Exploring spatial variations in photometry: Aperture versus PSF-fitting

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Science Image Selection Criteria
(*quadrant based*)

- 2020-01-12 <= night date <= 2020-03-03
- DIQ (median FWHM) <= 3.0 arcsec
- Airmass <= 1.1
- Moon altitude < 30 deg.
- Photometric ZP > 25.5 mag.
- 1000 <= number PSF-fit catalog sources <= 5000 (*g*), 6000 (*r*)
- Number of matching PS1 calibrator stars >= 250
- Exptime = 30 sec.
- Processing quality status flag > 0
- Archive status > 0

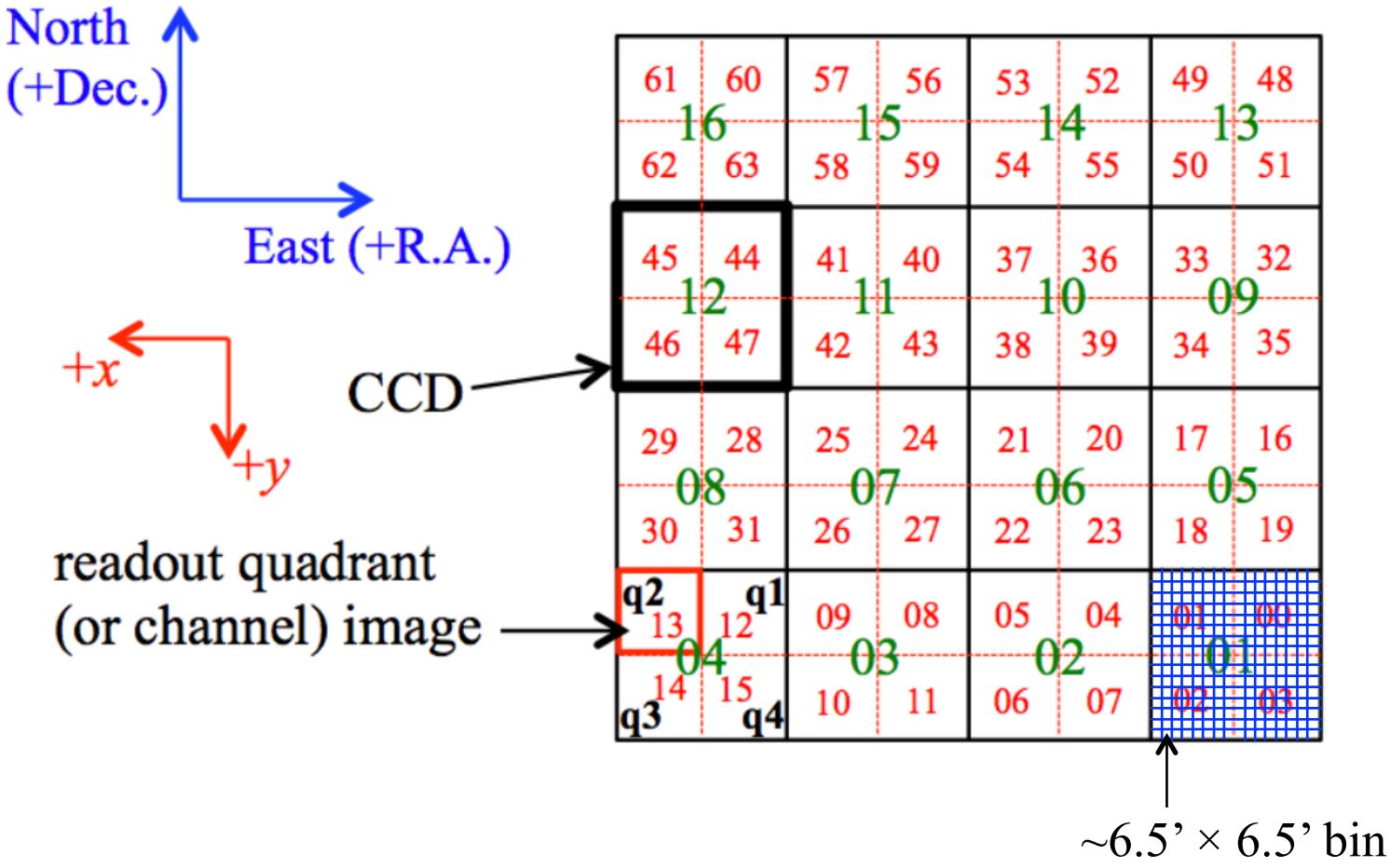
- Total number of quadrant images in *g*-filter = 73,114
- Total number of quadrant images in *r*-filter = 64,207

