

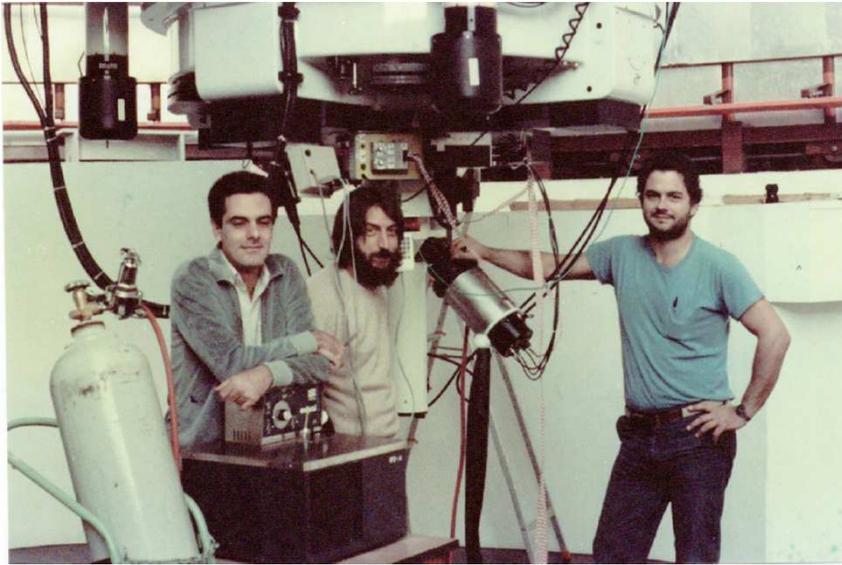
# Dark Energy Survey: Status Report

Luiz Nicolaci da Costa  
LIneA & ON



Rests upon three mysterious pillars  
All implicate new physics!

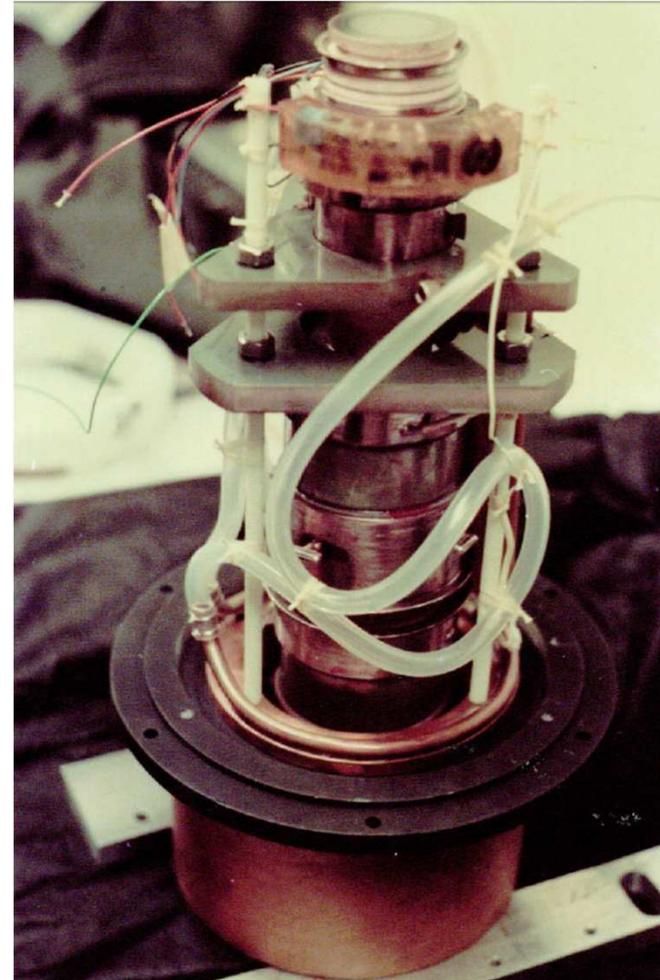
# Background



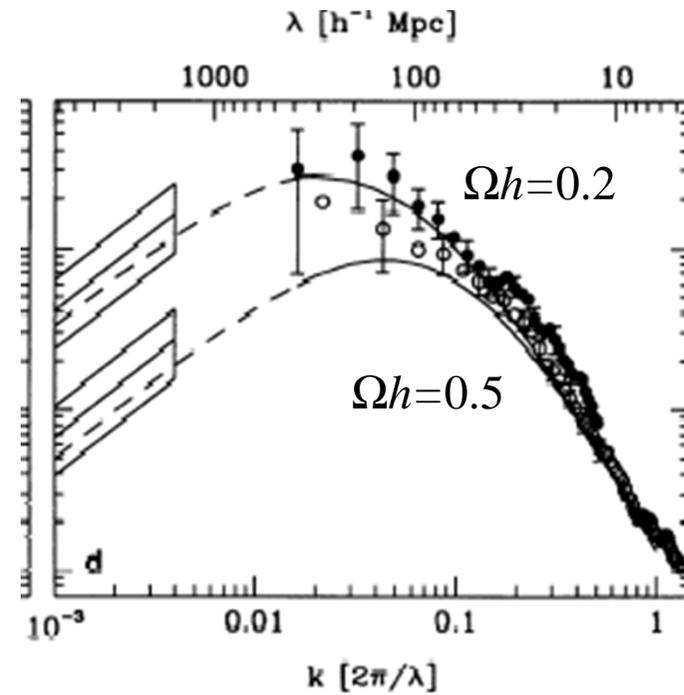
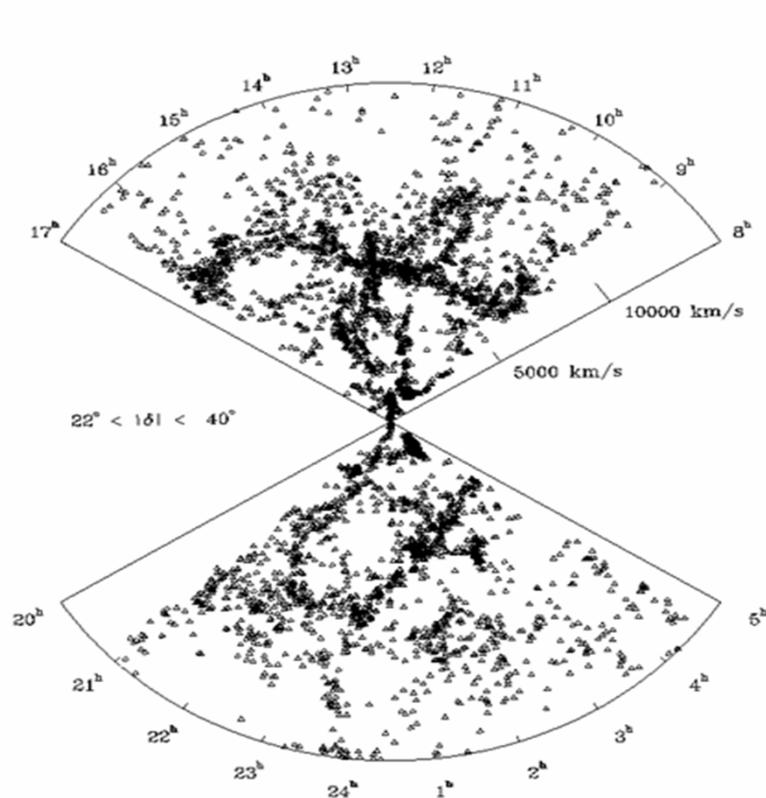
(1982)

**ON-CfA Collaboration**

Z-machine



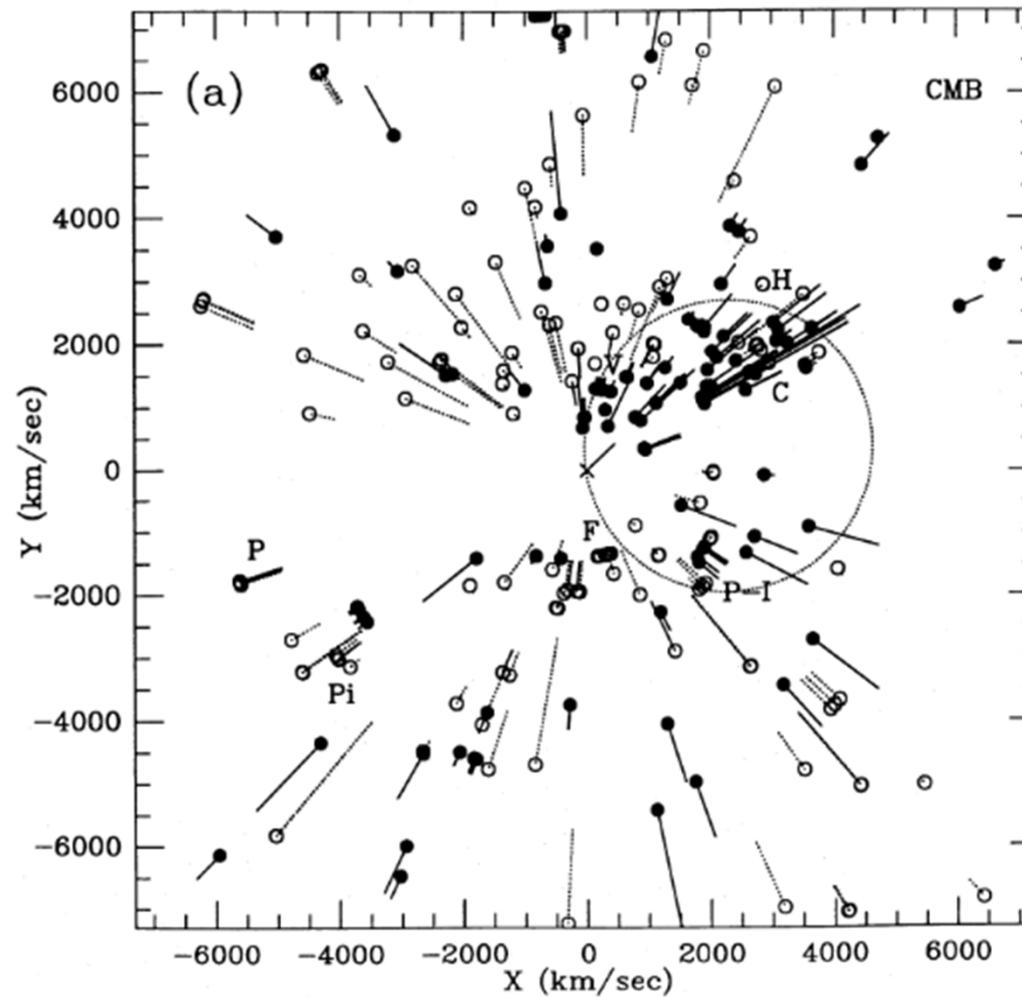
# LSS (1979-1994)



**Best-fit  $\Lambda$ CDM with  $b \sim 1$ ;  $\Omega_m = 0.3$**

# Great Attractor

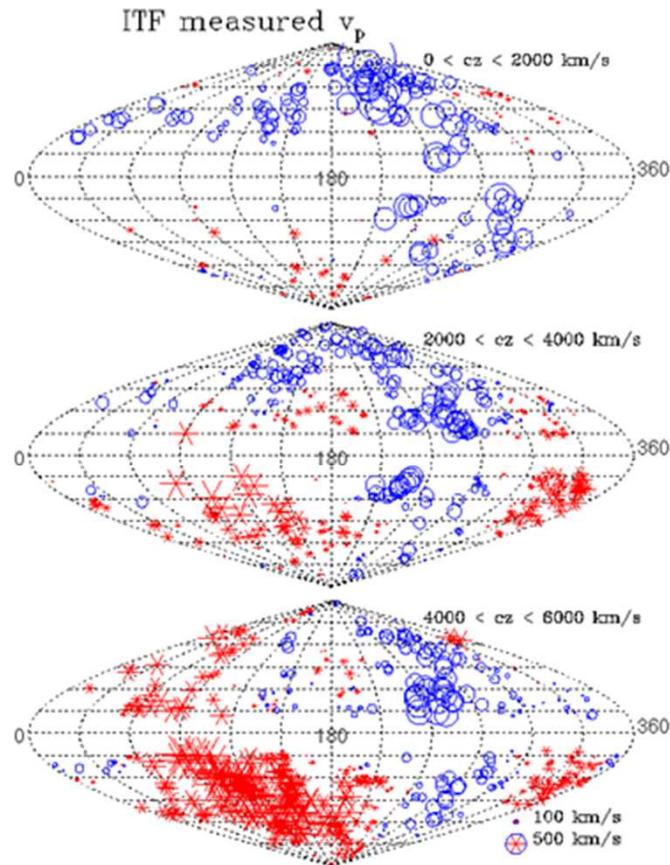
7 Samurai  
(1988)



$\Omega = 1$   
*Inconsistent with LSS*

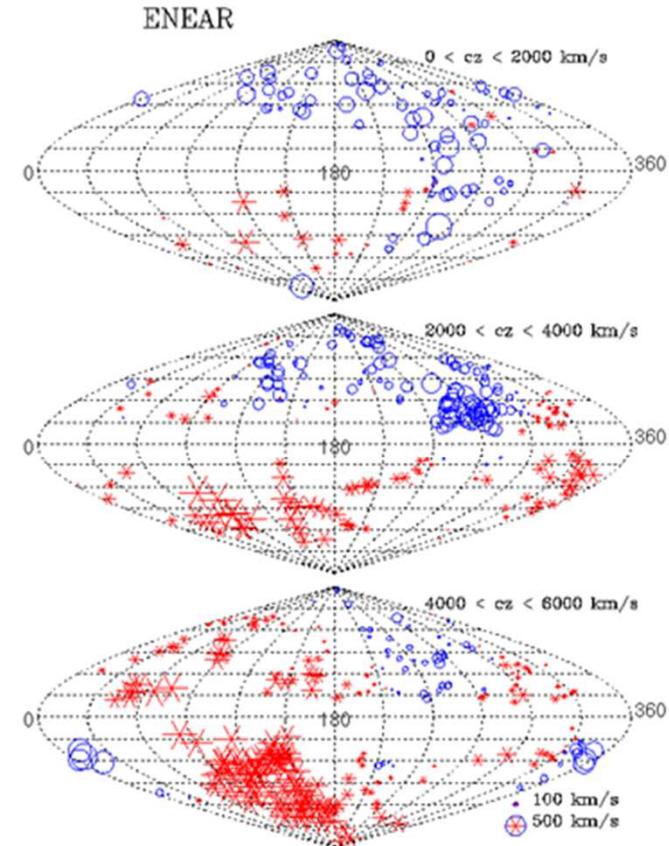
# Peculiar velocity field (1988-2003)

