AG Calibration

Method

- Take all AG camera data from the July runs (after the focus correction)
- Filter out frames not associated with a pfs_visit_id
- Pull the sources from agcc_match (ie, matched to GAIA sources)
- Retrieve GAIA g, rp and bp measurements
- Filter by seeing (using the median FWHM on one side of the image as a proxy)
- Filter out sources near the edge of the detector, saturated sources, faint sources
- Fit a linear fit to g - 2.5log10(agFlux) vs (bp-rp) for a set of frames at each pointing
- calculate a histogram of the fitted parameters

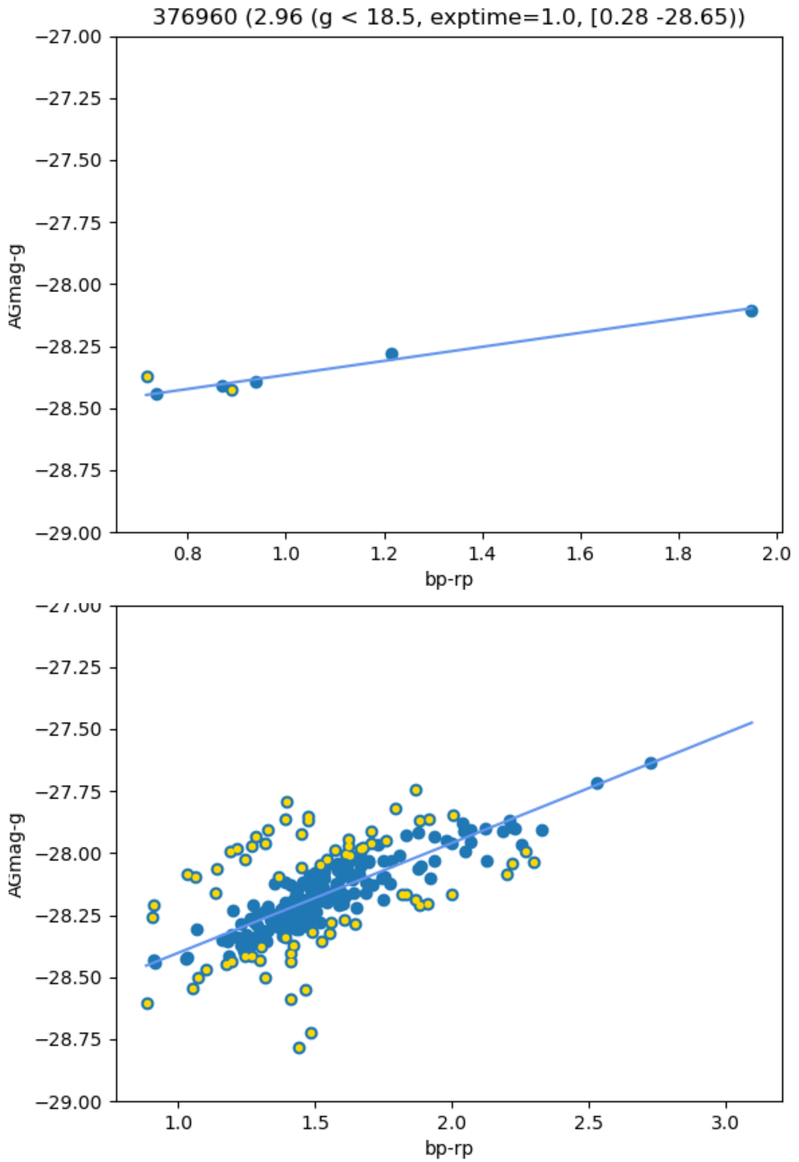
Notes

- Many frames only have a few sources with both GAIA matches and g, bp and rp. The gaia_match table has cut of g < 20.
- The May 23 observations don't have the exposure time written to agc_exposure (needed to scale the flux).
- Data before May 23 was generally not in focus
- Of the Jul 23 data sets, there are 14 distinct pointings, in 7 regions (ie, some pointings are only slightly different and may have overlapping sources).
- For a given pfs_visit_id the number of agc frames varies from 7 to > 100.
- Given the last two points, there may be bias in the samples (ie, multiple datasets for a single set of stars). Therefore I included 7 from each pfs_visit_id.

