



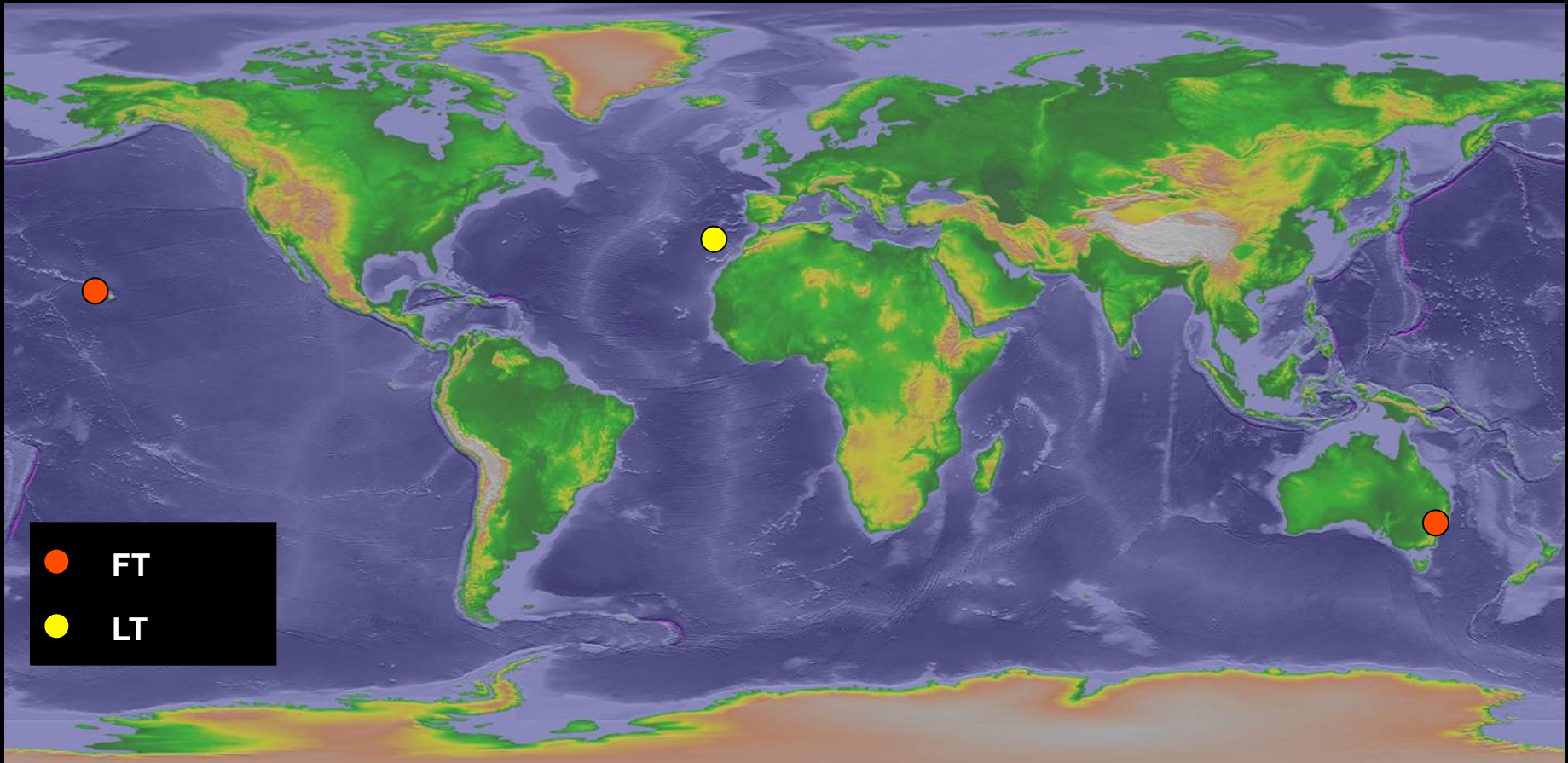
Education with Gaia and the Faulkes Telescopes



