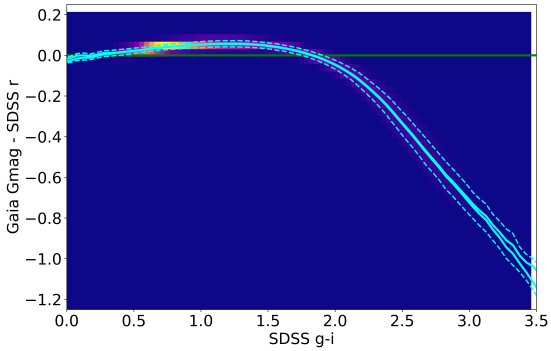

Figure 1. The variation of the difference between Gaia's Gmag magnitude from Data Release 2 and SDSS r magnitude with the SDSS $g-i$ color. The color map illustrates the distribution of $\sim 393,000$ matched stars with 16 <Gmag< 19.5. The two (barely distinguishable) solid lines represent the median values $\pm$ uncertainty of the median for 0.05 mag wide $g-i$ bins. The short-dashed lines show the median values $\pm$ the robust standard deviation for each bin. The horizontal solid line at zero is added to guide the eye. The mean of the two solid lines is used to derive the gray zeropoint correction, as a function of R.A. and Declination.

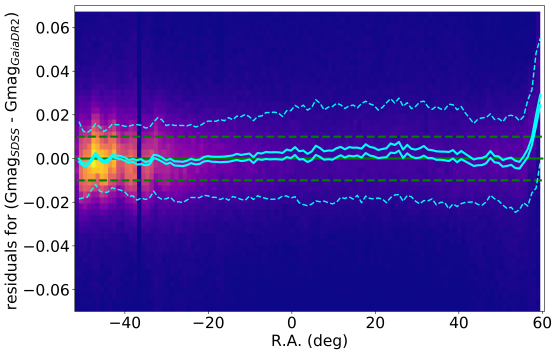

Figure 2. The R.A. variation of the residuals between Gaia's Gmag from Data Release 2 and synthetic Gmag values generated using SDSS *gri* photometry. The color map illustrates the distribution of $\sim 372,000$ matched stars with 16 <Gmag< 19.5 and $0.4 < g-i < 3.0$. The two solid lines represent the median values $\pm$ uncertainty of the median for 1 degree wide R.A. bins. The short-dashed lines show the median values $\pm$ the robust standard deviation for each bin. The horizontal solid and long-dashed lines at zero and ± 0.01 mag, respectively, are added to guide the eye. The mean of the two solid lines is the gray correction, as a function of R.A., applied to the SDSS *ugriz* magnitudes. The standard deviation for the applied correction is 3.5 milimag.

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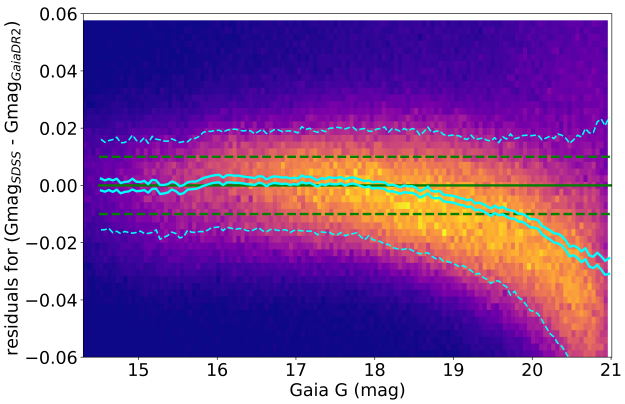

Figure 3. Analogous to Figure 2, except that here Gmag residuals are shown as a function of Gmag magnitude. Note the jump by about 3 milimag at Gmag∼16 – that was a known and larger problem in Gaia Data Release 1 and apparently not entirely fixed in Data Release 2. Note also large (> 0.01 mag) discrepancy at the faint end – a comparison of the SDSS catalog with Pan-STARRS and DES catalogs suggests that its origin is a bias in Gaia photometry at the faint end.

