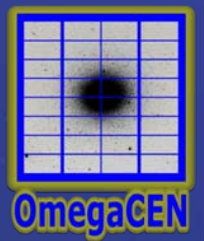
Astro-WISE



I-science workshop
Lorentz center Leiden

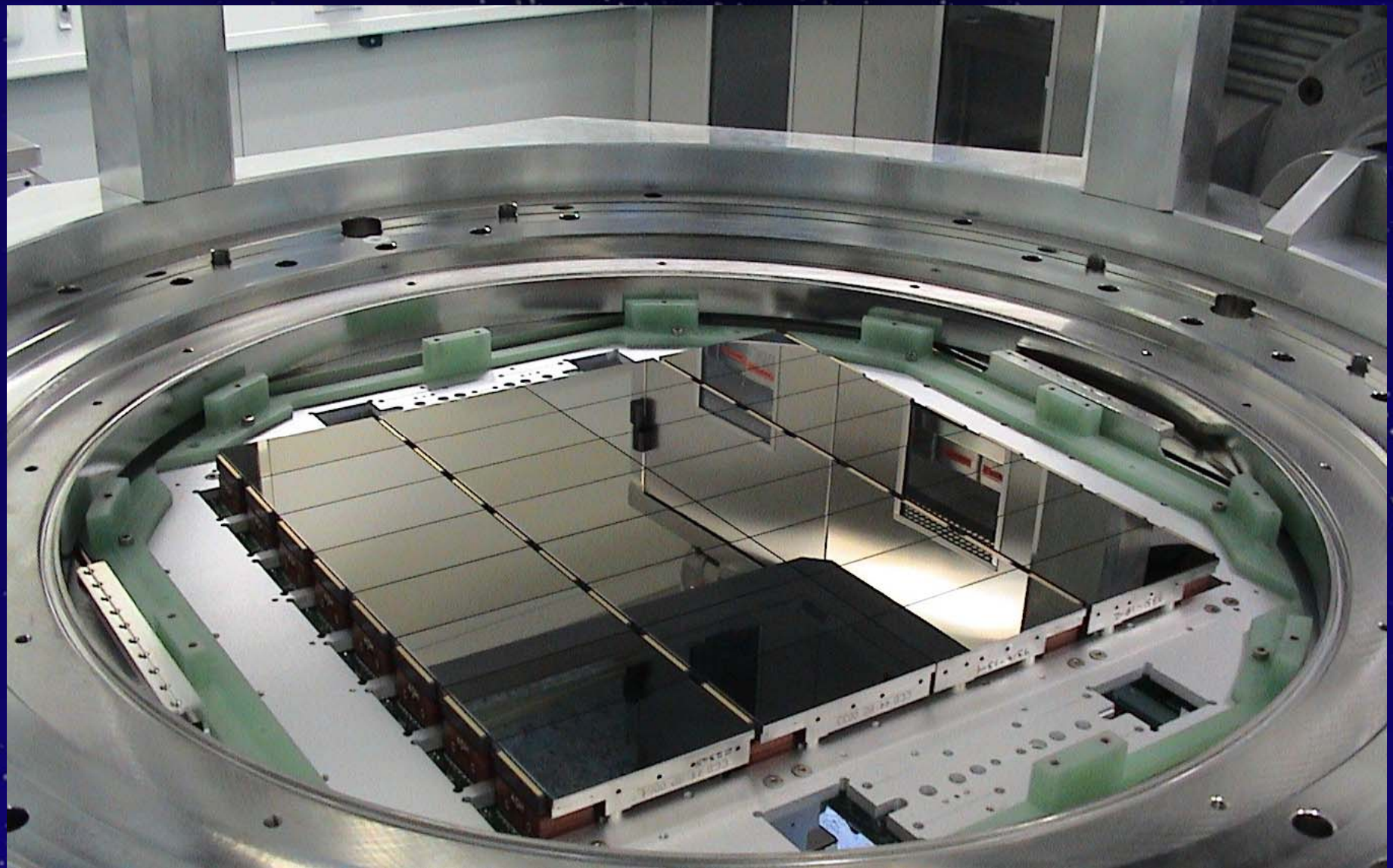
OmegaCEN
NOVA – Kapteyn Institute –
University Groningen

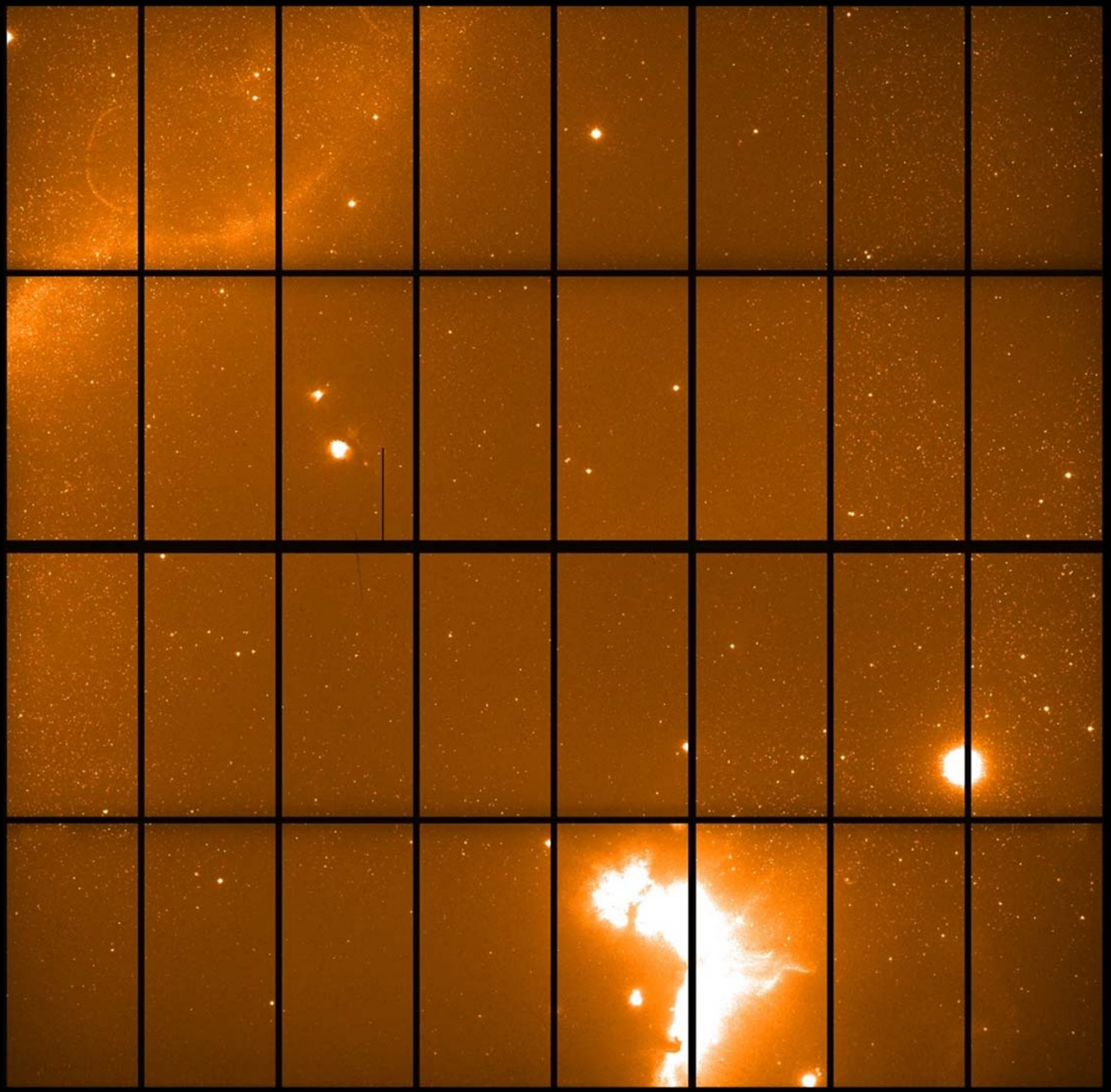
Edwin A. Valentijn

15 Oct 2008

OmegaCAM

32 x 2 x 4 = 256 k 0.21”





