



Nebencal Results for the Y I P I Equatorial Region

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Nebencal Code

- the übercal algorithm, but with the option to split the sky into overlapping Healpix regions and combine results at the end.
- can include a standard catalog, in which case the zero points are normalized at the end to the standard's level.
- solve for one ZP per X , where X is any property of the objects, e.g. `image_id`, `exposure_id`, `superpixel` (= star flat code)
- new!
 - solve for ZPs as a coefficient of any object property, e.g. x, y, r
 - solve simultaneously for multiple types of ZPs, e.g. one per superpixel and one per `image_id`
- the extra functionality is cool, but doesn't help the results (so far)...



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Nebencal Code

Standard config file, used in the following results

```
config.yaml
1 general:~
2 ~
3 # what filter(s) do we want to calibrate? this is a list.~
4 filter : 'i'~
5 ~
6 # note that these input files depend on the filter!~
7 precam_filename : "/Users/bauer/surveys/DES/precam/PreCamStandarStars/I.Stand1percent.s"~
8 zp_phot_filename : "/Users/bauer/surveys/DES/zp_phots/i.dat"~
9 ~
10 # these inputs do not depend on the filter.~
11 globals_dir : '/Users/bauer/surveys/DES/y1p1/equatorial'~
12 sdss_filename : "/Users/bauer/surveys/DES/y1p1/equatorial/sdss/SDSSDR10_SouthGalCap/strip82_grid5x5.csv"~
13 ~
14 # file to use as validation objects when making plots~
15 sdss_validation : "/Users/bauer/surveys/DES/y1p1/equatorial/sdss/SDSSDR10_SouthGalCap/strip82_sample2.csv"~
16 ~
17 # include precam and/or sdss as standards?~
18 use_precam : False~
19 use_sdss : True~
20 ~
21 # what nside is used in the global object file pixelization scheme?~
22 nside_file : 32~
23 ~
24 calibrations:~
25 ~
26 - id_strings : ['exposureid']~
27   outfilenames : ['nebencal_exp_zps_i']~
28   nside : 2~
29   max_dets : 2500~
30   use_standards : True~
31   require_standards : True~
32   operands : [1]~
33 ~
34 - id_strings : ['image_id']~
35   outfilenames : ['nebencal_img_zps_i']~
36   nside : 32~
37   max_dets : 500~
38   use_standards : True~
39   require_standards : False~
40   operands : [1]~
41 ~
```

- a list of calibrations to perform in series
- we want one ZP per... (this is a list to perform in parallel)
- what Healpix resolution to use? 0 = all sky
- use standards, and require their presence in every Healpix pixel?
- the ZP multiplies... (1 or None = constant additive ZP)



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Nebencal Code

A more complicated config file, for example.

1. find one ZP per superpixel (32 per CCD) and one ZP per image_id. (the star flat algorithm!)
2. find one ZP per image, where the ZP is multiplied by the object's CCD x coordinate. Previous ZPs are applied before calculating current ones.

