# OpSim Simulations & Small Body Metrics (with MAF)

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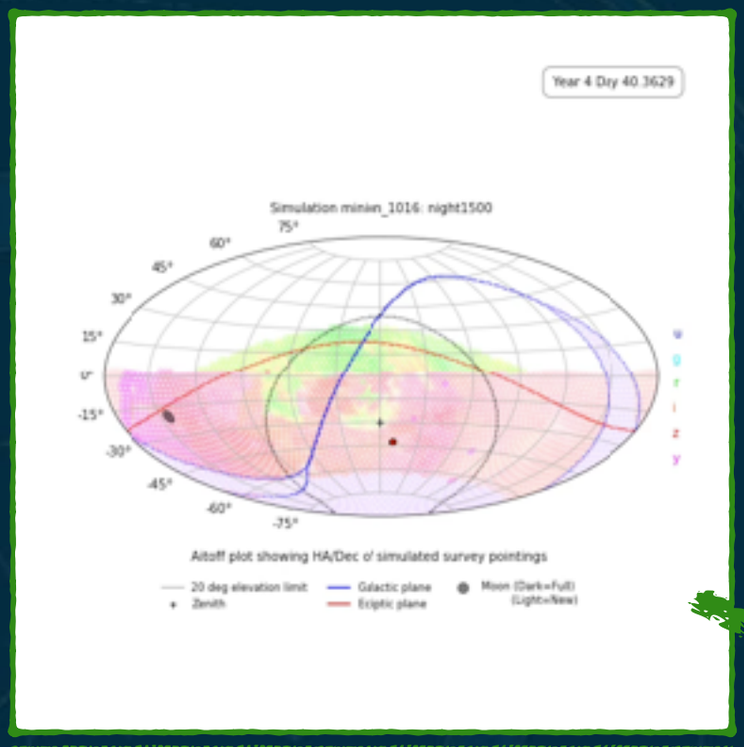
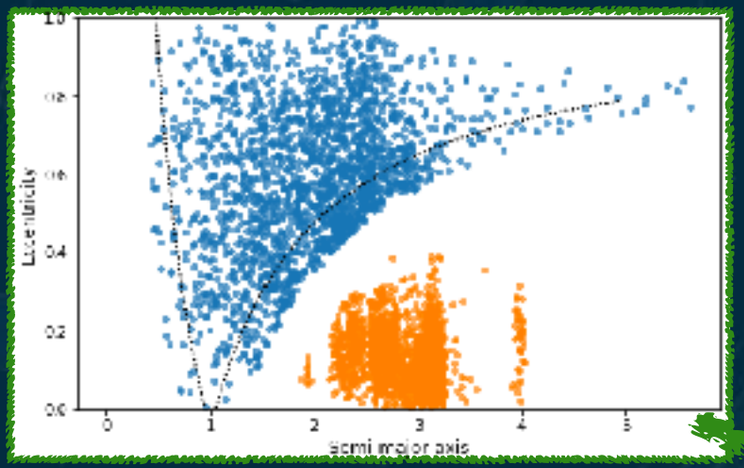
Large Synoptic Survey Telescope

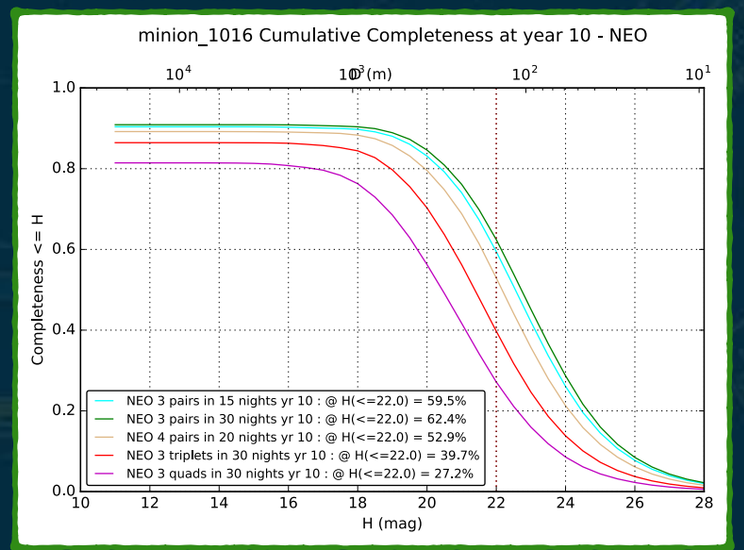
# OpSim, sims_movingObjects, & MAF




Operations Simulation (OpSim) generates simulated pointing histories under realistic conditions.
Scheduler in OpSim will be the LSST scheduler.




sims_movingObjects takes a set of orbits and generates the observations LSST would acquire




MAF analyzes these observations and applies a “metric” to all observations of the same object.