OmegaCEN

I-Science
Leiden oc

VST

OmegaCEN

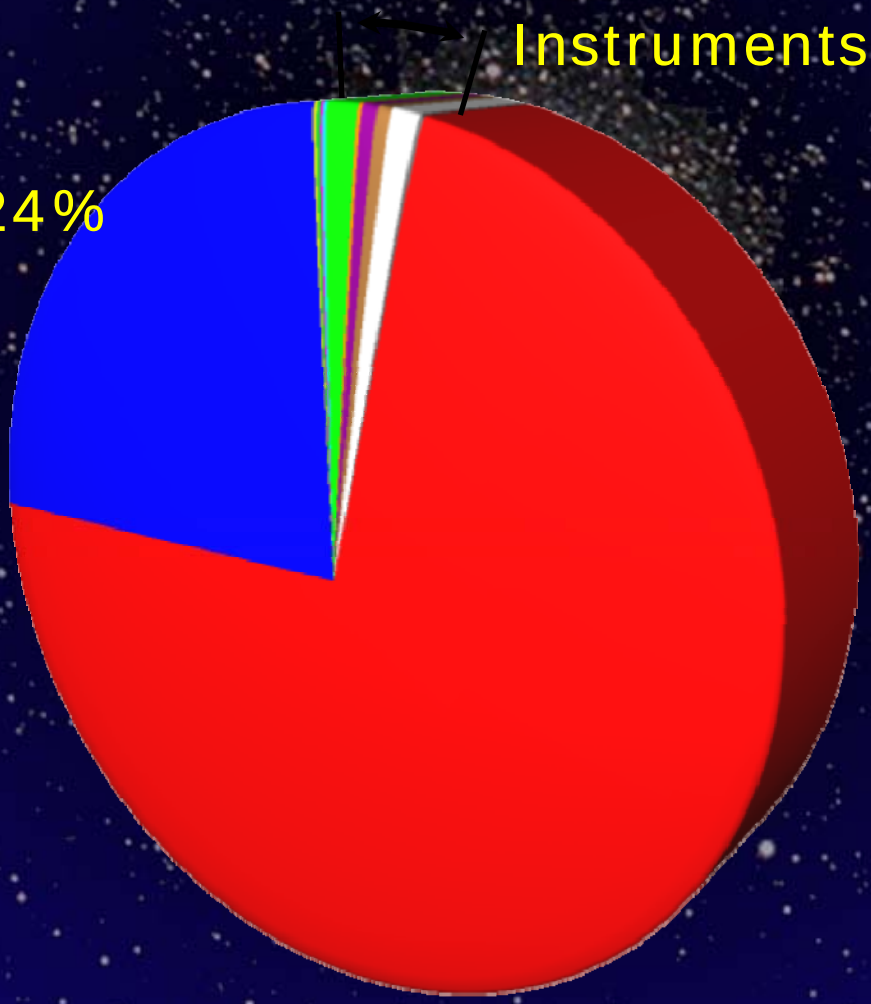
I-Science worksh
Leiden oct 2008

OmegaCAM at ESO-HQ

I-Sc
Leid

Paranal Monthly Data Rates 2007 statistics

FORS1 FORS2 GIRAFFE ISAAC MIDI
NACO SINFONI UVES VIMOS VISIR
VIRCAM OmegaCAM



All Current Paranal Instruments 4% (433.2 GB)

OmegaCAM 24% (~2500 GB)

VIRCAM 72% (~7500 GB)

I-Science workshop-
Leiden oct 2008

Mark Neeser

Example Public Survey KIDS – VIKING

~250 nights

~500 nights

VIKING

VISTA

0.6 sq.deg.
InfraRed camera

16 2kx2k
detectors

0.35” pixels

KIDS

OmegaCAM @VST

1500 sq.deg. u g r i

2 Million CCD readouts

32 2kx4kdetectors

0.21” pixels

3 – 10 year project

Home | AWE Information System | Instruments | AWE projects

www.astro-wise.org

- What is Astro-WISE?
- Using Astro-WISE
- Publications
- Job openings
- Contact
- Team
- Index
- News Mailinglist
- Issues Mailinglist
- External links
- Search

Astronomical Wide-field Imaging System for Europe

a partnership of

- OmegaCEN-NOVA/Kapteyn Institute, Groningen - NL
- Osservatorio Astronomico di Capodimonte, Napoli - I
- Terapix, IAP, Paris - F
- ESO, Garching bei München - D
- Universitäts-Sternwarte München - D
- OmegaCEN-NOVA - NL

co-ordinated by

An on-going project which started from a FP5 RTD programme funded by the EC Action "Enhancing Access to Research Infrastructures".

Astro-WISE Online

Overall storage and user statistics

Online storage: 363 TB
Number of files stored: 1605413
Database accounts: 104
Total queries[1]: 496136

[1] *sum for all databases since their last restart*

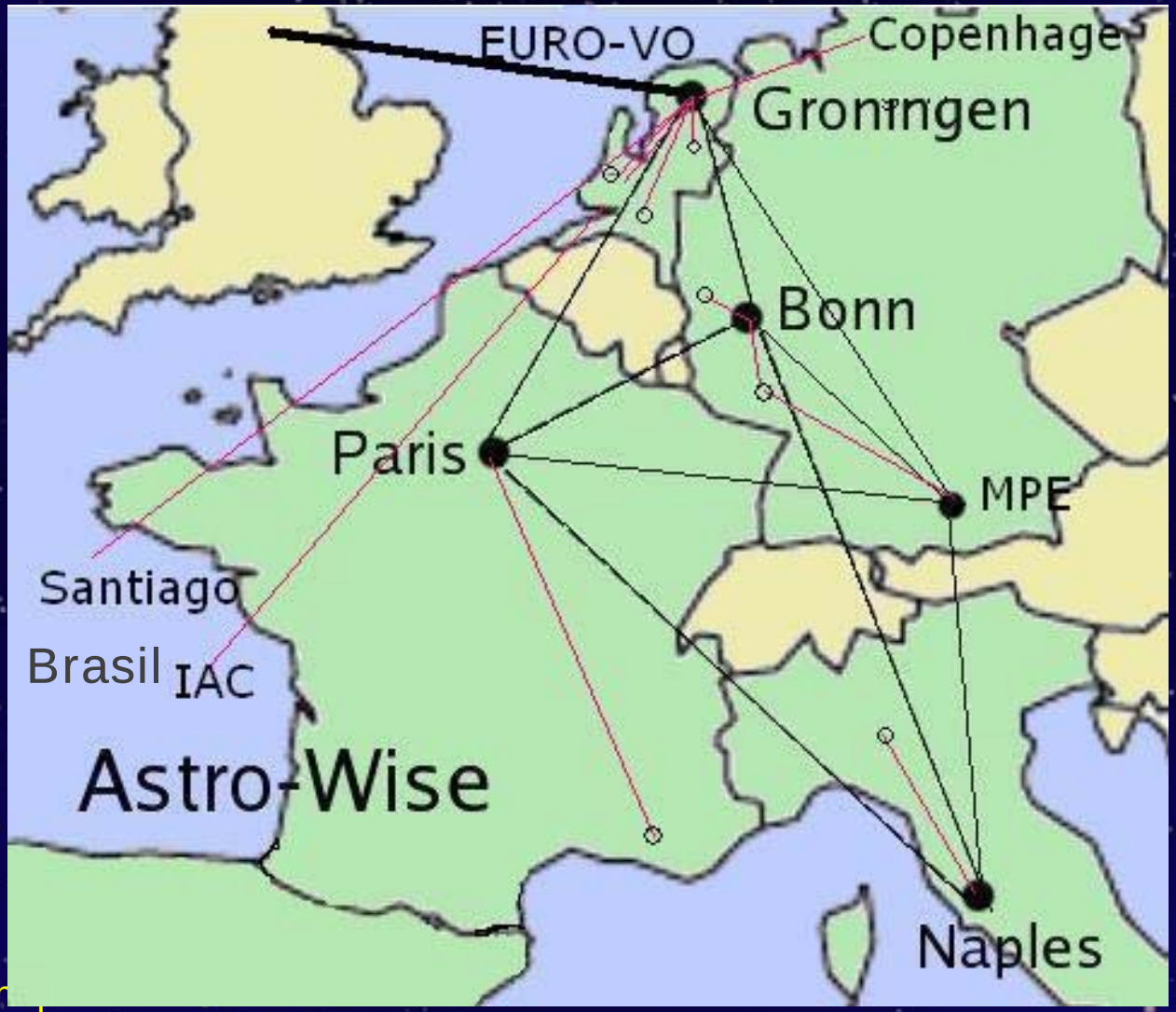
Status of services at Astro-WISE nodes

Bonn
Groningen
München
Napoli

poll details

Updated: 14 Jun 2008 18:10:02

Centers – satellites



VST - Virtual Survey Telescope

HPC (RC)

Parallel Pipeline (Python)
Oracle Client
FileServer Client (Python)

Users

Gateway to Astro–Wise Compute Server

Compute Server

AWE Monitor
Pipeline (Python)
Oracle Client
FileServer Client (Python)

Leiden
München
Napoli
Paris

WAN

Switching Hub

NAS (OmegaCEN)

FileServer Server (Python)

RAC (OmegaCEN)

Oracle Server

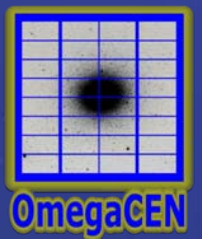

Nice 2001

Surveys in AstroWise

- PANSTARRS: MDS – 3 pi
- HST: Coma LS
- VISTA: ULTRAVISTA – VIKING
- LOFAR

- VST: KIDS/ VESUVIO nearby superclusters Hercules
- VST: Many more OmegaCAM GT
  - LSB galaxies
  - VST16
  - Dwarfs
  - Quasar searches
  - OmegaWHITE
  - SUDARE - supernovae at z=0.5
  - STREGA
  - Streps
  - OmegaTRANS- PanPlanet

What is ASTRO WISE



- an e-science infrastructure with fully distributed resources,
- which allows teams distributed over Europe
- to jointly collaborate on the data production, calibration, QC, analysis of wide field imagers,
- in the optical, IR and radio.
- Current: WFI@2.2m, INT, Subaru, ACS@ST
- Near future: Panstarrs, VST, VISTA, Lofar
- Far future: EUCLID

Virtual Survey Telescope paradigm

raw pixel data ⇔ pipelines/cal files ⇔ catalogues

all integrated in one information system

100% data lineage - data driven

1 dec 2006 delivered

- Collected in database – Oracle 10g Relational
- distributed services
- processing GRID / Storage GRID
- Methods GRID