Procedure

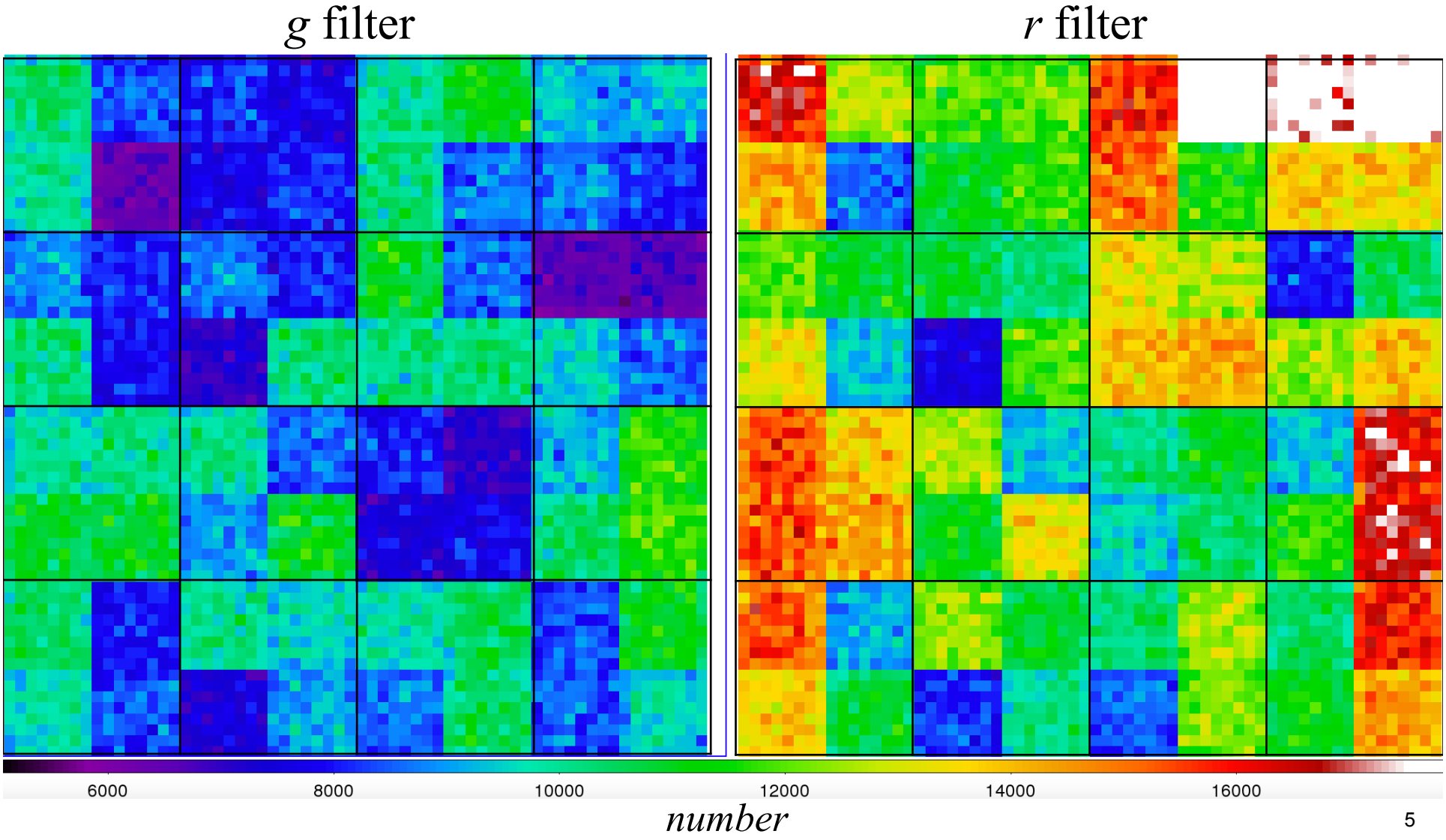
- Partitioned each quadrant image into 8 × 8 bins (~ 6.5 × 6.5 arcmin^2 bins)
- Used ZTF sources with mags: 13.5 <= mag <= 18.5
- Used *raw* archived catalogs with **no corrections** applied to photometry
- For aperture catalogs: used measurements in 14-pixel diameter aperture (aper #6)
- Used unmasked, uncontaminated ZTF extractions with *flags* = 0
- Matched to *stellar* sources in PS1 catalog per quadrant partition over 8 × 8 grid
- Calibrated ZTF mags using quadrant-based ZP, color term, and PS1 g – r colors
- Computed median *DeltaMag* = *PS1mag* – *ZTFmag* per quadrant partition
- Stitched all 8 × 8 quads × (8 × 8 partitions per quad) = 64 × 64 bins into mosaic