# Small Body Metrics

## Please see chapter 3 of the Community Observing Strategy Evaluation Paper (COSEP) @ http://ls.st/o5k (github repo)

- Metrics include:
  - Discovery - time of first discovery & number of opportunities over survey (per object). Results can be summarized as Completeness as function of H over population.
  - Number of observations or total arc length of observations (per object). Results can be summarized as the median (or min/max/mean..) value as a function of H, across the population.
- If there is a series of observations that meet a given criteria for light curve inversion (more than # of obs with SNR>20) or color-determination (obs within dT in multiple filters with SNR>10, etc.). Results can be summarized as the fraction of the population as a function of H which pass criteria.
- The likelihood of detecting activity for any given object, assuming random distribution of times of activity. Summarized as the median (min/max/etc) across the population.

# Small Body Metrics

## Please see chapter 3 of the Community Observing Strategy Evaluation Paper (COSEP) @ http://ls.st/o5k (github repo)

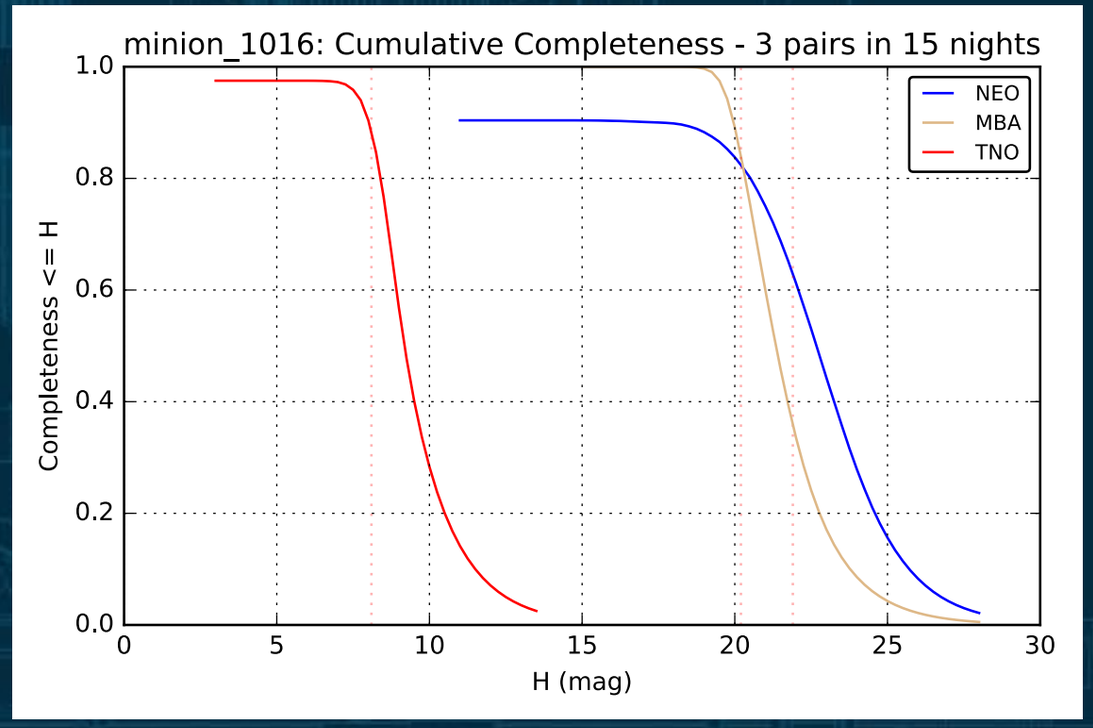
- Potential metrics to write:
  - Does an object become 'lost' or have a large gap in observations? (Fraction across population)
  - Accuracy of orbital parameters as function of time (per object). (Median across population).
- Does an object receive enough observations to measure a rotation period? Spin pole? Phase curve? (Fraction across population)
- Will an object need followup on any given night? (Total number of objects which will need followup, as a function of time).
- Improved versions of existing metrics.
- ??

# Small Body Metrics

## Please see chapter 3 of the Community Observing Strategy Evaluation Paper (COSEP) @ http://ls.st/o5k (github repo)

- Small body metrics can typically be applied to many different populations
- Write one, generate different sets of observations (different input orbital parameters, corresponding to different populations) and evaluate metrics for different populations
- Clone over H or use larger input pop.

