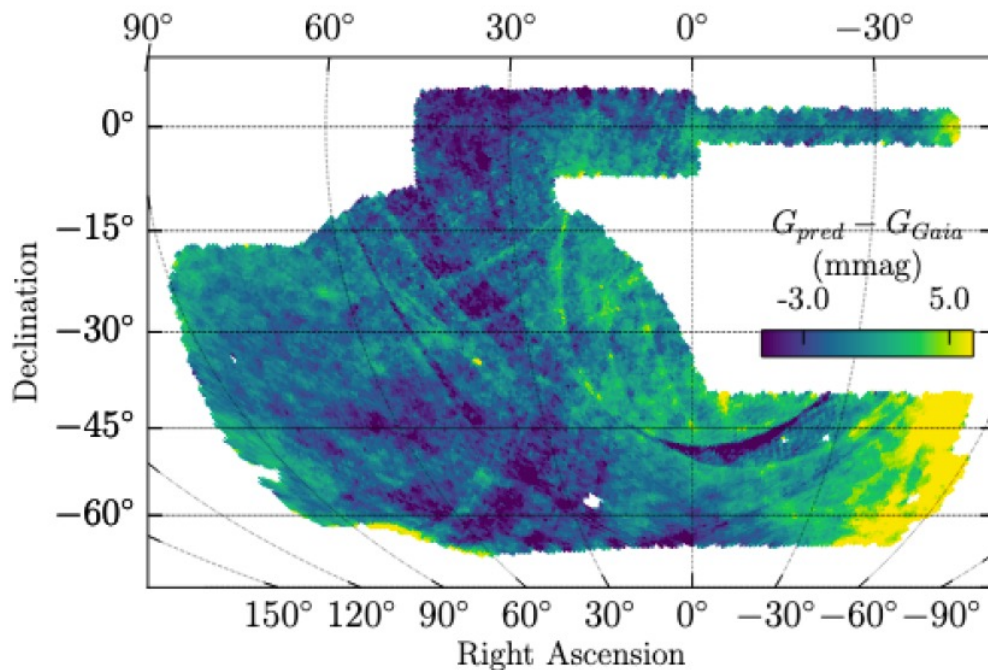
2004



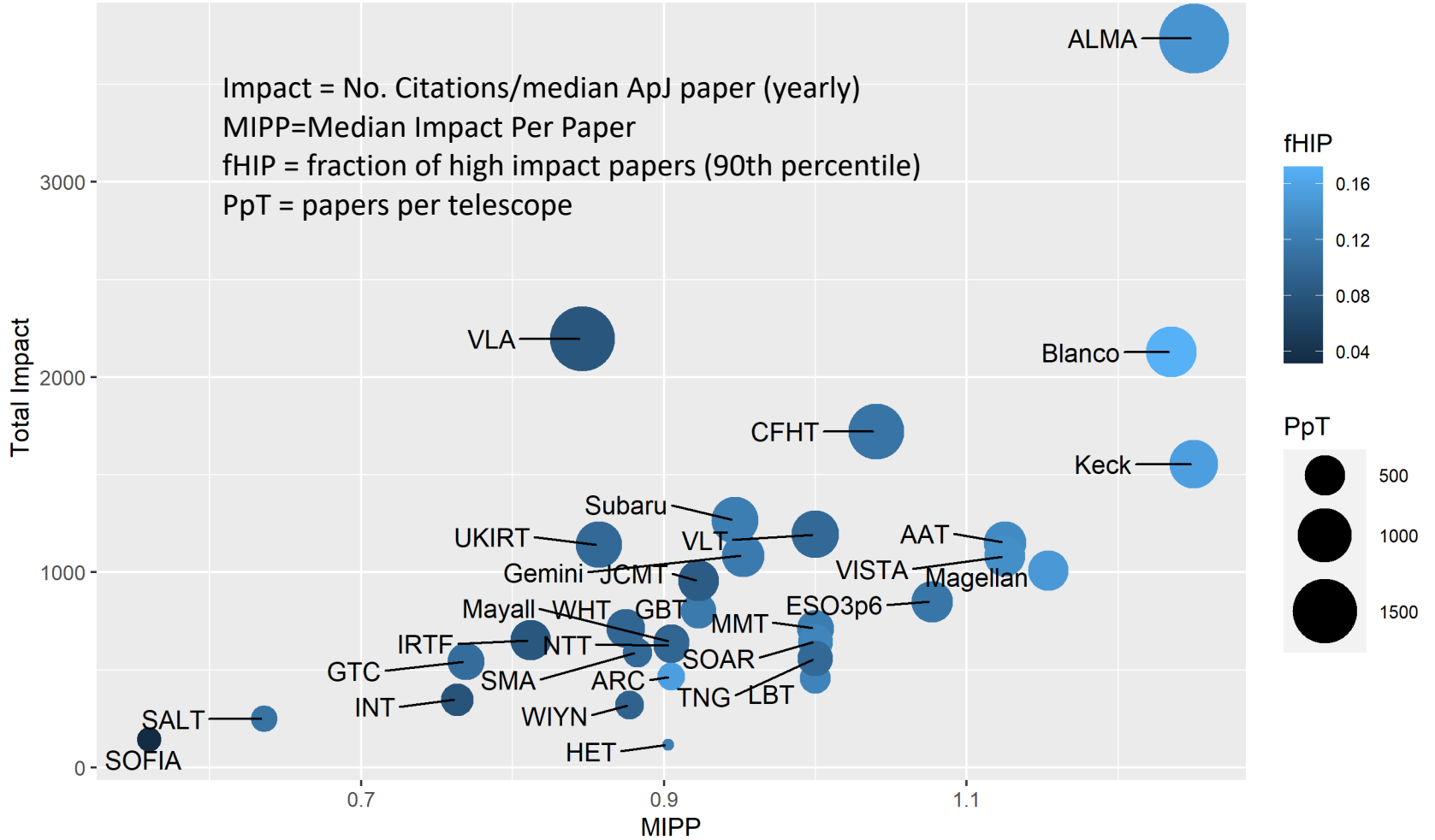
Astrometry ->



Photometry  
↓



### Overall Performance (per Telescope)



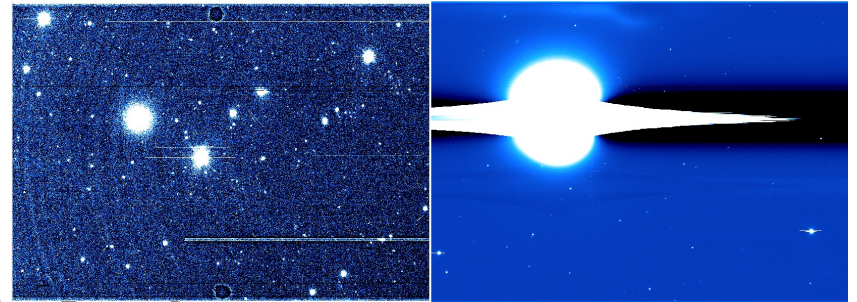
# DECam Operations

- The Blanco telescope is presently scheduled with DECam (at prime focus) and COSMOS (at F/8)
- We support remote observing (only, at this time).
  - The observing is often in units of half-nights, which helps to optimize sky brightness with the observing programs.
  - The DECam user interface is set-up for handling remote observing, multiple programs per night – which enables target of opportunity efficiently
  - Multi-telescope connections are coming to Blanco – AEON talk by Cesar Briceno
- DECam data operations:
  - DECam data flows to Tucson, where it is run through the Community Pipeline and then into the Science Archive
  - Arrangements can be made for rapid (raw) data access



# DECam CCDs and Filters

- CCDs
  - One science CCD (N30) has very low full well and is not used, another (S7) has one amplifier (half of the CCD) unstable and non-linear. The Lazarus CCD (S30) is still alive.
  - We do not plan to open the Imager dewar and service the focal plane unless we lose “more” CCDs, or there is a serious cryovac or electronics issue.
- We now have 14 filters: the original u,g,r,i,z,Y, plus VR, N419, N501, N540, N662, N673, N708, N964
  - Asahi have made 13 of these filters, and Materion one.
  - ~\$100K each. We have just ordered a 395/10 (Call H+K) filter, due by the end of the year
  - Operational issues – 8 filters installed, filter swaps no more than once per month.



# DECam – now in mid-life

- We are very conscious that the Blanco telescope is over 40 years old
