

Review of Charge Diffusion Variations in Pan-STARRS 1 CCDs
Magnier et al

This paper clearly presents a new effect in CCD images that will be an important consideration for anyone attempting high-precision measurements from wide-field astronomical imaging in the future. I recommend its publication with some minor revisions, which the editor could review. I have no comments to make on the analysis in or conclusions of the paper, they are all sound. The one substantive issue I have is that it would be good to have some comment on what differences in CCD architecture could cause such substantial difference in tree-ring behavior between the Gigacam and DECam devices.

I do, however, have a few suggestions below on making the paper more concise and easier for readers to follow.

Figures: there are substantially more than are needed; I don't think you need to show every band of every effect in Figs 3,4,5, and 6 - Fig 7 is by far the most informative, allowing comparison of your diagnostics. Similarly, showing all the scatter plots for all bands in Figs 8,9,10,11,12 is overkill, in my view. I'm not sure any of these x vs y scatter plots are really needed; for me it suffices to give the amplitudes of each effect relative to g band in tabular or graphical form. The most important figure that I would want to see is, in fact, missing: a plot of the radial run of each effect (a 1d plot of Fig 7, basically), so that I can e.g. visually see whether the flat field is the derivative of the astrometric displacements, as the lateral-field model predicts.

Also the spacing of the arrows in the ellipticity figures is too coarse to see whether there are radial shear variations that are coherent with any of the ring patterns. Here a 1d radial plot would be essential.

page 4, Line 18: "non-pixel uniformity" ??

4/22: "relatively coarse grid" - can you give the grid size?

4/36: Can you say whether there are any differences between the "PV2 analysis discussed here" and the public data releases, i.e. corrections that this work implies need to be made to the public data?

5/12: "diffusive effects of the lateral fields" - the lateral fields effects I would not consider "diffusive" since they simply are conducting the charge packets in a tranverse direction. The effect you find dominating the PS1 devices differs in being primarily diffusive.

Table 1, 8/13, other places: these values are referred to as the "per-pixel standard deviations" which is unclear to me. Is this the SD of different stellar measurements or flat-field pixels contributing to the mean of a given super-pixel in the plots? Or is it the SD of the super-pixel averages, i.e. the SD of the plotted values? Or something else? The most relevant statistic is the SD after the shot noise of the individual measurements has been suppressed, since we don't care about measurement noise in this paper.

Fig 1: In the caption it would be good to state that this is for one device in the camera (even though this is stated in the text).

Figs 1,2, 4: Why does Y band have so many missing (white) pixels? It makes it impossible to look for patterns.

Fig 3: what are the units of the plot?

Table 2 (and in text in many places): you talk about "correlations" between filters or different effects, but my guess is that what you are really plotting is the amplitude of variations relative to those in g band. The correlation coefficient would be something different - and less interesting, since the correlation coefficient will depend heavily on size of irrelevant sources of variation like measurement noise and the g-band striping. A graph of these values (grizY along the x axis, different symbols for each effect) might be more effective than this table.

Table 3: same comment, what does "correlation" mean here?

11/9: "deviations relative to the median flat-field image" - do you mean that you are plotting the deviations relative to the median *of* the flat-field image? Otherwise I don't understand.

11/25: A Gaussian smoothing of 3 superpixels - is this well above the max "wavelength" of the rings? If not it can suppress a lot of them. Seems small compared to the features visible in some of the figures.

Fig 14: what are the red and blue lines?

24/19-21: These statements seem contradictory: the slope should be -1; the data give a slope of 0.5; they are consistent.

24/23, 25/28, 25/30: Here you should probably be referring to DECam (the camera) rather than DES (the survey).

25/17: Is there any concise way to explain why adding dopants (space charge) will *decrease* the transit time and charge diffusion at fixed voltage and distance across the device?

Conclusions: you should probably say something about which published quantities of the PS1 catalogs are affected by this effect, by how much, and whether any corrections have been applied, whether the effects are reduced by averaging over multiple exposures.