- Resulting number of source matches per bin: ~ 6,000 – 20,000

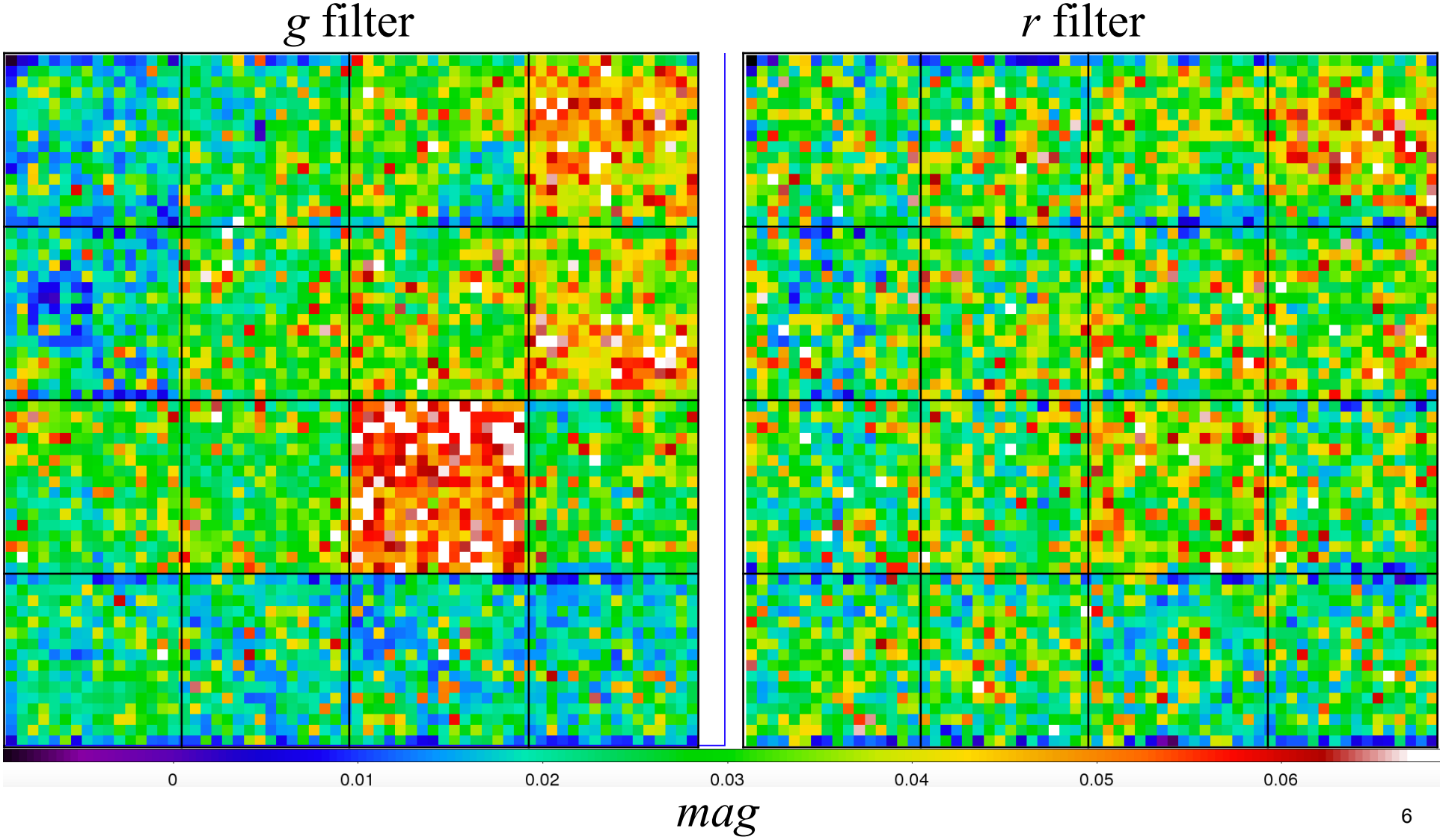
Assumed CCD / quadrant image layout



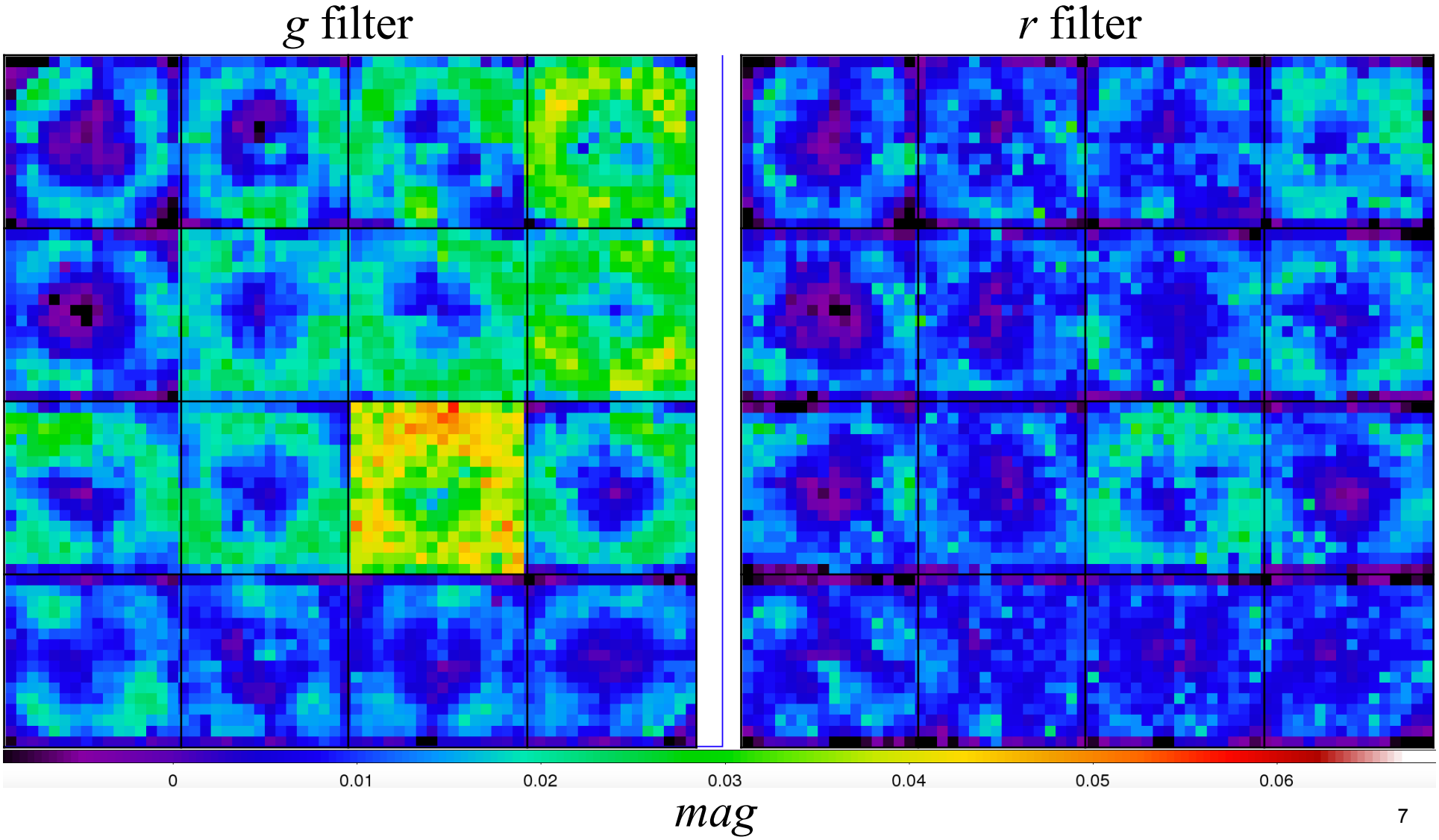
Number of PS1 to ZTF catalog matches (Aper. or PSF)



