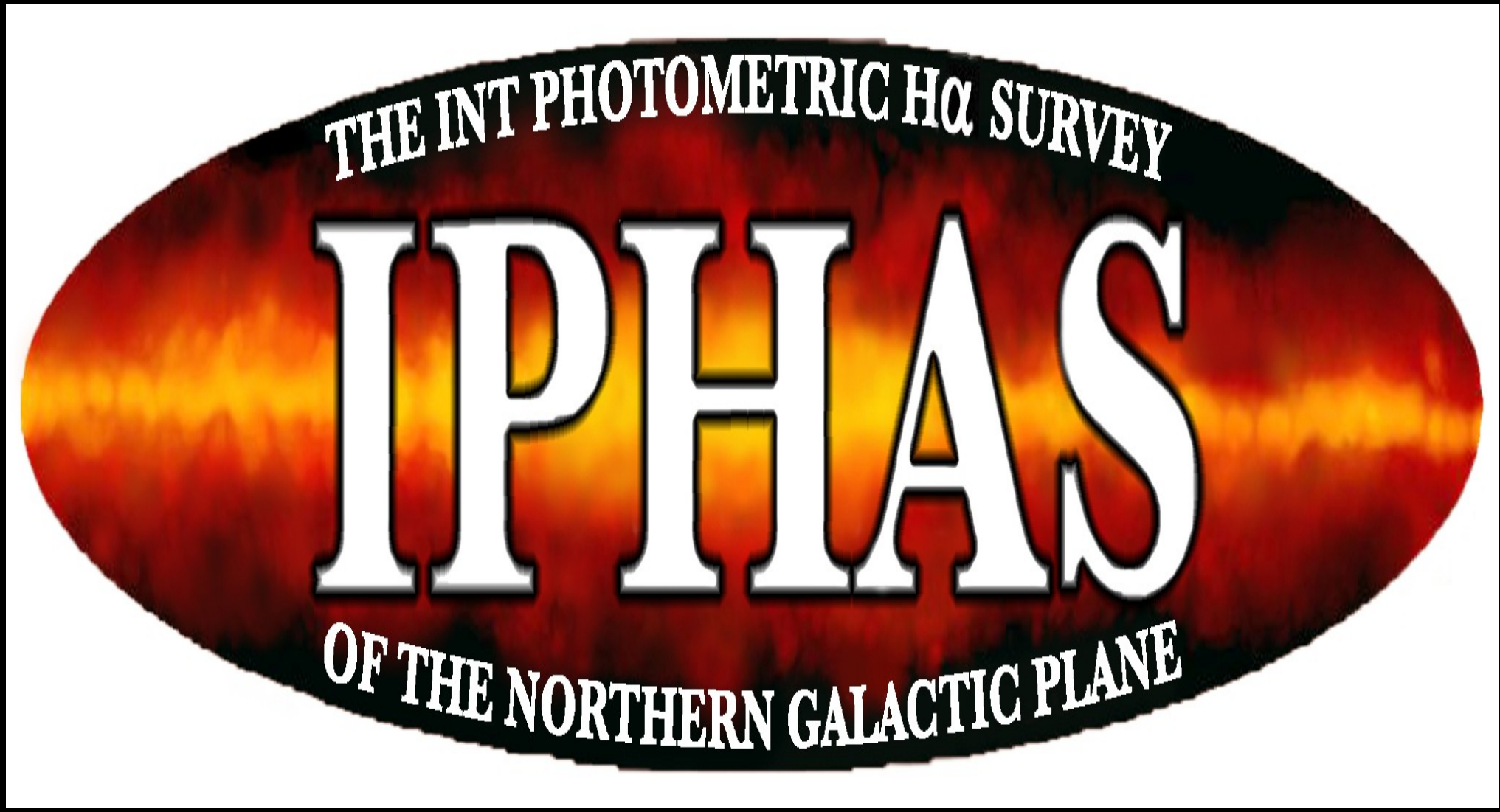
IPHAS Status

R. Greimel (U. of Graz)

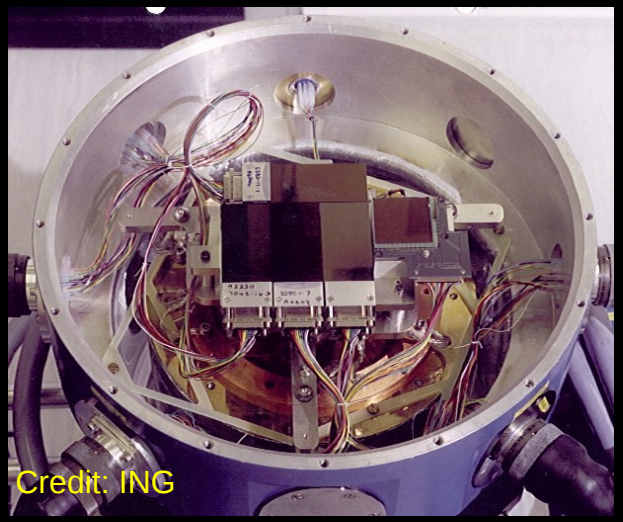


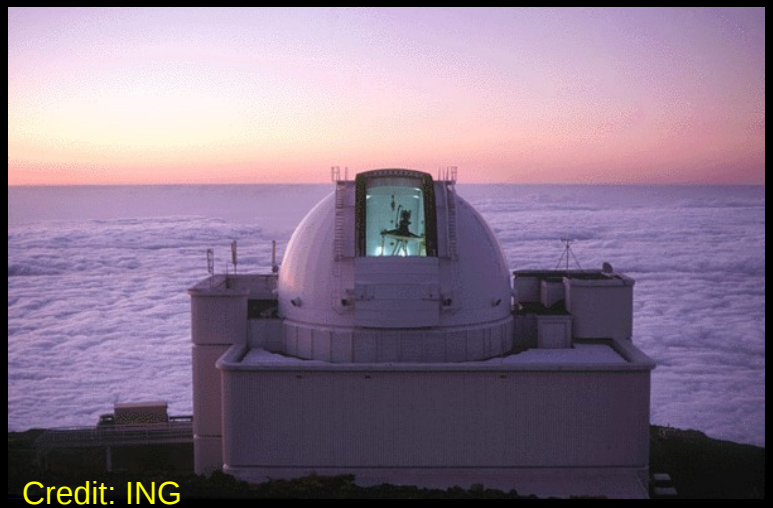
OIRGS Meeting 18-22. Jul. 2011

University of Hertfordshire

IPHAS Overview

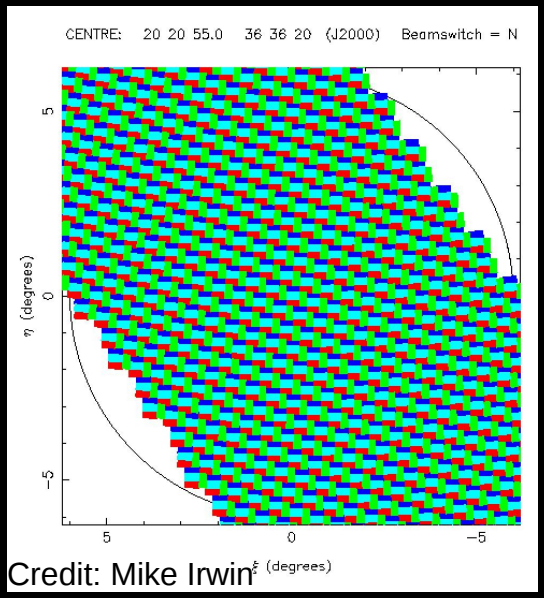
- WFC at 2.5m INT, La Palma
- 4 CCD
- FOV ~ 0.25 sq. deg
- 0.33 “/pixel
- 1850 sq. deg. of the northern galactic plane
- -5 < b < 5
- 30 < l < 215
- Filters: Halpha 120s, r 30s, i 10s


Credit: ING


Credit: ING

IPHAS – Observing Statistics

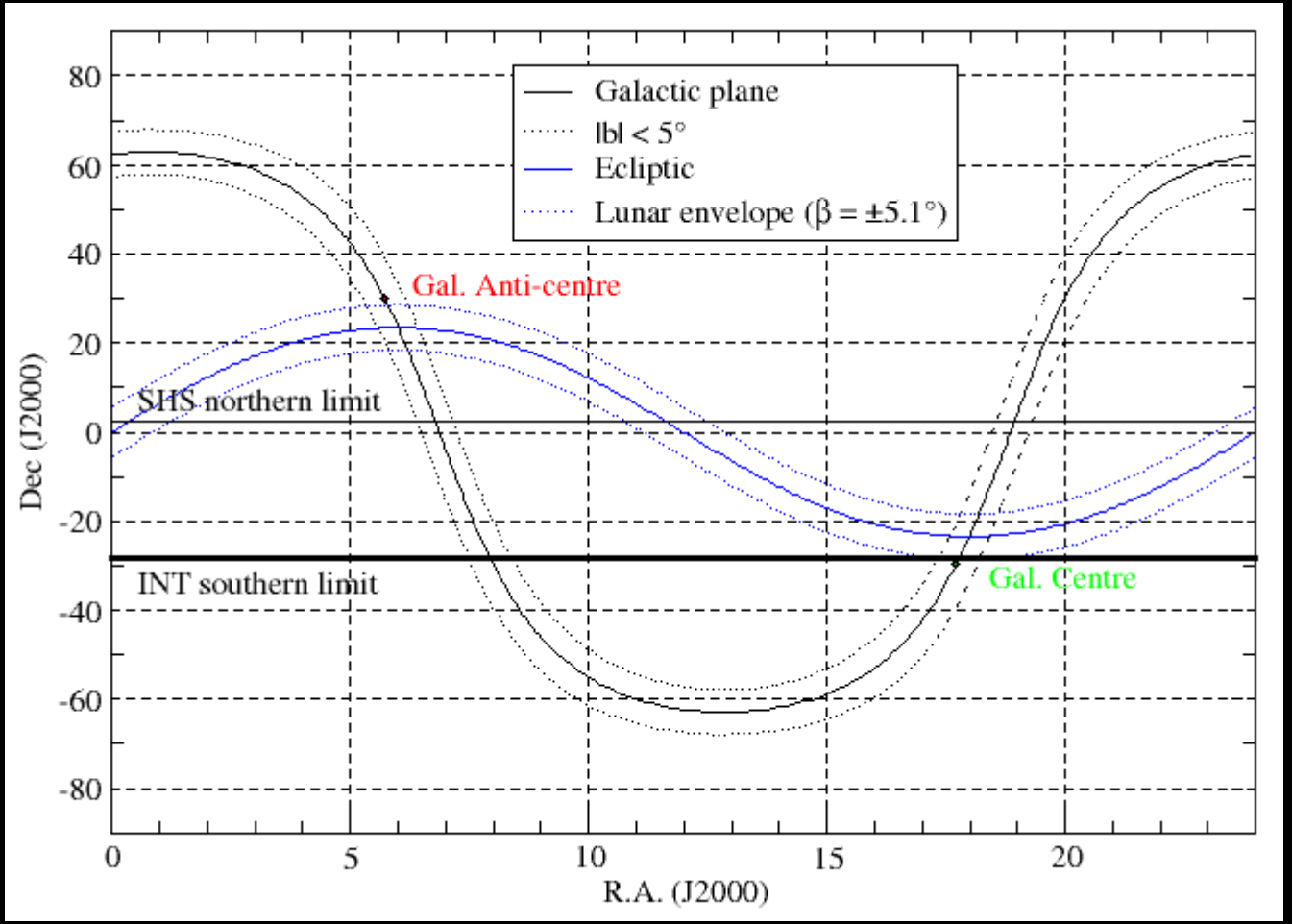
- Observations started in 2003
- Mostly bright time
- Field/Offset Field strategy
  - Covers CCD gaps
  - Provides overlap for calibration
  - Ensures 2 measurements / source
- 7635 fields
- 15270 pointings
- Area finished on 08. Dec. 2008
- **Reobservations ongoing**
- Final Data Quality criteria
  - FWHM < 2 arcsec
  - Ellipticity < 0.2



Credit: Mike Irwin

Observed fields/year

Year	IPHAS
2003	4260
2004	5149
2005	5787
2006	2678
2007	2467
2008	1476
2009	1457
2010	410
2011	-



Observing “Problems”:

- Moon passes through plane near anti-GC => dark time
- Winter weather in La Palma

Unfortunately both issues correlate

IPHAS – Observing

IPHAS Object selections to date mainly based on field pairs:

- Emitters (Witham et al., 2008)
- Symbiotics (Corradi et al., 2008)
- Point source PNe (Viironen et al., 2009)
- Extended PNe (Sabin et al., unpublished)
- ERSOs (Wright et al., 2008)
- High Proper Motion IPHAS-POSS I (Deacon et al., 2009)
- Accreting low mass stars (Valdivielso et al., 2009)
- Variable Stars (Greimel, unpublished)

