DARK ENERGY SURVEY
GALAXY CLUSTERS

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DARK ENERGY & ACCELERATED EXPANSION

- Cold Dark Matter
- Dark Energy
- Photons
- "Baryons"
- Inflaton

Time (~15 billion years)

Expanding universe

Accelerating expansion

Slowing expansion

Farthest supernova

Present

Big Bang
The growth of the largest structures in the universe, clusters of galaxies, is inhibited by dark energy.
DARK ENERGY SURVEY

DEcam

3 sq deg FOV, 570 Mpix optical CCD camera

Facility instrument at CTIO Blanco 4-m telescope in Chile

First light: Sep 2012

Survey

5000 sq deg grizY to 24th mag overlapping with SPT and VISTA

30 sq deg SNe survey

0.9 arcseconds seeing

525 nights: 2013-2018
The number of clusters as a function of mass and redshift is a dark energy probe. Reliable detection of clusters, and accurate mass calibration are required.

Systematics can be controlled by understanding the astrophysics of clusters.

Number of clusters above $10^{14.5}$ solar masses as a function of $z$, for a 4000 sq-deg survey in 3 different cosmologies.
DES RESULTS: CLUSTERS

Mass and galaxy distributions of four massive clusters from DES Science Verification data

Constraints on the richness–mass relation and the optical-SZE positional offset distribution for SZE-selected clusters

Optical-SZE Scaling Relations for DES Optically Selected Clusters within the SPT-SZ Survey

The RedMaPPer Galaxy Cluster Catalog From DES Science Verification Data
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Galaxy Populations in Massive Galaxy Clusters to z = 1.1

The Evolution of Active Galactic Nuclei in Clusters of Galaxies from the Dark Energy Survey

Comparing DES and HST–CLASH observations of the galaxy cluster RXC J2248.7–4431

Galaxies in X-ray Selected Clusters and Groups in DES Data I: Stellar Mass Growth of Bright Central Galaxies Since z~1.2
DES PROJECTIONS

5000 deg$^2$, 0.9” seeing, 24$^{th}$ mag (redshift~1.4)
300M galaxies, shapes, 100K clusters, 4K SNe
4 combined probes
3-5x improved Dark Energy measurement
These are exciting times for Dark Energy science, and more, with DES. Stay tuned for more results soon!

The DES site at Cerro Tololo Inter-American Observatory, Chile