  - We are working to replace/spare the critical – and now generally custom - components such as the big motors, encoders – for telescope and dome
  - Systems such as the TCS, mirror support control etc are updated/replaced on Typically ~ decade time scale.
  - Facility supplies – air, glycol, AC. Electricity – all need attention and regular upgrades/replacement
  - Regular maintenance!
- DECcam itself is a complex instrument
  - with a many-component LN2 cooling system, 17 vacuums in total
  - And many moving parts (filters, shutter, hexapod, various pumps, cryo-coolers, chillers)
  - 32 computers, software mostly frozen, but some parts poorly documented
  - 74 CCDs and associated electronics.
  - The maintenance plan is designed to support several more years of service
  - We are attending to some obsolescence issues e.g. computers
  - Replacement of LN2 lines, LN2 pump issues, hexapod driver failure, AOS woes...

# Looking forwards

- Blanco 4m telescope + DECam remains a highly effective combination as we move into the era of Rubin/LSST
- NOIRLab plans to keep supporting DECam for several more years
- We expect to start using NEWFIRM (IR Imager, 30 arcmin field) in 2023 and retire COSMOS
- We should be thinking about the further future NOW. Big instruments take several years to plan and develop!
- What would be “DECam 2”? Should of course be science driven and cognizant of other facilities available or coming on line. Options -
  - A major refurbish of DECam systems, but retain the focal plane?
  - Or an Imager with a different focal plane (e.g. CMOS, IR)?
  - A close copy of another existing instrument, like DESI or DESI II?
  - Something completely different?
- Final session - Arjun Dey talk and subsequent moderated discussion



Thanks to Thomas Puzia