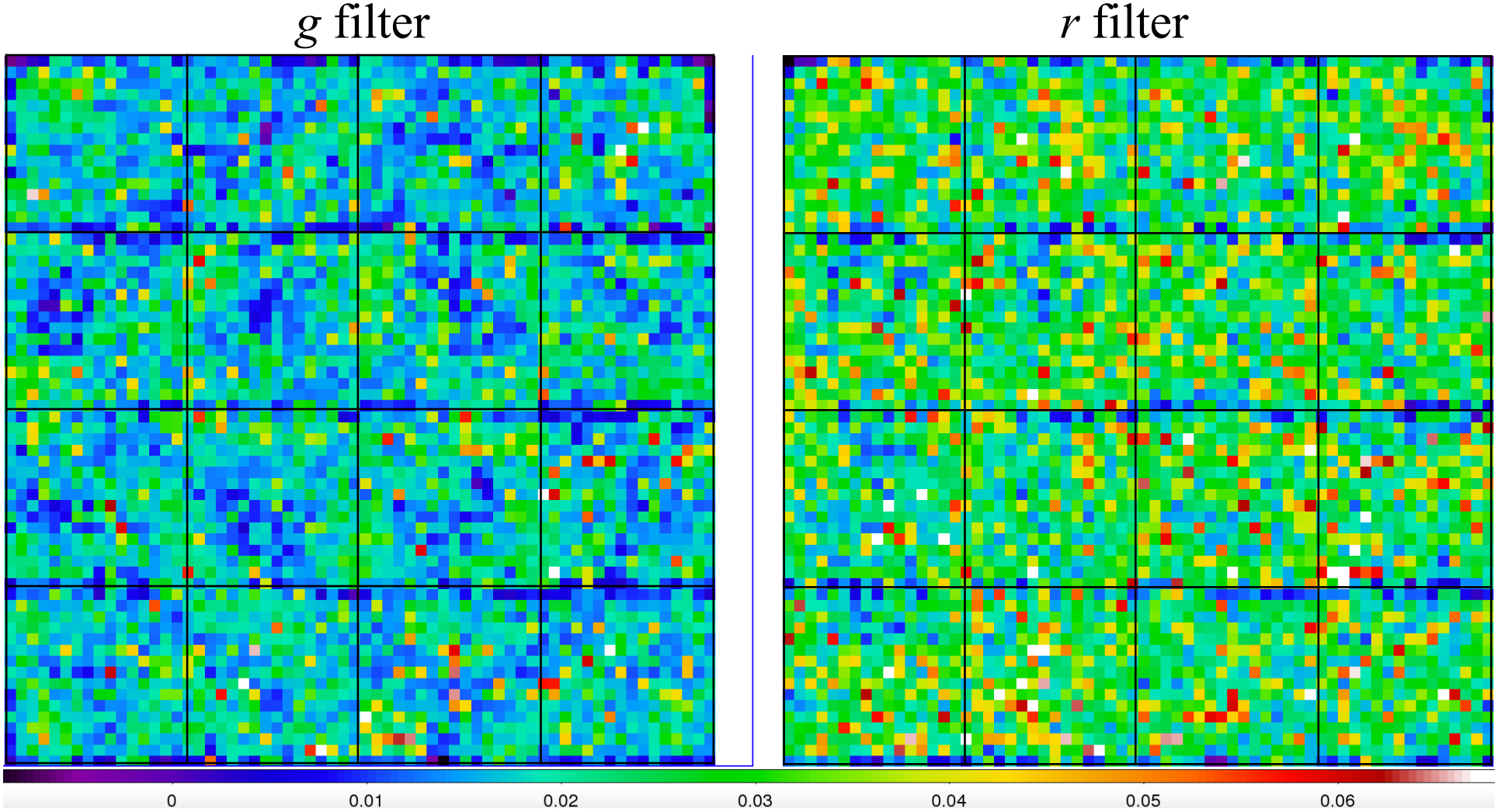
"PS1 – Aperture" photometry mag residuals (2020 Jan – Mar)



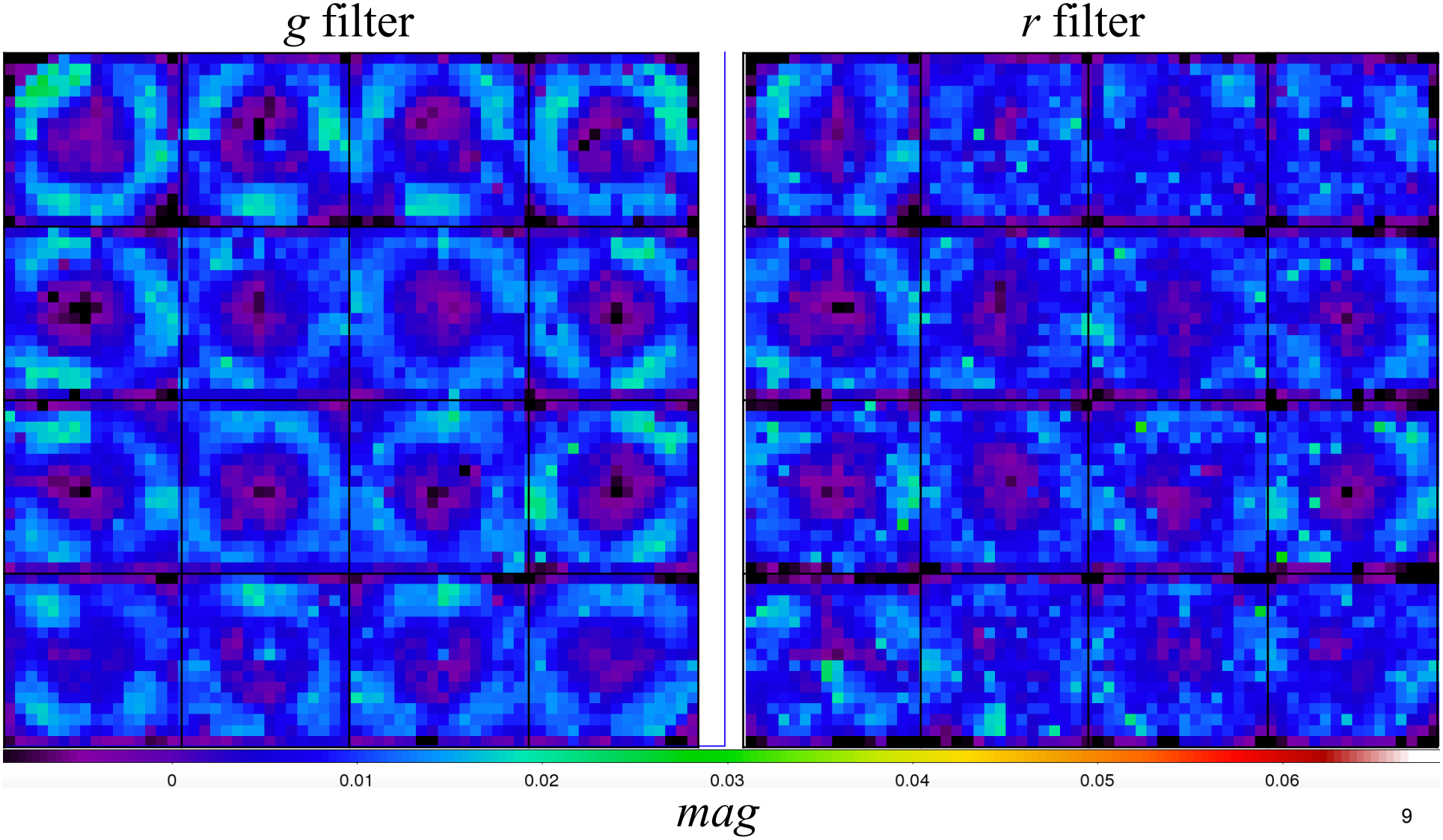
"PS1 – PSF-fit" photometry mag residuals (2020 Jan – Mar)