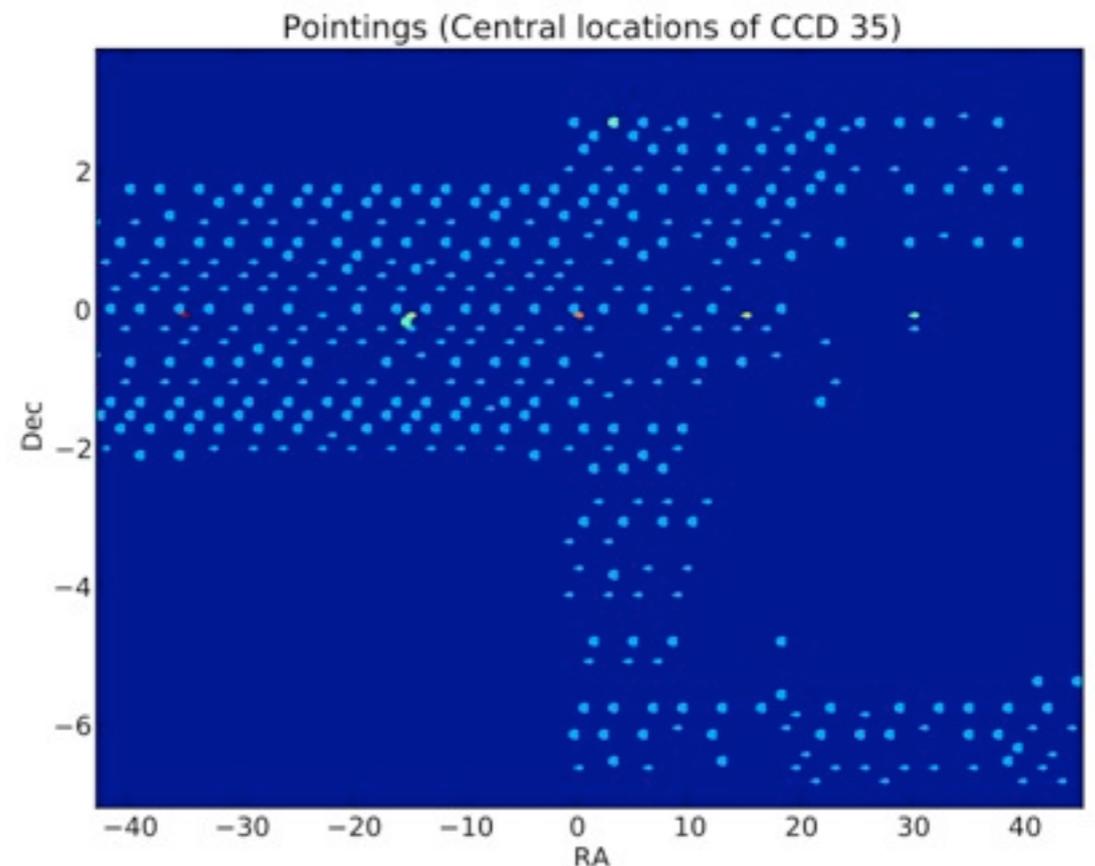
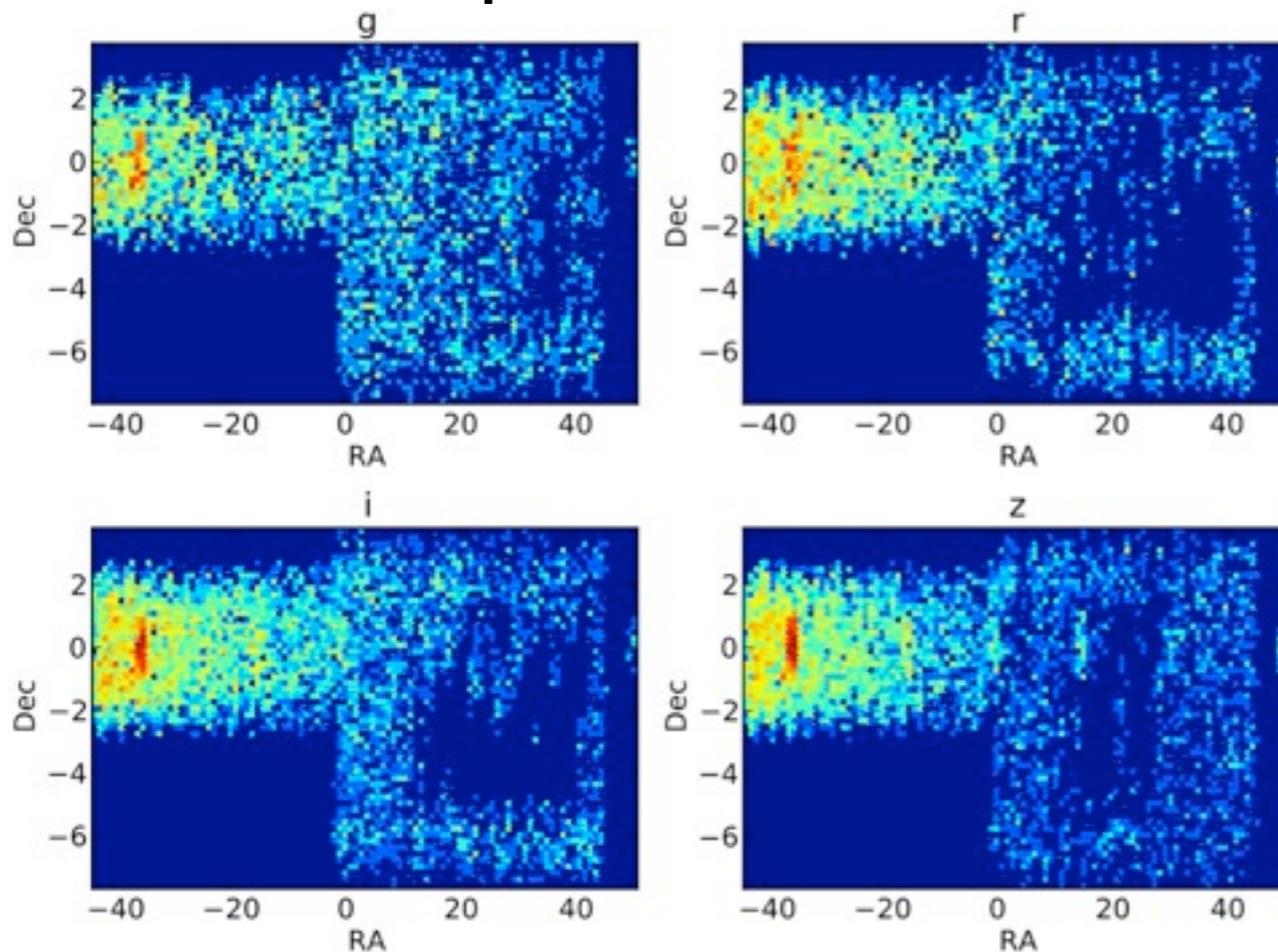
```
24 calibrations:-  
25   -  
26   - id_strings : ['superpixel', 'image_id']-  
27     outfilenames : ['nebencal_spx_zps_i', 'nebencal_img_zps_i']-  
28     nside : 32-  
29     max_dets : 500-  
30     use_standards : False-  
31     require_standards : False-  
32     operands : [1, 1]-  
33   -  
34   - id_strings : ['image_id']-  
35     outfilenames : ['nebencal_imgx_zps_i']-  
36     nside : 2-  
37     max_dets : 2500-  
38     use_standards : True-  
39     require_standards : True-  
40     operands : ['x_image']
```



