

PIRATE

Physics Innovations Robotic Astronomical
Telescope Explorer Mallorca, Spain

Lynn van Rooijen
Hawaii, August 16, 2015



- Introduction to PIRATE

- Location
- Observatory instruments
- PIRATE in practice

- Demo: observing with PIRATE

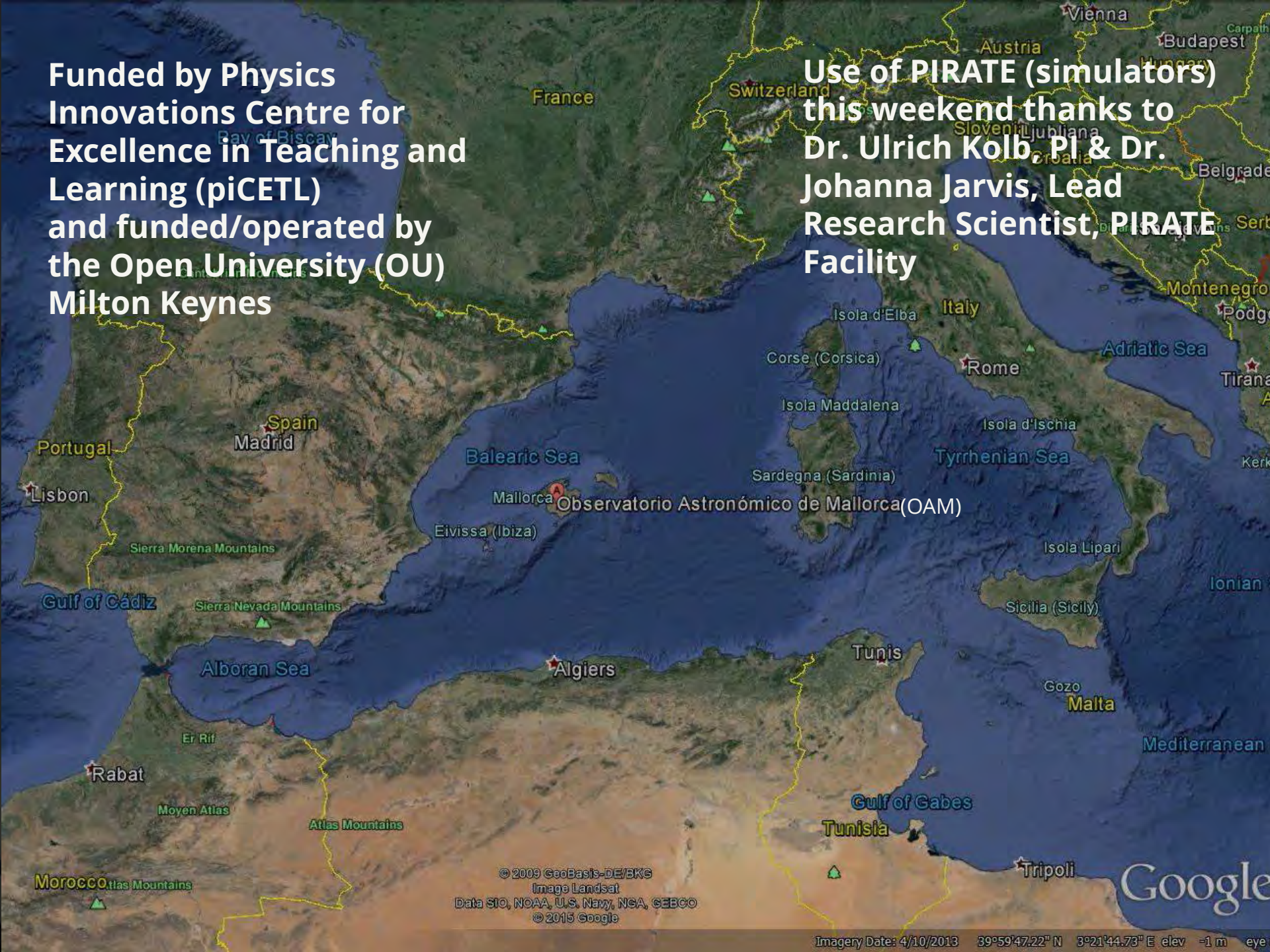
- Target selection
- Overview of tools
- Observatory set-up
- Observations

WHERE IN THE WORLD IS PIRATE?




Funded by Physics
Innovations Centre for
Excellence in Teaching and
Learning (piCETL)
and funded/operated by
the Open University (OU)
Milton Keynes

Use of PIRATE (simulators)
this weekend thanks to
Dr. Ulrich Kolb, PI & Dr.
Johanna Jarvis, Lead
Research Scientist, PIRATE
Facility





Longitude: E 2° 57' 03.34"
Latitude: N 39° 38' 34.31"
Altitude: 162 m
Weather : so-so!



Observatorio Astronómico de Mallorca

Located at the Observatori Astronomic de Mallorca (OAM), together with the Mallorca Planetarium.

THE OAM



The OAM celebrates its 25th anniversary!

THE PIRATE OBSERVATORY





Located in east tower (r) of
the OAM observatory building.

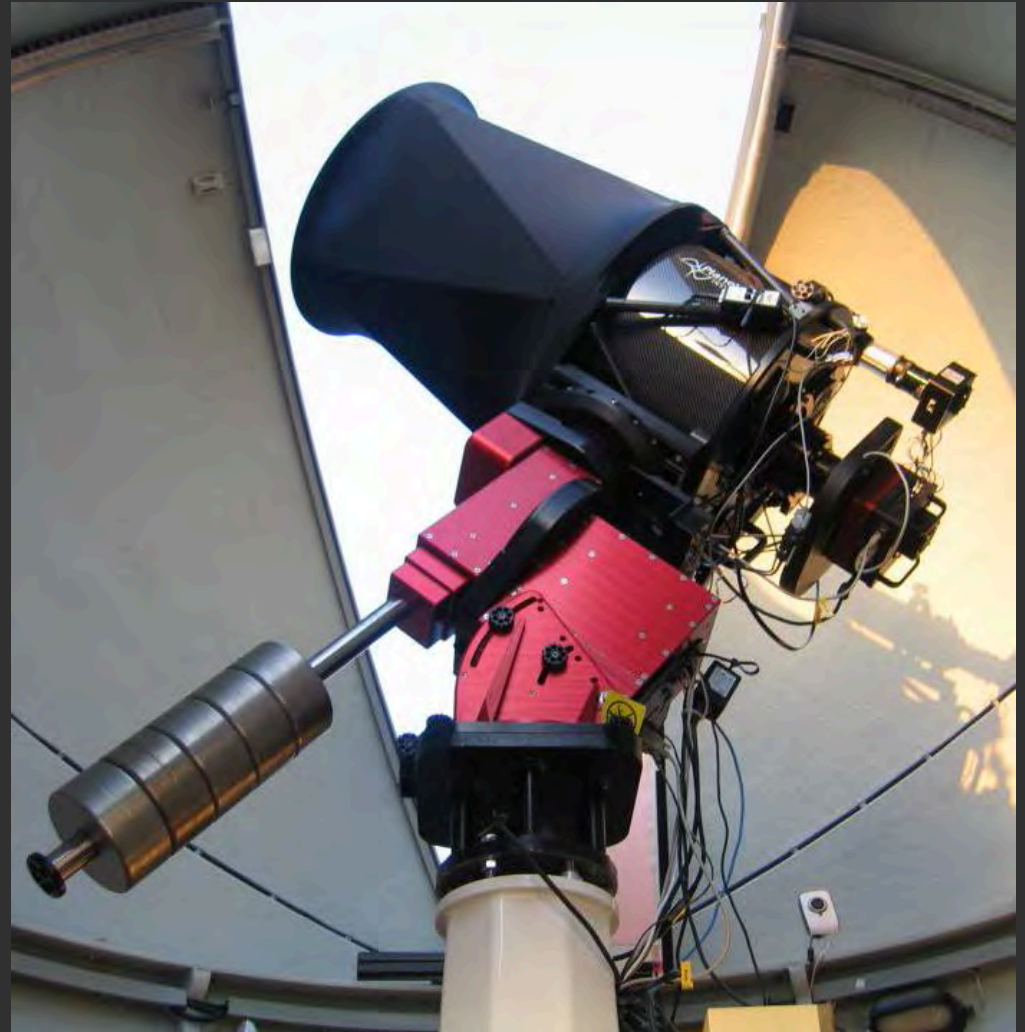
DOME



3.5m All-Sky dome in clam-shell design,
manufactured by Baader Planetarium.
Battery back-up for power-outages!

TELESCOPE MAIN OPTICAL TUBE ASSEMBLY

- PIRATE Mark 1 –
before 8/2010: Celestron-14
- PIRATE Mark 2 –
from 8/2010:
PlaneWave Instruments
CDK17: 17 inch aperture,
 $f6.8$, focal length
2939mm, "*Corrected Dall-Kirkham*"
- Paramount ME



IMAGING

- SBIG camera STX-16803
- KAF-16803 CCD, 36.8 x 36.8 mm, 4096 x 4096 pixels @ 9 μ m
- FOV: 42 arc min
- 5 position filter wheel
- Guider: ST402ME on 80mm Celestron, focal length 600mm



SOFTWARE

- Main user interface:
ACP Observatory
Control by
DC-3 Dreams
- Driver for
Paramount: TheSky
- Camera control:
MaximDL
- Focus control:
Focus Max

System Status

[Help](#) Hover the mouse mouse over the links to see what they do

Observatory	Telescope	Imager	Activity	Plan "NGC-7331"
In use	Sidereal Track	Expose 600 sec.	Observing	Set 1/1
Local: 23:33:12	RA: 22:37:48.00	Filter Luminance	FWHM 3.1	Target NGC 7331 (1/1)
UTC: 22:33:12	Dec: 34°27'55.0"	Binning 1:1		Repeat 2/5
LST: 23:05:15	Az: 198.92°	Cooler -10°C		Filter Luminance (1/1)
Owner Russell Arch	Alt: 72.33°	Guider		Count 1/1
Weather	Air: 1.049	Interval (sec) 0.00		Tracking Errors
		Error Ex: 0.10		
		(pix) Ey: 0.17		

[Show/Hide Run Log and Abort Control](#)

[Stop Run](#)

```
This is target repeat 2 of 5.  
(long exp(s) or requested, no orbital tracking, trying to autoguide)  
(guide star SNR=1.7 X=310 Y=76)  
(initial exposure interval 0.16)  
(guide star SNR=1.7 X=309 Y=77)  
(final exposure interval 0.09)  
(one more exposure for simple auto-dark)  
(guide star SNR=1.7 X=310 Y=76)  
(wait 0.9 sec for AO startup darkframes...)  
(autoguiding at 0.09 sec.)  
=== Place in plan ===  
Set 1 of 1  
Target is "NGC 7331" (1 of 1)  
Repeat 2 of 5 for this target  
Filter Luminance (1 of 1)  
Image 1 of 1 for this filter  
Imaging to NGC 7331-001-002-001-600secs-Luminance  
(taking 600 sec. exposure, Luminance filter, binning = 1)  
(ex=0.10 ey=0.15)  
(guider check OK)  
(starting exposure)
```

PIRATE & THE OU



WHY PIRATE?

