Autoguider Photometric Calibration

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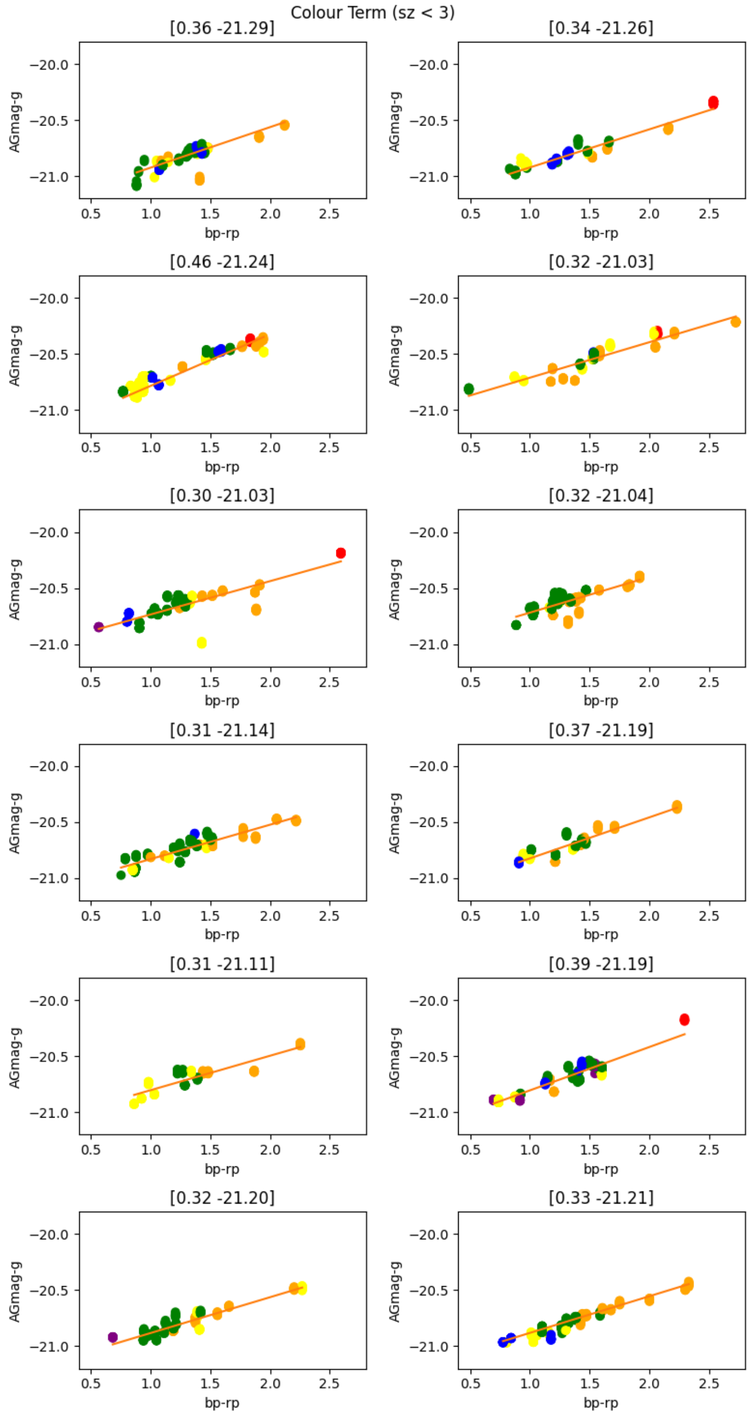
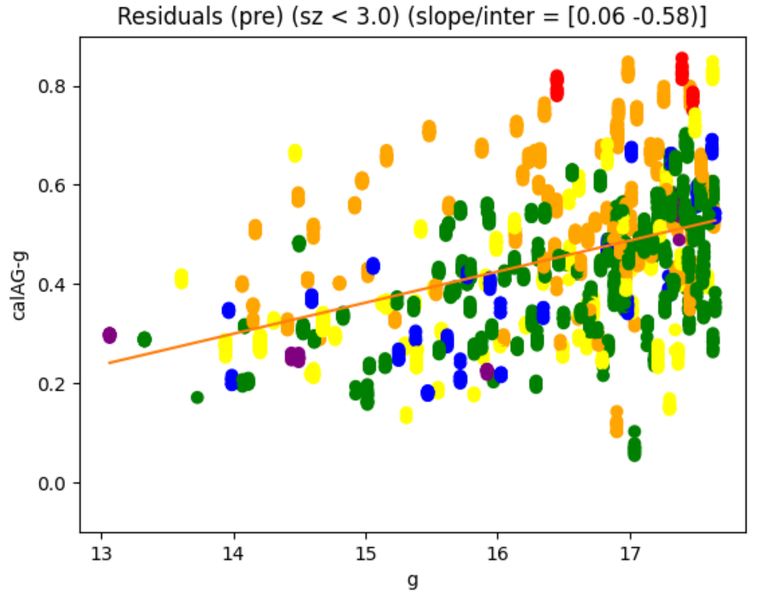
Processing