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The relative calibration works well

- Using Y I P I griz (no Y: my bad.)
- Mean RMS of objects' measurements after calibration:
6.0, 4.4, 5.1, 5.1 mmag (g,r,i,z)
- Note: pointings seem to be \sim constant: same objs on same parts of the focal plane

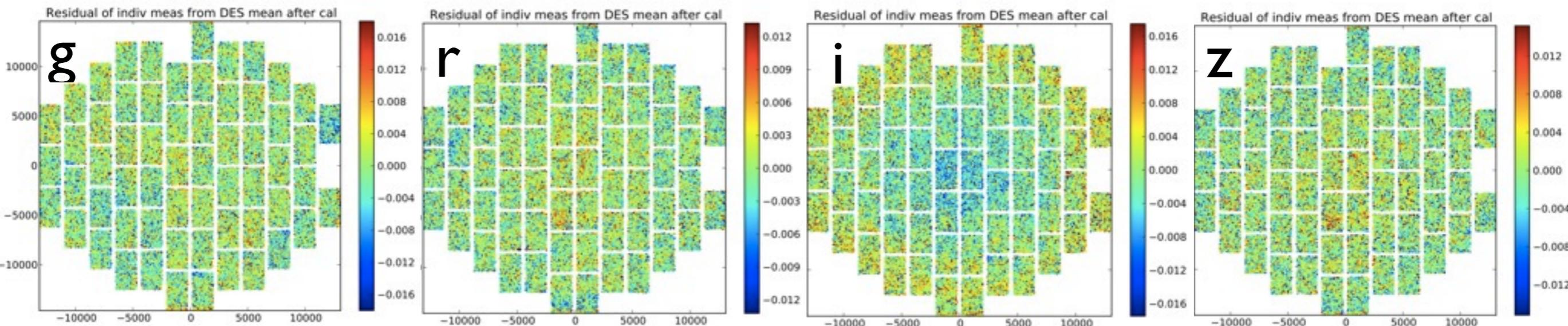




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Residuals vs. Focal Plane

- Residuals between individual measurements and the DES mean (internal)
- Color terms!
- My code could calibrate vs., e.g., g-i... (so far uses single-band detections)
- This is a big problem for results vs. standards

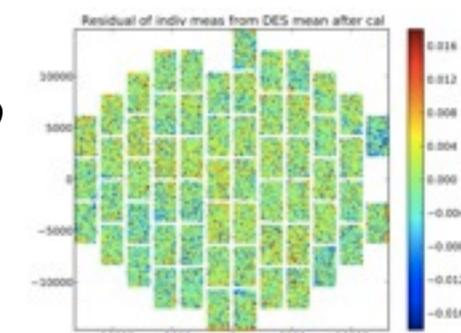
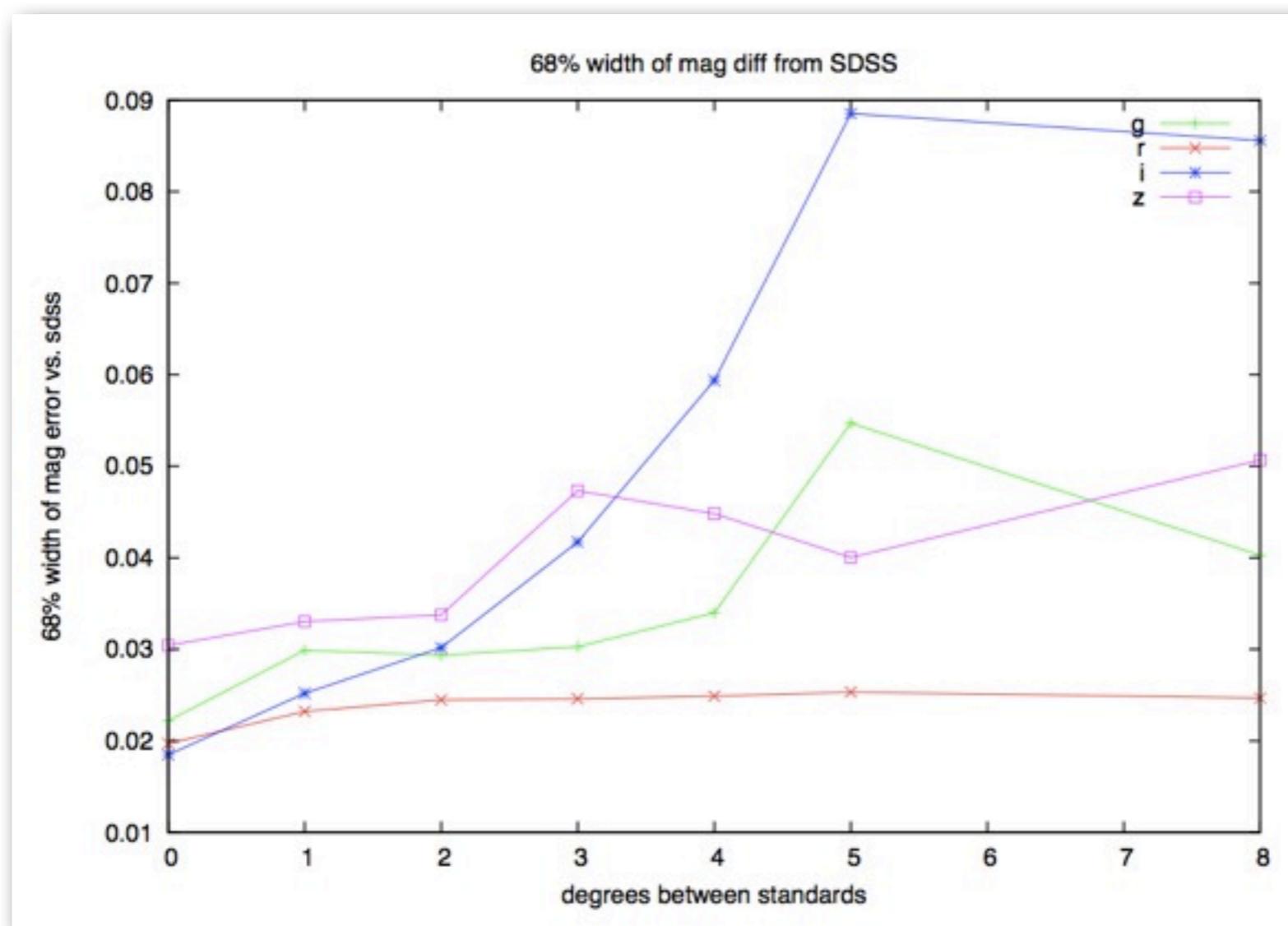