Tully-Fisher relation



Spirals

Dn- $\sigma$  relation



Early-types

$$b \sim 1; \Omega_m = 0.3$$

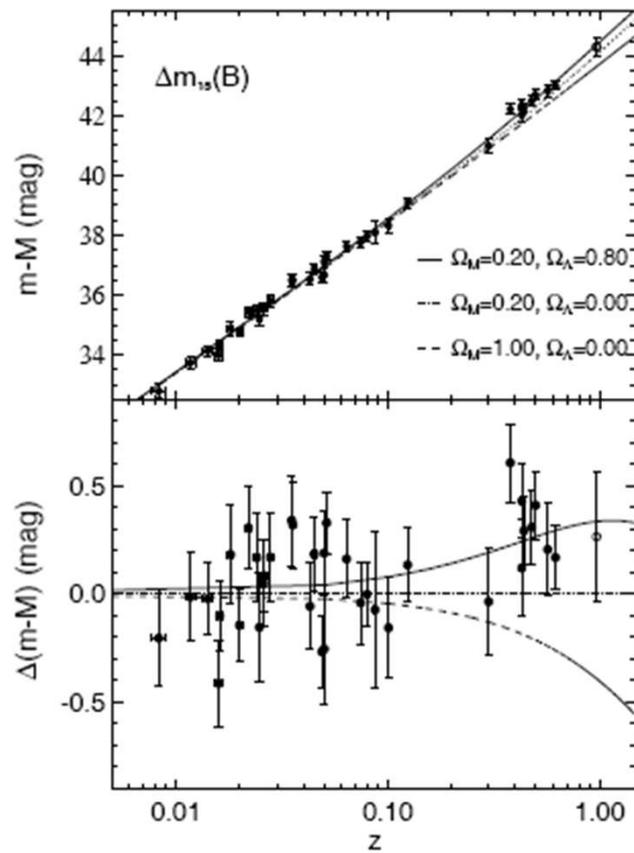
# First Evidences LCDM/DE

**After long debate concordance among different estimates such as:**

- 1) LSS**
- 2) Peculiar motions on small and large scales**
- 3) Other measurements (e.g. cluster abundances)**

$$b_0 \sim 1 \Rightarrow \Omega_m \sim 0.3$$

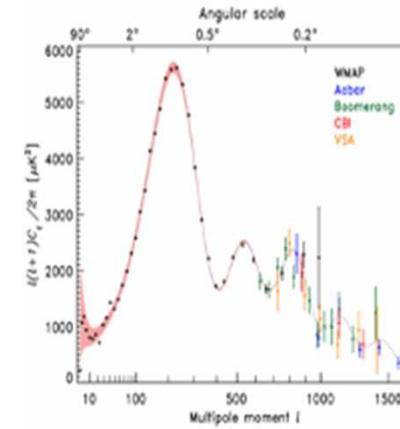
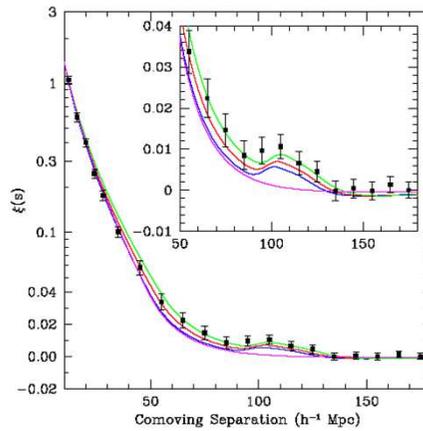
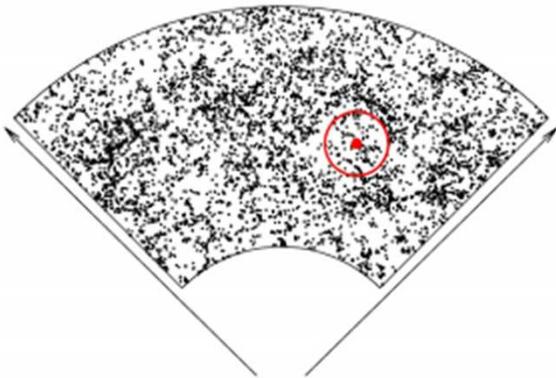
# Direct confirmation (1998)



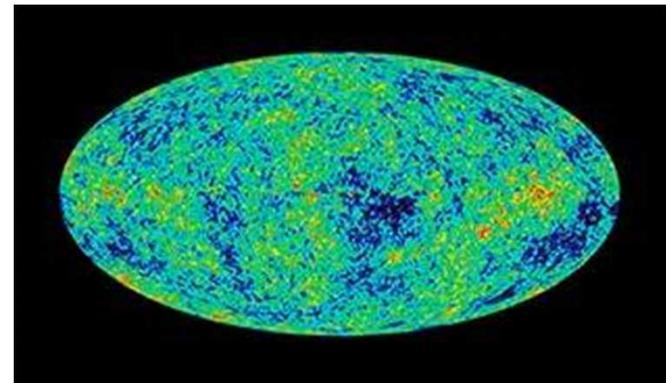
The screenshot shows the Nobel Prize website interface. At the top, there are navigation tabs: "Nobel Prizes", "Alfred Nobel", "Educational", "Video Player", and "Nobel Organizations". Below the navigation is a breadcrumb trail: "Home / Nobel Prizes / Nobel Prize in Physics / The Nobel Prize in Physics 2011". There are utility links for "Printer Friendly", "Share", "Tell a Friend", and "Comments". A search bar shows "1901" and "2011". A dropdown menu is set to "Sort and list Nobel Prizes and Nobel Laureates" and "Prize category: Physics". A red box highlights the entry for "The Nobel Prize in Physics 2011" awarded to "Saul Perlmutter, Brian P. Schmidt, Adam G. Riess". Below this, the names of the laureates are listed with dropdown arrows: "Saul Perlmutter", "Brian P. Schmidt", and "Adam G. Riess". At the bottom, there are three portrait photographs of the laureates.

# Evidence for Dark Energy

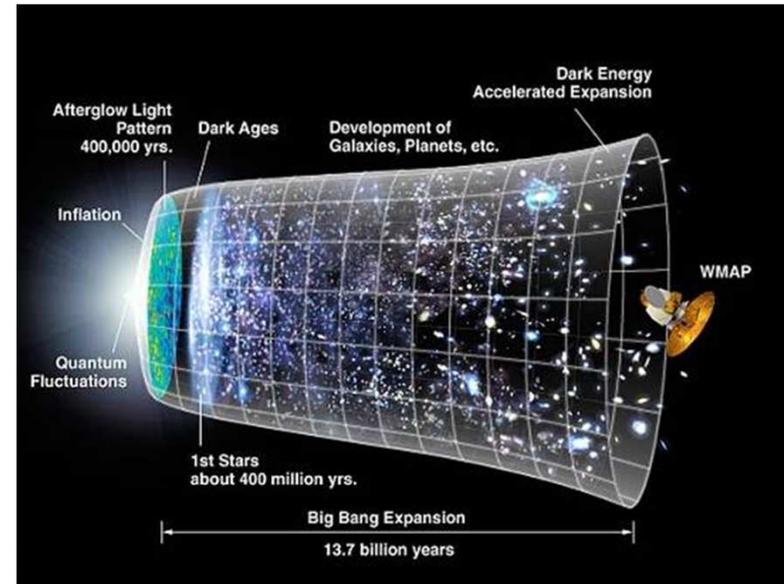
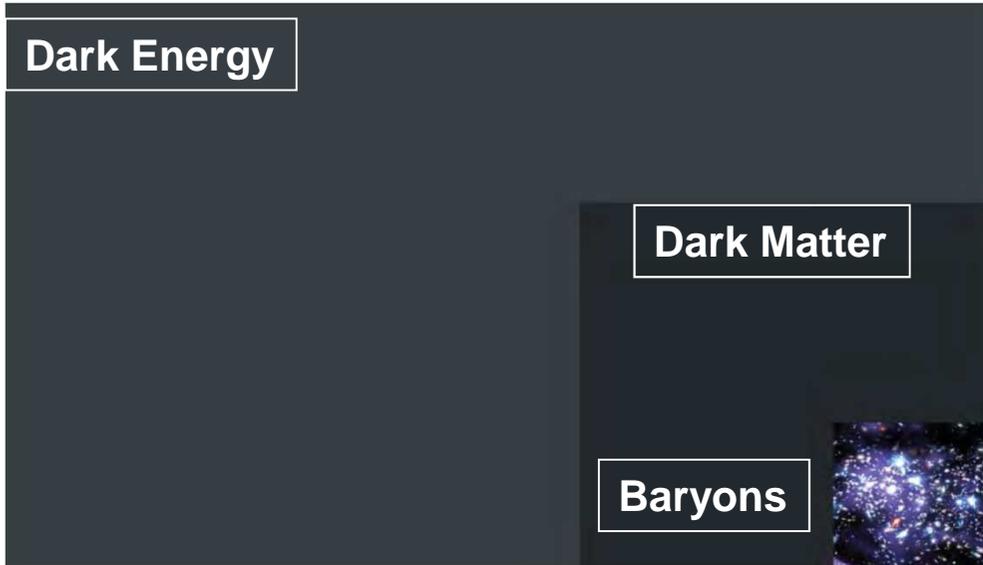
## LSS



## CMB



# Contents of the Universe



# REPORT OF THE DARK ENERGY TASK FORCE

September 2006

Andreas Albrecht, University of California, Davis  
Gary Bernstein, University of Pennsylvania  
Robert Cahn, Lawrence Berkeley National Laboratory  
Wendy L. Freedman, Carnegie Observatories  
Jacqueline Hewitt, Massachusetts Institute of Technology  
Wayne Hu, University of Chicago  
John Huth, Harvard University  
Marc Kamionkowski, California Institute of Technology  
Edward W. Kolb, Fermi National Accelerator Laboratory and The University of Chicago  
Lloyd Knox, University of California, Davis  
John C. Mather, Goddard Space Flight Center  
Suzanne Staggs, Princeton University  
Nicholas B. Suntzeff, Texas A&M University

Dark energy appears to be the dominant component of the physical Universe, yet there is no persuasive theoretical explanation for its existence or magnitude. The acceleration of the Universe is, along with dark matter, the observed phenomenon that most directly demonstrates that our theories of fundamental particles and gravity are either incorrect or incomplete. Most experts believe that nothing short of a revolution in our understanding of fundamental physics will be required to achieve a full understanding of the cosmic acceleration. For these reasons, the nature of dark energy ranks among the very most compelling of all outstanding problems in physical science. These circumstances demand an ambitious observational program to determine the dark energy properties as well as possible.

The Dark Energy Task Force (DETF) was established by the Astronomy and Astrophysics Advisory Committee (AAAC) and the High Energy Physics Advisory Panel (HEPAP) as a joint sub-committee to advise the Department of Energy, the National Aeronautics and Space Administration, and the National Science Foundation on future dark energy research.

# Dark Energy Task Force

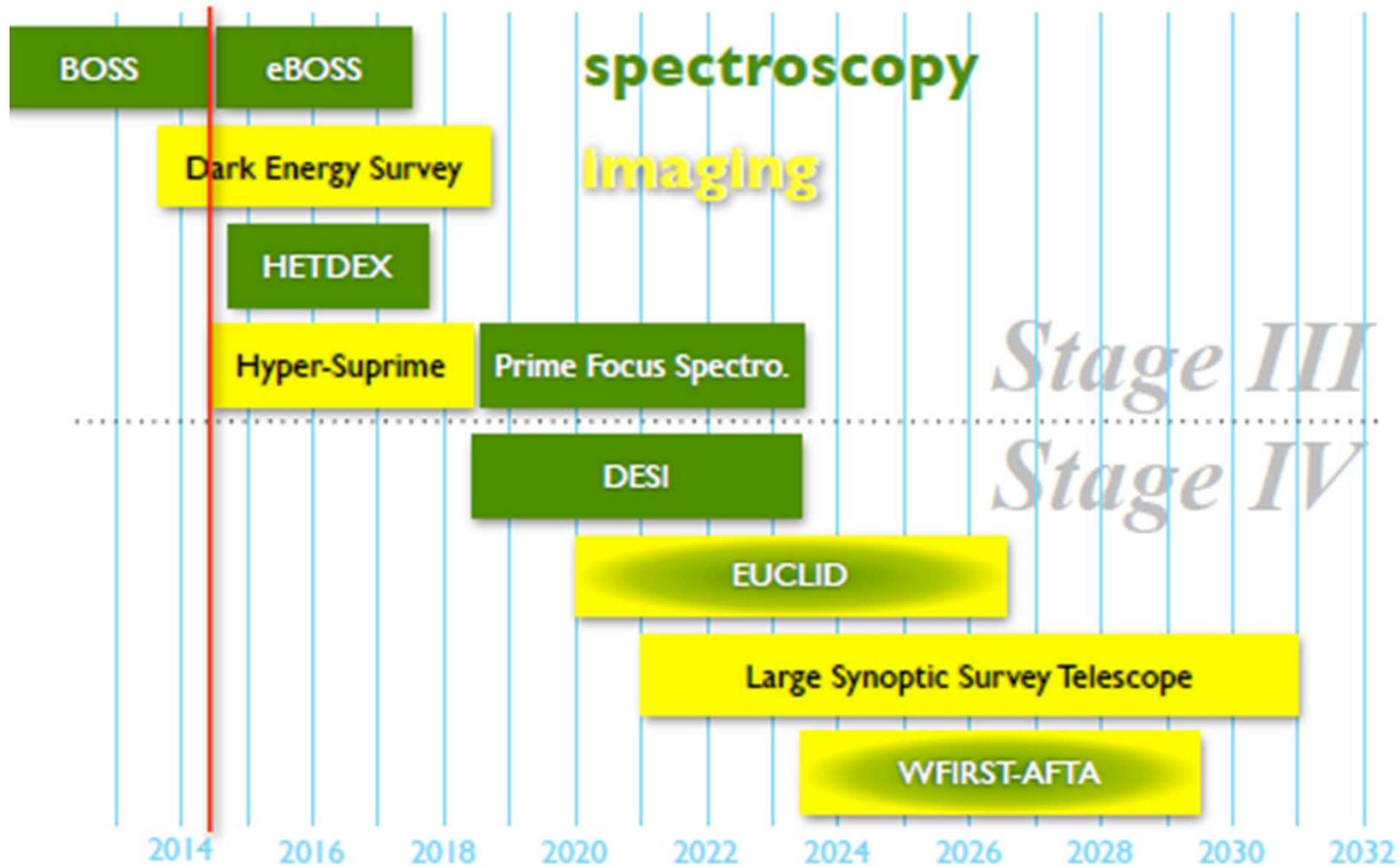
## Recommended techniques for probing dark energy

1. Supernovae
2. Baryon Acoustic Oscillations
3. Galaxy Cluster Counting
4. Weak Gravitational Lensing

geometry

growth of structures

# The dark energy facilities roadmap





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# Building for Discovery

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Strategic Plan for U.S. Particle Physics in the Global Context

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Report to the Particle Physics Project Prioritization Panel

