DARK ENERGY SURVEY

Data Reduction Pipelines in a Portal Environment

Marcio Maia on behalf of
LIneA Team

Science with the LSST – Campos do Jordão – April 1-4, 2012

PreCam Survey Reduction Pipeline

DARK ENERGY SURVEY

DES-BRAZIL

Use of science portal infrastructure for:

- Reduction of PreCam data in a streamlined way.
- Storage of raw and processed data + catalogs.
- Distribution of images + catalogs to DES Collaboration.
- Host analysis and calibration tools.

What is PreCam Survey ?

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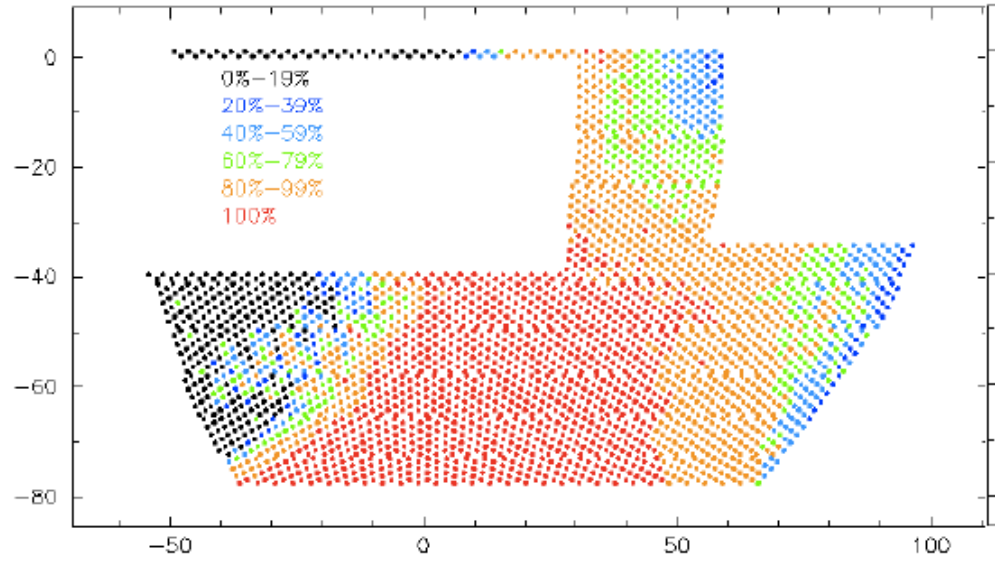
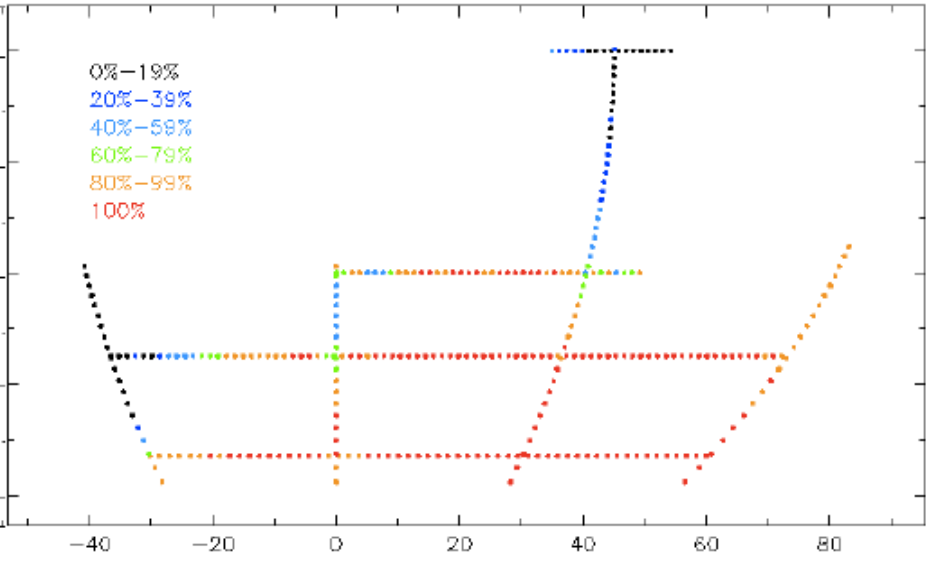
Filled Survey



Cover full DES footprint

Rib and Keel Survey

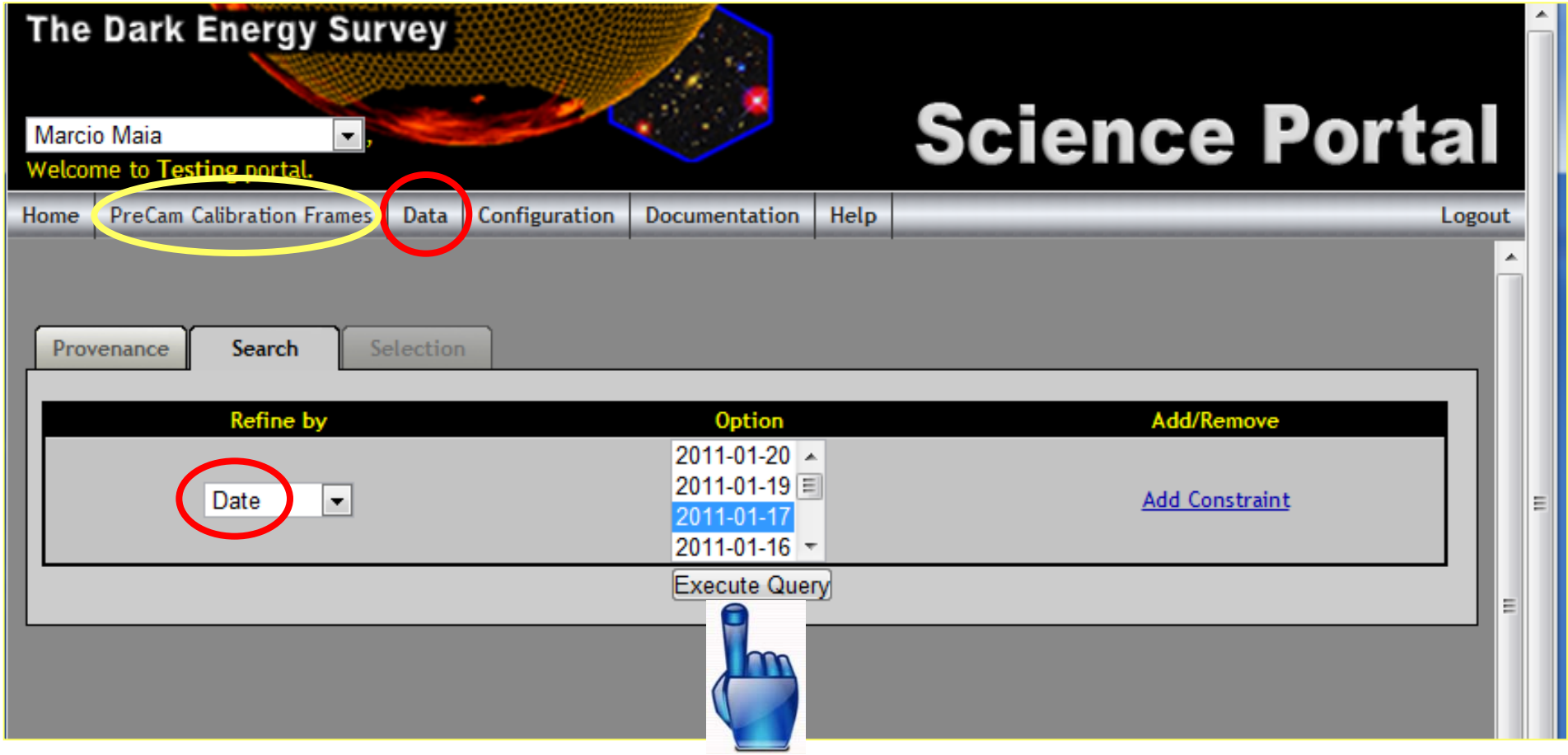


Cover 1/10th of the DES footprint 10x

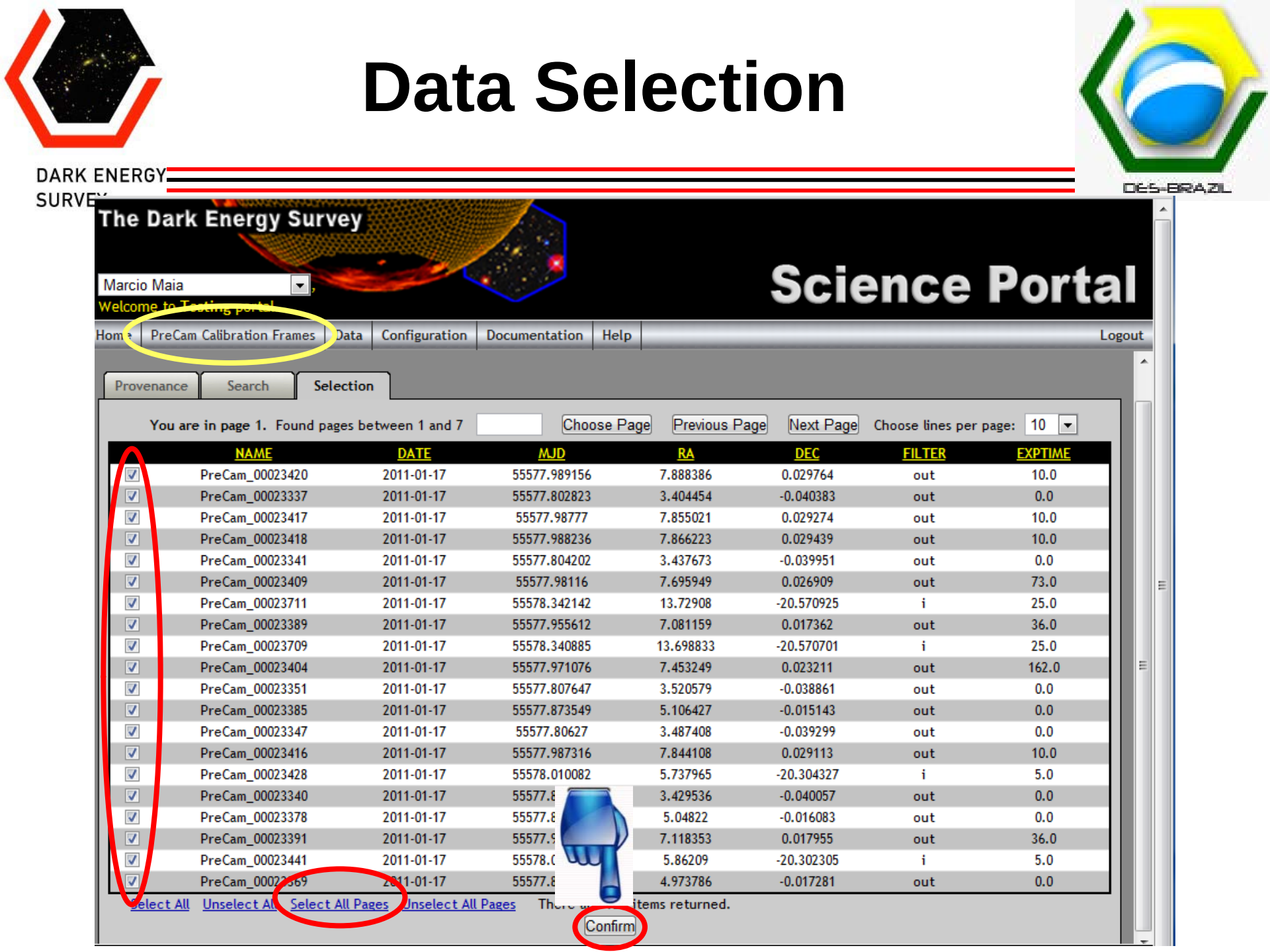
Portal

DES-Brazil Portal
testing.des-brazil.org/#
UOL - O melhor con...
Webmail ON :: Bem...
https://www2.banc...
LIneA Webmail :: Be...
Gmail: Email do Goo...
Outros favoritos
The Dark Energy Survey
Marcio Maia
Welcome to Testing portal.
Science Portal
Home
Release Notes
My Workspace
Pipelines
Tools
Data Server
Documentation
Help
Credits
Other Portals
Logout
Data Reduction
Advanced Products
Science
Quality Assessment
Quick Reduce
Co-addition
PreCam
Quality Control
Science
Calibration Frames
Introduction to the Science Po
This portal is a web-based service that gives t
, monitor the
progress of the survey, and to manage product
system tries to be
self-evident with in-line help available in various parts of the system as well as short explanatory demonstration movies a
the Help session.
The portal also provides tools for power-users and system administrators to oversee the entire system.
The services currently available under the menu folder include:
My Workspace: provides access to the profile, processes, configurations, products from process and uploaded data. Besides that, the user can require a developer status, allowing the access to: 1) the portal machines through ssh; 2) the code repository in order to pull and push code;
Pipelines:
Data Reduction: provides access to Quick Reduce, a tool to reduce DECam data in the mountain. Also an adapted version to CTIO 1m runs is currently available and will turn into the PRECam reduction pipeline.
Advanced Products: here the user can produce and export catalogs, either regular or value-added, and validate them using the tools available in the portal.
Science: provides access to the available scientific pipelines, grouped in sub-categories (sub-folders) representing different working and study groups. The available pipelines (processes) in each group varies in the degree of sophistication and scope but all consist of concatenated full configurable modules chosen according to the user-specified workflow and algorithms, that query for data, process one or more jobs, depending on the number of input data sets, and generate scientific products that are stored in a temporary directory,

Data Selection



Data Selection



Data Selection

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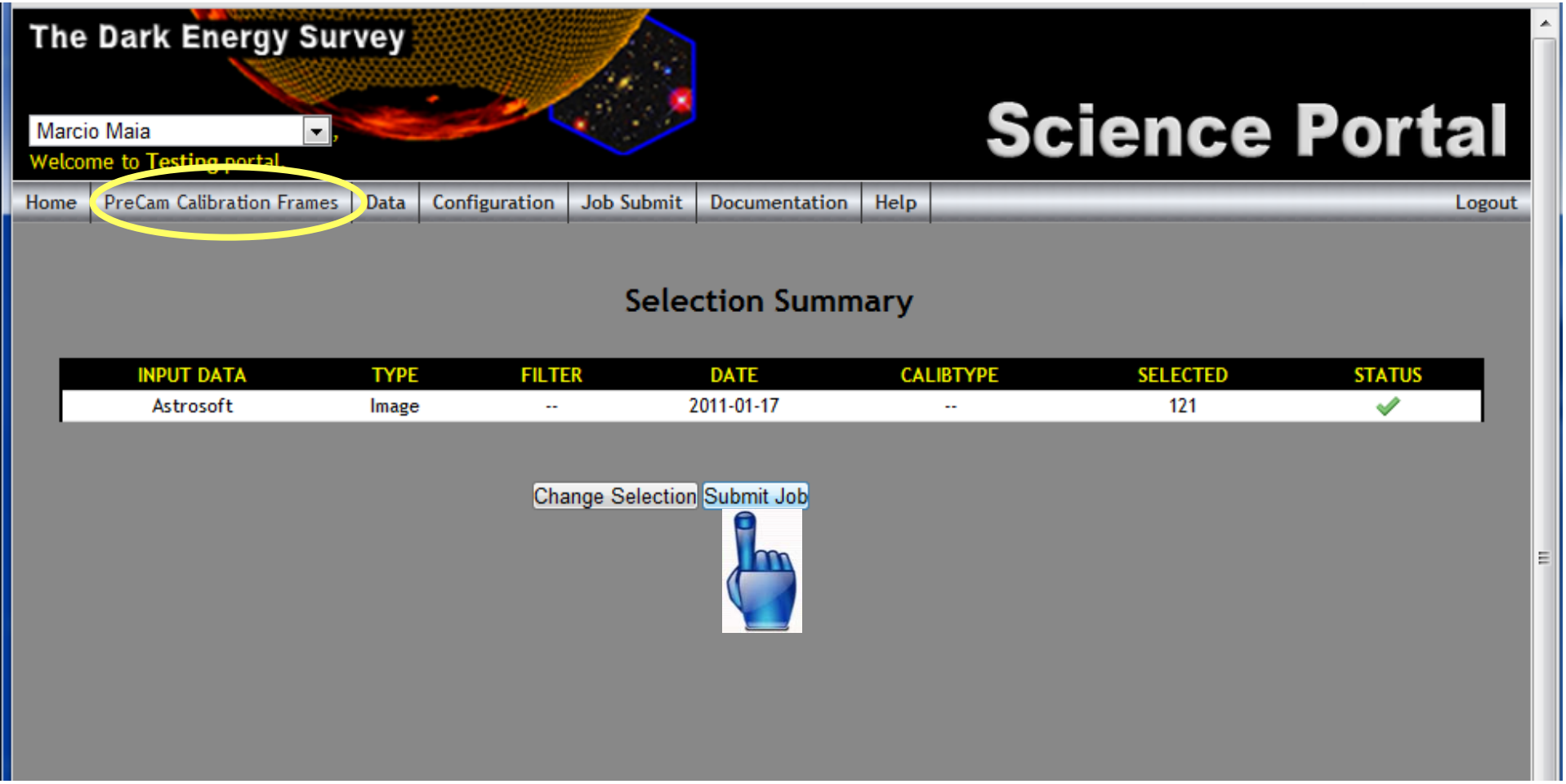
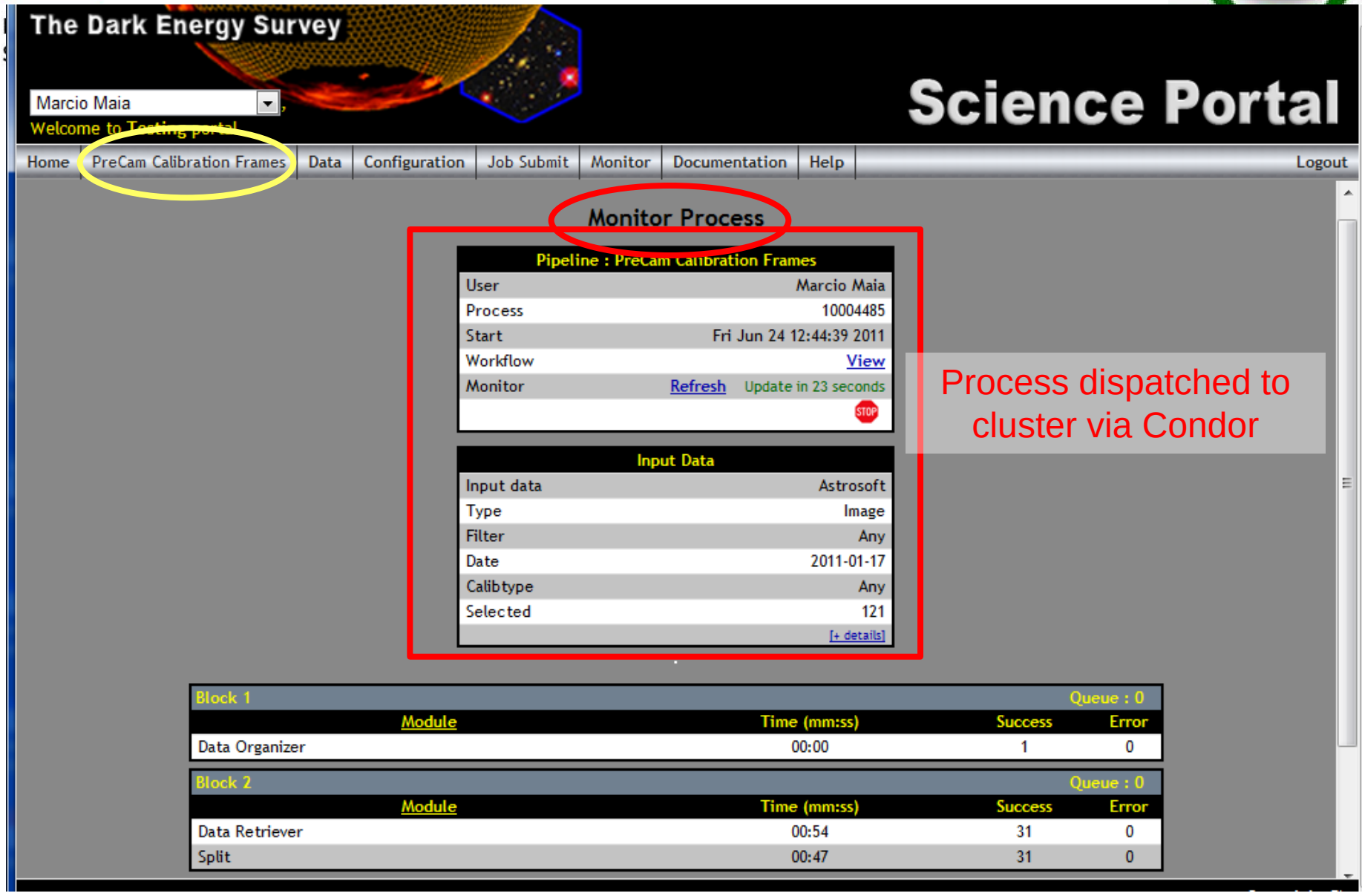


Reduction Calib Frames



Process ready

Assunto **Science Portal Process Result**
Remetente Science Portal <noreply@portal.linea.gov.br>
Data 24.06.2011 13:05

Dear Marcio Maia,

Your PreCam Calibration Frames job has finished !

