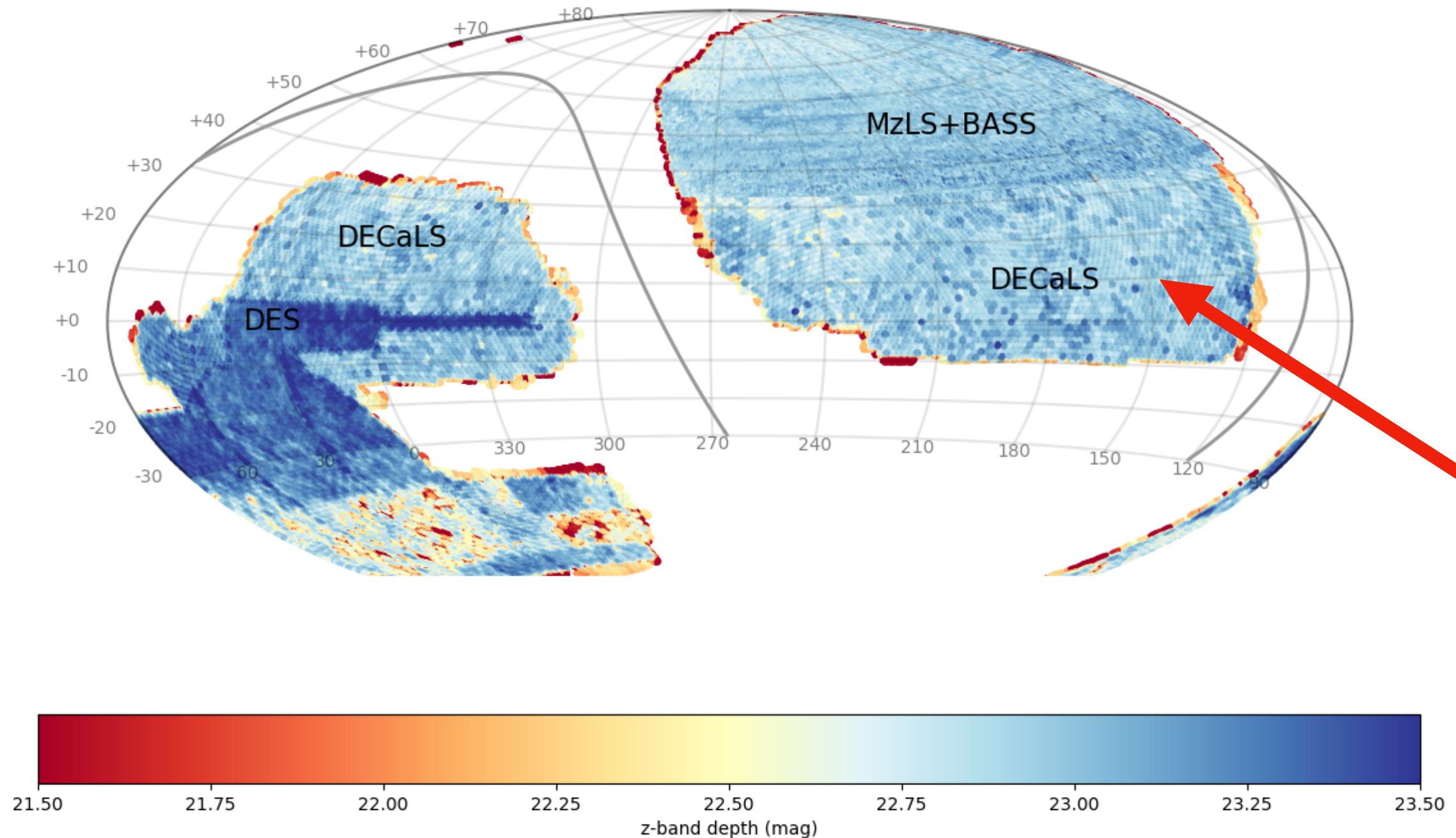


**density of reliable
WISE-only sources in COSMOS**

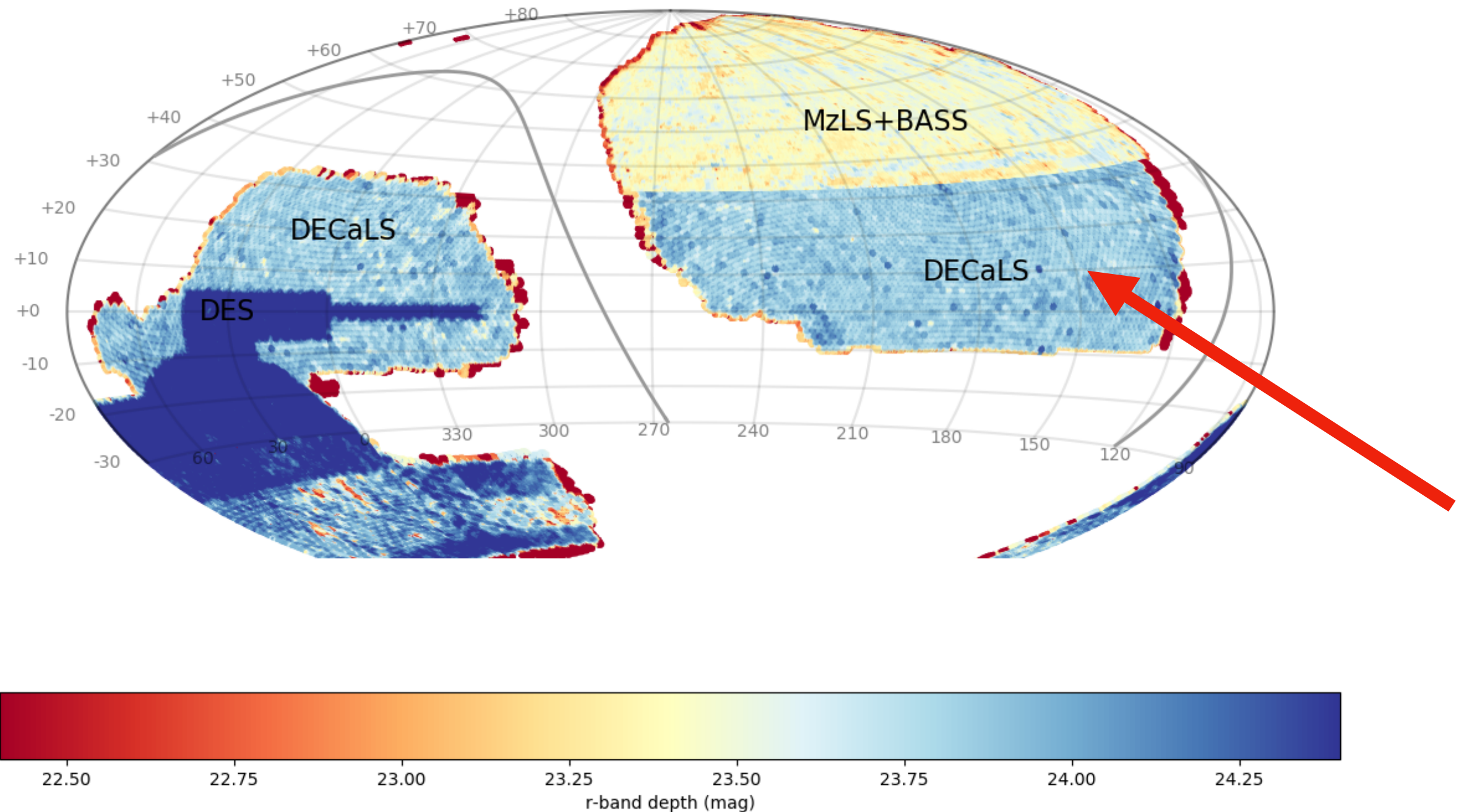
Aaron Meisner

COSMOS: a typical depth sky region in DECaLS DR8



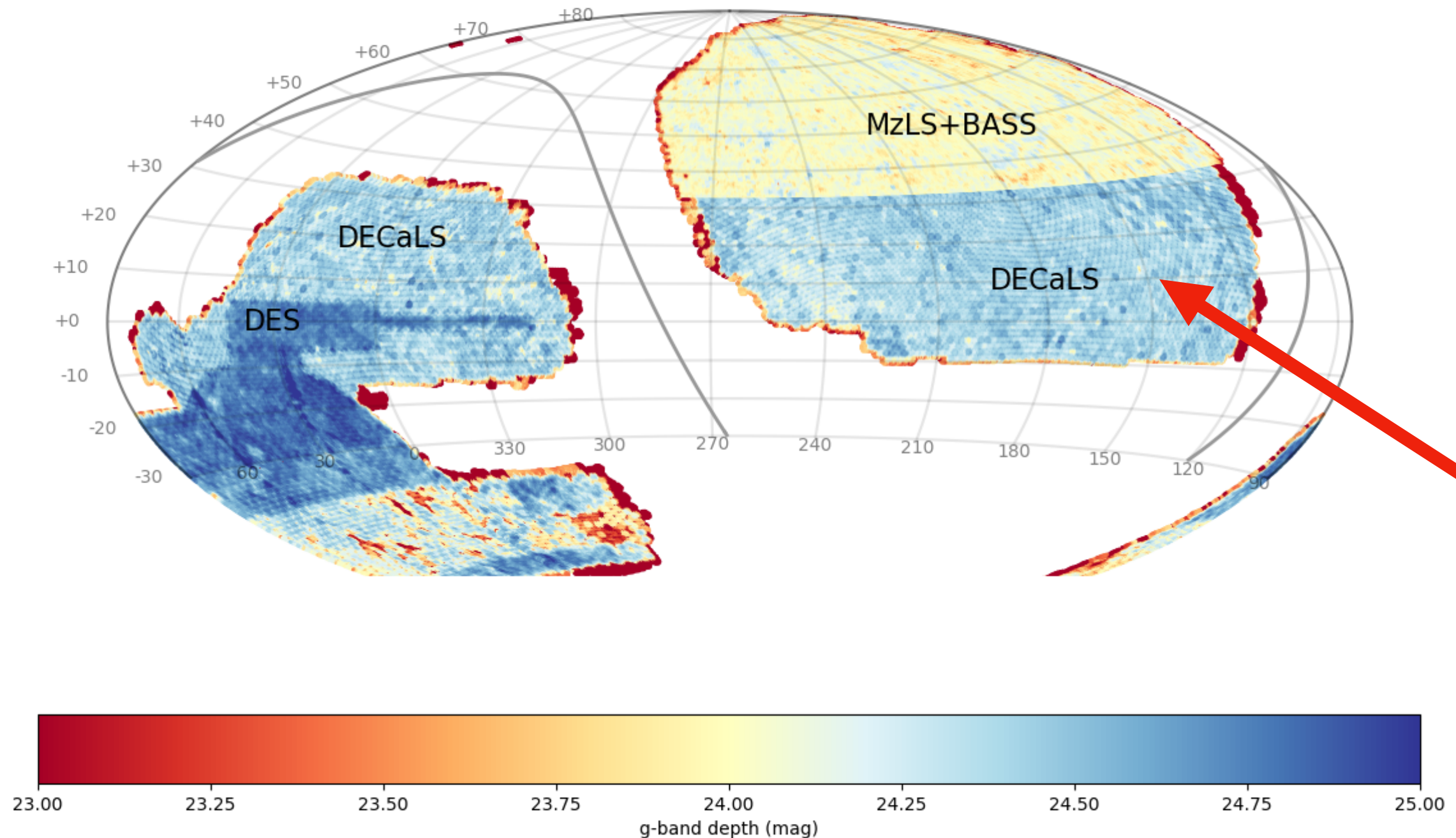
