South African Virtual Observatory

A New Era of Data Intensive Astronomy in Africa
(SAAO Virtual Observatory Initiative)

Sudhanshu Barway
South African Astronomical Observatory (SAAO)

SALT-MeerKAT Collaborations Workshop 05 November 2012

The Changing Face of South African Observational Astronomy

Optical & NIR Astronomy

South African Astronomical Observatory (SAAO)

Small telescopes - 1.9m, 1.4m(IRSF-Japan), 1.0m, 0.75m, 0.5m…

Small automated telescopes - UK, Germany, USA, Poland

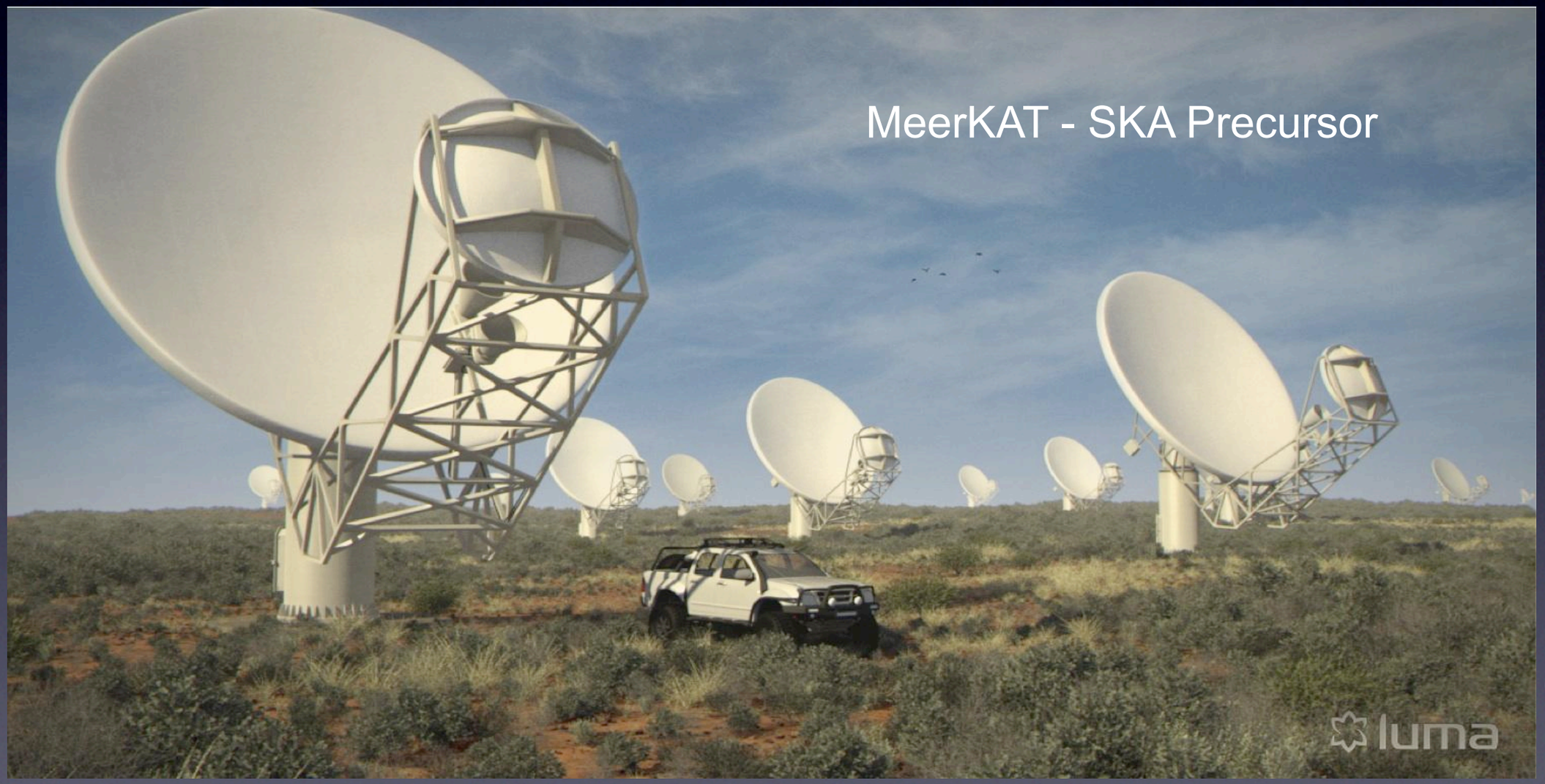
South African Large Telescope (SALT) - 10m class telescope