Process: PreCam Calibration Frames

User: Marcio Maia
Process Id: 10004485
Start: 06-24-2011 12:44:39
End: 06-24-2011 13:05:16
Process Time: 00:20:37
Ingest Time: 00:00:03
Expiration: 06-28-2011 13:05:16
Jobs: 330

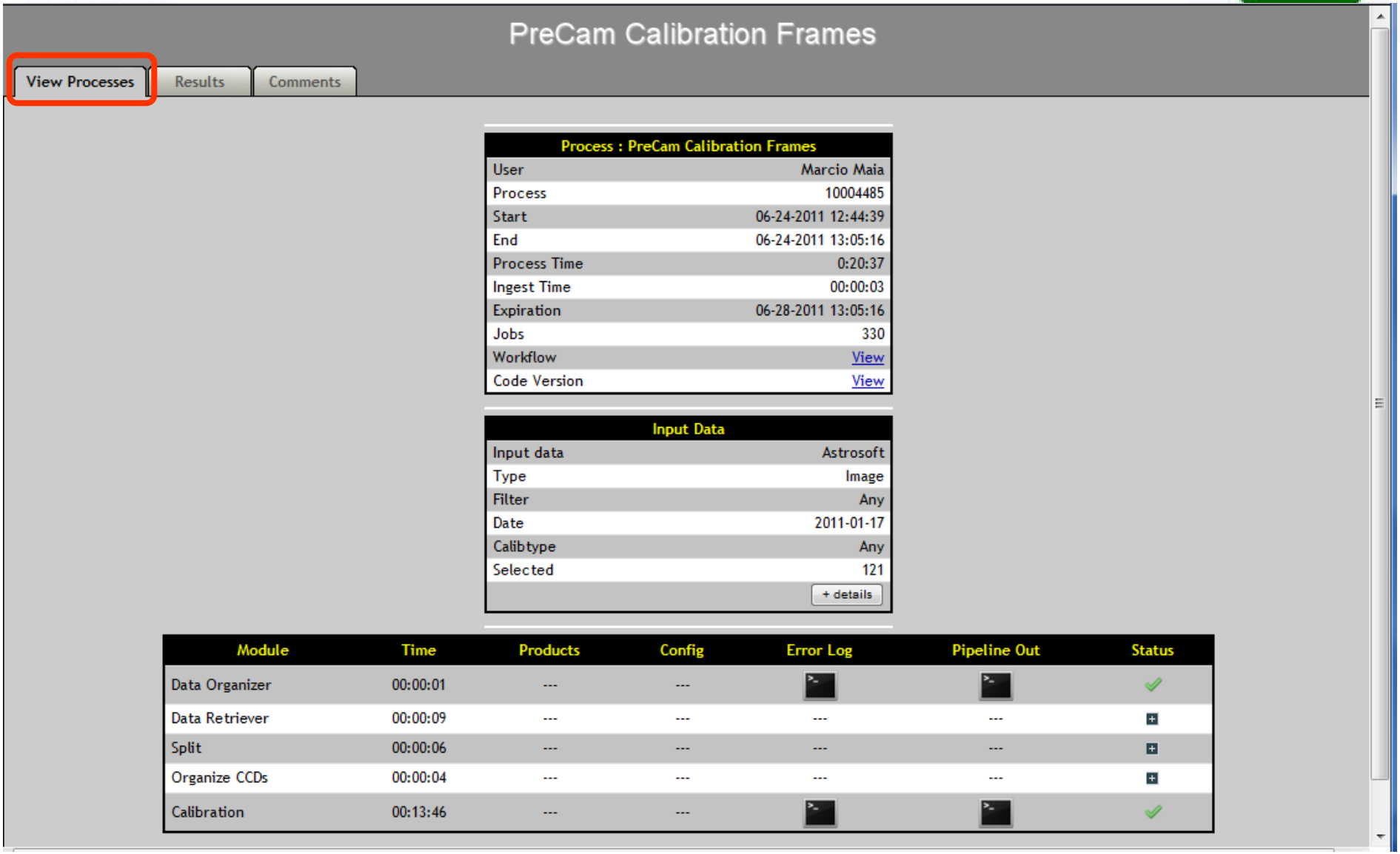
Input data: Astrosoft
Type: Image
Filter: Any
Date: 2011-01-17
Calibtype: Any
Selected: 121
Process size: 11G

Please use the following link to check your results.
http://testing.des-brazil.org/VP/getViewProcessCon?pro=10004485

The data will be available in the system until 06-28-2011 13:05:16

You receive an e-mail from the Portal announcing your process is ready.

Process ready !



PreCam Calibration Frames

View Processes | Results | Comments

Process : PreCam Calibration Frames	
User	Marcio Maia
Process	10004485
Start	06-24-2011 12:44:39
End	06-24-2011 13:05:16
Process Time	0:20:37
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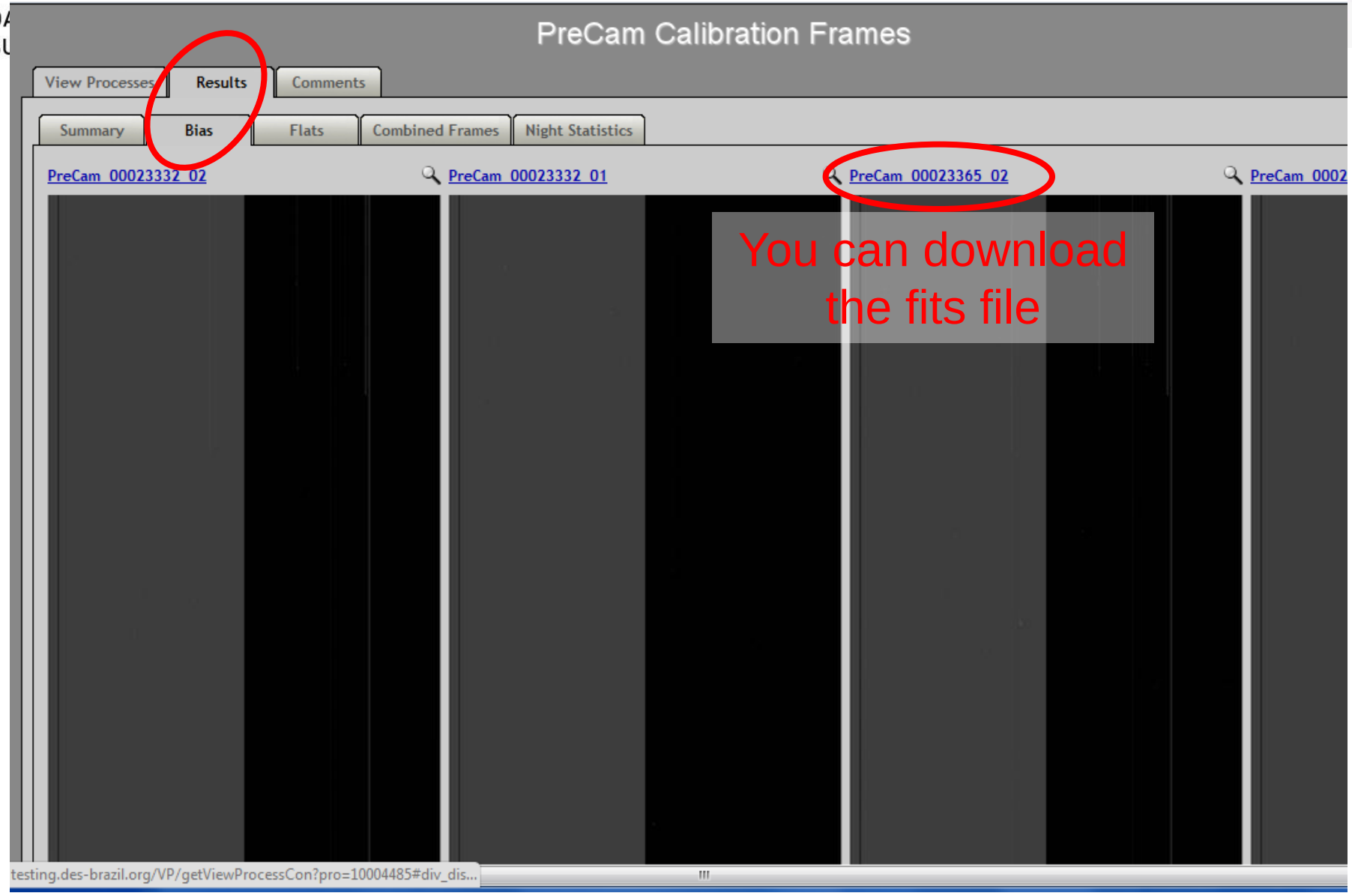
Expiration	06-28-2011 13:05:16
Jobs	330
Workflow	View
Code Version	View

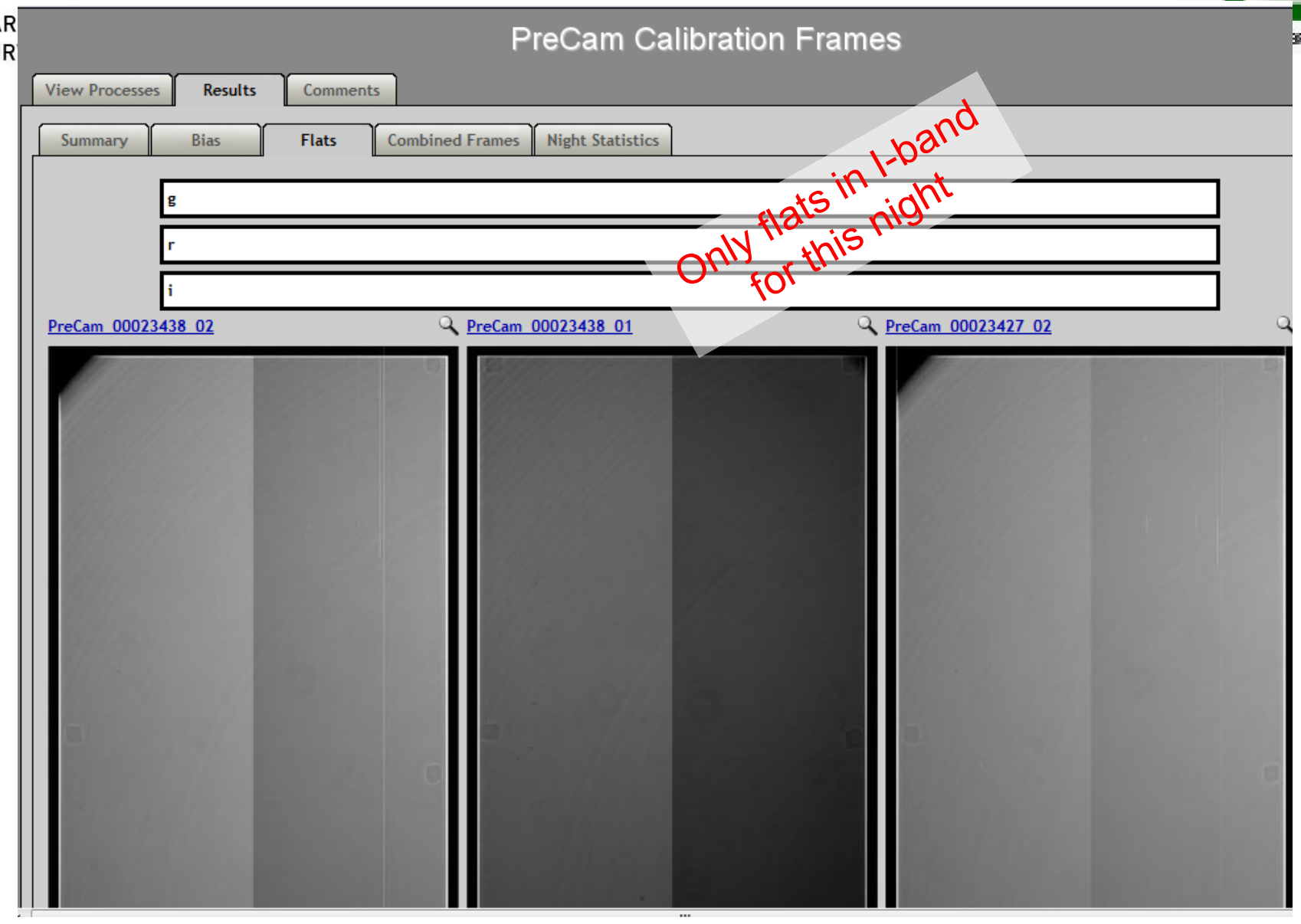
Input Data	
Input data	Astrosoft
Type	Image
Filter	Any
Date	2011-01-17
Calibtype	Any
Selected	121
	+ details

Module	Time	Products	Config	Error Log	Pipeline Out	Status
Data Organizer	00:00:01	---	---			✓
Data Retriever	00:00:09	---	---	---	---	+
Split	00:00:06	---	---	---	---	+
Organize CCDs	00:00:04	---	---	---	---	+
Calibration	00:13:46	---	---			✓

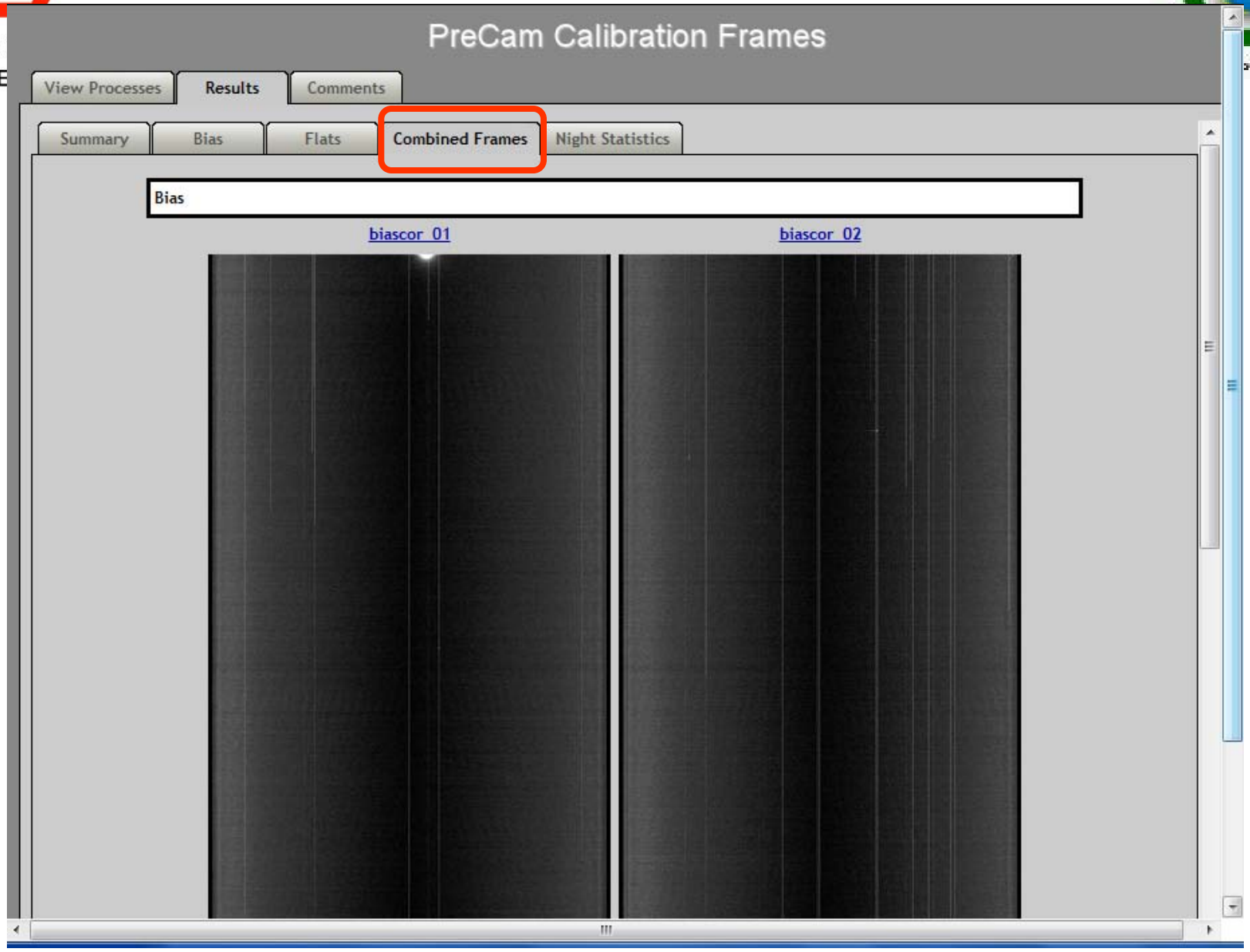
Results


PreCam Calibration Frames
View Processes
Results
Comments
Summary
Bias
Flats
Combined Frames
Night Statistics
PreCam_00023332_02
PreCam_00023332_01
PreCam_00023365_02
PreCam_0002
You can download the fits file
testing.des-brazil.org/VP/getViewProcessCon?pro=10004485#div_dis...