NL: Leiden, Nijmegen, Groningen

EU: Napoli, Munchen, Bonn, Heidelberg, Paris, Santiago de Chile, Brasil

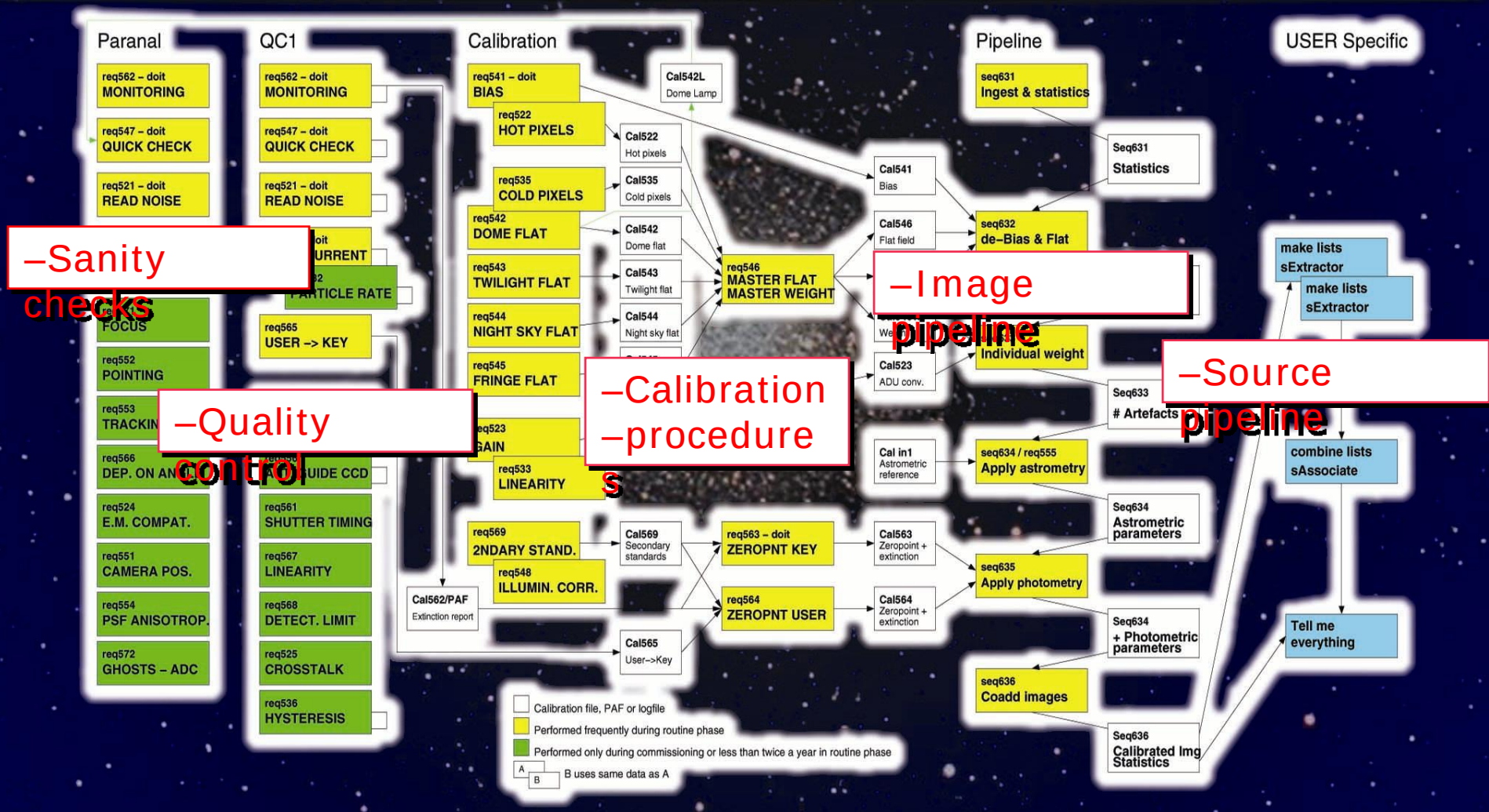
Central role db

- All I/O via db ; metadata; sources
- Objects persistent in db
- data server access via global filename (key) in db
- Security
- (parallel)processing
- Webservers
- Synchronized real time National Nodes

AstroWise paradigm

“Classical” paradigm Forward chaining	**Target processing - Awe Backward chaining**
waterfall model TIER architecture	User hunts upstream
driven by input raw data	Driven by query of user
Process in pipeline workflow	Process in bits and pieces on the fly Backward chaining
Operators push data	User pulls data
Results in releases	Provide information system
Static archives – publish	Dynamic archives –publish Internet
Raw data - obsolete	Raw data is sacred