- OU wanted to give distance-learners similar experiences to those available at a residential school
- OU had a long-standing relationship with OAM



PIRATE & DISTANCE LEARNING

- 2007: OAM offered to host a robotic facility for the OU
- Extra challenges:
 - Not always someone available on-site
 - Use by students introduces additional challenges and requirements
 - = much less can be left to chance than in an on-site, supervised situation
- Solution: automated procedures, tiered control and a UK-based night-duty astronomer (NDA)

PIRATE OU PROJECTS

- Intermediate level undergraduates: supervised, short-term use
- Advanced undergraduates: team use via Skype, several nights per team
- Simulator training prior to actual use
- Post-graduate: individual research projects
- Public: simulator project publicly available

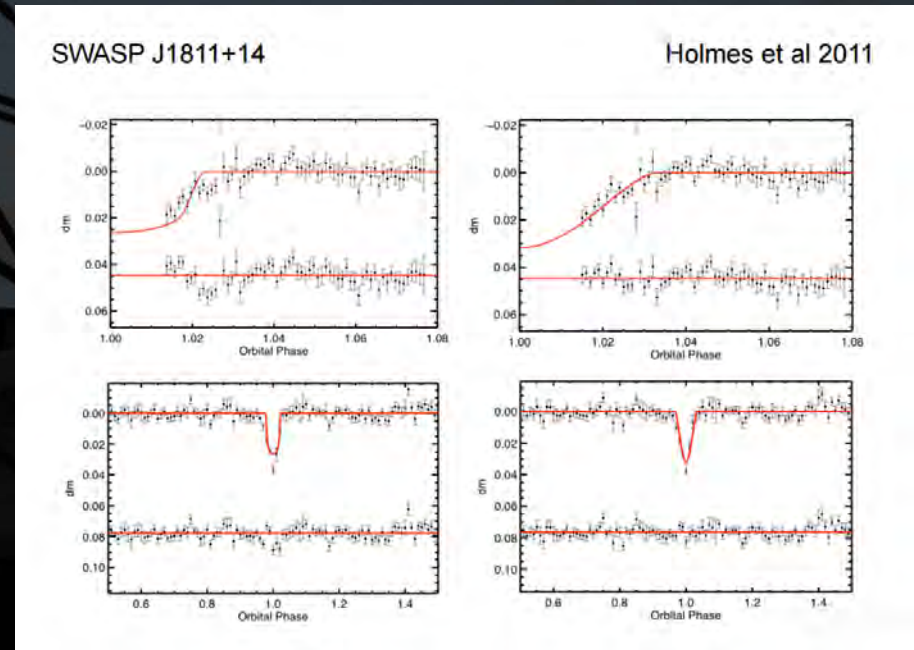
PIRATE IN PRACTICE

- 5+ years experience
- In use since 2010 for level 3 courses & 2012 for level 2
- Teaching tool for both undergraduate and postgraduate work
- Also research including photometric monitoring of :
 - transiting exoplanets
 - periodic variable stars
 - transient sources



PIRATE RESEARCH

- Support for SWASP
 - Classification
 - Verification
- Gaia transient follow-up support
- M31 novae
- M101 SN (2011fe)



SUPERWASP/ROSAT RESEARCH



- 428 periodic variables coincident with ROSAT X-ray sources (>350 new)
- [Norton et al. \(2007\)](#)



PIRATE DEMO



Follow along: <http://pirate.open.ac.uk/index.html>

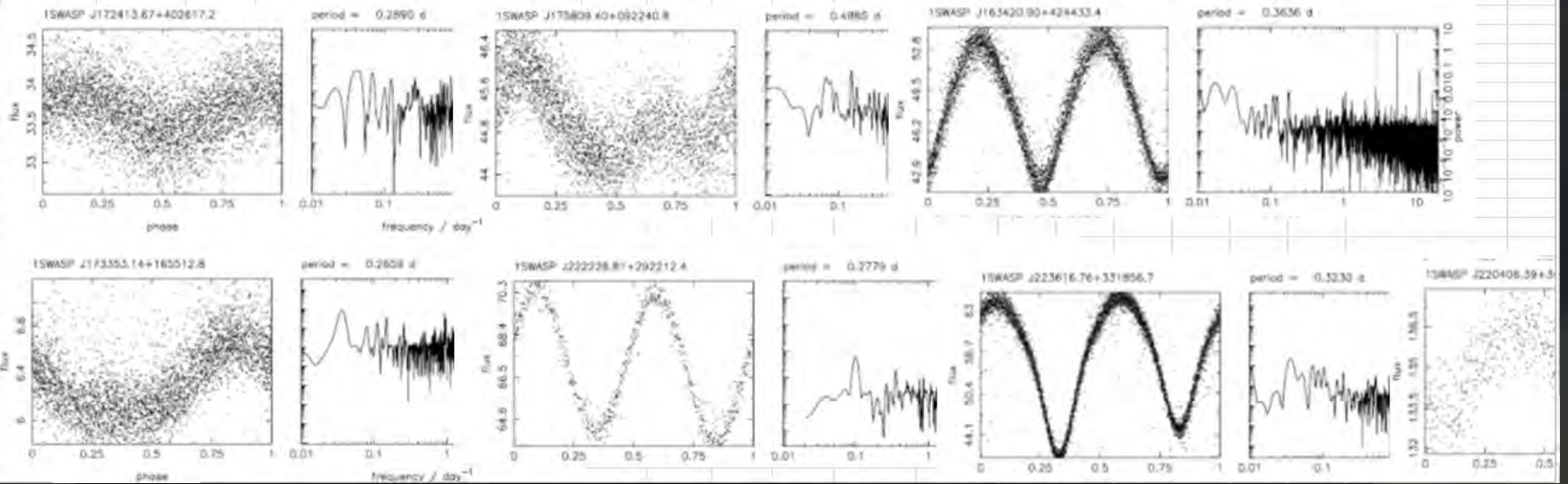
Useful links: <http://www.knvshetgooi.nl/astrofest-2015/>

TARGET SELECTION

A large satellite dish antenna is silhouetted against a twilight sky. The dish is mounted on a structure with a tracking system, including a large rectangular frame and various sensors. The sky is a mix of dark blue and light orange, suggesting sunset or sunrise. The overall scene is dark and atmospheric.

What's important?

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
_RAJ2000	_DEJ2000	n_1SWASP	1SWASP	ROSAT	Per	Vmag	B1mag	R1mag	RA	dec	Alt	AZ	Rise	Transit	Set	Con	Finder		name
3	261.05696	40.43811	1	J172413.67+402617.2	1RXS J172413.5+402616	0.289	11.38	12.27	10.55	17 24 00.0	+40 26 00.0	66.36	281.98	12:52	21:52	07:03	Her	OK, but Δ mag 0.05	
*	263.47142	16.92022	1	J173353.14+165512.8	1RXS J173353.5+165515	0.2659	13.04	16.14	13.93	17 33 00.0	+16 55 00.0	56.24	235.97	15:04	22:01	05:09	Her	no star at coord.	
2	269.53917	9.378	2	J175809.40+092240.8	1RXS J175809.3+092241	0.4885	10.9	11.79	10.38	17 58 00.0	+09 22 00.0	53.67	219.64	15:56	22:26	05:07	Oph	OK, crowded/ Δ mag 0.08	
*	331.02662	34.55147	2	J220406.39+343305.3	1RXS J220407.2+343309	0.3717	9.9	10.26	9.63	22 04 00.0	+34 33 00.0	58.75	86.88	18:13	02:35	11:01	Peg	3 stars in aperture	BD+33
*	335.62004	29.37011	2	J222228.81+292212.4	1RXS J222228.4+292216	0.2779	10.44	11.43	10.12	22 22 00.0	+29 22 00.0	53.12	92.47	18:59	02:53	10:50	Peg	2 stars in aperture	
7	339.06983	33.31575	1	J223616.76+331856.7	1RXS J223616.0+331909	0.323	10.66	11.2	10.21	22 36 16.76	+33 18 56.7	52.13	84.49	18:52	03:07	11:25	Peg	OK, Δ mag 0.5	
*	248.58708	42.74261	1	J163420.90+424433.4	2RXP J163420.4+424426	0.3636	10.86	11.42	10.54	16 34 00.0	+42 44 00.0	57.46	289.86	11:42	21:02	06:34	Her	Bright star in FOV	



Object Visibility – STARALT

Staralt is a program that shows the observability of objects in various ways: either you can plot altitude against time for a particular night (**Staralt**), or plot the path of your objects across the sky for a particular night (**Startrack**), or plot how altitude changes over a year (**Starobs**), or get a table with the best observing date for each object (**Starmult**). For further information, click on the "help" button at the bottom of the page.