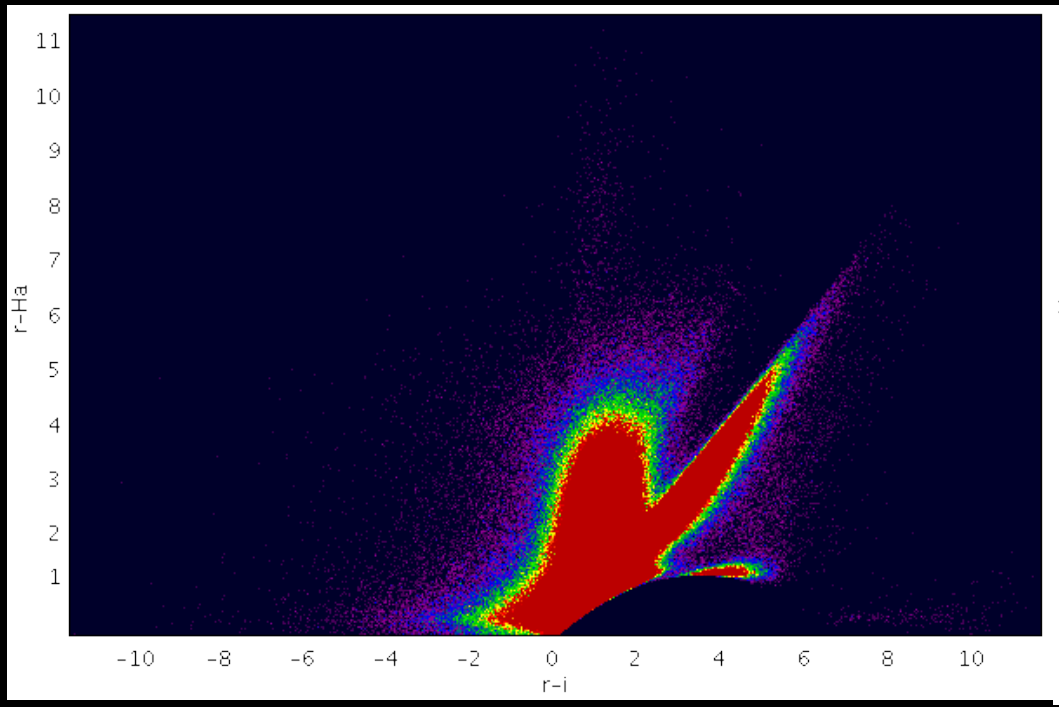
Global selections require **global** calibration
=> work ongoing (see talk by Brent Miszalski)

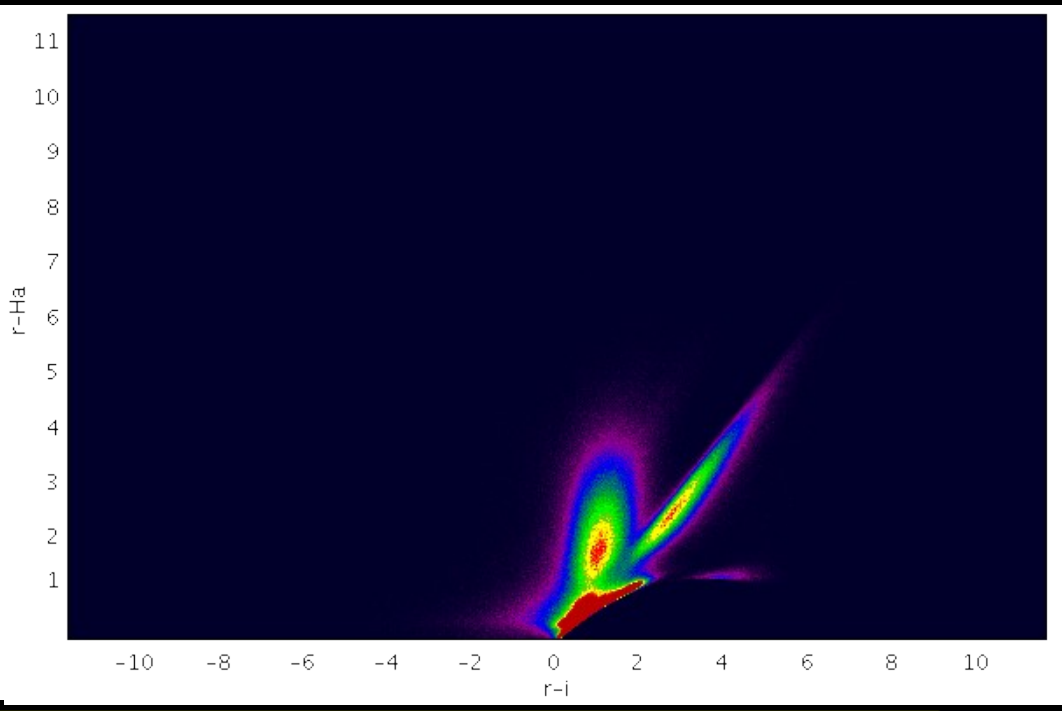
Global calibration also delivers important information about fields that need to be reobserved. (Currently ~160 field pairs, ~ 2 % of the survey area).

IPHAS – Source Catalogues

Global selection of Halpha Emitters

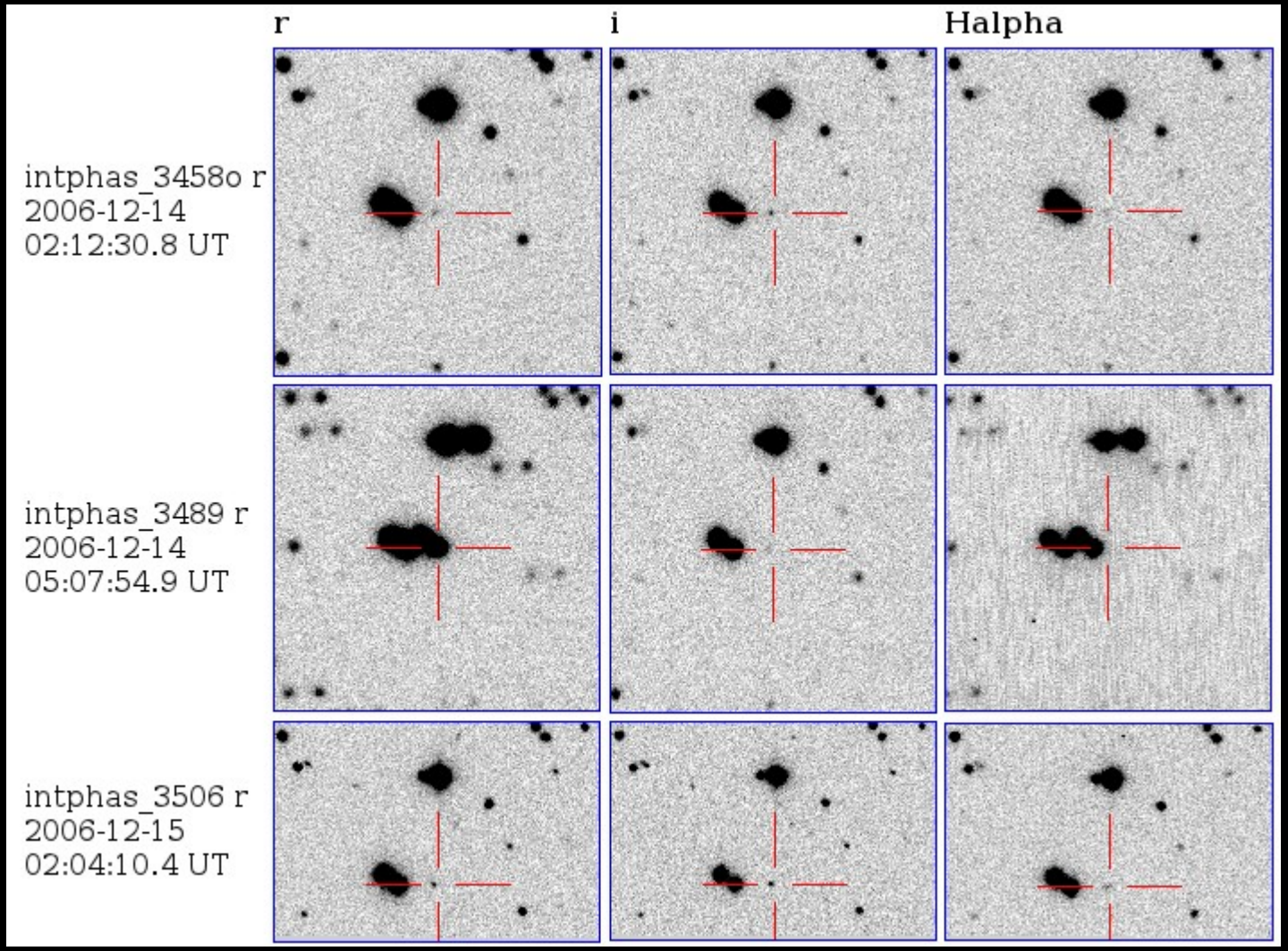
- Apply photometry offsets from global calibration
- Select stellar sources (class -1 or -2) in all bands
- r-Ha > 0.06 and
- r-Ha > -0.015 + 0.675*(r-i) -0.098*(r-i)^2 + 3*sigma(r-Ha)
- => **3242449** Measurements selected
- Clearly lots of garbage -> look at stamps of outliers