May 2014

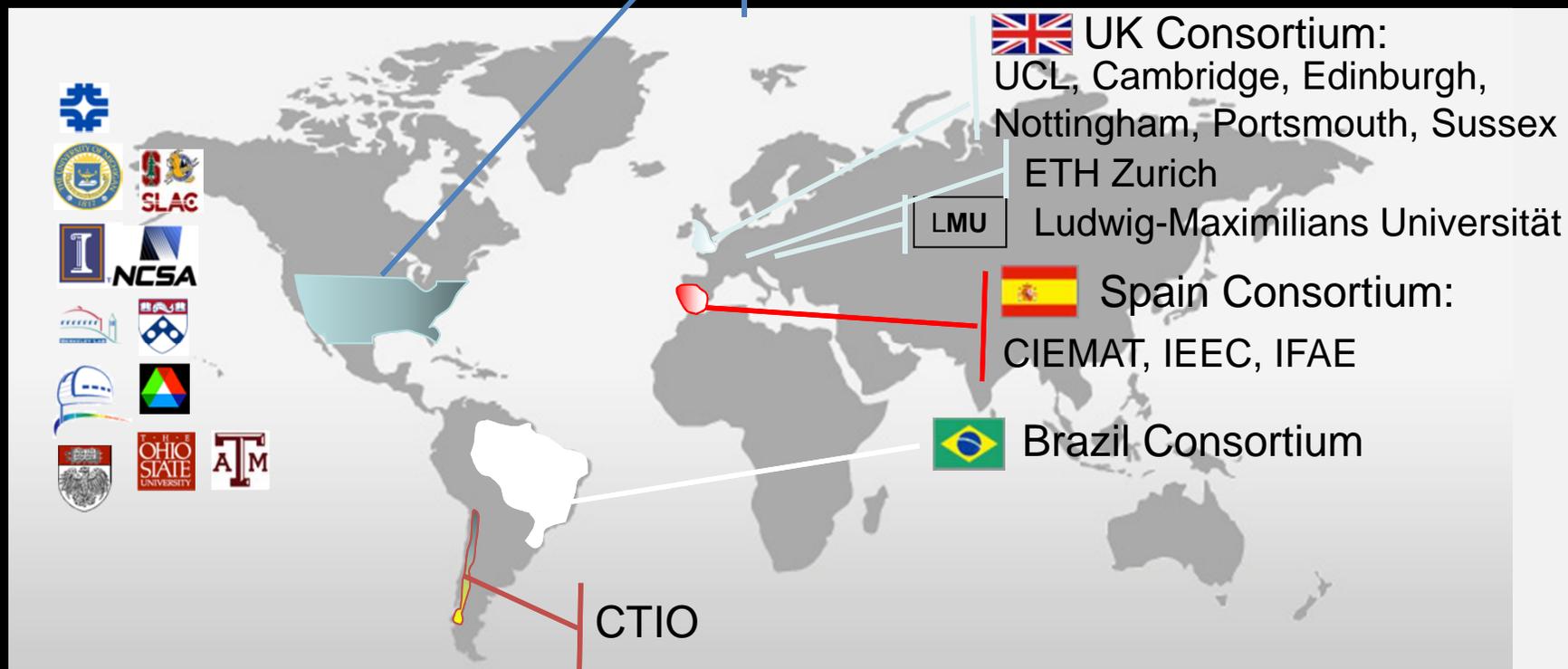
# Dark Energy Survey (DES)



# Dark Energy Survey Collaboration

~300 scientists  
US support from DOE+NSF

Fermilab, UIUC/NCSA, University of Chicago, LBNL, NOAO, University of Michigan, University of Pennsylvania, Argonne National Lab, Ohio State University, Santa-Cruz/SLAC/Stanford, Texas A&M

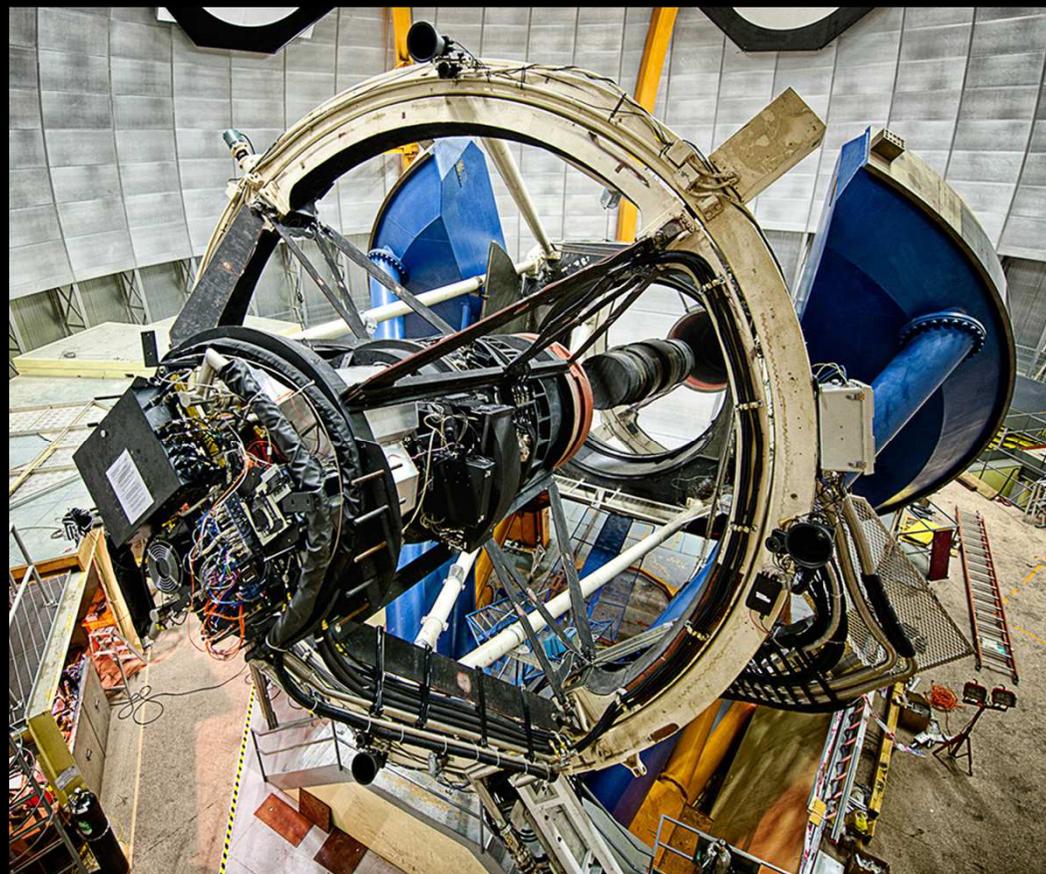




# The Dark Energy Survey

- **Probe Dark Energy and the origin of Cosmic Acceleration:**
  - Distance vs. redshift
  - Growth of Structure
- **Two multicolor surveys:**
  - 300 M galaxies over 1/8 sky
  - 3500 supernovae (30 sq deg)
- **Built new camera for CTIO Blanco telescope**
  - Facility instrument
- **Five-year Survey started Aug. 31, 2013**

DECam on the Blanco 4m



17 525 nights (Sept.-Feb.)

[www.darkenergysurvey.org](http://www.darkenergysurvey.org)

[www.darkenergydetectives.org](http://www.darkenergydetectives.org)



# DES Science Summary

## Four Probes of Dark Energy

- **Galaxy Clusters**

- Tens of thousands of clusters to  $z \sim 1$
- Synergy with SPT, VHS

- **Weak Lensing**

- Shape and magnification measurements of 200 million galaxies

- **Baryon Acoustic Oscillations**

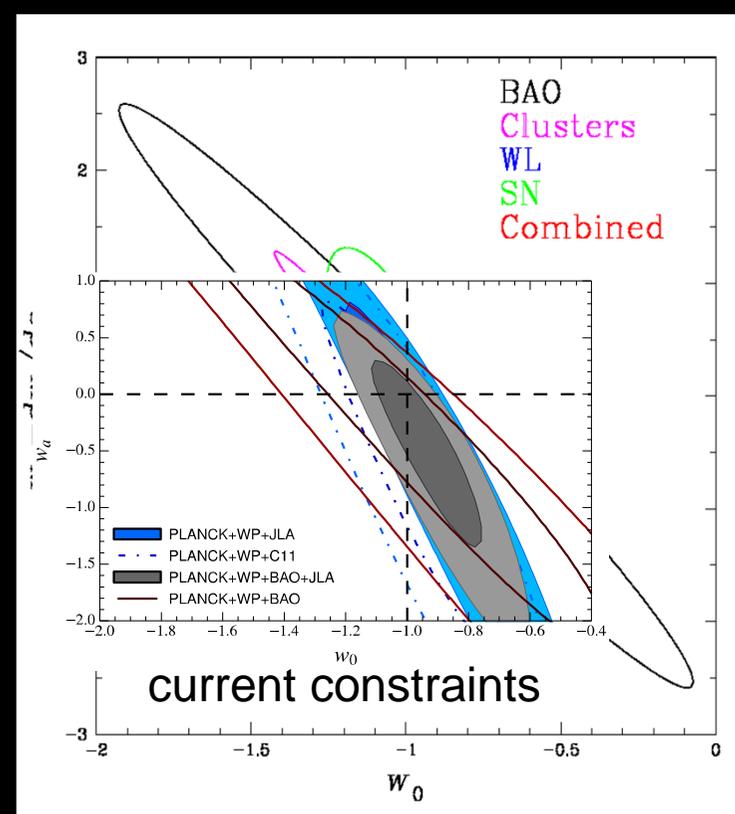
- 300 million galaxies to  $z = 1$  and beyond

- **Supernovae**

- 30 sq deg time-domain survey
- 3500 well-sampled SNe Ia to  $z \sim 1$

## Forecast Constraints on DE Equation of State

$$w(a) = w_0 + w_a(1 - a(t))$$



**DES forecast**

# The Dark Energy Survey Camera

## DECam:

Replace this PF cage with a new 2.2 FOV, 570Mega pixel red sensitive CCD camera and optics

## Time scale:

- R&D and Reviews 2003-2008
- Instrument Construction 2008-2011
- Delivery to CTIO 2011-2012
- Installation Jan.'11-Aug.'12

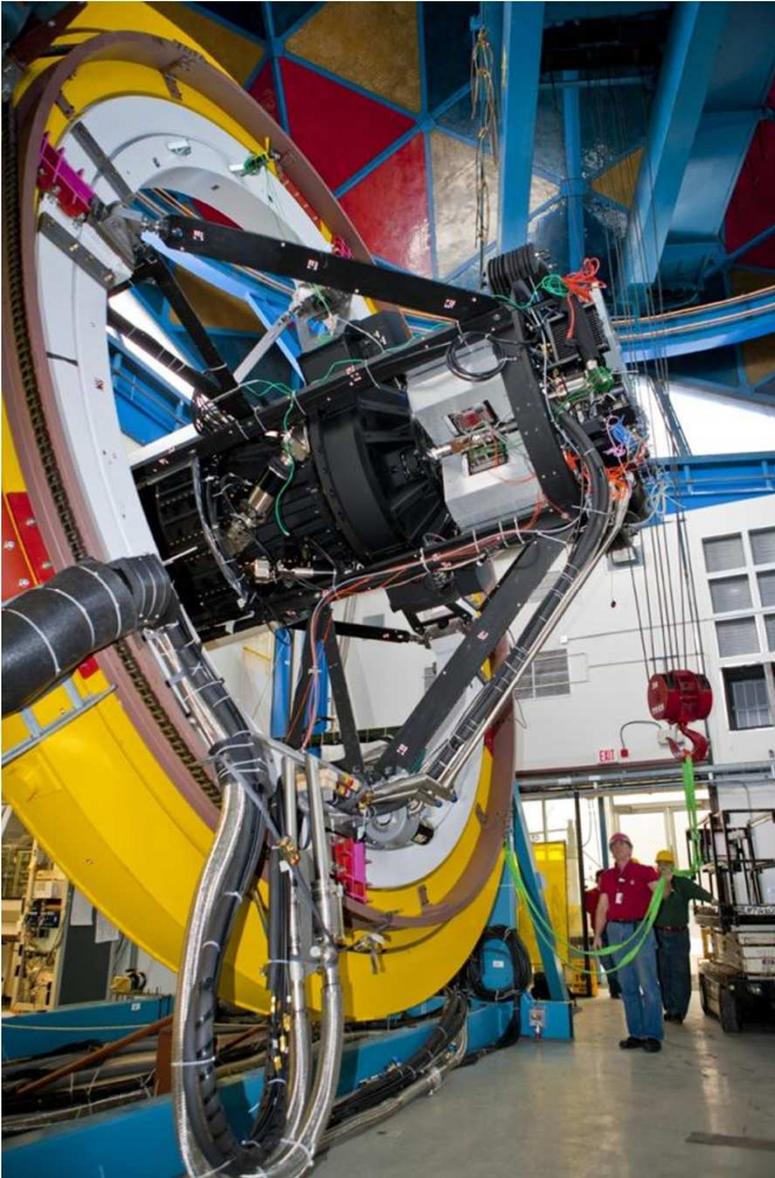
First Light: Sept. 2012

Beginning of Survey: Aug 2013

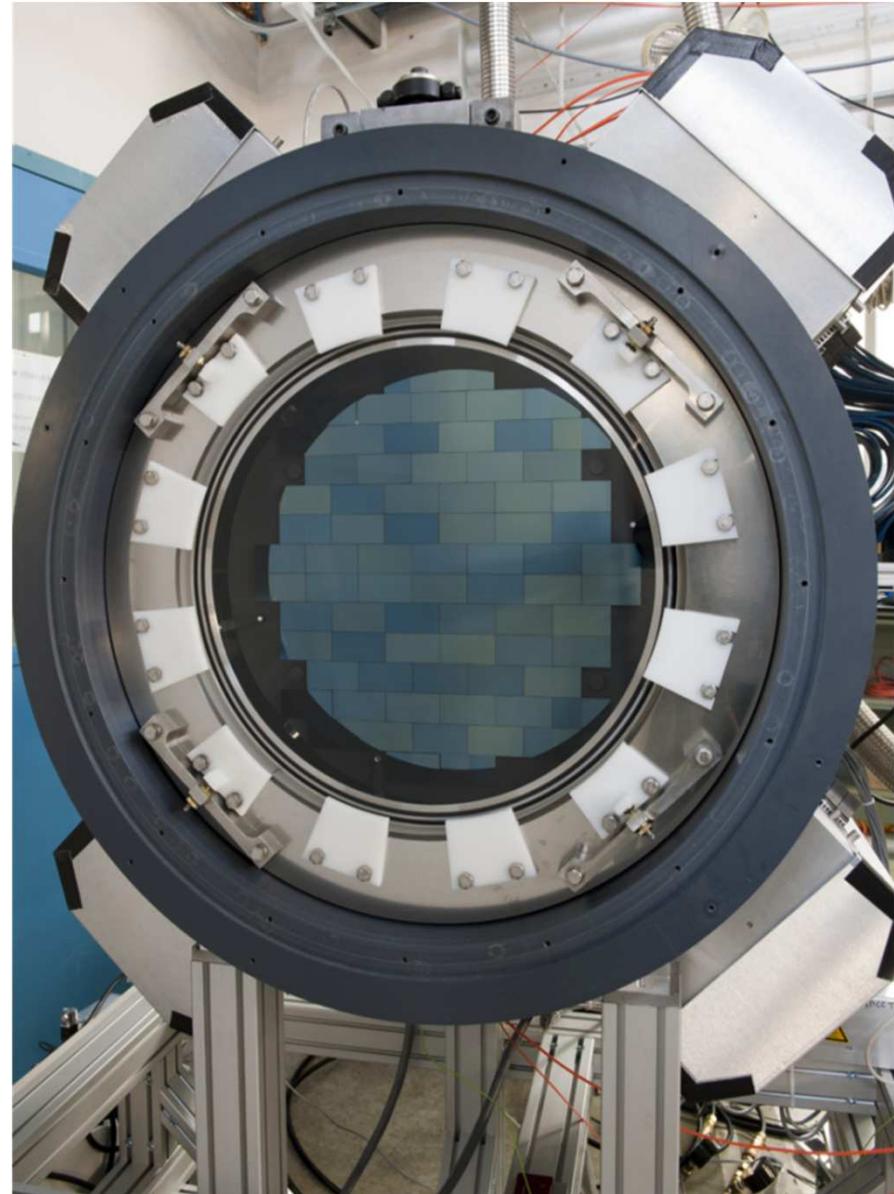


Use the Blanco 4M Telescope at the Cerro-Tololo Inter-American Observatory (CTIO)