<https://www.legacysurvey.org/status/>

COSMOS: a typical depth sky region in DECaLS DR8



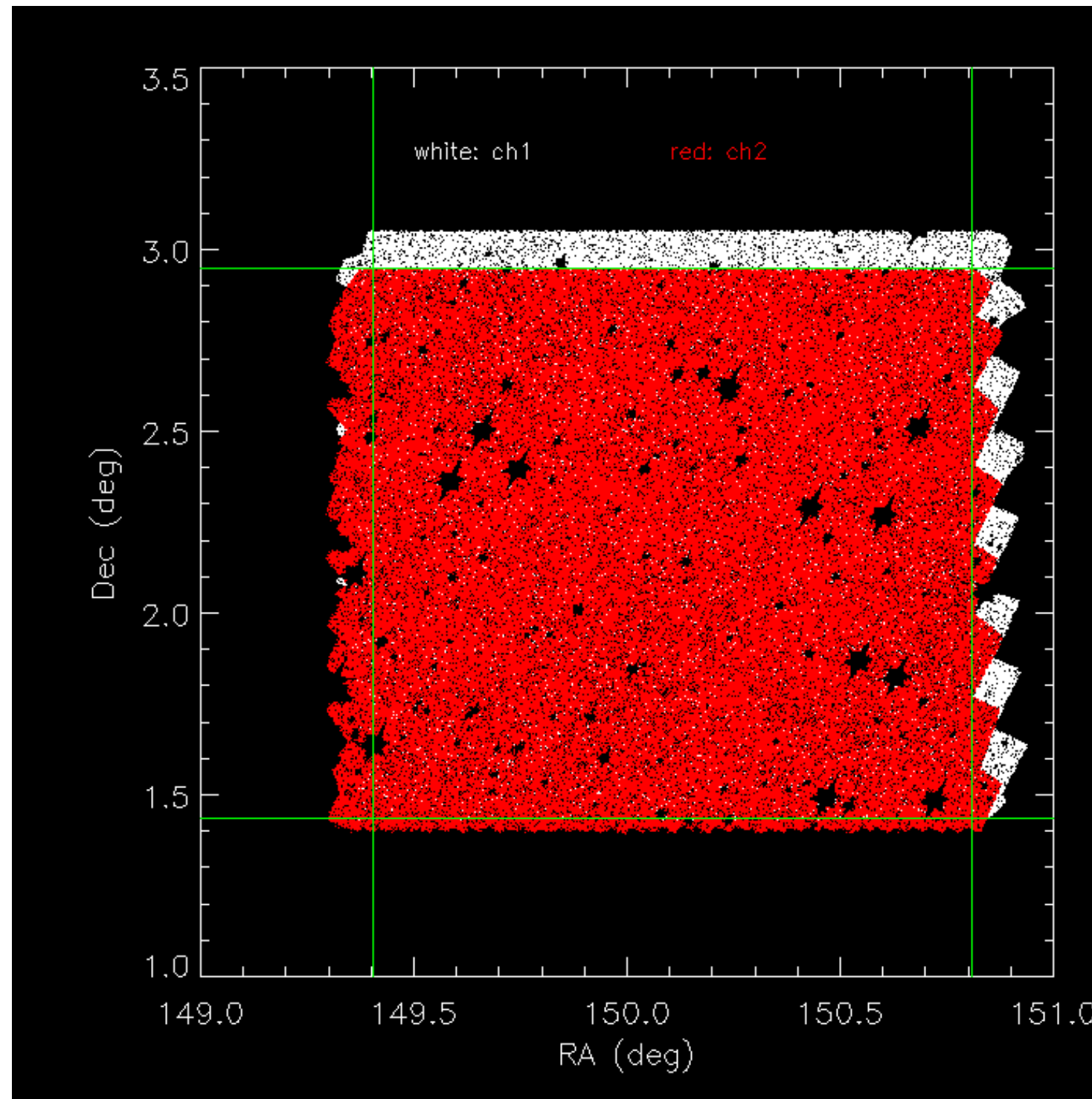
<https://www.legacysurvey.org/status/>

COSMOS: a typical depth sky region in DECaLS DR8



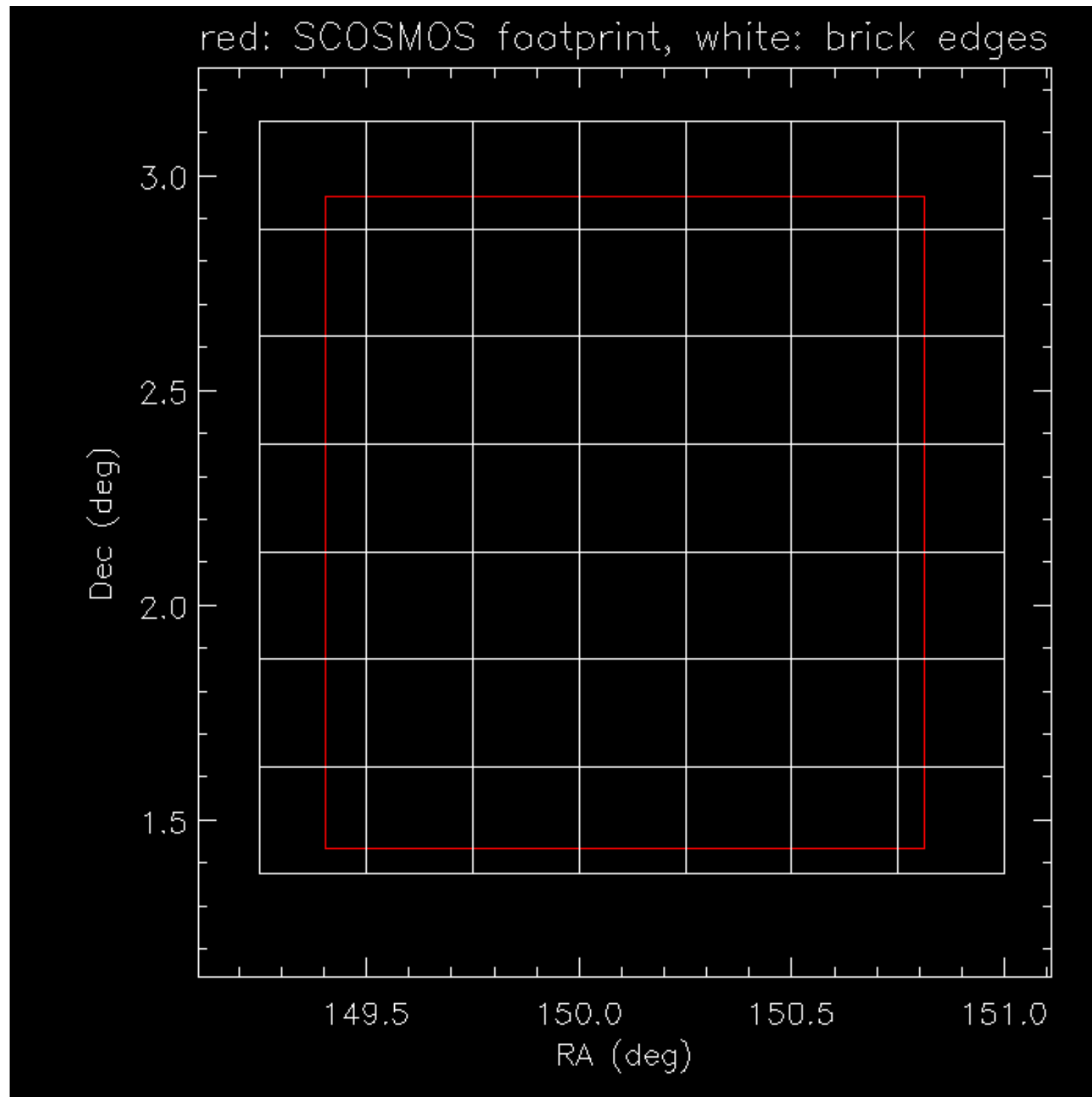
<https://www.legacysurvey.org/status/>

Spitzer S-COSMOS footprint



- use the “fully covered” area inside of the green rectangular RA/Dec box
- this is 2.12 square degrees (this value does not account in detail for the “empty” flagged regions around relatively bright stars)