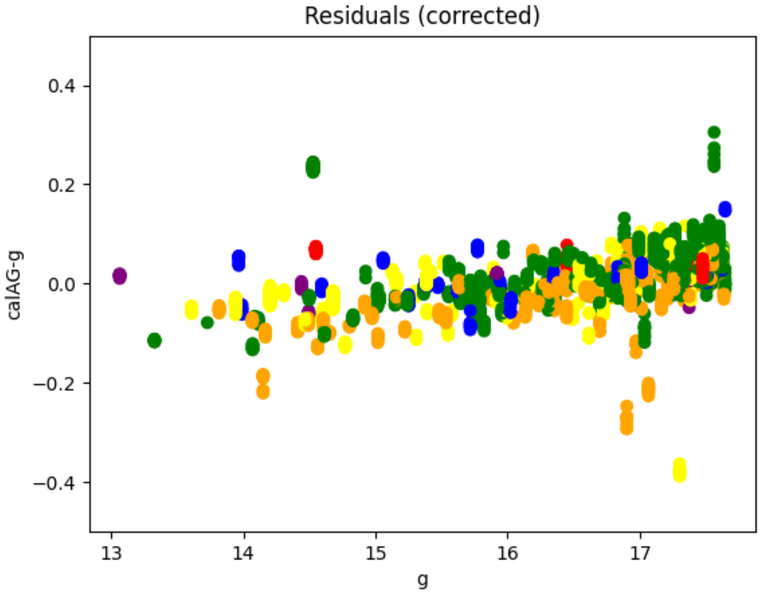
- Select only fields with good seeing (determined from PSF size)
- Use only sources with spectral type classification in GAIA database ($g < \sim 17.5$)
- Exclude saturated sources, sources near edge of image
- Fit for each camera / side of camera separately
- Reprocessed all data with bias subtraction and flat field correction

Fits

- Colour indicates spectral type
- Left: fits for individual camera / side
- Right top: uncorrected residuals
- Left top: corrected residuals
- A slight slope remains in the residuals