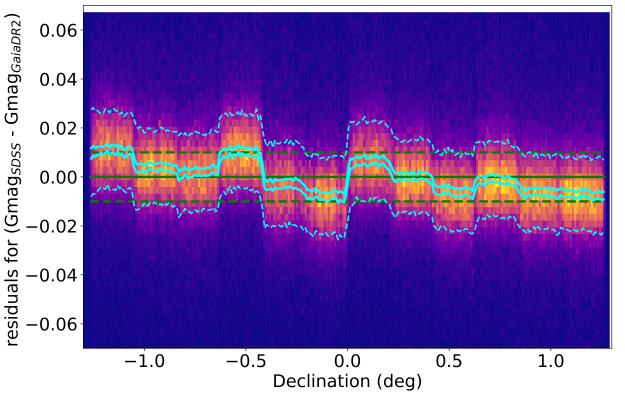

Figure 4. Analogous to Figure 2, except that here results are shown for 0.01 degree wide Declination bins. The 12 cleary visible regions correspond to two SDSS scans (in R.A. direction) and six CCD columns in the SDSS camera. The standard deviation for the applied correction is 6.2 milimag, with a maximum absolute value of ~ 0.01 mag.

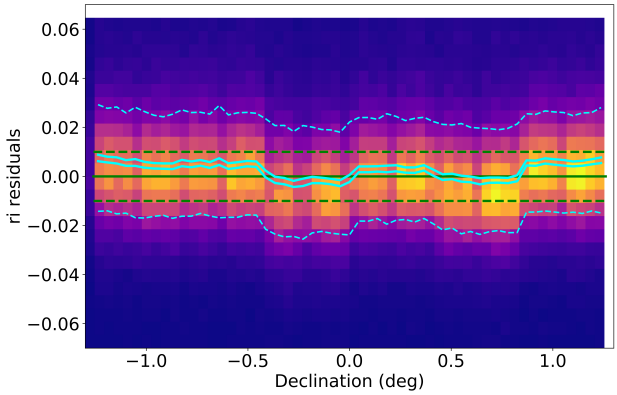

Figure 5. Analogous to Figure 4, except that here residuals correspond to differences between the SDSS $r - i$ color and a synthetic $r - i$ color generated using Gaia's $BP - RP$ color. Note the signature of SDSS camera columns at the level of a few milimags. The standard deviation for the binned medians is 3.2 milimag (for other bands, please see Table X1.

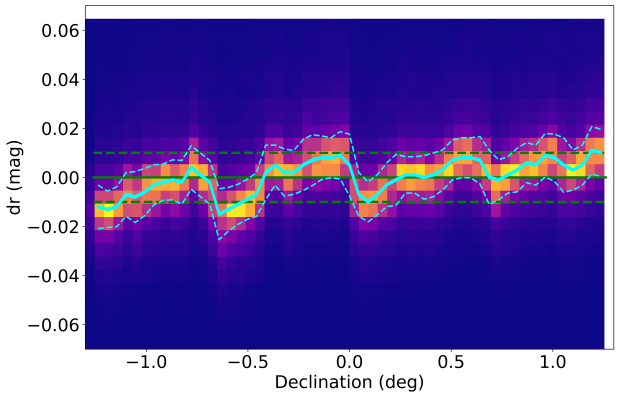

Figure 6. The differences between r band magnitudes listed in the v2.6 and v3.4 SDSS Standard Star catalogs. The size of the four regions corresponds to the field-of-view size of the SDSS Photometric Calibration Telescope. The standard deviation for the binned medians is 6.8 milimag. The binned median scatter in R.A. direction is much smaller – 2.0 milimag. For statistics in other bands, please see Table X2.

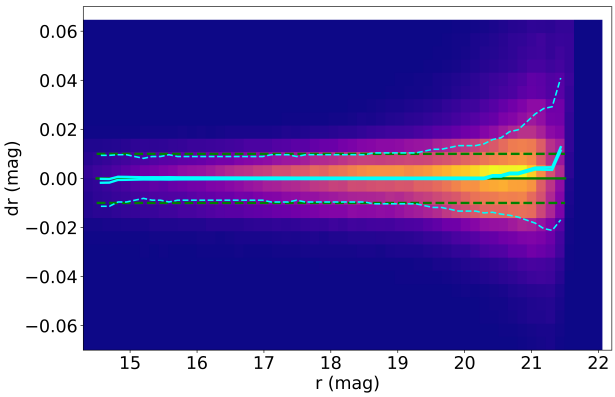

Figure 7. Analogous to Figure 6, except that here the r band differences are shown as a function of the r band magnitude. The binned median scatter is 1.9 milimag.