DR8 Tractor catalogs

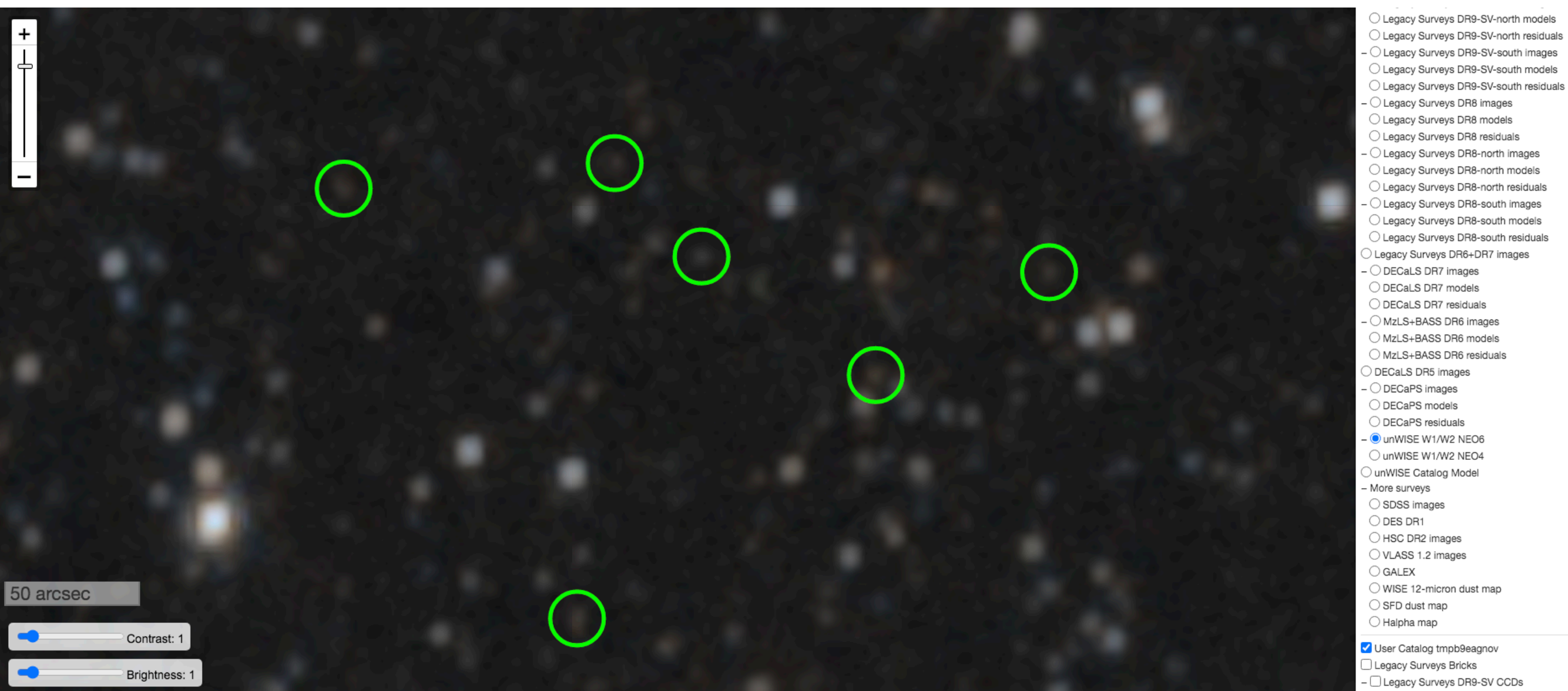


- 49 Legacy Surveys bricks overlap with this S-COSMOS RA/Dec box

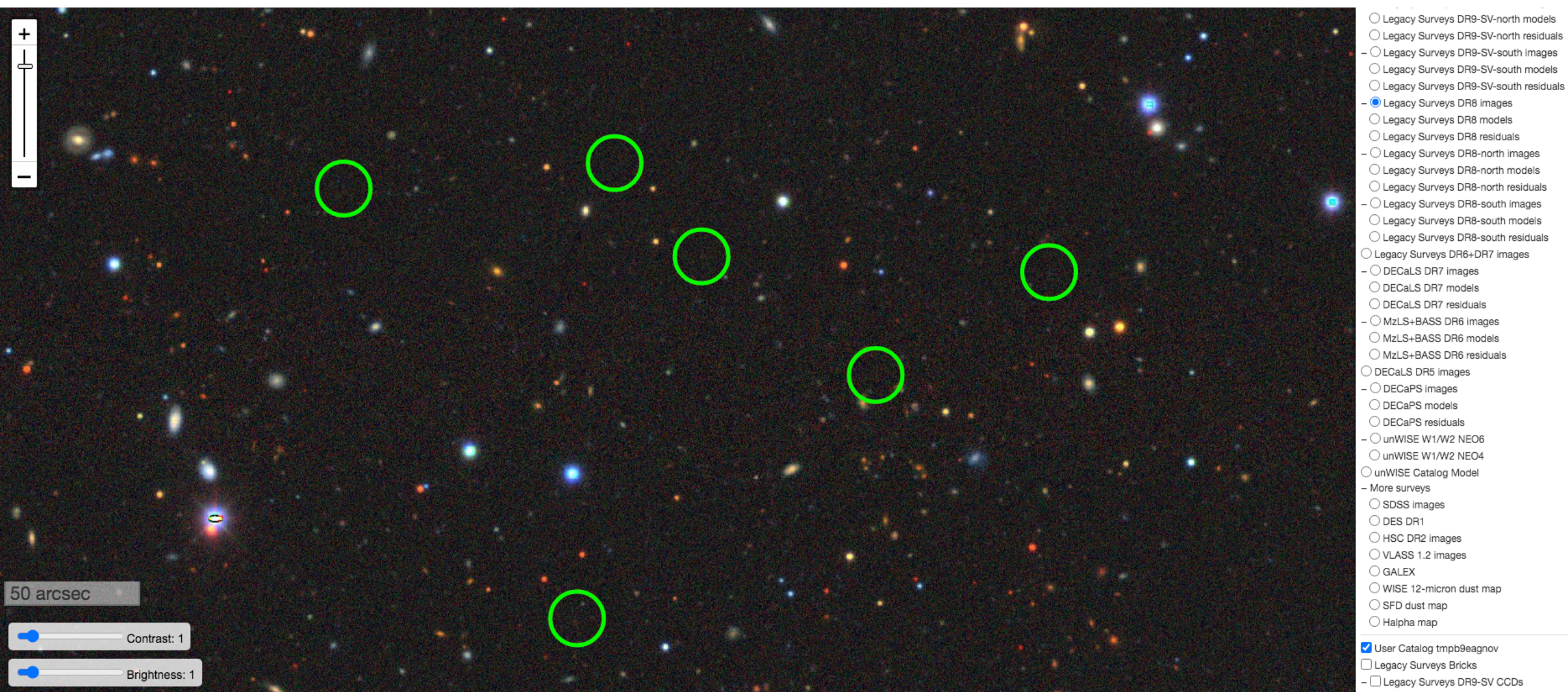
WISE-only source selection

- Starting point is NEO6 unWISE Catalog
 - Specifically the band-merged “object” catalog
- Restrict to the nominal “full-coverage” S-COSMOS RA/Dec rectangle
- Require unWISE Catalog PRIMARY = 1
- Require unWISE Catalog FLAGS_UNWISE = 0 and FLAGS_INFO = 0 in both W1 and W2
- Require unWISE mag to be brighter than the 90% reliability threshold and unWISE (FRACFLUX \geq 0.5) in at least one of W1, W2
 - 90% reliability threshold taken to be 17.8 (16.4) Vega in W1 (W2)
 - Based on Figure 4 of Schlafly+ <https://arxiv.org/pdf/1901.03337.pdf>
- Require a Spitzer ch1 and/or ch2 S-COSMOS match within 1.3”
 - 1.3” \sim [WISE FWHM]/5
- Require no BRICK_PRIMARY = T Legacy Surveys source within 2.75” of the unWISE Catalog source
 - 2.75” = WISE pixel sidelength