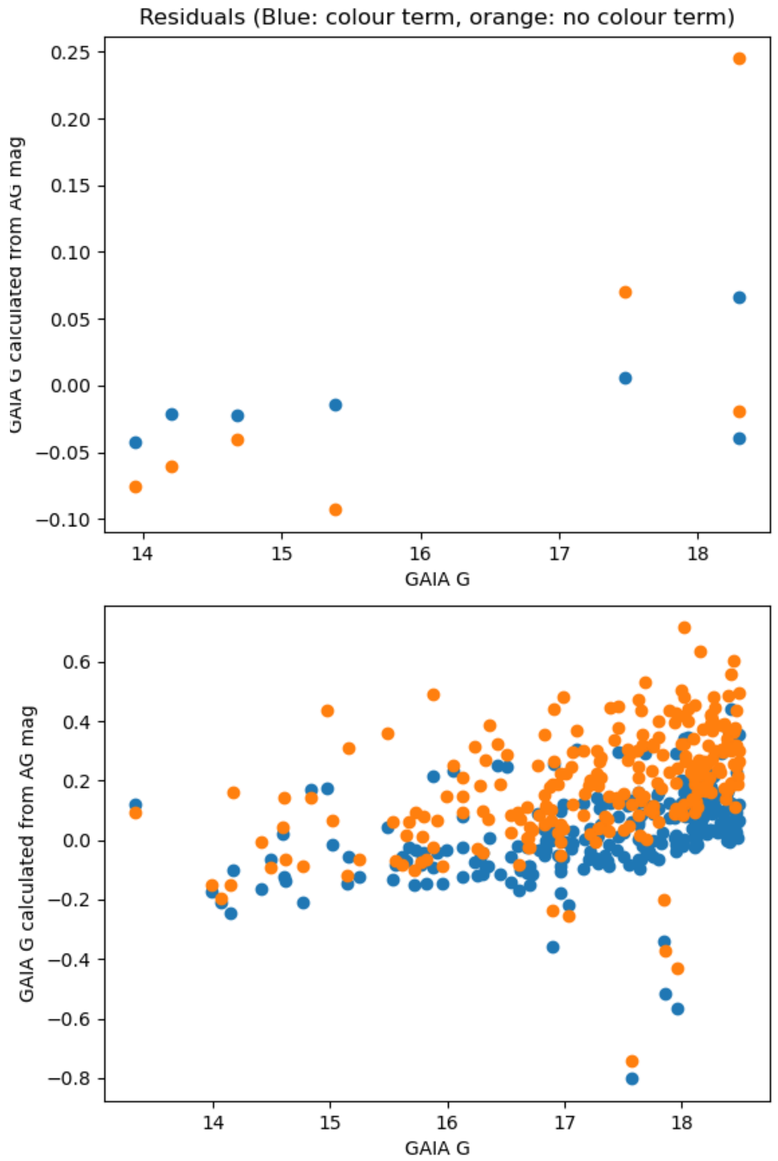
Example colour-colour fits

- CC fits for example fields, one with few sources and one with many sources
- Yellow points indicate sources removed from the fit via outlier rejection
- Flux cut of g < 18.5
- Applying the colour correction reduces RMS scatter/slope.