Data Model



–Sanity checks

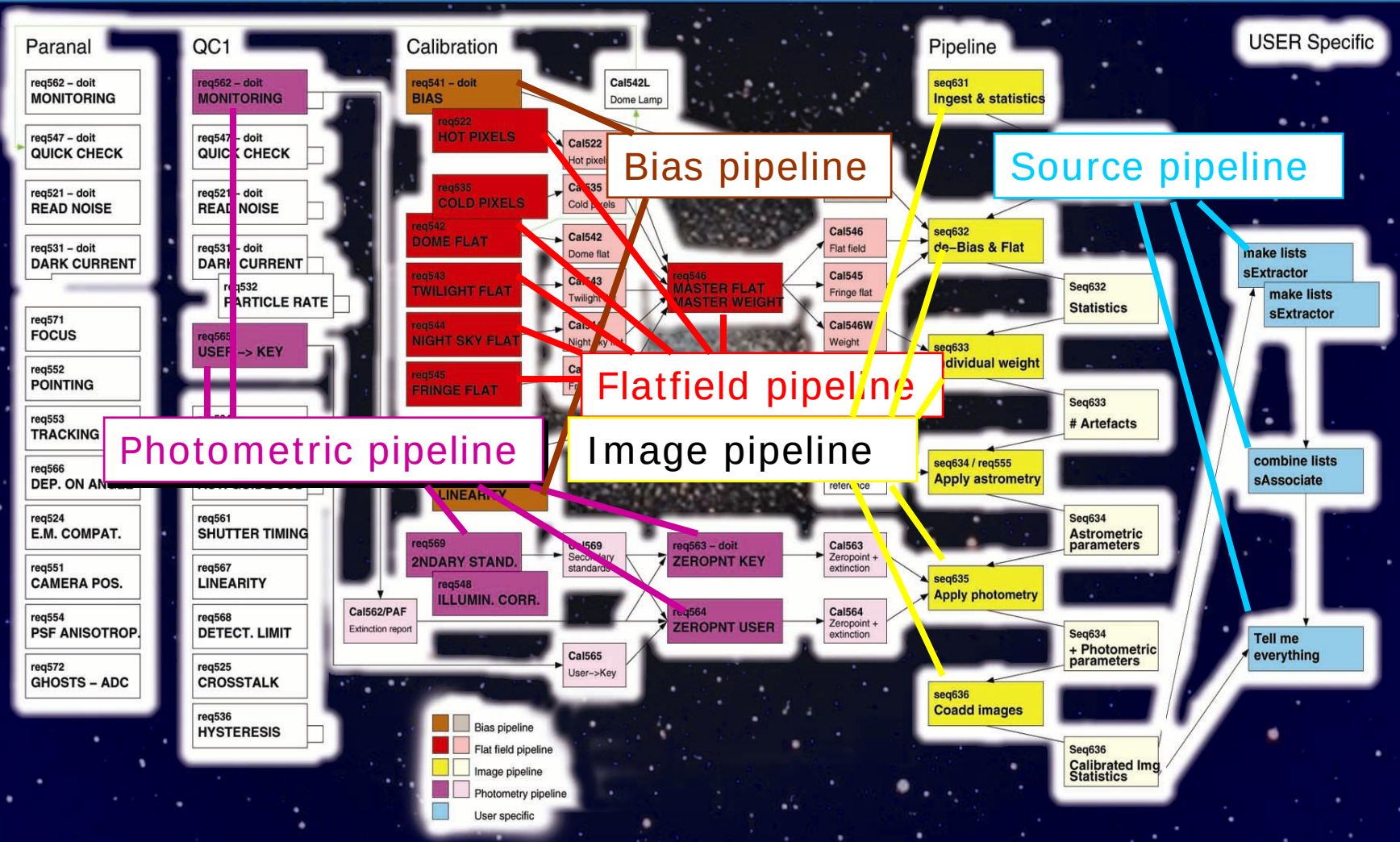
–Quality control

–Calibration –procedures

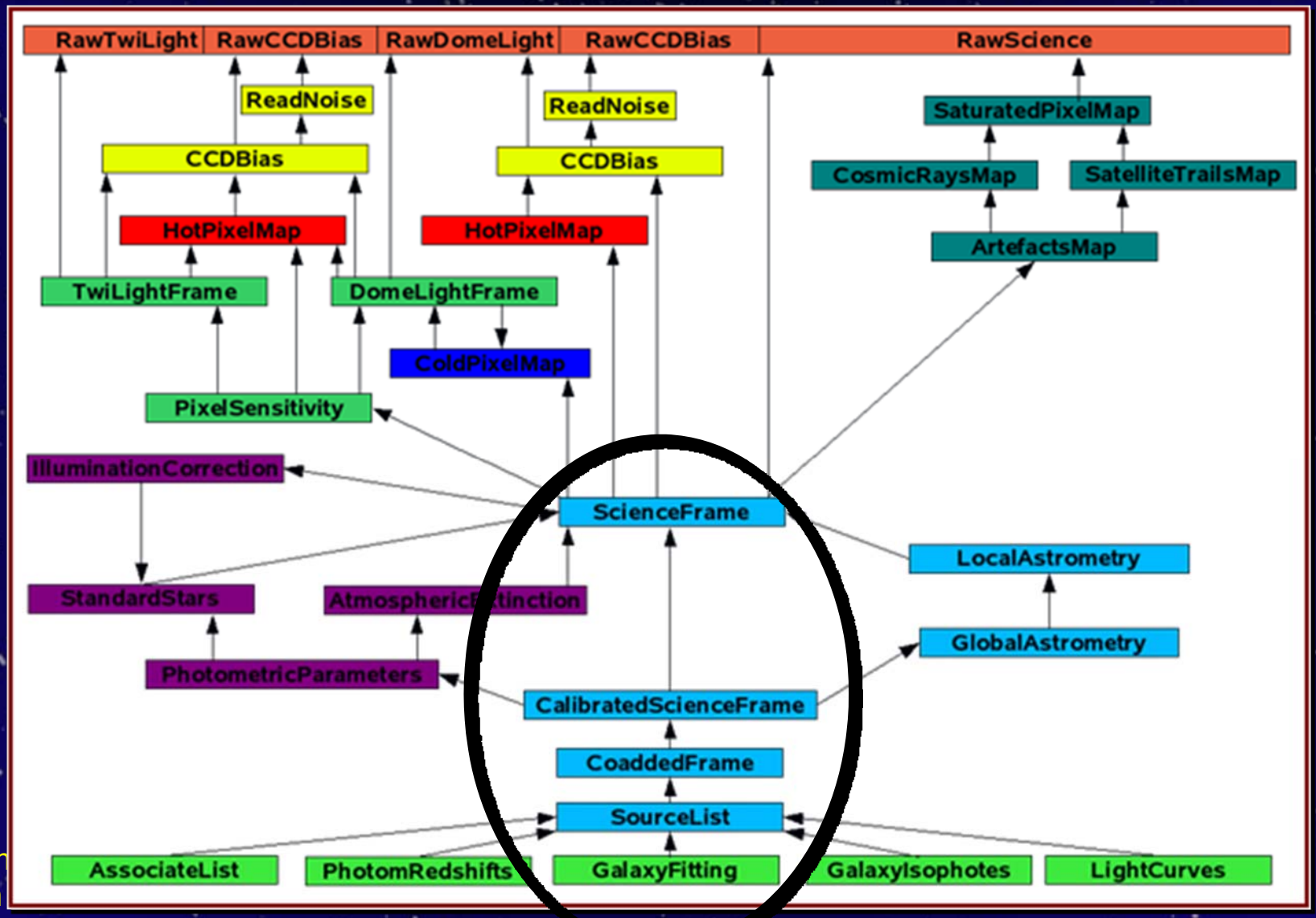
–Image pipeline

–Source pipeline

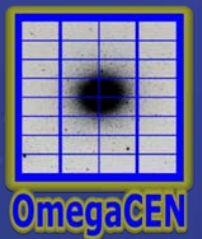
Astro-Wise Pipelines



TARGET diagram



The avalanche integrated dynamic db



- on-the fly re-processing for everything
- 5LS: 5 Lines Script Awe> prompt
- Trend analysis Awe > prompt
- All dependent bits are traced “tell_me_everything_tool
- Administration for parallel processing -compute GRID
- Connect to EGEE - Grid
- Global solutions –astrometry/photometry
- Build–in workflow
- Fully user tunable – own provided script
- Context: projects/surveys, instruments, mydb
- Publish directly in EURO-VO

Example 5LS

```
#Find ScienceFrames for a ccd named ccd53 and filter

   Awe> q = (ReducedScienceFrame.chip.name == 'ccd‘) and
     (ReducedScienceFrame.filter == ‘841’)
# From the query result, get the rms of the sky in image
   Awe> x = [k.imstat.stdev for k in q]

# get the rms of the used Masterflat
   Awe> y = [k.flat.imstat.stdev for k in q]

# Make a plot
   Awe> pylab.scatter(x,y)
```

Target processing: ++ the make metaphor


```
awe> targethot=HotPixelMap.get(date='2003-02-14', chip='A5382')
```

The processing chain is

ReadNoise <-- Bias <-- HotPixels

- > class HotPixelMap(ProcessTarget):
- > > def self.make()

- > class ProcessTarget():
- > > def get(date, chip) # if not exist/up-to-date then make()
- > > def exist() # does the target exist?
- > > def uptodate() # is each dependency up to date?

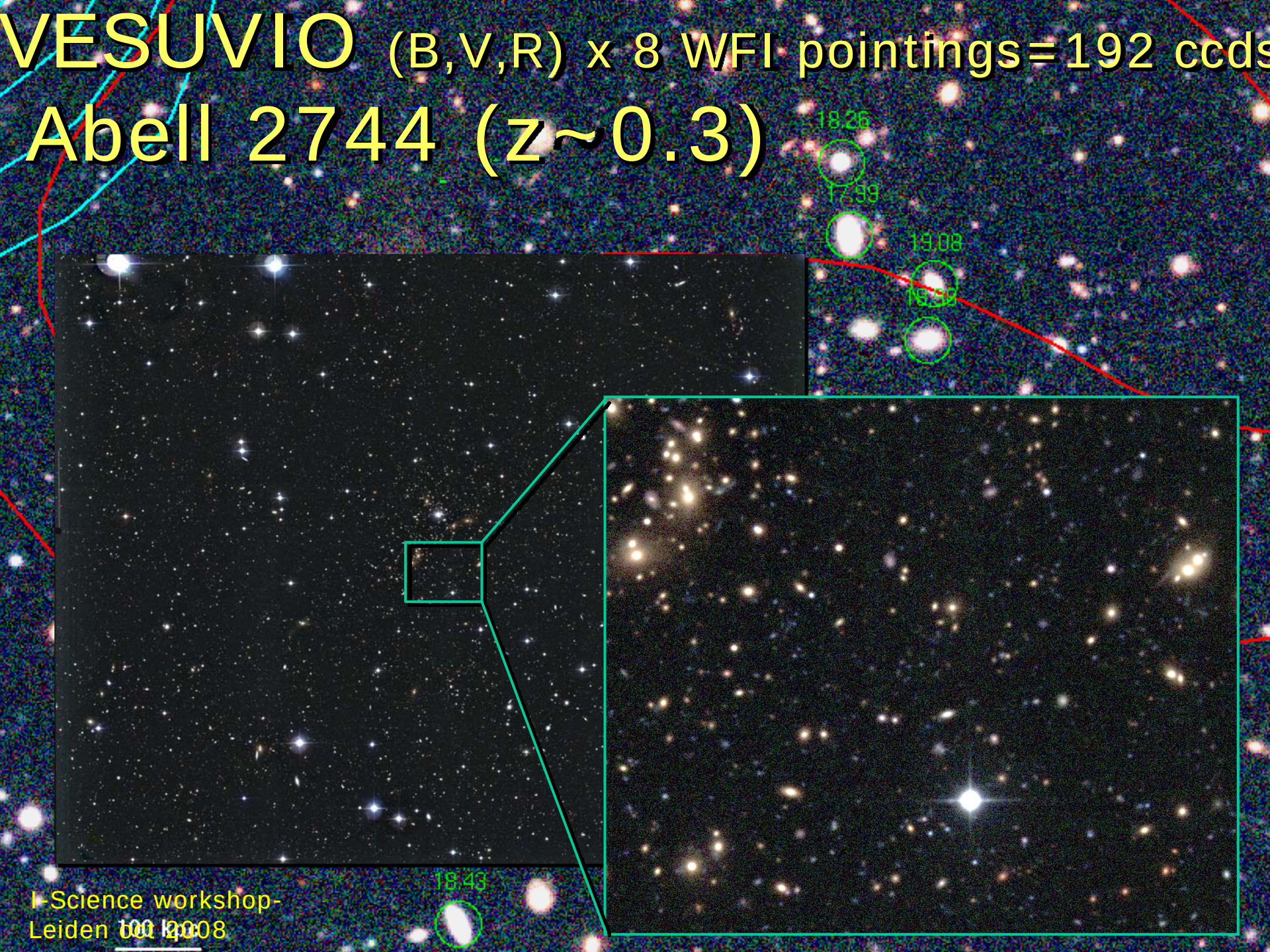
Fully recursive

Persistency dbobject

```
Class DBMeta                                  # python<->db
   def __new__    # makes any derived Class persistent
   def __call__     # instantiate persistent object - attributes

Class DBObject:
   __metaclass__= DBMeta
   object_id = persistent('The object identifier', oidtype)  #unique

# make it
   example = DBObject()
   example.commit()

# get it
   oid = example.object_id
   result = DBObject(object_id = oid)
```

Persistency dataobject

```
from astro.database.DBMain import DBObject, persistent
class DataObject(DBObject):
   filename = persistent('File part of this object',
   str, '')

example =DataObject(pathname='example.txt')
example.store()
example.commit()

g = DataObject.filename.like('example*')
```


VESUVIO (B,V,R) x 8 WFI pointings=192 ccds
Abell 2744 (z~0.3)
18.26
17.99
19.08
18.43
I-Science workshop-
Leiden oct 2008

Quality control

- Distributed
- Shared over the whole community
- web based
- OmegaCAM calibration plan
- OmegaCAM observing strategies

time

- Calibrations vary in time due to
  - Physical changes
    - eg gain of detectors, atmosphere, flexure in telescope
  - Our insight in these changes, better modeling
  - Bugs in code and improved coding
  - sociology

