

Atmospheric Transparency Statistics from 6 year ESSENCE survey, CTIO

Cloud transparency statistics from the ESSENCE Survey

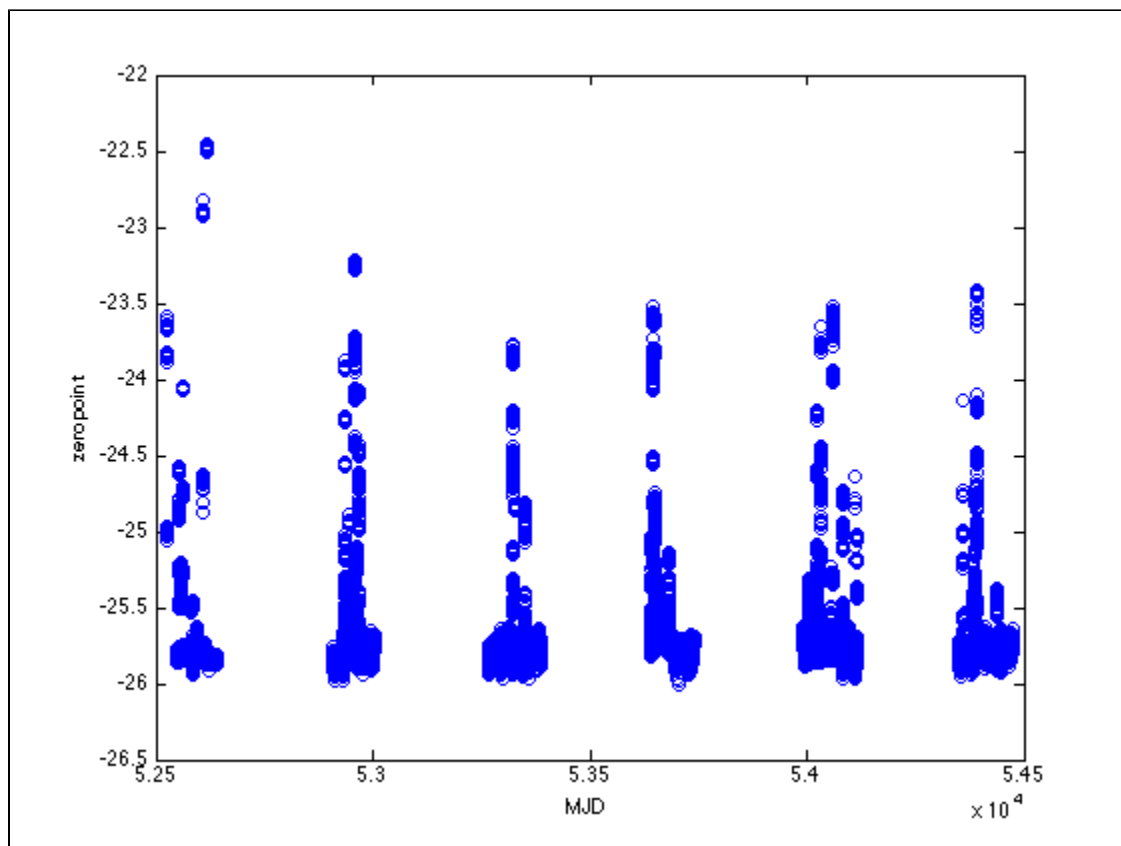
Feb 8 2014. Stubbs

With help from Gautham Narayan, I extracted the photometric zero point data from images obtained on the Blanco 4m using the MOSAIC II imager, for the ESSENCE supernova survey. This project obtained data for 3 months of the year, over the course of 6 seasons. Survey ran for 198 half nights, from Sept 2002 to Oct 2008, and took data during dark time from Sept to Jan.

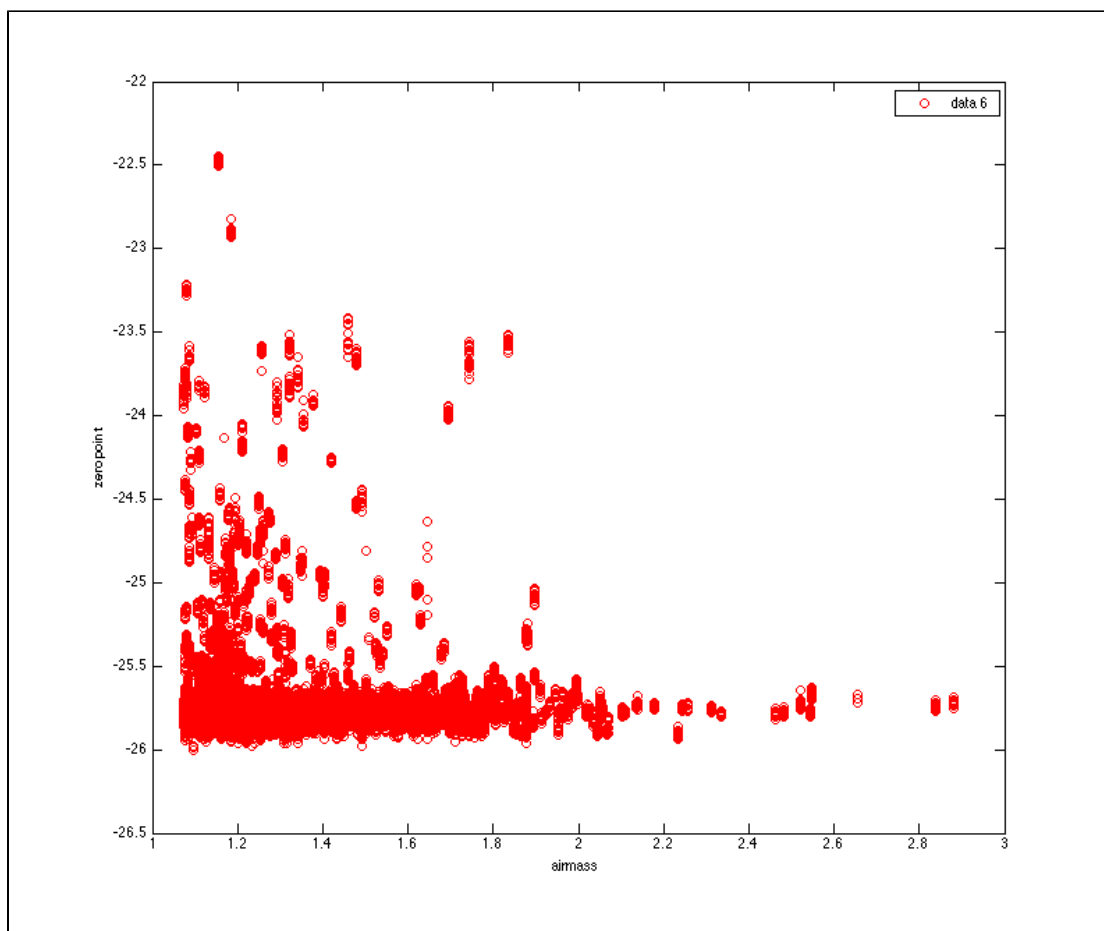
(note to Stubbs, details here: <https://wiki.harvard.edu/confluence/display/stubbslab/LSST+Scheduler>)