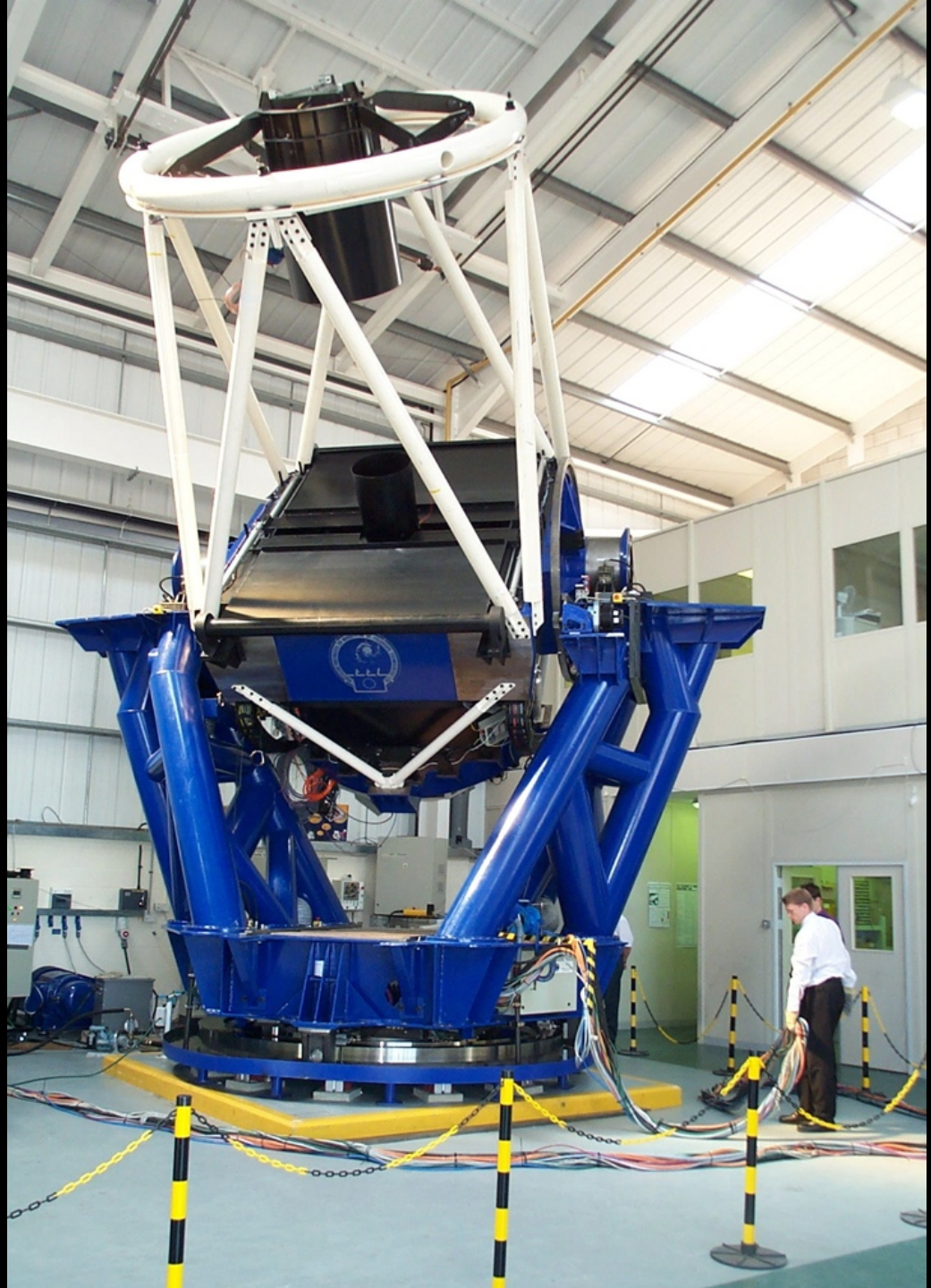
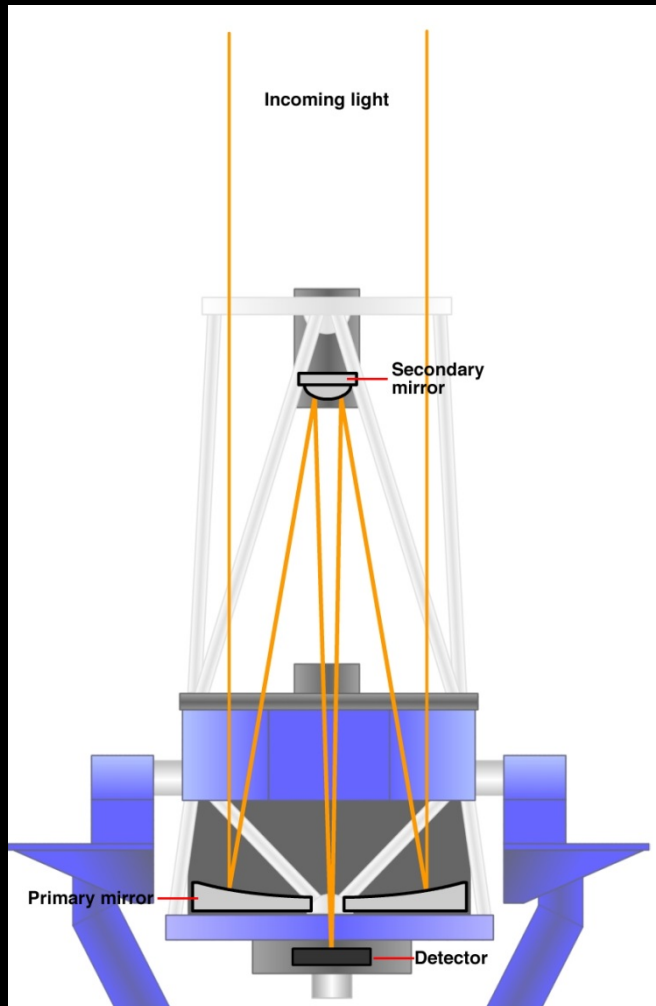
Fraser Lewis
Faulkes Telescope Project
National Schools' Observatory
Liverpool John Moores University
The Open University



Robotic telescopes allow us to obtain images
from (several) distant good quality sites
Only 3 * 2-metre 'scopes that do this for education



Faulkes Telescope Design





2-metre 'scopes 10' x 10' FOV

1-metre 'scopes 26' x 26' FOV



Pipeline-processed FITS

20 filters (including Bessel BVR, SDSS ugri,
 $H\alpha$, $H\beta$, O III)

All controlled from one interface

Opportunity to set up timed observations and
cadences

The Interface

So simple,
even a ~~child~~
teacher
could use it

Add a target

Target name: (e.g. "M82" or "Eagle Nebula")

GX339-4

Low Mass X-ray Binary according to Simbad

Sidereal:

Yes

Right Ascension: (e.g. "05:34:31.940")

17:02:49.360

Declination: (e.g. "+22:00:52.200")

-48:47:22.800

Telescope class:

2.0 meter Spectral

Wavelength filter:

Bessell-V

Duration (seconds): (e.g. 30)

60

Exposures: (1 or more)

1

Fill Window?: ☐

Binning: (1-2) Recommended is 2.

2

Target Of Opportunity (interrupts currently running observations)? ☐

Add

Clear form

Cancel

Help

Add Cadence

To schedule repeated observations of the same target with a specific period of hours between frames, provide a start date/time, end date/time, period for the cadence (in hours), and a jitter (in hours). All times/dates are in Universal Time.

Cadence start:

2015-11-09	00:00:00
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End:

2015-11-30	00:00:00
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Period: (in fractional hours)

24	⬆⬇⬆
----	-----

Jitter: (in fractional hours)

