gfa_reduce
'field acquisition mode'

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Summary

- I have adapted the off-line gfa_reduce pipeline so that it can handle the special file format in which ICS writes the acquisition image for use by PlateMaker

    - files like platemaker/test/43860/gfa-43860.3.fits within tar archives like pm-00043860-logs.tar are being used as examples for my code development

- Additionally, I have brought on desimeter as a gfa_reduce dependency, which allows me to fit a desimeter FieldModel object within gfa_reduce using my Gaia cross-matches

    - The Gaia cross-matches are made possible with my per-camera WCS solutions

    - The FieldModel fitting is basically just taken from Julien's desi_fit_guide_star_coordinates script in desimeter/bin

- In gfa_reduce field acquisition mode, a FieldModel object is returned as the sole output and no files are written to disk

    - The underlying gfa_reduce "_proc" driver also includes a keyword option to write the FieldModel to a JSON file rather than returning it in-memory

how to use gfa_reduce field acquisition mode

gfa_reduce and desimeter must be installed

main gfa_reduce 'driver' script is gfa_red.py

```
import gfa_reduce.gfa_red as gfa_red
fname_in = '/global/cscratch1/sd/ameisner/platemaker_logs/00043860/data/platemaker/test/43860/gfa-43860.3.fits'
fm = gfa_red.acquire_field(fname_in)
```

output is a desimeter FieldModel object

I un-tarred a bunch of pm-????????-logs.tar files to this NERSC directory

special GFA image format written for PlateMaker to perform field acquisition

Implementation

```python
def acquire_field(fname_in):
    fm = _proc(fname_in, no_ps1_xmatch=True, skip_image_outputs=True,
               dont_write_invvar=True, skip_psf_models=True,
               dont_write_catalog=True, dont_write_ccds=True,
               return_fieldmodel=True, multiproc=True)

    return fm
```

- In detail, 'field acquisition mode' is really just a particular combination of keyword options that gets sent into the gfa_red._proc primary pipeline driver function

https://github.com/ameisner/gfa_reduce/blob/
01c7906ef34a0c974129b3df348b336e4c7993b6/py/gfa_reduce/gfa_red.py#L18

ADC angles hack

- Virtually all of the necessary metadata appears to be present in the files like gfa-43860.3.fits. However, I can't find ADC1PHI and ADC2PHI in these files.

- For now I simply use placeholders of ADC1PHI = ADC2PHI = 0

  - This hack has the potential to cause confusion in the future if forgotten about

- Would it be possible for ICS to add ADC1PHI and ADC2PHI keywords to the PRIMARY headers of files like gfa-43860.3.fits in the future?

- For current off-line purposes, I may write my own tweaked versions of files like gfa-43860.3.fits where I add in ADC1PHI and ADC2PHI keywords based on the full guider cubes available in the raw data directory

ICS/PlateMaker acquisition image naming convention?

- It's not clear to me why files like "gfa-43860.3.fits" have the ".3" in their file names.

- A small number of such files have ".7" instead of ".3"

  - Specific examples are: gfa-55656.7.fits, gfa-43027.7.fits, gfa-48773.7.fits, gfa-55359.7.fits

  - I don't understand this

- Can I always assume gfa_reduce should be looking for a pattern of gfa-<expid>.?.fits ?

adding GCCDTEMP to the acquisition image headers?

- I am not able to find the GFA CCD temperatures in the acquisition image files like gfa-43860.3.fits

- The gfa_reduce pipeline can empirically fit the dark current scaling, and so does not strictly need GCCDTEMP

- Subtracting the dark current based on GCCDTEMP is slightly faster than fitting the dark current scaling empirically, so it might be nice to include GCCDTEMP in the acquisition image headers if it's not too much trouble

Next steps: minimizing field acquisition mode run time

- There are many gfa_reduce computations that are still happening in field acquisition mode, but are unnecessary for field acquisition — I need to more systematically eliminate all such extraneous computations.

  - Examples are aperture photometry, sky surface brightness estimation, raw image pixel statistics, …

- Not all gfa_reduce computations necessary for field acquisition mode have been parallelized yet.

  - For example, pixel-level detrending still happens in serial right now.