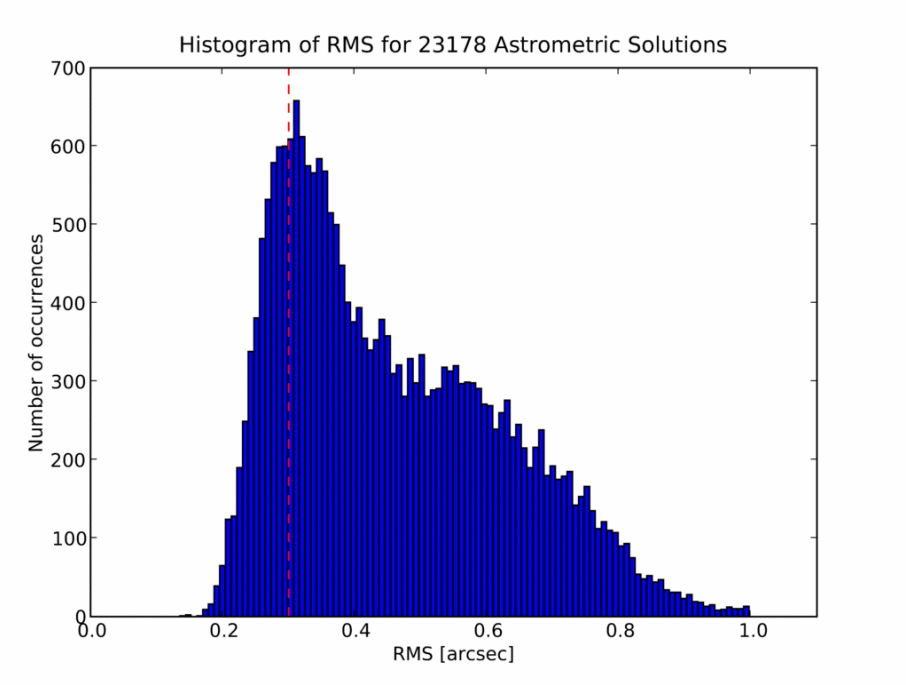
QC - calibration scientist monitoring

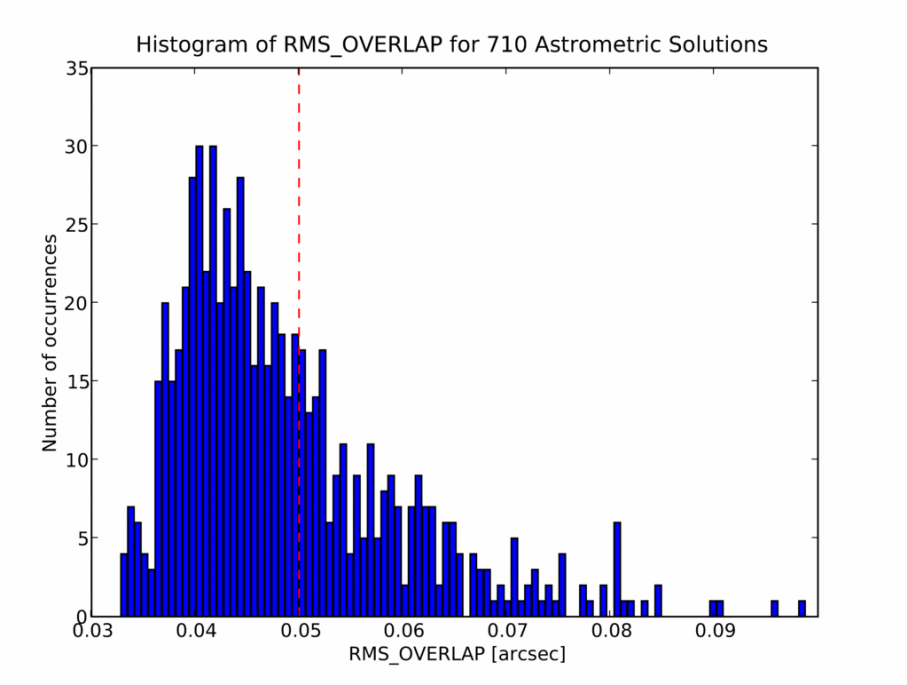
Quality control- flags

- Quality flags
  - System quality_flags (method verify)
  - User is_valid (method inspect by user)
    - 0 = bad
    - 1 = OK
    - 2 = Qualified - ready for delivery
- Context - privileges
  - 1 Mydb — user_CalFile
  - 2 Project, eg KIDS
    - Project favorite flag — project CalFile
  - 3 AstroWise — Awe Calfile
  - 4 World
  - 5 VO

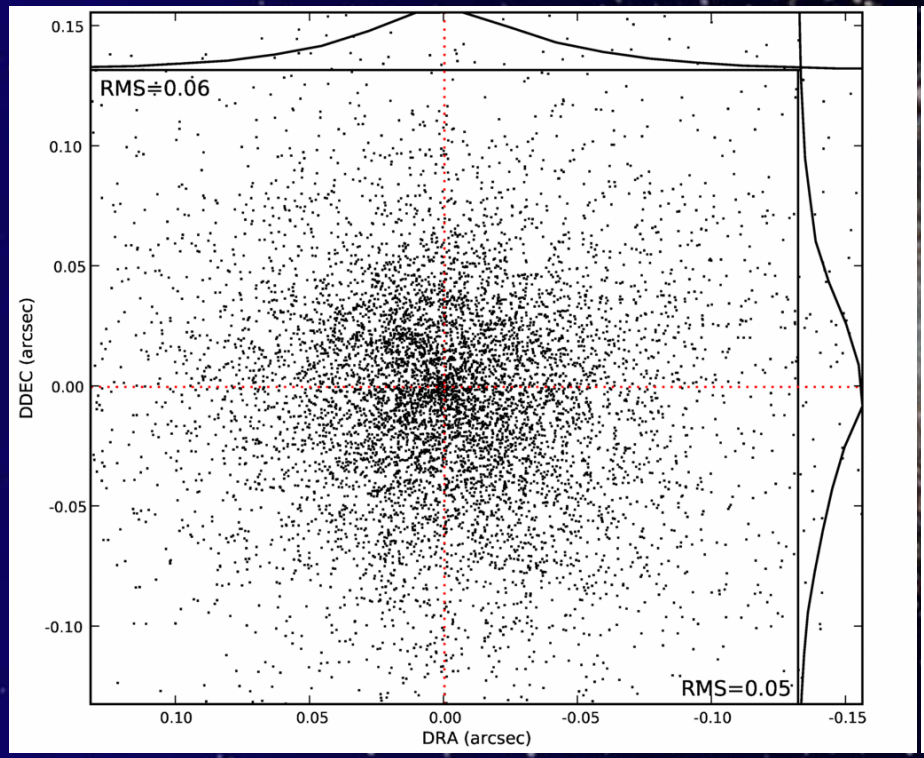
Astro-WISE Astrometry

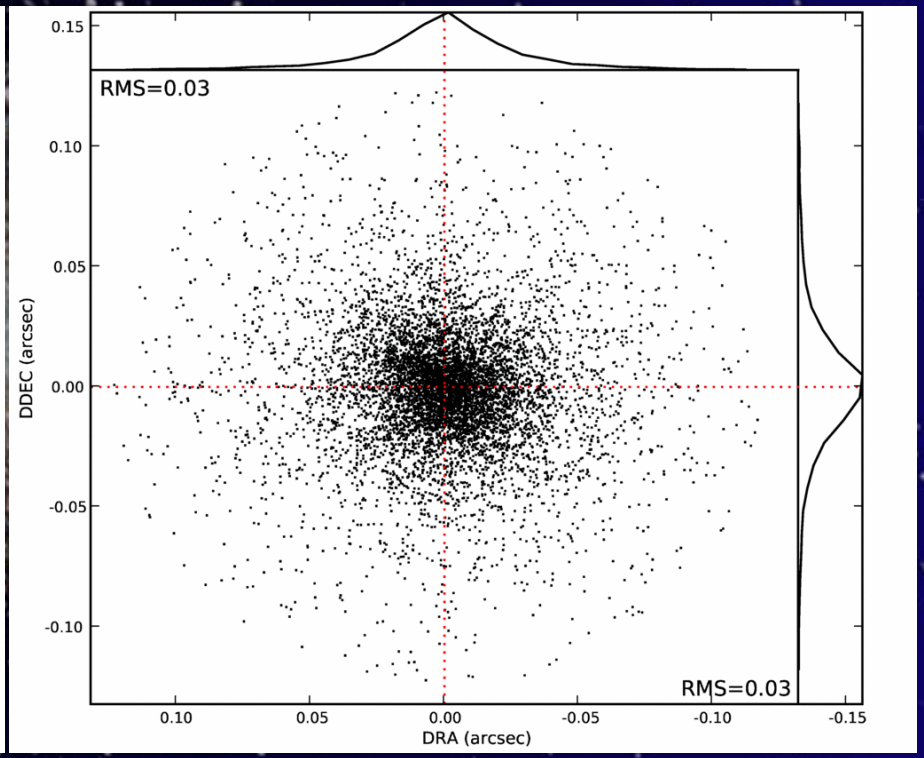
- Local solution
  - 0.3” follows reference cat (USNO)
- Global solution
  - 0.04” compared to overlapping residuals