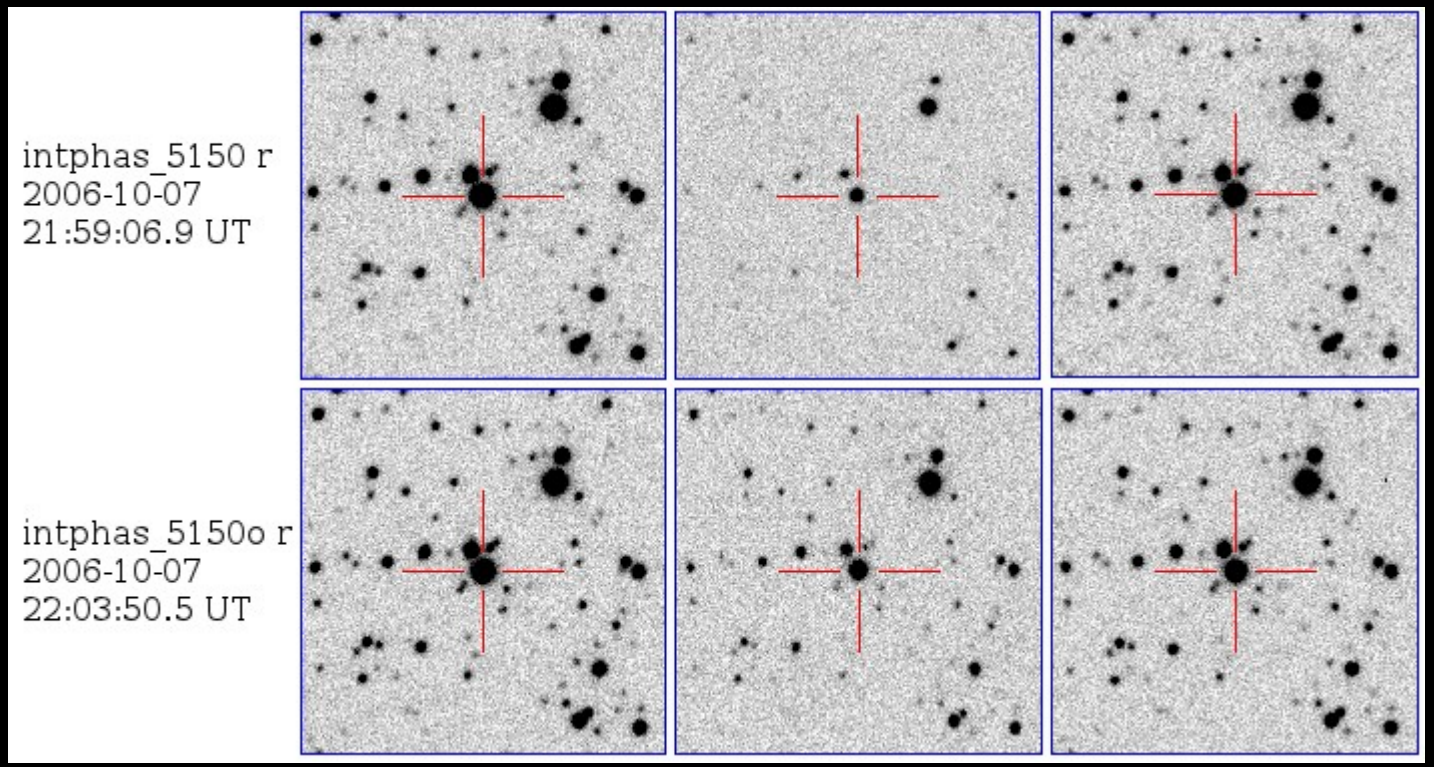
IPHAS – Example Selection Emitters

Data Problems – Mirror Oscillation -> reobserve



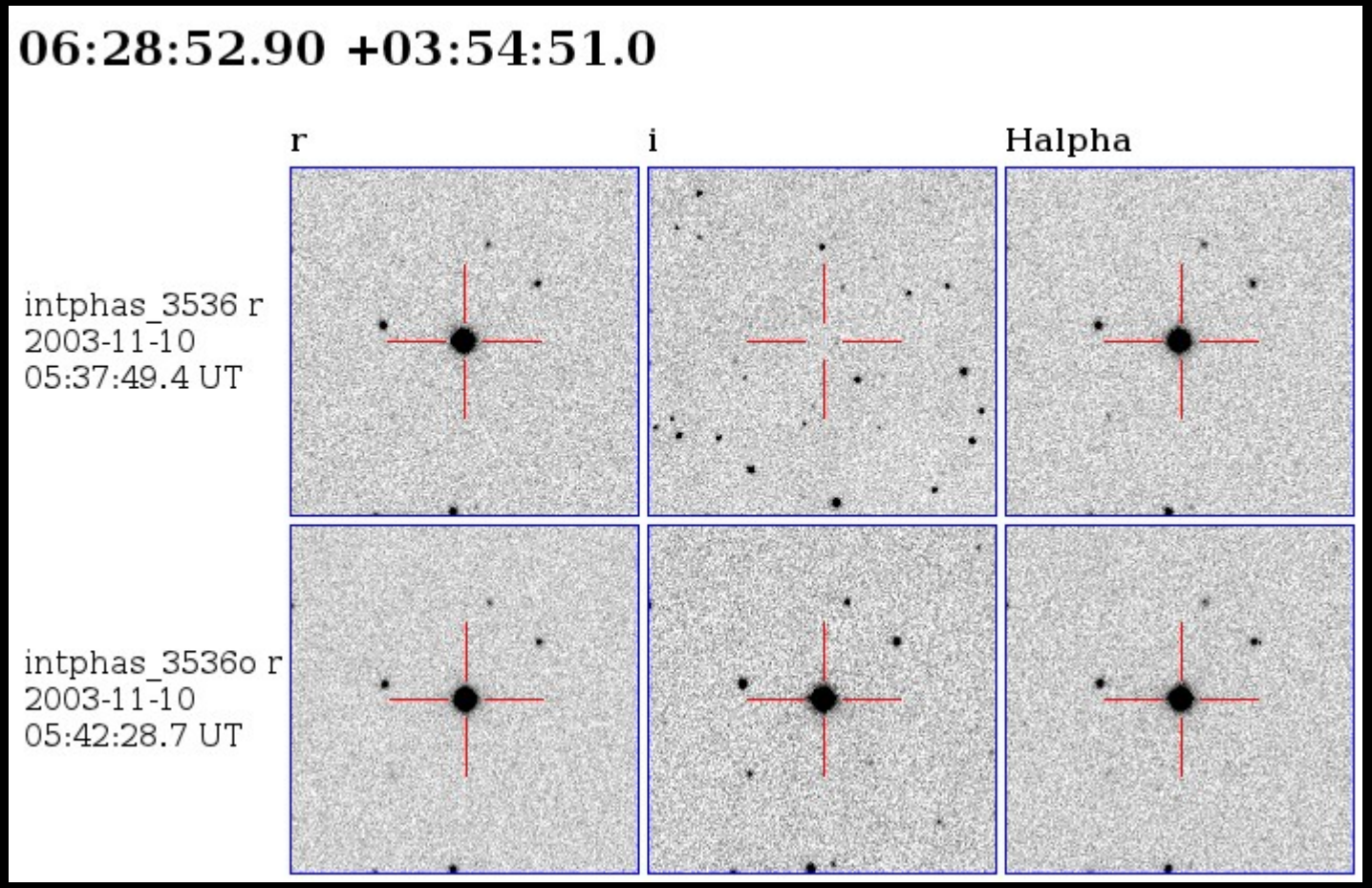
IPHAS – Example Selection Emitters

Data Problems – Clouds -> reobserve



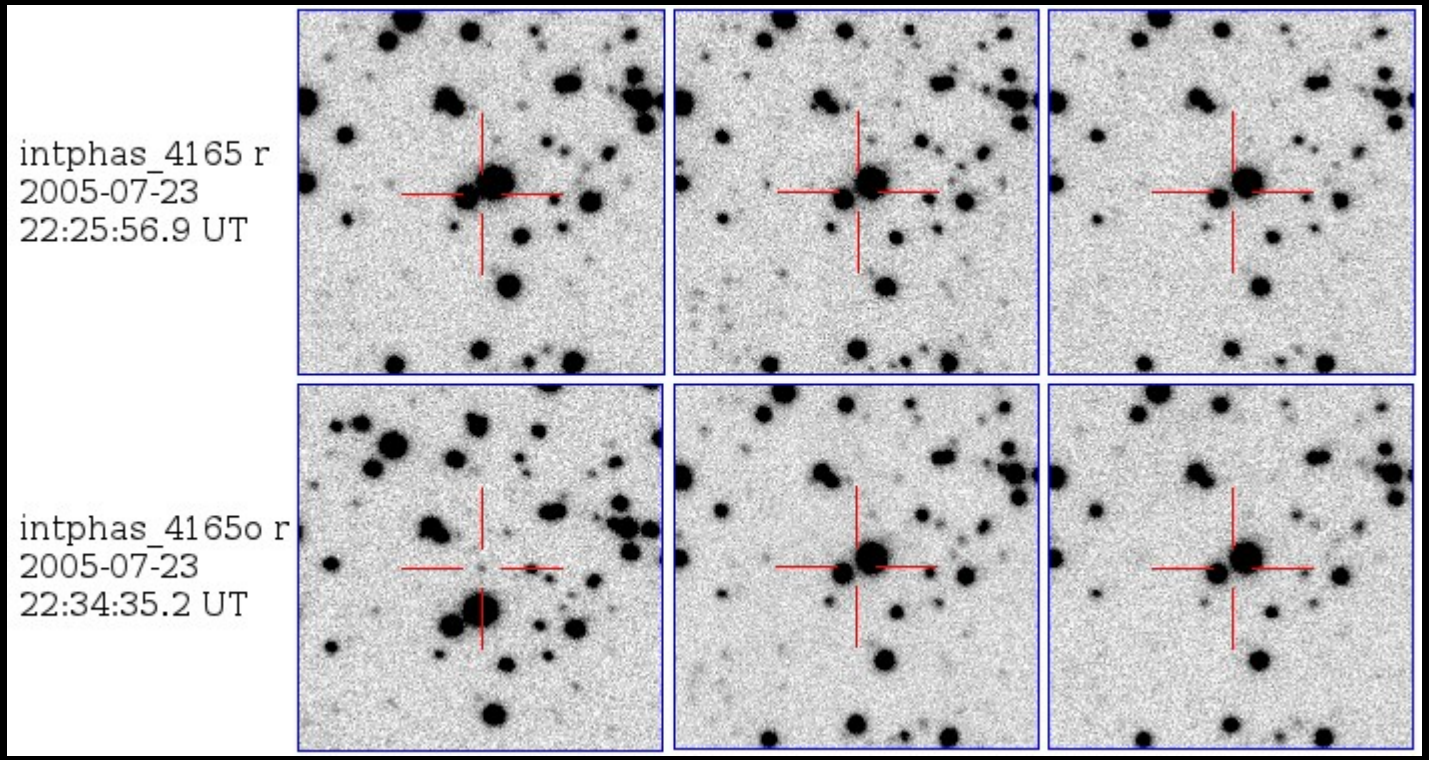
IPHAS – Example Selection Emitters

Data Problems – Astrometry -> recreate catalog



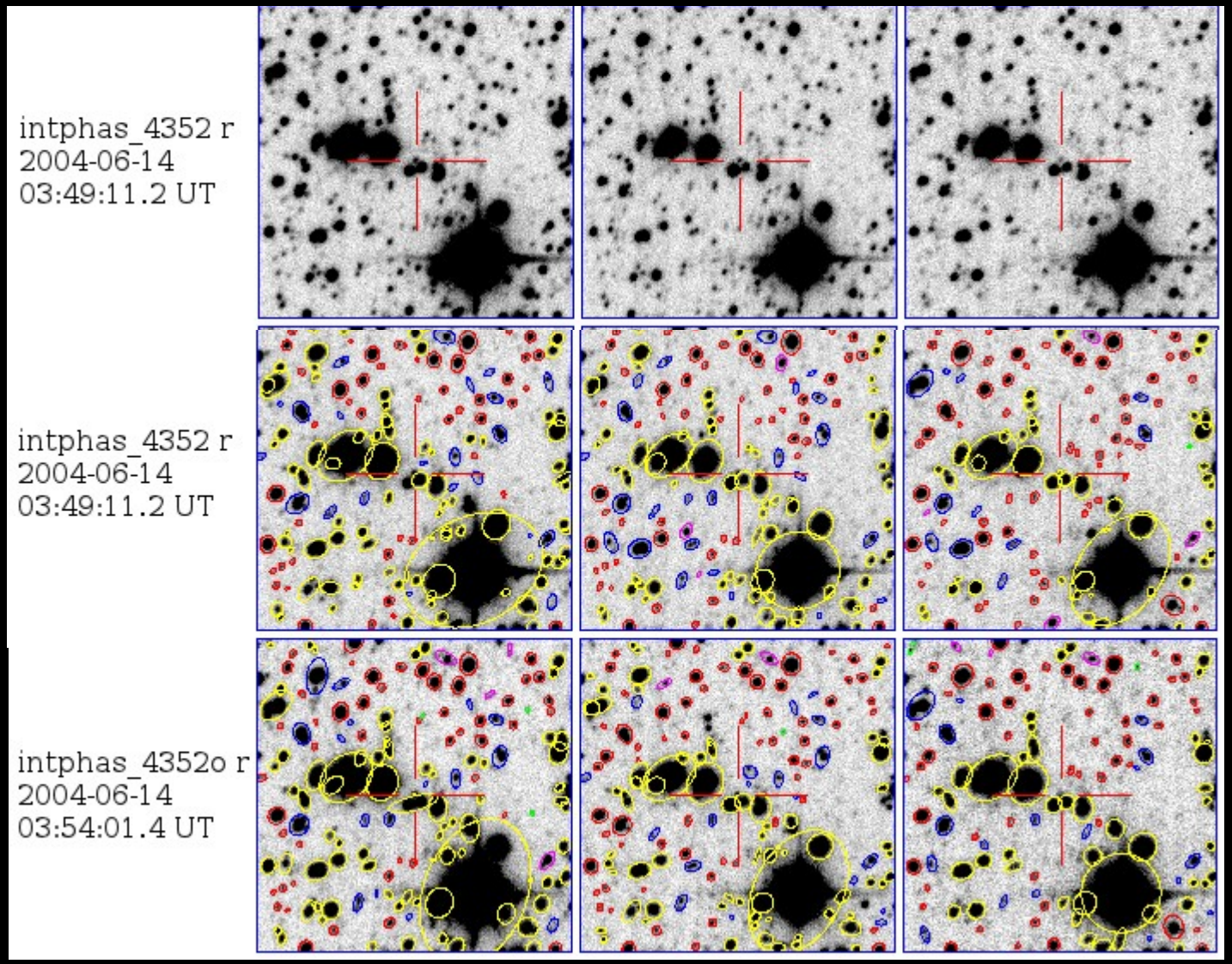
IPHAS – Example Selection Emitters

Data Problems – Astrometry -> recreate catalog



IPHAS – Example Selection Emitters

Data Problems – Source detection/matching
-> get Mike to improve Software ;-)



IPHAS – Example Selection Emitters

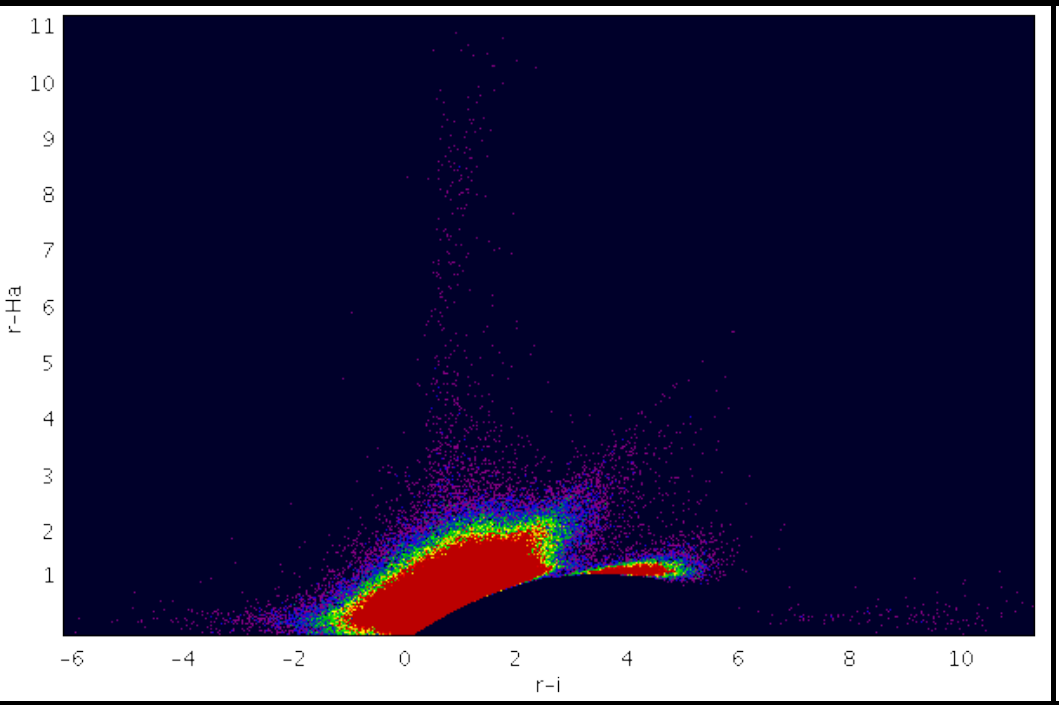
- Looking at outliers is important for QC (finding bad data), but will not significantly reduce candidates.
- It will however provide hints on selection refinements that should drastically reduce the number of candidates