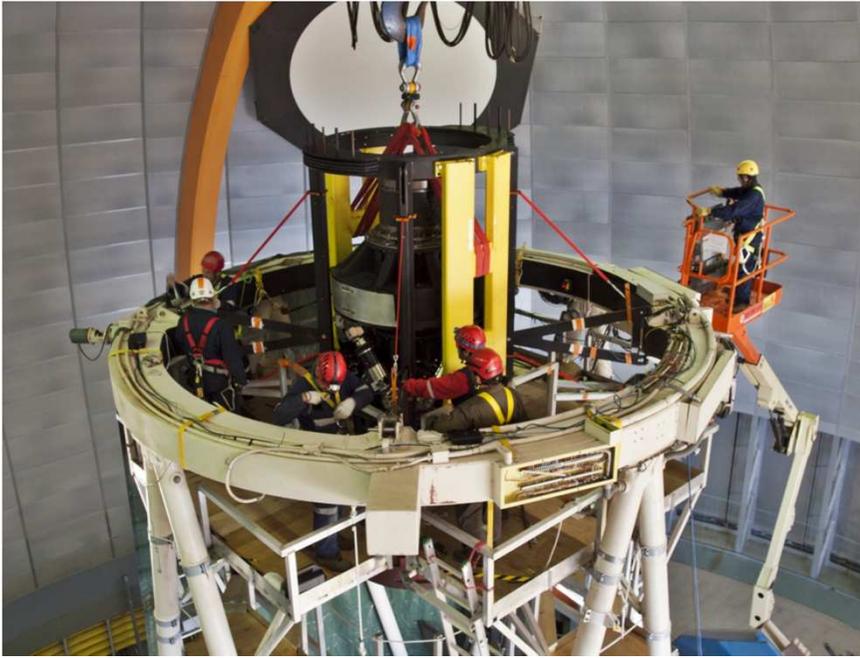
Telescope Simulator



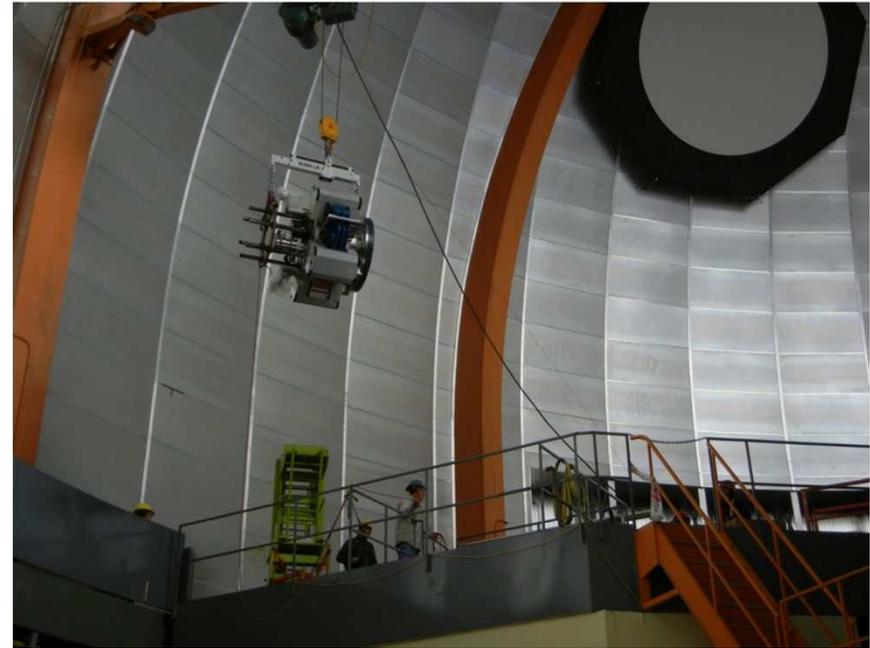
570-Million pixel DECam



# Installation at CTIO



New cage – May 2012



Imager – August 2012



# First Light Sept 2012

First light: Sep 2012

SV: Oct 2012/Feb 2013

Hand over to CTIO

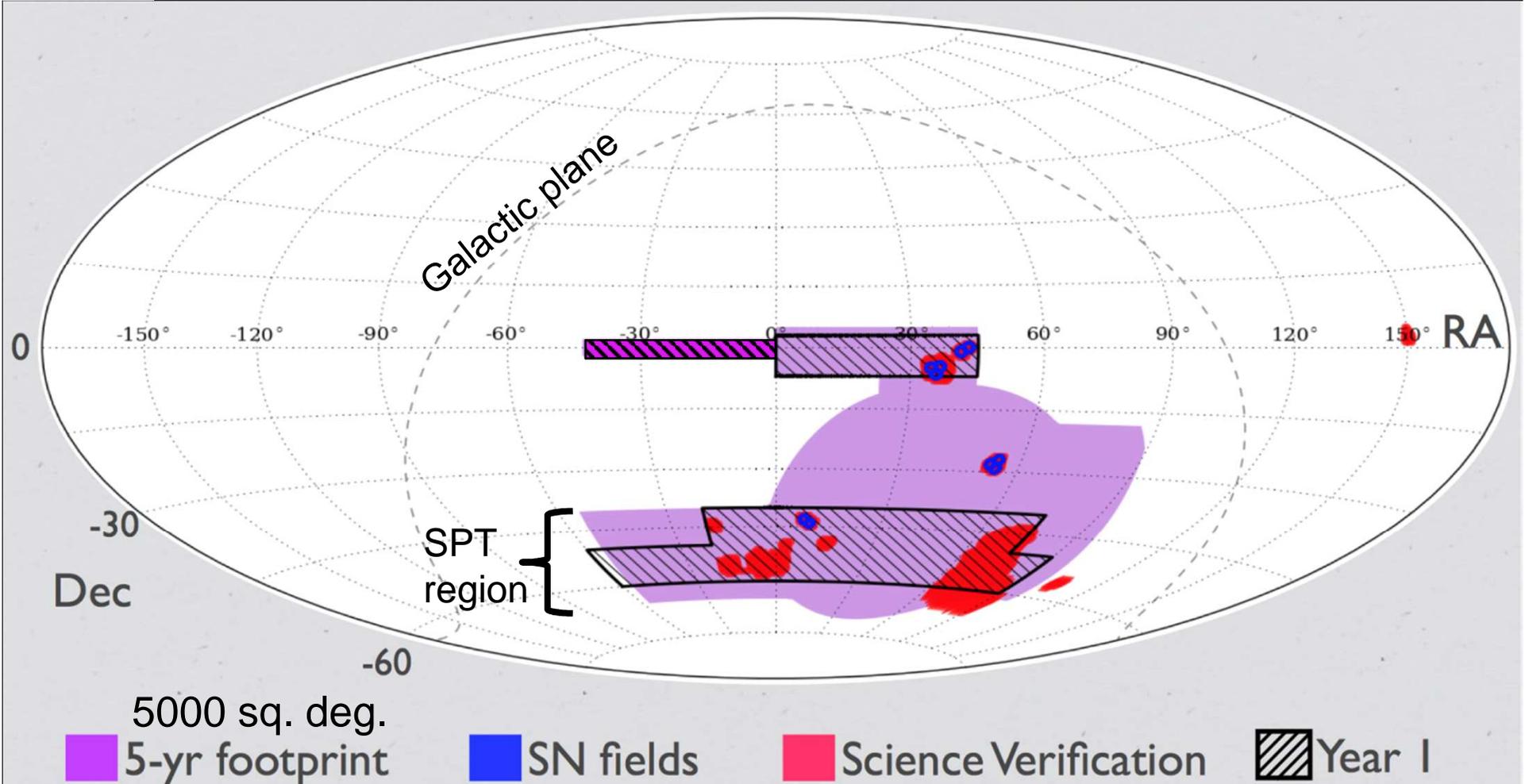
Survey: Aug 2013





DARK ENERGY SURVEY

# DES Survey Footprint



- Science Verification: ~250 sq. deg. to ~full depth; 45 M objects
- Year 1: ~2000 sq. deg. overlap SPT, SDSS: 4/10 tilings; 140 M objects

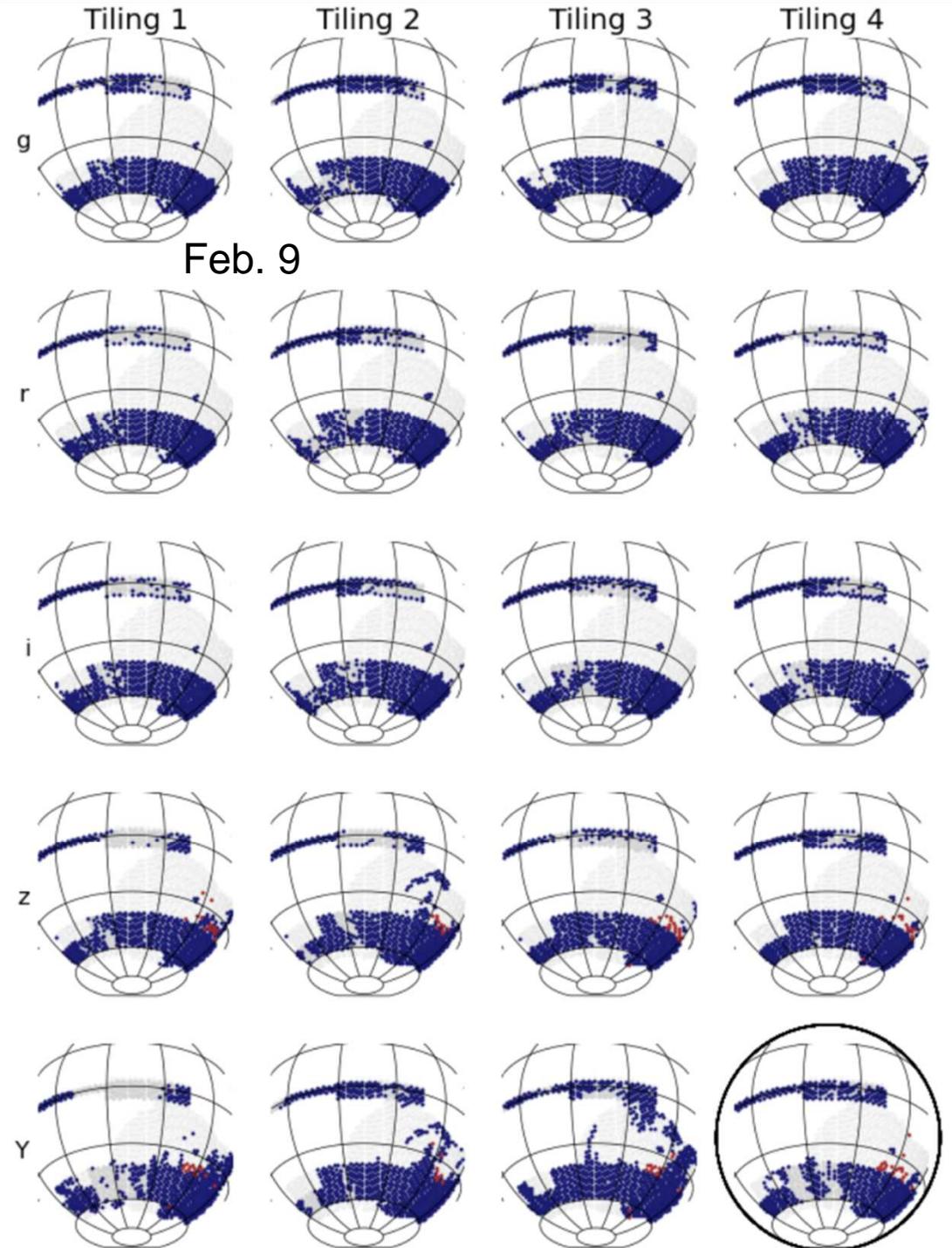


# Survey Progress

Goal for Year 1: cover northern (SDSS stripe 82) and southern (SPT) regions 4 times in each filter (grizY): ~2000 sq deg.

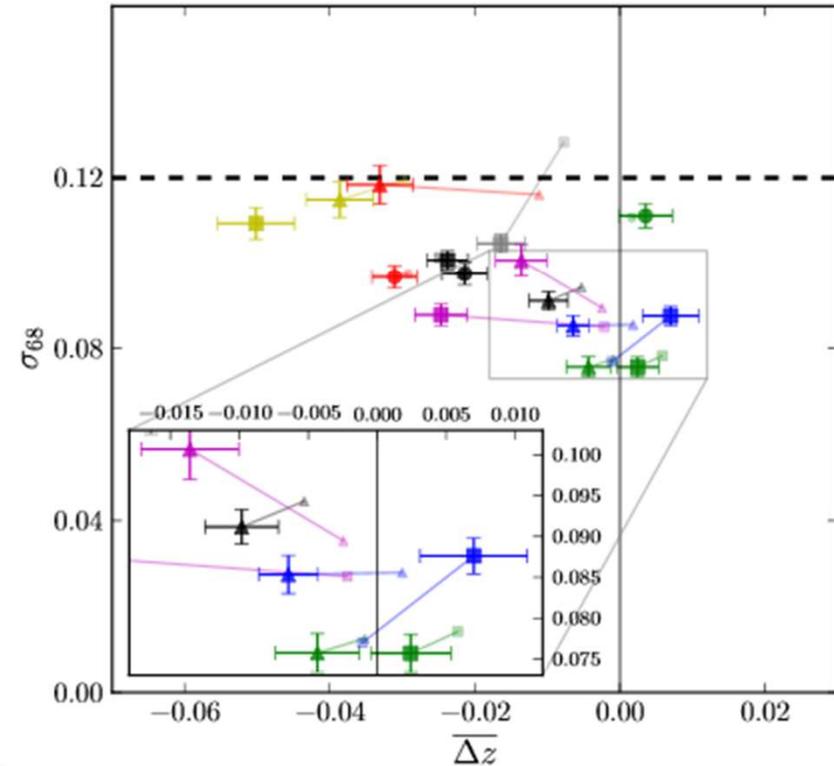
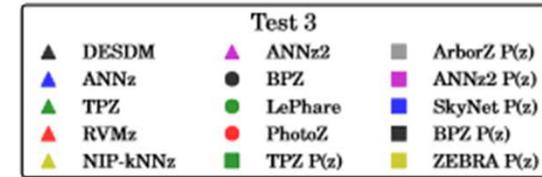
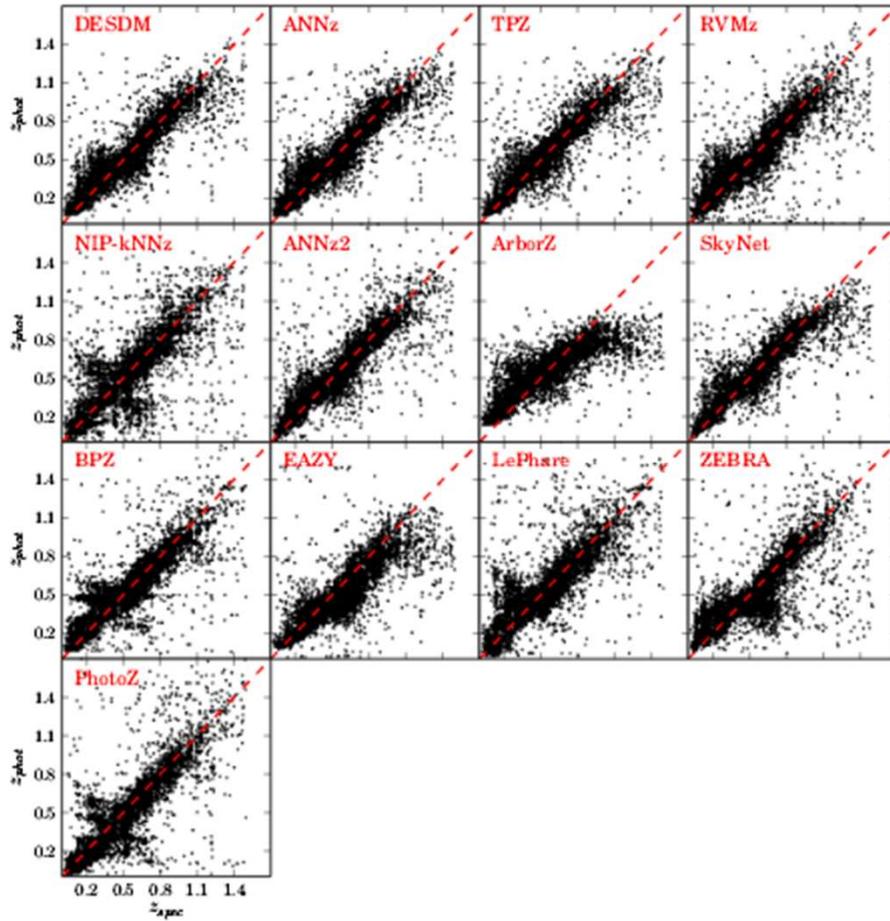
Completed 82% of survey-quality Y1 exposures (11,215/13,691) and 17% of Y2 exposures