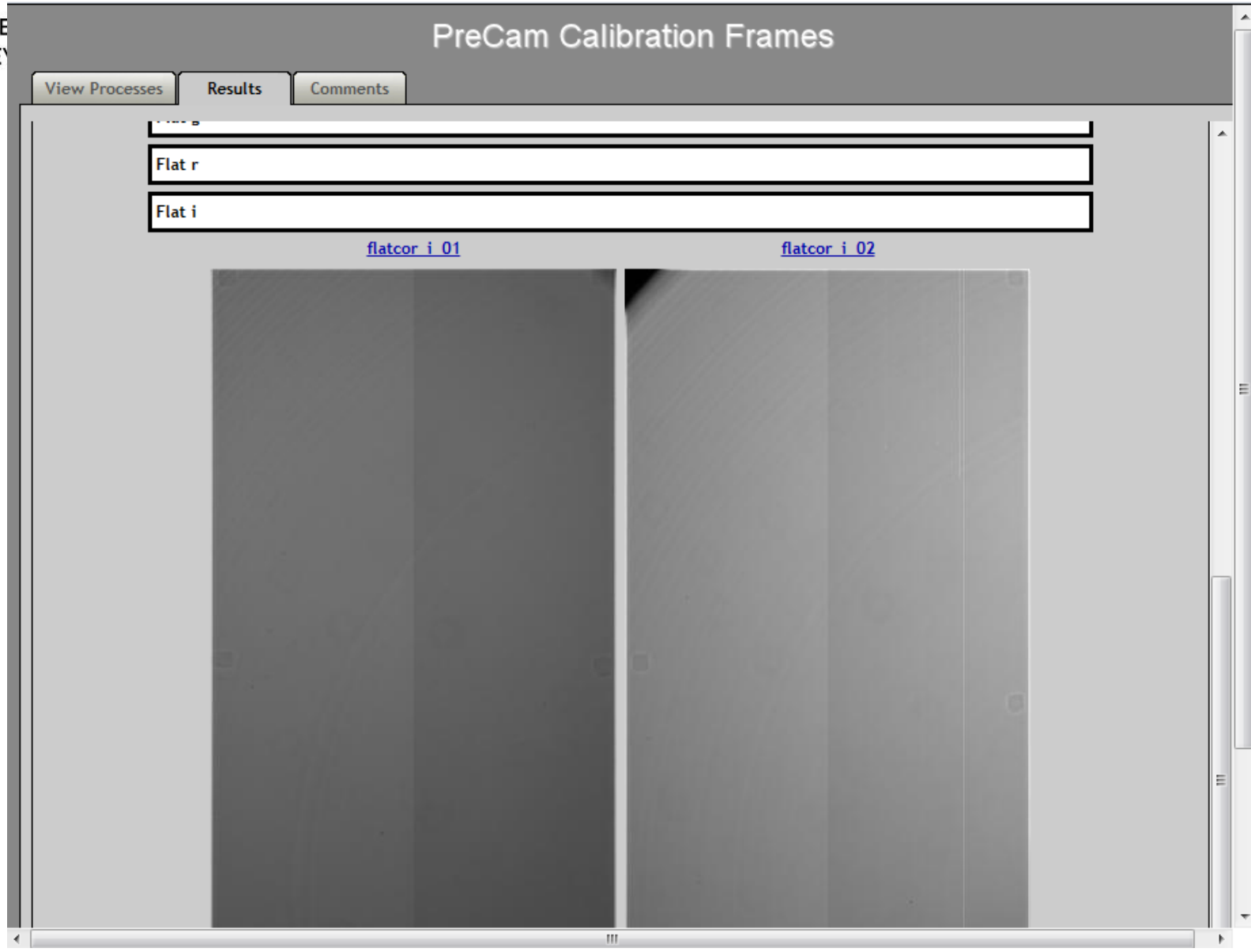
Individual Flats



Combined Frames - Bias



Combined Frames - Flats



Night Statistics

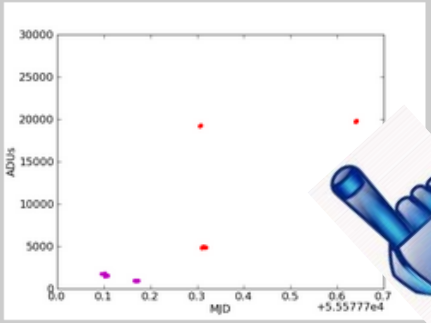
PreCam Calibration Frames

View Processes | Results | Comments

Summary | Bias | Flats | Combined Frames | Night Statistics

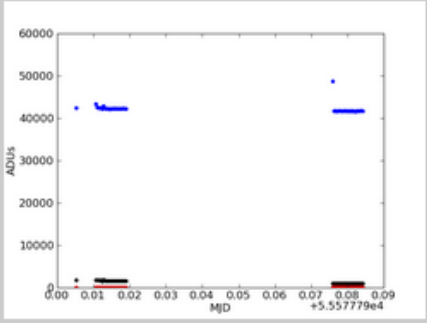
Median Counts

ADUs x MJD

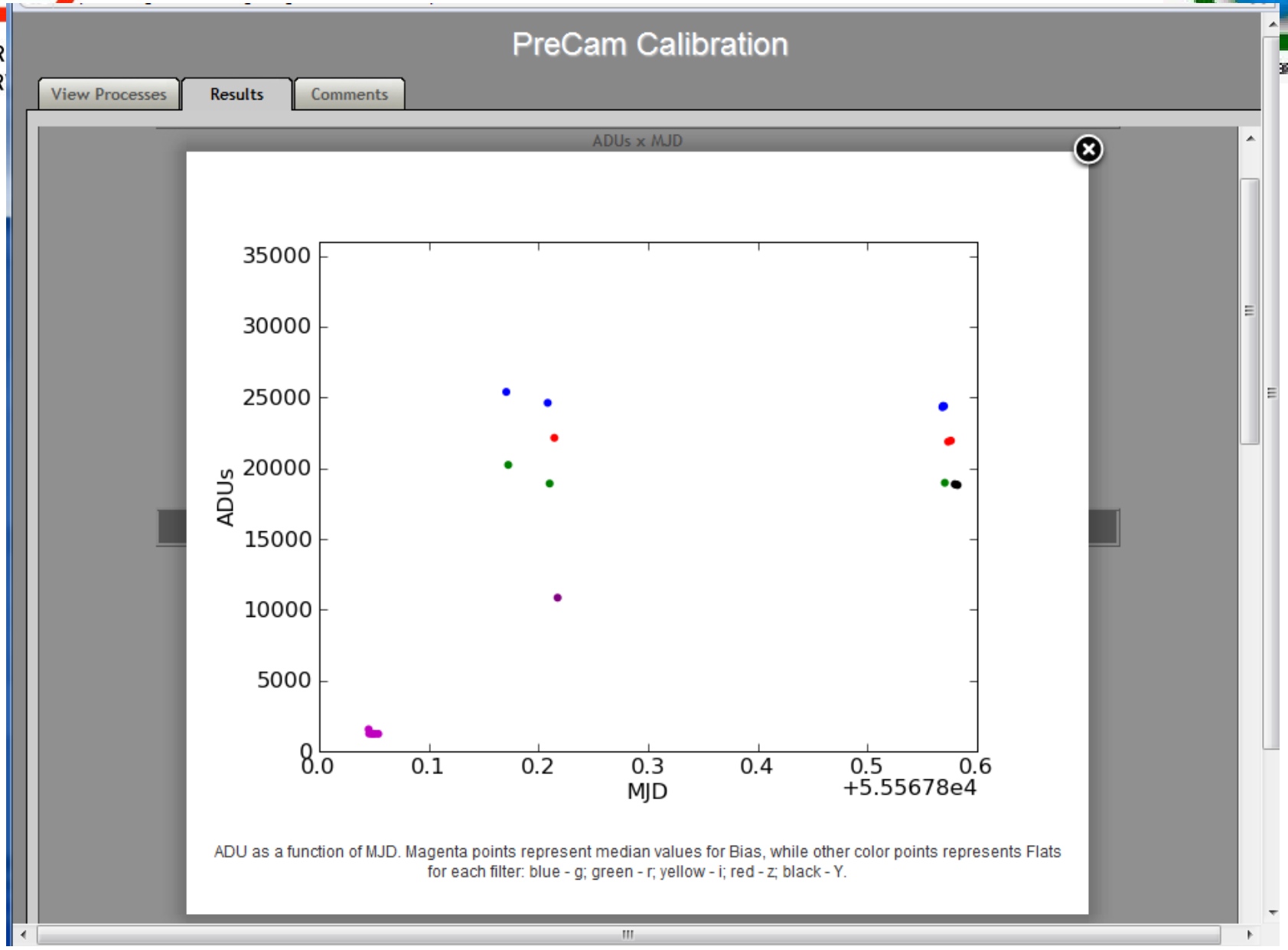


Bias

ADUs x MJD



Night Statistics



Let´s save the Process

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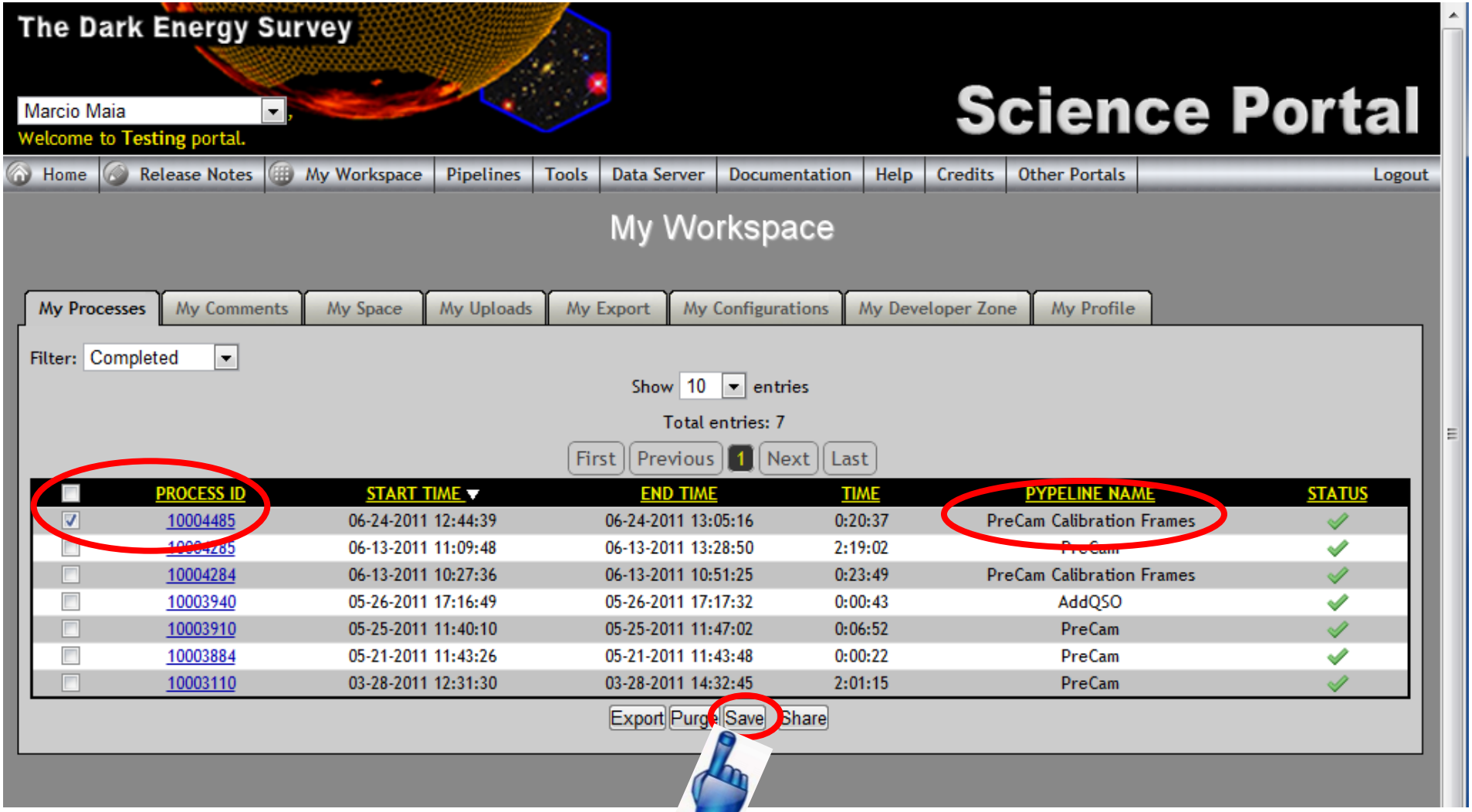
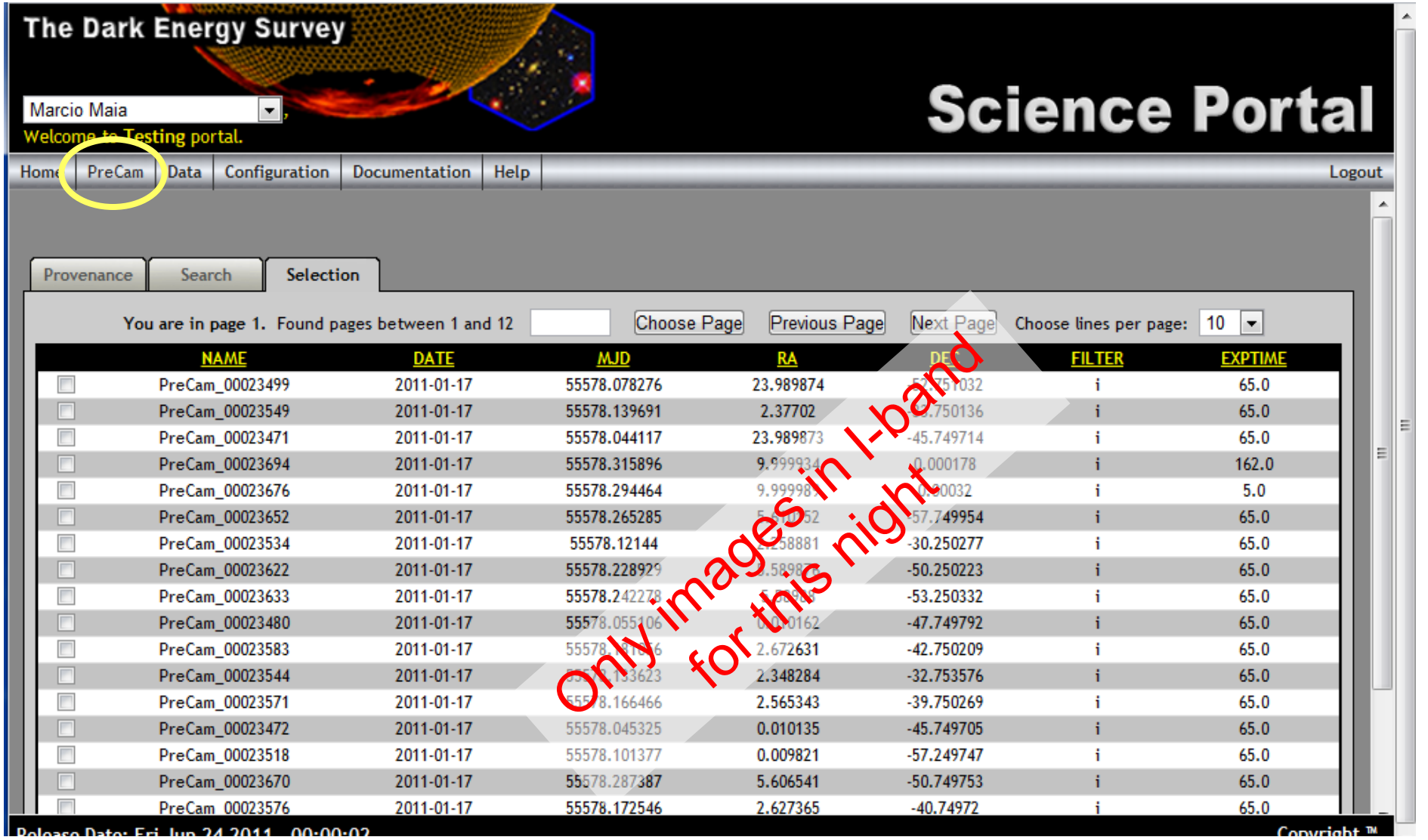