Mode	Staralt ▾
Night	15 ▾ August ▾ 2015 ▾ or date when the local night starts. <i>Staralt, Startrack only.</i>
Observatory	Roque de los Muchachos Observatory (La Palma, Spain) ▾ or specify own site with this format: East_Longitude(deg) Latitude(deg) [Altitude(m)] [UTC time offset(h)] Ex.: 289.2767 -30.2283 2725 -4 <input type="text"/>
Coordinates	Available formats: [name] hh mm ss ±dd mm ss ; [name] hh:mm:ss ±dd:mm:ss ; [name] ddd.ddd dd.ddd. [name] must be a single word with no dots. Every entry must be in the same format, do not use different formats with different entries. 22 36 17 +33 18 57 <input type="text"/> or upload file containing the coordinates. You can use the same format as in the TCS catalog . Target names must be single words with no dots. <input type="button" value="Browse..."/> No file selected.
Options	Moon Distance ▾ Included on plot. Moon coordinates at ~02:00 UT. <i>Staralt only.</i> 10°, X=5.8 ▾ Min. elevation (or max. airmass X). <i>Starobs, Starmult only.</i> Gif-HTML ▾ Output format
Submit request	<input type="button" value="Retrieve"/> <input type="button" value="Help"/>
ING telescope limits	WHT: 89.8° < Altitude < 12° (plot). Targets with +28:57:40>Dec>+28:33:40 won't be accessible when transiting the zenithal blind spot (~0.2° size). INT: 90° < Altitude < 33° (20° if lower shutter raised), -6h < HA < +6, +90°>Dec>-30° 09' 30" (HA-Dec plot - lower shutter raised; lowest altitude-Dec plot).

Altitudes, Observing site coordinates:

2.9500E 39.6500N, 162 m above sea level

LST ---->

18^h47^m 19^h47^m 20^h47^m 21^h48^m 22^h48^m 23^h48^m 0^h48^m

S.set

Twil

Twil

S.rise

UT -> 18^h48^m

20^h27^m

3^h18^m

4^h57^m

Moon (dashed):

Coordinates:

10^h37^m + 6°33'

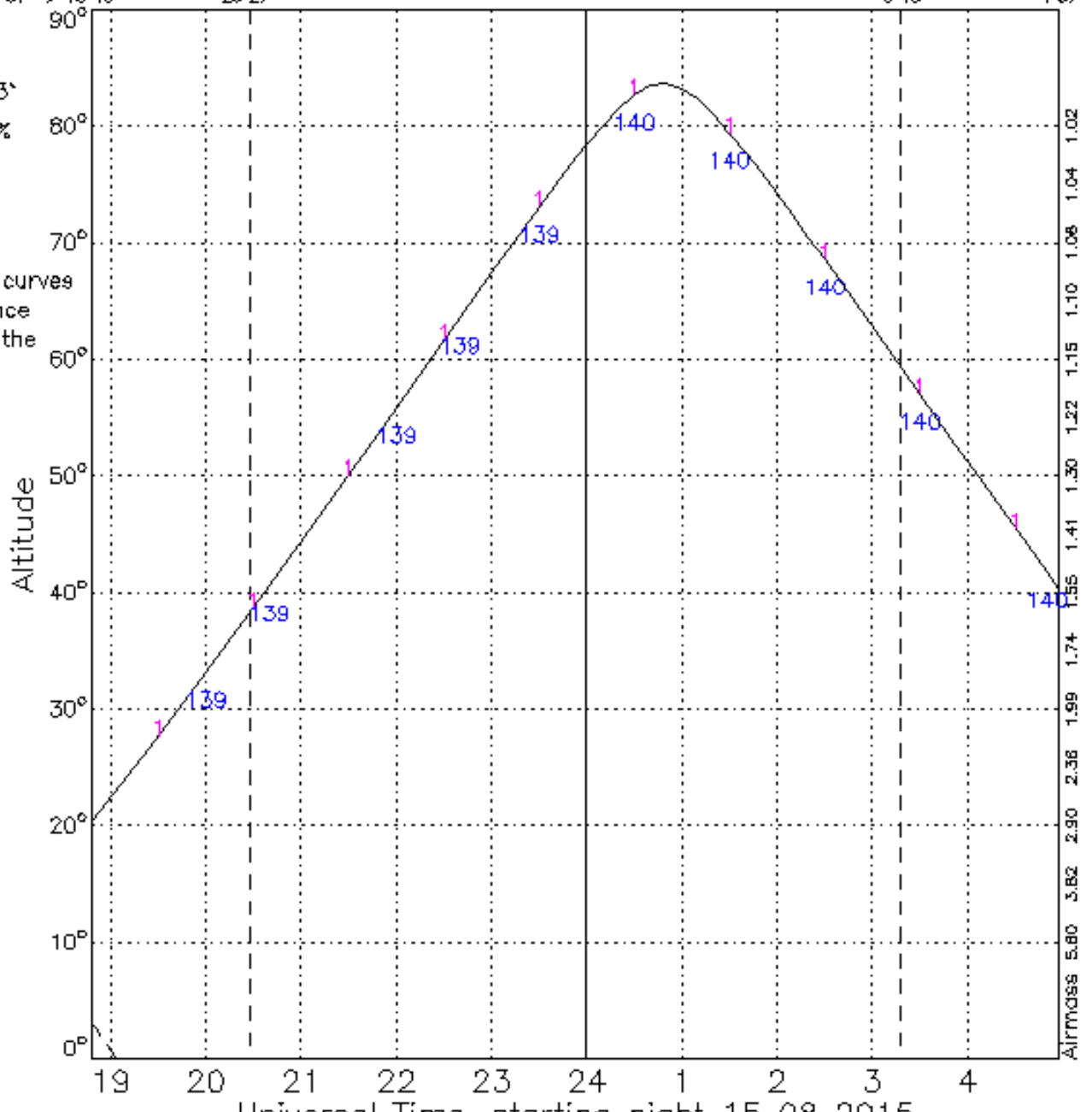
Illumination 2%

Quarter 1

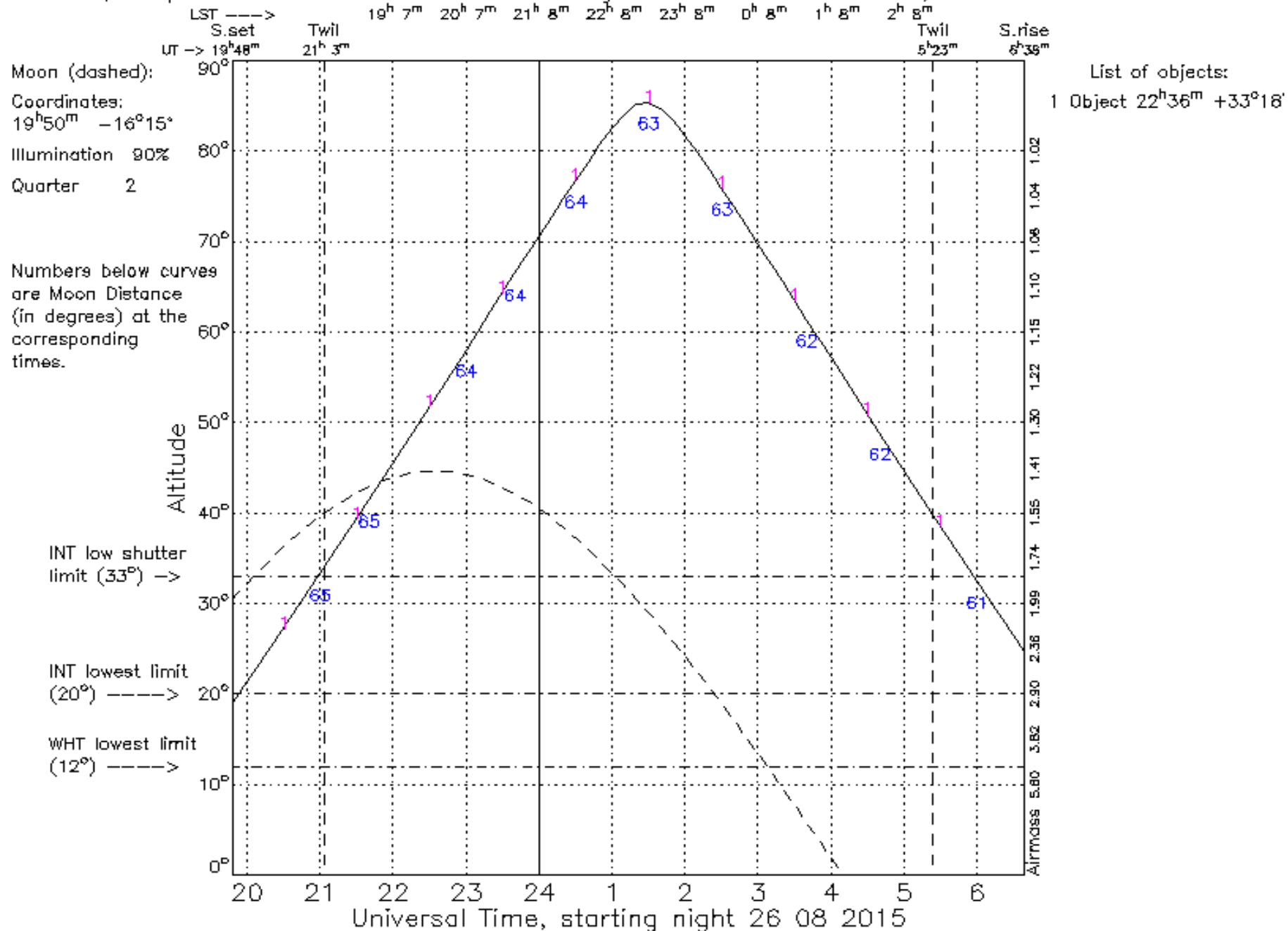
Numbers below curves
are Moon Distance
(in degrees) at the
corresponding
times.