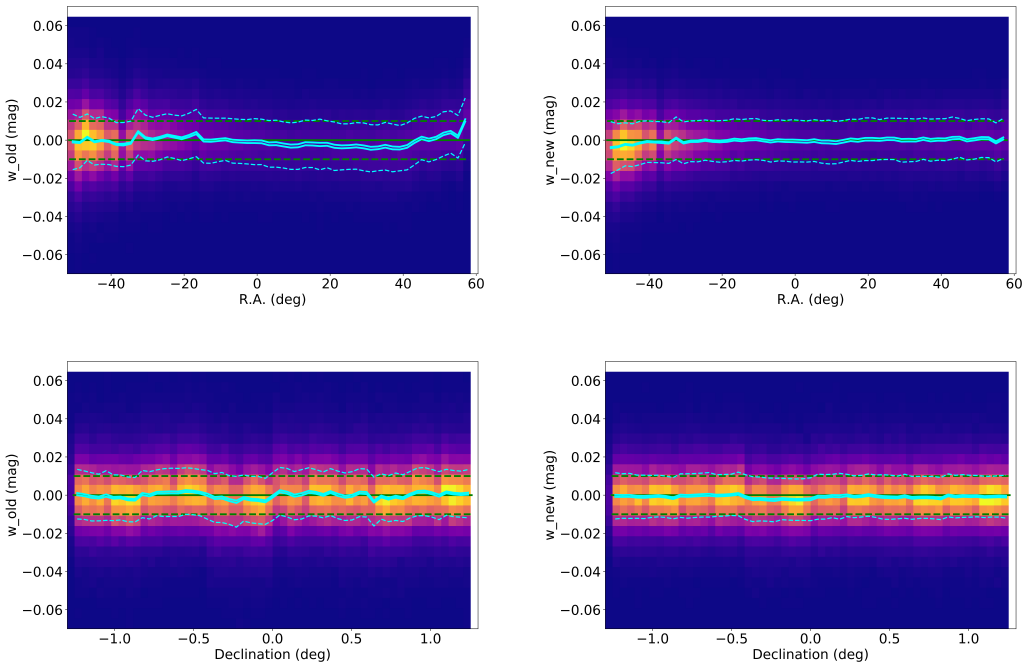

Figure 8. A comparison of the w color, the second principal color in the SDSS $r-i$ vs. $g-r$ color-color diagram, behavior for the v2.6 (left) and v3.4 (right) catalogs. The standard deviation of the median values binned by R.A. and Dec is 2.7 milimag and 1.0 milimag for v2.6 and 1.5 milimag and 0.7 milimag for v3.4, respectively.

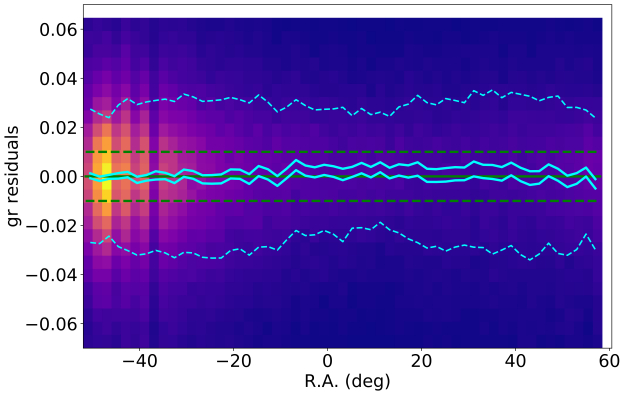

Figure 9. Analogous to Figure 2, except that here residuals between the SDSS $g-r$ color from the v3.4 catalog and a synthetic $g-r$ color generated using Gaia's $BP-RP$ color. The binned median scatter is 1.6 milimag.

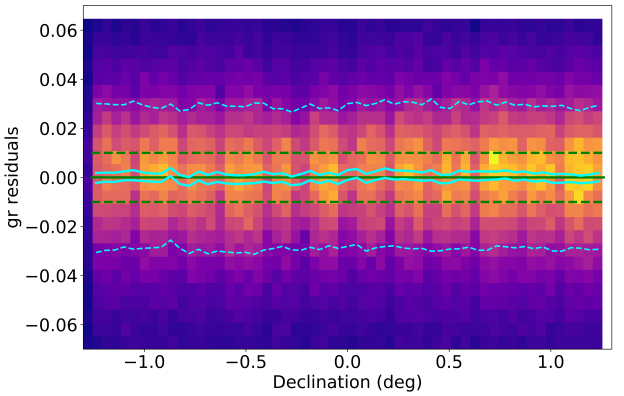

Figure 10. Analogous to Figure 9, except that here the $g-r$ residuals are shown as a function of Declination. The binned median scatter is 0.8 milimag.