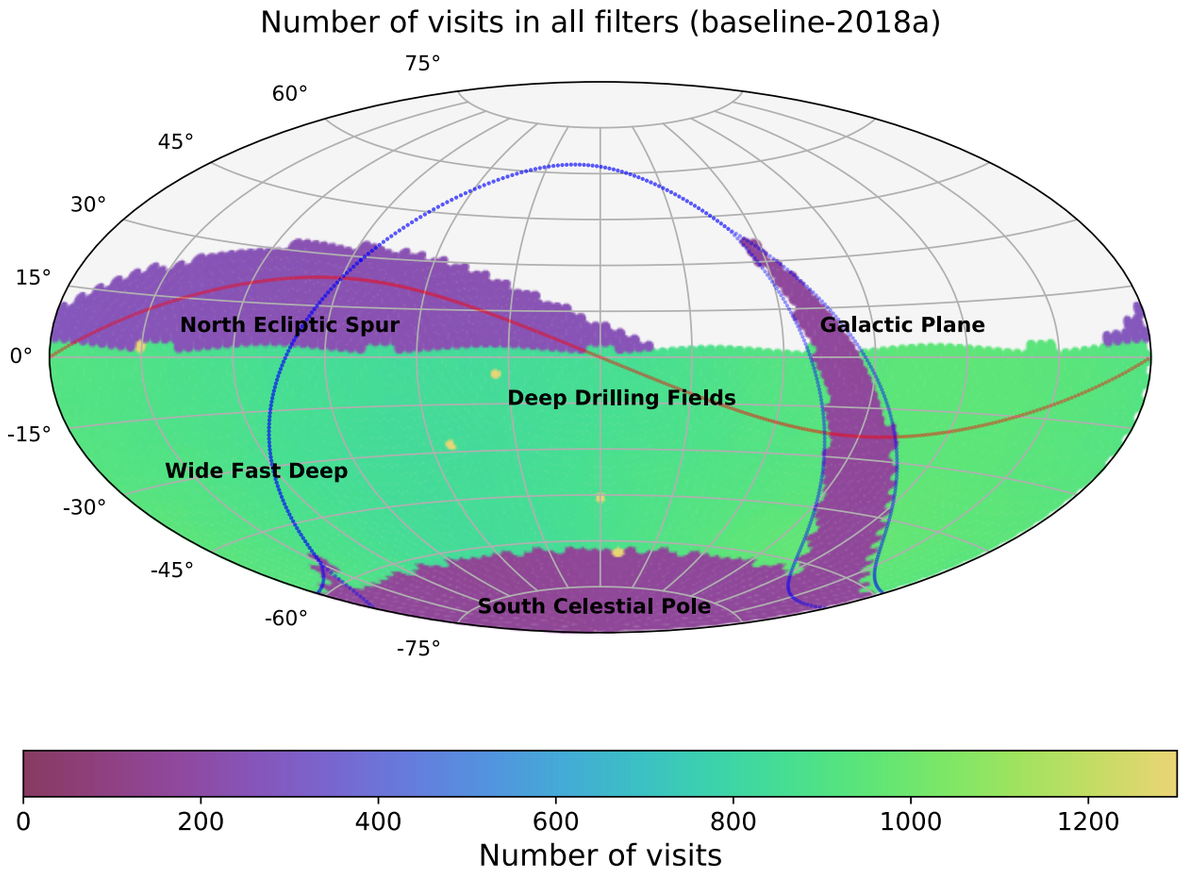
Metrics serve to define performance of a given survey strategy in a quantitative way.



# LSST Survey Strategy

## Survey Strategy must be defined with input from the community.

- LSST Call for White Papers on Survey Strategy: http://ls.st/c66




Survey strategy can be improved beyond current reference but there are open questions as to how.

Snaps (2x15 or 1x30)?

WFD cadence?

NES footprint & cadence?

Pairs in same or different filters? No pairs at all?

New mini surveys for other purposes?

# LSST Survey Strategy

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- LSST Call for White Papers on Survey Strategy: http://ls.st/c66
- Write metrics (and justify minimum / optimal requirements on related FoM)
  - Contribute metrics to sims_maf_contrib (github @ lsst-nonproject)
    - Add sections to the COSEP, to include supporting text
    - Defend your science!
- For specific suggestions on observing strategy, write white papers!
  - ‘Open questions’ on previous slide = white paper material

# LSST Survey Strategy

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- LSST Call for White Papers on Survey Strategy: http://ls.st/c66
- New survey simulations ongoing; primary goal will be to respond to white papers, create options for survey strategy, and present to Survey Strategy Committee. Goal is to have transparent, community-driven process to determine initial survey strategy for LSST Operations.
- Call for white papers comes with some alternative survey strategy examples. See https://github.com/lsst-pst/survey_strategy/tree/master/WPruns for a summary.