Reduction of Science Images

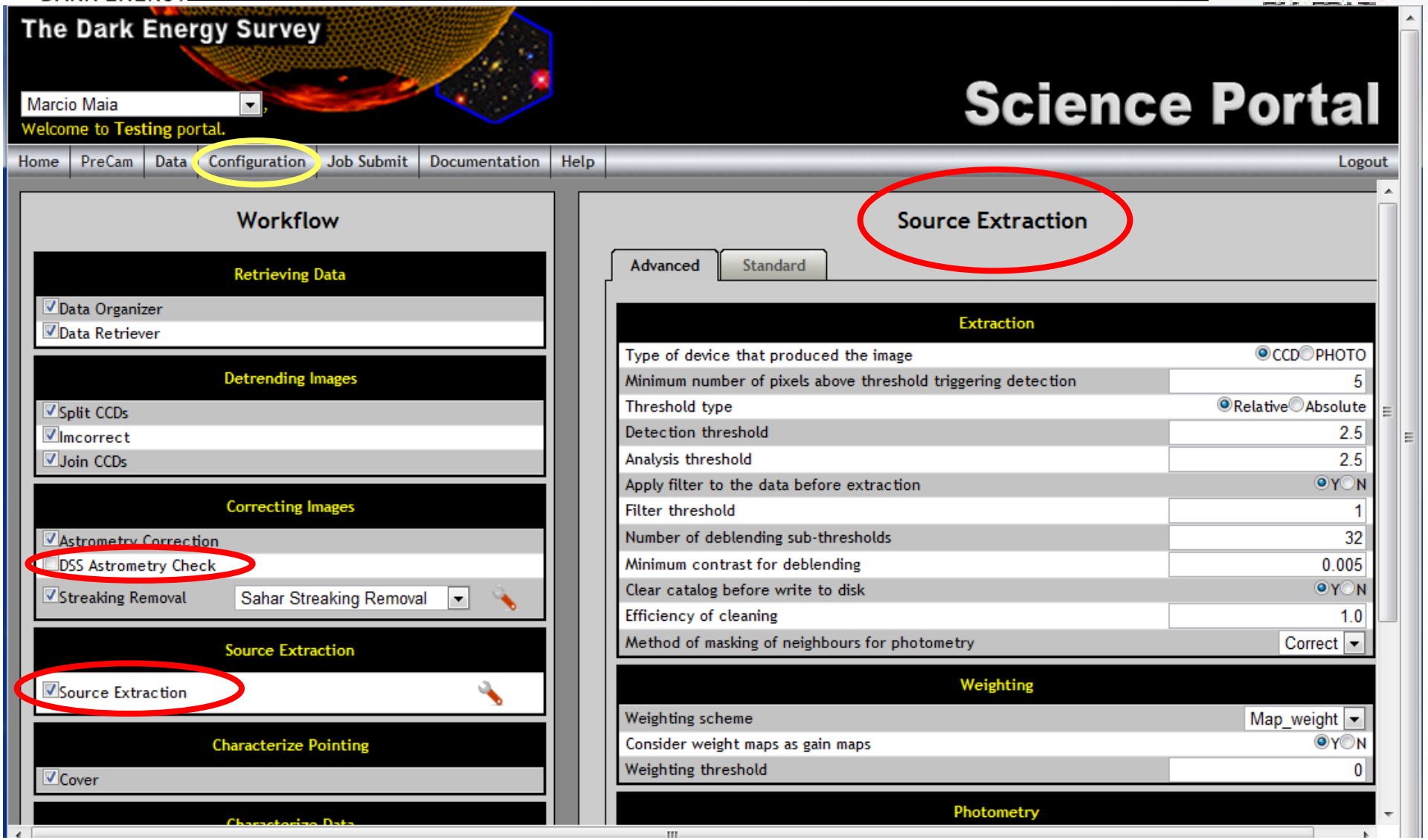
DARK ENERGY SURVEY

DES-BRAZIL

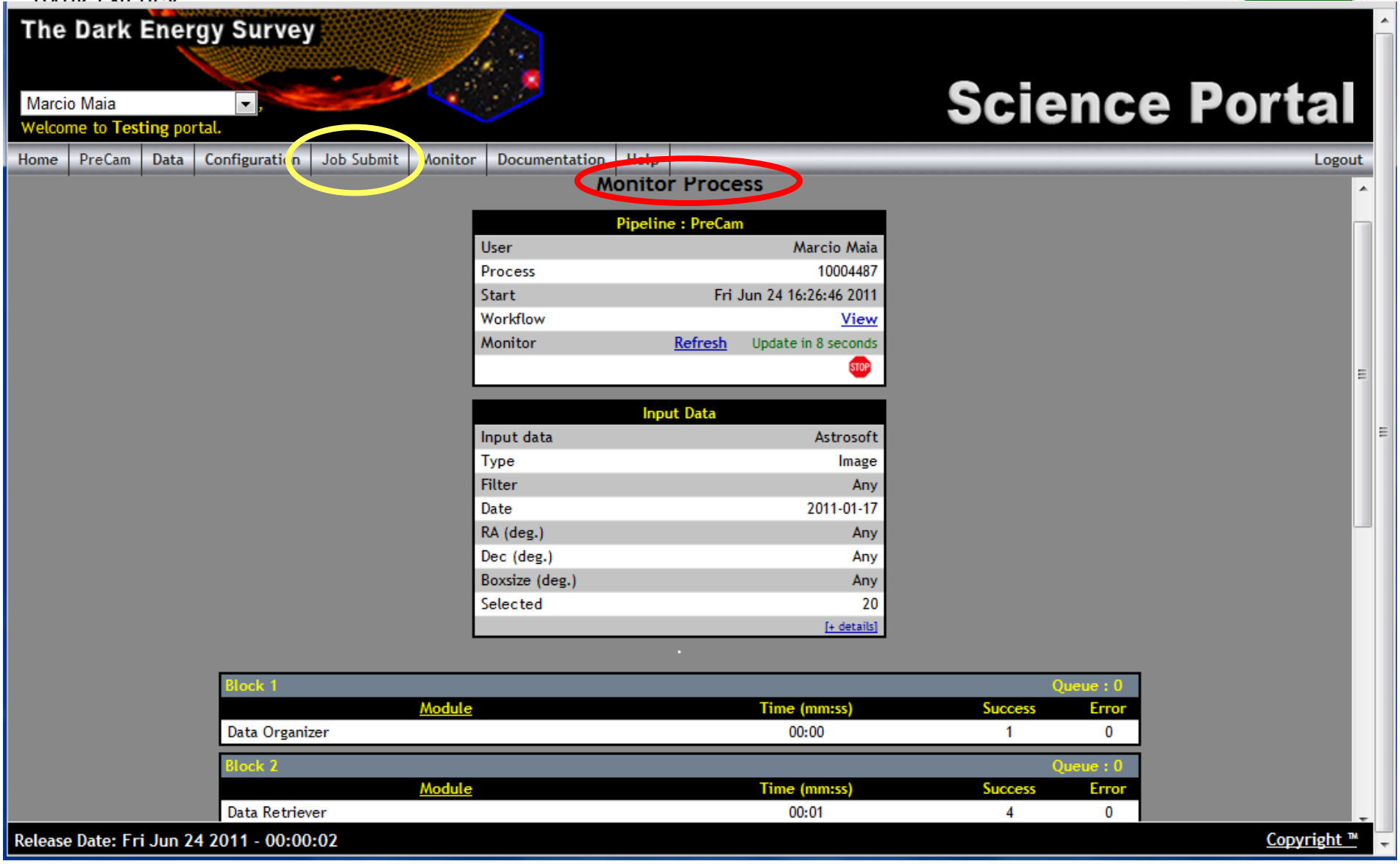


Only images in I-band for this night

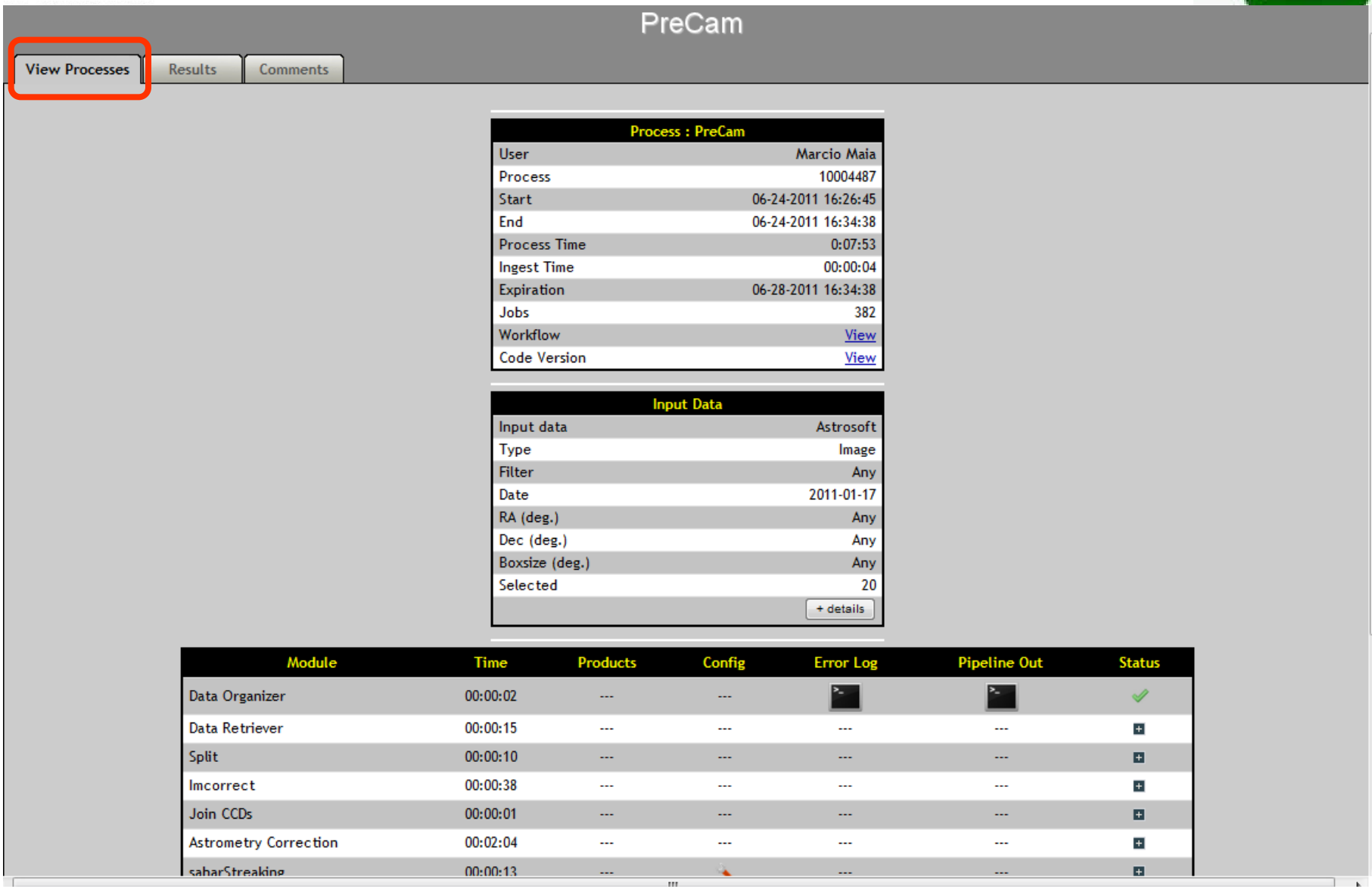
Workflow Configuration



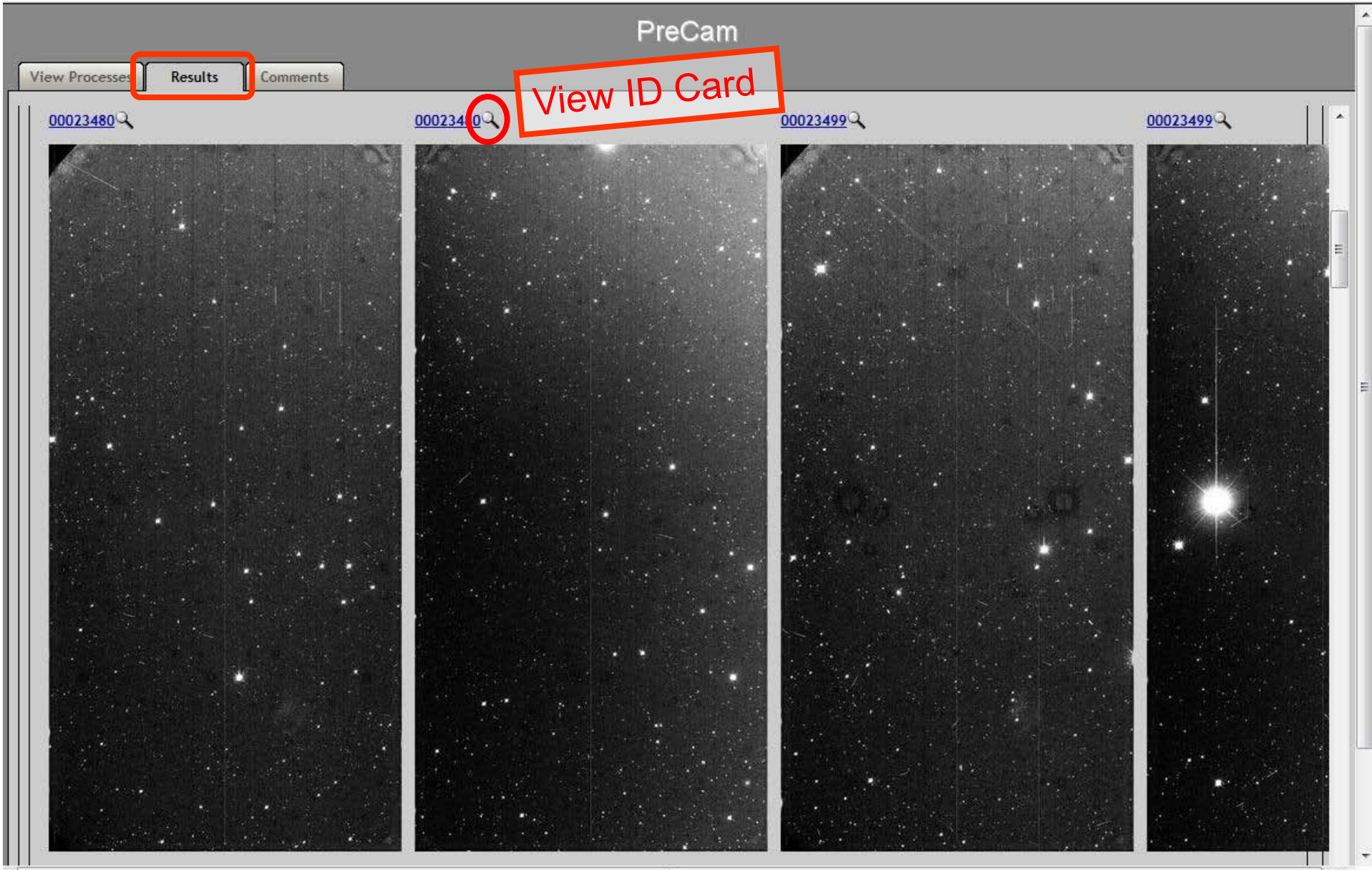
Submitting Process



Process Ready !



Checking Results



Evaluation of image quality – ID Card

DARK ENERGY SURVEY

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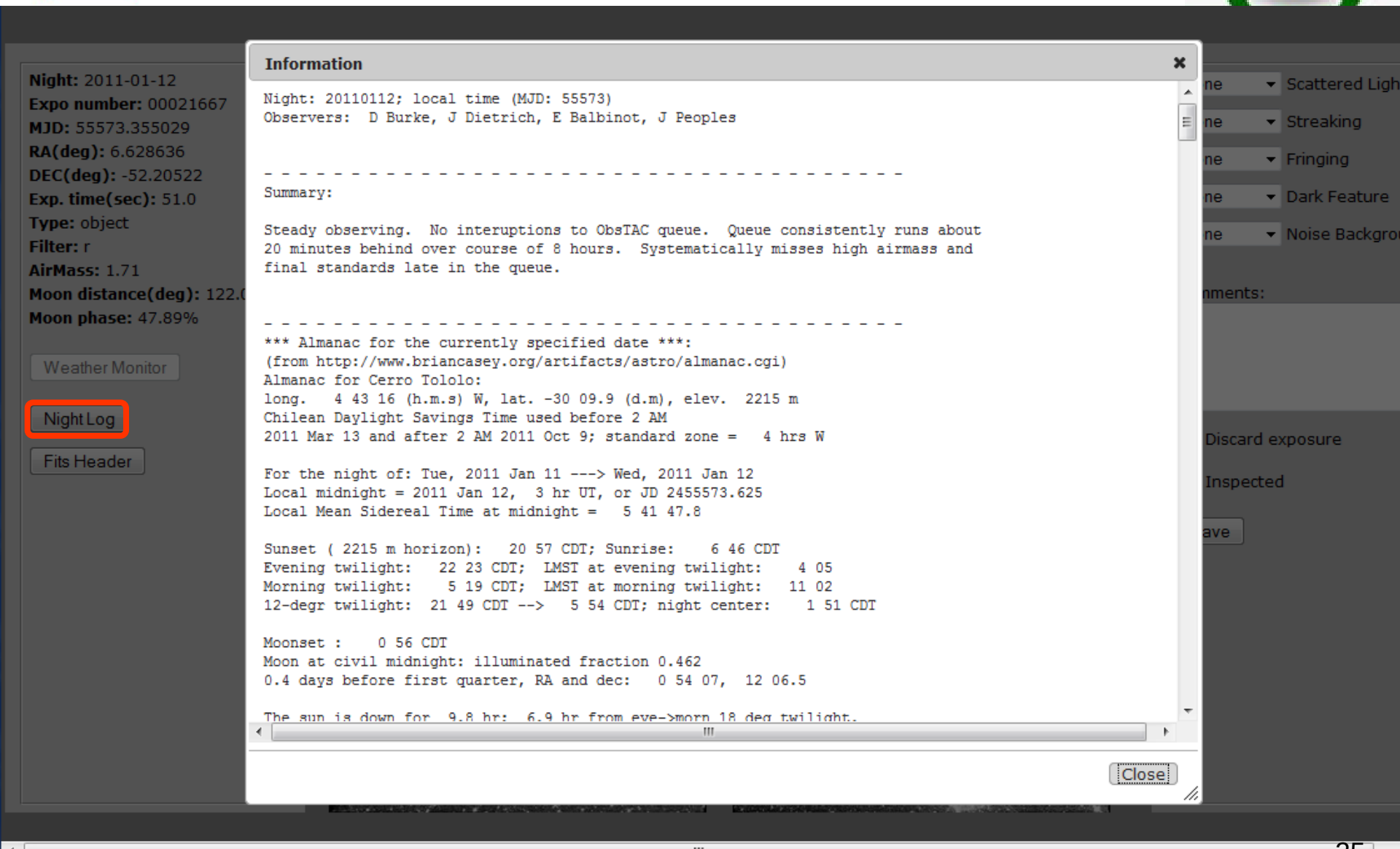
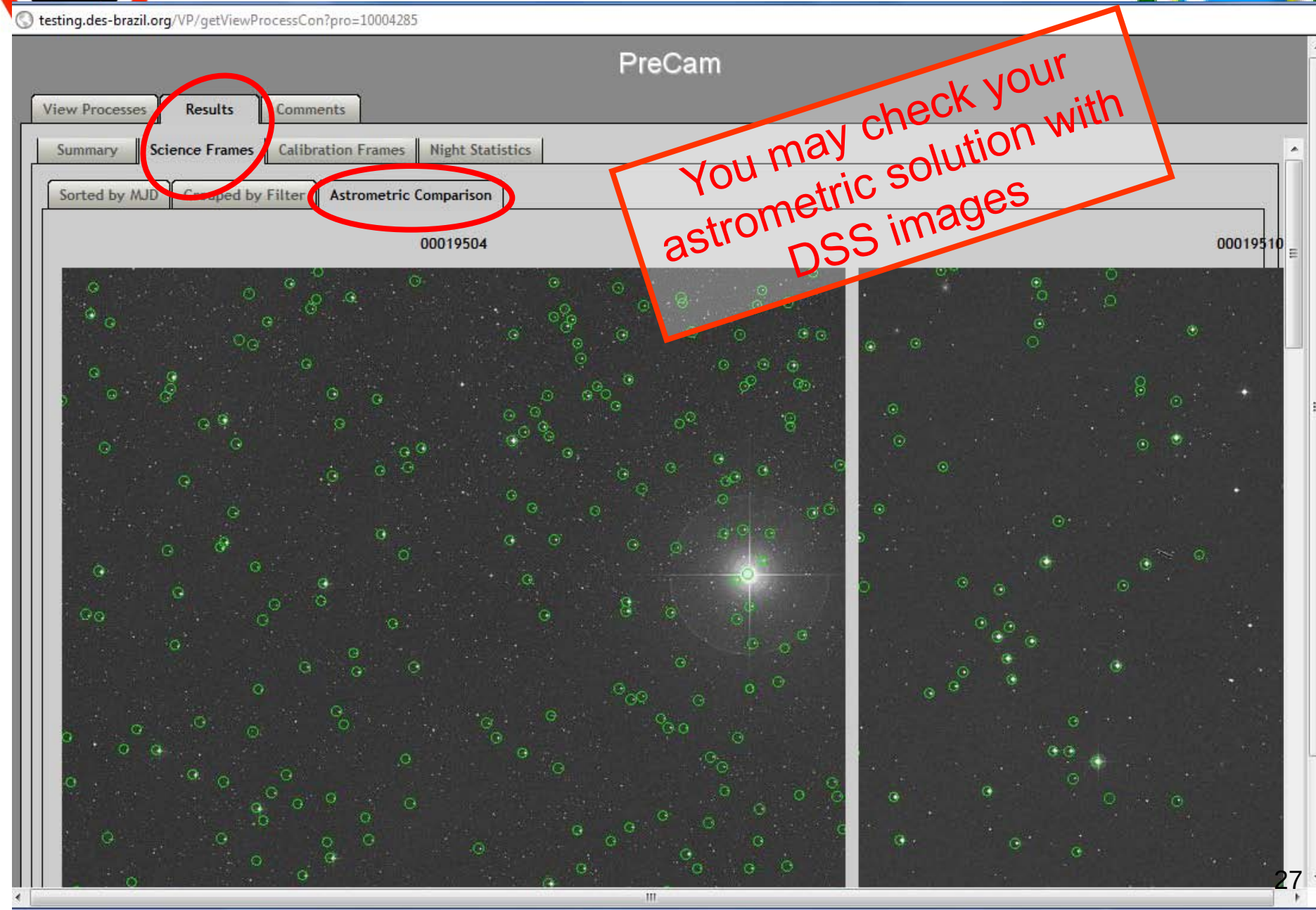
Night Log


