



## Analyzing Simulated LSST Surveys With MAF

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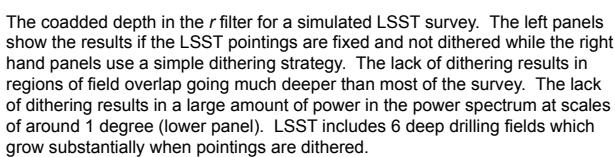
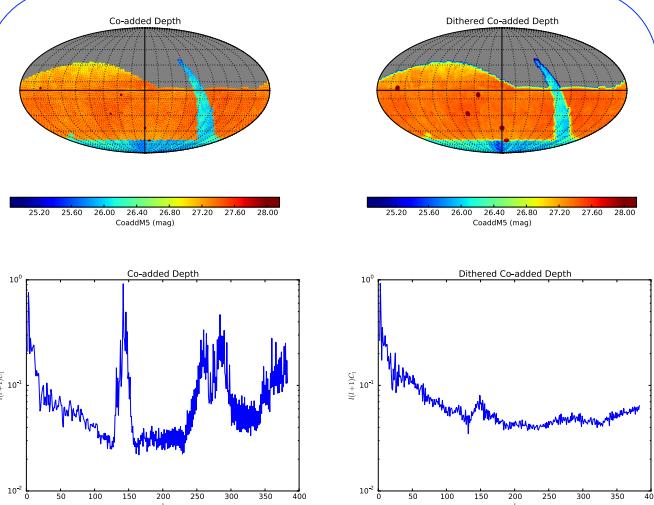
### Abstract:

The LSST will make around 2.5 million observations in 6 filters over a 10-year survey. Optimizing the scheduling of these observations involves a variety of scientific trade-offs. We illustrate the wide variety of survey metrics that can be designed and implemented with the Metrics Analysis Framework (MAF) using simulated LSST surveys. In particular, we illustrate how MAF can (1) be used to compare dithering strategies, (2) quantify how well the observing cadence allows for the characterization of lensing time delay measurements, and (3) how MAF can be easily extended to analyze other surveys such as Stripe 82 in SDSS.

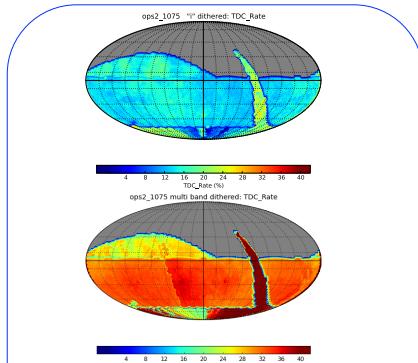
### Introduction:

The Large Synoptic Survey Telescope will survey the visible sky approximately every 7 nights in 2 filters, making it possible to do a large number of scientific studies in parallel. To help optimize the scheduling algorithm, we have developed the Metric Analysis Framework to analyze simulated survey properties to measure their scientific potential.

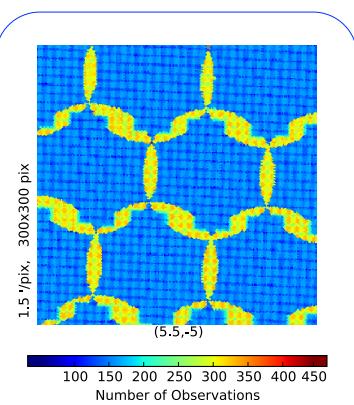
MAF provides an all-python framework for reading in a survey's pointing history, slicing the data in a desired manner (e.g., finding all observations which overlap a point on the sky), and calculating metrics on those slices.



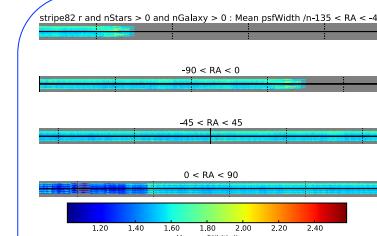
The coadded depth in the  $r$  filter for a simulated LSST survey. The left panels show the results if the LSST pointings are fixed and not dithered while the right hand panels use a simple dithering strategy. The lack of dithering results in regions of field overlap going much deeper than most of the survey. The lack of dithering results in a large amount of power in the power spectrum at scales of around 1 degree (lower panel). LSST includes 6 deep drilling fields which grow substantially when pointings are dithered.



Computation made with MAF looking at the success rate of observing lensed quasar time delays with LSST. The top panel shows the rate if only  $i$  filter observations are used, while the bottom panel shows all filters. These results suggest LSST will detect many strong lensing events, but the analysis will require more advanced multi-filter analysis. This metric was developed by the weak lensing community and contributed via our github repo.



By using HEALpixels, we can easily run at different resolutions and display the results in different projections. Here we show the number of visits at high resolution, including the effect of chip gaps in the LSST focal plane. For this simulation, the pointings were not dithered.



The MAF code can easily be extended to analyze different surveys. Here we look at the mean seeing values across the SDSS Stripe 82 survey area.

### Please Contribute Your Metrics to MAF:

Help us help you! The LSST cadence and dithering schemes have not yet been finalized! We are very interested in how you would decide which survey strategy best supports your science.

See the MAF documentation at: <http://ls.st/ziz>  
Contribute code to our community github repo at: <http://ls.st/zm9>

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