Colours



Residual Magnitudes

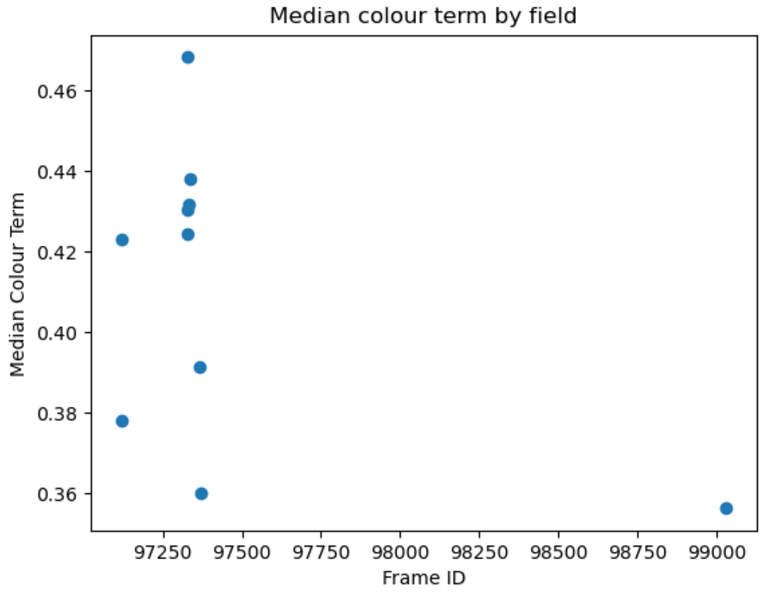


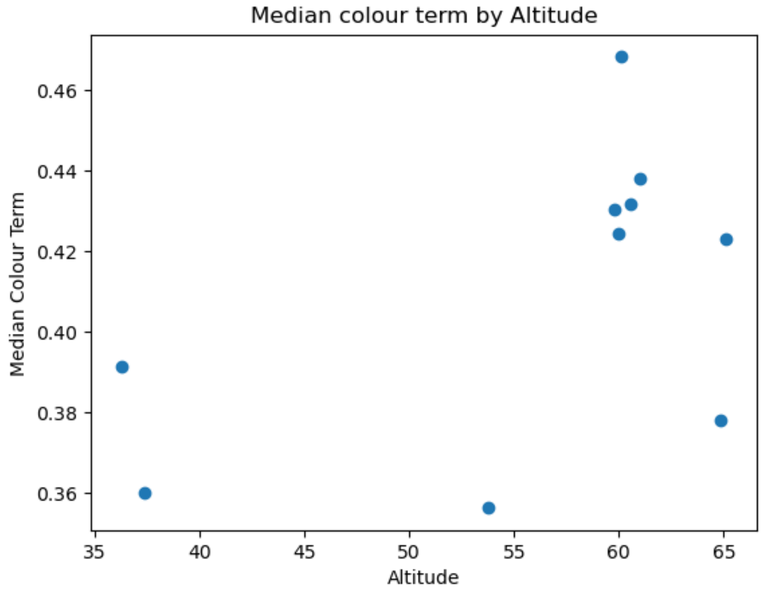
Fit Notes

- Varying the seeing criteria has little effect on the derived parameters
- The intercept is relatively stable to changes in limiting magnitude (-28.7 at g = 18.5)
- The derived slope varies with the choice of limiting magnitude. A brighter cut results in fewer sources to fit, a fainter cut has more sources, but more scatter, and adds a systematic change to the results.
- The colour correction varies by field.
- The slope of GAIA g vs AG magnitude is almost 1, but there is a small but systematic offset after application of the colour term.
- Tested the variation with both an outlier rejection fit and a simple least squares produces similar results.