Night: 2011-01-12
Expo number: 00021667
MJD: 55573.355029
RA(deg): 6.628636
DEC(deg): -52.20522
Exp. time(sec): 51.0
Type: object
Filter: r
AirMass: 1.71
Moon distance(deg): 122.(
Moon phase: 47.89%
Weather Monitor
Night Log
Fits Header
Information
Night: 20110112; local time (MJD: 55573)
Observers: D Burke, J Dietrich, E Balbinot, J Peoples
- -
Summary:
Steady observing. No interuptions to ObsTAC queue. Queue consistently runs about
20 minutes behind over course of 8 hours. Systematically misses high airmass and
final standards late in the queue.
- -
*** Almanac for the currently specified date ***:
(from http://www.briancasey.org/artifacts/astro/almanac.cgi)
Almanac for Cerro Tololo:
long. 4 43 16 (h.m.s) W, lat. -30 09.9 (d.m), elev. 2215 m
Chilean Daylight Savings Time used before 2 AM
2011 Mar 13 and after 2 AM 2011 Oct 9; standard zone = 4 hrs W
For the night of: Tue, 2011 Jan 11 ---> Wed, 2011 Jan 12
Local midnight = 2011 Jan 12, 3 hr UT, or JD 2455573.625
Local Mean Sidereal Time at midnight = 5 41 47.8
Sunset (2215 m horizon): 20 57 CDT; Sunrise: 6 46 CDT
Evening twilight: 22 23 CDT; LMST at evening twilight: 4 05
Morning twilight: 5 19 CDT; LMST at morning twilight: 11 02
12-degr twilight: 21 49 CDT --> 5 54 CDT; night center: 1 51 CDT
Moonset : 0 56 CDT
Moon at civil midnight: illuminated fraction 0.462
0.4 days before first quarter, RA and dec: 0 54 07, 12 06.5
The sun is down for 9.8 hr: 6.9 hr from eve->morn 18 deg twilight.
Close
Scattered Ligh
Streaking
Fringing
Dark Feature
Noise Backgro
nments:
Discard exposure
Inspected
ave

Fits Header

http://testing.des-bra
Night: 2011-01-12
Expo number: 0002
MJD: 55573.355029
RA(deg): 6.628636
DEC(deg): -52.205
Exp. time(sec): 51.
Type: object
Filter: r
AirMass: 1.71
Moon distance(deg
Moon phase: 47.89
Weather Monitor
Night Log
Fits Header
http://testing.des-brazil.org/PRJSUB/ES/openFitsHeaderCon?exp_id=19116
Fits Header
Header listing for HDU #1:
SIMPLE = T / conforms to FITS standard
BITPIX = 16 / array data type
NAXIS = 0 / number of array dimensions
EXTEND = T
BZERO = 32768
BSCALE = 1
NEXTEND = 6
FILENAME= '/data1/images/PreCam_precam_21667.fits'
PROCTYPE= 'Raw '
PRODTYPE= 'image '
DETSIZE = '[1:4146,1:4208]'
PIXSCAL1= 1.43
PIXSCAL2= 1.43
UTSHUT = '2011-01-12T08:32:09.468'
DHEINF = 'MNSN fermi hardware'
DHEFIRM = '/software/products/_precam-trunk/config/Macros/descb_6.9_withsync_cl'
SLOT00 = 'MCB 0x0 4.620000'
SLOT02 = 'DESCB 0x0 10.240000'
SLOT04 = 'CCD12 0xAF31B1 4.030000'
OBS-LONG= '70:49:00 W'
TELESCOP= 'UM Curtis Schimdt'
OBSERVAT= 'CTIO '
OBS-LAT = '-30:09:54'
OBS-ELEV= 2215.0
INSTRUME= 'PreCam '
EXPREQ = 51.0
EXPTIME = -1.0
DARKTIME= 0.0
DATE-OBS= '2011-01-12 08:31:14.482678+00:00'
TIME-OBS= '08:31:14.482678'
MJD-OBS = 55573.35502873454
RADESYS = 'FK5 '
TIMESYS = 'UTC '
TELEQUIN= 2000.0
EXPNUM = 21667
OBJECT = 'precam2170_16'
OBSTYPE = 'object '

Results – Astrometric Comparison



Results – Night Statistics

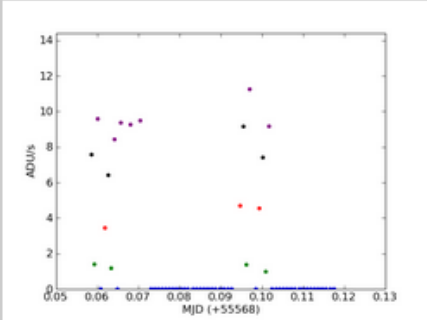
testing.des-brazil.org/VP/getViewProcessCon?pro=10004285

PreCam

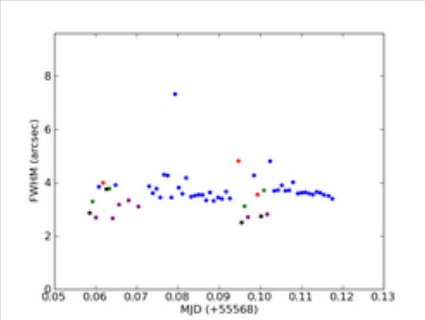
View Processes | Results | Comments

Summary | Science Frames | Calibration Frames | Night Statistics

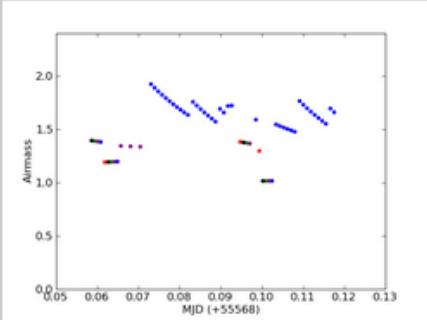
Sky Brightness



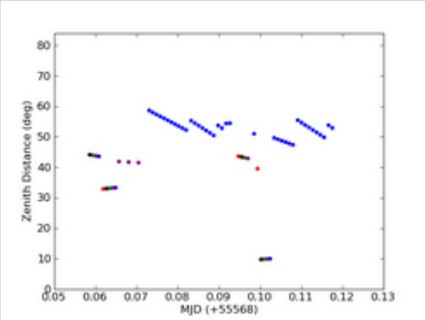
Seeing



Airmass

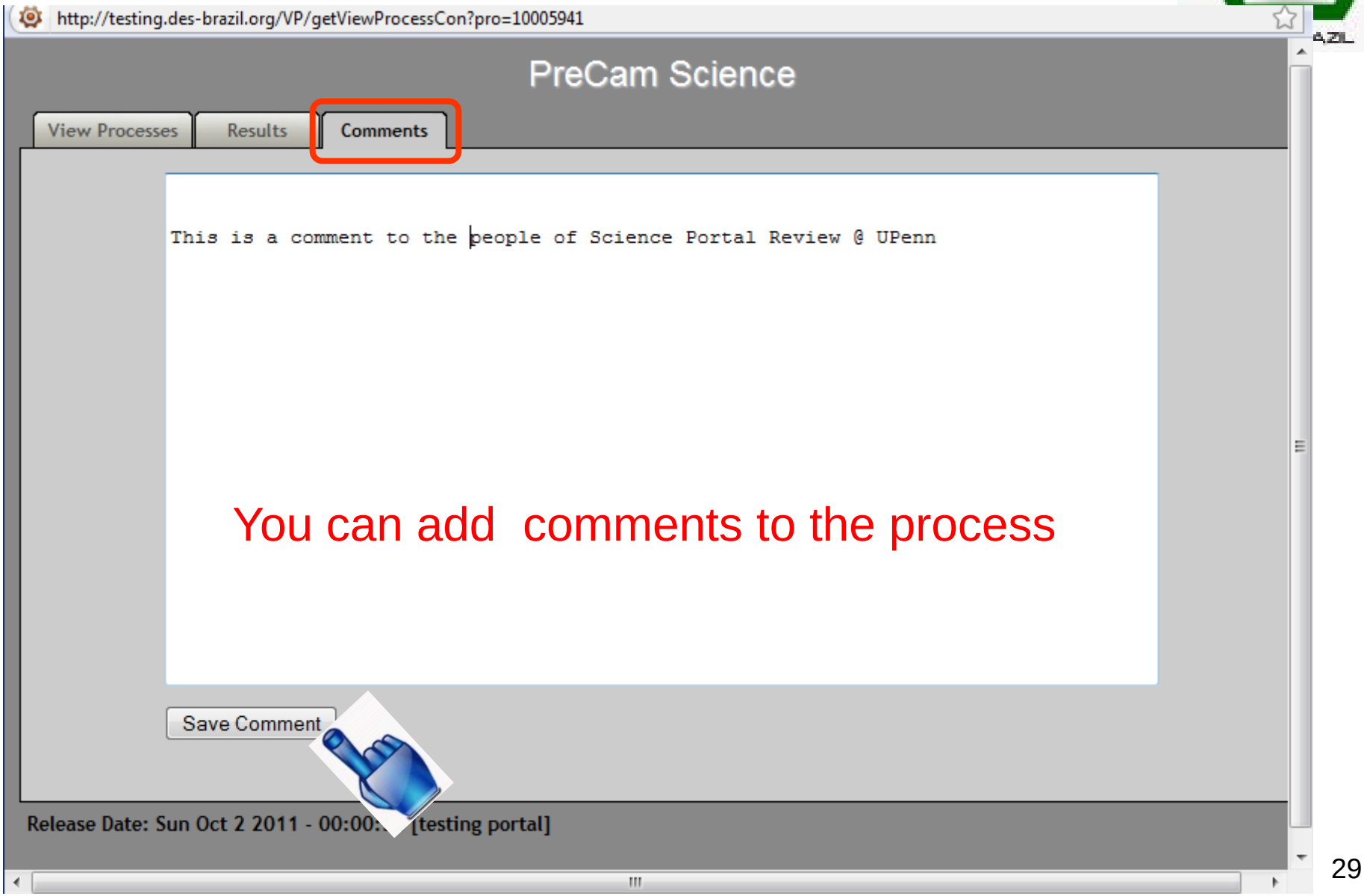


Zenith Distance (from Airmass)



Zenith Distance (from header)