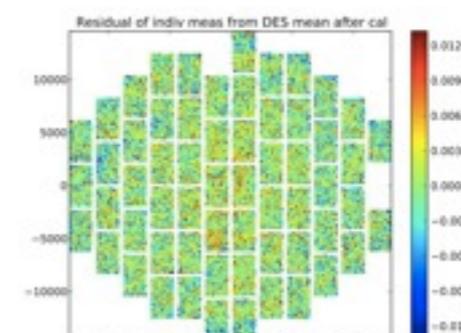
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Dependence on spatial density of standards

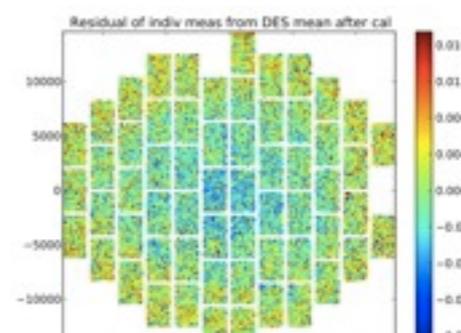
- Does not always scale strongly with standards density. Due to focal plane resid spatial properties vs. the dither?
- Fixing color term problems may fix this?



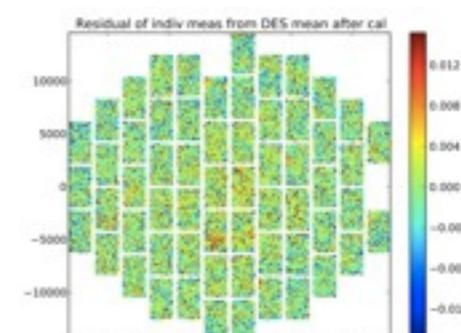
g



r



i

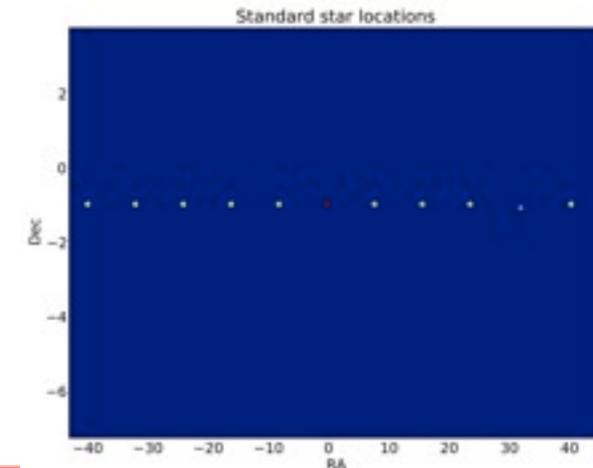


z



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The problem



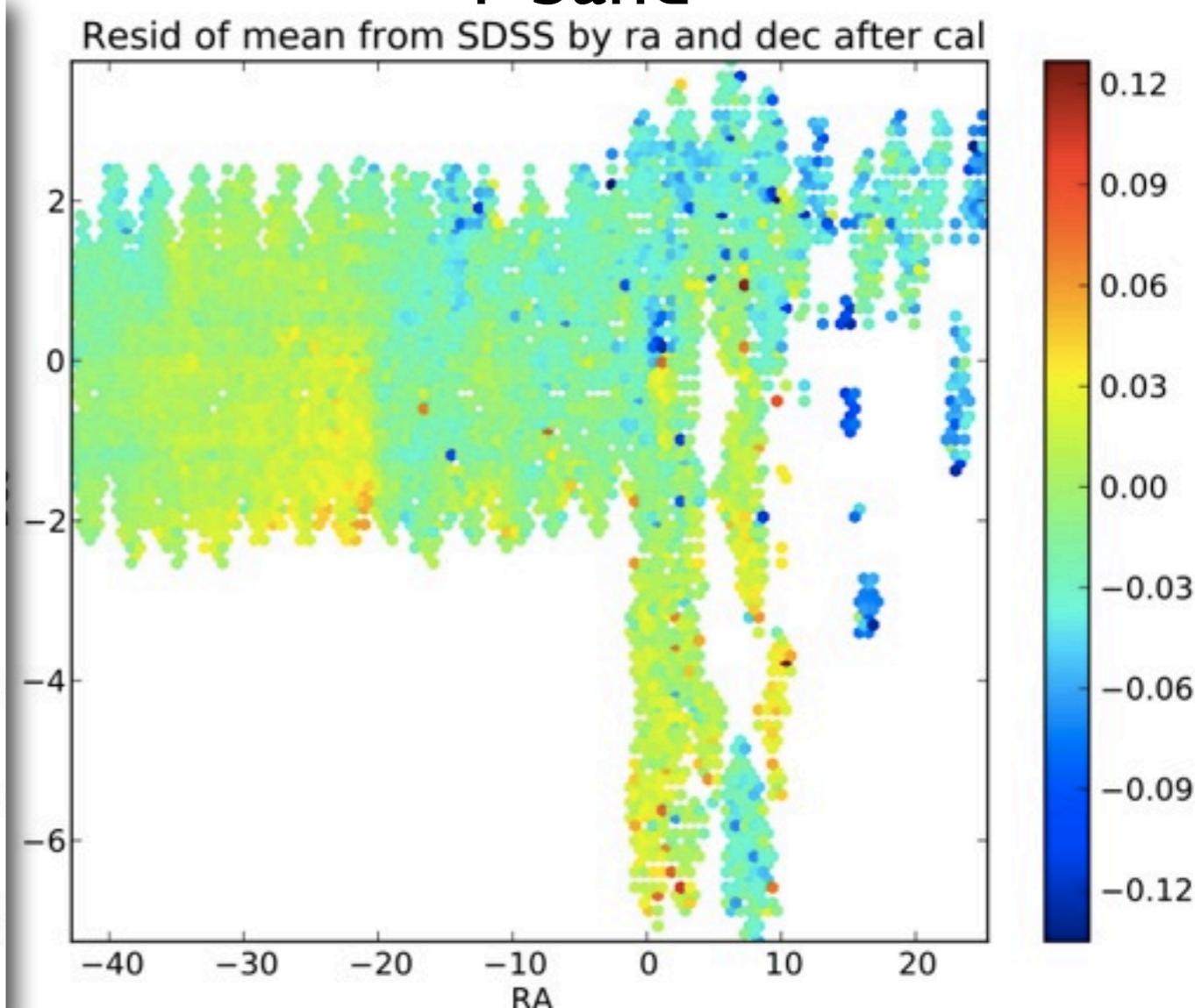
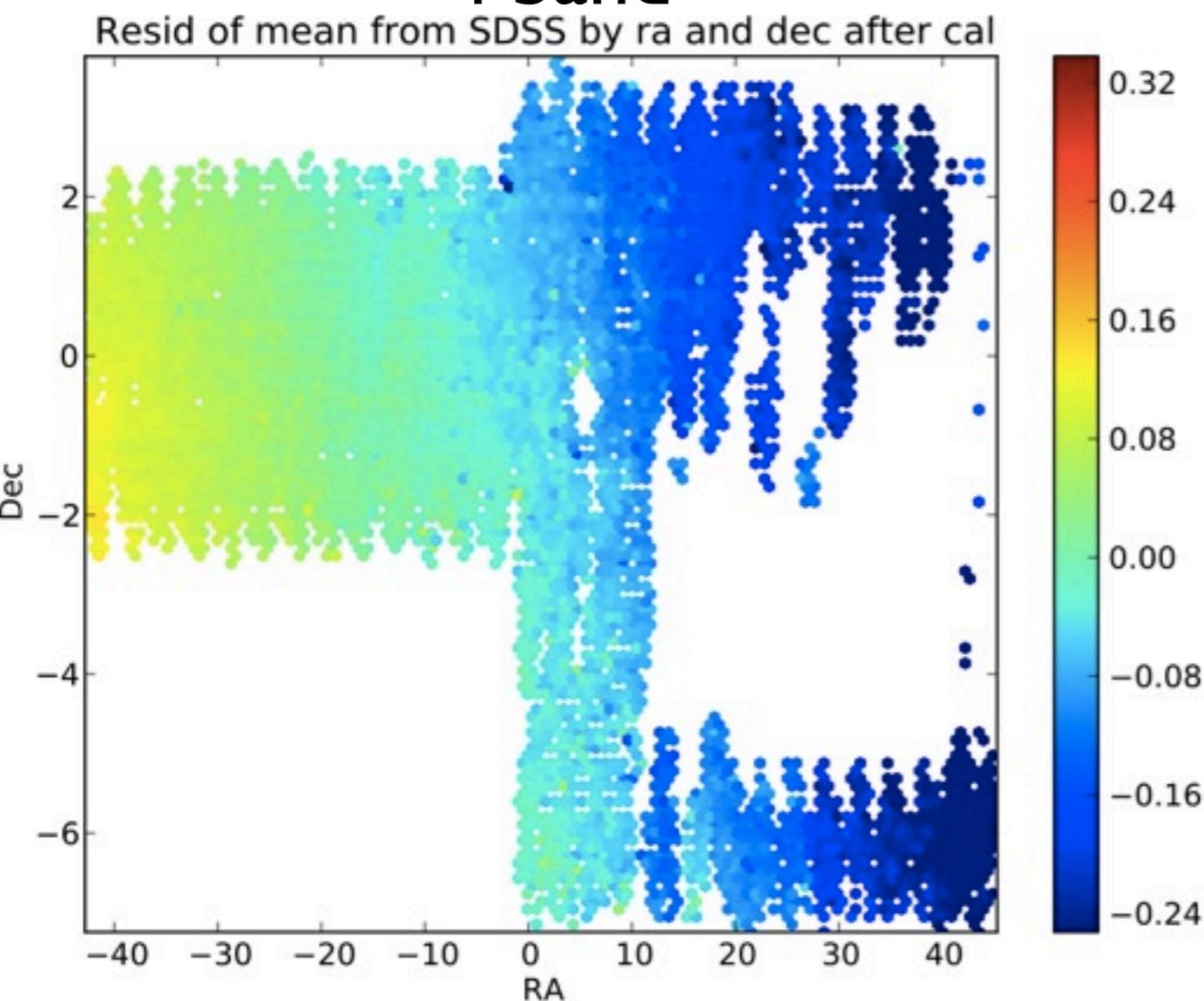
i band 68% width of the resid distribution = 0.09 mags.