Slide credit - Patricia Whitelock

The Changing Face of South African Observational Astronomy

Radio Astronomy

HartRAO, KAT-7, MeerKAT, SKA



SKA AFRICA
SQUARE KILOMETRE ARRAY

The Changing Style of South African Observational Astronomy

The Old Way

- Pointed, heterogeneous Observations (~ MB-GB)
- Small samples of objects (~10-1000 sources)

Now

- Large & homogeneous observations & surveys (~10^6 - 10^9 sources)
- Archives of pointed observations (~TB)

Future

Multiple sky surveys (10^6 sources per night) and archives (~PB)

South African Large Telescope (SALT) ~01 TB/Year

Square Kilometer Array (SKA) ~10^6 TB/second (raw data)

Virtual Observatory

Virtual Observatory

A Virtual Observatory (VO) provides a scientific research environment with a collection of interoperable complex data sets, software tools and applications which utilize the power of Internet or WWW to conduct astronomical research, education and outreach projects.

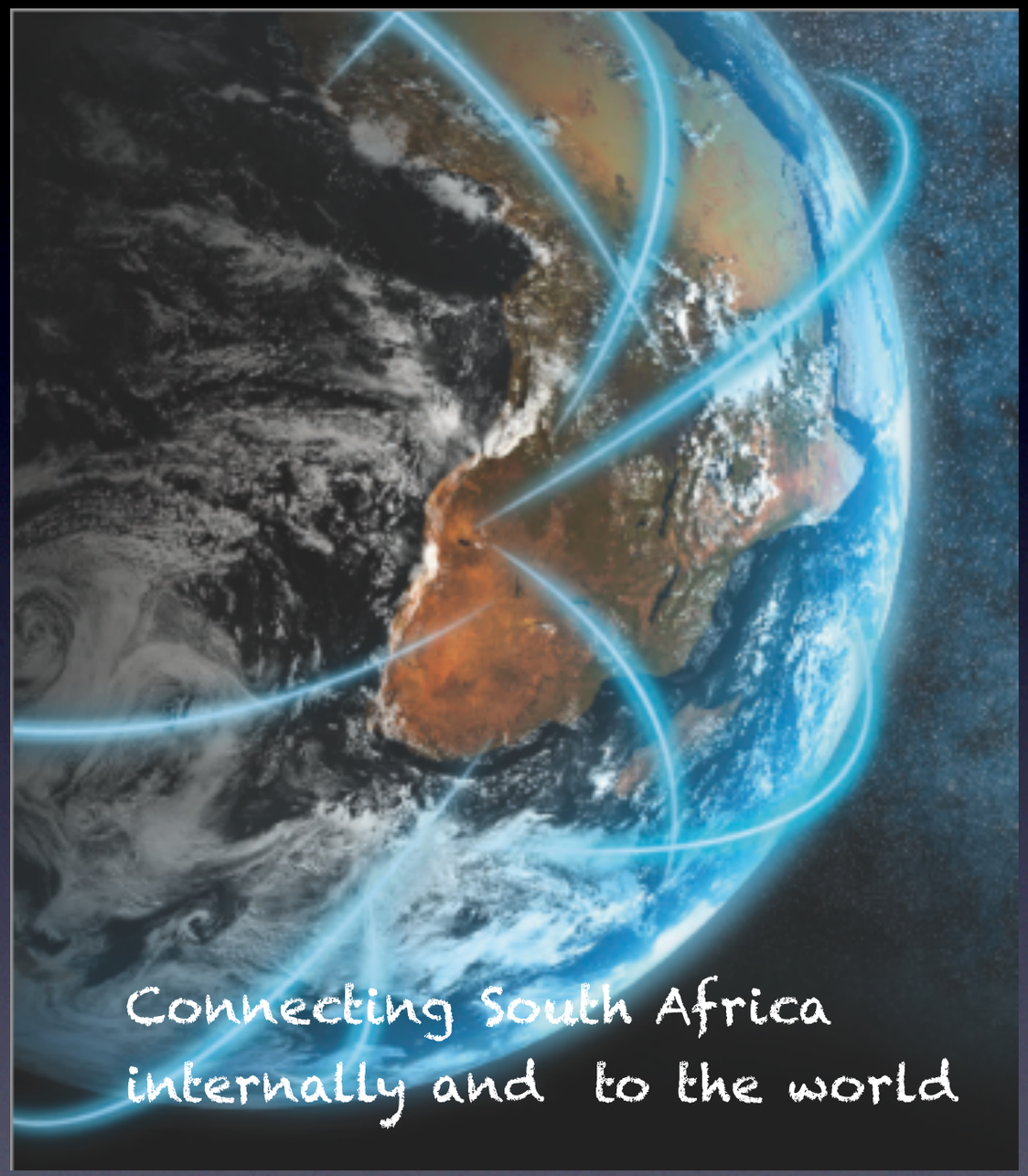
Log on to Internet and get the Data!