"PS1 – Aperture" photometry mag residuals (2019 Jan – Mar)



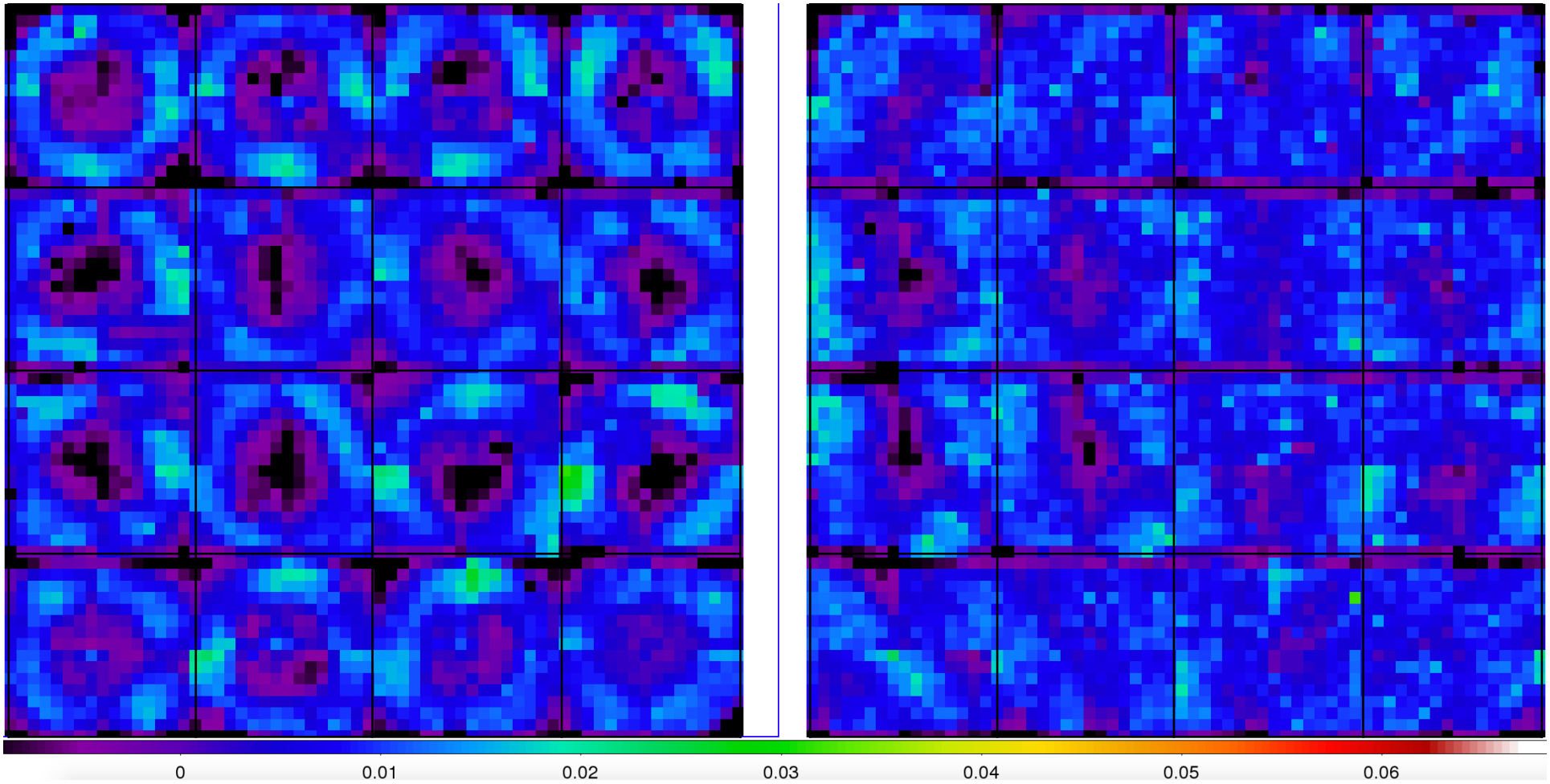
"PS1 – PSF-fit" photometry mag residuals (2019 Jan – Mar)



"PS1 – PSF-fit" photometry mag residuals (2018 Jan – Mar)