List of objects:

1 Object 22^h36^m +33°18'



Altitudes, Roque de los Muchachos Observatory 342.1184E 28.7606N, 2326 m above sea level



Sky tracks, Roque de los Muchachos Observatory 342.1184E 28.7606N, 2326 m above sea level
All times are in UT. Tracks are shown only if above horizon and between Sunset–Sunrise

Moon track dashed

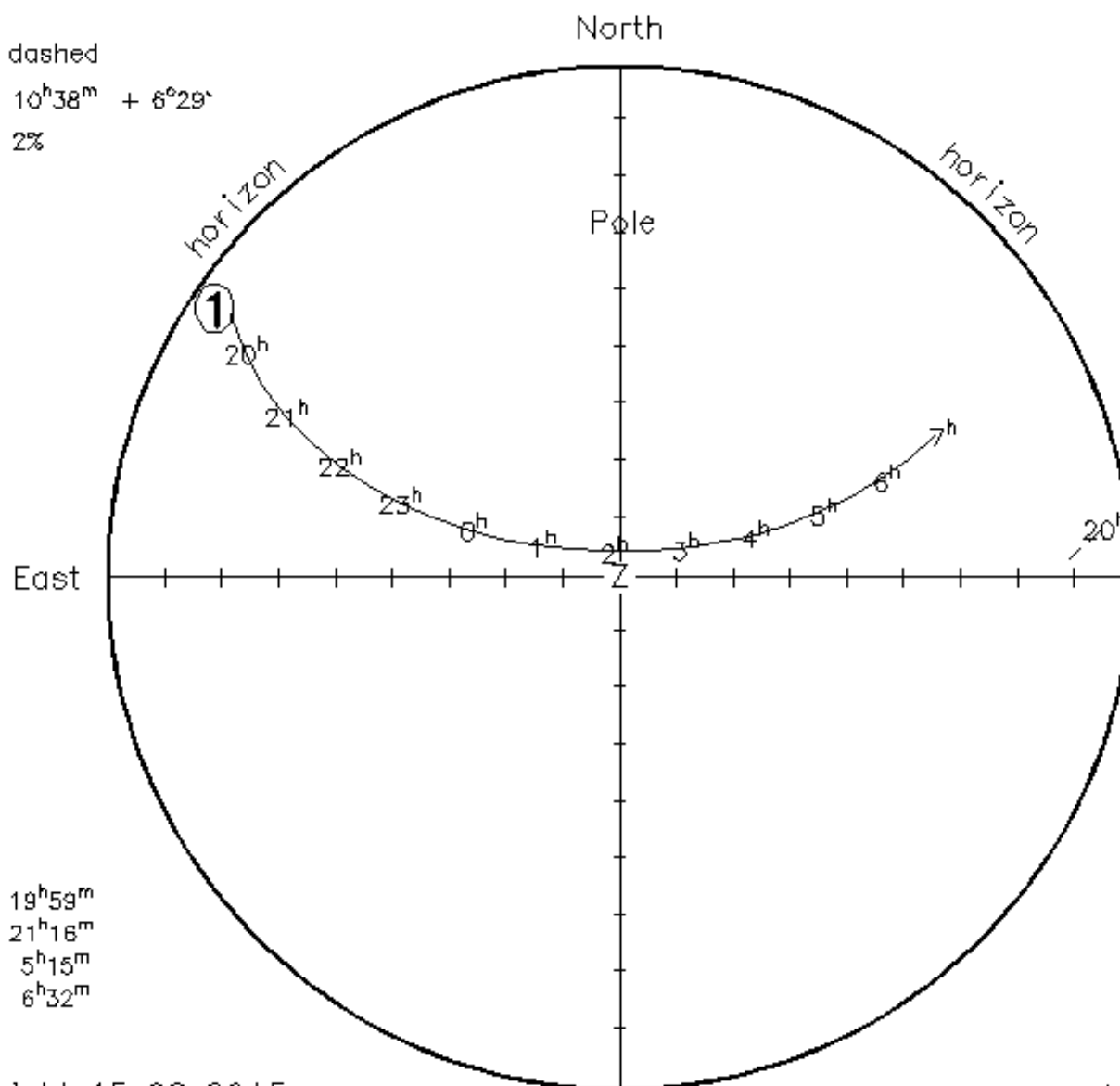
Coordinates: $10^{\text{h}}38^{\text{m}} + 6^{\circ}29'$

Illumination 2%

Quarter 1

List of objects:

1 Object $22^{\text{h}}36^{\text{m}} +33^{\circ}18'$



Sunset $19^{\text{h}}59^{\text{m}}$

Evening Twi. $21^{\text{h}}16^{\text{m}}$

Morning Twi. $5^{\text{h}}15^{\text{m}}$

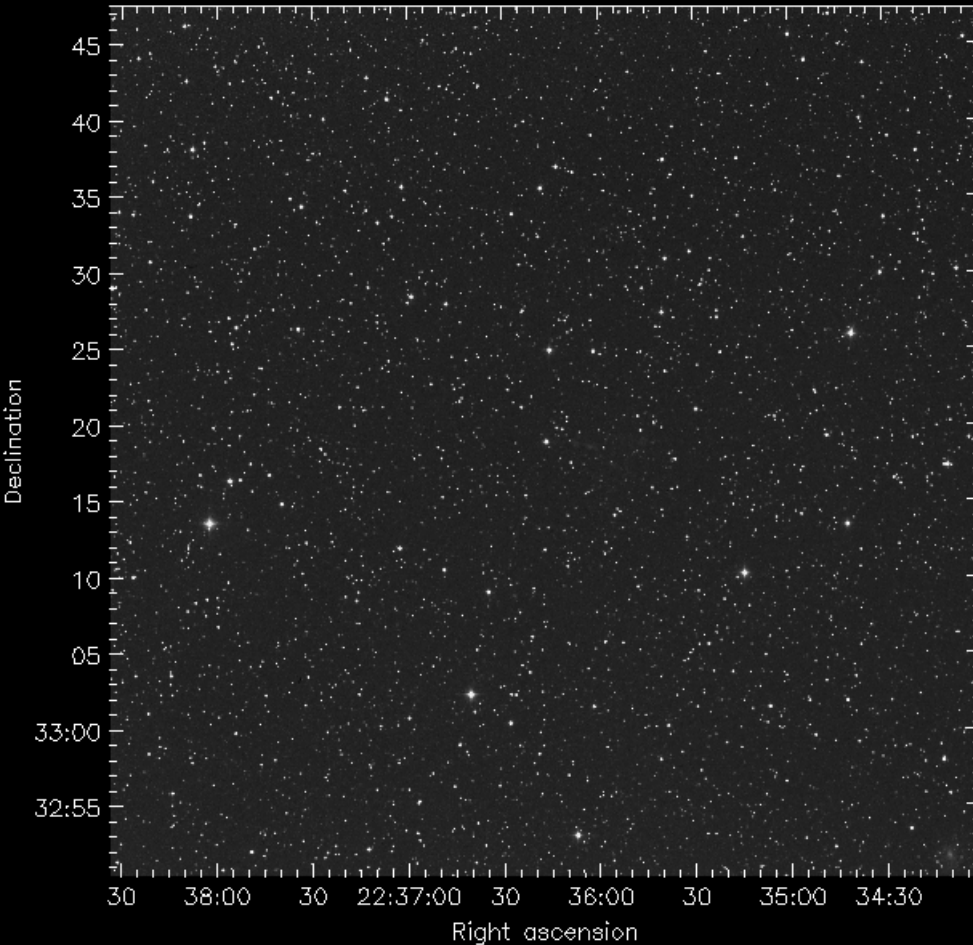
Sunrise $6^{\text{h}}32^{\text{m}}$

Starting night 15 08 2015

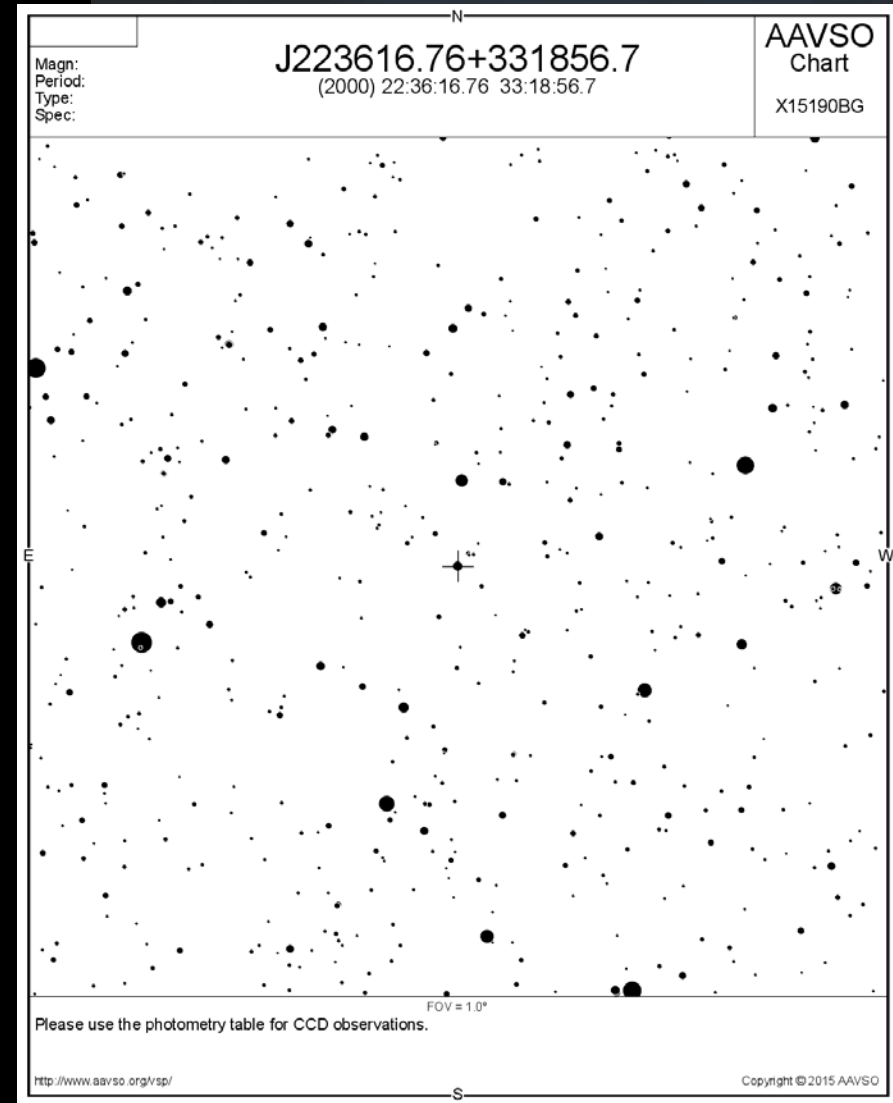
Processed on 2015/08/01 at 13:13:53 UT

DSS-I Image

FK5 equatorial coordinates; mean equinox J2000.0; gnomonic projection



Generated by LEDAS DSS image service: <http://www.ledas.ac.uk/>





Latest Details ?