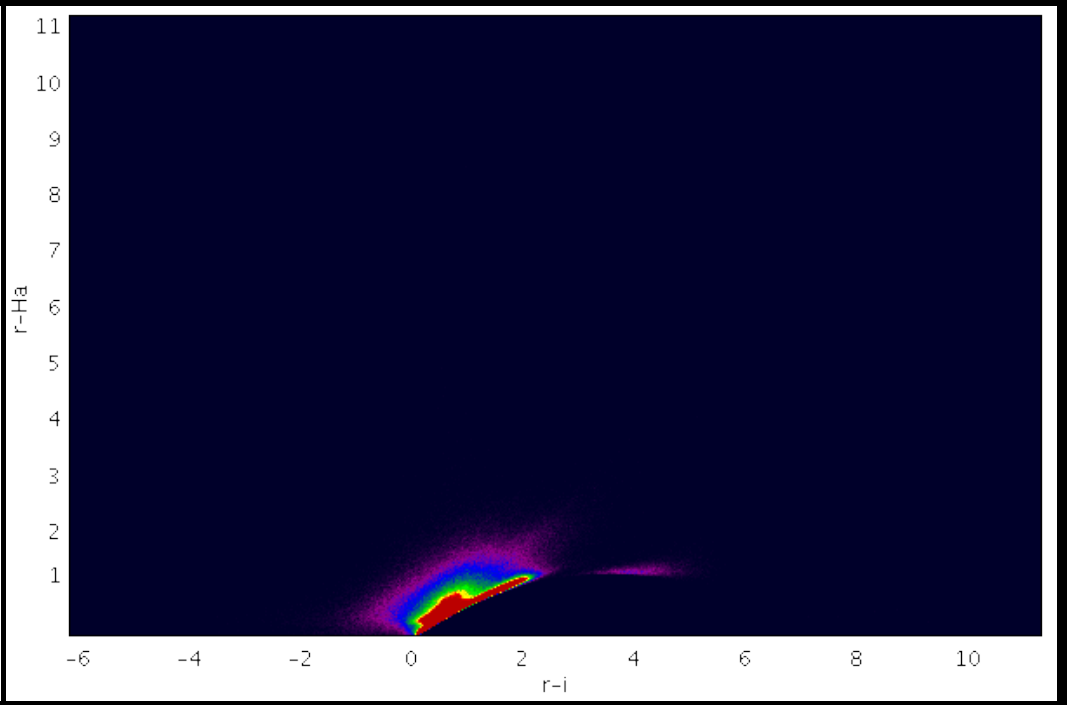
For example:

#candidates	%	selection refinement
3242449	100	initial selection
3091324	95	mag<22
2618597	81	mag<21
2656680	82	dpos<0.5 arcsec
2402369	74	dpos<0.1 arcsec
2369305	73	single (magnitude only assigned to 1 object)

IPHAS – Example Selection Emitters

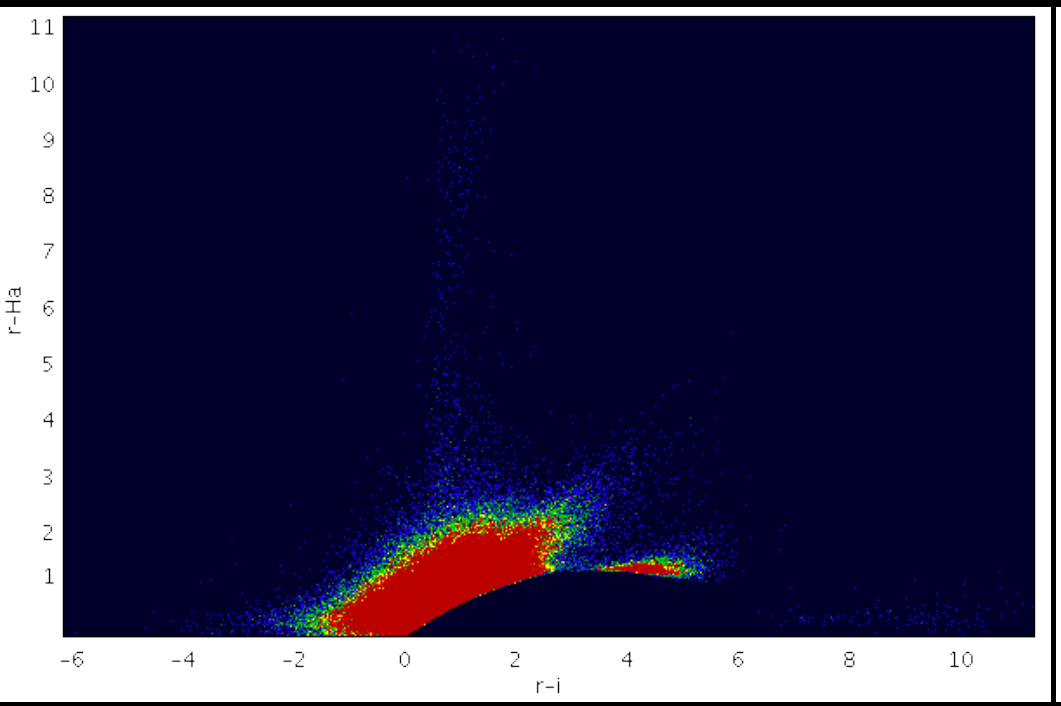
- Apply single, mag<22 and dpos<0.5 arcsec
- => **2337974 (72%)** Measurements selected
- Outliers clearly much reduced, but still too many candidates
- Natural spread of unreddened main sequence
  => add offset to r-Ha selection criterion

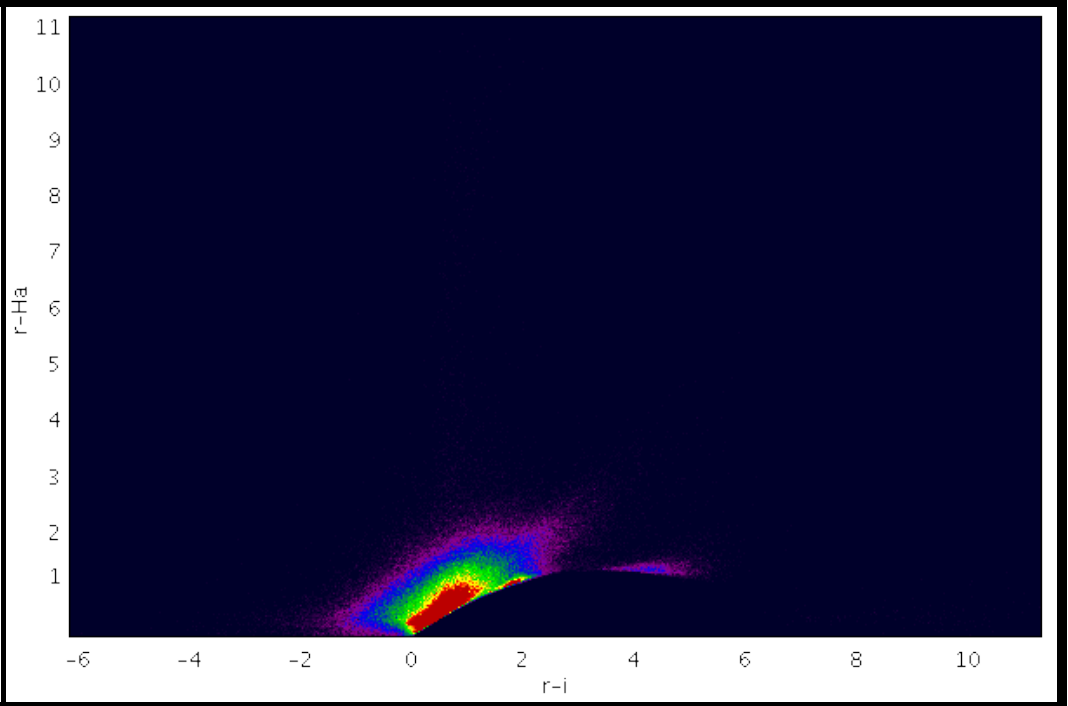




IPHAS – Example Selection Emitters

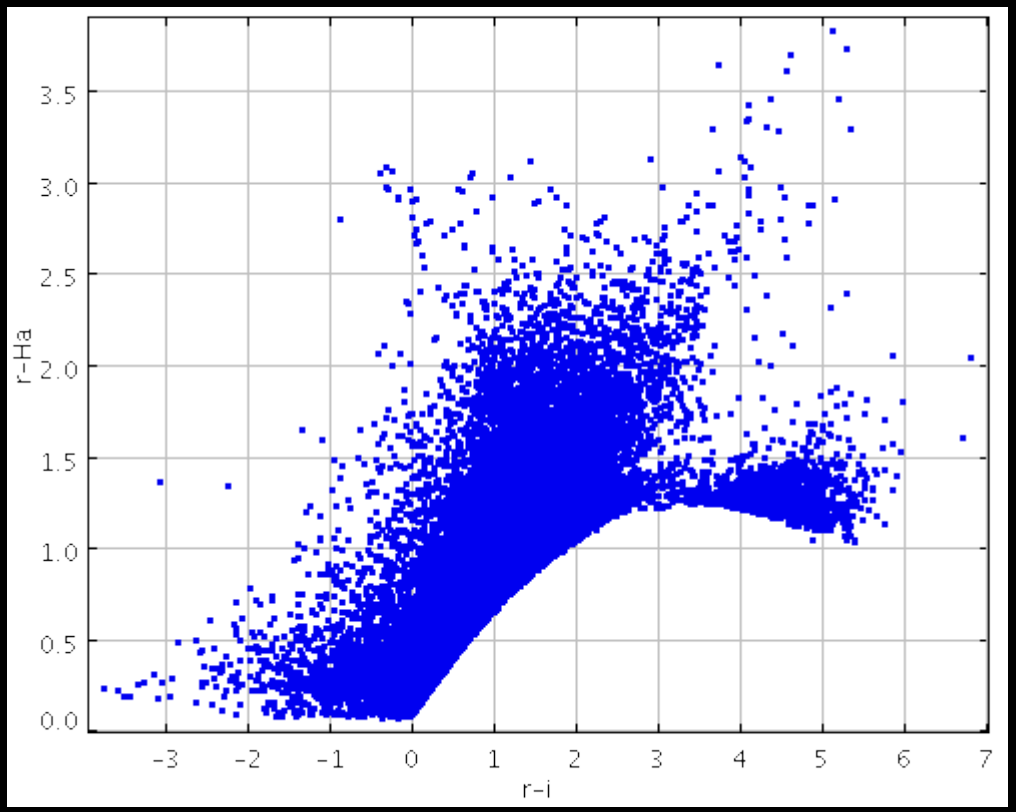
- Apply single, mag<22 and dpos<0.5 arcsec (as before)
- Shift selection line upward by 0.075 mag in r-Ha
- r-Ha > **0.075** -0.015 + 0.675*(r-i) -0.098*(r-i)^2 + 3*sigma(r-Ha)
- => **233532 (7.2%)** Measurements selected
- Much improved numbers, but still impossible outliers
- => require (at least) two detections/source

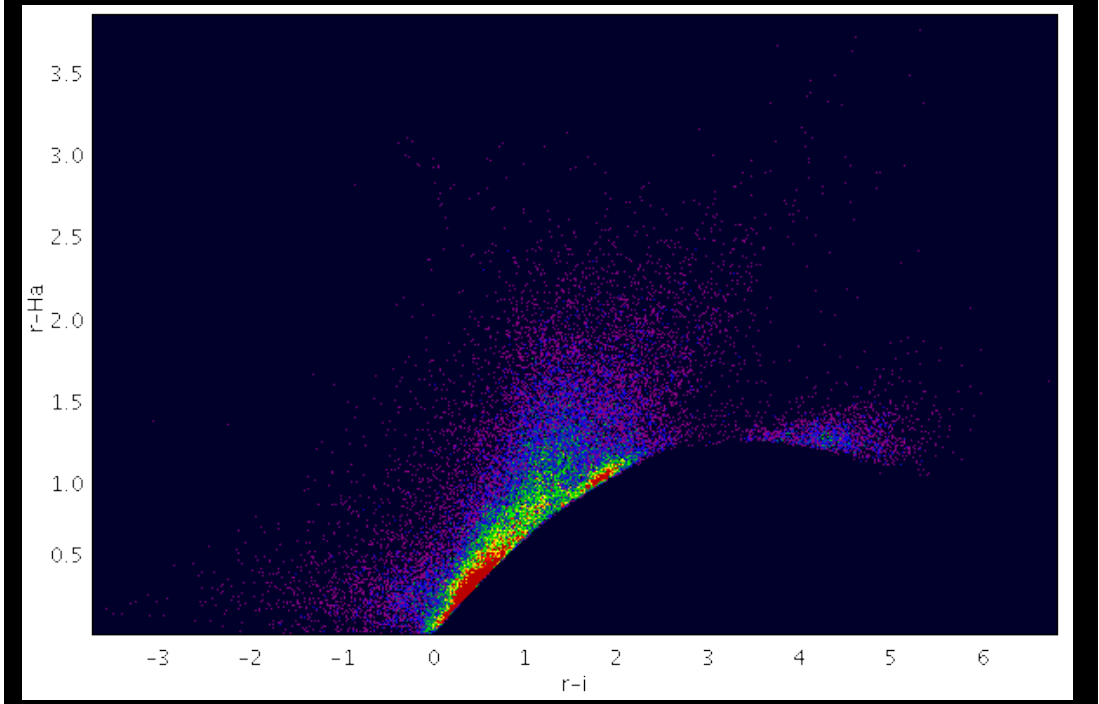




IPHAS – Example Selection Emitters

- Apply single, mag<22, dpos<0.5 arcsec, shift r-Ha 0.075 (as before)
- Require (at least) two selected measurements/source
- => **46134 (1.4%)** Measurements selected
- => **21681** candidate emission line stars
- Note reduced colour range of candidates in final selection
- Further check on extreme outliers necessary