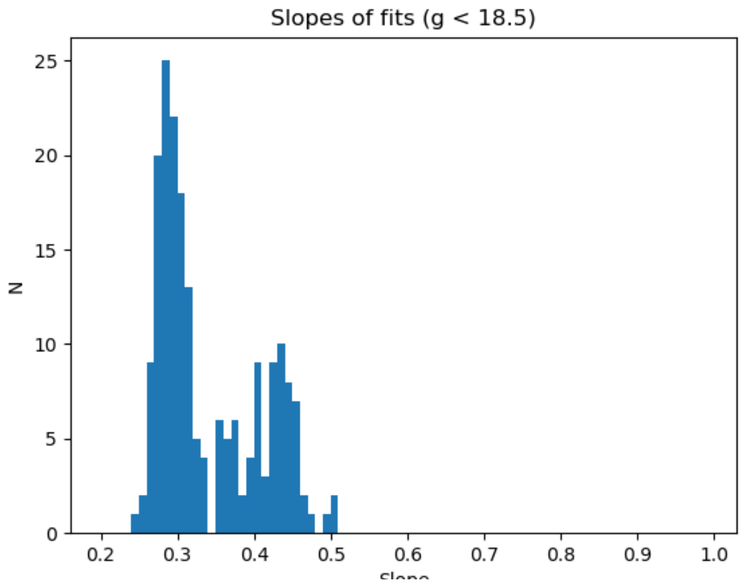
Variation of Color Term with Field

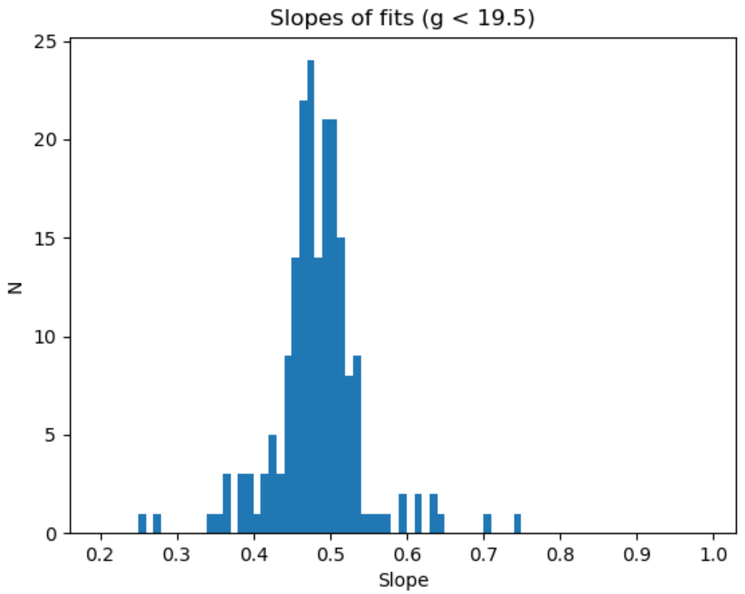
- For all fields with significant number of sources to fit (> 10)
- If we compare the derived values by field (ie, pfs_visit_id) we see noticeable scatter.
- Possibly due to selection of stars, foreground extinction, observing conditions…
- There is no strong dependence on altitude.