Inclusion of aliases from SIMBAD may be set from Preferences.

Name	V V0535 Peg
AAVSO UID	» Request AUID...
Constellation	Pegasus » Sequence
J2000.0	22 36 16.76 +33 18 56.8 (339.06983 +33.31578) » Search nearby
B1950.0	22 33 58.73 +33 03 21.0
Galactic coord.	92.949 -21.571
Other names (Internal only)	1RXS J223616.0+331909 1SWASP J223616.76+331856.7 BD+32 4464 GSC 02739-00689 NSVS 8907725 » Add name
Variability type	EW ?
Spectral type	--
Mag. range	10.567 - 10.952 R1 ?
Discoverer	--
Epoch	--
Outburst	--
Period	0.3230
Rise/eclipse dur.	--

Remarks ?

There are currently no remarks on file for this star.

[» Add remark](#)

References ?

Click reference title/citation to view in new window. Roll over index number to view submission details.

1	E.V. Kazarovets, N.N. Samus, O.V. Durlevich, N.N. Kireeva, E.N. Pastukhova, 2013, IBVS 6052	2013IBVS.6052....1K
2	O.W. Butters et al., 2010, A&A 520, L10 (SuperWASP data)	2010A&A...520L..10B
3	Norton A.J. et al., 2007, astro-ph/0702631	2007astro.ph..2631N
4	Norton, A.J., Wheatley, P.J., West, R.G., et al. 2007, AsAp, 467, No. 2, 785	2007A&A...467..785N
5	S.J.Gettel, M.T.Geske, T.A.McKay, AJ 131, 621, 2006.	2006AJ....131..621G

External Links ?

Links open in a new window. Not all links may be valid for this particular target.

Location [» Go](#) Select a Location for more details.

Images ?

Please review [Digitized Sky Survey Acknowledgment and Copyright](#).



Size	5' x 5' (297 x 298 pixels)
Center	22 36 16.76 +33 18 56.8 (J2000)
Source	STScI
Survey	POSS2/UKSTU Blue <input type="text"/>
	Blue, all sky. 1.0 arcsec/pixel in the North, 1.7 arcsec/pixel in the South.
	<input checked="" type="checkbox"/> Negative

Supporting Documents ?

There are currently no supporting documents on file for this star.

[» Add document](#)

Revision History ?

Currently approved revision is checked. Click revision number to view details of that revision.

<input checked="" type="checkbox"/>	2	Admin, VSX	2013-04-15 21:23 UTC	Update from [2013IBVS.6052....1K]
	1	Admin, VSX	2005-12-17 20:33 UTC	Initial upload.

[» Guidelines](#) [» Variability Types](#) [» Passbands](#) [» Copyright](#) [» Acknowledgments](#) [» Privacy](#) [» Contact](#)

The International Variable Star Index

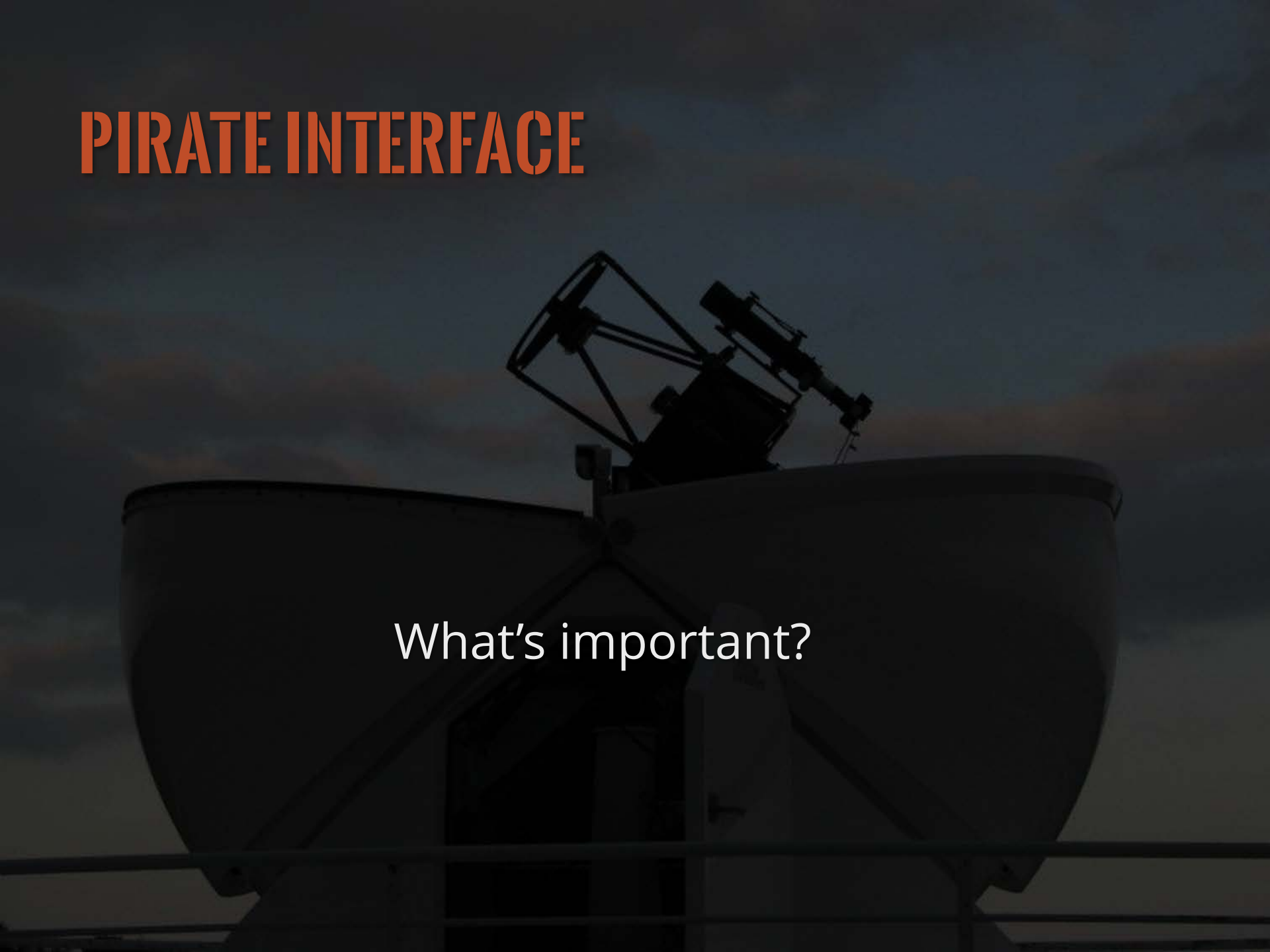
© 2005-2015 American Association of Variable Star Observers (AAVSO)

Version 1.1 [C]

84.106.252.199

PIRATE INTERFACE

What's important?



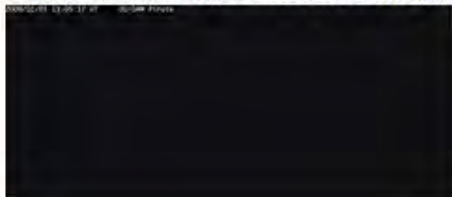


Live views of PIRATE

OAM view north 2015-07-31 21:34:59



PIRATE interior view 2015-07-31 21:34:59



(Dome interior is dark unless light is on.)



Click [here](#) to see the PIRATE [Baader Planetarium](#) All-Sky 3.5 m dome open and close.

Introduction

PIRATE is a remote-controlled observatory with a 17 inch telescope on a robotic mount in an automated 3.5m dome. It is mainly used for university level astrophysics teaching, both in a distance learning context and in traditional lab courses.

Research applications include the photometric monitoring of transiting exoplanets, periodic variable stars and transient sources.

PIRATE was funded by the *Physics Innovations Centre for Excellence in Teaching and Learning* ([piCETL](#)) and the Open University's (OU) Department of Physics and Astronomy (now the [Department of Physical Sciences](#).)

Undergraduate students

Students connect to PIRATE via a web interface and submit commands to remotely open or close the dome, point the telescope, and acquire images of the night sky. Observers download images to their own PC for analysis with commercial CCD image manipulation software. Expert users have full access to the PIRATE control PC for system maintenance, development and more advanced applications.

Small student groups have shared, real-time simultaneous access to PIRATE via the automated observatory control software ACP.

PIRATE News

> [News item archive](#)



We are on

Tweets [Follow](#)

 **RAS** 17 Jul
@RoyalAstroSoc
Rare eclipsing binary star system found by professional & amateur astronomers w/ @ESAGaia
ras.org.uk/news-and-press...

pic.twitter.com/5zIecyJg2

Retweeted by PIRATE Facility



Expand

 **ESA Gaia** 17 Jul
@ESAGaia

Image of the Week: #Gaia satellite and amateur astronomers spot one in a billion star

Current observing conditions

Latest available OAM environmental data. Selected frames on this page update automatically in regular intervals.