View Process



DARK ENERGY
SURVEY

The Reduction Pipeline

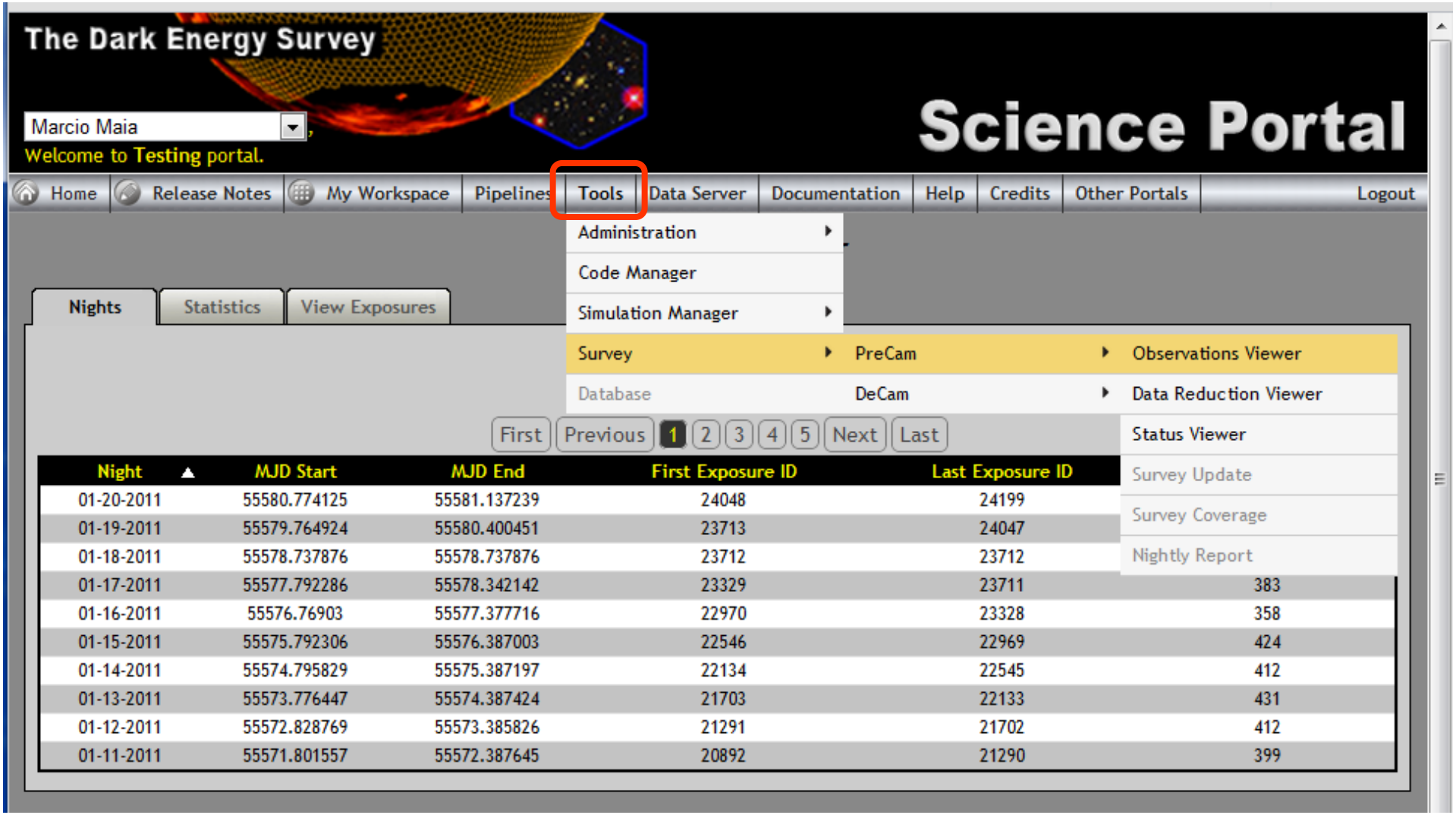
+

Portal Environment

Observations Viewer Tool

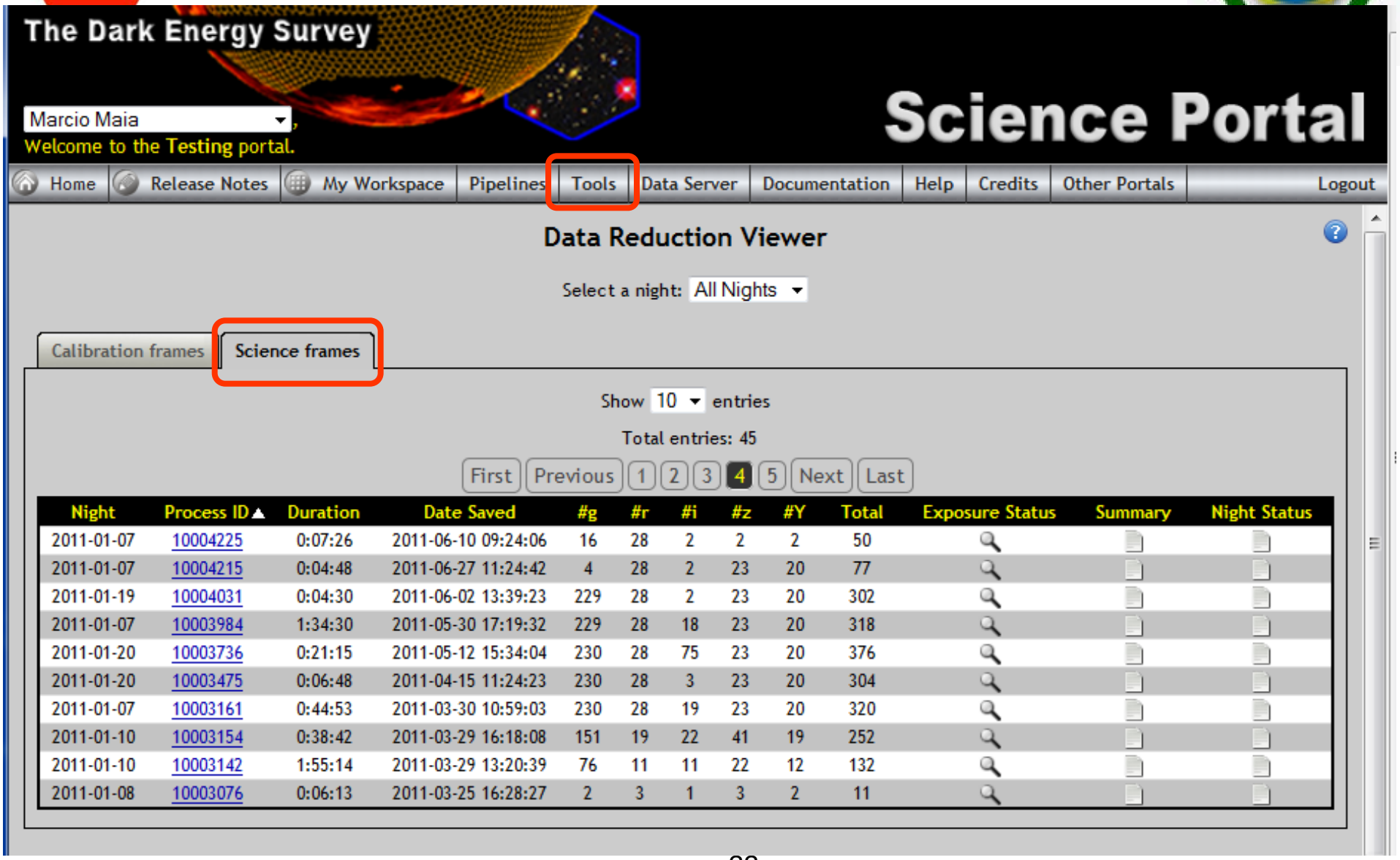
DARK ENERGY SURVEY

DES-BRAZIL



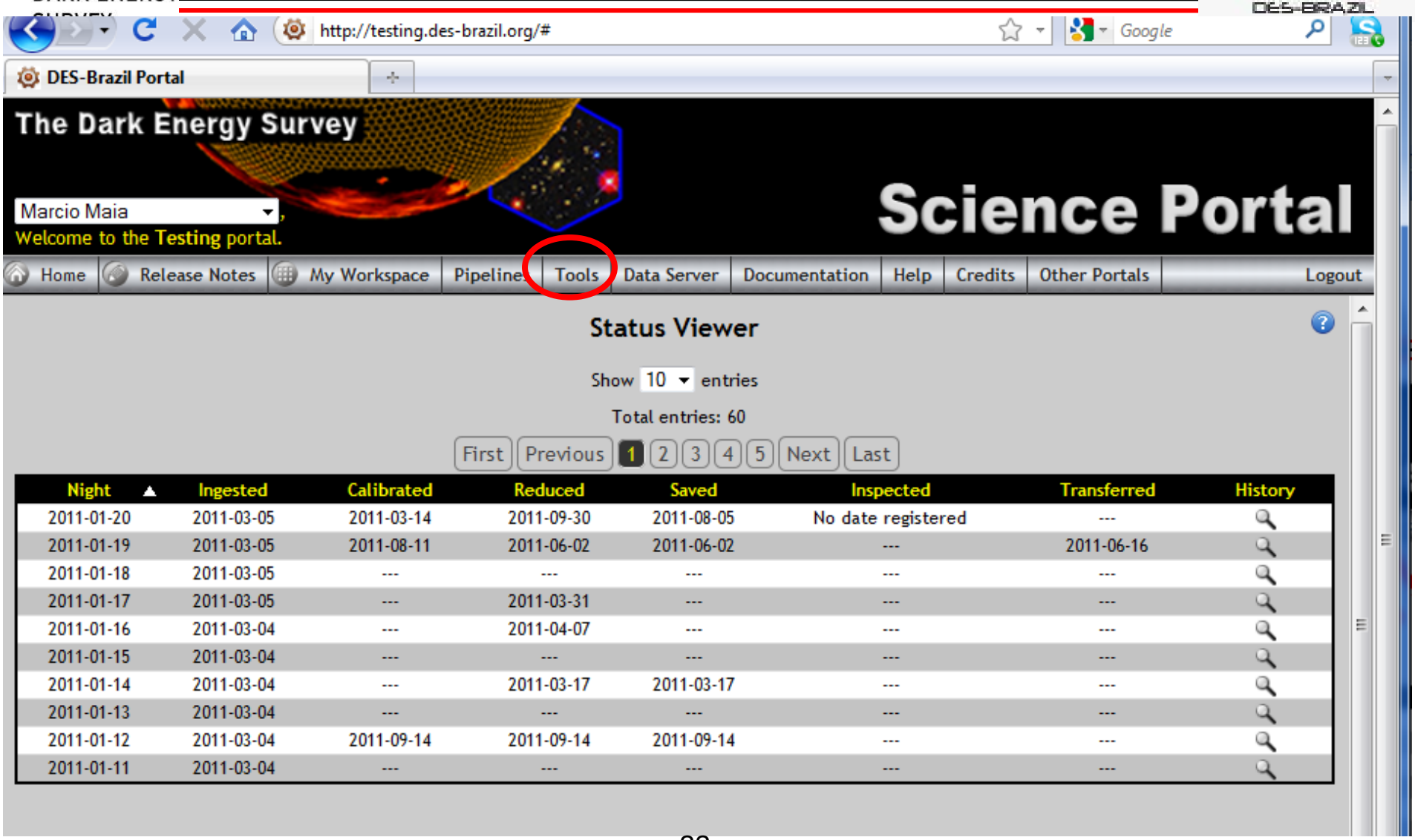
Night	MJD Start	MJD End	First Exposure ID	Last Exposure ID	
01-20-2011	55580.774125	55581.137239	24048	24199	
01-19-2011	55579.764924	55580.400451	23713	24047	
01-18-2011	55578.737876	55578.737876	23712	23712	
01-17-2011	55577.792286	55578.342142	23329	23711	383
01-16-2011	55576.76903	55577.377716	22970	23328	358
01-15-2011	55575.792306	55576.387003	22546	22969	424
01-14-2011	55574.795829	55575.387197	22134	22545	412
01-13-2011	55573.776447	55574.387424	21703	22133	431
01-12-2011	55572.828769	55573.385826	21291	21702	412
01-11-2011	55571.801557	55572.387645	20892	21290	399

Data Reduction Viewer



Night	Process ID	Duration	Date Saved	#g	#r	#i	#z	#Y	Total	Exposure Status	Summary	Night Status
2011-01-07	10004225	0:07:26	2011-06-10 09:24:06	16	28	2	2	2	50			
2011-01-07	10004215	0:04:48	2011-06-27 11:24:42	4	28	2	23	20	77			
2011-01-19	10004031	0:04:30	2011-06-02 13:39:23	229	28	2	23	20	302			
2011-01-07	10003984	1:34:30	2011-05-30 17:19:32	229	28	18	23	20	318			
2011-01-20	10003736	0:21:15	2011-05-12 15:34:04	230	28	75	23	20	376			
2011-01-20	10003475	0:06:48	2011-04-15 11:24:23	230	28	3	23	20	304			
2011-01-07	10003161	0:44:53	2011-03-30 10:59:03	230	28	19	23	20	320			
2011-01-10	10003154	0:38:42	2011-03-29 16:18:08	151	19	22	41	19	252			
2011-01-10	10003142	1:55:14	2011-03-29 13:20:39	76	11	11	22	12	132			
2011-01-08	10003076	0:06:13	2011-03-25 16:28:27	2	3	1	3	2	11			

Status Viewer Tool

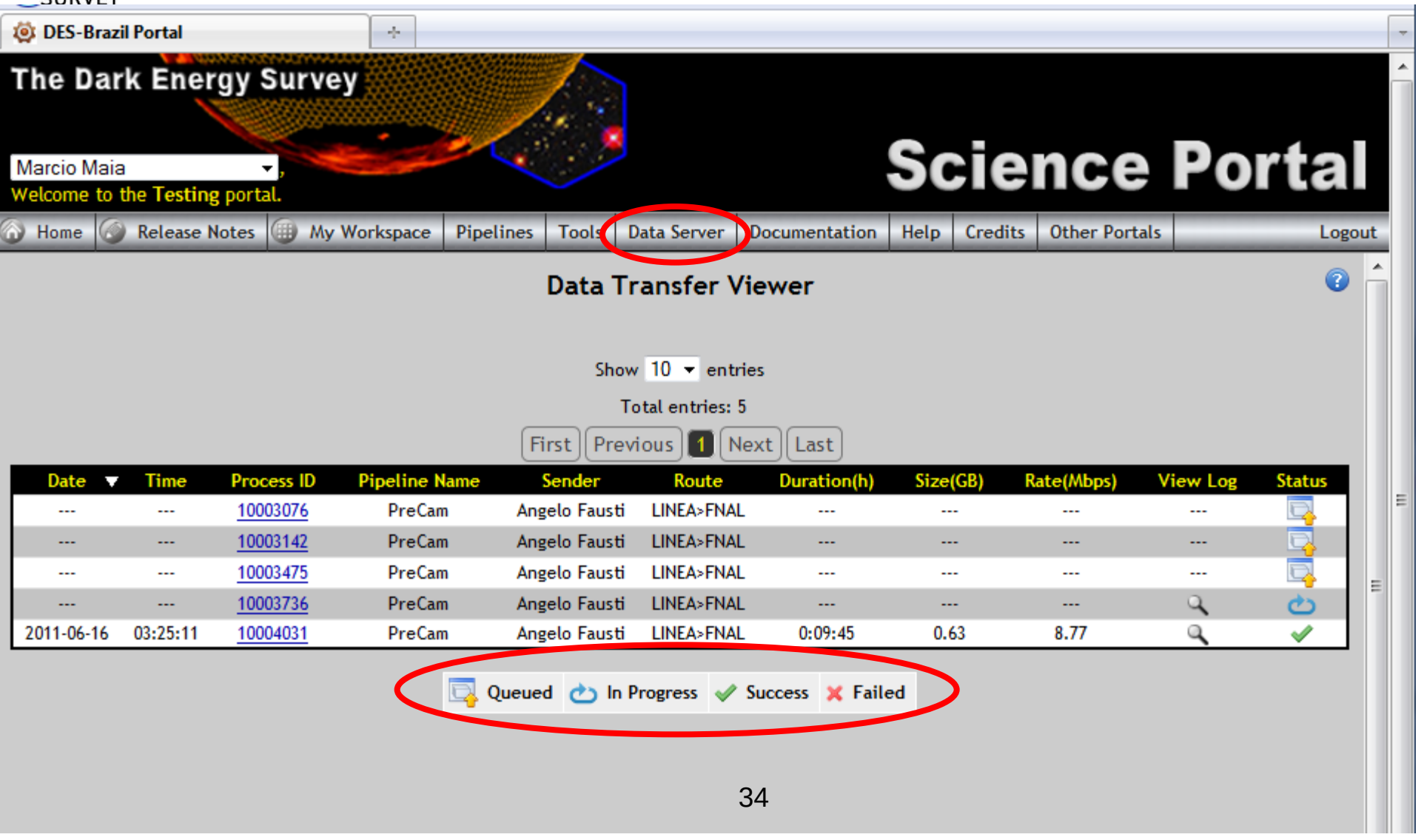


Night ▲	Ingested	Calibrated	Reduced	Saved	Inspected	Transferred	History
2011-01-20	2011-03-05	2011-03-14	2011-09-30	2011-08-05	No date registered	---	
2011-01-19	2011-03-05	2011-08-11	2011-06-02	2011-06-02	---	2011-06-16	
2011-01-18	2011-03-05	---	---	---	---	---	
2011-01-17	2011-03-05	---	2011-03-31	---	---	---	
2011-01-16	2011-03-04	---	2011-04-07	---	---	---	
2011-01-15	2011-03-04	---	---	---	---	---	
2011-01-14	2011-03-04	---	2011-03-17	2011-03-17	---	---	
2011-01-13	2011-03-04	---	---	---	---	---	
2011-01-12	2011-03-04	2011-09-14	2011-09-14	2011-09-14	---	---	
2011-01-11	2011-03-04	---	---	---	---	---	

Data Transfer Tool

DARK ENERGY SURVEY

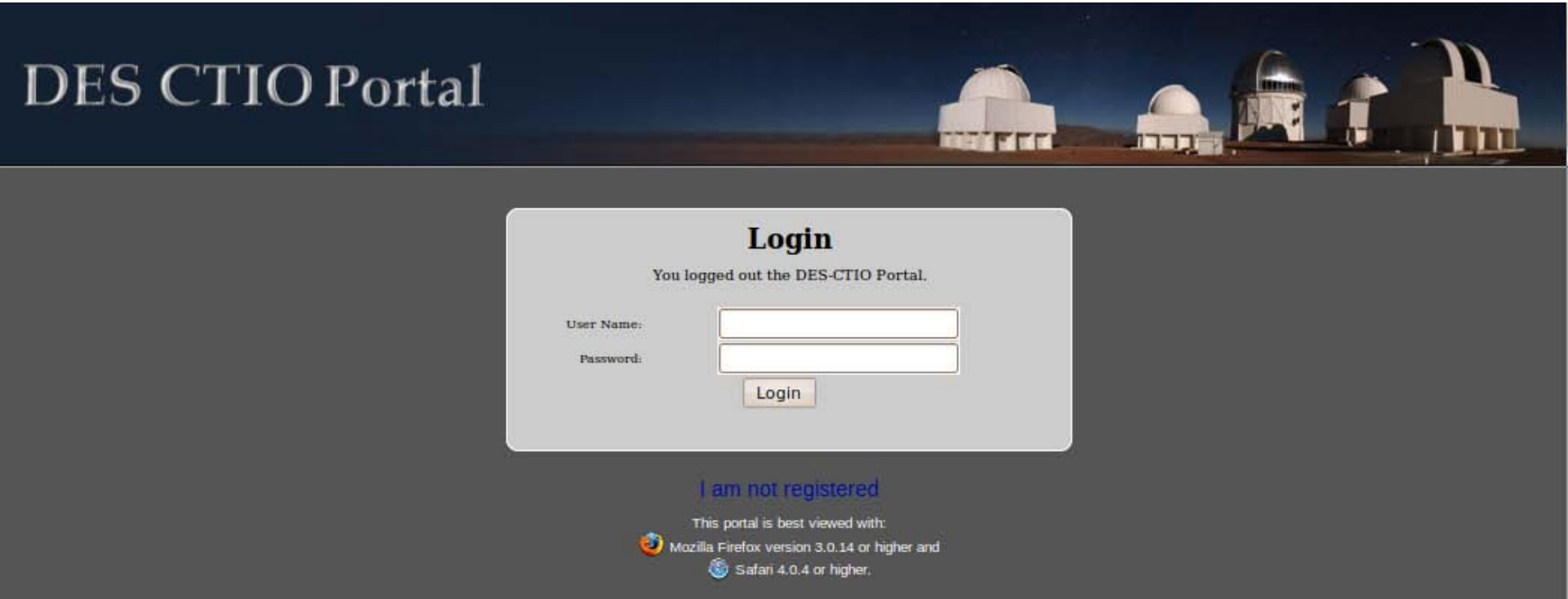
DES-BRAZIL



“Real time” reductions

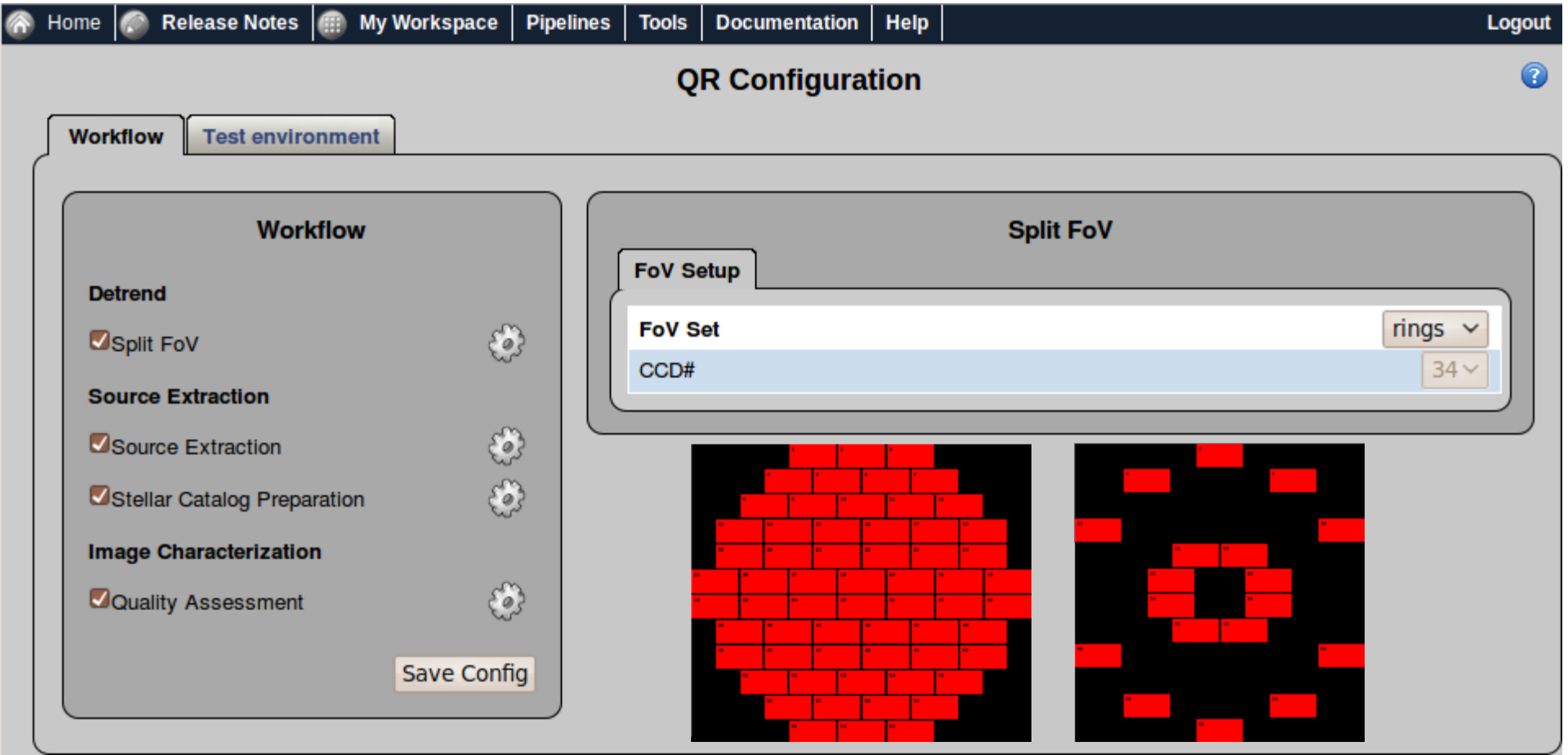
Quick Reduce overview

- Quick Reduce (QR) is a tool to **provide observers with automated feedback** regarding the quality of the DeCam data being collected during a night of observation.
- QR shares the same code infrastructure of the DES-Brazil Science Portal and Precam reduction pipeline.