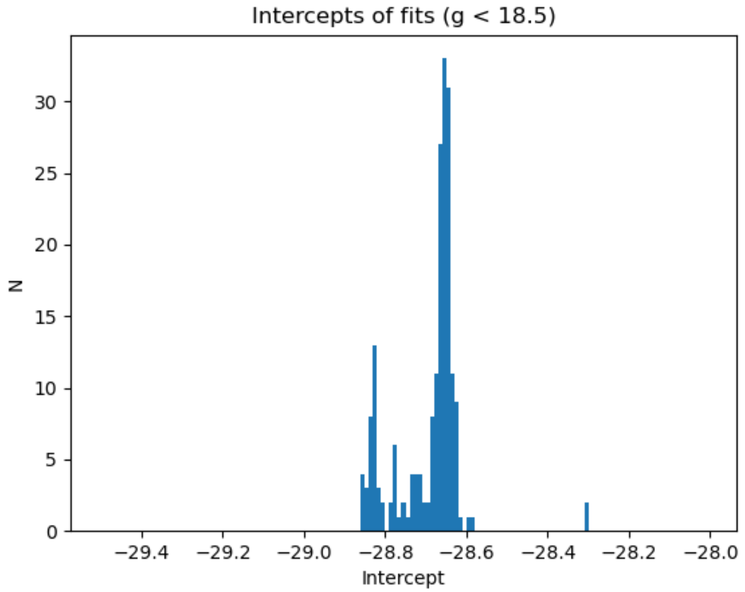


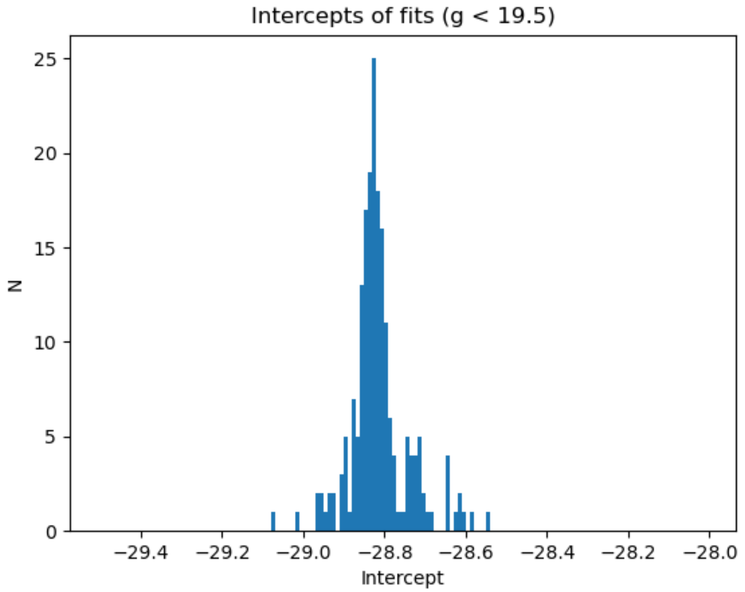


Histograms of fit parameters









- Histograms of fit parameters, for two different limiting magnitude cuts.
- Fits from 7 randomly chosen frames from each pfs_visit_id used in the histogram.