PIRATE Boltwood Sensor data

date	29.07.15
time (CET)	16:43:58
humidity	45
sky dT	-22.5
ambient T	35.4
wind speed	10.5
rain flag	0

PIRATE Reinhardt Sensor data

date	12.05.15
time (CET)	08:16:00
humidity (%)	77.03
sky dT	-9.38
dome T	17.53
-	-
-	-

PTST Reinhardt Sensor data

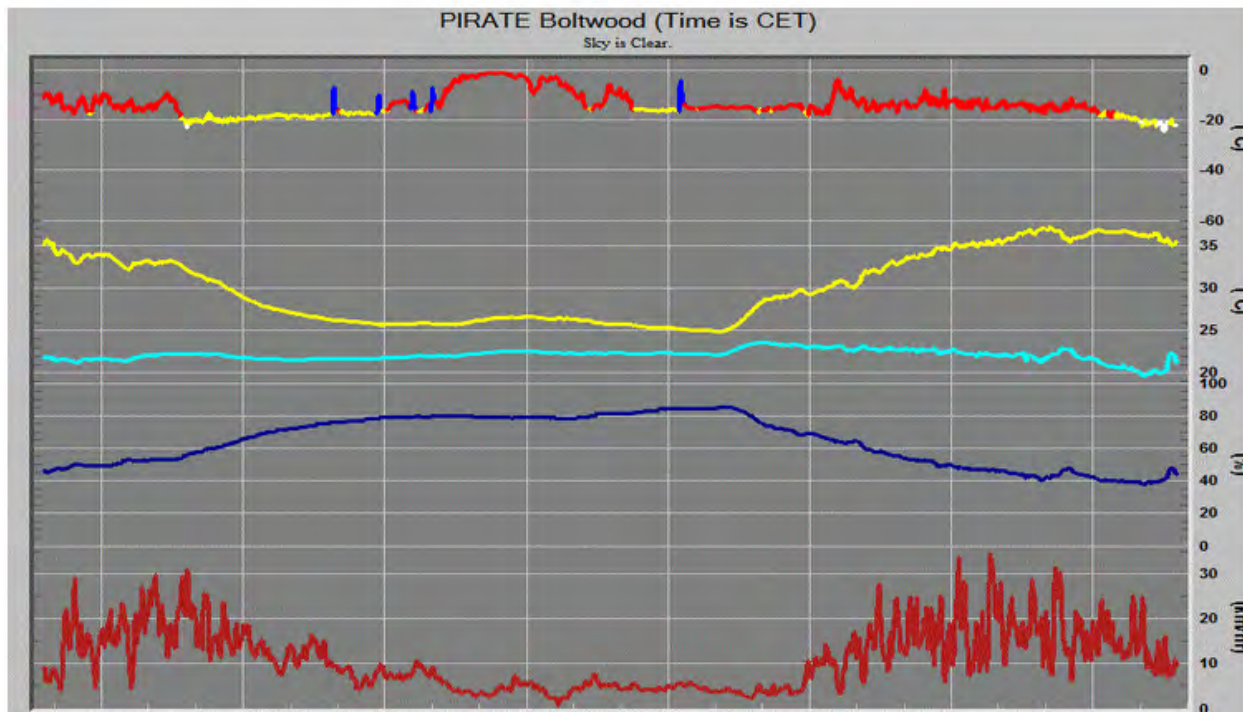
date	29.07.15
time (CET)	16:44:00
humidity (%)	43.64
sky dT	
dome T	36.31
wind speed	17.42
wind dir	224.57
rain flag	0.00

OAM local time
Wed, 29 Jul 2015, 17:32:48

UTC
15:32:48



[PIRATE Sensor data \(page @ MPE\)](#)
[PTST Sensor data \(page @ MPE\)](#)



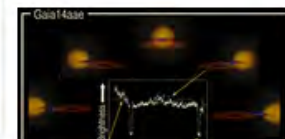
Tweets

RAS @RoyalAstroSoc 17 Jul
Rare eclipsing binary star system found by professional & amateur astronomers w/ @ESAGaia ras.org.uk/news-and-press...pic.twitter.com/5zlecYJg2
Retweeted by PIRATE Facility



Expand

ESA Gaia @ESAGaia 17 Jul
Image of the Week: #Gaia satellite and amateur astronomers spot one in a billion star cosmos.esa.int/web/gaia/iow_2.pic.twitter.com/uWzPIFULsi
Retweeted by PIRATE Facility

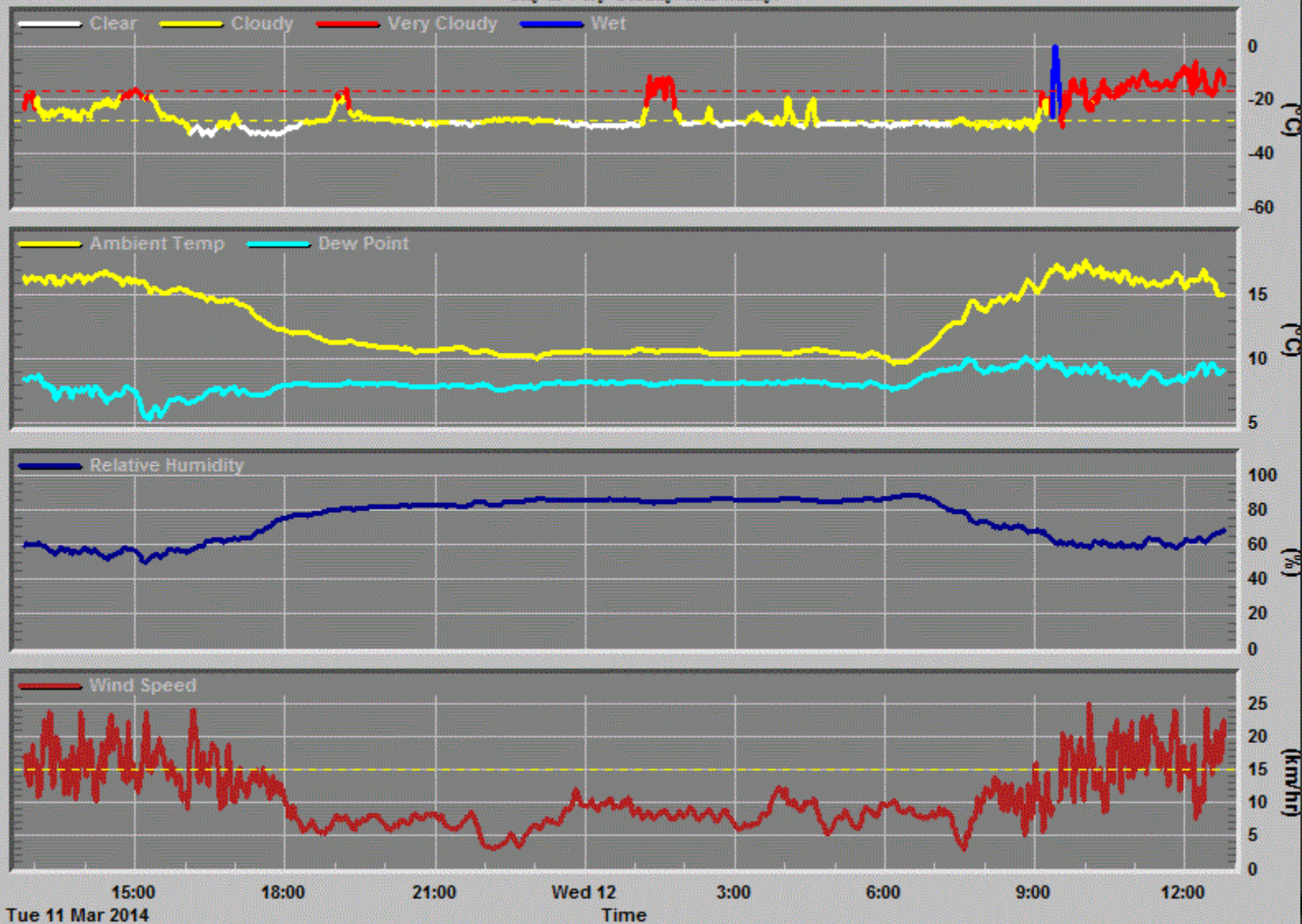


Useful Links

- [OU Science](#)
- [Study with the OU](#)
- [OAM](#)
- [Mallorca Planetarium](#)
- [SIMBAD](#)
- [NED](#)
- [ADS](#)

PIRATE - OAM cloud sensor data (time is UTC)

Sky is Very Cloudy. It is windy.



Search This Site

Search
 www PIRATE

OAM view north 2015-07-29 15:30:03



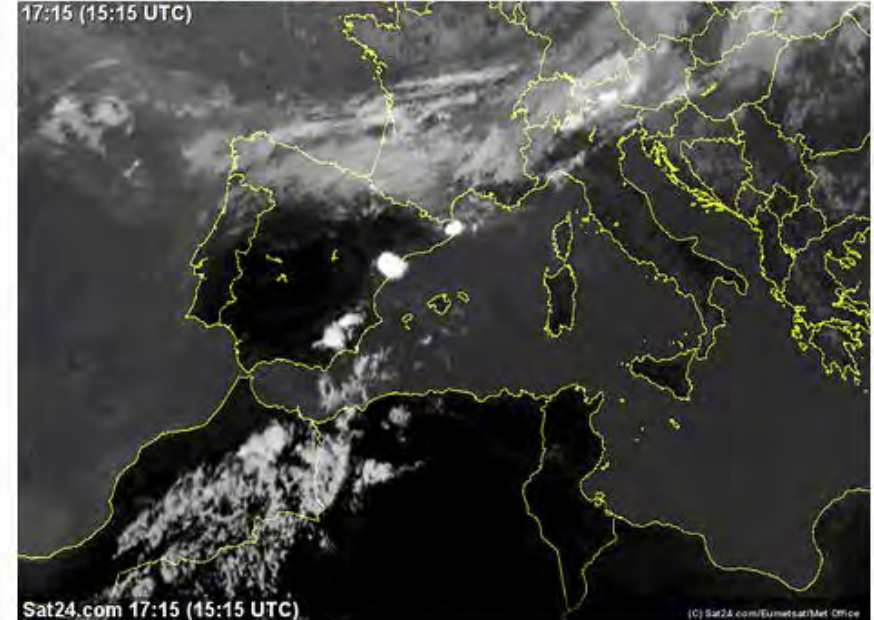
PIRATE interior view 2015-07-29 15:30:03



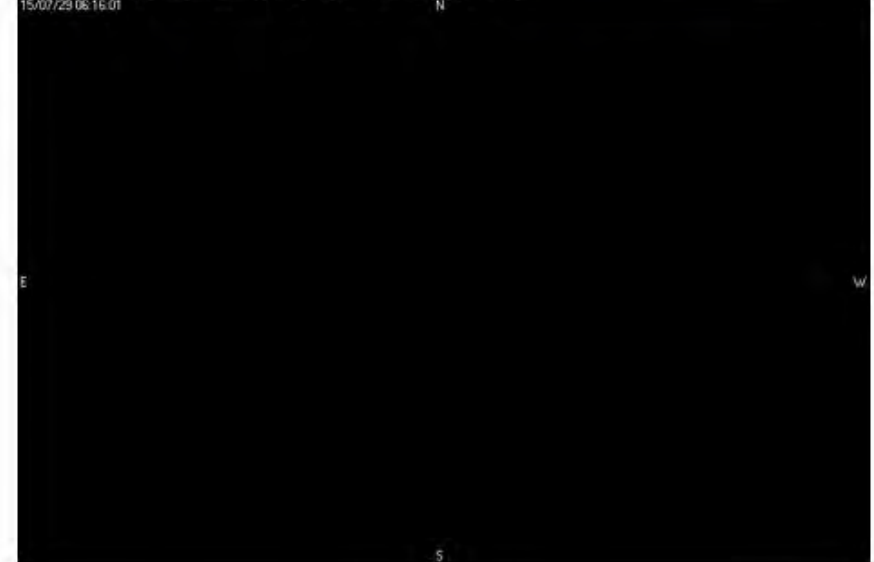
Last frame CET 2015-07-22 23:22:21



IR satellite view from Sat24.com. See also the [animated version](#).