Project ran in R and I bands, with long integrations on selected fields. Each observation was run through Armin Rest's photometric reduction pipeline, with astrometric registration and also a photometric calibration. We extracted the photometric zero point information from the resulting photometry files. Since we're interested here in attenuation from clouds, I just used the R band images. Any image that failed upstream in the pipeline is not shown here, of course.

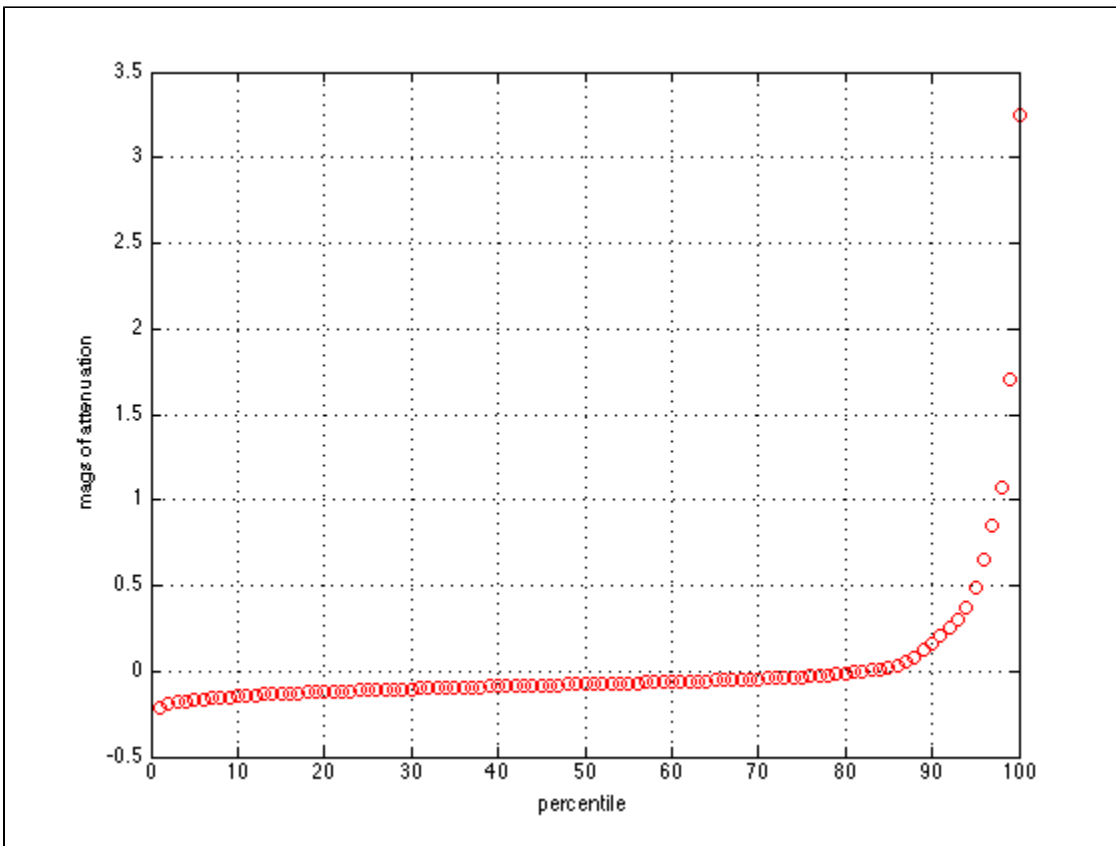
Here is a plot of attenuation (vertical axis, in magnitudes) vs. MJD:



After correcting airmass-dependent extinction with Gautham's coefficient of 0.104 mags/airmass, we get this plot of zero points vs. airmass:



Then we can sort by amount of attenuation, and bin into percentiles. This plot shows percentile with attenuation below some value:



Here is the data table for this. Columns are percentile and magnitudes of extinction. Mean value has been subtracted from all of them:

[percentiles.dat](#)

Conclusions:

The best 85% of the observations have a histogram with one sigma width of 0.047 magnitudes.

The worst 15% of the observations have a wide range of extinction from clouds, spanning over 3 magnitudes.