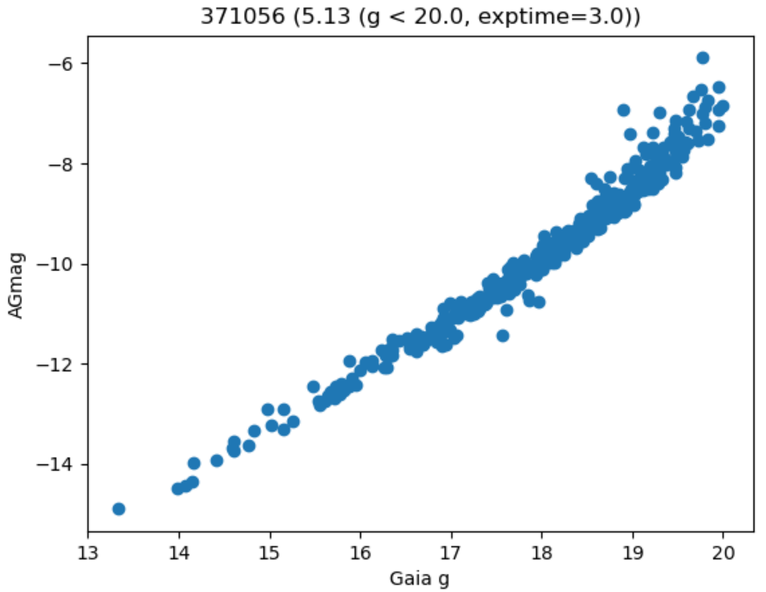
Validation

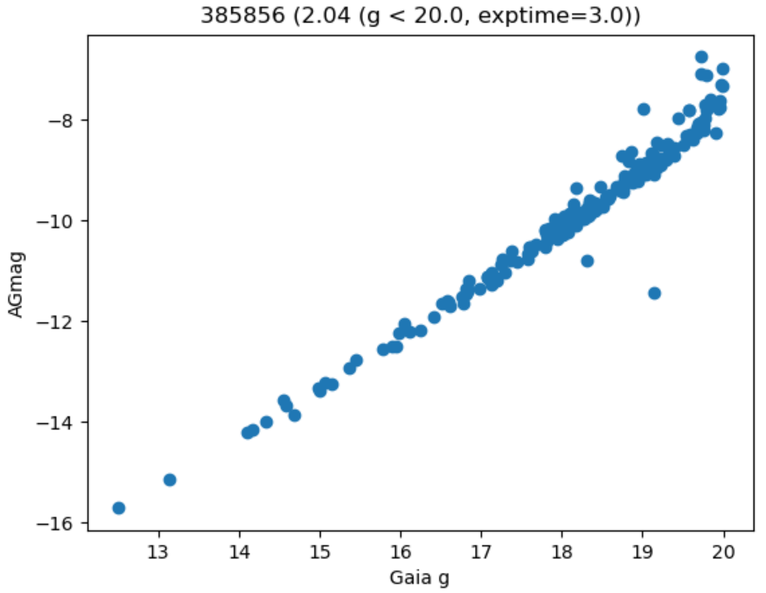
Validation

- Check the validity of the derived spot brightness and size calculations
- Use the same data set as for the AG calibration, but also filtering out spots where the iterative weighted Gaussian fit failed.
- The raw AG magnitude (-2.5log10(agFlux)) is linear to about GAIA g = 19.5 (for 3s exposures), at fainter levels the AG flux is underestimated.
- The spot size performs as expected; the dominant effect in a single frame is the glass/no glass sides (one having a larger spot size), and the variation in spot size between cameras, caused by a tilt in the mounting of the AG cameras. There is no variation with spot brightness. The spot shape also changes with camera number.
- Note that most AG fields do not have enough sources to do a meaningful comparison, the plots shown are for fields with larger numbers of sources.

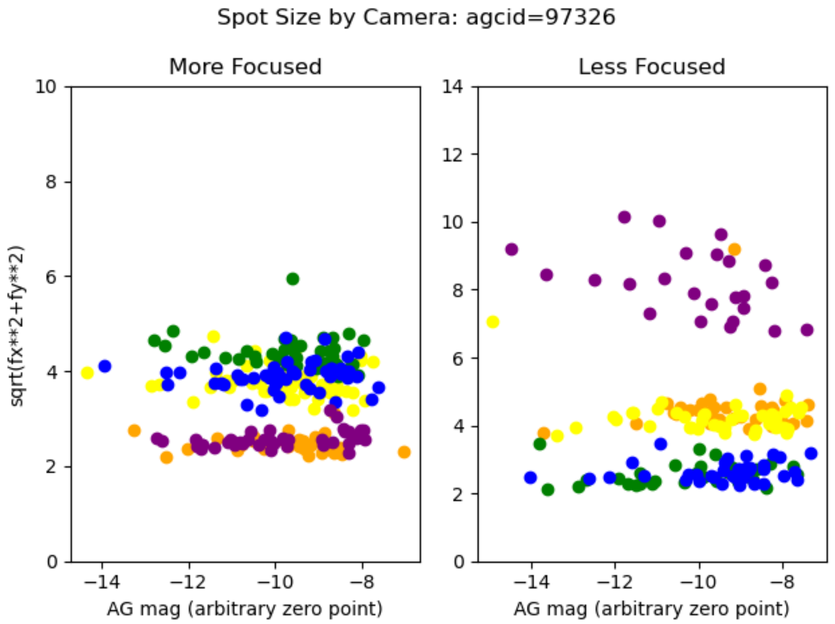
Fluxes

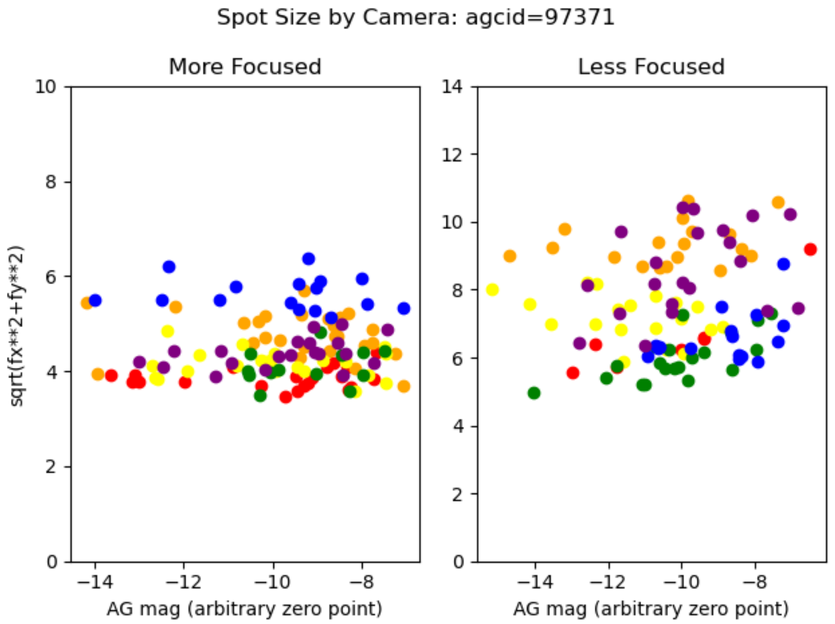
- AGmag vs GAIA g for representative fields
- Linear until GAIA g ~ 19.5 (at 3s integration)