Virtual Observatory

- WWW - all the docs in the world inside your PC
- VO - all the database in the world inside your PC

A set of services and tools

SAAO Virtual Observatory Initiative



SAAO Virtual Observatory web page -

http://www.saao.ac.za/resources/virtual-observatory

SAAO Virtual Observatory Initiative

Connecting South Africa
internally and to the world

Initiated VO activities at SAAO

(Prof. Patricia Whitelock & Prof. Phil Charles)

- With the help from Astrogrid VO project (Prof. Nic Walton)
- Installing, running and maintaining Astrogrid tools & applications

SAAO Virtual Observatory Initiative

VO activities at SAAO

- Data Archive System Developments
- VO tools developments
- Astronomical Data Mirrors
- VO for education, research & public outreach

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SAAO Virtual Observatory Initiative

VO activities at SAAO

Data Archive System Developments

(SAAO-SALT-VOI collaboration*)

- In collaboration with VO-I project
  1. SALT-VODAS Development
  2. Similar data archive system for SAAO telescopes

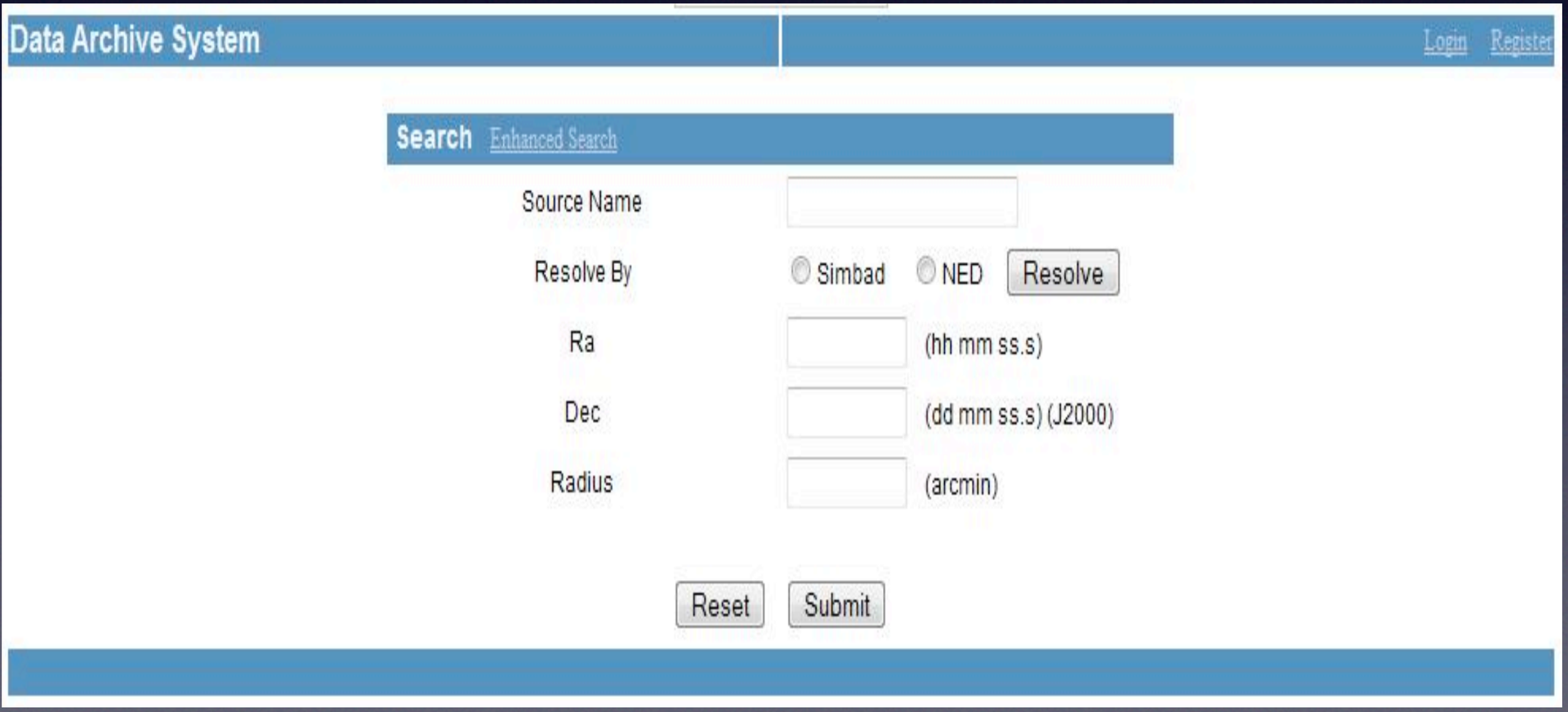
*Steve Crawford (SALT) & Sharmad Navelkar (VO-I)