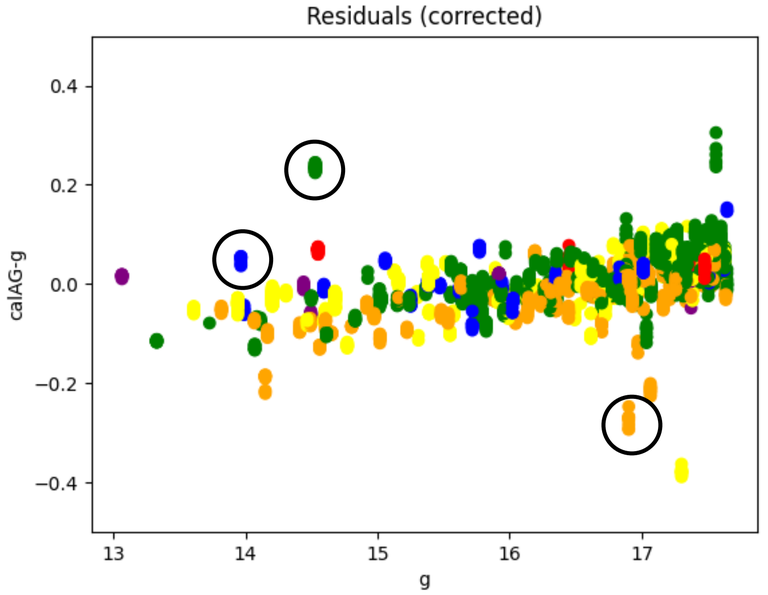


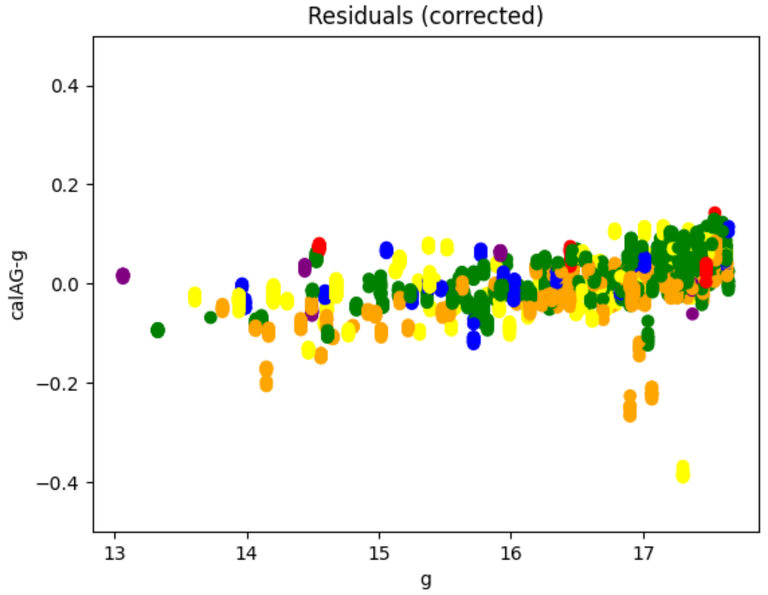




Effect of FF/Bias

- Changes in individual fluxes, noise characteristics
- Reduces number of outliers
- Doesn’t affect colour correction
- Top panel: original images
- Lower panel: bias subtraction, FF correction

