Telecons / Meetings

1/8/2015 (Peter, Chris, Michael)

Plot sky brightness as a function of extinction
- As cloud extinction increases, sky brightness increases (they are probably correlated enough that if you know one, you know the other)
- Likely knowing the lunar term is enough because it will dominate the term that is constant in time (due to the stars' placement in the sky)

Update the files on a daily basis
- Currently stuck at a month ago

Grab spectra from ESO model to try to predict magnitudes
- There have been some weird discrepancies (ESO slope not matching observed slope)
- Also of course twilight and cloud cover

- Can just fit to the available sky brightness data

12/1/2014 (Peter, Chris, Michael)

· Pixels from camera are large and also many sources detectable by LSST will form “sky brightness” for the camera

· Camera: we measure two components, one is sky brightness that is just sky background that is function basically of source identification algorithm, we do not measure this well

    o Instead, we can measure component that depends on moon-light / man-made light that scatters off of clouds (can measure time-variable part of sky brightness, not static)

    o Goal is to produce a background sky model

        § Static background sky level as function of RA and dec (after remove sources)

        § What is sky brightness as function of lunar phase, angle from moon, latitude of moon

        § Need to separate cloud / time-variable part from static part

    o Also have the sun brightness measurements as proxy for moon

· OpSim: Given the position of the moon and the sky, how bright is it at each point on the sky?

    o What about the Milky Way? What is ratio of LSST sky brightness to all-sky camera sky brightness as a function of stellar density?

        § Under the assumption that we will take the same exposure to all fields, as a function of time, what is the sky brightness at all fields you care about throughout the night?

        § For each RA and Dec, find a dark-time sky brightness at that position. Can subtract off that number from all subsequent exposures.

        § Take all measurements of each source, figure out the dark time measurement for each source, plot as function of RA /dec

        § What will this plot look like? Should increase with zenith angle.

        § Correct for area per pixel, pixels have measurements in adu/arcsec

        § Flat fielding for point sources and for surface brightness are different

        § Also how to go from RGB in camera to LSST u,g,r,i,z,y (paper involving Tyco stars)

    o Currently only uses photometric or closed dome

        § How is the implementation for somewhere in-between?

            · Currently has some implementation

            · Talk to Kem

· To do:

    · Sky brightness as function of RA/Dec as a function of time

    · Generate time-history of sky brightness for fields in file regardless of positions.

6/6/2014 (Simulations Telecon):

- Sky brightness, single value for sky at zenith as a function of time (to go into evolution of sky model)

    - B, G from all-sky channel, R, Y, and Z from photo-diode

    - B, G are not well-calibrated, but can give sky-cover. photo-diode well calibrated.

  - Cloud model
    - Check that the cloud model is appropriate
    - Hard to fill-in the structure function scale (up to 1 degree) -> all-sky camera scale (5-10 degrees)

- Format for sky brightness time-series
  - OpSim: Altitude and azimuth, not really high resolution, break sky into quadrants
    - Healpix! (email Peter)
    - Break up data into eighths and classify nights into eighths
    - Compare our camera cloud cover to the telescope operator values
  - Stick it in a database that we can query (few week time-frame)
    - Night timestamp, observation timestamp, B/G/R/Y/Z (at zenith)
- Michael needs to remember that each pixel maps out the same solid angle

- CTIO water vapor absorption vs. time (no spatial dependency), up for several months

6/3/2014:

September: paper titled "Dynamic real-time scheduling of optical systems"
  - Write down merit functions
  - 5 sigma zero point magnitude of stars
  - Include seeing model