SAAO Virtual Observatory Initiative

SALT VO Data Archive System (SALT-VODAS)

In collaboration with SALT and VO-India project

Some ScreenShots –
Basic Search



SALT Banner Goes Here

Data Archive System Login Register Help

Search Switch to Simple Search

Cone Search

Conesearch

Source Name

e.g.- PG1159-035, EC14012-1446

Resolve By (•) Simbad ( ) NED [Resolve]

Ra (hh mm ss.s)

Dec (dd mm ss.s)(J2000)

Radius (arcmin)

[Reset] [Submit]

Project parameters

Project parameters

Proposal code / Partner OR

[Select a partner country]

Proposal title

Science category Disabled

Proposal type Disabled

Investigator

[Reset] [Submit]

Observation parameters

Observation parameters

Instrument & Filter [Any] [Any]

Observation date Start-date

End-date

Exposure time (seconds)

[Reset] [Submit]

SAAO Virtual Observatory Initiative
SALT-VODAS

Some ScreenShots – Result page

SALT Banner Goes Here

Data Archive System Login Register Help

Aladin

View/Add Comments

Showing page 1 of 4. Total records: 20

<< first < prev 1 2 3 4 next > last >> 5

Object: PG1159-035 , Ra: 12 01 45.97 , Dec: -03 45 40.60 , Radius: 100 arcmin

File	Target	Ra (hh mm ss.s)	Dec (dd mm ss.s)	Observation Date	Observation Time	Exposure (seconds)	Filter	P.I.	Instrument	Observation mode	Detector mode	Proposal code	Proposal Title	Semester	Year	view Comments
bxpS200804040194.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
bxpS200804040195.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
bxpS200804040196.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
bxpS200804040197.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
bxpS200804040198.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments

<< first < prev 1 2 3 4 next > last >> 5

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SAAO Virtual Observatory Initiative

Sor
Res

File: bxpS200804040194.fits

Object: PG1159-035	**RA (hh.mm.ss):** 12:01:47
Instrument: SALTICAM	**DEC (dd.mm.ss):** -03:45:39
Observation mode: IMAGING	**Date:** 2008-04-04 19:39:41.0
Filter: B-S1	**Investigator):** Buckley
Exposure: 0.2	**Proposal:** 2007-1-RSA-015

Data Archive S

Help

Comments

id1 2010-10-22 14:27:09.0
this comment is submitted on 22 Oct 2010

Object: PG1159-035

File	
bxpS20080404019 Aladin	**sdn 2010-06-22 11:41:25.0** this is another comment
bxpS20080404019 Aladin	**sdn 2010-06-22 11:42:46.0** this is the third comment
bxpS20080404019 Aladin	**sdn 2010-08-28 12:12:14.0** This is a new comment.
bxpS20080404019 Aladin	

nts

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SALT-VODAS

Some ScreenShots – Cone Search

SALT Banner Goes Here

Data Archive System Login Register Help

Showing page 1 of 4. Total records: 20

<< first < prev 1 2 3 4 next > last >> 5

Cone Search

Select Row	File	Target	Ra (hh mm ss.s)	Dec (dd mm ss.s)	Observation Date	Observation Time	Exposure (seconds)	Filter	P.I.	Instrument	Observation mode	Detector mode	Proposal code	Proposal Title	Semester	Year	viewComments
☑	bxpS200804040194.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
☐	bxpS200804040195.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments
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☐	bxpS200804040198.fits Aladin	PG1159-035	12:01:47	-03:45:39	2008-04-04	19:39:41.0	0.2	B-S1	Buckley	SALTICAM	IMAGING	Slot mode	2007-1-RSA-015	WET Observations of Pulsating White Dwarfs	1	2007	View/Add Comments