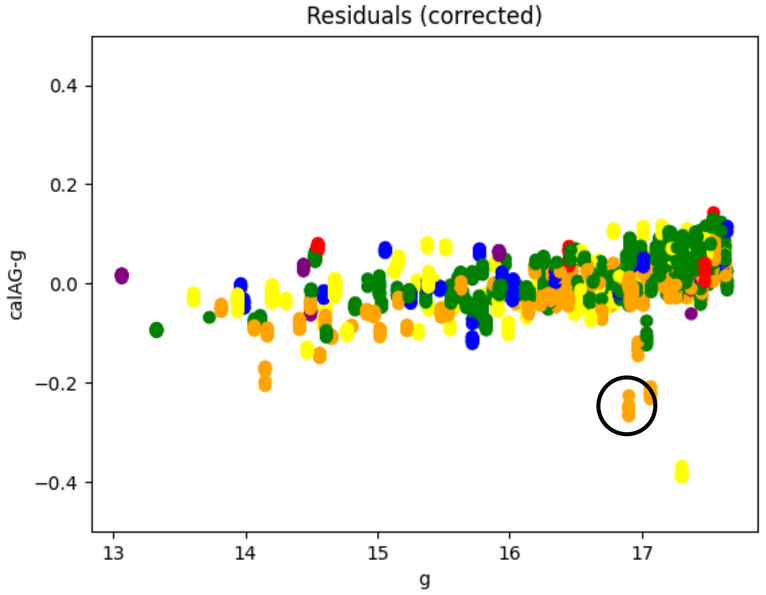


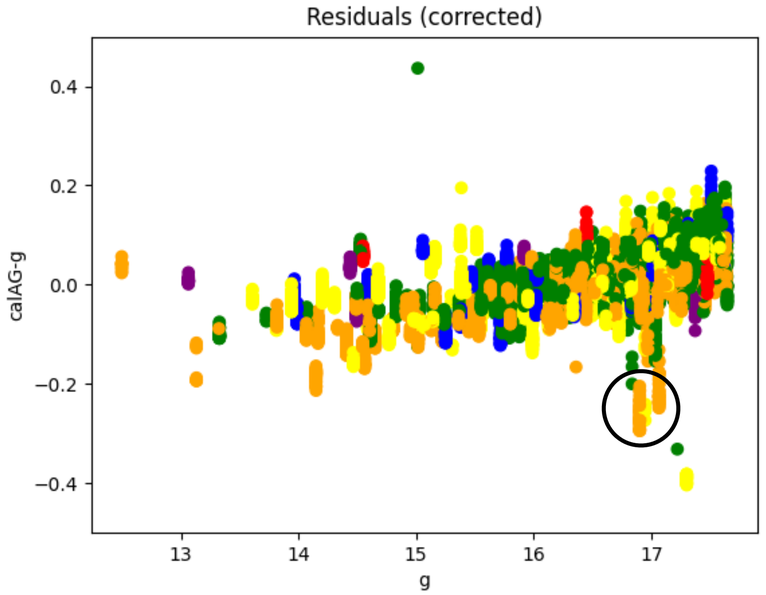


- Circles mark a couple of stars with repeat observations
- Note the frame to frame scatter in individual fluxes is quite small

Effects of seeing

- Poor seeing increases the scatter in the fluxes
- Little effect in the colour correction
- Top image: spot size < 3 pixels
- Lower image: spot size < 15 pixels
- Note the greater scatter in fluxes for individual points

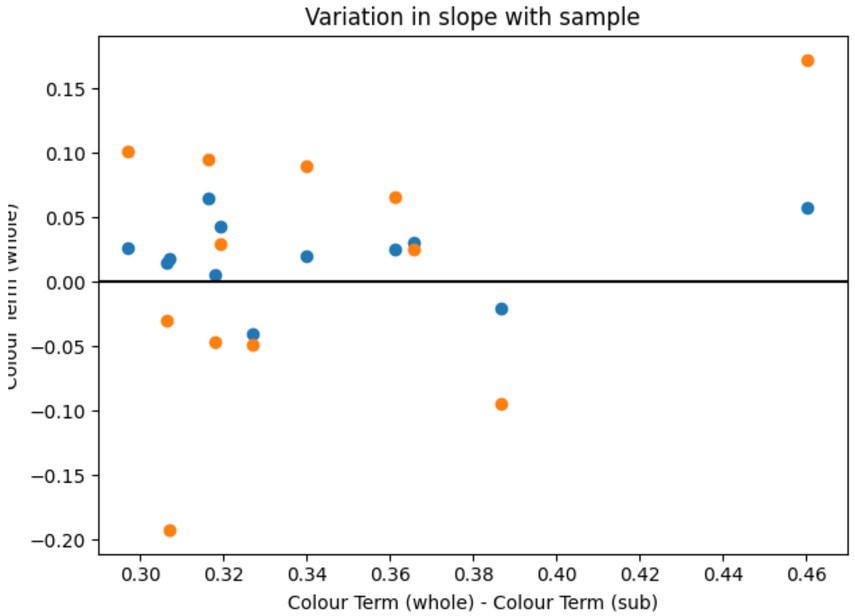




- Note the increase in frame to frame scatter of the measured fluxes

Effects of sample

- Split the sample into two sets of sources, redo analysis
- Some scatter on order of 0.1 magnitudes in fitted slope.
- Range of bp-rp covered varies with sample
- More distinct sources will produce a more robust results



- Above: difference in slope of the fitted colour-colour diagram for all cameras, comparing two non-overlapping subsamples with the whole sample

Slope in residuals

- An artifact of the sextractor default flux calculation, which sums the flux above the given threshold. For the calibration set, the magnitude of the effect is <= 0.1 mag.
- To improve: more sophisticated flux measurement
- Do we need to do this?

Comments

- The calculated colour corrections are robust to seeing changes and flat-fielding / bias calculation. They do change with choice of subsample, indicating that we need more sources for a robust calculation.

- The frame to frame variations in magnitudes are dominated by the seeing / transparency effects. With good seeing, the variation in source to source flux is < 0.05 mag.

- There is a small residual slope in the comparison of GAIA and AG camera fluxes due to the threshold based flux calculation. Increasing the accuracy of the calculated flux will require a different method, and can be explored if necessary. This results in a ~0.1 mag variation in calculation of bright sources, but doesn't affect the source to source variation.

- We should re-run calculations when we have a larger sample size.