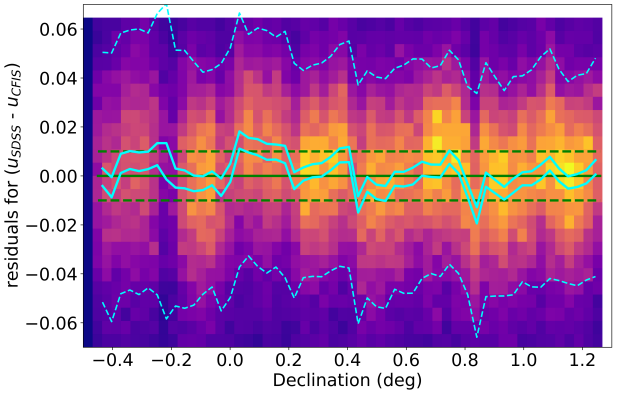

Figure 11. Analogous to Figure 4, except that here residuals between the SDSS u band magnitudes and u band magnitudes from the CFIS catalog (corrected for small color terms, ~ 0.05 mag, as a function of the $u-g$ color), for ∼150,000 matched stars with $1.0 < u-g < 2.1$ and $r < 20$ are shown. The binned median scatter is 5.7 milimag. Note that the CFIS data are available only for Declination > -0.45 degree.