<< first < prev 1 2 3 4 next > last >> 5

Show Selected Rows in GoogleSky — **Google Sky Map**

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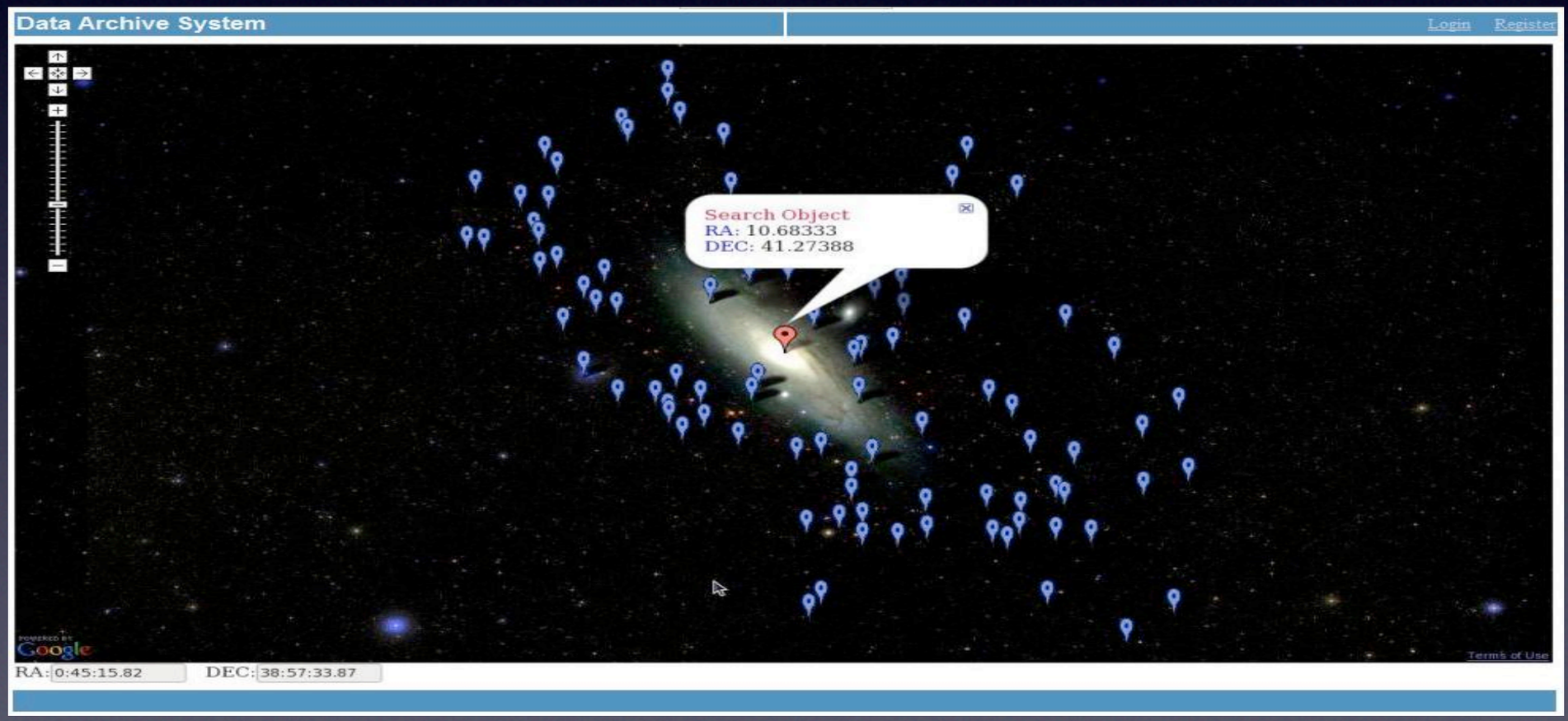
SALT-VODAS

Google Sky Interface -

- Display query results on a Sky-Map as labelled markers
- To display the footprint of a cone search on a Sky-Map



SAAO Virtual Observatory Initiative
SALT-VODAS

Data found(320) No data (5522) Errors(32) Waiting(0) 100% complete

Position:12 01 45.97,-03 45 40.60 Resources/hits: 5874/61127 Cache age:19.694 hours

Matching Resources These resources had data in the specified region.

Click on the

checkbox to select the data for download or analysis.
name to view the catalog data and select files.
? to see the metadata for the resource.

When the number after the name is given as *nn/mm* you have selected *nn* of the *mm* files indexed in that resource. Click on the resource name to select files within such resources.
Download selected resources from the Summary tab.