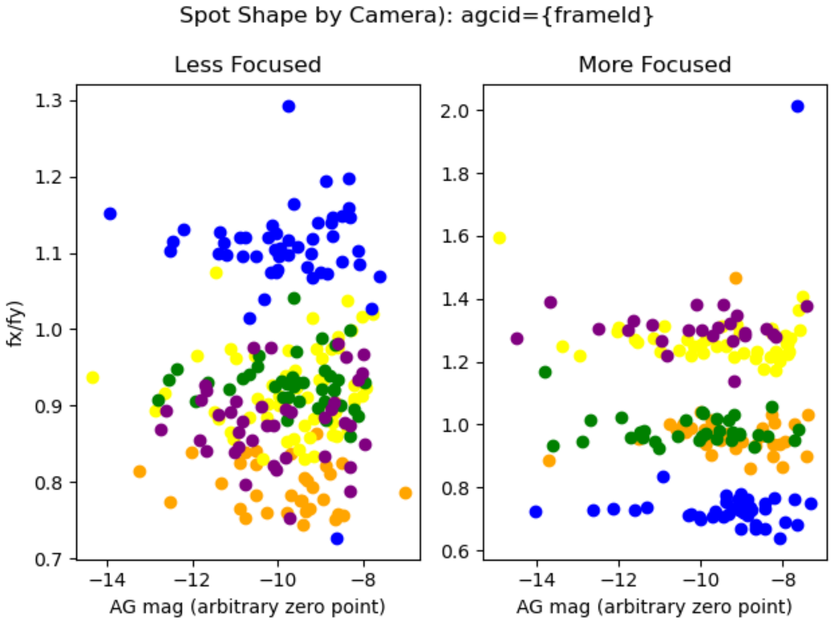


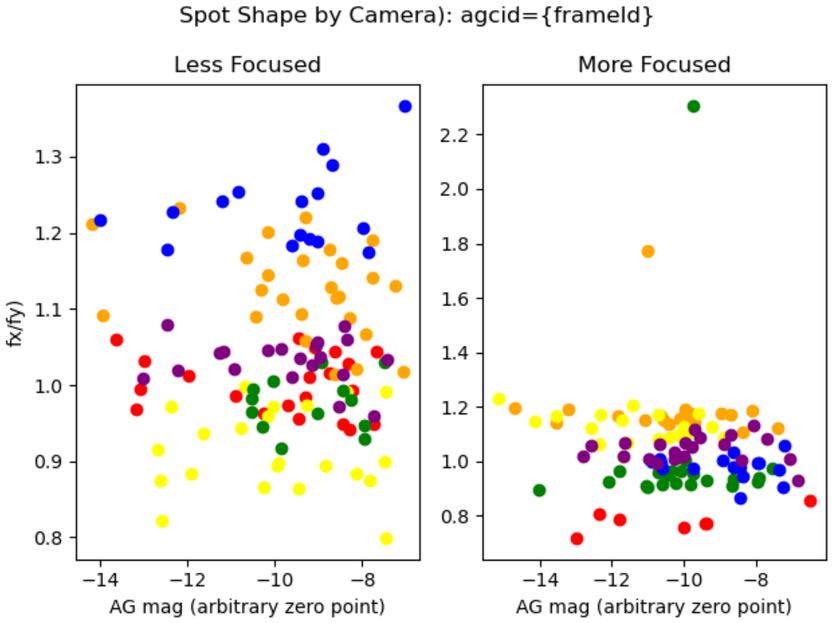


Plots









- Variations in spot size and shape.
- Glass/No Glass in separate panels
- Camera number is red -> purple = 1 -> 6 in chromatic order.