From Nov. onward, >92% of exposures were survey-quality (not returned to queue for re-observing). For season, ~16% of time lost to weather+HW failures

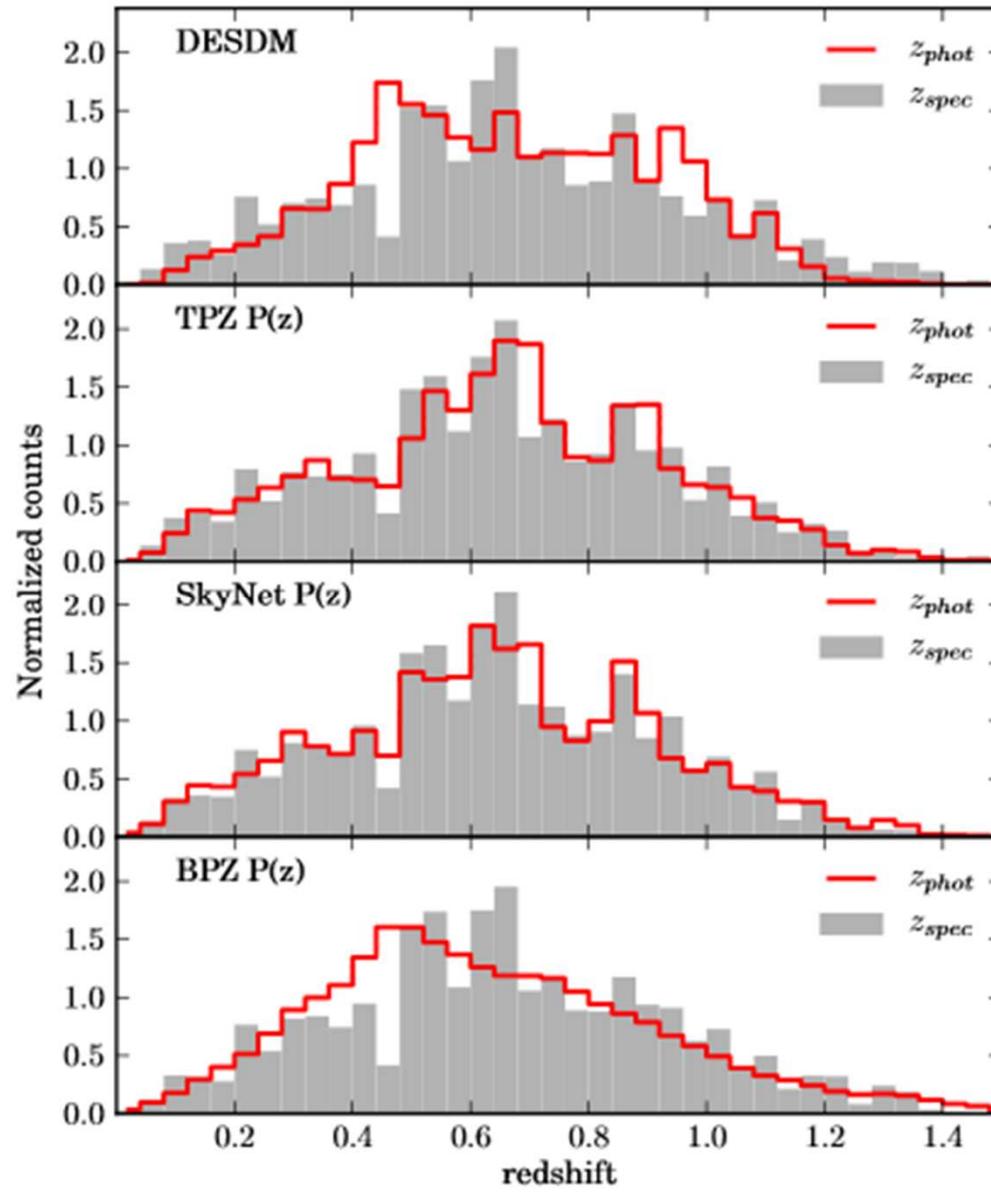


# First Results

# Photo-z



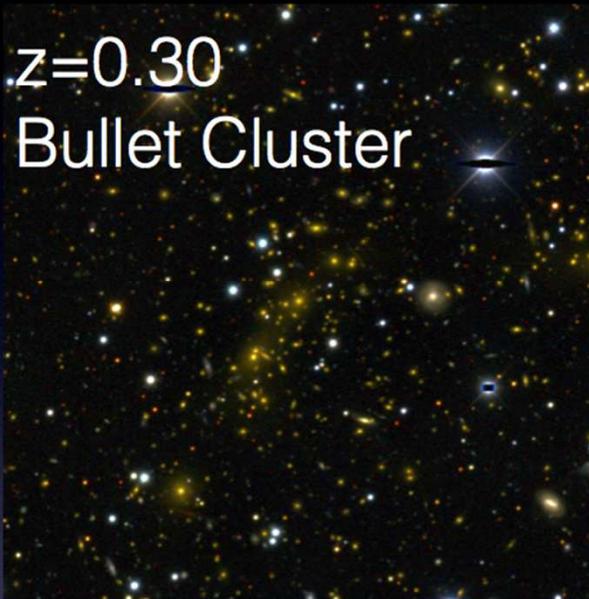
Sanches et al



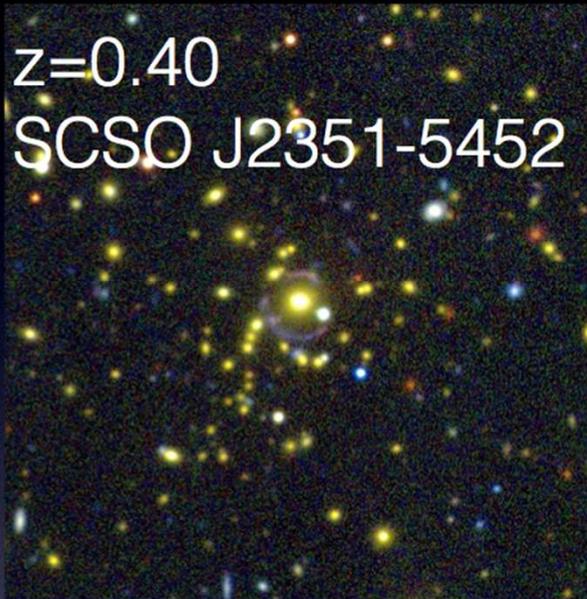


# Galaxy Clusters in SV

$z=0.30$   
Bullet Cluster



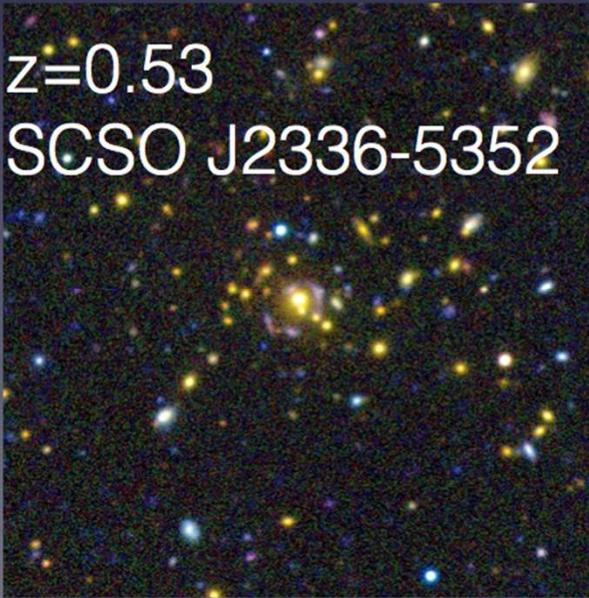
$z=0.40$   
SCSO J2351-5452



$z=0.87$   
"El Gordo"



$z=0.53$   
SCSO J2336-5352



$z=0.76$   
DES J0449-5909



$z=0.83$   
DES J0250+0008



# Clusters in Science Verification

RXC J2248.7-4431 ( $z=0.35$ )



5 x 3

# Clusters in Science Verification

RXC J2248.7-4431

( $z=0.35$ )

preliminary mass  
map contours:  
significance



Clus

RXC J

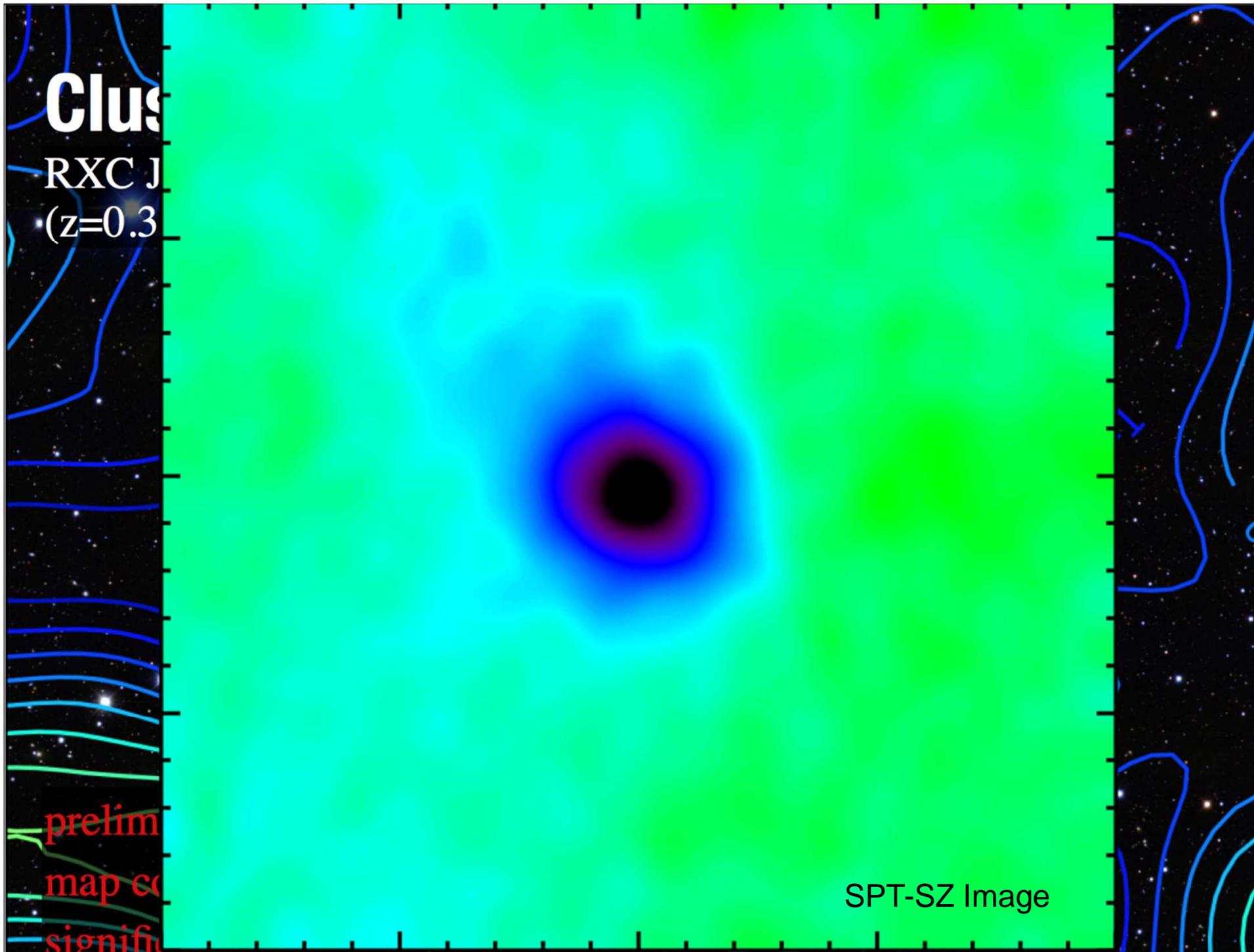
(z=0.3

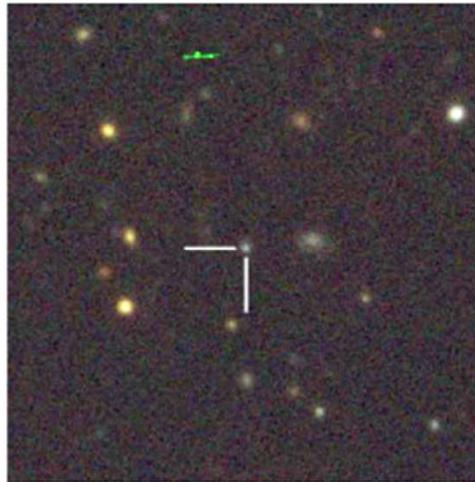
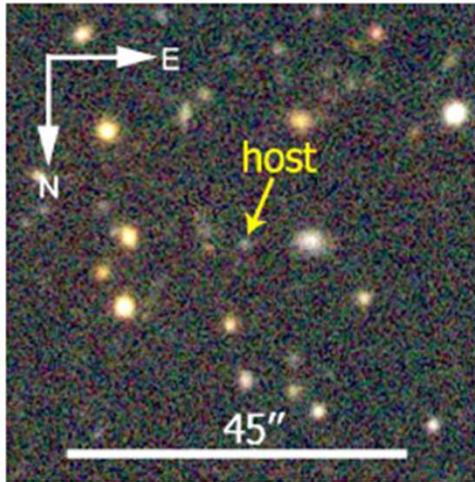
prelim