Major Multiwavelength Services					
	ADS (200) ?	NED(images) (0/4) ?	Simbad (45) ?	SkyView (0/47) ?	
Images (Data in one or more FITS files)					
Multi	CADC (0/16) ?	CADC/HST (0/16) ?	MAST Scrapbook (0/1) ?	MAST-Scrapbook (0/1) ?	
Optical	DSS (0/1) ?	DSS1B (0/1) ?	DSS1R (0/1) ?	DSS2 (0/3) ?	HAlpha (0/1) ?
	HST Previews (0/8) ?	MACHO Image SIAP (0/64) ?	NEAT (0/1) ?	SDSS (0/5) ?	SDSSDR2-Color (1) ?
	SDSSDR2-G (0/3) ?	SDSSDR2-I (0/3) ?	SDSSDR2-R (0/3) ?	SDSSDR2-U (0/3) ?	SDSSDR2-Z (0/3) ?
	SHASSA (0/4) ?				
Radio	FIRST (0/1) ?	GB6 (0/1) ?	NVSS (0/1) ?	PMN (0/1) ?	VLSS (0/1) ?
Infrared	2MASS (0/3) ?	2MASS ASKY AT (0/24) ?	2MASS QL (0/24) ?	IRAS (0/4) ?	IRIS (0/4) ?
	ISSA (0/4) ?	SFD100m (0/1) ?	SFDdust (0/1) ?		
UV	EUVE (0/4) ?	GALEX (0/2) ?	GalexFar (0/1) ?	GalexNear (0/1) ?	WFC (0/2) ?
X-ray	PSPC1 (0/1) ?	PSPC2 (0/1) ?	PSPC2cnt (0/1) ?	PSPC2exp (0/1) ?	RASS (0/1) ?
	RASS3 (0/3) ?	RASSALL (0/3) ?	ROSAT SIA (0/48) ?		
Other	DSS ESO (0/8) ?	HST/SIAP/PREVIEW (0/8) ?			
Lists of Observations (Data in one VOTable)					
Multi	HETE2 (9128) ?	HST (54) ?	HST.FOS (5) ?	HST.HSP (3) ?	HST.STIS (31) ?
	HST.WFPC2 (4) ?				
Optical	HST (84) ?	SubaruPFC (36) ?			
Infrared	HST.NICMOS (8) ?				
UV	EUVE (2) ?	EUVE (2) ?	FUSE (1) ?	HUT (1) ?	IUE (30) ?
	IUE (30) ?	TUES (2) ?	UIT (2) ?		
X-ray	EXOSAT (6) ?	ROSAT (5) ?			
Gamma-ray	COS-B (16) ?	GRO/EGRET (33) ?			
Other	RASS Photons (710) ?	denis (572) ?	gsc1_2 (27) ?	gsc2_3_2 (1499) ?	nomad (1467) ?
	sdssdr5-photoobj (2718) ?	sdssdr5-phototag (2718) ?	sdssdr6-photoobj (2718) ?	sdssdr6-phototag (2718) ?	twomass-psc (348) ?
	twomass-xsc (10) ?	tycho2 (7) ?	ucac2 (51) ?	usnoa2 (495) ?	usnob1 (1456) ?
	xmm2p (14) ?				