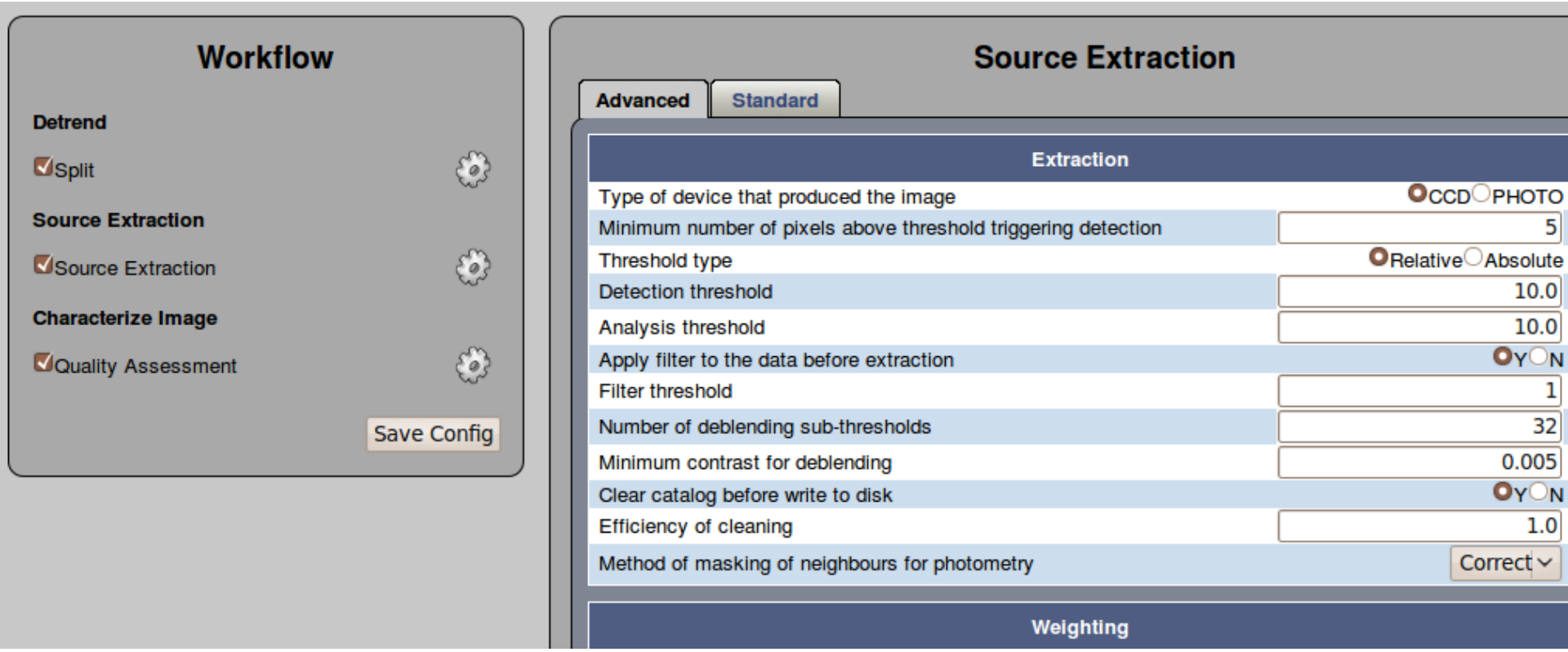
1. Select the CCDs to be processed

- The user can force a particular CCD or a list of CDDs to be reduced, use predefined configurations (ring, cross, etc) or even process ALL CCDs



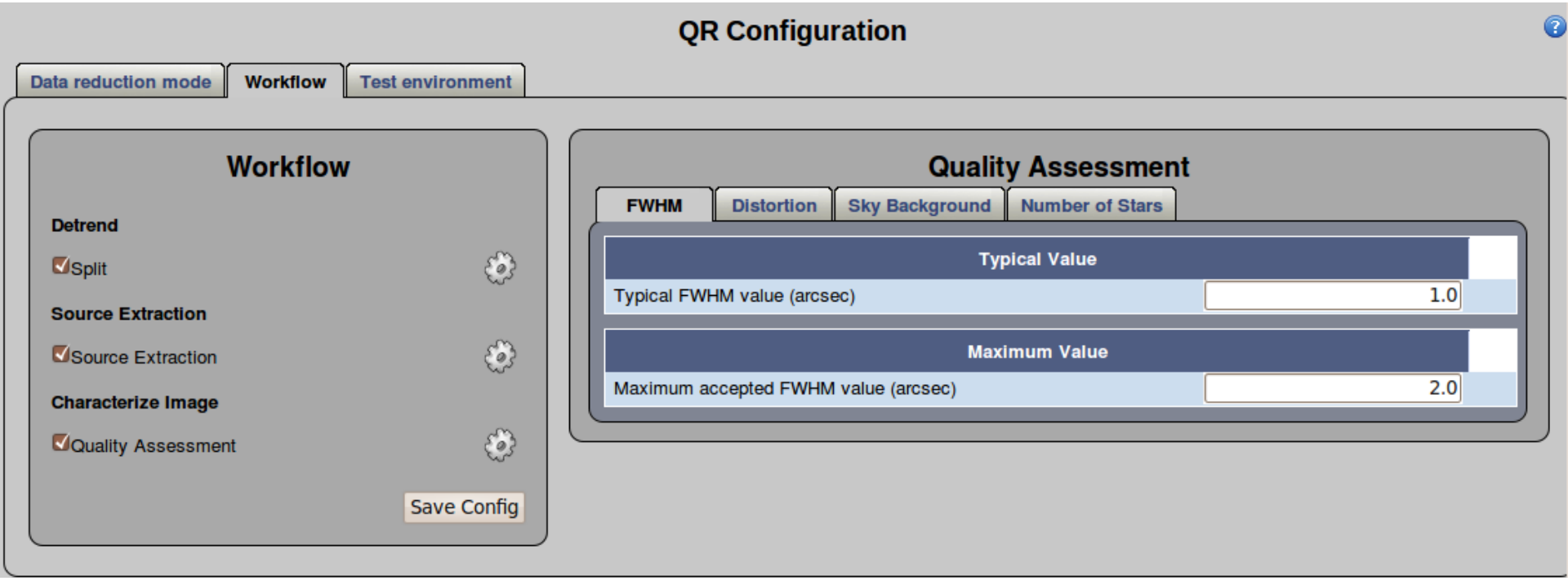
2. Source Extraction parameters

The user is able to modify SExtractor standard and advanced parameters



3. Quality Assessment

- On the quality Assessment configuration the user set the accepted limits on problems related to PSF and PSF distortion, sky noise and the number of detected stars
- In case the measured values are beyond the accepted limits QR **send alert messages to the telescope control system.**

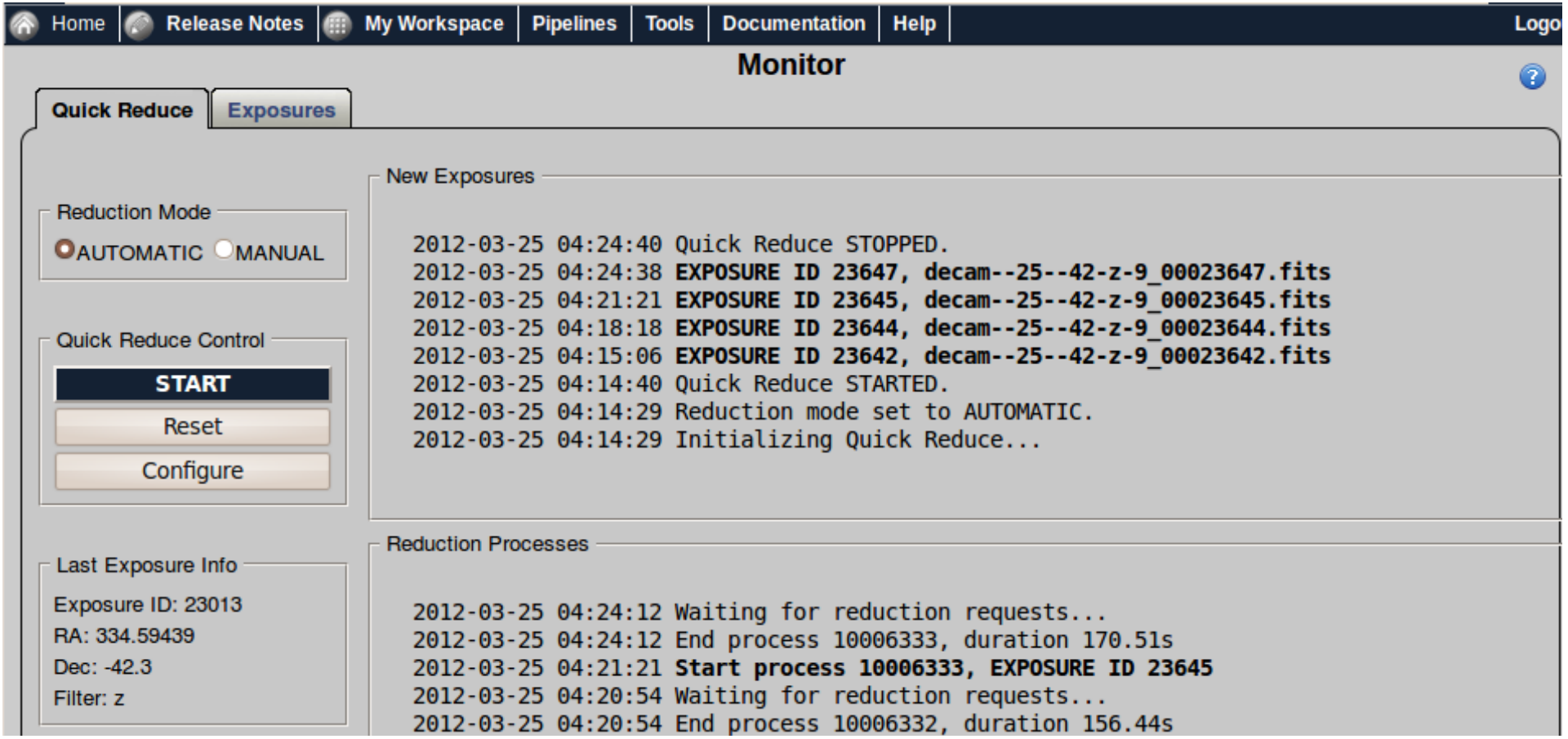


“AUTOMATIC” reductions

DARK ENERGY SURVEY

DES-BRAZIL

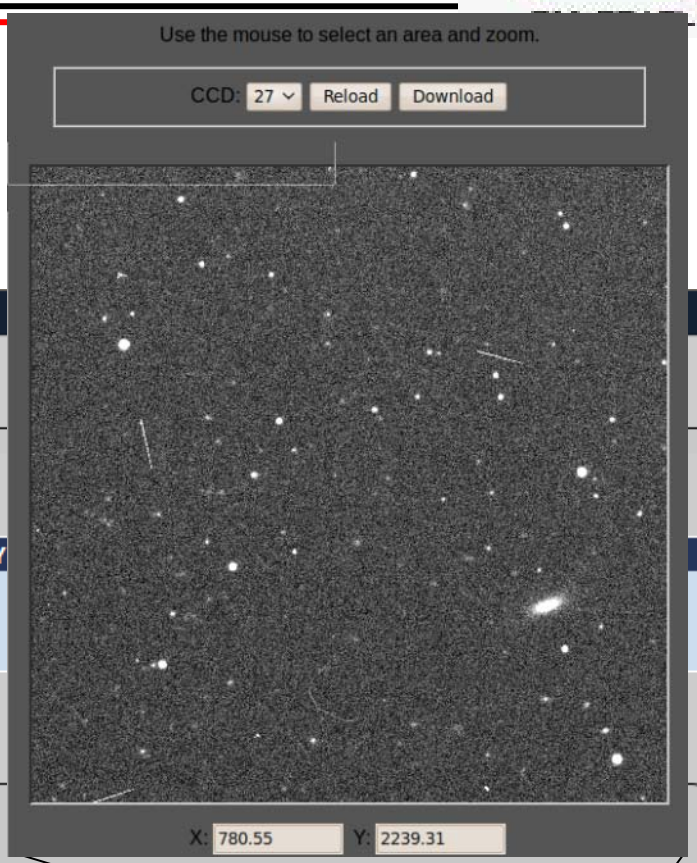
Monitoring new images aquired by the telescope and unattended reductions...



Reduced Images

DARK ENERGY SURVEY

- List of reduced images
- Image viewer



Home | Release Notes | My Workspace | Pipelines | Tools | Documentation | Help | Logo

Monitor

Quick Reduce | Exposures

View results

NIGHT	TY
2010-10-27	all object

Search

Raw | Reduced

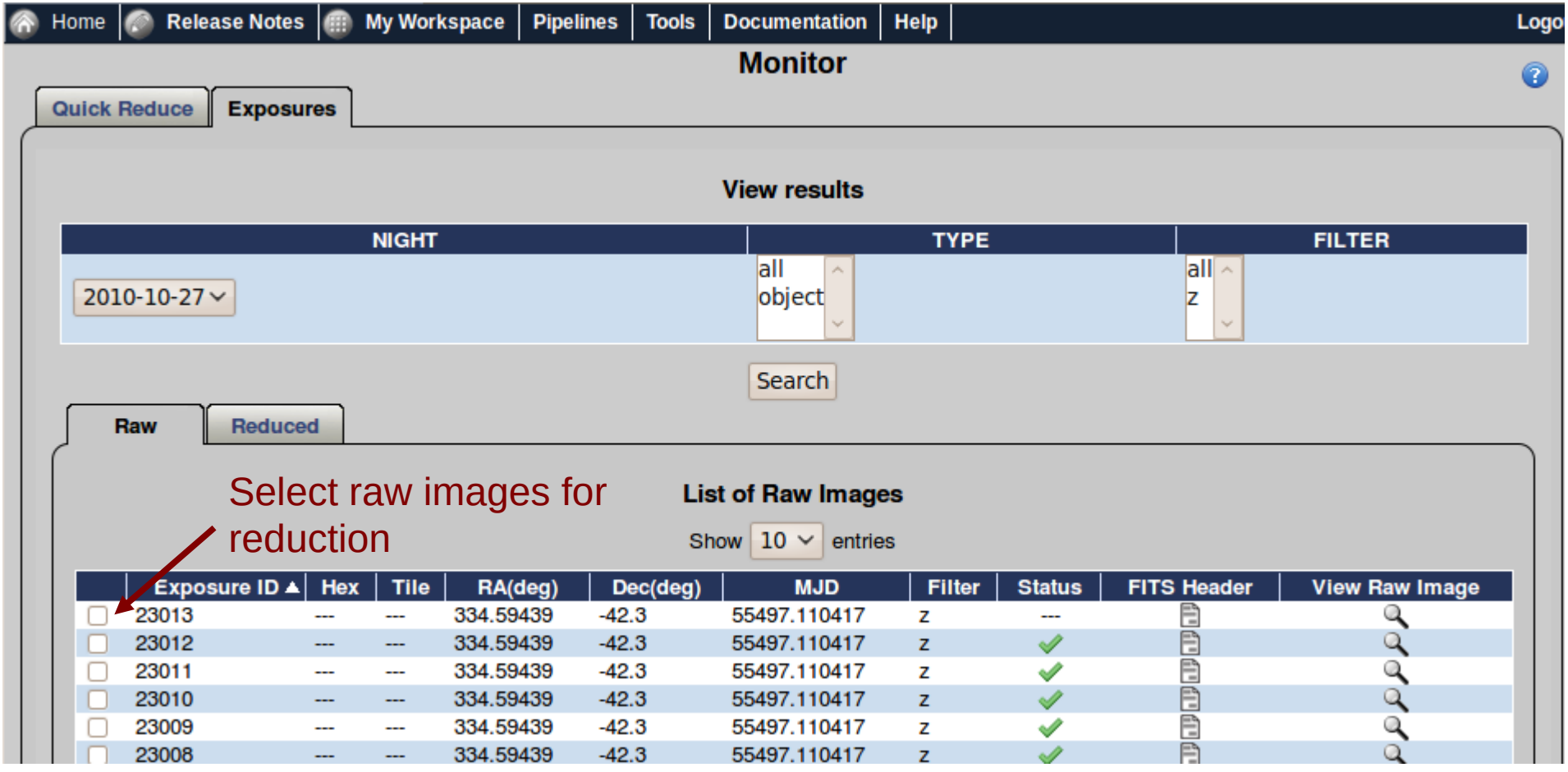
Results

Show 10 entries

Exposure ID	Hex	Tile	RA(deg)	Dec(deg)	MJD	Filter	# of CCDs Reduced	Process ID	Start	Duration	View Reduced Image
22994	---	---	334.59439	-42.3	55497.110417	z	---	10006317	2012-03-23 17:43:41	00:02:30	
22999	---	---	334.59439	-42.3	55497.110417	z	---	10006319	2012-03-23 20:40:26	00:02:40	
23000	---	---	334.59439	-42.3	55497.110417	z	---	10006320	2012-03-23 20:43:09	00:02:34	
23001	---	---	334.59439	-42.3	55497.110417	z	---	10006321	2012-03-23 20:45:45	00:02:15	
23002	---	---	334.59439	-42.3	55497.110417	z	---	10006322	2012-03-23 20:48:03	00:02:47	
23003	---	---	334.59439	-42.3	55497.110417	z	---	10006323	2012-03-23 20:50:53	00:02:05	
23004	---	---	334.59439	-42.3	55497.110417	z	---	10006325	2012-03-25 15:51:55	00:02:35	

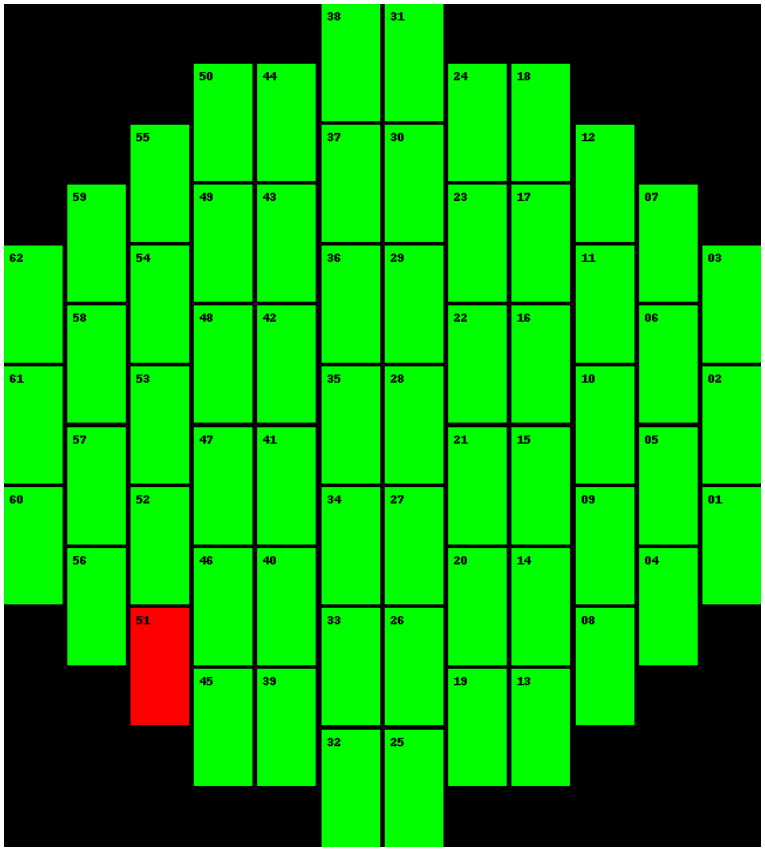
“MANUAL” reductions

- Raw images can be **reprocessed** for tunning the QR configuration parameters and day-time tests

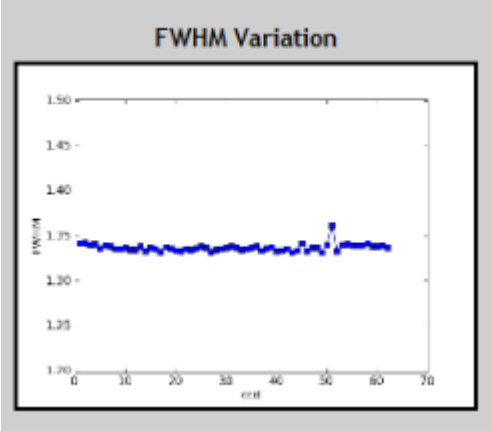


QR global and local tests

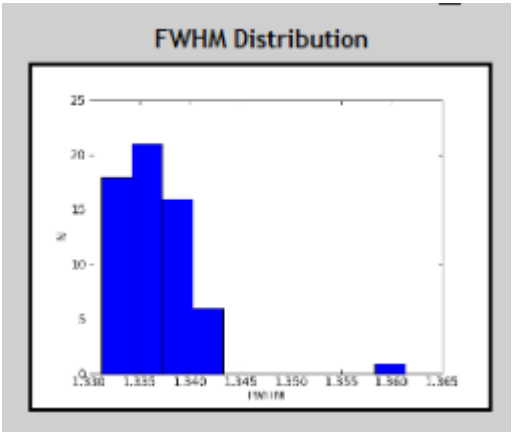
CCDs that have been examined and **failed** the Quality Assessment constraints specified by the user **are showed in red.**



