

# The Dark Energy Survey

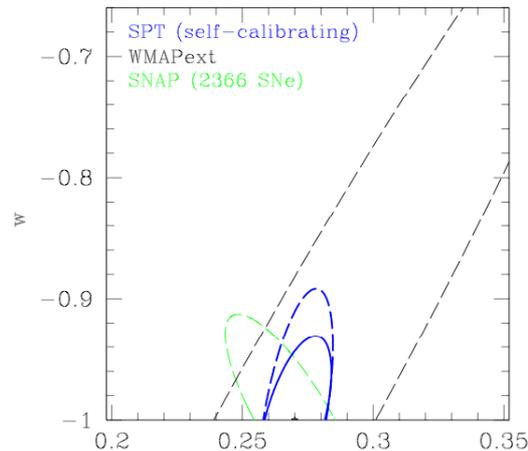
- Aimed at precision measurements of Dark Energy
- 5000 sq-degree 4-bandpass sky survey
  - g,r,i,z  $i=24, z=23.6$
  - Photometric redshifts for South Pole Telescope SZ cluster survey to  $z > 1$ .
  - Cluster counting via SZ, optical, WL
  - Weak lensing: shear-shear and shear-galaxy power spectra
  - Galaxy angular power spectra
  - SN light curves: 1 hour per night for 60 nights over 5 years
- The Dark Energy Camera
  - CTIO 4m prime focus
  - 2 degree FOV corrector
  - 66 CCD, 500 megapixel focal plane array
  - Full depletion LBNL CCDs
  - ~500 nights over 5 years

# The Dark Energy Survey

- Physics of the Universe
  - “immediate priority is heavily weighted towards investigation of Dark Energy”
- DOE Office of Science
  - HEP performs experiments that explore the fundamental nature of matter, energy, space, and time, often leading to the development of cutting edge technology
  - DOE teams most often centered at one of the National Labs, almost always including university-based researchers
- Fermilab
  - Dark Matter: SDSS and CDMS
  - Dark Energy: DES and JDEM
- DES collaboration
  - Fermilab, University of Illinois, NOAO, NCSA, University of Chicago, LBNL, Carnegie
- NOAO Long Range Plan
  - CTIO 4m aimed at wide field imaging
- CTIO
  - Announcement of opportunity
  - Major instrumentation in return for up to 30% telescope time over 5 years
- The System and Surveys
  - 4m telescope: imaging surveys
  - 8m telescopes: spectroscopic surveys
  - [Experiment driven collaborations provide instrumentation/software](#)
  - Surveys provide the best science for the most researchers at the least cost

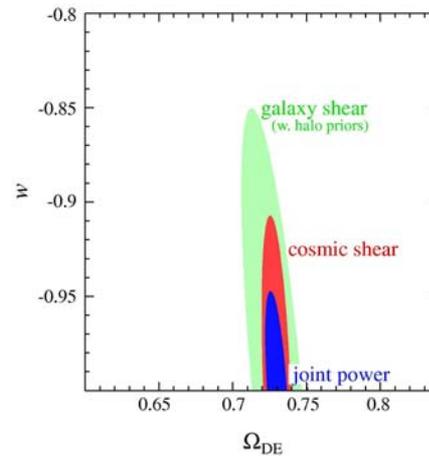
# We aim at $\sim 5\%$ precision on Dark Energy

## Cluster Counting



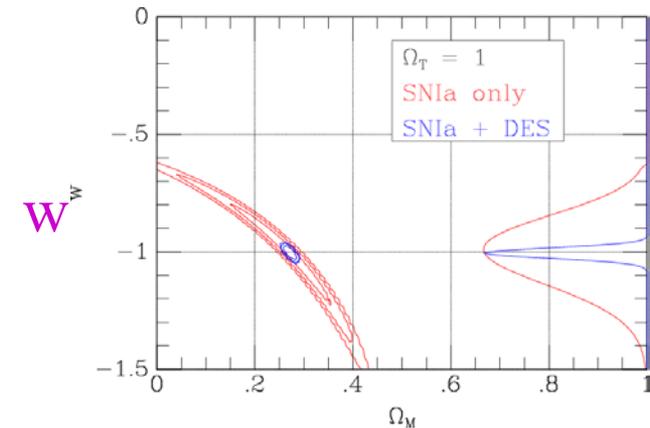
$\Omega_M$

## Weak Lensing



$\Omega_{DE}$

## Supernova



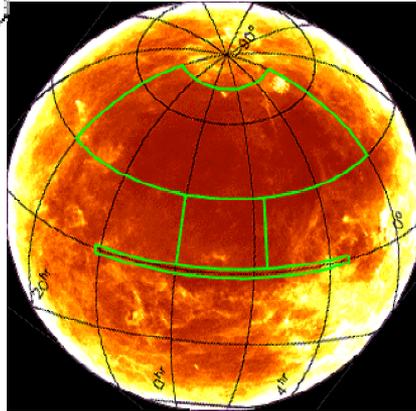
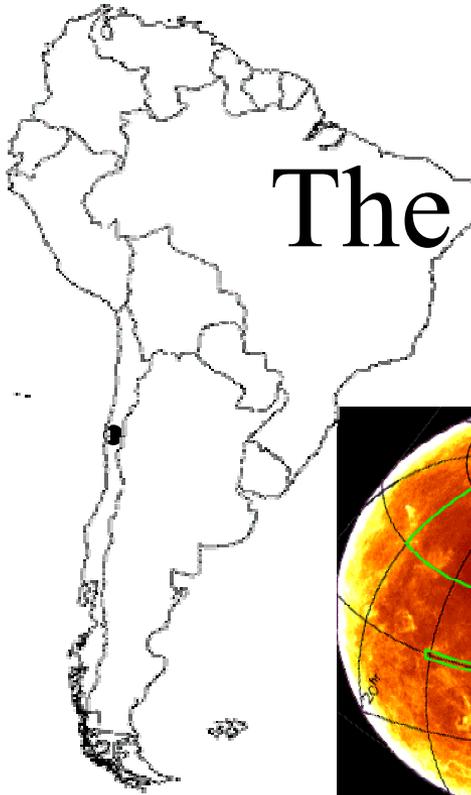
$\Omega_M$

$\delta w \sim 5\%$  and  $\delta \Omega_{DE} \sim 3\%$

The Planck satellite will provide tighter input CMB measurements, and the constraints will improve slightly.

Joint constraints on  $w$  and  $w_a$  are promising: initial results suggest  $w_a \sim 0.5$

# The Dark Energy Survey



- We propose to make precision measurements of Dark Energy
  - Cluster counting, weak lensing and supernovae
  - Independent measurements
- by mapping the cosmological density field to  $z=1$ 
  - Measuring 300 million galaxies
  - Spread over 5000 sq-degrees
- using new instrumentation of our own design.
  - 500 Megapixel camera
  - 2.1 degree field of view corrector
  - Install on the existing CTIO 4m