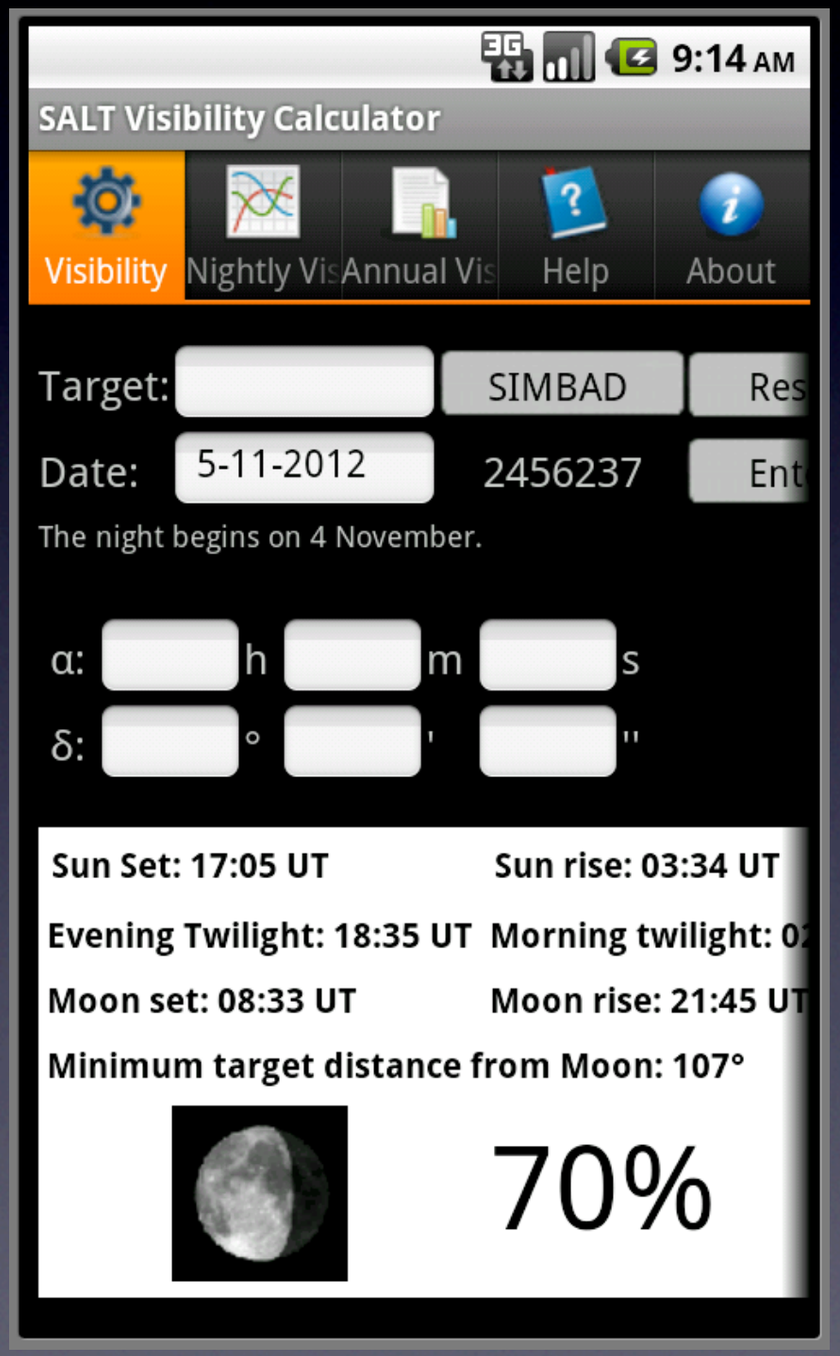
SAAO Virtual Observatory Initiative

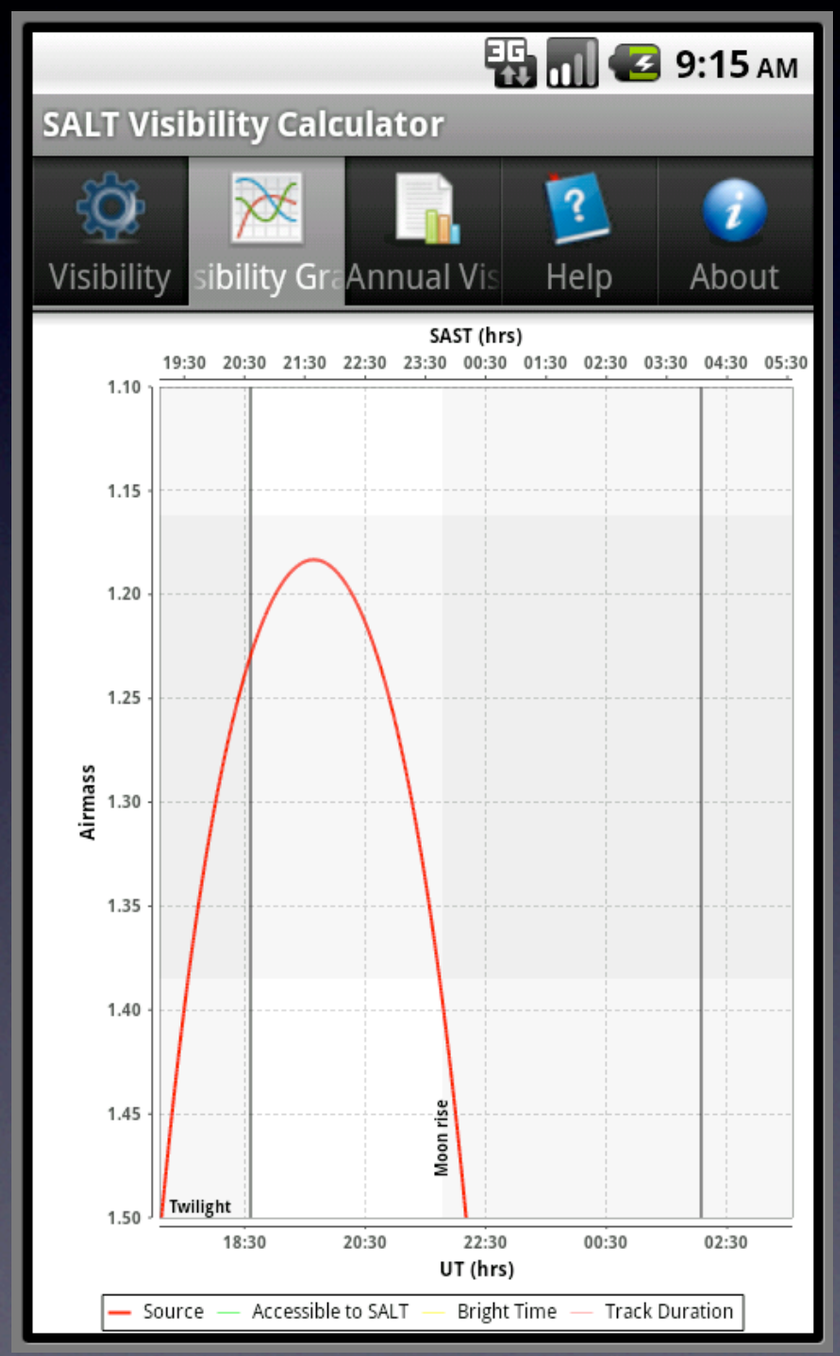
VO activities at SAAO

- Data Archive System Developments
- VO tools developments
- Astronomical Data Mirrors
- VO for education, research & public outreach