map co

signifi

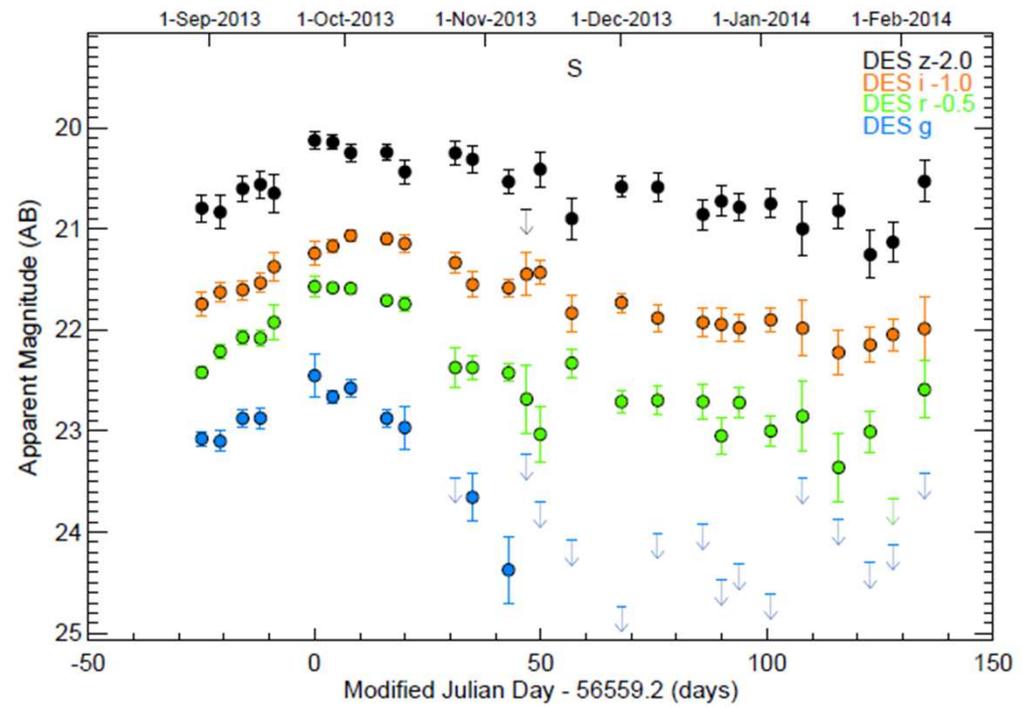
SPT-SZ Image



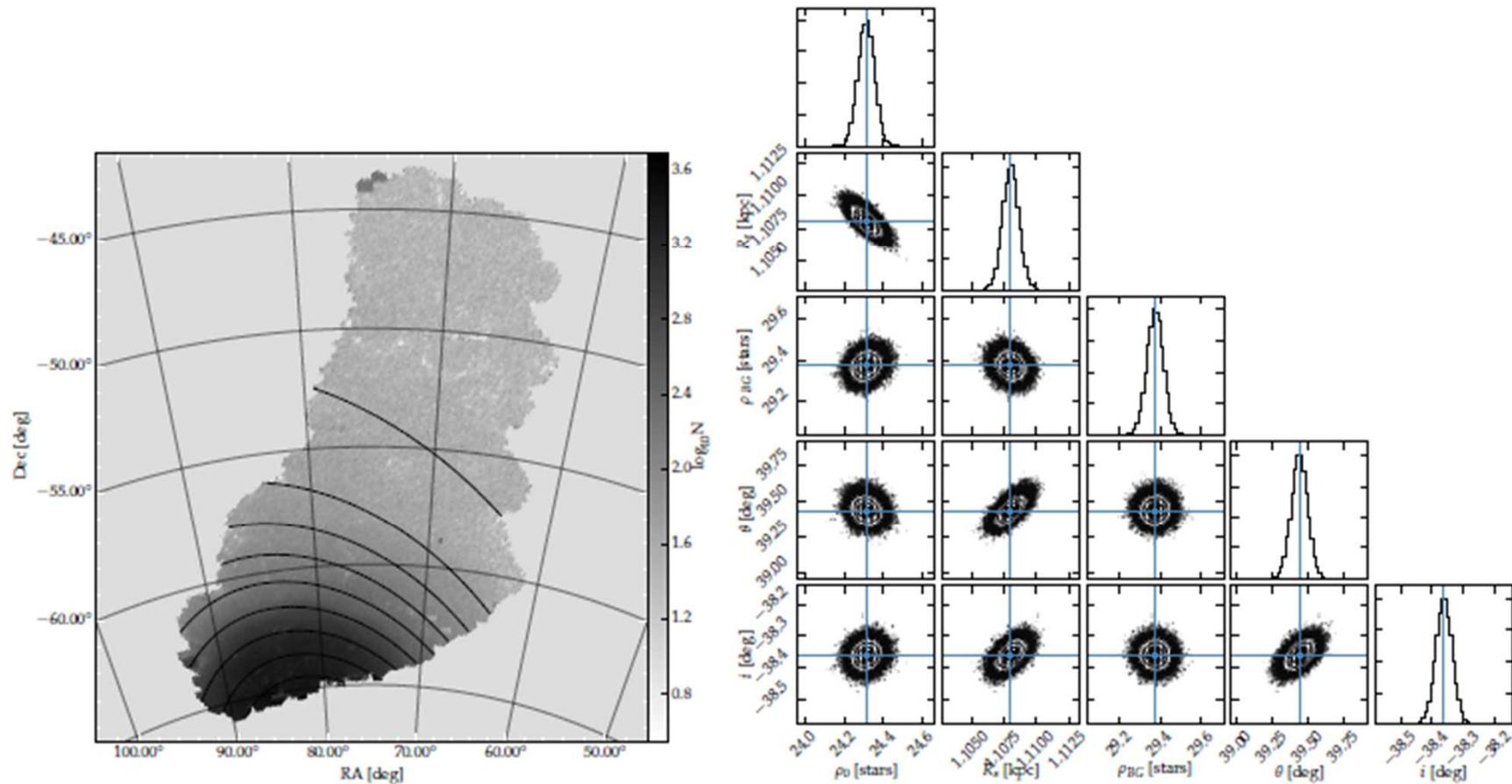


$z=0.66$

Papadoupolos et al.



# LMC Geometry



Balbinot et al

# Star Cluster Catalog

Software interface showing a star cluster catalog table and a corresponding mosaic image.

**Table:**

	Tilename	RA (deg)	Dec (deg)
1	DES0608-6456	91.5725	-65.0989
2	DES0601-6456	90.6761	-65.2648
3	DES0601-6456	90.1003	-64.8865
4	DES0608-6456	92.1615	-64.8037
5	DES0609-6414	91.97	-64.3027
6	DES0609-6414	91.6451	-64.3405
7	DES0601-6456	90.8292	-64.8305
8	DES0601-6456	90.4689	-64.8826
9	DES0601-6456	90.1553	-64.753
10	DES0602-6414	90.5724	-64.3311
11	DES0602-6414	90.4662	-64.1341
12	DES0558-6331	90.1247	-63.7245
13	DES0606-6248	92.0608	-62.9866
14	DES0559-6039	90.5239	-60.6508
15	DES0552-6539	88.919	-65.6237
16	DES0559-6539	89.6323	-65.4804
17	DES0559-6539	89.3302	-65.5335
18	DES0559-6539	89.3851	-65.3441

**Mosaic Image:** A multi-color mosaic of the star cluster, showing stars in various colors (blue, yellow, red, green). A green crosshair is overlaid on the image, and a small white box with a red 'X' is visible in the upper right quadrant. The image is labeled "Unavailable" at the bottom left.

**Target Properties Table:**

	Name ^	Value	Unit
1	a	180.00	pixel
2	b	180.00	pixel
3	dec	-65.10	deg

Page 1 of 3 | Displaying 1 - 100 of 294

# A “modest” data challenge

- Each image 1GB; 300–700 GB of raw data/night
  - Data must be moved from Chile to NCSA before next night begins (<18 hours), preferably in real time
  - **YEAR 1: Each image transferred in <120 sec!**
  - Data must be processed within <24 hours to inform next night’s observing: using NCSA resources
- TOTAL Dataset will be ~5 PB
- Considered by DOE a precursor of LSST

# DES Science Portal



(1996-2005)

People ....

- get tired
- get sick
- change jobs
- make mistakes
- get bored
- .....



**Login**

You logged out the DES-Brazil Portal.

User Name:

Password:

[I am not registered](#)

[I forgot my password](#)

This portal is best viewed with:



Need to have an integrated system with streamlined procedures running unsupervised

Start 2006  
480 FTE-months

# IT Team



Cost: US\$ 800k/year

<http://www.linea.gov.br/>

DOU Novembro de 2010



Convidado



**LIneA**  
Laboratório Interinstitucional de e-Astronomia

Início • Ciência • Serviços • Colaboradores • Atividades • Notícias • Divulgação • LIneA na Mídia • Fale Conosco

## O que é o LIneA?

É o laboratório interinstitucional envolvendo o Observatório Nacional, o Laboratório Nacional de Computação Científica, e a Rede Nacional de Ensino e Pesquisa, criado com a finalidade de dar suporte à participação brasileira em experimentos científicos utilizando os dados provenientes de grandes levantamentos astronômicos - os projetos Dark Energy Survey e Sloan Digital Sky Survey III. Para alcançar os objetivos científicos destes projetos, o LIneA gerencia toda uma infraestrutura de armazenamento, processamento, análise e distribuição de dados astronômicos através do projeto Astrossoft. Participam do LIneA pesquisadores e técnicos dos institutos do MCTI mencionados acima, além de professores de universidades.

### Notícias

December 13, 2013  
**Quick Reduce completa 1 ano de funcionamento no CTIO**  
O Quick Reduce (QR) é um sistema desenvolvido pelo LIneA capaz de monitorar a qualidade das imagens obtidas pela câmera do Dark Energy Survey, DECam em tempo real. O QR está em funcionamento no Campo Tolo Interamerican Observatory (CTIO) desde ... [Leia mais](#) →

November 27, 2013  
**LIneA assume novos compromissos com a colaboração do Dark Energy Survey**  
Nos dias 7 e 8 de novembro, o coordenador do LIneA e um representante da equipe técnica apresentaram no Fermilab, EUA.

#### Astrossoft

O objetivo do projeto Astrossoft é desenvolver uma infraestrutura de hardware e software necessária para gerar e explorar os dados provenientes de grandes levantamentos como o DES e o SDSS-III. Levantamentos deste porte requerem grande capacidade para a transferência, armazenamento e processamento de dados. A disponibilidade do sistema Astrossoft permitirá não apenas a participação brasileira nos levantamentos DES e SDSS-III, mas também a participação de toda a comunidade brasileira em outros levantamentos, seja de forma direta ou indireta, explorando cientificamente os dados acumulados por estes levantamentos na medida em que estes se tornem públicos. Dados disponíveis

[Mais informações >>](#)

#### DES-Brazil Dark Energy Survey

O levantamento Dark Energy Survey tem o objetivo de estudar a natureza da energia escura, uma componente descoberta recentemente, que representa da ordem de 70% do conteúdo do Universo, sendo esta energia a responsável pela aceleração de sua expansão. O projeto procura determinar a abundância da energia escura e a sua variação ao longo da história do Cosmos, através de quatro observáveis obtidos através dos estudos: 1- do número de aglomerados de galáxias em função do desvio para o vermelho (redshift); 2- das distorções nas imagens das galáxias causadas pelo efeito de lentes gravitacionais fracas; 3- da distribuição de galáxias em grande escala e; 4- da variação da distância de supernovas do tipo Ia com redshift. O

[Mais informações >>](#)

#### SDSS III BRAZILIAN PARTICIPATION GROUP

O projeto Sloan Digital Sky Survey III é uma colaboração internacional, consistindo de vários levantamentos espectroscópicos de extensas regiões do céu, que criará amostras estatísticas sem precedentes para estudos em diferentes áreas. Quatro grandes temas serão estudados: a) através da distribuição de galáxias em grande escala serão examinadas as condições físicas nos primórdios do Universo; b) será mapeada a estrutura, cinemática e composição química das partes mais externas da Via Láctea; c) exames das partes centrais da Via Láctea serão feitos no infravermelho, de forma a se evitar o obscurecimento pelas nuvens de poeira nestas regiões; d) monitoramento de 11 mil estrelas para detecção de planetas gigantes. Além destes objetivos, muitos

[Mais informações >>](#)

Observatório Nacional | Laboratório Nacional de Computação Científica | RNP Rede Nacional de Ensino e Pesquisa

Apoio: CNPq | FAPERJ | FINEP

LIneA • Laboratório Interinstitucional de e-Astronomia  
Rua General José Cristiano, 77 • Sítio Cristóvão • Rio de Janeiro • RJ • Brasil • CEP: 20921-400  
Tel.: (21) 3504-9165 • contato-linea@linea.gov.br • Mapa de localização