Astrometry- reproducibility





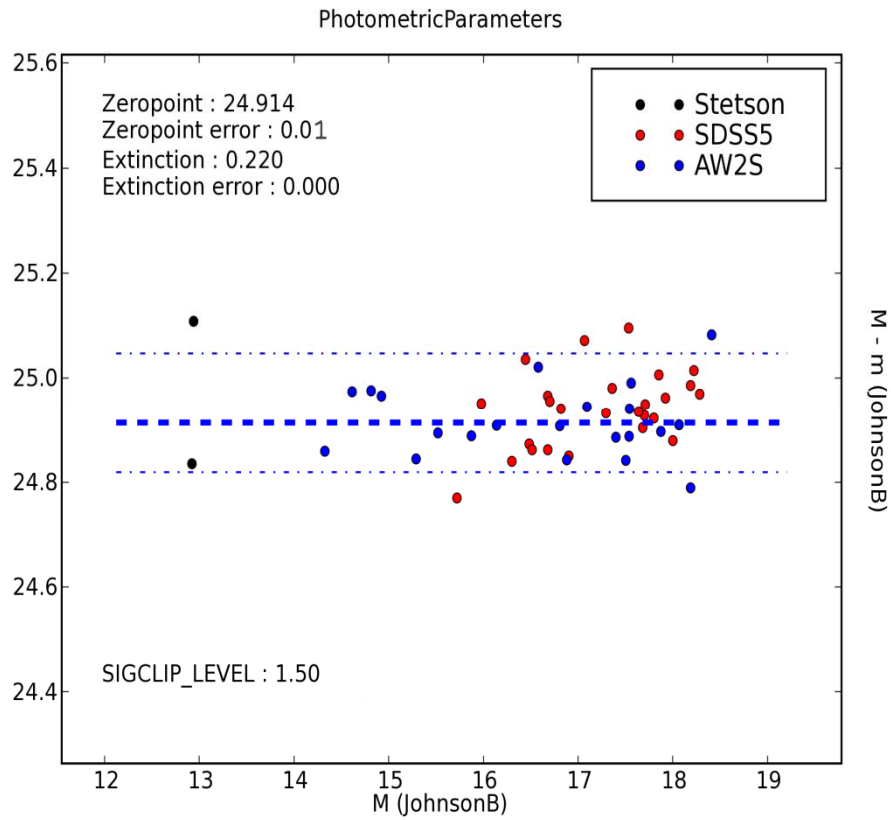
Local solution

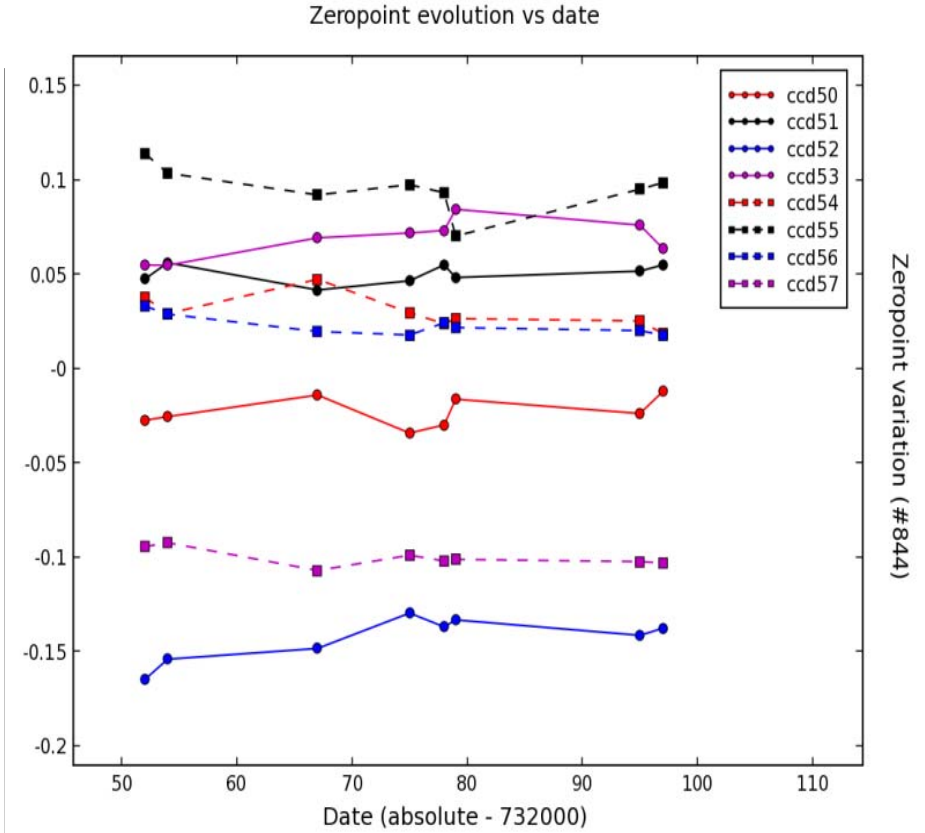
Global solution

(Internal regrid-to-regrid residuals of one WFI N=4 dither)

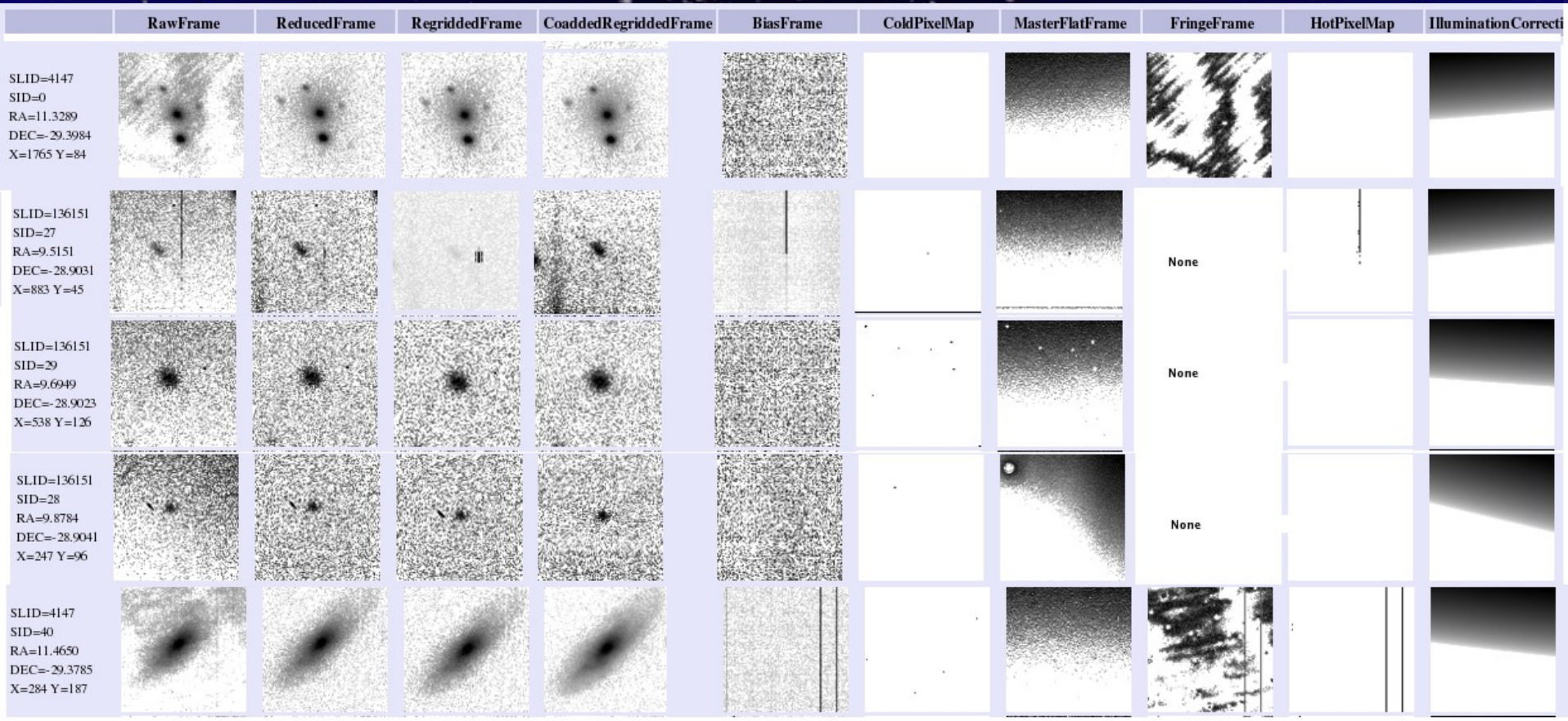
Astro-WISE
photometric calibration chip-by-chip

Example WFI@2.2m 8 chips CEN-A





Extreme data lineage



RuG Target

- www.astro-wise.org

Sensor Universe

- Monck AI
- Lofar
- Lifelines IJkdijk

- Research collaborations IBM, Oracle
- TAsk24
- Heeii, Search machines

projects

- Extreme data lineage *****
- GoWISE
- Semantic web
- Qc visualization
- File/disk distribution db content visualization - data diffusion

File Edit View History Bookmarks Tools Help

http://quality.astro-wise.org/QualityWISE?object_str=RegriddedFrame&object_id=4A5A1A6C90048502E0407D

Google

Quality of RegriddedFrame:

Sci-EVALENTYN-WFI------#842-ccd50-Regr---Sci-54566.313105O-f56144d965b5e765b40bdec3d685fe595215d52b.fits

AstroWISE DEView CalTS Process

no previous comments

DBname: awgvertices project: WFI@2.2m

is_valid = 1: valid | Enter comment her | Submit

Processing Details

creation_date	2008-04-10 07:31:02
is_valid	1
quality_flags	0
Privileges	4

Image Statistics Details

mean	+9.327e+01
median	+8.887e+01
stdev	+2.945e+03
min	-6.036e+06
max	+3.727e+06

Local Astrometry Details

creation_date	2008-04-10 07:30:42
is_valid	1
quality_flags	0
RMS	0.252
SEEING	0.856
NREF	317
SIG_DRA	0.209
SIG_DDEC	0.178
MEAN_DRA	-0.001
MEAN_DDEC	0.002