1,149 WISE-only sources retained = 541 per square degree

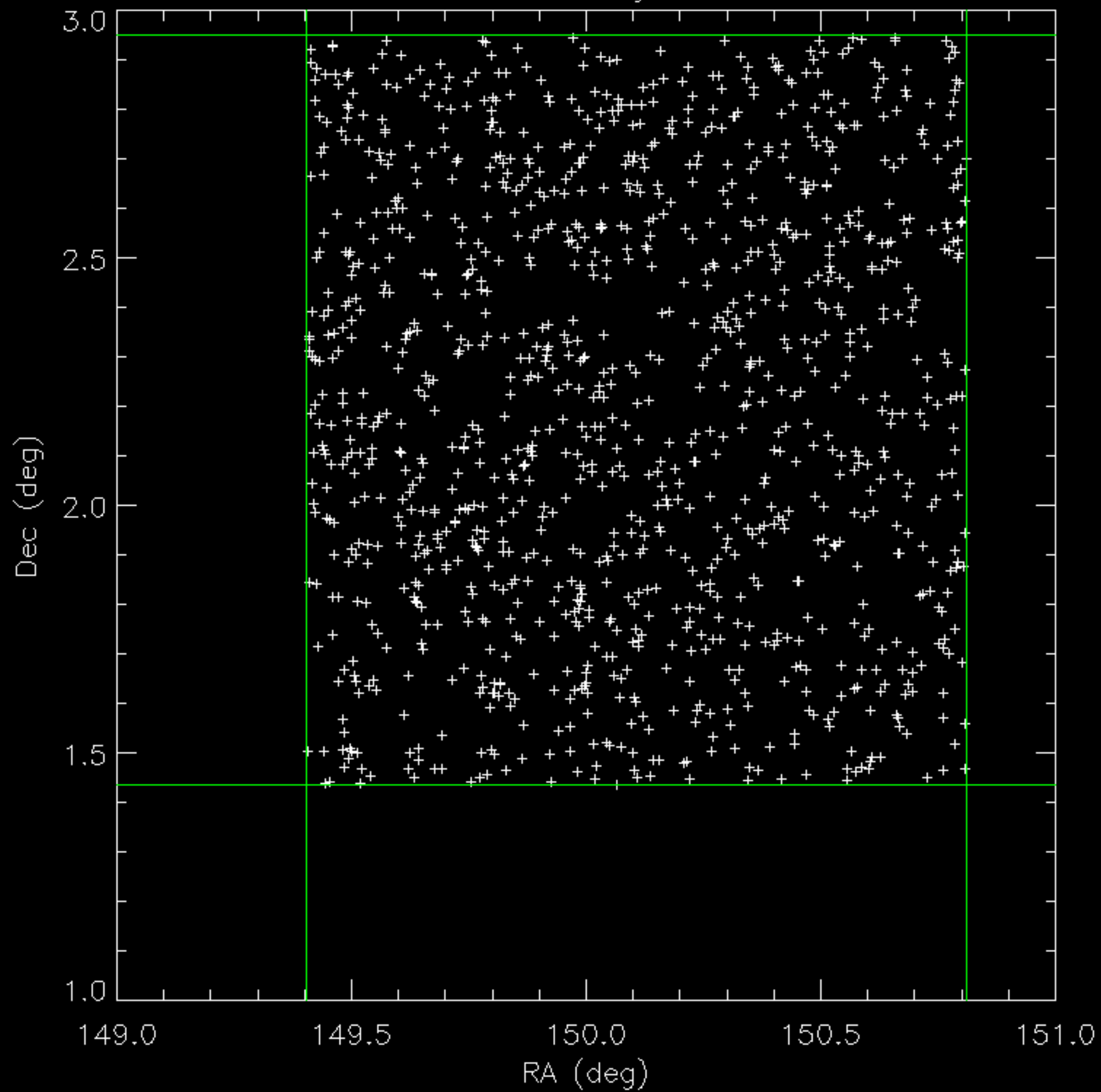


`/global/cfs/cdirs/cosmo/work/wise/etc/wise_only/wise_only.fits`

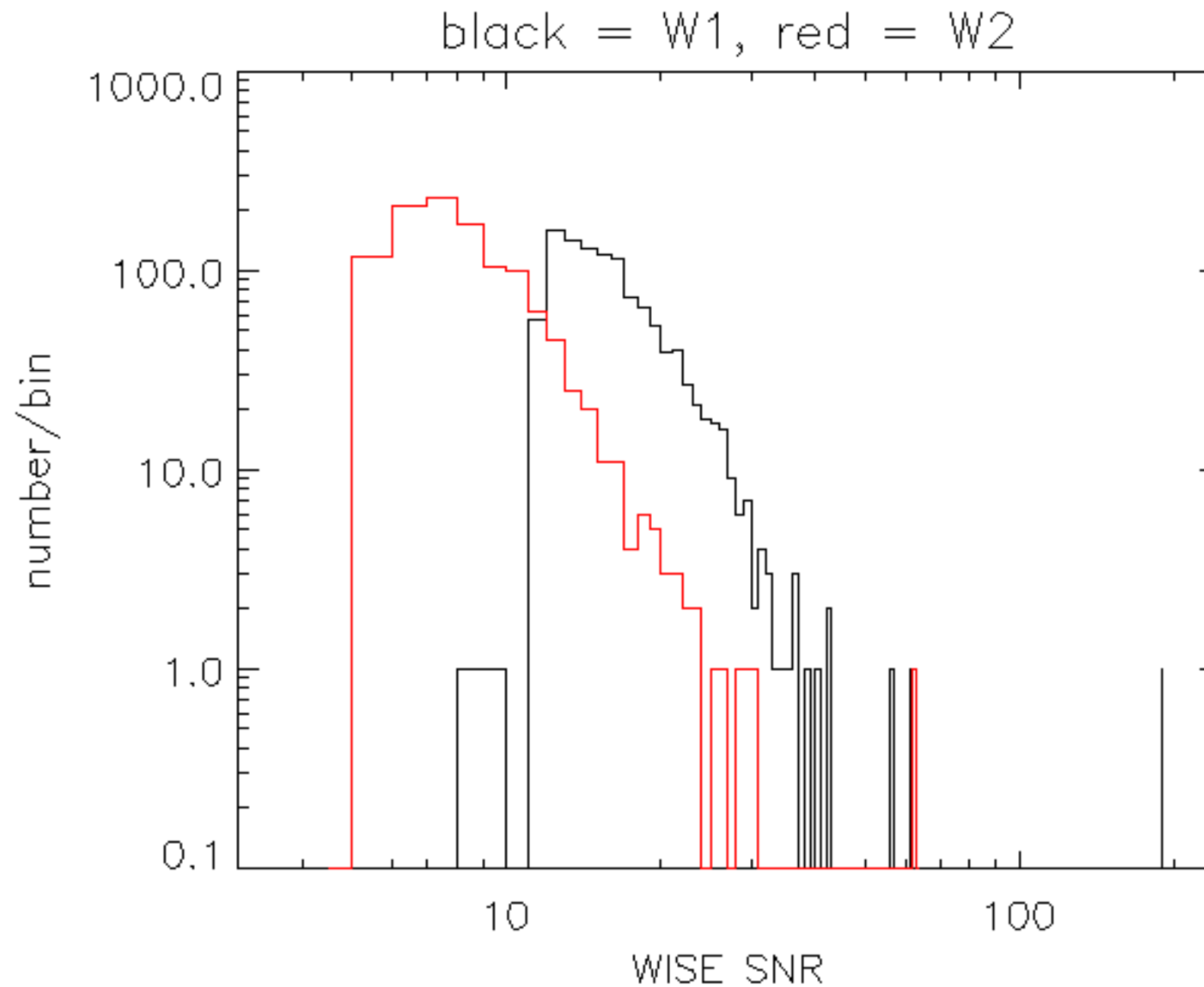


`/global/cfs/cdirs/cosmo/work/wise/etc/wise_only/wise_only.fits`