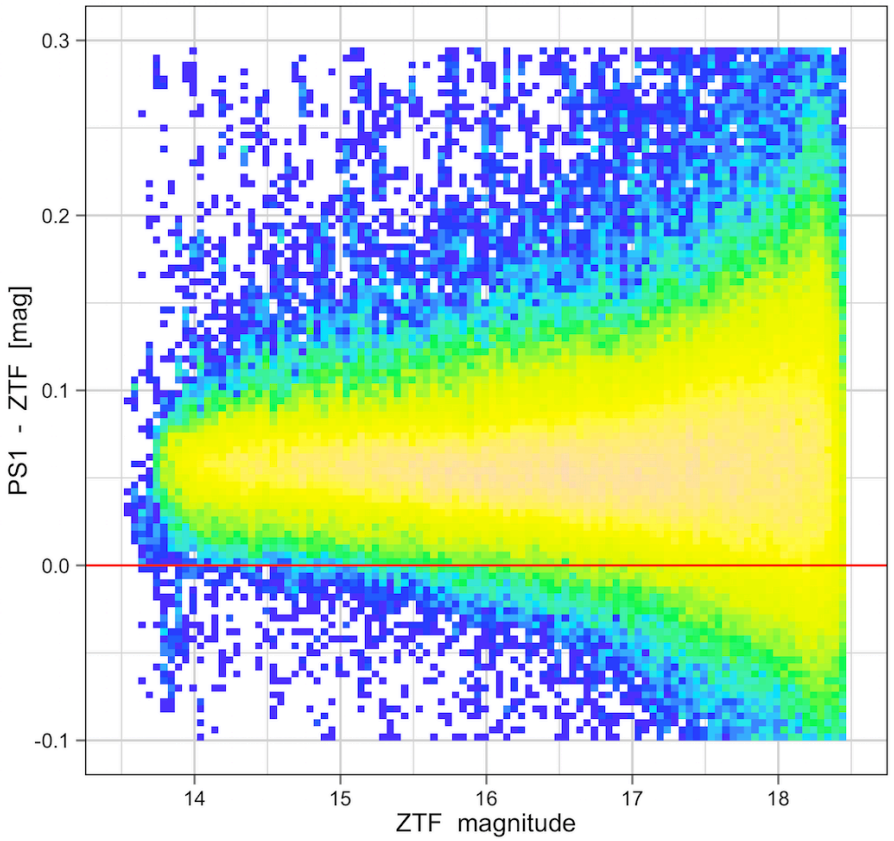
g filter

r filter

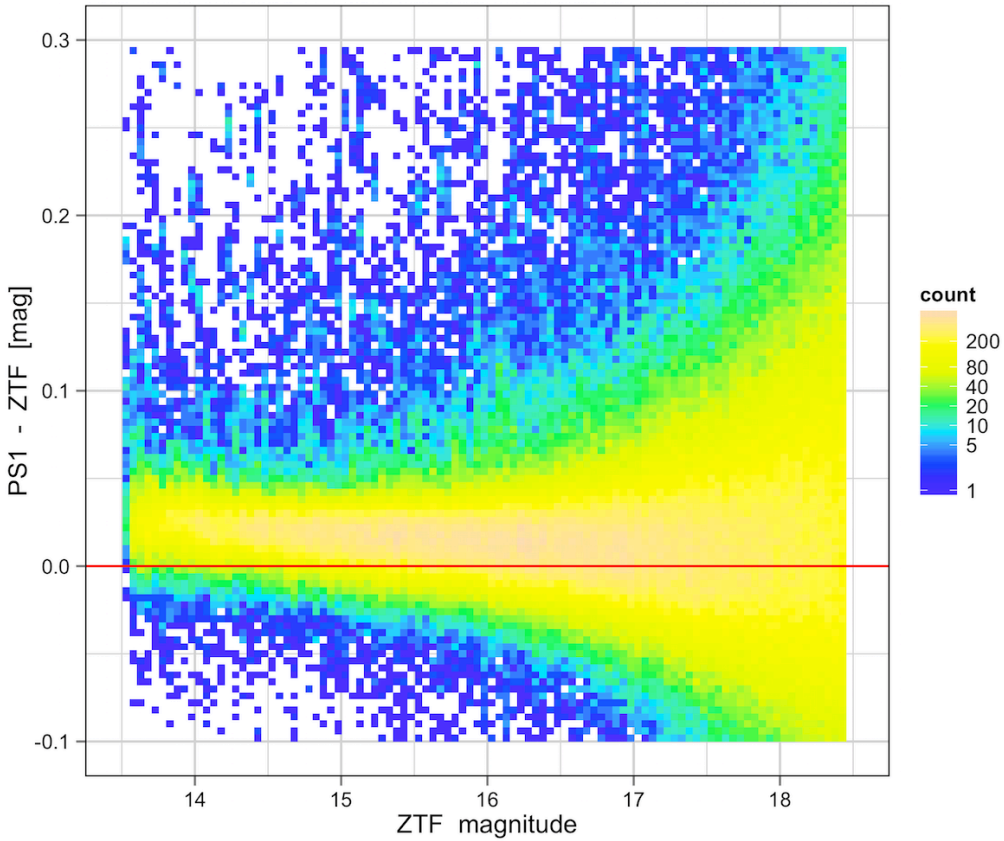


"PS1 – Aperture" versus Aperture mag for quadrant 2, CCD 6 (2020 data)