unesp

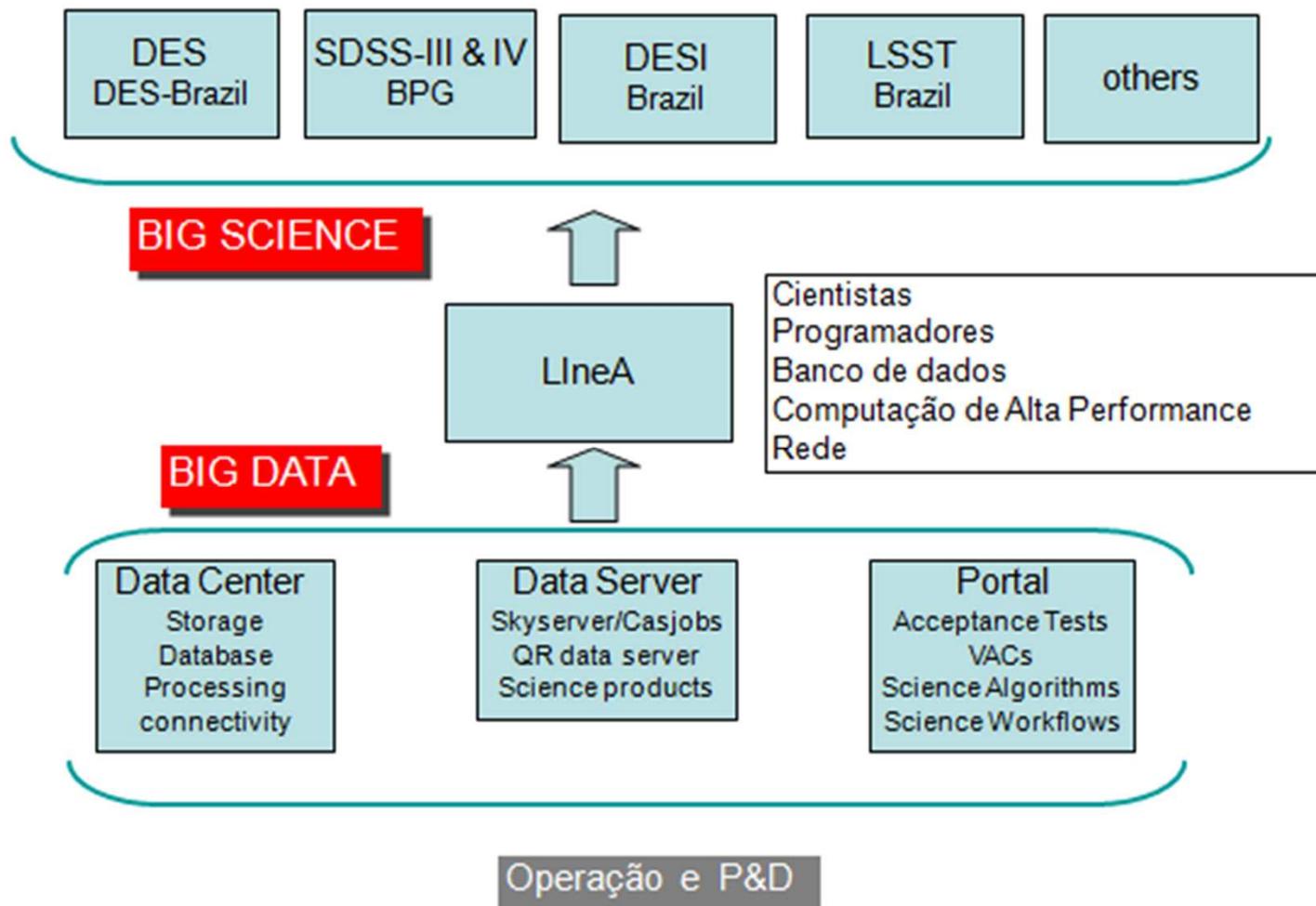
USP



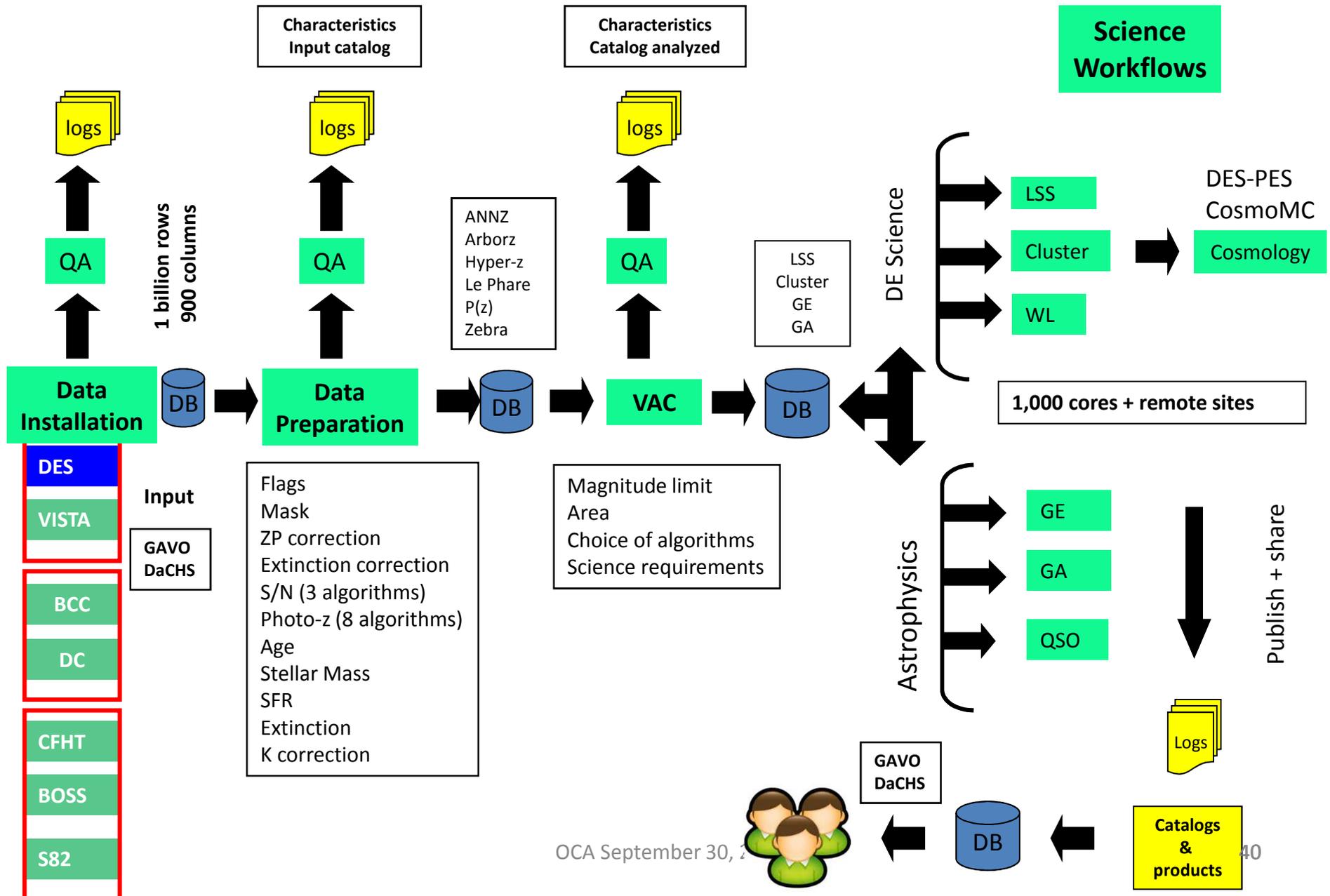
UFRGS



Observatoire  
de la CÔTE d'AZUR



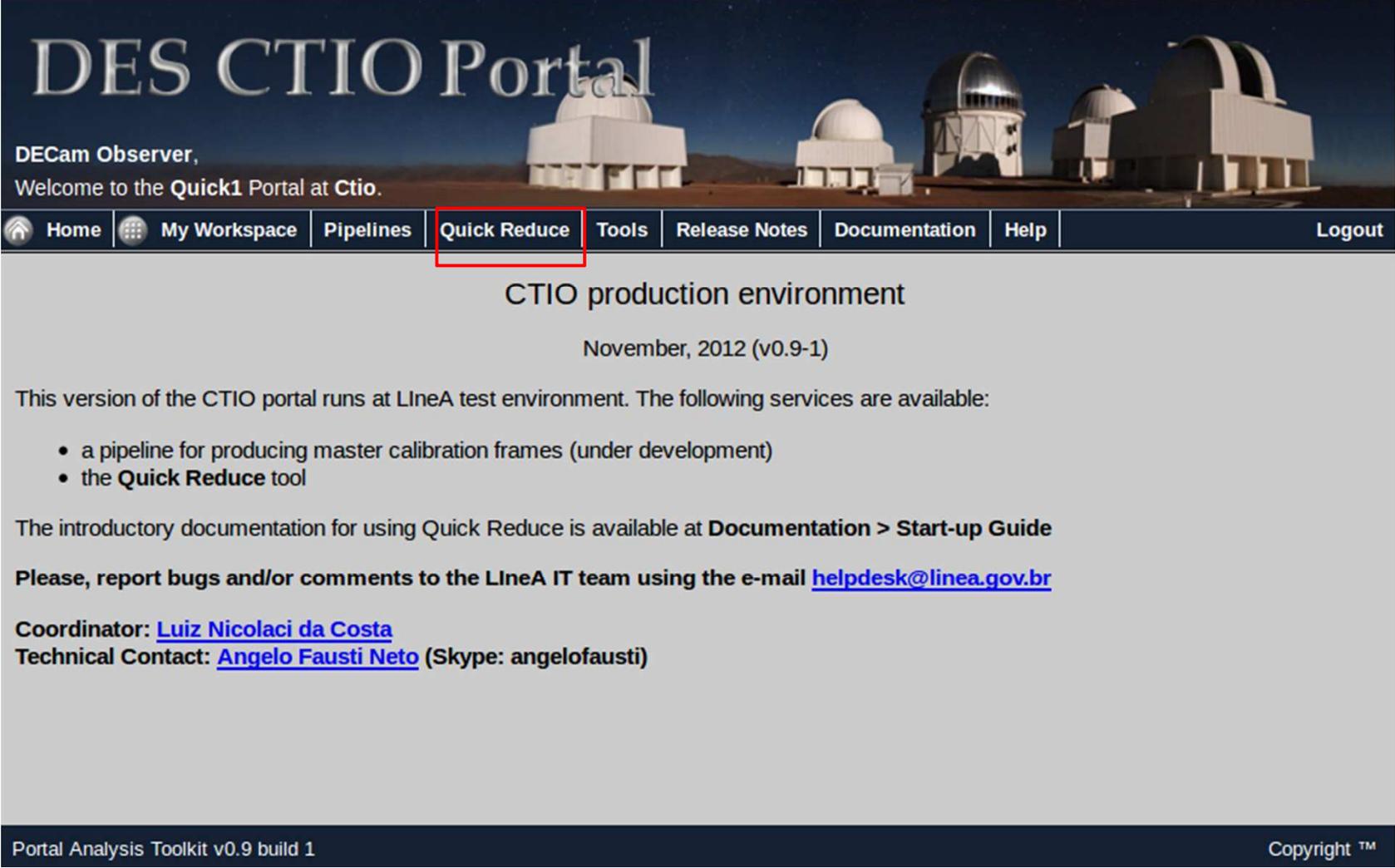
# Science Portal Grand View



# Portal Instances & operation model

- CTIO Portal
  - Quick reduce
- DES Science Portal (LIneA, restricted access)
  - Data installation
  - Data preparation
  - Value-added catalogs
  - Science workflows
  - Other ancillary pipelines (e.g. training set maker, random catalogs)
  - Administration
- DES Data server (Fermilab)
  - Reductions (QR server, Final cut)
  - Monitoring survey progress
  - Coadds (product log, footprint, tile viewer, object viewer)
  - User queries
  - Catalog server (value-added catalogs, favorites, targets)
  - Science Workflow products

# CTIO Portal: all DECam users



DES CTIO Portal

DECam Observer,  
Welcome to the **Quick1** Portal at **Ctio**.

Home My Workspace Pipelines **Quick Reduce** Tools Release Notes Documentation Help Logout

CTIO production environment

November, 2012 (v0.9-1)

This version of the CTIO portal runs at LineA test environment. The following services are available:

- a pipeline for producing master calibration frames (under development)
- the **Quick Reduce** tool

The introductory documentation for using Quick Reduce is available at **Documentation > Start-up Guide**

Please, report bugs and/or comments to the LineA IT team using the e-mail [helpdesk@linea.gov.br](mailto:helpdesk@linea.gov.br)

Coordinator: [Luiz Nicolaci da Costa](#)  
Technical Contact: [Angelo Fausti Neto](#) (Skype: angelofausti)

Portal Analysis Toolkit v0.9 build 1 Copyright <sup>TM</sup>

# Quick Reduce

The screenshot displays the QR Monitor interface. At the top left is a 'Back to Home' button. The main title is 'QR Monitor'. Below the title, there are five status indicators: 'Status' (STOPPED, red), 'Mode' (Automatic, green), 'Environment' (SISPI, blue), 'Disk Usage' (9%, green), and 'Current Observer' (DECam Observer, blue). On the left side, there is a 'Reduction Mode' section with 'AUTOMATIC' selected and 'MANUAL' unselected. Below that is a 'Control Panel' with a 'START' button and several other buttons: 'Select Configuration', 'Select CCDs', 'Raw Exposures', 'Reduced Exposures', 'Observing History', 'Reset', 'Clean Disk', and 'Save Log'. At the bottom left is an 'External Info' section with buttons for 'Environmental Conditions', 'RASICAM', and 'Trend Analysis'. The main area on the right contains a 'System Log' window with a scroll bar, showing a list of system events with timestamps and details. Below the log is a '3-day Storage' section showing a list of exposure records.

Back to Home

QR Monitor

Reduction Mode  
 AUTOMATIC  MANUAL

Control Panel

**START**

Select Configuration

Select CCDs

Raw Exposures

Reduced Exposures

Observing History

Reset

Clean Disk

Save Log

External Info

Environmental Conditions

RASICAM

Trend Analysis

Status: **STOPPED**

Mode: **Automatic**

Environment: **SISPI**

Disk Usage: **9%**

Current Observer: **DECam Observer**

System Log

```
2012-12-07 06:56:53 Waiting for reduction requests...
2012-12-07 06:56:53 Finished process 10014117 with Success, duration 91.42s
2012-12-07 06:56:39 The distortion of the PSF for exposure 158793 has exceeded the upper l
2012-12-07 06:55:22 Number of CCDs to reduce: 14
2012-12-07 06:55:22 EXPOSURE ID 158793 Filter z
2012-12-07 06:55:22 Starting process 10014117
2012-12-07 06:55:06 Transferring EXPOSURE ID 158793 to local disk.
```

3-day Storage

```
2012-12-11 01:37:38 EXPOSURE ID 160178, object, Filter r, field168
2012-12-11 01:36:57 EXPOSURE ID 160177, object, Filter r, field163
2012-12-11 01:30:12 EXPOSURE ID 160176, object, Filter r, field163
```

# Quick Reduce

**QR Monitor**

Back to Home

Reduction Mode:  AUTOMATIC  MANUAL

Status: **STOPPED** Mode: **Automatic** Environment: **SISPI** Disk Usage: **9%** Current Observer: **DECam Observer**

Control Panel:

- START**
- Select Configuration
- Select CCDs
- Raw Exposures
- Reduced Exposures
- Observing History
- Reset
- Clean Disk
- Save Log

System Log:

```
2012-12-07 06:56:53 Finished process 3
2012-12-07 06:56:39 The distortion of
2012-12-07 06:55:22 Number of CCDs to
2012-12-07 06:55:22 EXPOSURE ID 158793
2012-12-07 06:55:22 Starting process 3
2012-12-07 06:55:06 Transferring EXPOSU
2012-12-07 06:53:52 Quick Reduce onlin
```

3-day Storage:

```
2012-12-11 01:30:12 EXPOSURE ID 160176
2012-12-11 01:29:35 EXPOSURE ID 160175
2012-12-11 01:22:44 EXPOSURE ID 160174
2012-12-11 01:22:09 EXPOSURE ID 160173
2012-12-11 01:14:58 EXPOSURE ID 160172
```

External Info:

- Environmental Conditions
- RASICAM
- Trend Analysis

update Time: Wed Dec 5 13:25:36 2012

**Select CCDs**

FoV Pattern:

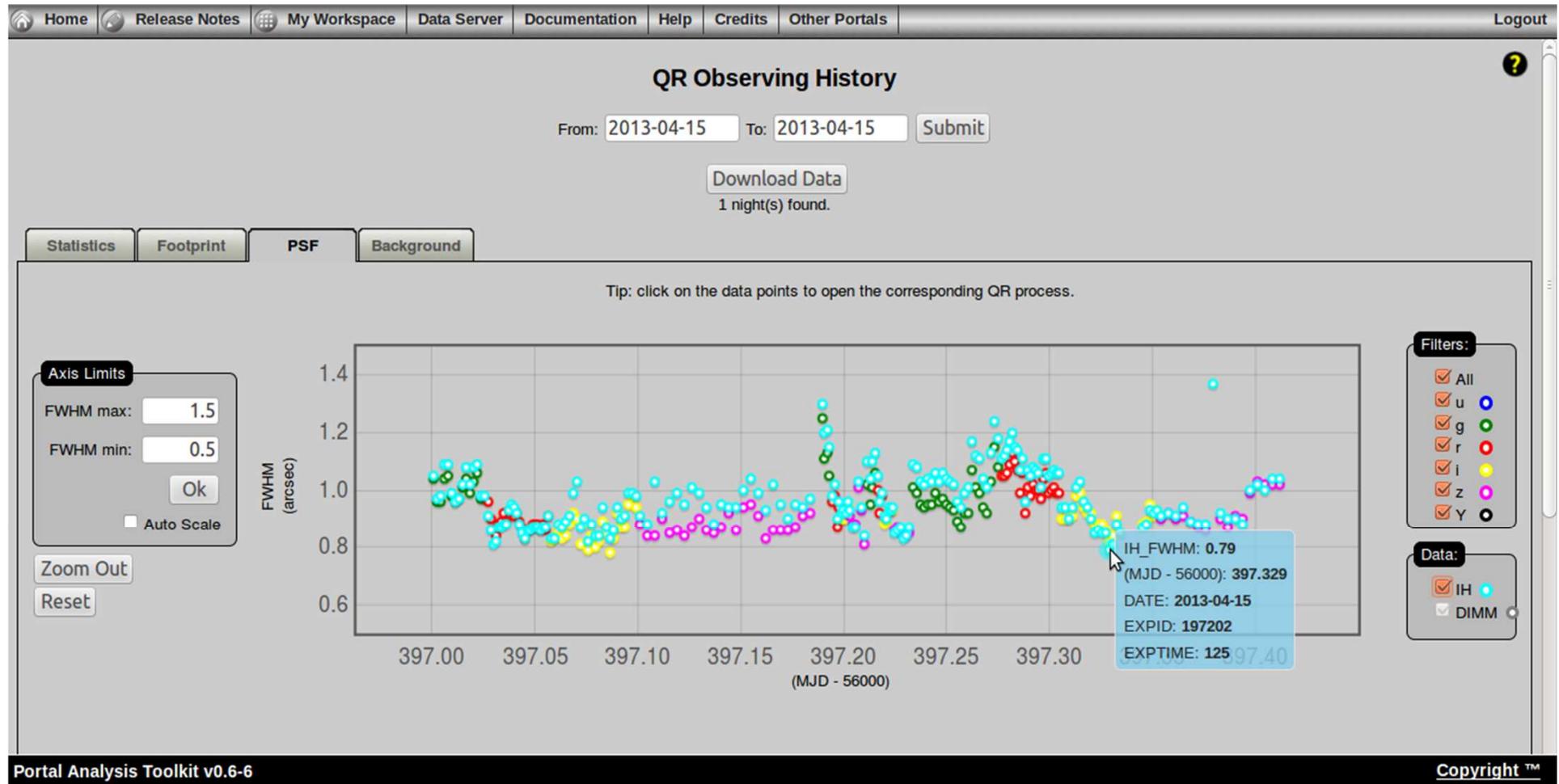
- Core
- Cross
- Rings
- Backplane
- Random
- All
- User selected