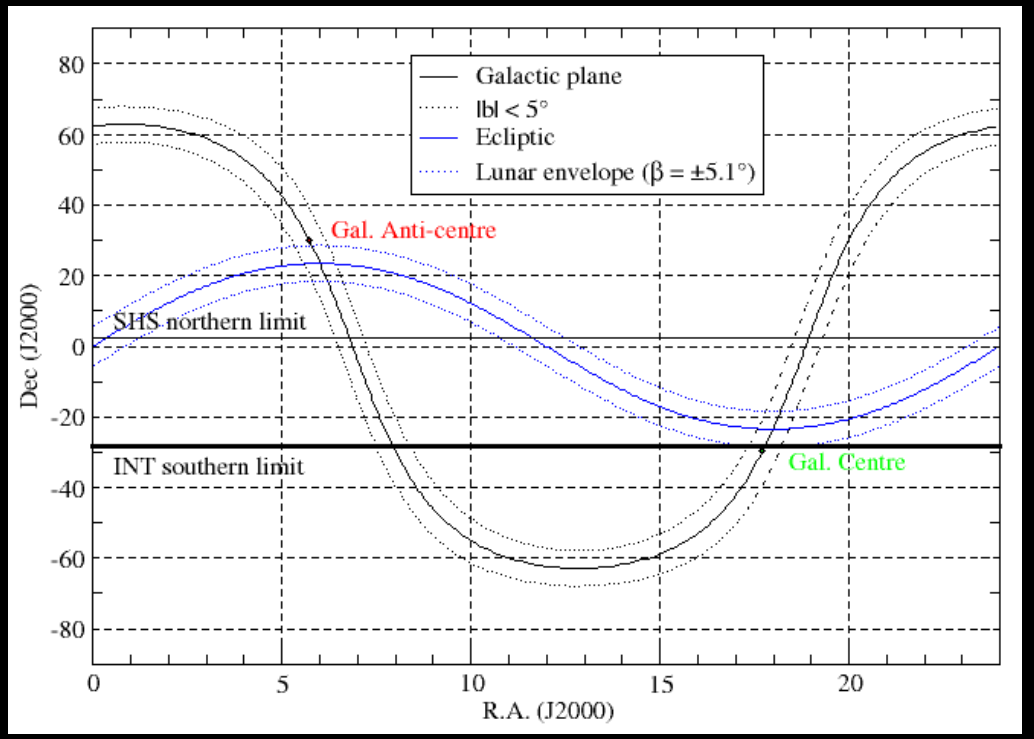




IPHAS – Example Selection Emitters

Asteroids in IPHAS

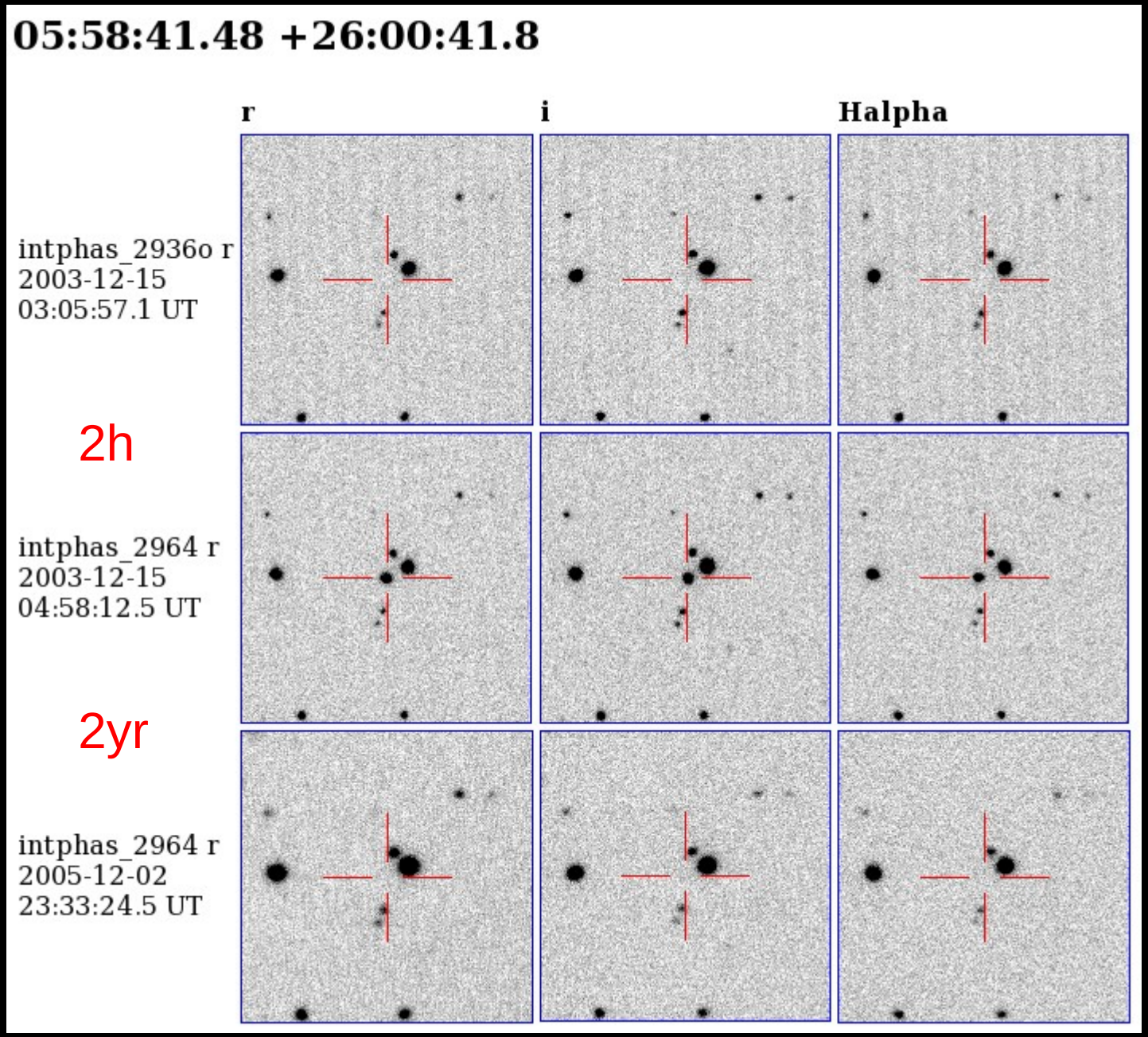
- Ecliptic crosses the galactic plane close to the GC and anti-GC.
- Up to ~10/asteroids per IPHAS image
- Main belt asteroids move with dRA< 45”/hr, dDec<20”/hr
- 3 Minutes between Halpha and i image (mid exposure)
  -> movement is < 2.5” or 8 pixel
- Movement during exposures:
  Halpha<1.6”, r<0.28”, i<0.14”
- Most asteroids will appear stellar and as one object in the merged catalogue



IPHAS – Asteroids

Asteroid
(13812) 1998 YR
r~17 mag

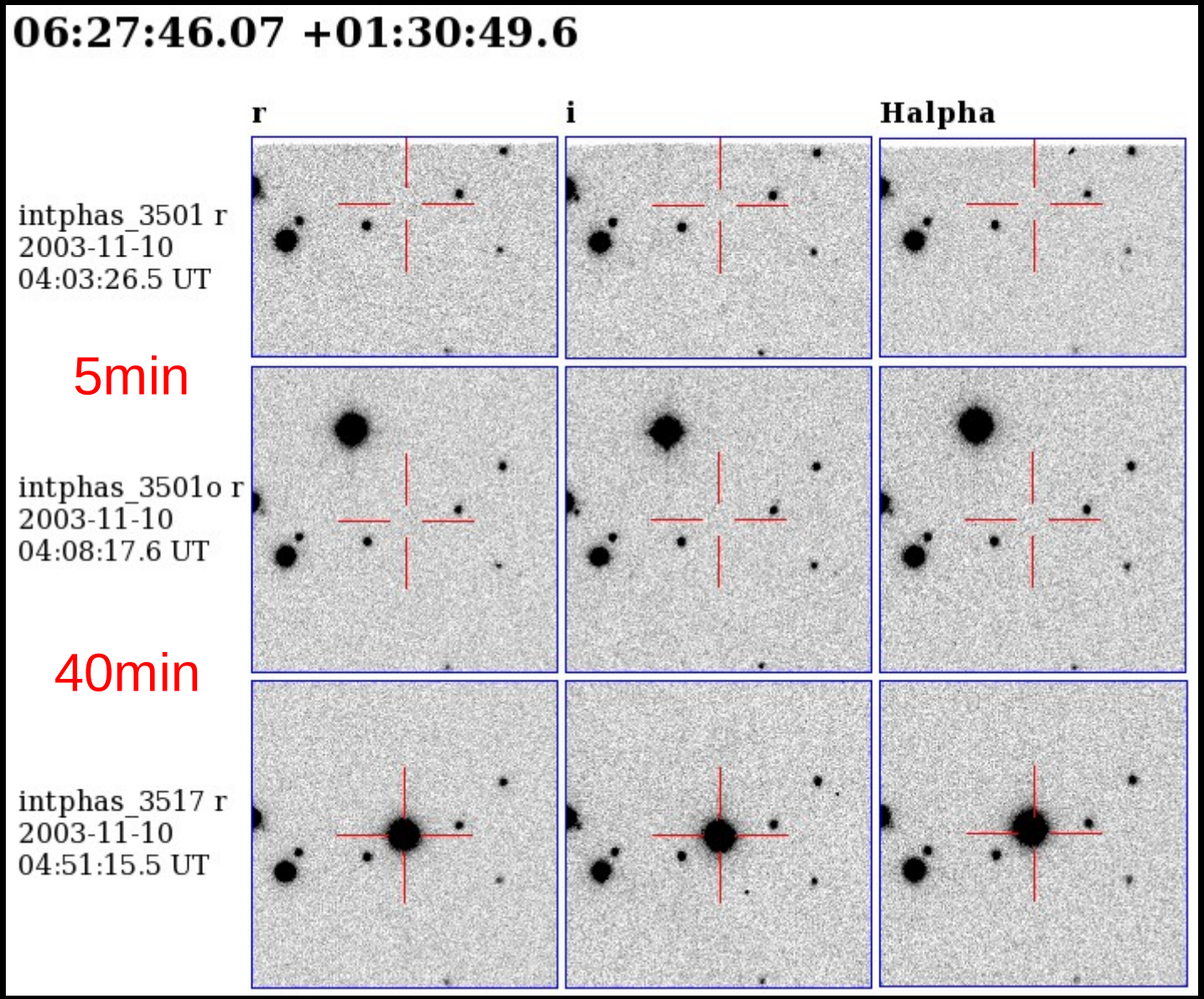
- Not visible in top and bottom images
- Position shifts between Halpha, r and i image
- If this was a variable star it would have to brighten from r>22 to r~17 mag in less than 2 hours
- At MPC expected position