Photometry Details

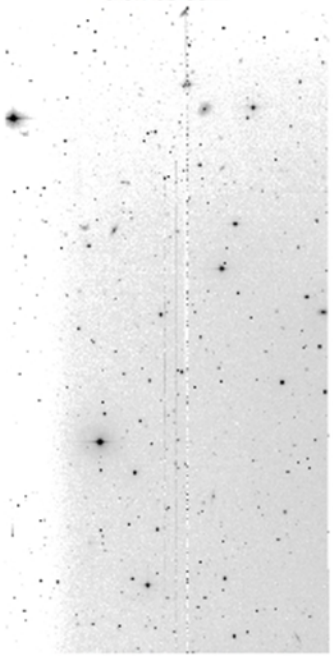
creation_date	2008-03-29 20:15:06
is_valid	1
quality_flags	0
zeropoint	24.759
zp_error	0.000
zp_origin	derived
num_sources	173

Observational Details

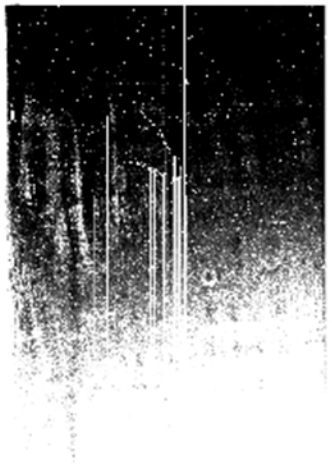
DATE_OBS	2000-03-18 03:38:21	OBSERVER	UNKNOWN
MJD_OBS	52351.1495509	EXPTIME	299.9176
OBJECT	Sns-W	AIRMSTRT	1.246
R.A.	13:25:30.0000	AIRMEND	1.246
Dec.	-31:35:44.6808	Filter	#842
		mag_id	JohnsonB

Chip ccd50 of Instrument WFI

RegriddedFrame
2439 X 4873 pixel
8.13 X 16.24 arcmin



WeightFrame
2439 X 4873 pixel
8.13 X 16.24 arcmin

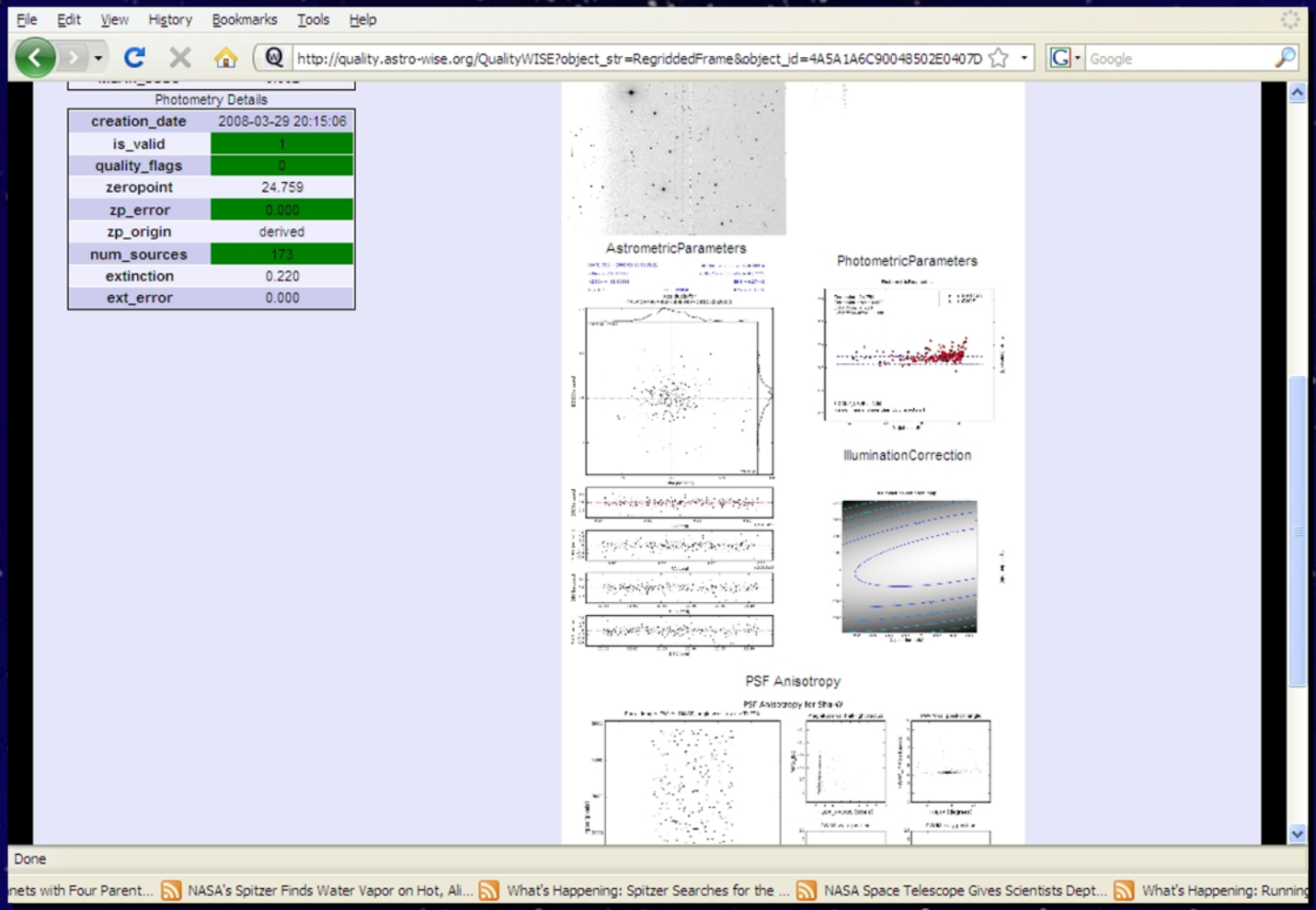


AstrometricParameters

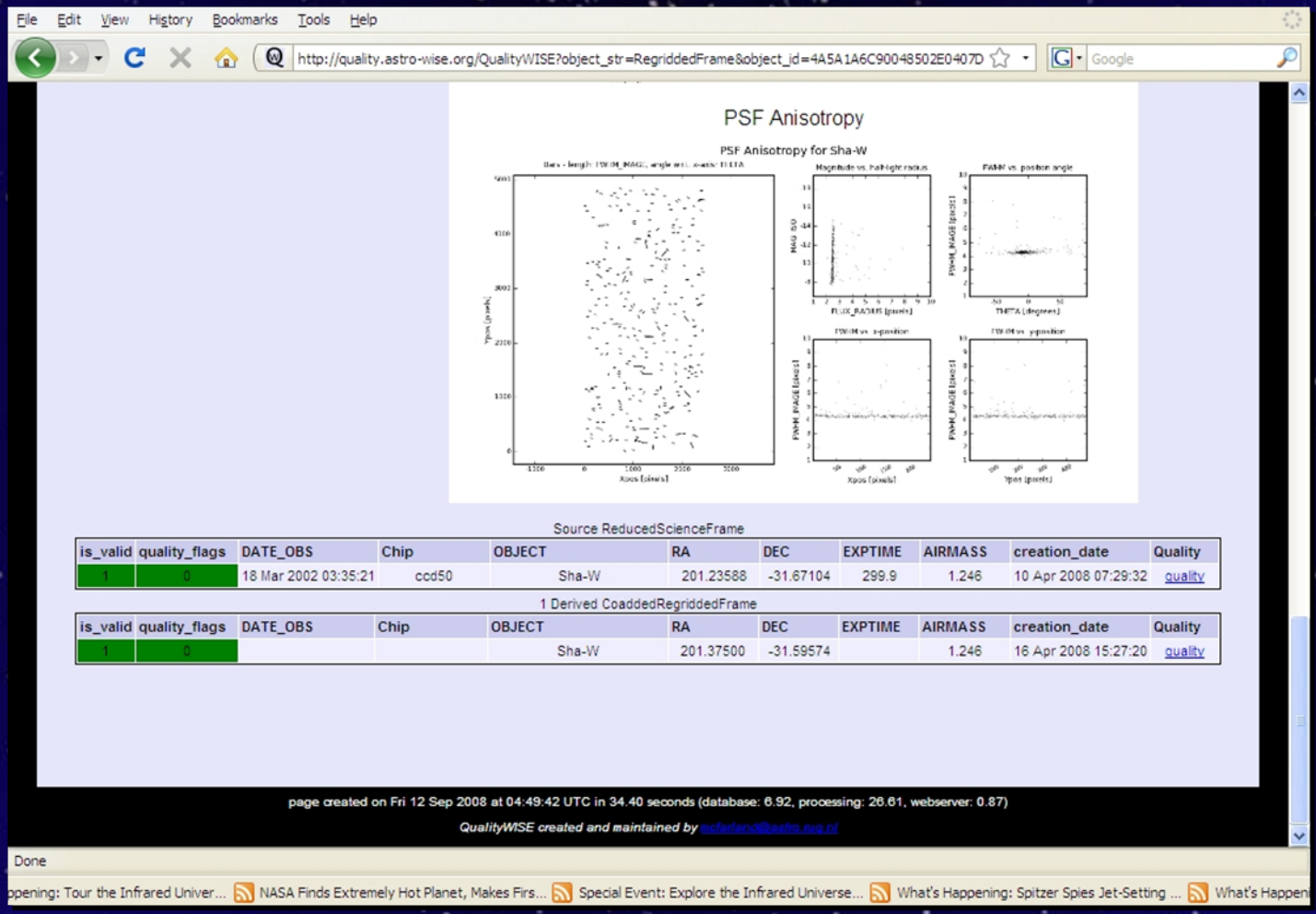
Done

Infrared' Eyes i... | Featured Image: Coronet -- A Star-Formatio... | What's Happening: Cosmic Neon Lights the ... | NASA Space Telescopes Find 'Lego-Block' Gal... | Water Vapor Seen 'Raining Do

Quality view (b)



Quality view (c)



Supported data sources

Here you can find quick links to different subsets of all public data in our database.

