# **DECam Status and Future**

Alistair Walker NOAO/CTIO

# Dark Energy Camera

- 570 Mpixels
- 62 science CCDs
- 0".263 per pixel
- FOV: 2.2 deg, 3 deg<sup>2</sup>
- Blanco 4m telescope





NORTH

### DECam – Timeline

The era of DES & DECaLS (2013-2018)

The era post-DES and pre-LSST (2019-2021)

The era of LSST (2022-2032)

Specifically -

- Jan 8 2019: DES and DECaLS finish (100 nights in 2018B)
- 2021: LSST camera commissioning and science verification
- Jan 2022: LSST science operations commence







# **DECam Operations I**

- DECam science operations team: Alistair Walker (leader), Tim Abbott, Kathy Vivas, Clara Martínez-Vázquez, Alfredo Zenteno.
  - On a semester by semester basis, a scientist is assigned to each observing run
  - We presently are on-the-mountain for the first night, remote support from La Serena for the rest of the run
  - Several programs have cunningly accreted some of the above people as co-l's, to get "enhanced service"...
- DECam technical operations:
  - The telescope operators and observer support folks are familiar with DECam and can help the observers
  - Technical support is available both on Tololo, and in La Serena. At least for 2018 (until DES is completed) some specialist help is available from the instrument builders.
  - Programmed engineering blocks are used for maintenance, and on-sky nights for tests and calibrations
  - We try (obviously) to not have "surprise technical issues", but average one per year...

# **DECam Operations II**

- DECam data operations: DECam data flows to Tucson, where it is run through the Community Pipeline (see Frank Valdes poster) and then into the Science Archive.
- The Blanco telescope will be scheduled with only DECam (at prime focus) and COSMOS (at F/8) for 2018B
  - Switching between them involves installing/removing the F/8 mirror, a few-hour daytime procedure
  - There is the "bright time" issue some corridor talk about NEWFIRM/ISPI at F/8?
- We support "classical" observing, some remote observing, target-ofopportunity programs.
  - The classical 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.
  - At present remote observing has been done from NOAO Tucson, Fermilab, and LBL.
- Chile time is 10%, and we have swap time with Brazil (SOAR) and Australia (AAT).

# 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 motors, encoders – if you are interested talk to Tim Abbott.
  - Along with the replacement of more regular components e.g. chillers, compressors, various bearings etc etc as and when needed, and regular maintenance.
- DECam itself is a complex instrument:
  - with a many-component LN2 cooling system,
  - And many moving parts (filters, shutter, hexapod, various pumps, cryo-coolers, chillers),
  - 32 computers,
  - 74 CCDs and associated electronics.
- DECam post-DES operations review
  - Soon
  - We are planning for another 10 years of DECam
  - The maintenance plan reflects this
  - In particular we will attend to some obsolescence issues

### Usage statistics

#### DECam & Blanco time lost to technical failure:

Year	%
2013	9.1
2014	2.0
2015	3.3
2016	2.7
2017	2.1
2018*	1.6

# **DECam Characteristics**

- DECam has 62 science CCDs, 8 focus & alignment CCDs, and 4 guider 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.
- We benefit from the PF location and a corrector designed for imaging only
  - The image scale and image quality are both nearly constant over the whole field of view.
  - Scattered light is very well controlled
  - The data from the camera are of very high quality.
- We now have nine filters: the original u,g,r,i,z,Y, plus VR, N964 and N662.
  - The latter two filters were funded via CASSACA.
  - Asahi have made 8 of these filters, and Materion one.
  - One can think of other filters e.g. CaH+K,
  - DDO-51, filters to complement LSST, etc.
    - ~\$100K each.
  - Swapping out a filter takes ~ 2 hours, and can be done safely but we do not want to do this too often.



### **DECam Future**

- Some "DES-related" features will no longer be developed/supported after DES completes e.g. Kentools, Quick Reduce.
- What else would be useful? as an example DECaLS "copilot" is a useful tool giving automatically-updated strip charts of sky brightness, transparency, fwhm in real time.
- Community Pipeline?
- DECam Data Splinter Meeting:

The primary goal is to take advantage of everyone's presence in Tucson to discuss common interests in DECam data processing (broadly defined), identify priorities in this area for the future, and potentially nucleate new collaborations.









# DES-heritage hardware

- We should continue to support RASICAM, aTmCam, DECal?
- aTmCam likely needs signifcant investment to last another 5+ years. Software...
- DECal (the whole-system calibration) has plenty of spares, but does need some work now, and the software is "opaque".
- Why do we need these things?



RMS 3.8 mmag Gaia DR2 G compared to DES Y4A1 r

for stars 0.5<g-r<1.5, from Eli Rycoff

# Summary

- Blanco 4m telescope + DECam remains a highly effective combination as we move into the era of LSST
- CTIO plans to keep supporting DECam for several more years
- Let's be creative in thinking of how to use it!
- There is a lot of telescope time available!
- There is a lot of science to do!