24	⬆⬇⬆
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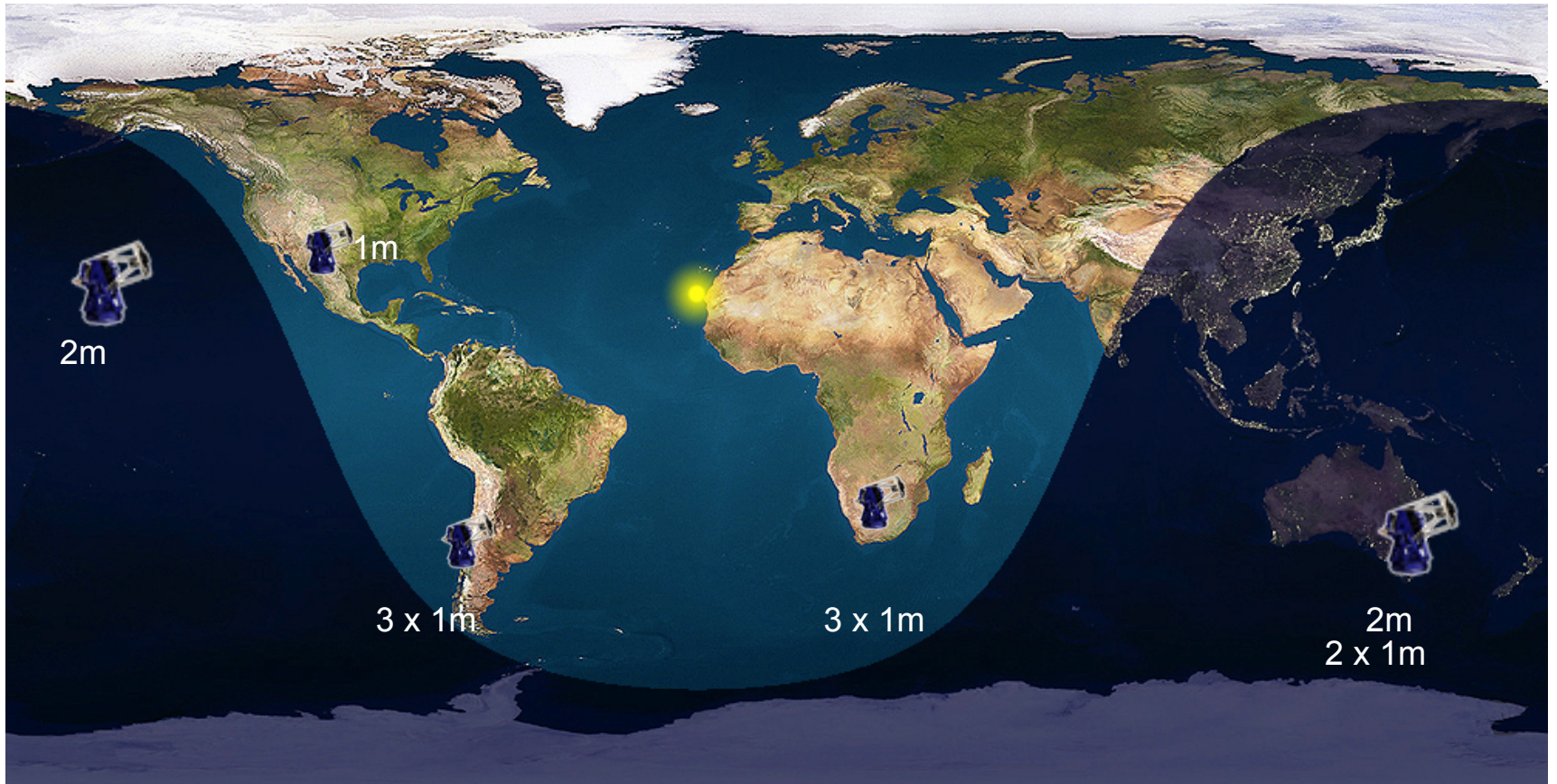
Add	Clear form	Cancel	Help
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Tarantula
Nebula