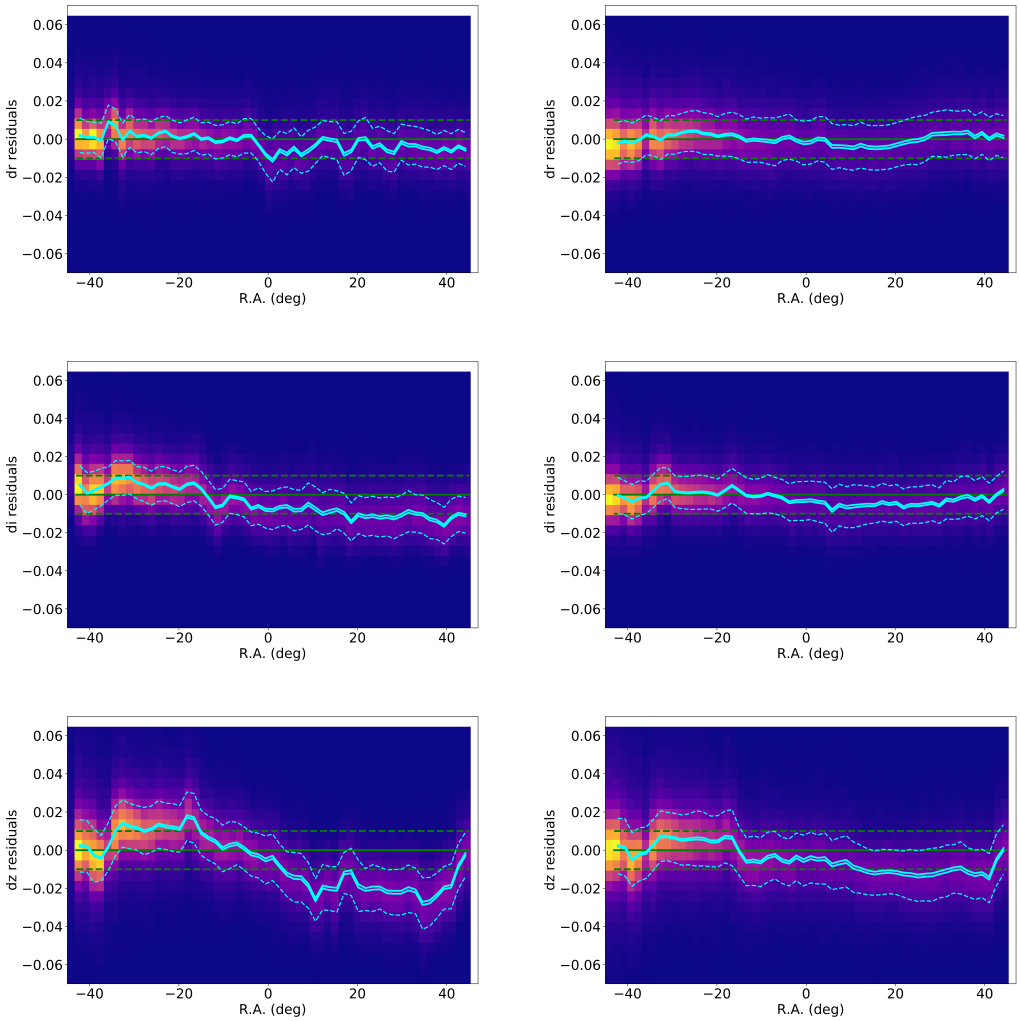

Figure 12. A comparison of the magnitude differences between the SDSS v3.4 catalog and DES (left) and Pan-STARRS (right) catalogs, for the *riz* bands.

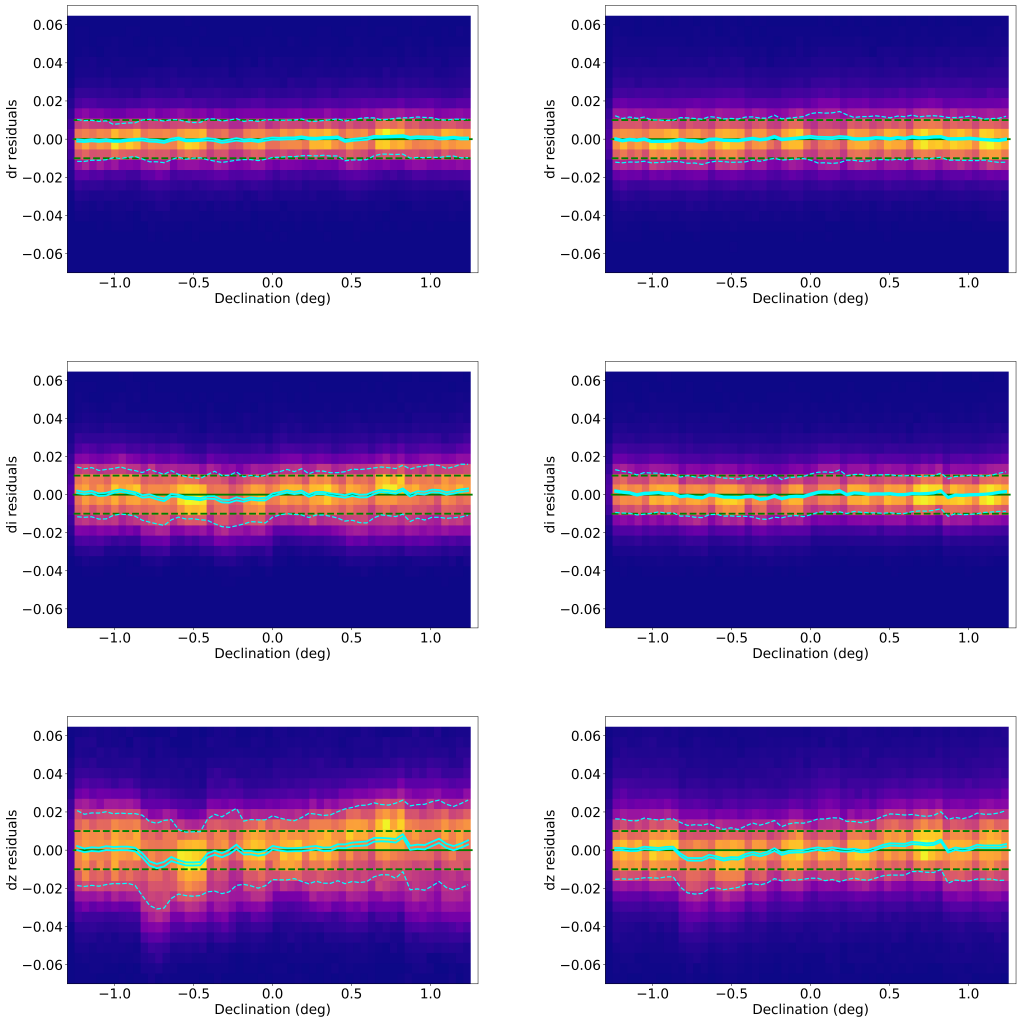

Figure 13. Analogous to Figure 12, except that magnitude differences are binned by Declination.