WFI@2.2m data

raw science | reduced science | coadded science

sourcelists | world

Find data for the WFI instrument.

WFC@INT data

raw science | reduced science | coadded science

sourcelists | world

Wide-Field Camera on the Isaac Newton Telescope at La Palma.

SUP@Subaru data

raw science | reduced science | coadded science

sourcelists | world

Suprime-Cam data from the Subaru telescope on Mauna Kea, Hawaii.

HST ACS data

coadded science | sourcelists | world

Data from the Advanced Camera for Surveys instrument aboard

WENSS data

radio images | world

Data of the Westerbork Northern Sky Survey.

ESO-LV data

ESO-LV Images | ESO-LV Catalogue | world

Browse the images in the LV-Catalogue, query them using RA and DEC, description or ESO name.
or
Browse the ESOLV-Catalogue, query all objects using numerous properties.

SDSS DR4 data

SDSS DR4 subset SourceList | world

Browse an exemplary subset of the SDSS DR4 catalog locally. This subset has been inserted into an Astro-WISE SourceList. Complete ingestion of DR4 is pending.

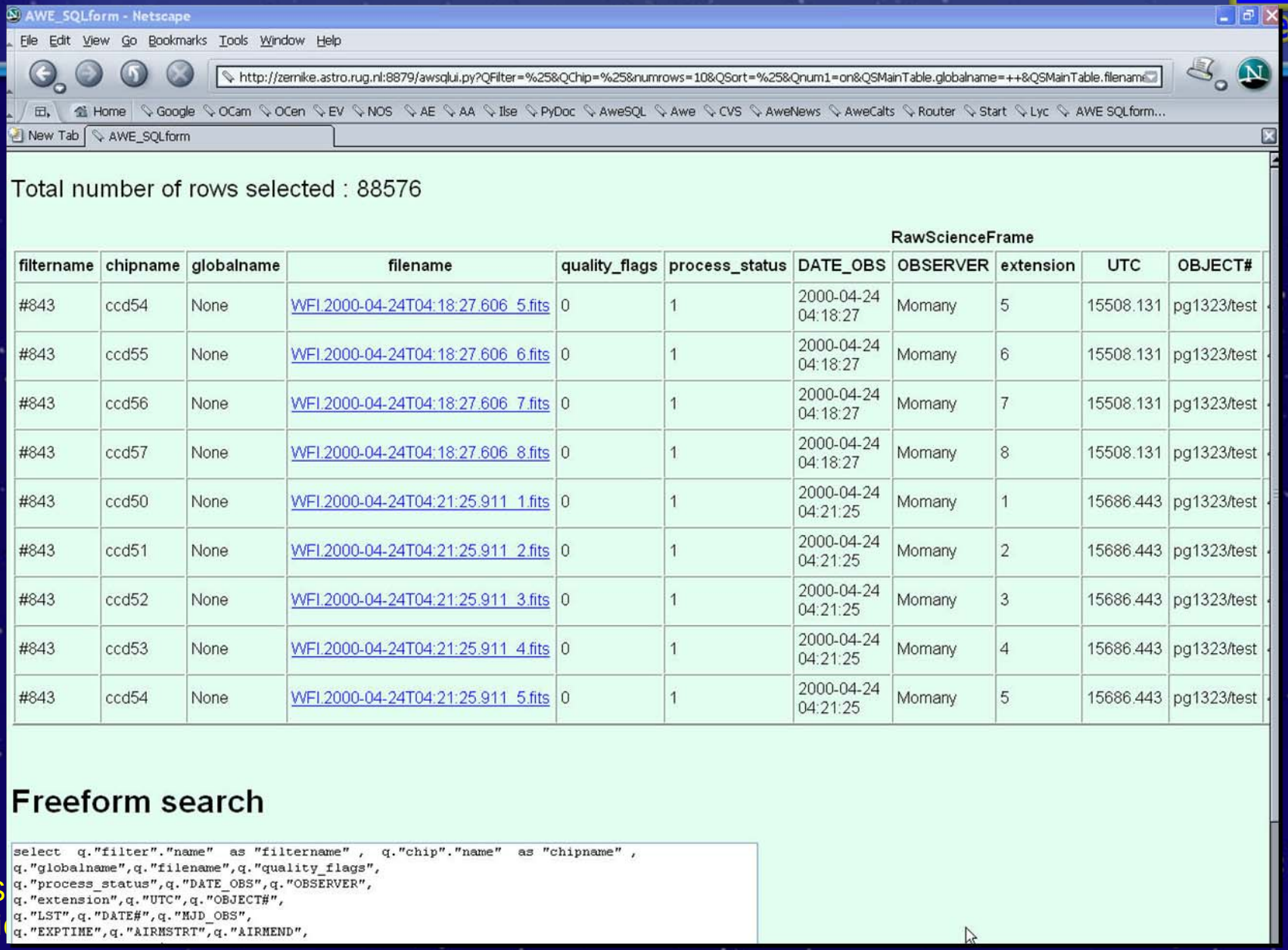
SDSS DR5 data

SDSS DR5 subset SourceList | world

Browse an exemplary subset of the SDSS DR5 catalog locally.

+ WFCAM, MegaCAM, LBC, ISAAC, Lofar

Web services- object



Total number of rows selected : 88576

RawScienceFrame

filtername	chipname	globalname	filename	quality_flags	process_status	DATE_OBS	OBSERVER	extension	UTC	OBJECT#
#843	ccd54	None	WFI.2000-04-24T04:18:27.606_5.fits	0	1	2000-04-24 04:18:27	Momany	5	15508.131	pg1323/test
#843	ccd55	None	WFI.2000-04-24T04:18:27.606_6.fits	0	1	2000-04-24 04:18:27	Momany	6	15508.131	pg1323/test
#843	ccd56	None	WFI.2000-04-24T04:18:27.606_7.fits	0	1	2000-04-24 04:18:27	Momany	7	15508.131	pg1323/test
#843	ccd57	None	WFI.2000-04-24T04:18:27.606_8.fits	0	1	2000-04-24 04:18:27	Momany	8	15508.131	pg1323/test
#843	ccd50	None	WFI.2000-04-24T04:21:25.911_1.fits	0	1	2000-04-24 04:21:25	Momany	1	15686.443	pg1323/test
#843	ccd51	None	WFI.2000-04-24T04:21:25.911_2.fits	0	1	2000-04-24 04:21:25	Momany	2	15686.443	pg1323/test
#843	ccd52	None	WFI.2000-04-24T04:21:25.911_3.fits	0	1	2000-04-24 04:21:25	Momany	3	15686.443	pg1323/test
#843	ccd53	None	WFI.2000-04-24T04:21:25.911_4.fits	0	1	2000-04-24 04:21:25	Momany	4	15686.443	pg1323/test
#843	ccd54	None	WFI.2000-04-24T04:21:25.911_5.fits	0	1	2000-04-24 04:21:25	Momany	5	15686.443	pg1323/test

Freeform search

```
select  q."filter"."name"  as "filtername" ,  q."chip"."name"  as "chipname" ,
q."globalname",q."filename",q."quality_flags",
q."process_status",q."DATE_OBS",q."OBSERVER",
q."extension",q."UTC",q."OBJECT#",
q."LST",q."DATE#",q."MJD_OBS",
q."EXPTIME",q."AIRMSTRT",q."AIRMEND",
```

Web services- object maker

Astro-WISE Processing

Contact
wjvriend@astro.rug.nl

DB User
awevalentyn

Help
Getting Started

Project
WFI@2.2m

Instrument
WFI

Single host

Parallel host
test.hpc.rug.astr...
status queue

Processing
Image pipeline
Depth 0
Full processing

Target
MasterBias
MasterFlat
RegriddedFrame
CoAddedFrame
SourceList
Advanced

Querying
Target only
Image pipeline
Depth 0
Full

Filter: #842 JohnsonB
Chip: ccd50

Date	Time	<<	Date	Time
2002-03-17	23:48:24	select	0000-00-00	00:00:00 select

Object	RA	DEC	+/-
select	10.684625	+41.26927	0.5 select

Search

Possible targets

0	Filter #842	Date 17 Mar 2002 23:48:24	(process) (all chips)
(+) (-)	RegriddedFrame (to be build)		
	AstrometricParameters (outdated)		
	ReducedScienceFrame (outdated)		
	GainLinearity (not checked)		
	BiasFrame (null)		
	PhotometricParameters (outdated)		
	AtmosphericExtinctionCoefficient		
	PhotSrcCatalog (outdated)		
	ReducedScienceFrame (outdated)		
	BiasFrame		
	ColdPixelMap		
	MasterFlatFrame (outdated)		
	FringeFrame (null)		
	HotPixelMap (outdated)		
	IlluminationCorrectionFrame (null)		