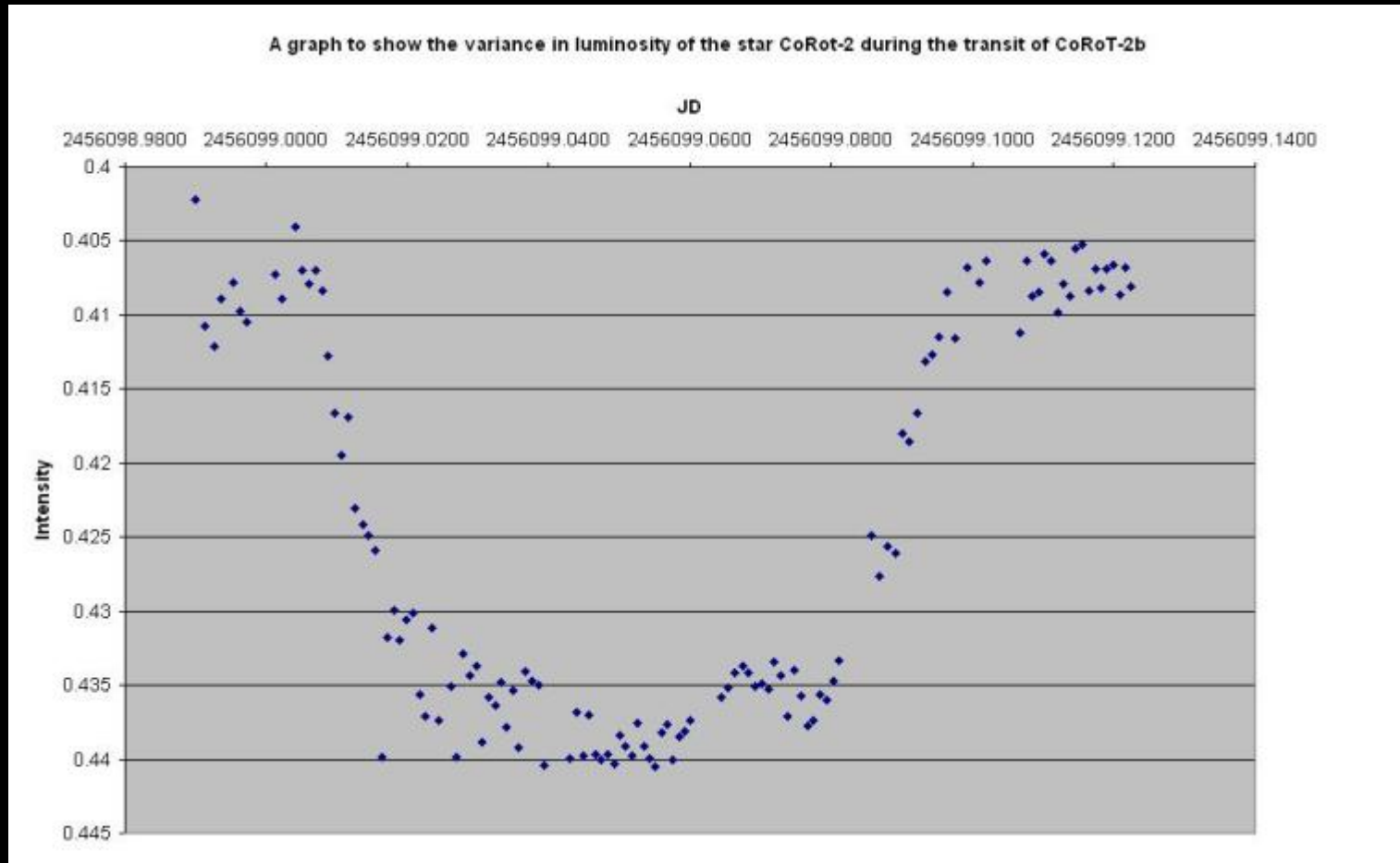


With 9 * 1-metre 'scopes



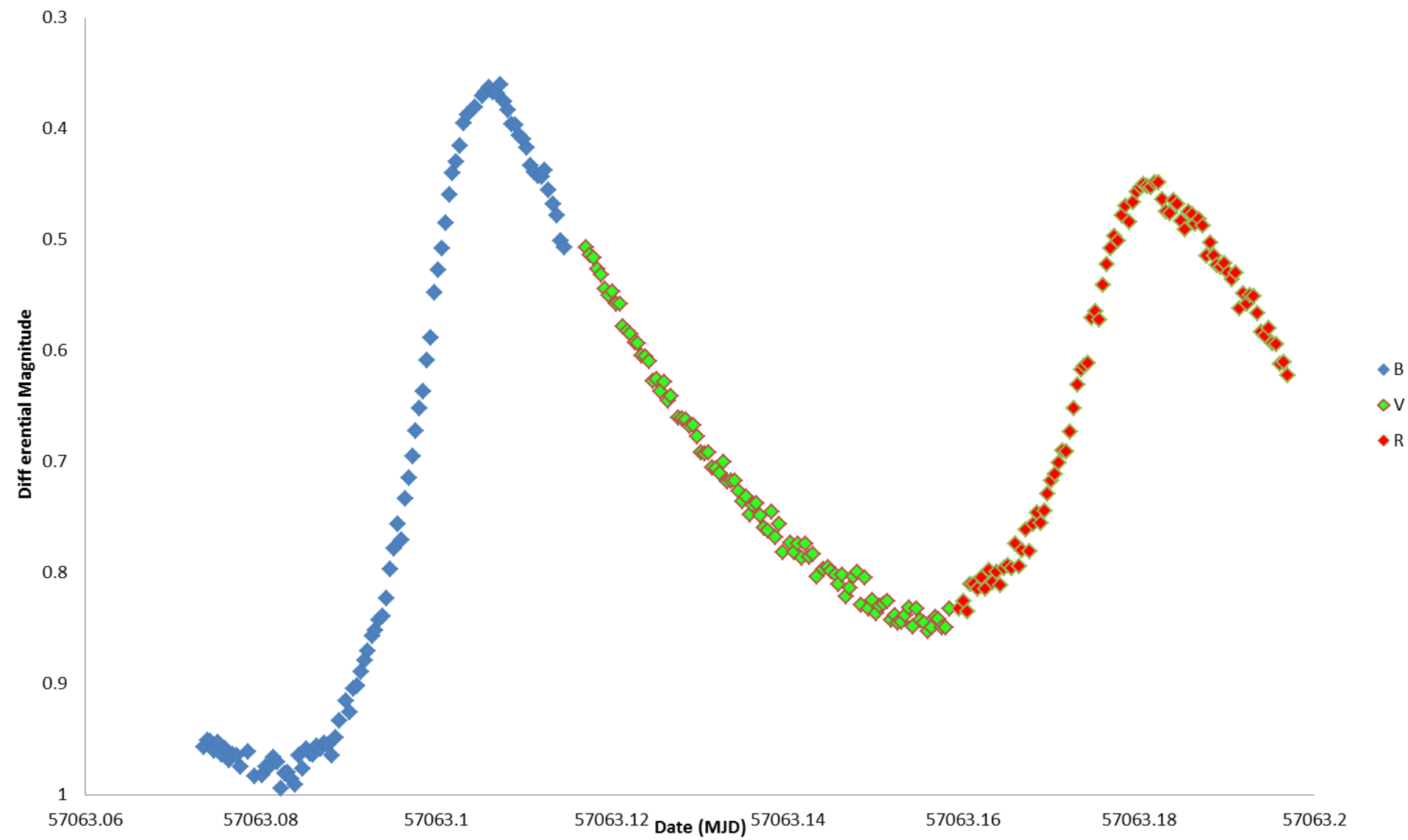
Las Cumbres Observatory Global Telescope

Exoplanet transits (6th formers)



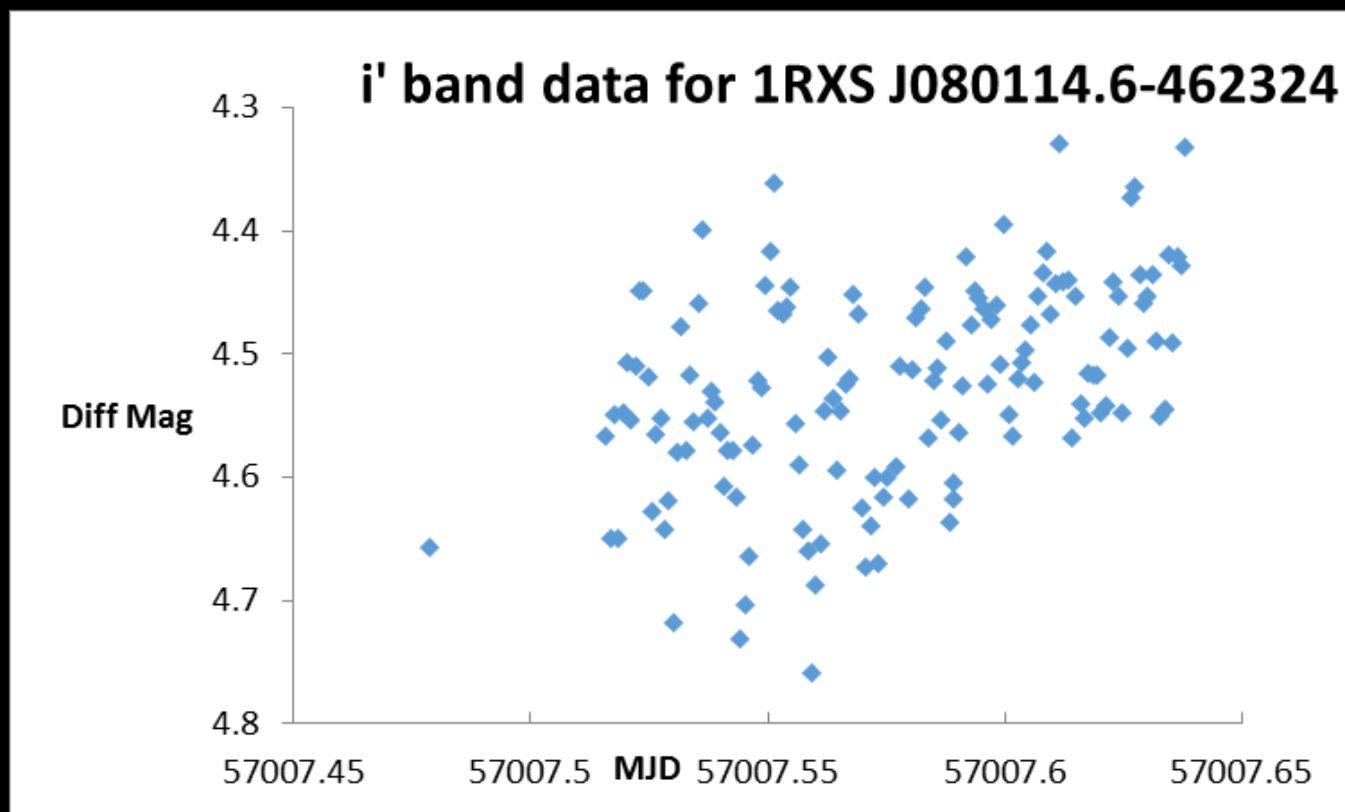
CoRot 2b: David Hardy & Thomas Ham (Cardiff schools), July 2012