Last all-sky camera image 2015-07-29 06:16:00



LIVE ALL-SKY VIEWS FOR WEATHER CONDITIONS

Night	Start Time [CEST] 1 hour sequence											Comments
2015 July	21	22	23	00	01	02	03	04	05	06	all	
Jul. 31 / Aug. 01	21	22	23	00	01	02	03	04	05	06	MPG GIF	
30 / 31	21	22	23	00	01	02	03	04	05	06	MPG GIF	
29 / 30	21	22	23	00	01	02	03	04	05	06	MPG GIF	
28 / 29	21	22	23	00	01	02	03	04	05	06	MPG GIF	
27 / 28	21	22	23	00	01	02	03	04	05	06	MPG GIF	
26 / 27	21	22	23	00	01	02	03	04	05	06	MPG GIF	
25 / 26	21	22	23	00	01	02	03	04	05	06	MPG GIF	
24 / 25	21	22	23	00	01	02	03	04	05	06	MPG GIF	
23 / 24	21	22	23	00	01	02	03	04	05	06	MPG GIF	
22 / 23	21	22	23	00	01	02	03	04	05	06	MPG GIF	
21 / 22	21	22	23	00	01	02	03	04	05	06	MPG GIF	
20 / 21	21	22	23	00	01	02	03	04	05	06	MPG GIF	
19 / 20	21	22	23	00	01	02	03	04	05	06	MPG GIF	
18 / 19	21	22	23	00	01	02	03	04	05	06	MPG GIF	
17 / 18											06	MPG GIF
16 / 17											06	MPG GIF
15 / 16											06	MPG GIF
14 / 15											06	MPG GIF
13 / 14											06	MPG GIF
12 / 13											06	MPG GIF

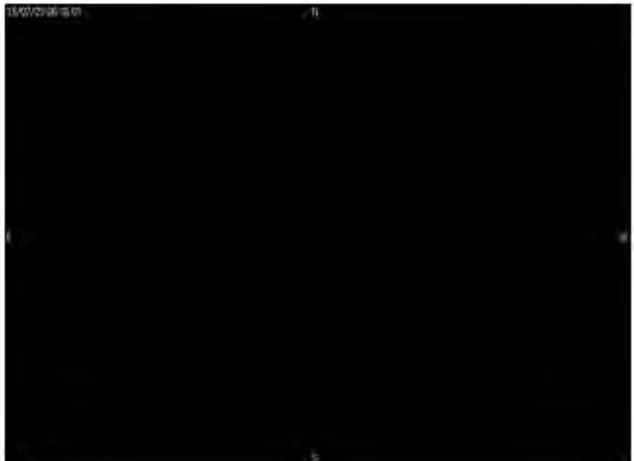
Open University PIRATE Robotic Telescope

OAM, Costitx, Mallorca

interior view



all sky view



OAM local time
Wed, 29 Jul 2015, 17:26:42

UTC
15:26:42

CURRENT MOON



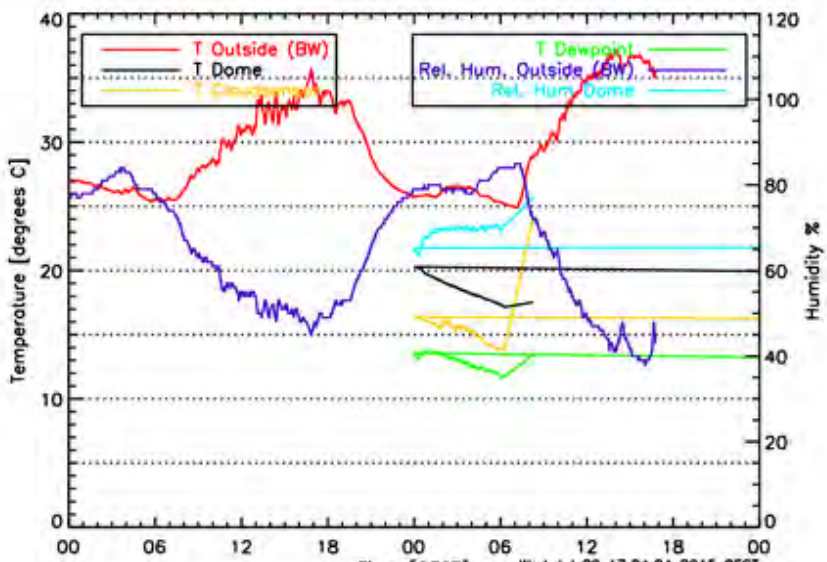
Waxing Gibbous
 96% of Full
 Wed 29 Jul, 2015
 17:26:45 

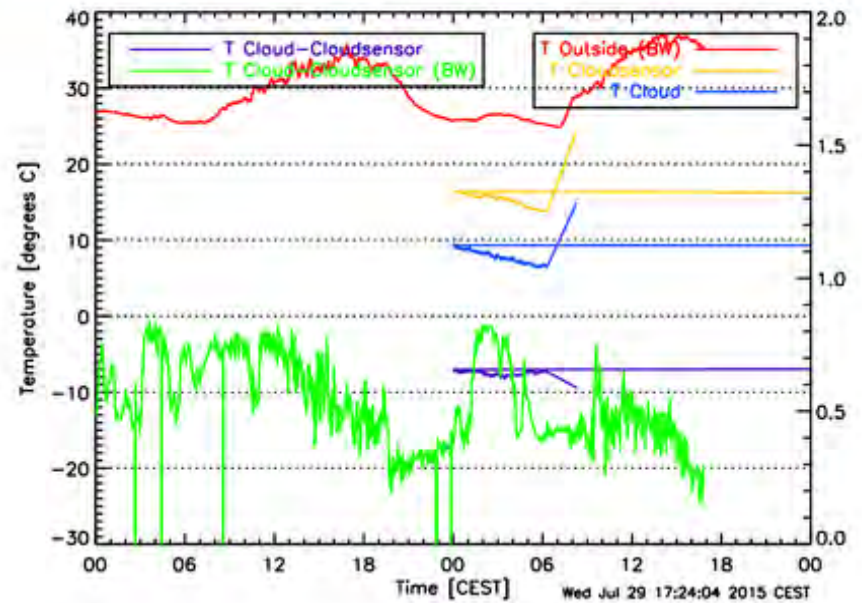
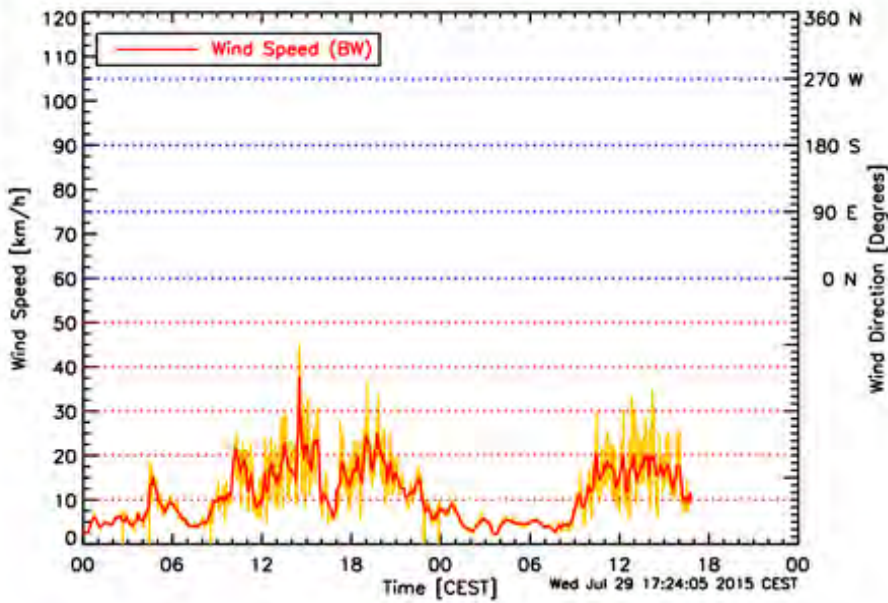
[Lunar phases](#)

Open University PIRATE Telescope / OAM Costitx Weather Station

- Date measure**
- T in dome = 17.5 °C
 - T outside = 35.6 °C (Boltwood)
 - T cloudsensor = 24.3 °C
- T dewpoint** = 13.5 °C
- RH in Dome = 77.0 %
 - RH outside = 43.0 % (Boltwood)
- Wind Speed** = 11.6 km/h (Boltwood)
- T cloud = 14.9 °C
 - T sky = -9.4 °C
 - T sky = -22.6 °C (Boltwood)
 - Clouds = 1.0

Wed Jul 29 15:24:05 2015 UT
 Wed Jul 29 17:24:05 2015 CEST





08:16:00,12.05.15,TE17.53,WU1443.53,WK1.00,WT24.27,FE77.03

[Meteoblu weather Prediction](#)

[Meteoblu seeing Prediction](#)

PIRATE weather station

Datenerfassung

am: 12.05.15 um: 08h : 16m : 00s

Weather in Costitx

Today	Tomorrow	Friday	Saturday
33°	29°	31°	31°
Max 34° Min 24°	Max 30° Min 24°	Max 32° Min 23°	Max 33° Min 22°
14 km/h	25 km/h	14 km/h	22 km/h
Sunrise / set 06:44 / 21:04	Sunrise / set 06:45 / 21:03	Sunrise / set 06:46 / 21:02	Sunrise / set 06:47 / 21:01

Sensor	Wert
TemperatureDome	17.53 degC
CloudAmbT	24.27 degC
HumidityDome	77.03 perc
CloudT	14.89 DegC
CloudT-CloudAmbT	-9.38 DegC

PIRATE REMOTE OBSERVATION SET-UP



28/03/2015

Tutor 16:36, 28 March 2015 (GMT) PIRATE powered up.