r band 68% width = 0.025 mags (standards every 8 deg)

Drift due to asymmetries in the focal plane residuals + non-ideal dithers?

i band

r band

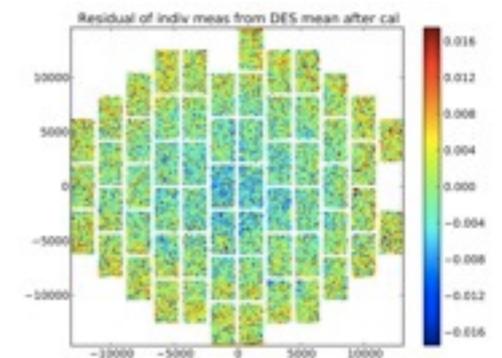
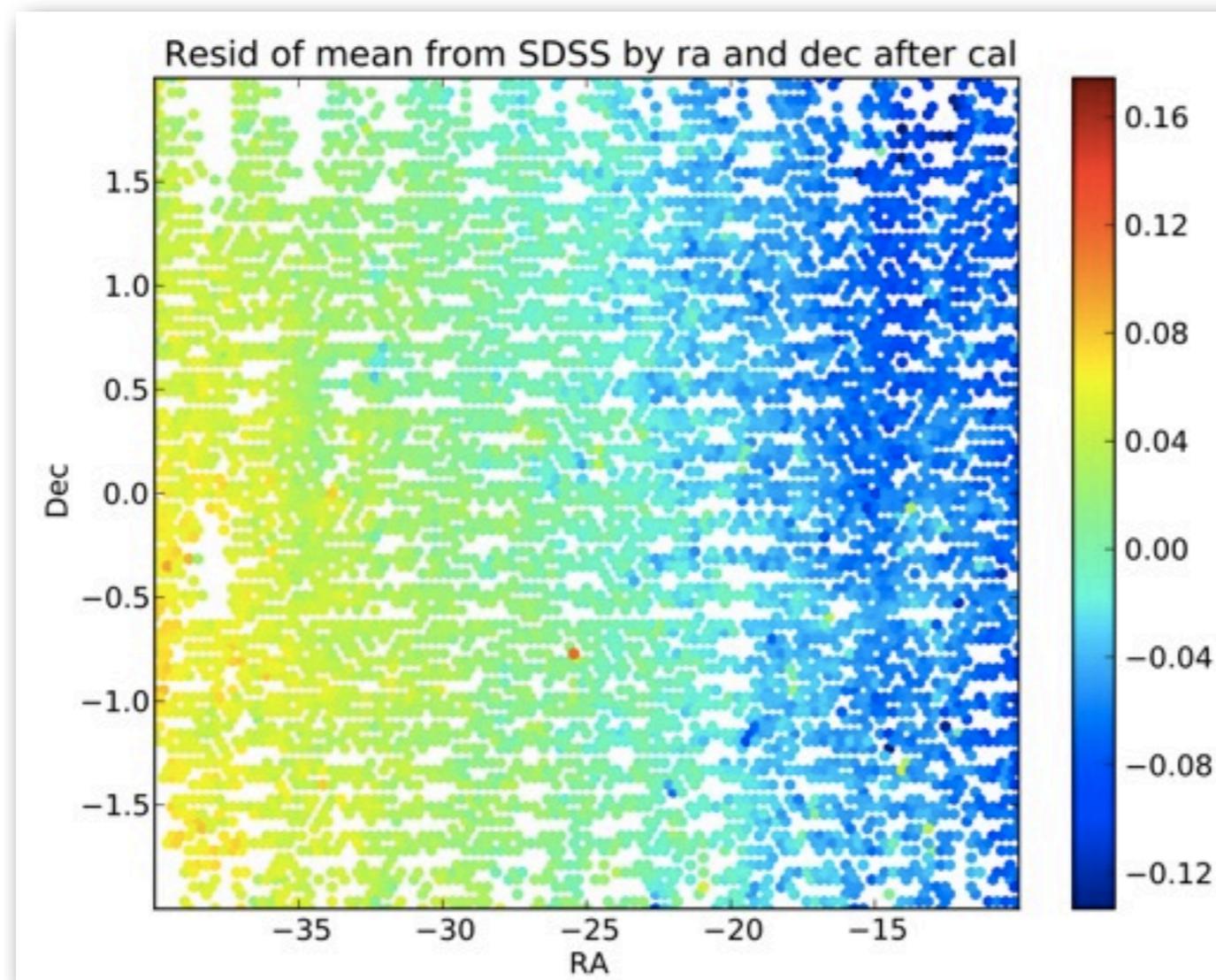