Lightcurve of NSV 855 (delta Scuti, dwarf Cepheid) (u'grad project)



3 hour lightcurve of magnetic CV

Discovery of 21 minute period – perhaps the white dwarf's spin ? (u'grad project)



LMXB Monitoring to Date

~40 LMXBs (NS and BH donors) for up to 10 years

Weekly monitoring of 'active' systems (V, R, i')

Less regular monitoring of truly quiescent systems (i' band)

Collaborators

Dave Russell, Federico Bernadini, Karri Koljonen (NYUAD)

Rob Fender (Oxford)

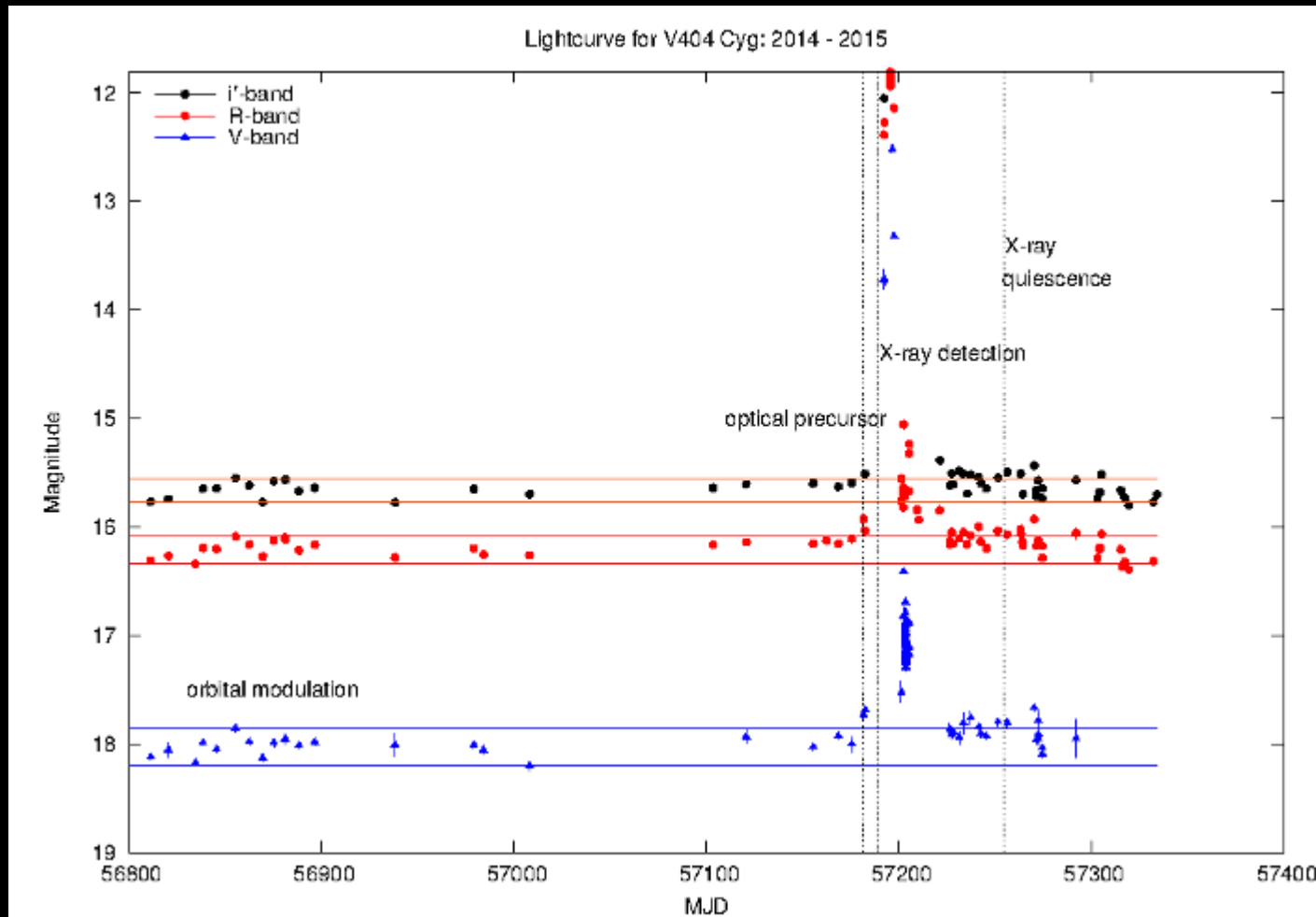
Paul Roche (FT, Cardiff)

Phil Charles (Southampton)

<http://www.faulkes-telescope.com/XRB>

V 404 Cyg optical precursor

Bernadini, Russell (New York Uni Abu Dhabi)

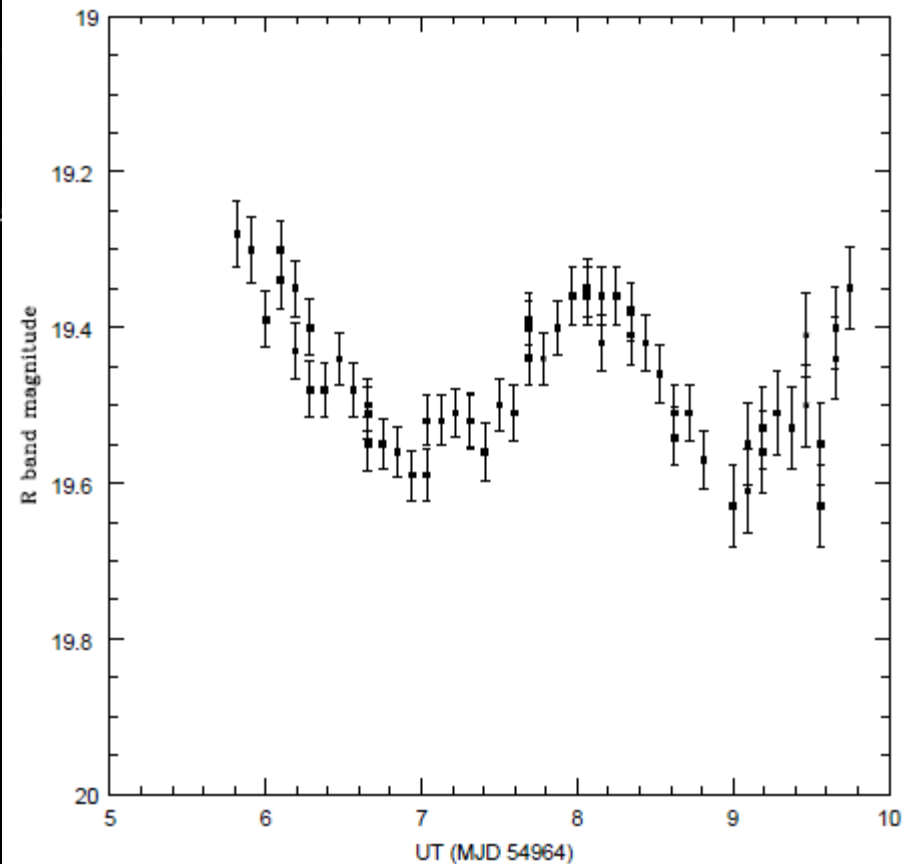
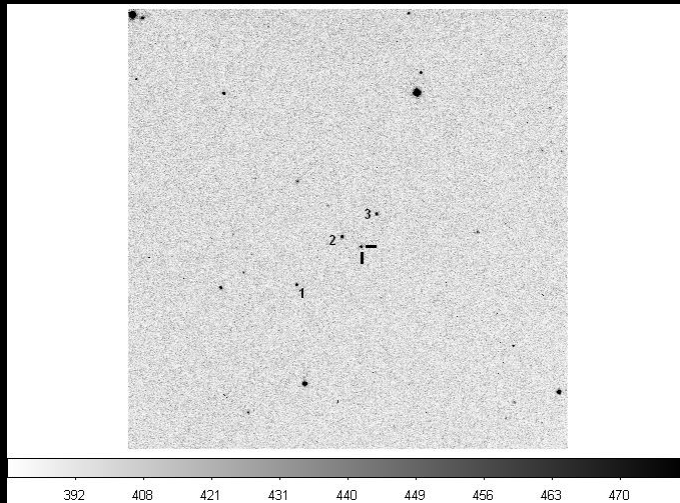