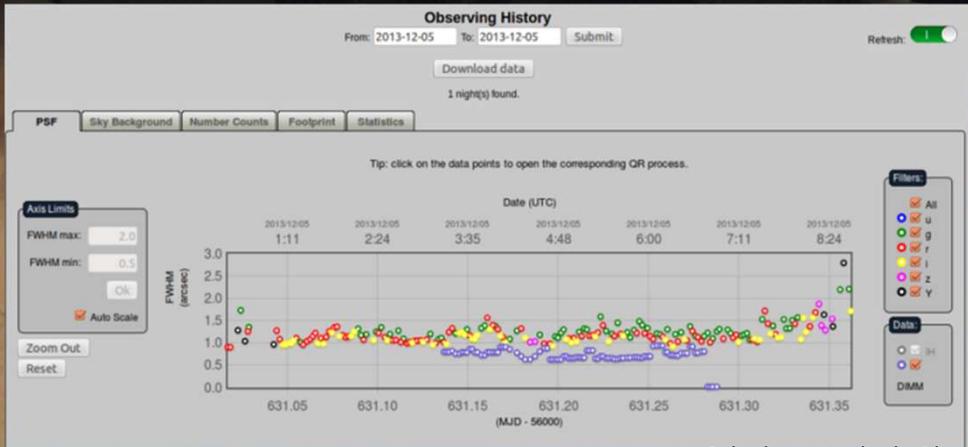
Clear selection

14 CCDs selected

Save Cancel

# Seeing monitor





# Science Portal: restricted Access

The screenshot displays the Science Portal interface. At the top, a dark navigation bar contains the following items: a home icon, 'My Workspace', 'Pipelines' (highlighted with a red box), 'Tools', 'Data Server', 'Documentation', and 'Help'. The user's name 'Luiz da Costa' is visible in the top right corner. Below the navigation bar, the main content area is titled 'DES Science Portal: Workflows'. It contains the following text and list:

The Science Portal has two instances:

- **Workflows:** hosts workflows for Quality Assessment (QA), for the creation of Value-Added Catalogs (VACs) and for Science Analysis.
- **Data Server:** provide access to the Catalog Server and published results

The system is designed to be self-evident, use the help icon "?" available on each page.

The Science Portal is a facility developed by [LineA](#). If you have any question please contact us through the [helpdesk@linea.gov.br](mailto:helpdesk@linea.gov.br)

On the right side, there is a 'Tweets' sidebar with a 'Follow' button. It displays four tweets from '@desportal\_linea':

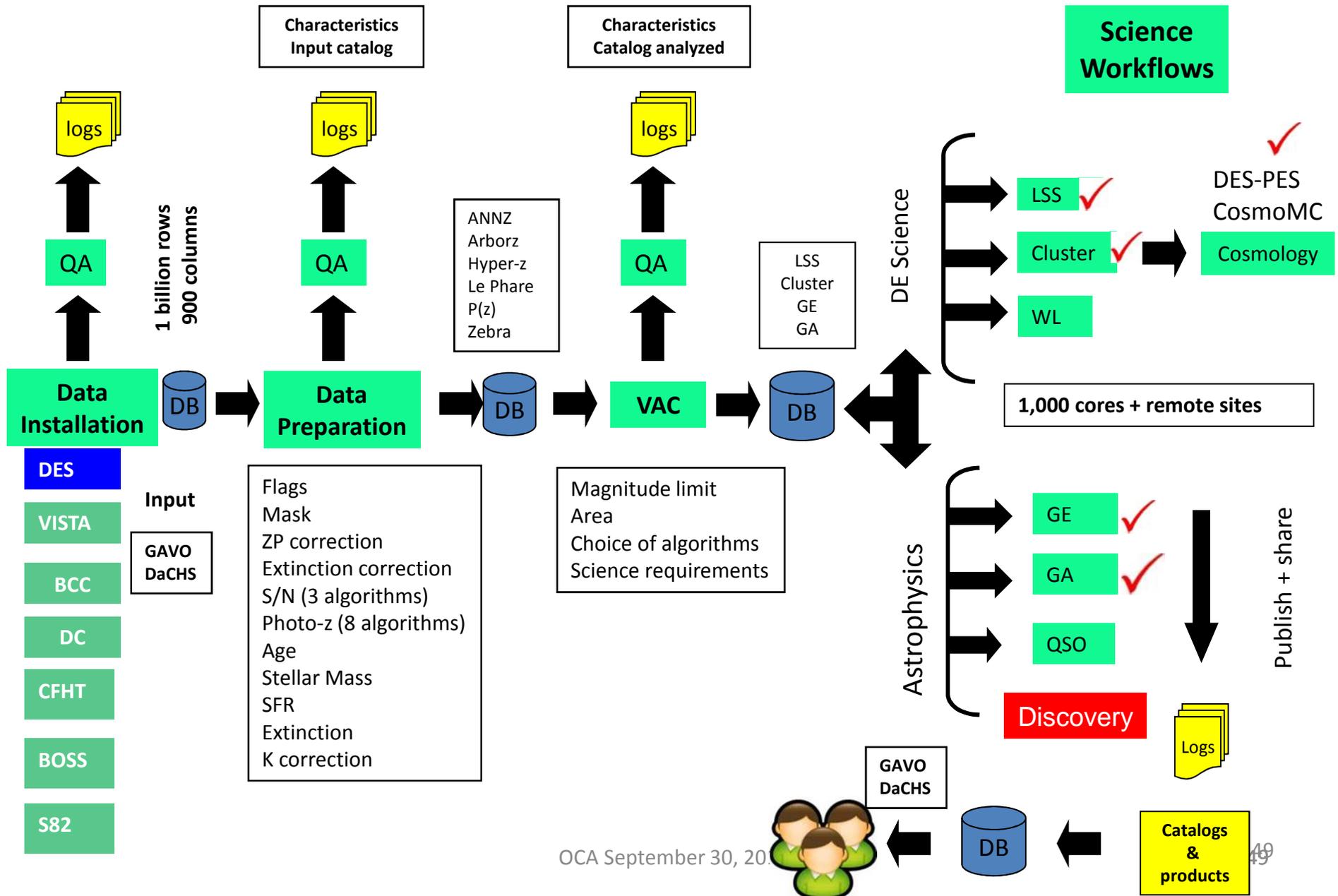
- 12h: The status of DES+VHS (20140610) was changed to "Pending".
- 1 Aug: The status of IM3Shape (5.0) has been updated to "OK".
- 1 Aug: The status of All Fields (v1.1) has been updated to "OK".
- 1 Aug: The status of All Fields (v1.1) has been updated to "OK".

At the bottom of the page, a dark footer bar shows 'Update Time: Fri Jul 25 14:57:27 2014' on the left and 'Powered by LineA' on the right.

# Workflows for SWG

The screenshot displays the LineA Science Portal interface. At the top, a navigation bar includes 'My Workspace', 'Pipelines', 'Tools', 'Data Server', 'Documentation', and 'Help', with the user name 'Luiz da Costa' on the right. A dropdown menu is open under 'Pipelines', listing categories like 'Data Reduction', 'Data Preparation', 'Acceptance Test', and 'Value-Added Catalog'. The 'Science' category is highlighted, showing a sub-menu with items such as 'LSS', 'Cluster', 'SN', 'WL', 'Simulation', 'Galaxy Archeology', 'Galaxy Evolution', 'QSO', 'Strong Lensing', and 'Combined Probes'. The main content area features a 'DES Science Portal' section with a description and a list of items: 'Workflows: hosted for Science Analysis' and 'Data Server: provided'. Below this is a 'Tweets' section with four tweets from '@desportal\_linea' reporting status updates for various datasets. The footer shows the URL 'testing.linea.gov.br/#', a timestamp '14:57:27 2014', and the text 'Powered by LineA'.

# Portal End-to-End Data Flow



# Data Server: open access to the collaboration

Observations Data Releases Footprint Tile Viewer User Catalog Catalog Server Science Products Help Luiz da Costa

## DES Science Portal : Data Server

The DES Science Portal hosts tools for Quality Assessment (QA), Value-Added Catalogs (VACs) preparation and Science Analysis.

From the Data Server instance you have access to following services:

- **Observations:** information about DES observations from the Night Summary and Quick Reduce
- **Data Releases:** list of the releases currently installed and associated data
- **Footprint:** spatial coverage and overlapping with external catalogs
- **Tile Viewer:** visual inspection of co-add images and catalogs
- **Catalog Server:** access to VACs produced by the portal, uploaded catalogs, reference catalogs and simulations

Science Products: access to science products produced by the portal or uploaded by other authors

The system is designed to be self-evident, use the help icon "(?)" available on each page.

The Science Portal is a facility developed by [LineA](#). If you have any question please contact us through the [helpdesk@linea.gov.br](mailto:helpdesk@linea.gov.br)

### Tweets

Follow

- Des Portal Testing** @desportal\_linea 12h  
The status of DES+VHS (20140610) was changed to "Pending".
- Des Portal Testing** @desportal\_linea 1 Aug  
The status of IM3Shape (5.0) has been updated to "OK".
- Des Portal Testing** @desportal\_linea 1 Aug  
The status of All Fields (v1.1) has been updated to "OK".
- Des Portal Testing** @desportal\_linea 1 Aug  
The status of All Fields (v1.1) has been updated to "OK".

Tweet to @desportal\_linea

Update Time: Fri Jul 25 14:57:27 2014 Powered by LineA

# Portal Reviews

2010 - “The system is actually much more than a Science Portal, it is a comprehensive, web-based eScience Analysis Center for the Dark Energy Survey Collaboration. It is designed to be very general, and allow the sharing of code, data, and results of analysis world-wide, in a virtual environment. **We don't know that anything quite like it exists yet - it is forward-looking and ambitious.**”

2011 - “The Brazil Portal concept includes a place where large-collaboration astrophysics analysis can be directed: a central place for checking in codes; compiling, linking, and running those codes; making plots and sharing them, all in a repeatable, archived fashion; and the ability to run things in parallel in larger volume. **The vision of the Brazil portal is commendable and should go forward.** The portfolio of tasks is large, yet the resources to undertake the work are limited.”

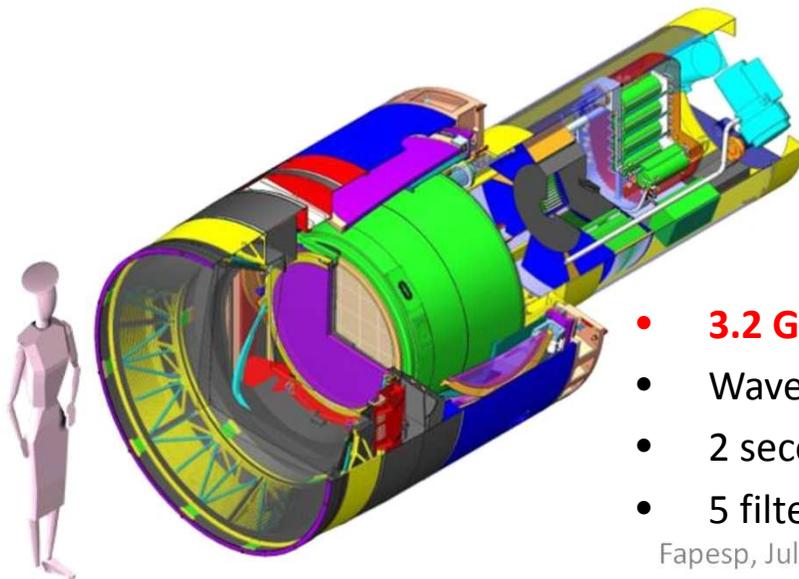
2012 – QR

2013 – July and November

2014- Scheduled

NCSA
NOAO
NERSC
LSST
LSST@Home

# LSST



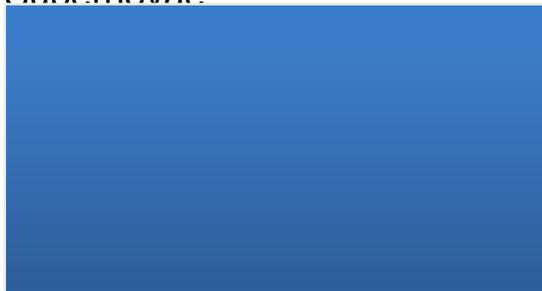
1.65 m  
(5'-5")

- **3.2 Gigapixel science array – 10 square degree FOV!**
- Wavefront and guide sensors
- 2 second readout
- 5 filters in camera

Fapesp, Julho 2014

# The LSST Science Book

- Contents:
  - Introduction
  - LSST System Design
  - System Performance
  - Education and Public Outreach
  - The Solar System
  - Stellar Populations
  - Milky Way and Local Volume Structure
  - The Transient and Variable Universe
  - Galaxies
  - Active Galactic Nuclei
  - Supernovae



Dark Energy



**Project & Science Collaboration**

# Summary of High Level Requirements

Survey Property	Performance
Main Survey Area	18000 sq. deg.
Total visits per sky patch	825
Filter set	6 filters (ugrizy) from 320 to 1050nm
Single visit	2 x 15 second exposures
Single Visit Limiting Magnitude	u = 23.5; g = 24.8; r = 24.4; I = 23.9; z = 23.3; y = 22.1
Photometric calibration	2% absolute, 0.5% repeatability & colors
Median delivered image quality	~ 0.7 arcsec. FWHM
Transient processing latency	60 sec after last visit exposure
Data release	Full reprocessing of survey data annually

# Petascale Data Management

- Each image roughly 6.5GB
- Cadence: ~1 image every 15s
- 15 to 18 TB per night, 30TB “reduced”!
  - ALL must be transferred to NCSA archive center
    - within image timescale (17s), >>10 Gbps
- **REAL TIME** reduction, analysis, & alerts
  - Send out alerts of transient sources within 60s
    - ~2 million events per night every night for 10 years
  - Provide automatic data quality evaluation, alert to problems
  - Change survey observing strategy on the fly based on conditions, last field visited, etc.

# LSST:

## “Data Science” in real time

### TRANSIENT SCIENCE (Data Stream)

- >3 Terabytes per hour (reduced) that must be mined in real time for alerts.
- 20 billion objects will be monitored for important variations in real time.
- ~2 million events per night every night for 10 years

***New approaches must be developed for knowledge extraction in real time***

### NON-TRANSIENT SCIENCE

- >10<sup>10</sup> objects in a 20 PB final database catalog, backed by a 100 PB final image archive

***New approaches to data mining needed to sift through data to identify samples, or individual objects, of interest***

# Summary

- DES has just started Y2
- Data meeting requirements
- Science already being produced with SV data
- Portal useful tool to explore the large volume of data in a reproducible way and capture and retain the know-how for the lifetime of the project
- Agreement with LSST being worked out
- DES path finder to LSST