g filter

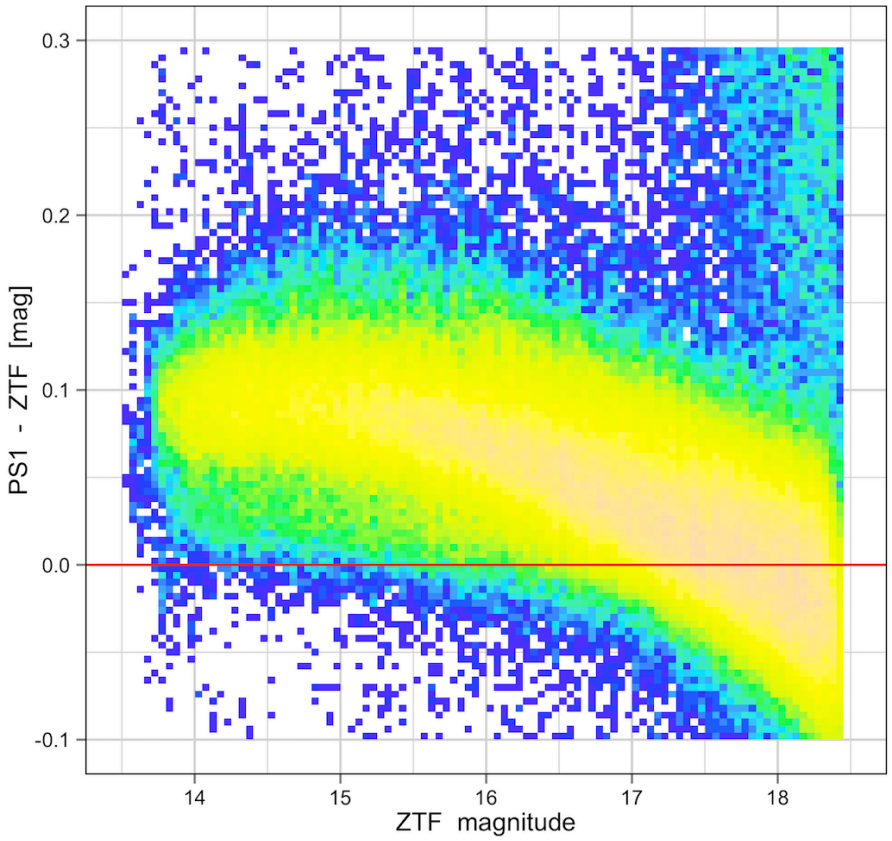


r filter

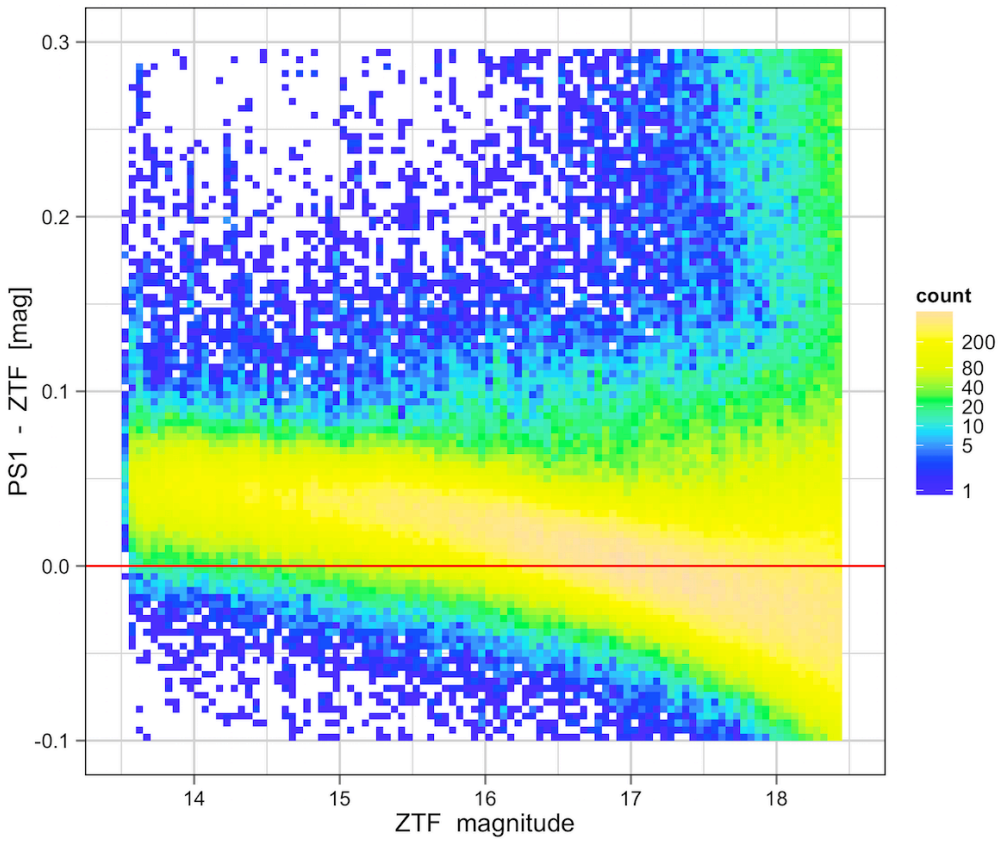


"PS1 – PSF-fit" versus PSF-fit mag for quadrant 2, CCD 6 (2020 data)