XTE J1118+480



A nearby and 'easy-to
measure' black hole !

Black Holes In My School
(BHIMS, Rosa Doran,
NUCLIO, GTTP)



More (Gaia) Specific Results

Some suggested by Morgan Fraser

Following up ASASSN SNe targets

15ng

15ov

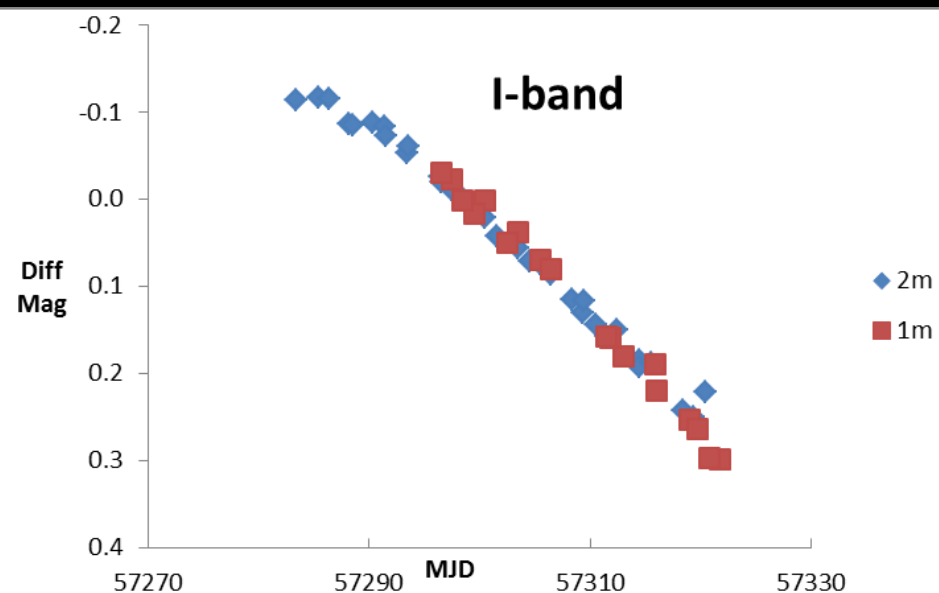
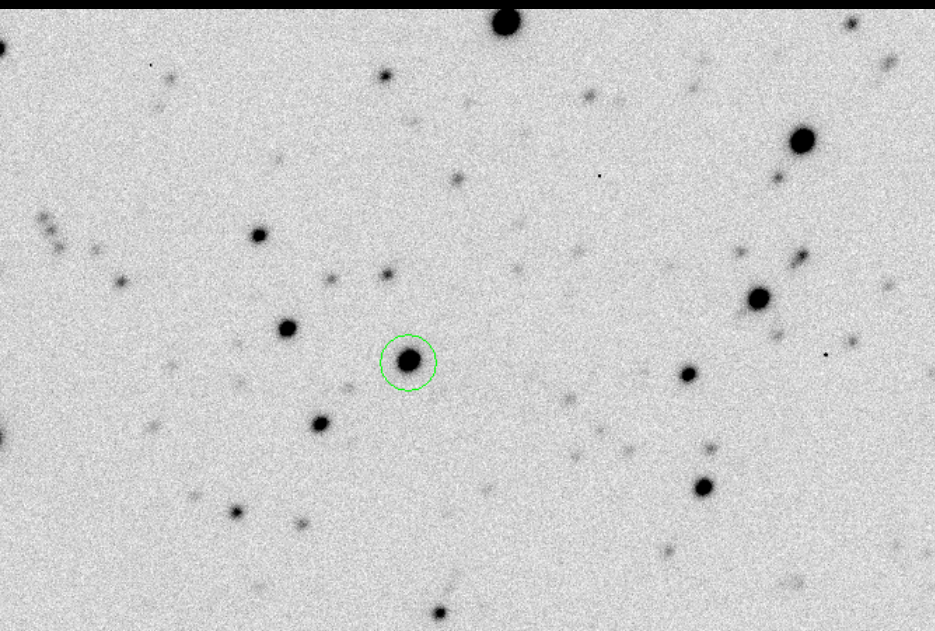
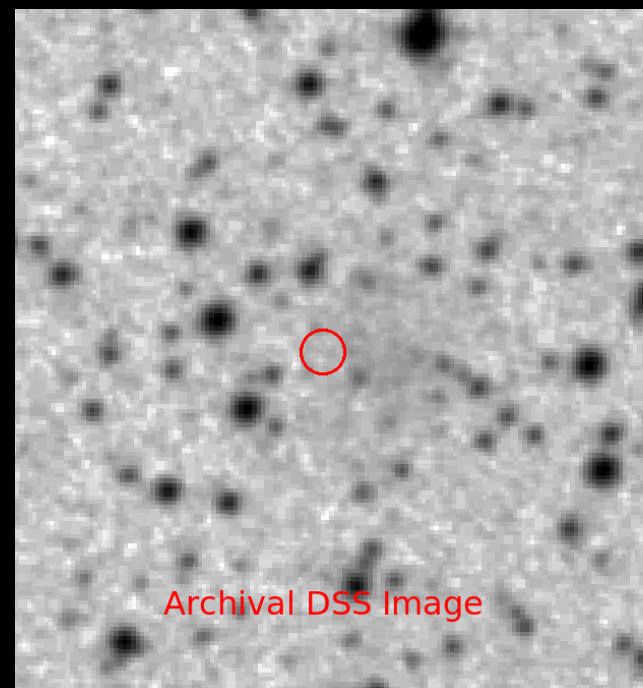
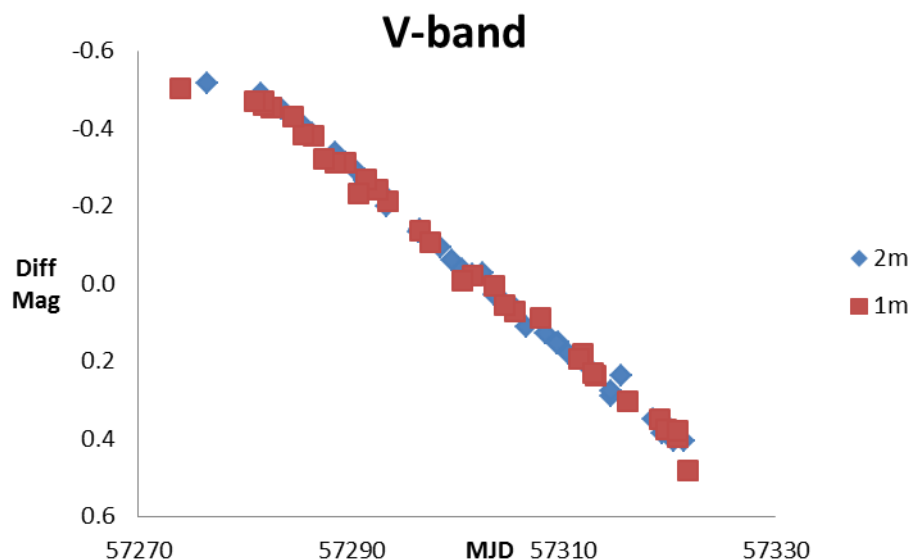
15oz