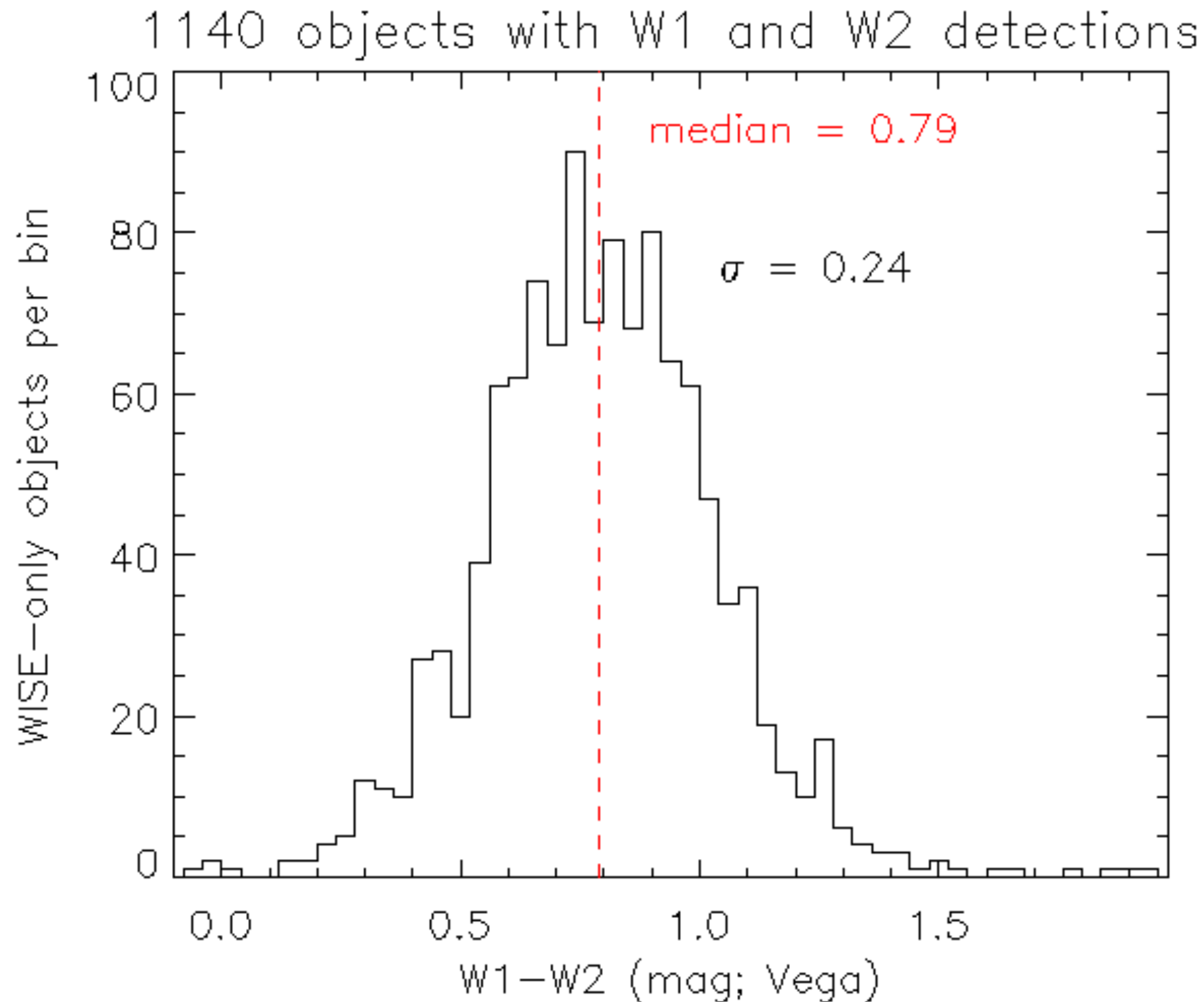
1149 WISE-only sources



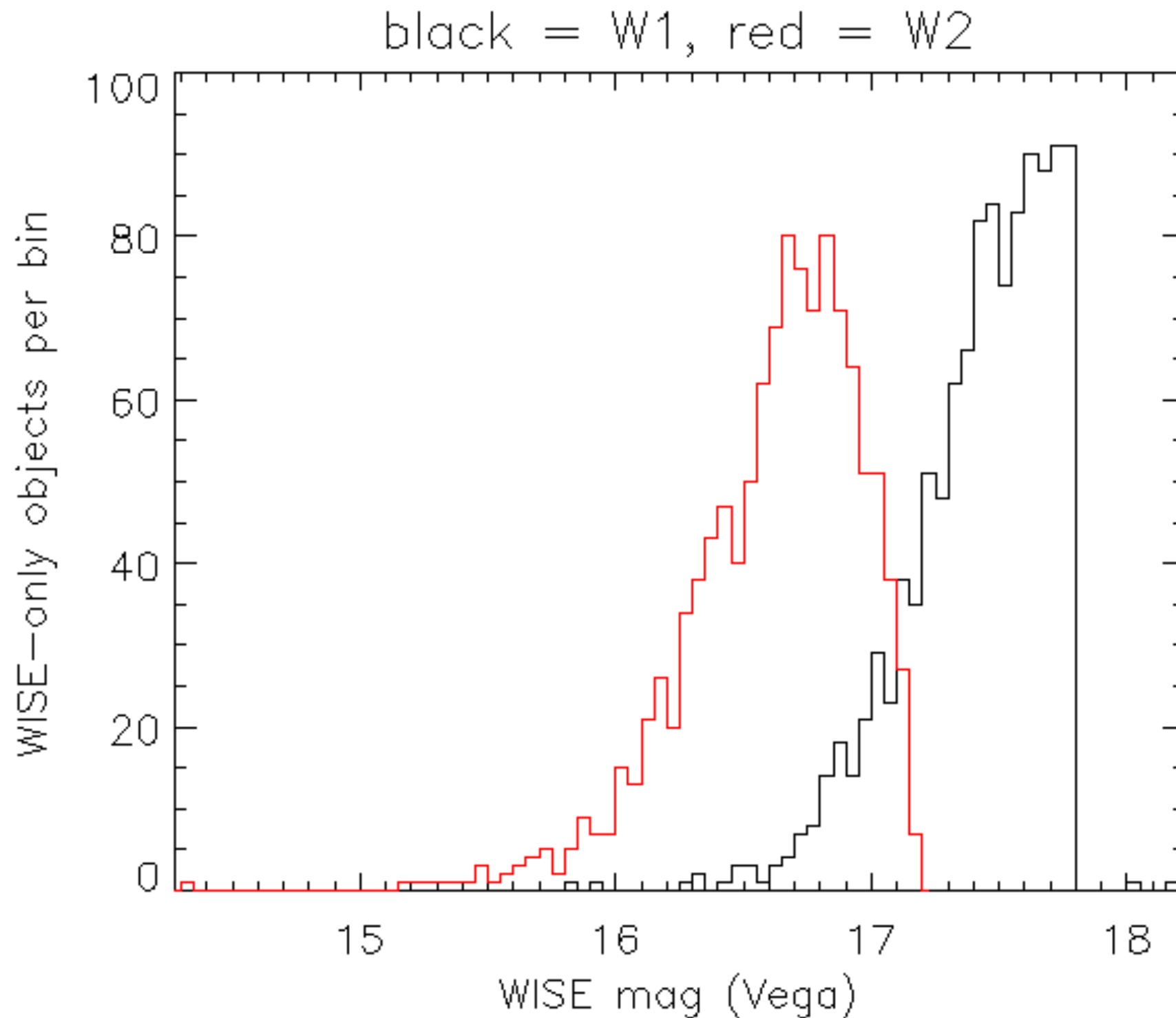
WISE-only source SNR

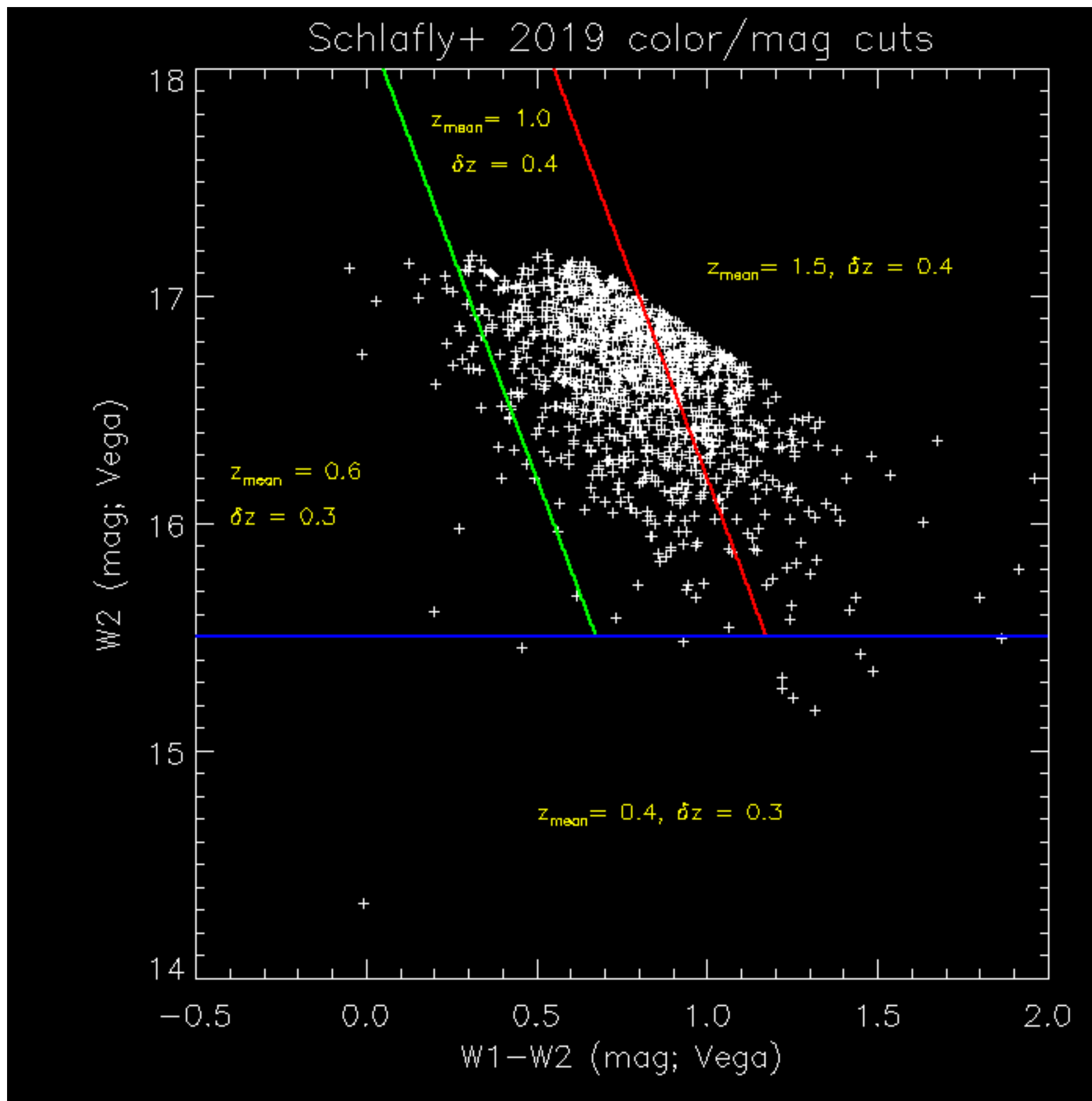


WISE-only source color



WISE-only source mags





color/mag cuts from Table 2 of <https://arxiv.org/pdf/1901.03337.pdf>

Cautionary notes

- COSMOS is near the ecliptic plane, making it among the shallowest areas in WISE
- This analysis completely ignores W3 and W4
- 90% reliability thresholds used in selection criteria pertain to NEO4 but are applied to NEO6

Possible future steps

- Investigate additional information available from other COSMOS data sets e.g., morphologies and photometric redshifts
- Consider additional cut that requires an unWISE Catalog detection in both W1 and W2