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Results on a compact sky area

- i band resid 0.09 mags \rightarrow 0.05 mags
- Fundamental problem still there.

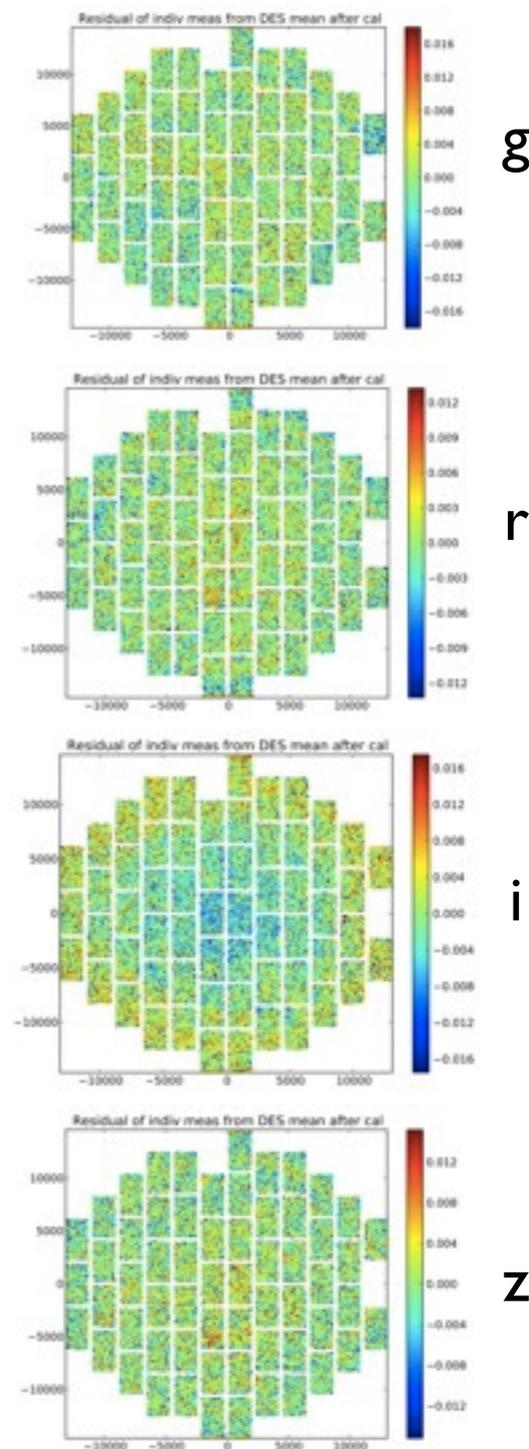
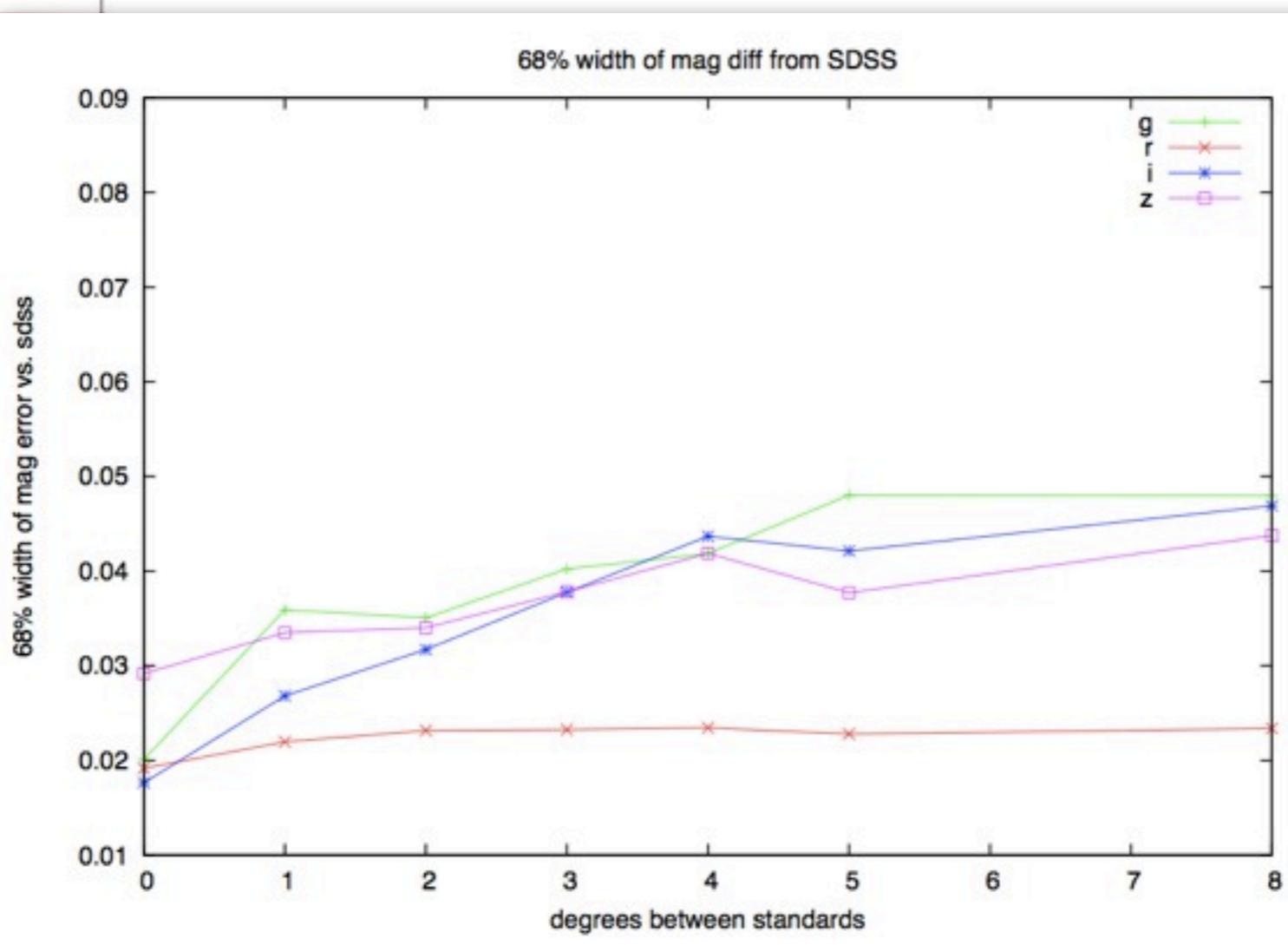
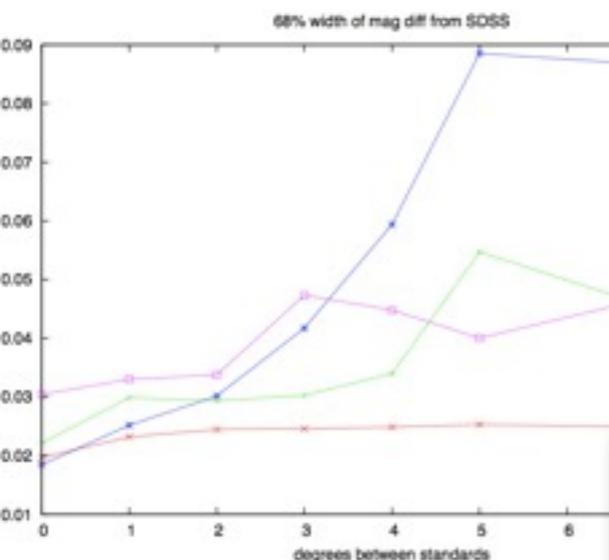




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Results on a compact sky area

- Better; implies future data will work better
- But not good enough...





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Summary

- The code has much flexibility
 - ▶ That has not yet been exploited
- Color terms currently the major issue!
 - ▶ Is this the place to address them?
- Is the 2% floor spread vs. standards too big to be explained by color terms?
- Should systematically calibrate vs. everything to take advantage of the code flexibility. (A search for the best band-aid?)