g filter

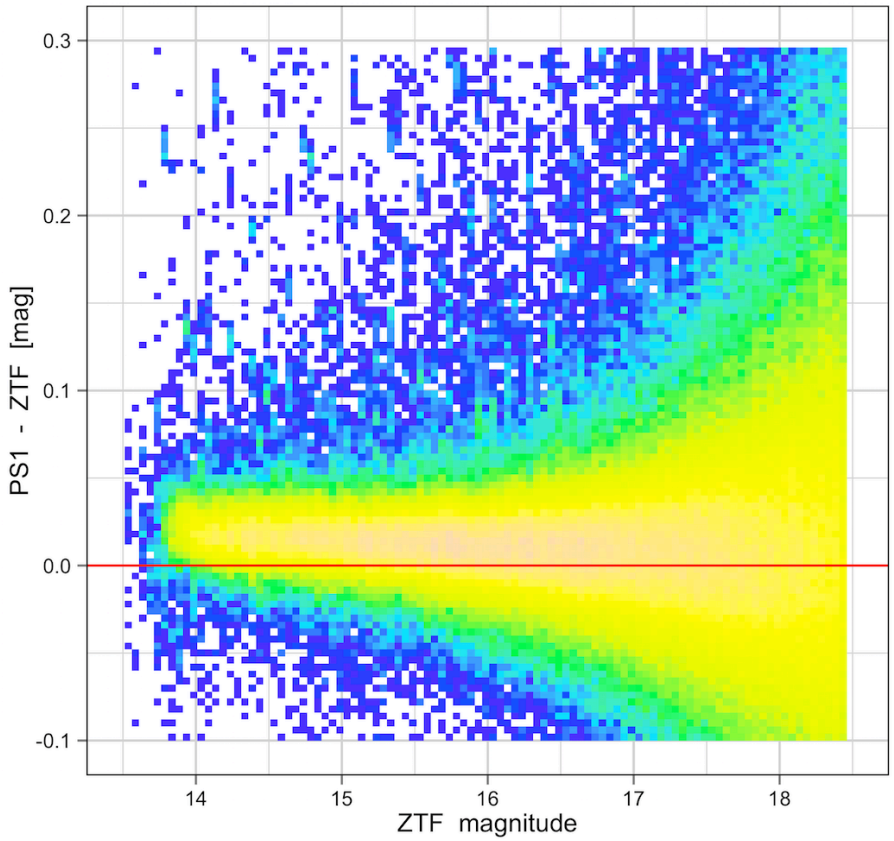


r filter

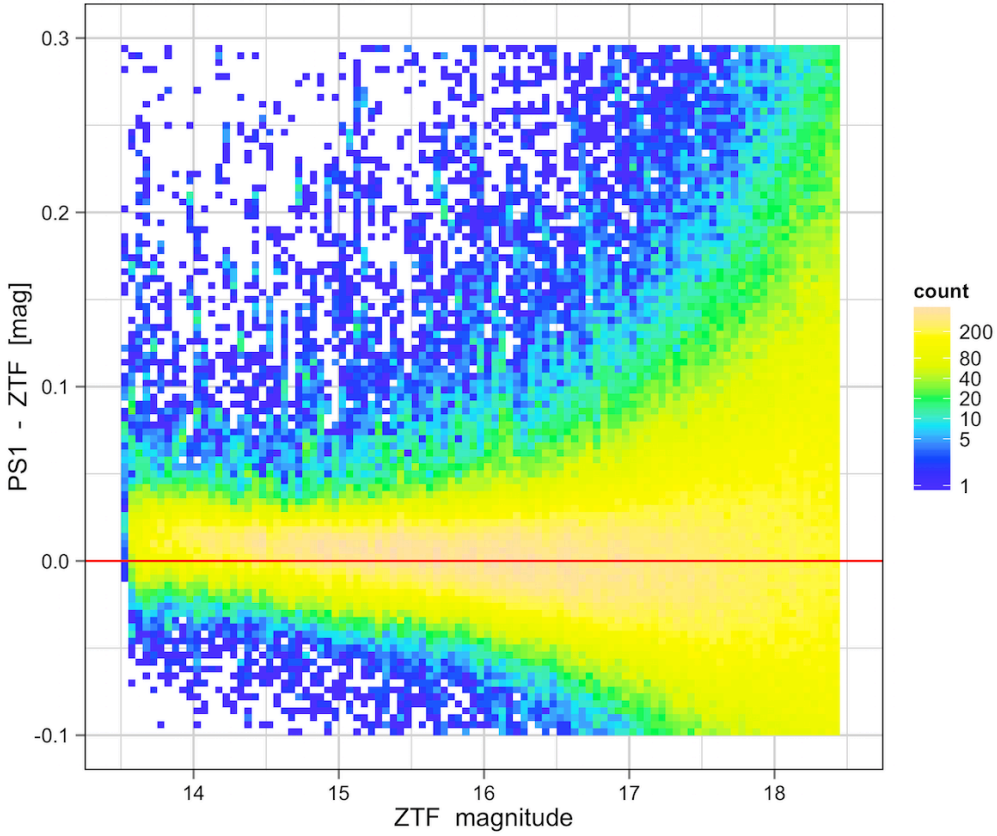


"PS1 – Aperture" versus Aperture mag for quadrant 2, CCD 6 (2019 data)

g filter

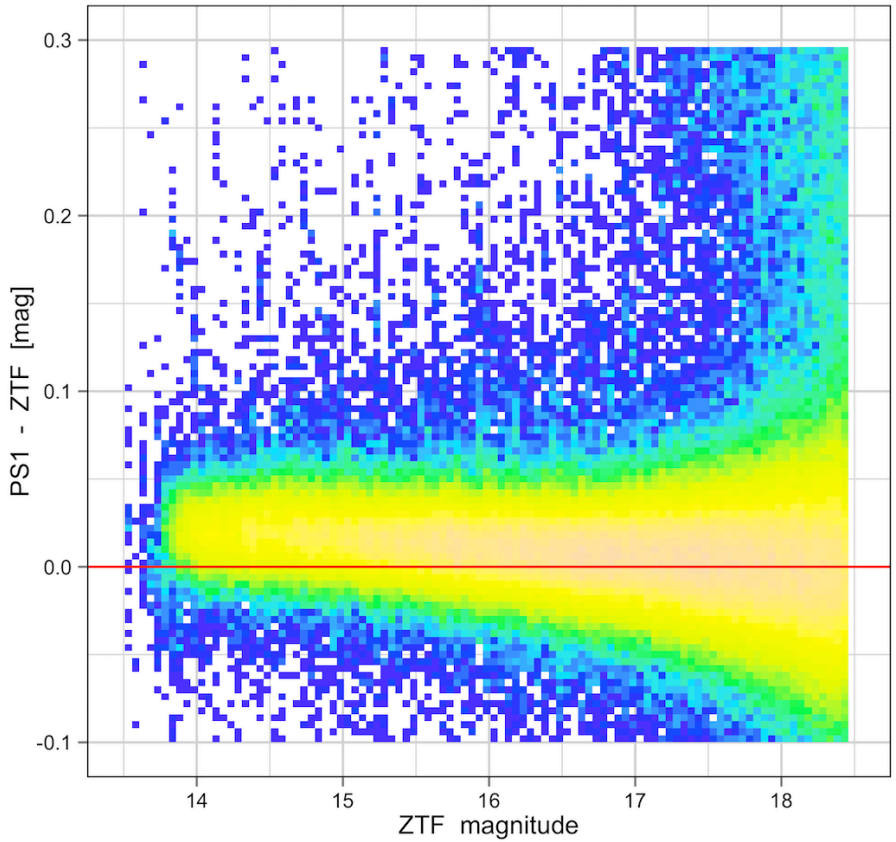


r filter



"PS1 – PSF-fit" versus PSF-fit mag for quadrant 2, CCD 6 (2019 data)

g filter



r filter