System Response and Science Requirements

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The goal here is to describe the problem in simple terms and to ask for creative solutions to acheive the best possible calibration

The requirements

R22- The system response curves must be known with sufficient precision that the calculated grizY magnitudes of an object with a precisely spectrophotometrically calibrated spectrum agree with the measured magnitudes to within 2%

Implies a system response engine and a rough zeropoint

R23- For the wide area survey, the rms fluctuations in the spatially varying component of the magnitudes error in the final catalog must be smaller than 2% overall scales smaller than 4 degrees in each of grizY

This is a spatially varying relative photometry discussion and remember that we cover >100 degrees in RA.

R24- The magnitudes for the final catalog must have an absolute zero point that is well defined and known to 0.5%. The magnitudes will be on the natural instrument system.

After we have the catalog, the mean ensemble offsets to AB should be known.

SN calibration

~100 white dwarfs inside WAS

absolute fluxes and absolute colors with 2% errors

ensemble average to reach 0.5%

SN fields also inside WAS: relative photometry must transfer calibration to these

1.6.1, 1.6.2, 1.6.3

System response

1.6.4

It is all about ensemble averages

These requirements support the 3 wide area key projects primarily through photometric redshifts and the SN key project through precision apparent magnitudes.

The issue

The issue today is the color terms:
objects with extreme colors will have systematically different ***fluxes*** depending on where they lie on the corrector optics/filter/CCD array.

Star flats do not fix this.

In single pass data, one applies a color term: a correction to the flux dependent on the color of the object.
This is done at the catalog level.

Except that for exotic objects, say M stars or SN, there are more than one correction branch that must be chosen from

In traditional coadds, one averages first and asks questions later.
That is, one does the coadd and then attempts a color term correction at the catalog level.

It is unclear whether we can get away with this.

The questions:

how do we use our assets?

Traditional all sky photometric techniques are good to 2%

Our goal is to do better.

Asset 1: clear night photometry

The massively overlapping hexes allow both relative photometry and global photometry (aka: star flat).

The aim is to place every CCD onto the natural instrument system, likely to be one of the central CCDs

Asset 2: multiple exposures of same field

We will have system response information.

Do we attempt to use this to correct the color terms?
At the catalog level?
During the image processing?

Asset 3: the system response

What I would like from you is thinking about the BEST way to calibrate the data given the spatially varying system response.

Compromises will come in time.

The field of calibrating these big surveys is still young.