Variation of the mean PSF as a function of CCD#

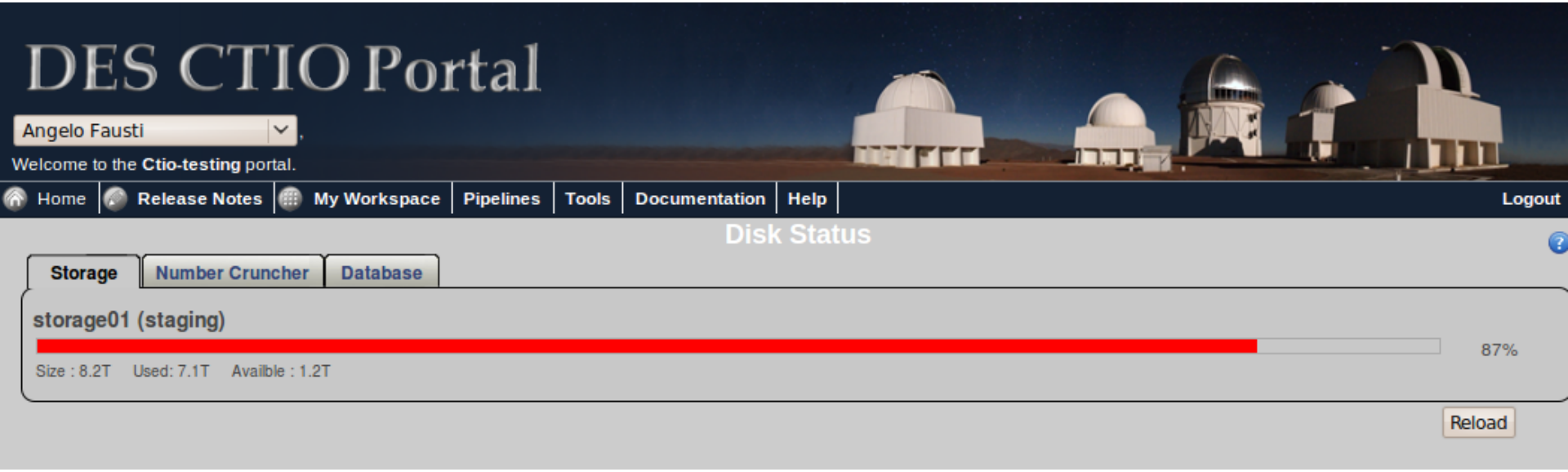


Histogram of the PSF for the selected CCD



Disk monitor

- Disk-full warnings
- Garbage collector



Documentation

DARK ENERGY SURVEY

DES-BRAZIL

- Guide for Observers
- Online help for each screen

Helpdesk

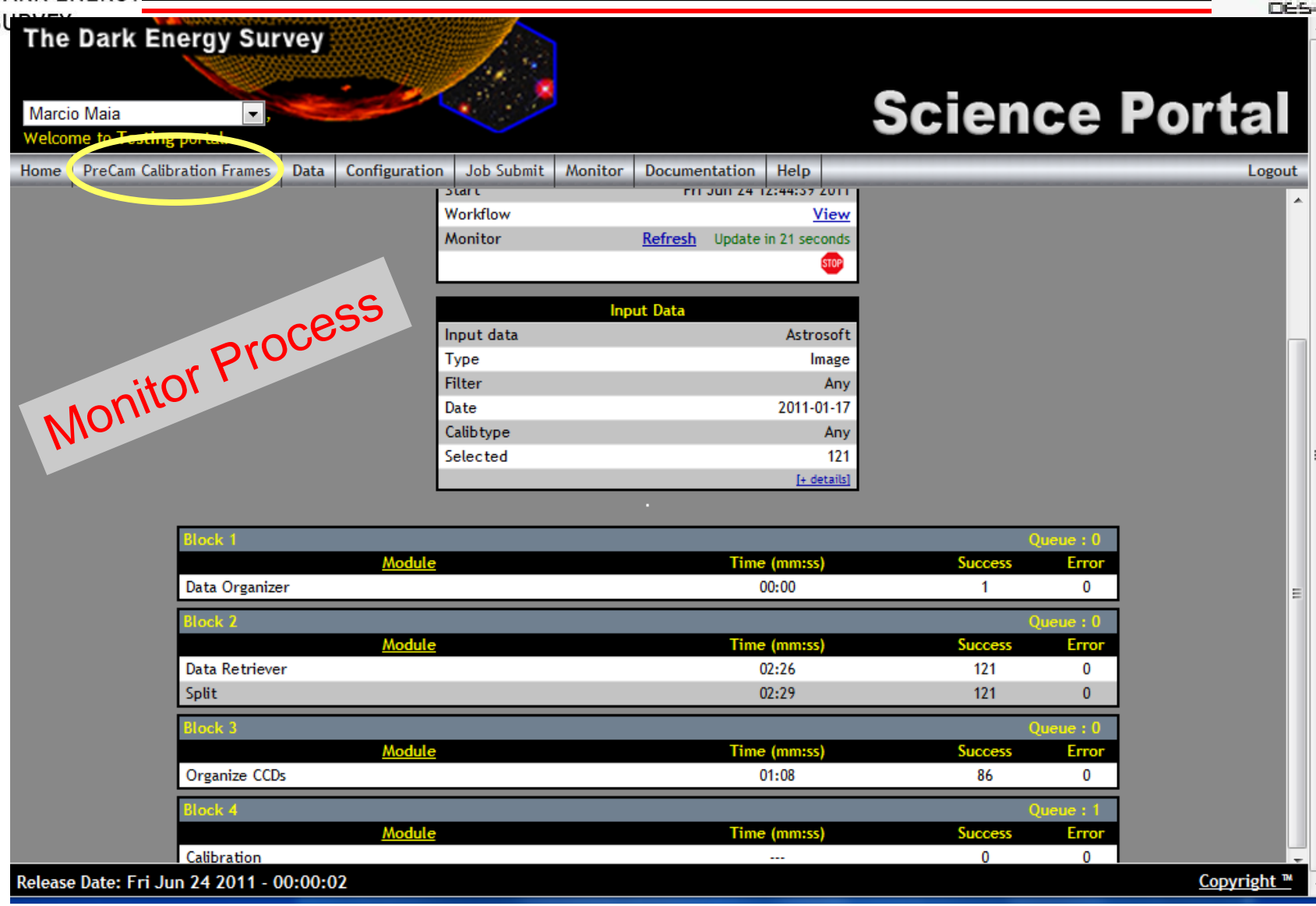
- Ticket system for issue tracking and user feedback

DARK ENERGY
SURVEY

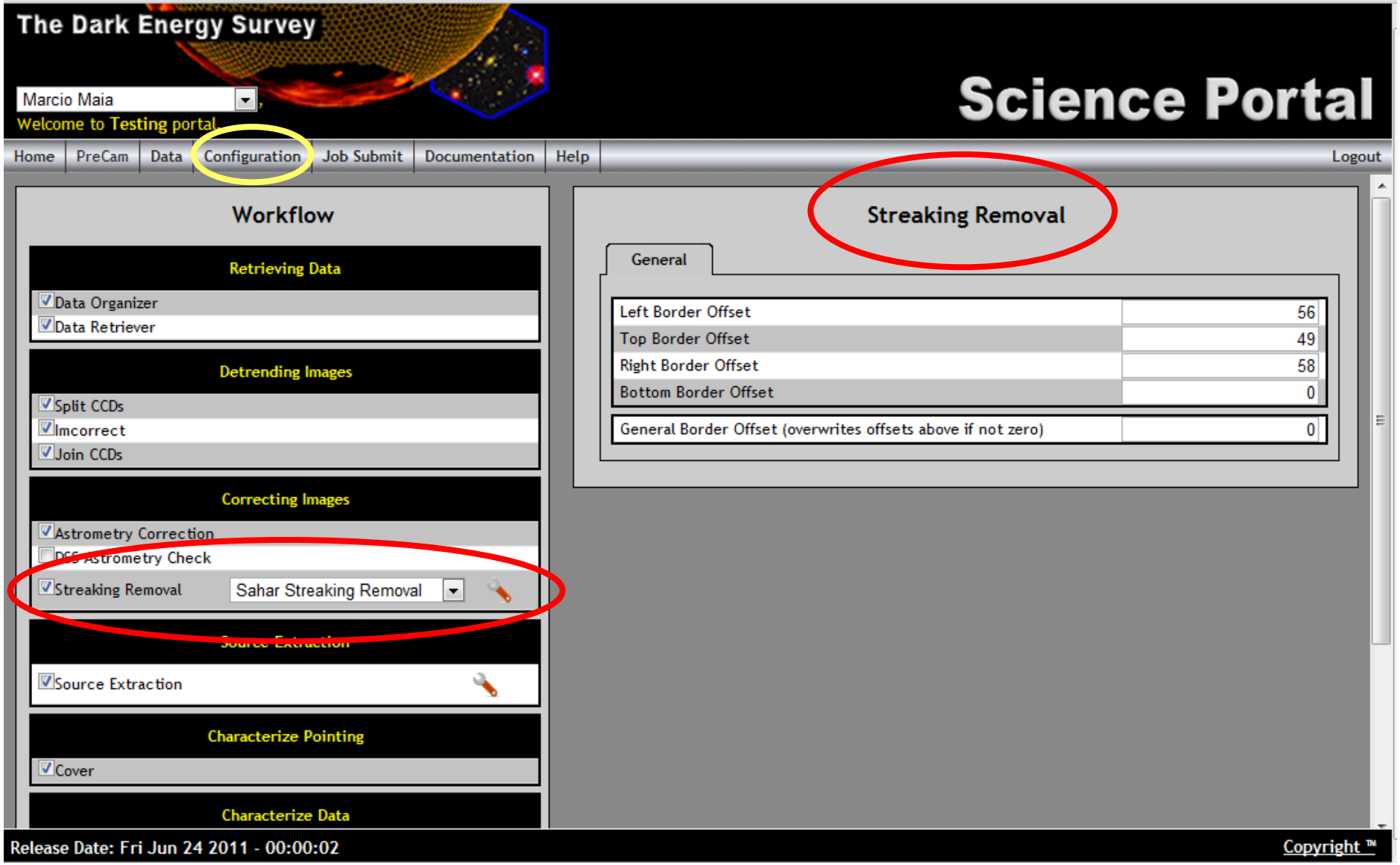
The End

Extra Slides

Reduction Calib Frames



Workflow Configuration



Ultimate Goal

Full automatic processing and +

1- Data transfer CTIO to Rio (end of night)

2- Data ingestion in database (in Rio)

3- Raw data transfer to FERMILAB

3- Data automatically reduced

4- Reduced data saved in database

5- Reduced data transfered to FERMILAB

6- Feed-back about bad frames to OBSTAC

7- Tool for analysis of PreCam data in the Science Portal

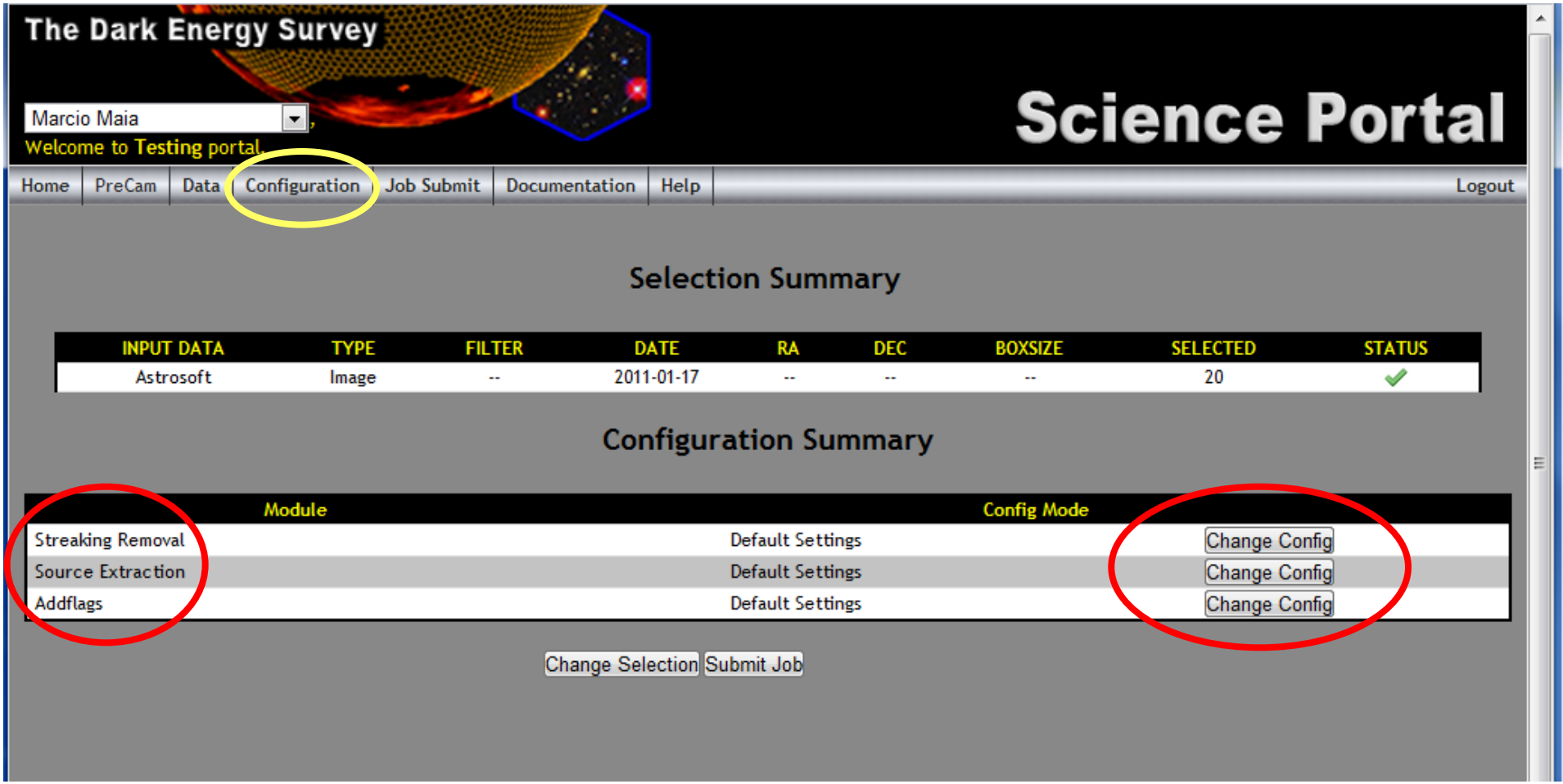
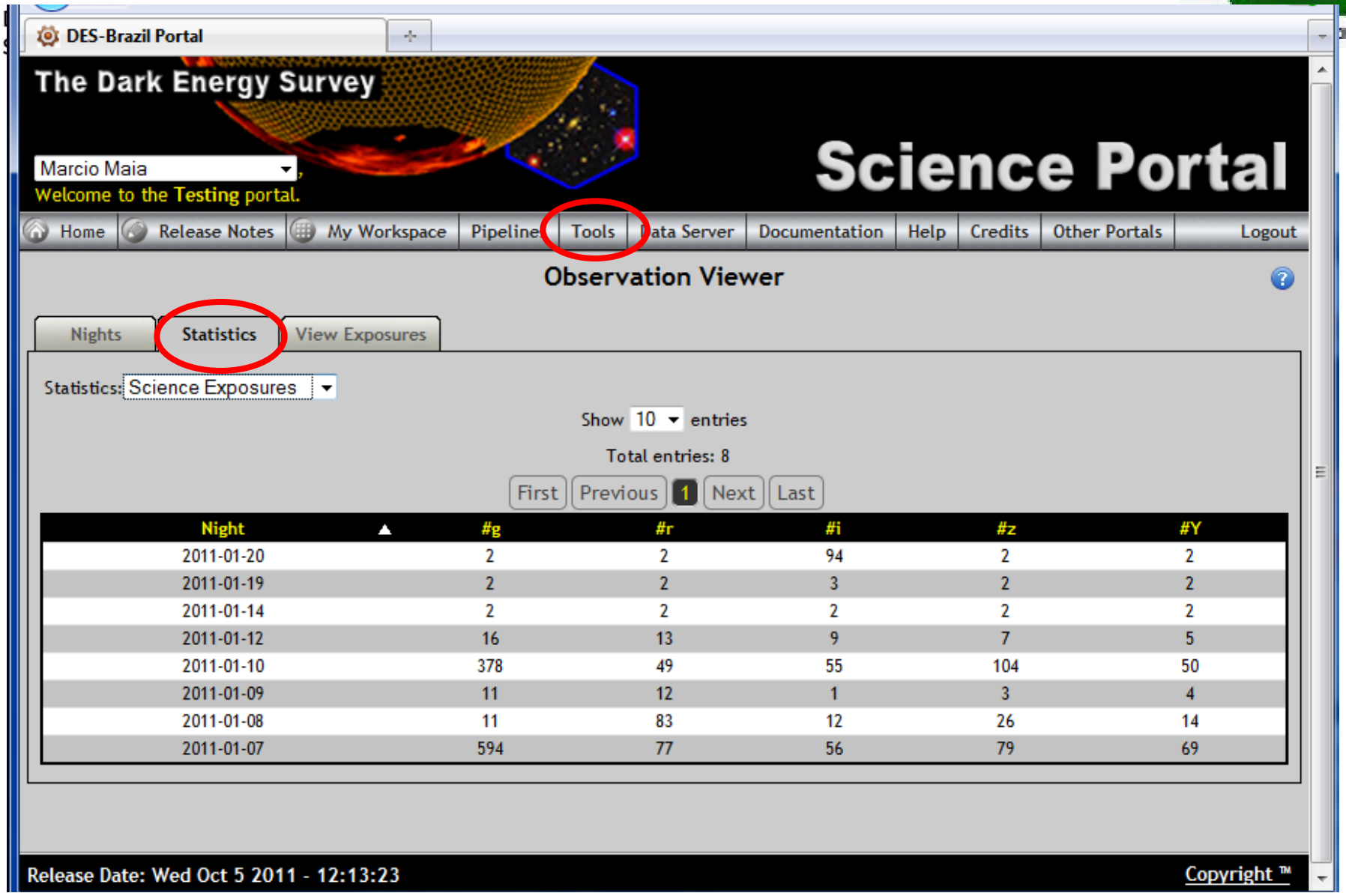
The Quick Reduce pipeline

- QR splits the DECam field-of-view into individual CCDS.
- Apply bias, flat field and over scan corrections.
- Run SExtractor to produce a star catalog.
- Measure mean PSF and PSF distortion, number of deteced stars and background counts on each CCD.
- Quality Assessment: compare measured values with predefined limits by the observer.

Selection & Configuration Summary

DARK ENERGY SURVEY

DES-BRAZIL



Observations Viewer Tool