IPHAS – Asteroids Examples

Asteroid
(25) Phocaea
r~12 mag

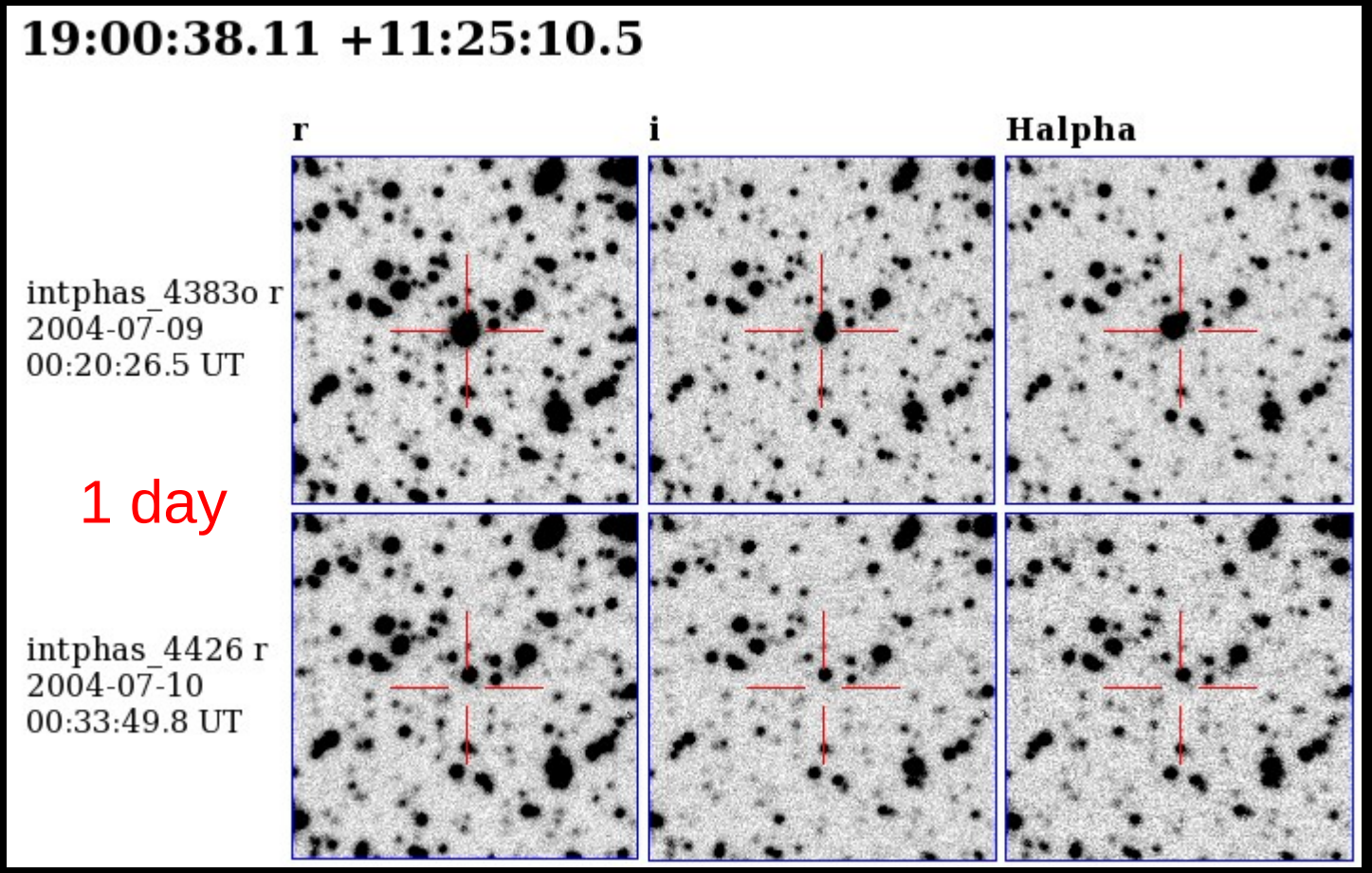
- The brightest asteroid found on IPHAS images
- Position shifts between Halpha, r and i image
- Visible in middle and bottom images



IPHAS – Asteroids Examples

Asteroid
(1263) Varsavia
r~15 mag

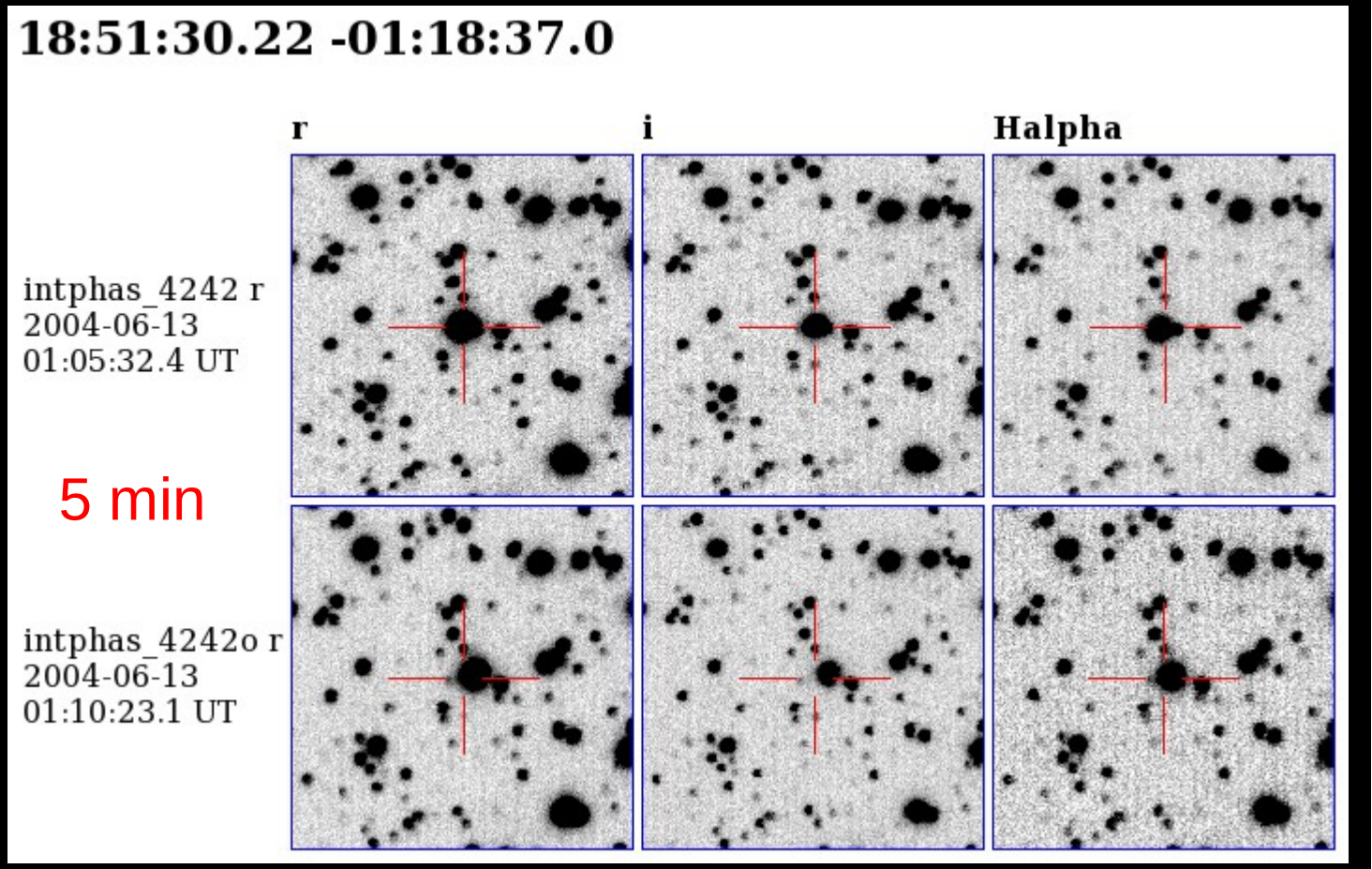
- More crowded area closer to GC
- Visible in first but not in second set of images



IPHAS – Asteroids Examples

Asteroid
(1031) Arctica
r~14 mag

- More crowded area closer to GC
- Visibly moved within and between set of IPHAS images



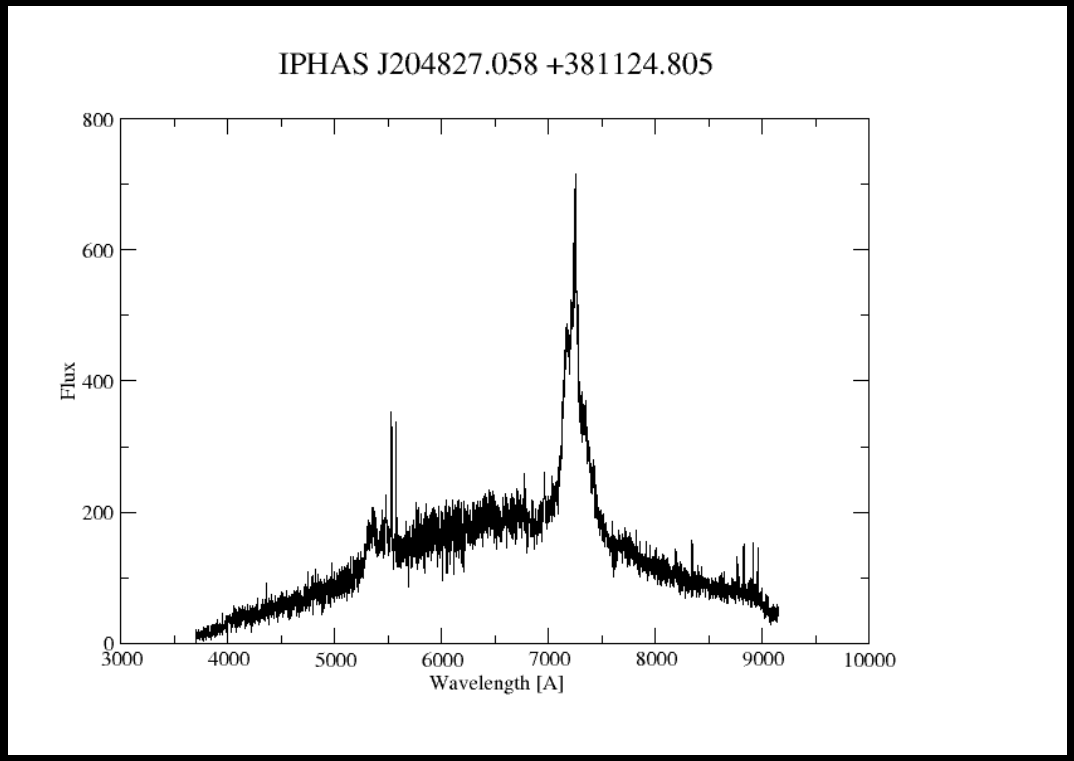
IPHAS – Asteroids Examples

Things To Do:

- Check all IPHAS (and UVEX) observations for known asteroids
- Search for unknown fast moving objects
  - Select sources that shift in the same direction between Halpha and r images and between r and i images. (Problem: Seeing, astrometric accuracy, ...)
  - Select (bright) sources that are visible only at one epoch
- Report positions to MPC

QSOs in IPHAS

An odd source from spectroscopic follow up



=> QSO at z=0.105 (Chris Benn)

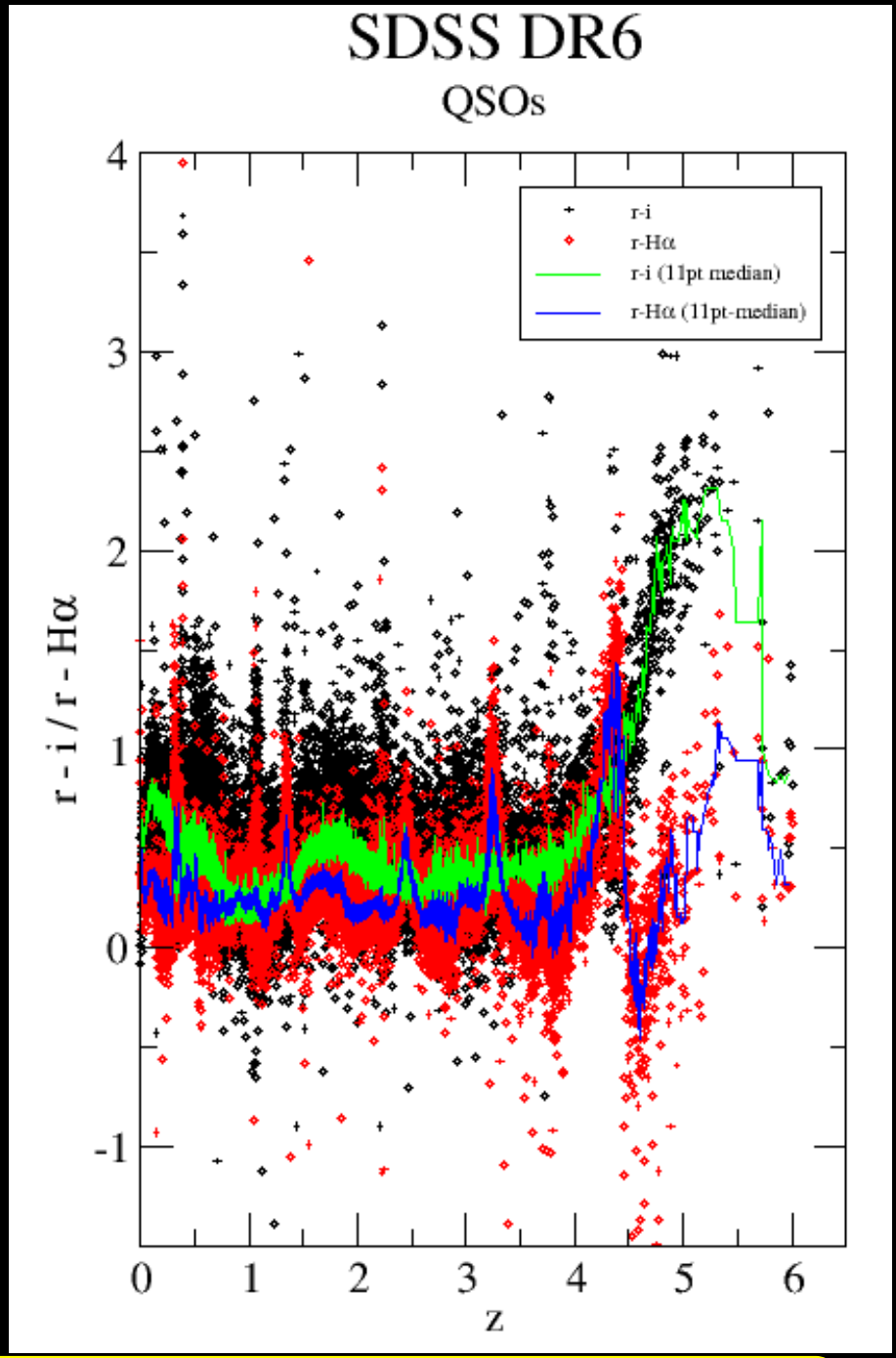
Where do QSOs appear in the IPHAS colour-colour diagram ?