Field FOM x SSM x DSM = IFM
Field FOM is a function of time
SSM is static airmass associated term (everything computable in advance)
DSM is sky brightness and clouds and like
Issues:
  - NCSA disk
  - Photometric scatter
  - Photometric transfer equations
    - Transform from our R,G,B to G,R,I,Z,Y (stars on Wiki can be used to generate)
  - Internal Reference Catalog
  - Deliverables
    - Convert FITs files to healpix
    - To observatories in real time (web server with FITs image and contour map with RA/Dec lines laid on top)
    - LSST simulation guys
  - Tier in to IR All Sky Camera
  - Dome flat
  - Sky flat
    - Making Reference catalog
  - Correction to LSST sky
    - Stelar density dependent correction to sky brightness because LSST can resolve many of the stars that we cannot
    - Pixel and time dependent
  - Sky brightness model
  - Jacobians
    - Check assumption that the solid angle subtended per pixel is same across entire image
    - Take white teflon sheet behind point source and rotate lens and ask if the number of counts per pixel insensitive to rotation info of lens

Opport:
  - Daytime contrails
  - Real-time to SOAR and Gemini
  - Calibrated sky brightness w/ PD's
  - Dome free sky obs to calibrate dome scatter
  - New dome?
  - Overall plan for calibration + schedule

  - DES tie-in

Michael to-do for scatter:

Excess noise (non-Gaussian)
  - take darks in lab
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/calibdata/d/10.00000/M/plots/d.0002.short.M.fits.old/hist.png
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/calibdata/d/10.00000/M/plots/d.0002.short.M.fits.old/fits.png
bad pixels
  - subtract pair of darks
aperture contaminated
  - plot dm vs. dx,dy

diagnostics:
  - m vs. t
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/mag_time.png

- dm vs. m
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/mag_dm_max.png
- m_i vs m_j,
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/mag_time_max_2.png
- m_R vs m_G
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/colorcompare
- residuals vs. dx, dy
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/mag_rerror_max.png
- resid vs dm
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/mag_dm_max.png
- resid vs chi/N
http://lsst-web.ncsa.illinois.edu/~coughlin/allsky/data/ut012914/fisheyeplots/M/

- compare short exposures

05/30/2014:

1. Talk with Andy to figure out what output they want
2. Convert pixels to RA, Dec for each image and then add it all together. Use to make a template and search for transients.
3. Things to fix / look at: secant, stars that have magnitude issues (look constant)
4. Make the deltax, deltay plots

05/29/2014:

Attendees: Michael and Chuck

1. Create a public fits files directory

2. [coughlin@lsst-dev ~]$ pwd
/lsst/home/coughlin

User specific environment and startup programs

PATH=$PATH:$HOME/bin
PATH=$PATH:$HOME/allsky/bin
PATH=$PATH:$HOME/wcstools-3.8.7/bin
PATH=$PATH:$HOME/fisheye
PATH=$PATH:$HOME/sextractor-2.19.5/bin
PATH=$PATH:$HOME/tphot
PATH=$PATH:$HOME/tonrytools
PATH=$PATH:$HOME/ffmpeg
PATH=$PATH:$HOME/ImageMagick-6.8.9-0/bin
PATH=$PATH:$HOME/cfitsio

https://github.com/mcoughlin/fisheye.git

3. Create master catalog for all stars by looking at photometry over all the nights
- Then will not have to recreate mapping for each night
- TODO: Michael and Jamie
- CS: There are existing catalogs of stars, for example the paper I sent you with bright stars and their griz-band magnitudes. It's better to get an external catalog
with excellent astrometry than to make our own, I think.

4. Abi (dophot) can fit individual images to extract magnitudes (compare with tphot/source extractor)

5. Search for transients with image subtraction (pixel by pixel image difference)
-> Convert (x,y) to RA/Dec (w/ fisheye)
- CS: Converting to RA, DEC is not enough. We'd have to rotate the images about the celestial pole, match PSF and sky, and then subtract.
Sounds hard.
6. For a given star, plot the magnitude differences vs fractional pixel remainder of the centroid (1024.35 -> 0.35) -> probably worst for R/B due to 1 pixel, different for x and y

7. Can see milky way in cloud plots -> problem with sky brightness in photometry. Fix!