15rw

15rx

15sf

ASASSN-15oz (~250 images in 4 filters over 7 'scopes on 5 sites)



15oz dataset being analysed by schools

Photometry

(using Windows-based, free software and Excel)

See Sophie's and Anna's talks for discussion of
resources, opportunities and curriculum links

e.g. astronomy clubs, extended projects
collaboration between schools
spectroscopy (using FLOYDS on 2-m)

Developing online IBSE (Inquiry Based Science Education) resources for EU-funded Go-Lab project alongside partners including ESA, CERN





Experience Inquiry Learning with Go-Lab

Enrich your class with exciting scientific experiments.
Teach your students inquiry methods with online labs and apps.





“Down 2 Earth” project – impacts, comets, asteroids and meteorites

Multi-disciplinary and inquiry-based



Thanks for listening





Please come find me or
e-mail me your ideas

fraser.lewis@
faulkes-telescope.com

spacemadesimple®



www.spacemadesimple.co.uk

<http://faulkes-telescope.com>

<http://resources.faulkes-telescope.com>

<http://education.down2earth.eu>

<http://www.golabz.eu/>

<http://schoolsobservatory.org.uk/>

<http://astrocymru.org.uk/>



FAULKES TELESCOPE

AstroCymru
Faulkes Telescope Project
GAIA Outreach
Go-Lab (EU)
Down2Earth
ESERO Wales

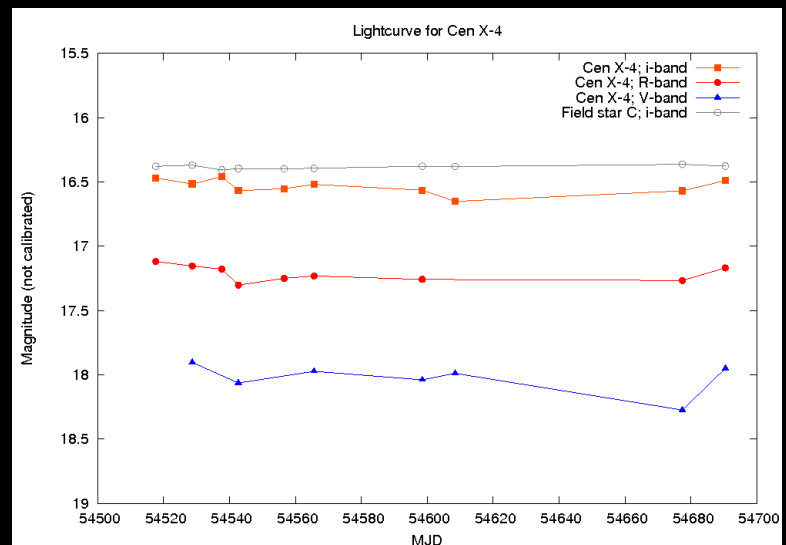
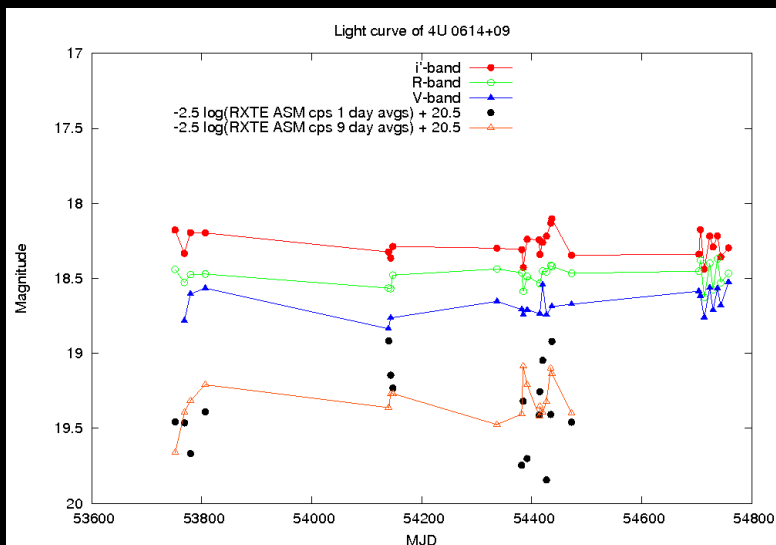
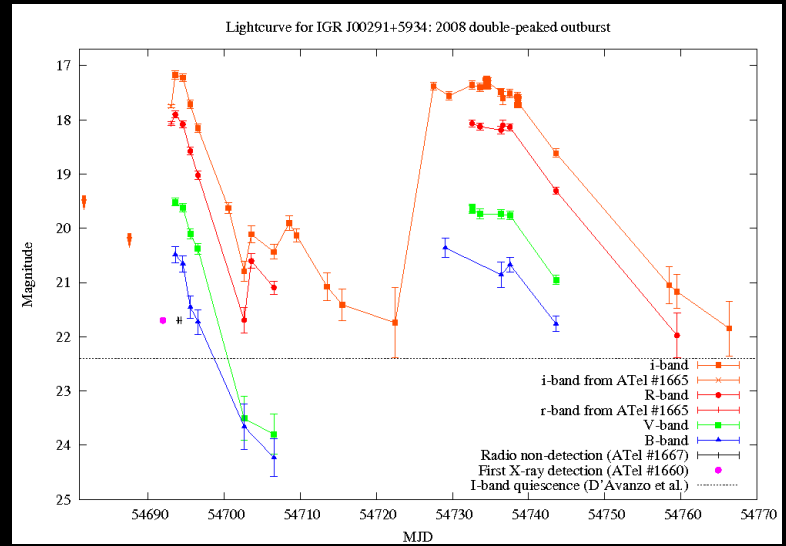
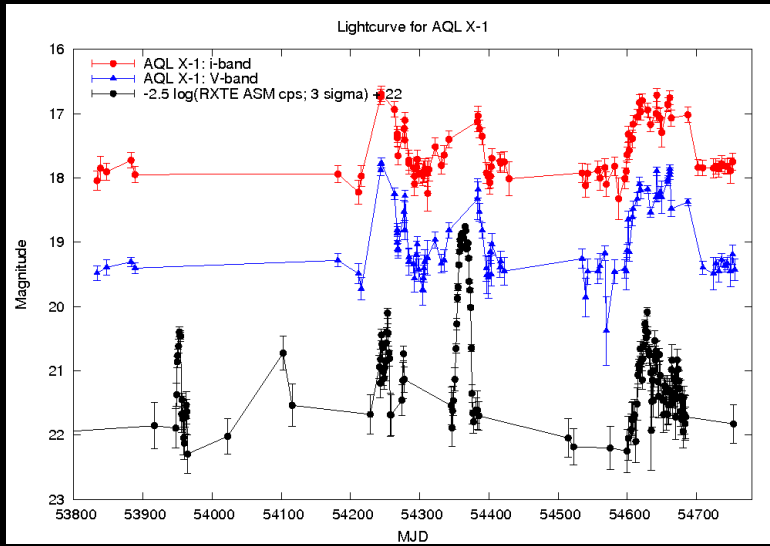
Based at Cardiff
University and working
alongside
Science Made Simple