IPHAS – QSOs

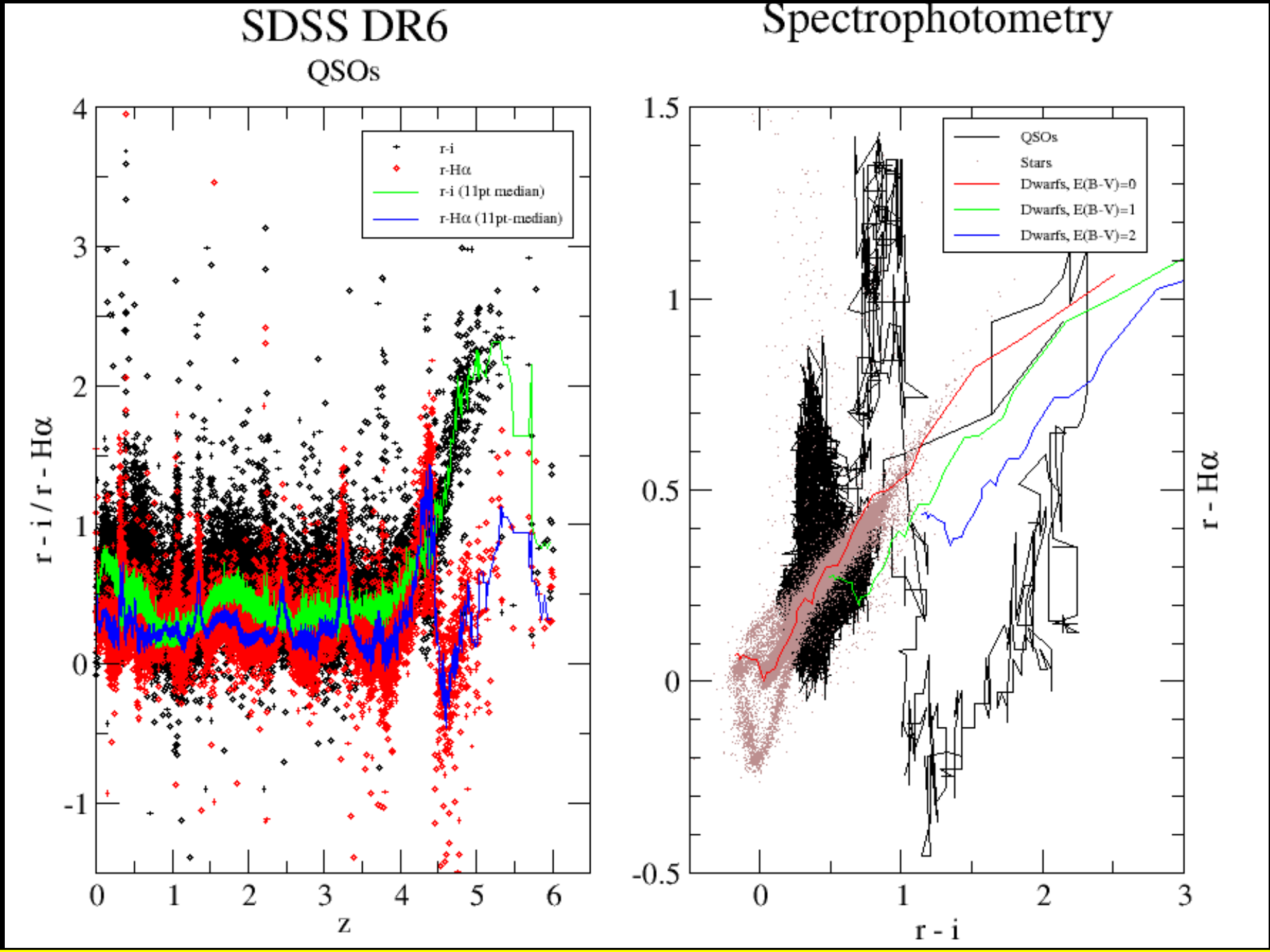
- Best source for QSO spectra is SDSS
- Fold SDSS spectra with IPHAS filter curves and CCD
- Look at resulting colours as a function of redshift

<u>r-Halpha</u>
Peaks at redshifts where emission lines are shifted into Halpha filter:
z=0.32 OIII
0.35 Hbeta
0.51 Hgamma
2.44 CIII
3.27 CIV
4.41 Ly Alpha

r-i mostly “constant”, Ly Alpha at z~4-5



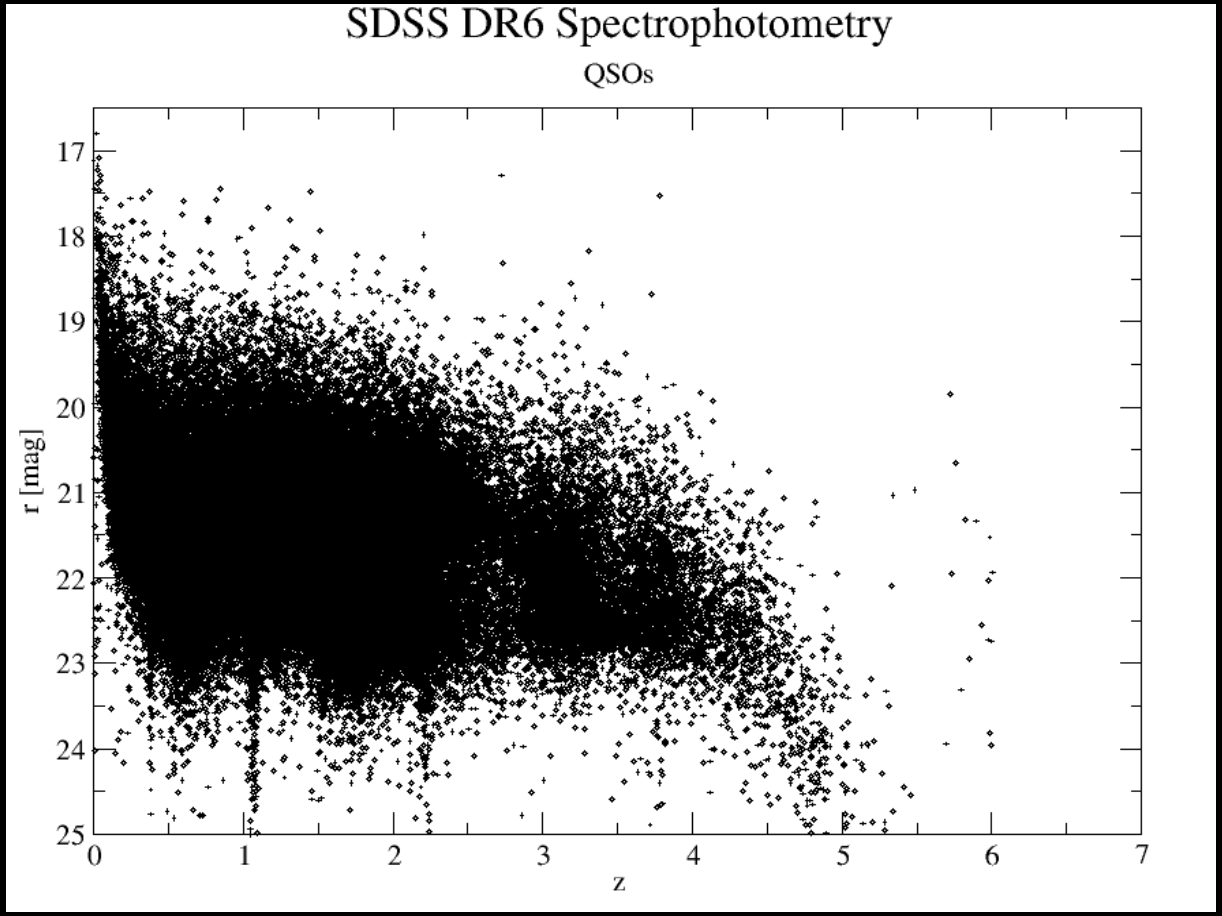
IPHAS – QSOs


SDSS DR6
QSOs
r-i
r-Hα
r-i (11pt median)
r-Hα (11pt-median)
r - i / r - Hα
z
Spectrophotometry
QSOs
Stars
Dwarfs, E(B-V)=0
Dwarfs, E(B-V)=1
Dwarfs, E(B-V)=2
r - Hα
r - i

IPHAS – QSOs

Is it easy to select high-z QSOs in IPHAS ?

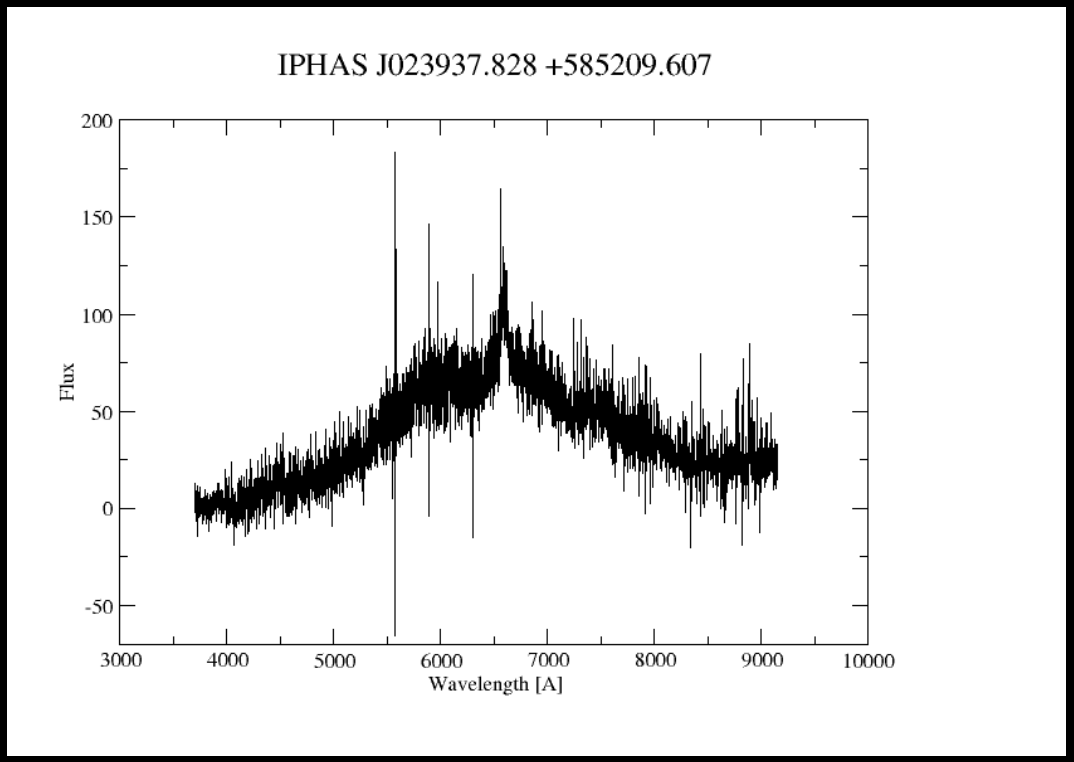
In principle yes, but ...