Tutor 16:42, 28 March 2015 (GMT) Cooling cameras.

S382 User Contact made with the NDA

Operator: Regine Schuler
Log Keeper: Dave Stanier

S382 User Michal Sowinski joined and took over the web cam

S382 User 17:59, 28 March 2015 (GMT) humidity 62, wind speed 15.8, DT -12.27, clear

S382 User 18:02, 28 March 2015 (GMT) Camera temp -20

S382 User 18:05, 28 March 2015 (GMT) Checking time stamp

S382 User 18:10, 28 March 2015 (GMT) Dome opened

S382 User 18:12, 28 March 2015 (GMT) Dusk flat requested

Flats: 1xH alpha, 5x B filter, 5 x V filter, 5 x R filter, 5 x clear, all binning 2

S382 User 18:28, 28 March 2015 (GMT) Error occured and telescope stopped slewing... but restarted after a pause.

Tutor 18:31, 28 March 2015 (GMT) (Clarification: System reported that one file could not be saved, and the whole flat-taking halted. The operator (Regine) aborted the run, and re-entered it, and it proceeded without difficulty.)

Calibration frames 10 bias 0 exposure, 10 dark frames at 60 secs, and 10 at 90 secs all at 2 binning

S382 User 18:38, 28 March 2015 (GMT) Dome closed

S382 User 18:39, 28 March 2015 (GMT) Calibration frames requested ... CCD temp -20

S382 User 19:03, 28 March 2015 (GMT) Calibration frames stopped.

Tutor 19:07, 28 March 2015 (GMT) Observatory went offline during the last set of darks (reporting wind). Used NDA privileges to disconnect weather from ACP so that remaining dark frames could be taken.

S382 User 19:16, 28 March 2015 (GMT) Calibration run complete

Tutor 19:19, 28 March 2015 (GMT) Weather sensor re-connected to ACP as soon as dark frames were completed.

S382 User 19:17, 28 March 2015 (GMT) Dome opened

Single image 60 secs, r filter, 2 binning

S382 User 19:41, 28 March 2015 (GMT) exposure complete ... checking exposure ... 4000?

New exposure at 90 sec

New cooler temperature or "off":

-20

OK

Cancel

fold close close-others refs+ jump side-bar x

System Status

[Help](#)

Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 08:12:56			FWHM	Target
UTC: 07:12:55	RA:	Filter Clear		Repeat
LST: 03:55:11	Dec:	Binning 1:1		Filter
Owner Free	Az:	<u>Cooler</u> 0°C/85%		Count
Weather Clear Wind	Alt:	Guider		Tracking Errors
<i>Hover mouse over links</i>	Air:	Idle		
		Interval (sec)		
		Error Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

Welcome

[Getting Started](#)

[Select a Theme -](#)

Welcome to *OpenScience* Observatory (Dome 3). If you haven't been here before, click the Getting Started button to expose some useful information or select a theme you like. Happy observing!

Observing

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Single Image

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OSO 2025-01-15 15:00

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Using This Web Site

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Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 10:18:09			FWHM	Target
UTC: 09:18:09	RA:	Filter Clear		Repeat
LST: 06:00:45	Dec:	Binning 1:1		Filter
Owner Free	Az:	Cooler Off		Count
Weather Clear Wind	Alt:	Guider		Tracking Errors
<i>Hover mouse over links</i>	Air:	Idle		
		Interval (sec)		
		Error Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

Calibration Frames

[Help](#)

Use Count Duration Binning

<input checked="" type="checkbox"/>	30	0	1 ▾
<input checked="" type="checkbox"/>	30	0	2 ▾
<input checked="" type="checkbox"/>	2	60	1 ▾
<input checked="" type="checkbox"/>	2	60	2 ▾

[More](#)

Require cooler temp deg C

[Acquire Cal Frames](#)

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Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 08:20:50			FWHM	Target
UTC: 07:20:50	RA:	Filter: Clear		Repeat
LST: 04:03:07	Dec:	Binning: 1:1		Filter
Owner: Free	Az:	Cooler: -20°C/85%		Count
Weather: Clear Wind	Alt:	Guider: Idle		Tracking Errors
<i>Hover mouse over links</i>		Air:	Interval (sec)	
			Error: Ex:	
			(pix): Ey:	

[Show/Hide Run Log and Abort Control](#)

One-Time Sky Flat Run

[Help](#)

This item allows you to do a one-time sky flat run per your specifications. Use this for special situations where you can't use the standard flat sets.

Use	Count	Filter	Binning
<input checked="" type="checkbox"/>	10	H-alpha	1
<input checked="" type="checkbox"/>	10	Red	1
<input checked="" type="checkbox"/>	10	Blue	1
<input checked="" type="checkbox"/>	10	Green	1
<input checked="" type="checkbox"/>		Clear	1

[More](#)

[Acquire Flat Frames](#)

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Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 10:03:26			FWHM	Target
UTC: 09:03:26	RA:	Filter: Clear		Repeat
LST: 05:46:00	Dec:	Binning: 1:1		Filter
Owner: Free	Az:	Cooler: Off		Count
Weather: Clear Wind	Alt:	Guider		Tracking Errors
<i>Hover mouse over links</i>	Air:	Idle		
		Interval (sec)		
		Error: Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

Acquire a Single Image

[Help](#)

Target Name: [Get Coordinates or Ephemeris](#)

Right Asc. (hrs): [Deep Sky Catalog Search](#)

Declination (deg): *(coordinates in J2000)*

Duration (sec): Filter: Binning:

Auto focus before imaging Auto calibrate

[Acquire Image](#)

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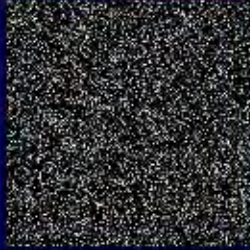
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Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 10:02:14			FWHM	Target
UTC: 09:02:14	RA:	Filter Clear		Repeat
LST: 05:44:48	Dec:	Binning 1:1		Filter
Owner Free	Az:	Cooler off		Count
Weather Clear Wind	Alt:	Guider		Tracking Errors
<i>Hover mouse over links</i>	Air:	Idle		
		Interval (sec)		
		Error Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

Single Object Color Series

[Help](#)

Target Name: [Get Coordinates or Ephemeris](#)

Right Asc. (hrs): [Deep Sky Catalog Search](#)

Declination (deg): *(coordinates in J2000)*

Use	Count	Filter	Duration	Binning	
<input checked="" type="checkbox"/>	<input type="text" value="10"/>	Clear	<input type="text" value="30"/>	<input type="text" value="1"/>	<input type="checkbox"/> Auto focus at start <input type="checkbox"/> Auto calibrate
<input checked="" type="checkbox"/>	<input type="text" value="5"/>	Red	<input type="text" value="40"/>	<input type="text" value="2"/>	<input type="checkbox"/> Periodic auto focus every <input type="text" value="30"/> minutes
<input checked="" type="checkbox"/>	<input type="text" value="5"/>	Green	<input type="text" value="30"/>	<input type="text" value="2"/>	<input type="checkbox"/> Random small position shift between images
<input checked="" type="checkbox"/>	<input type="text" value="5"/>	Blue	<input type="text" value="60"/>	<input type="text" value="2"/>	<input type="checkbox"/> Dusk Flats <input type="checkbox"/> Dawn Flats

OpenScience Observatory (Dome 3)

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Observatory	Telescope	Imager	Activity	Plan
Ready	Stopped	Idle	Idle	Set
Local: 23:27:36			FWHM	Target
UTC: 22:27:35	RA: 16:27:55.34	Filter: Clear		Repeat
LST: 19:16:18	Dec: -26° 31' 57.6"	Binning: 4:1		Filter
Owner: Free	Az: 218.00°	Cooler: -10°C/85%		Count
Weather: Clear Wind	Alt: 13.08°	Guider		Tracking Errors
RooF: Open	GEM: West	Idle		
<i>Hover mouse over links</i>	Air: 4.347	Interval (sec)		
		Error: Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

[Stop Run](#)

```
image finished
Plate-solve final image
14201 image stars found
15306 catalog stars found
Solved! 480 stars matched.
Average residual is 1.04 arcsec.
Pointing error is 0.060 arcmin @ angle 227.80
True focal length is 293.0 cm.
True binned plate scales (arcsec/pix): H = 2.53 V = 2.53
True image center (J2000): 16h 23m 35.7s -26° 32' 01.22"
Imager sky position angle is 0.0 deg.
(stopping the autoguider)
[Flip check: Tn=0s HAC=10095s GW=T HAZ=10095s DWz=T WF=no]
Re-slew to target.
Start slew to M 4...
(wait for slew to complete)
(slew complete)
Excessive pointing error, request pointing update for next target
(turning tracking off for safety)
```

Observing 

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Observatory	Telescope	Imager	Activity	Plan
Offline	Offline	Idle	Idle	Set
Local: 10:14:45			FWHM	Target
UTC: 09:14:45	RA:	Filter Clear		Repeat
LST: 05:57:21	Dec:	Binning 1:1		Filter
Owner Free	Az:	Cooler Off		Count
Weather Clear Wind	Alt:	Guider		
<i>Hover mouse over links</i>	Air:	Idle		Tracking Errors
		Interval (sec)		
		Error Ex:		
		(pix) Ey:		

[Show/Hide Run Log and Abort Control](#)

Acquired Images

If you have lots of images this could take a long time to appear.

[Help](#)

[Parent Folder](#) [/images/oso/20150405](#) [\(FTP\) Easy FTP in Explorer or Finder](#)

Name	Type	Date Modified	Size	
five-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:32:26 UTC	3.56Mb	Delete
four-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:28:06 UTC	3.56Mb	Delete
one-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:13:24 UTC	3.56Mb	Delete
seven-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:40:14 UTC	3.56Mb	Delete
six-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:36:22 UTC	3.56Mb	Delete
three-S001-R001-C001-Green.fits	MaxIm DL Image	5 Apr 2015 17:23:39 UTC	3.56Mb	Delete

KM UMa 1SWASP J1 14749.04+351 335.2
Pirate Data 20150308 - 20150414 & Data Lynn 20150311 - 20150323