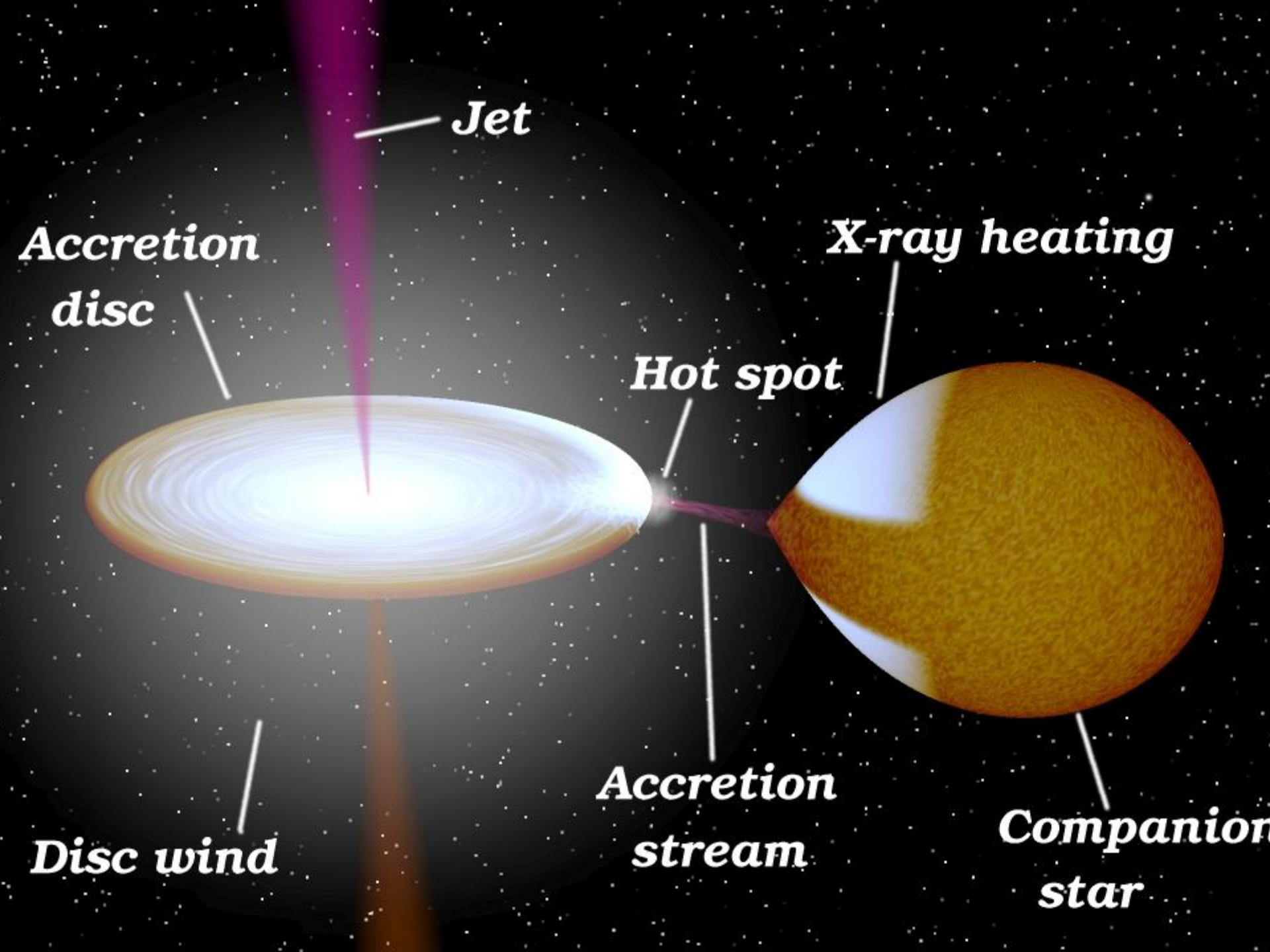
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www.spacemadesimple.co.uk

4 Types of Behaviour





Low-mass X-ray Binaries (LMXBs)

Donor main sequence or dwarf star

Accretion by Roche lobe overflow

System's luminosity dominated by disc

Long-lived ($\sim 10^7 - 10^9$ years)

Usually found in globular clusters and Galactic bulge