SAAO Virtual Observatory Initiative

SALT Visibility Calculator Android App*





*Christian Hettlage (SALT) & Santosh Jagade (VO-I)

SAAO Virtual Observatory Initiative

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SAAO Virtual Observatory Initiative

VO activities at SAAO

- Host mirrors of astronomical databases (SAAO-CHPC collaboration)

NASA Astrophysical Data System (ADS) mirror site - http://saaochpc.ac.za/

In Progress - CDS/Vizier

WISE, Millennium Simulation

SDSS, Chandra, XMM-Newton, 2MASS.....

SAAO Virtual Observatory Initiative

VO activities at SAAO

SAAO-ADS Mirror

The ADS bibliographic services are now available from several sites worldwide:

View ADS Mirrors in a larger map

- Harvard-Smithsonian Center for Astrophysics, Cambridge, USA
- Centre de Données astronomiques de Strasbourg, France
- University of Nottingham, United Kingdom
- European Southern Observatory, Garching, Germany
- Astronomisches Rechen-Institut, Heidelberg, Germany
- Institute of Astronomy of the Russian Academy of Sciences, Moscow, Russia
- Main Astronomical Observatory, Kiev, Ukraine
- Pontificia Universidad Católica, Santiago, Chile
- National Astronomical Observatory, Tokyo, Japan
- National Astronomical Observatory, Chinese Academy of Science, Beijing, China
- Inter-University Centre for Astronomy and Astrophysics, Pune, India
- Indonesian Institute of Sciences, Jakarta, Indonesia
- Observatório Nacional, Rio de Janeiro, Brazil

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- Astronomisches Rechen-Institut, Heidelberg, Germany
- Institute of Astronomy of the Russian Academy of Sciences, Moscow, Russia
- Main Astronomical Observatory, Kiev, Ukraine
- Pontificia Universidad Católica, Santiago, Chile
- National Astronomical Observatory, Tokyo, Japan
- National Astronomical Observatory, Chinese Academy of Science, Beijing, China
- Inter-University Centre for Astronomy and Astrophysics, Pune, India
- Indonesian Institute of Sciences, Jakarta, Indonesia
- South African Astronomical Observatory
- Observatório Nacional, Rio de Janeiro, Brazil

SAAO Virtual Observatory Initiative

VO activities at SAAO

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SAAO Virtual Observatory Initiative

VO activities at SAAO

VO is a powerful medium for education, research and outreach

- SAAO VO has started programmes to train students with NASSP
- Student projects to demonstrate the interesting and latest results astronomy using variety of online data archives and VO tools/applications.
- Conducting workshops - NASSP, UKZN, UWC, MEARIM, ISYA.....
- VO news e-letter - to update SA astronomers about latest developments in field of VO and IT driven astronomy

SAAO Virtual Observatory Initiative

VO activities at SAAO

VO is a powerful medium for education, research and outreach
(SAAO-OAD collaboration)

- SAAO VO & IAU-OAD has started a programme to train students/teachers using VO workshops

AsTROW (Astronomy Teaching and Research Orientation Workshop)
Oct 15-19, 2012

- provide hands-on training on observational & data intensive astronomy to people from Historically Black South African Universities
- To prepare astronomy class/lab curricula for universities and schools

- Public Outreach activities -
  Galaxy Zoo, Google Sky, Microsoft World Wide Telescope (WWT)
  WWT workshop (SAAO-OAD-Microsoft Research)

South African Virtual Observatory

1. Excellence in Research

   Combine world class multi-wavelength data with SALT & MeerKAT

2. Human Capital Development / Astronomy technology development

   Take a lead in defining data management standards and protocols & software development

3. Astronomy education/outreach & Marketing of Astronomy & Astrophysics

   VO tools/applications (WWT, Google Earth, Galaxy Zoo....)
   VO for University research & education

4. National/International partnership

   CHPC, Astrogrid, VO-India, AVO, CDS.....

South African Virtual Observatory

Provide SA community access to international multi-wavelength databases and the tools to use them effectively.

Ensure that the data produced by the big science projects in South Africa will ultimately be accessible to the community.

Thank you

SAAO VO web page -

http://www.saao.ac.za/resources/virtual-observatory

Acknowledgements-

Some of the text, figures and images has been drawn from articles and presentations given by members of various VO projects and I thank all of them.