... they are likely too faint for IPHAS :-(

IPHAS – QSOs

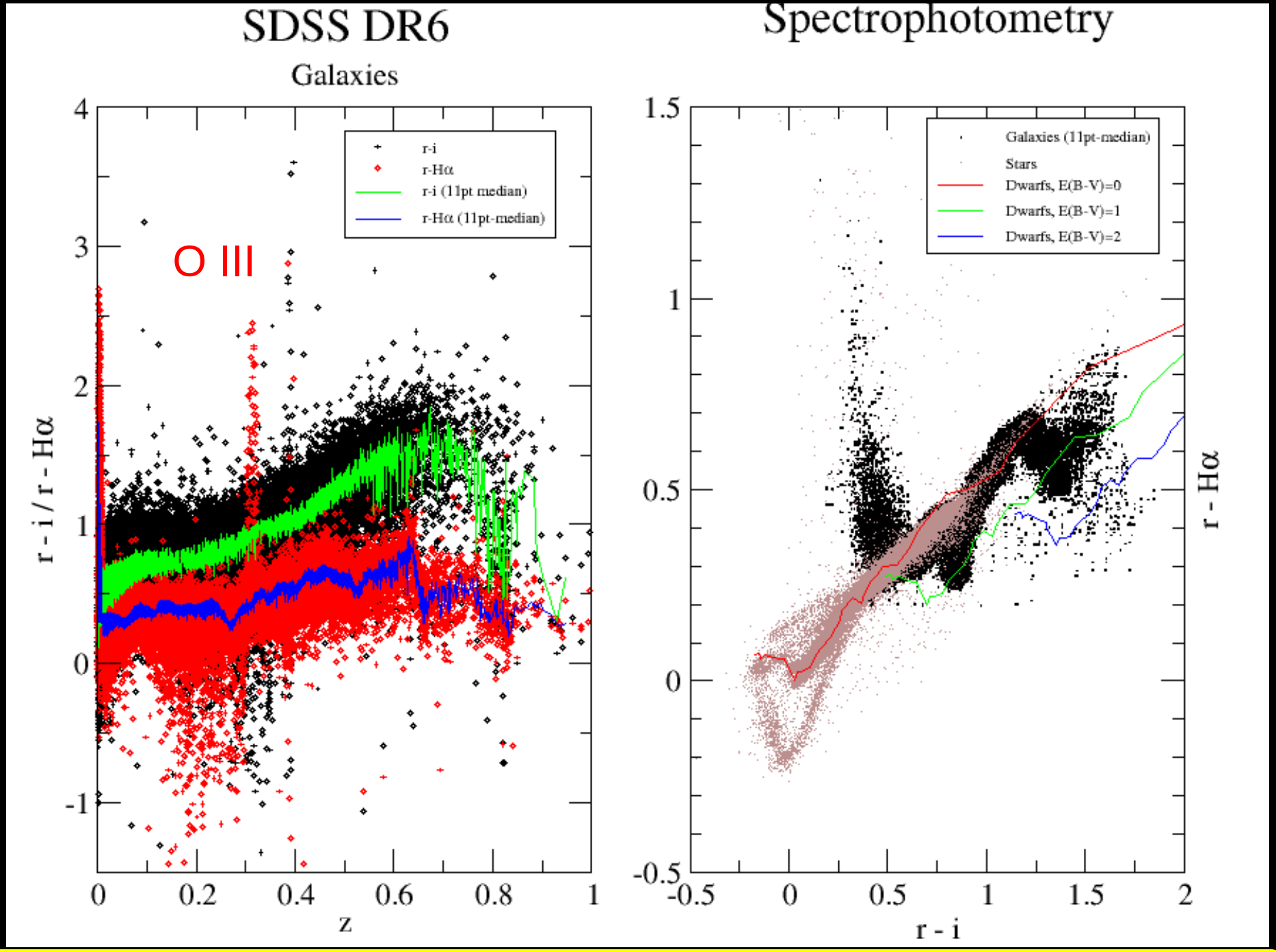
Another odd source from spectroscopic follow up



=> QSO at z=1.35 (Chris Benn)

(plus a few QSOs from UVEX spectroscopic follow up)

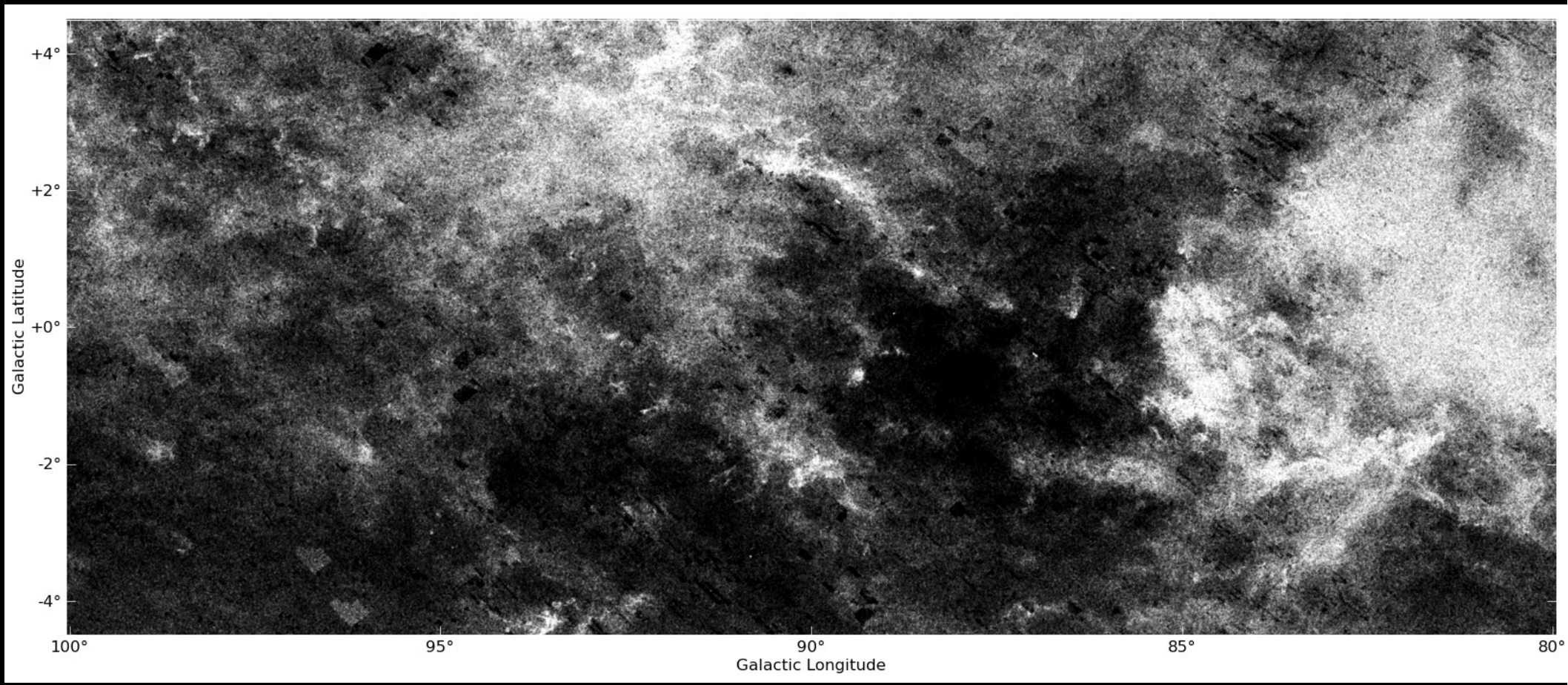
IPHAS – QSOs



IPHAS – Galaxies

IPHAS – Stellar Density Map (Hywel Farnhill, U. Hertfordshire)

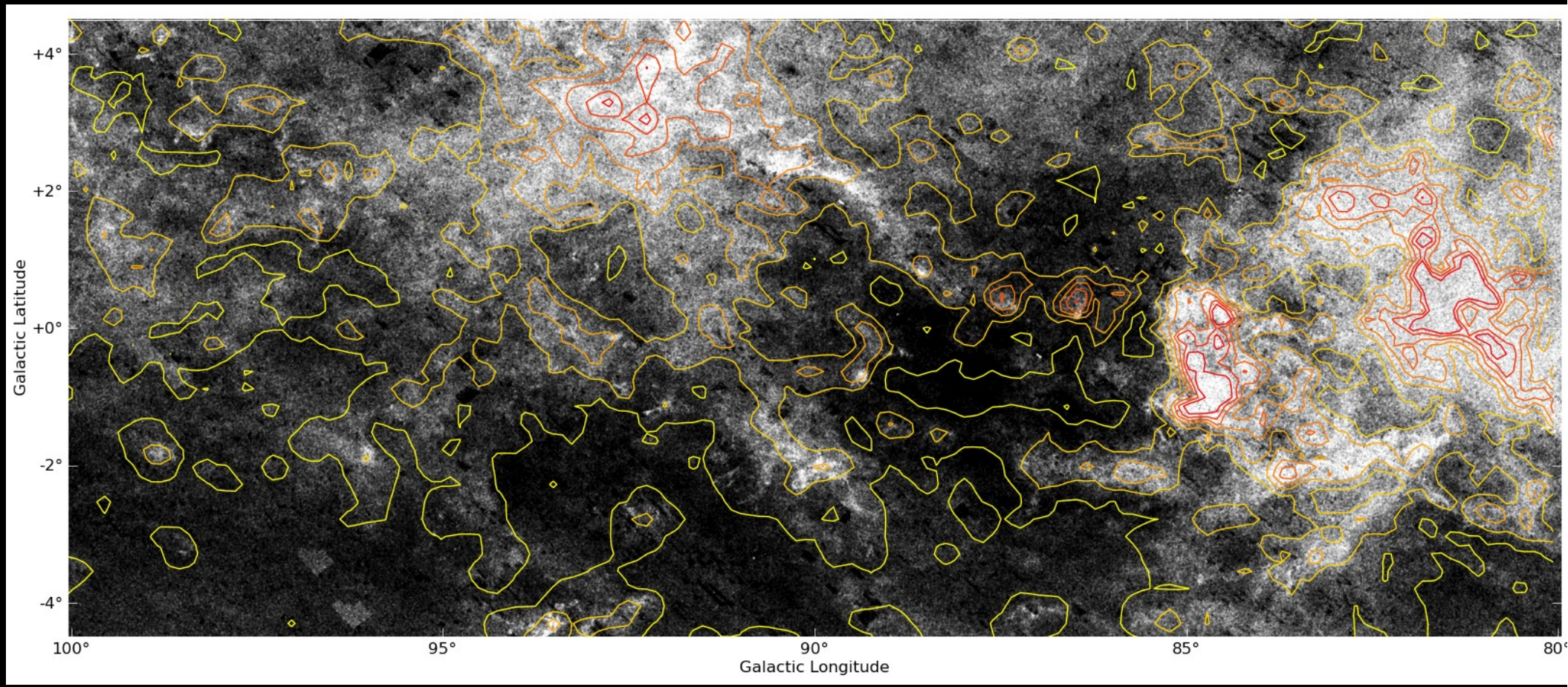
- All sources with classification -1,-2 and +1, r < 19
- Black = high density, White = low density



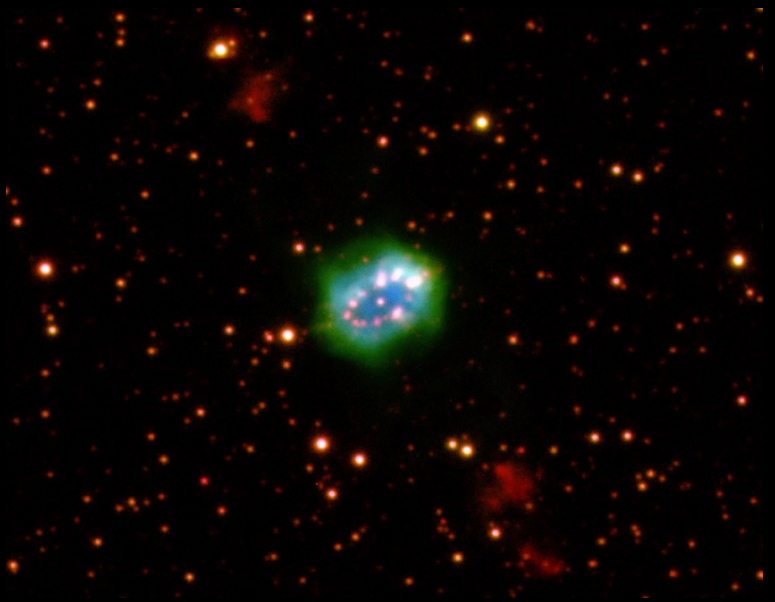
IPHAS – Stellar Density / CO Comparison

IPHAS – Stellar Density Map (Hywel Farnhill, U. Hertfordshire)

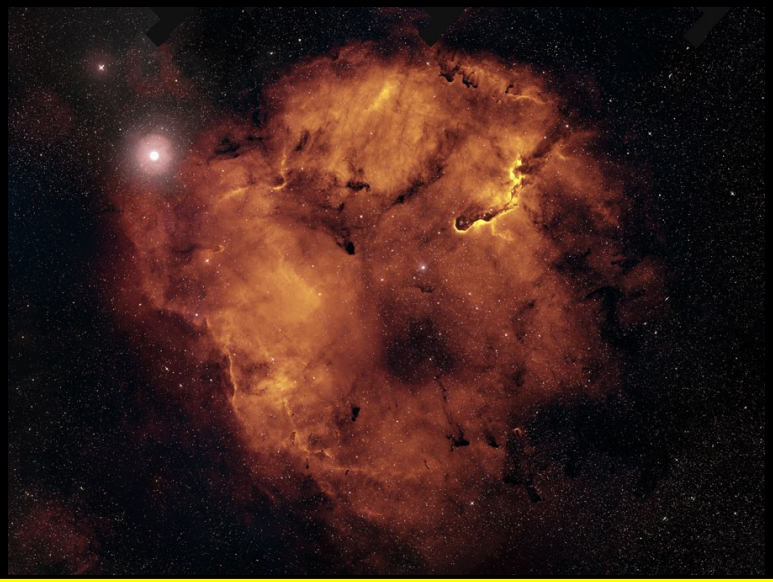
- Contours: CO-map from Dame et al., 2002
- Good **anti-correlation** of stellar density and CO



IPHAS – Stellar Density / CO Comparison



Thanks for listening :-)



The End