LSST Cadence Update

Kat Volk & Lynne Jones

Survey Cadence Optimization Committee Updates

SCOC activities since the last SSSC Sprint

- Virtual SCOC-Science Collaborations workshop in November 2022
  - Gave the preview of the Phase 2 recommendations, SCs presented summaries of V2.99 simulation analyses
- The Phase 2 Recommendations came out in late December 2022
  - OpSim Baseline v3.0
  - The SCOC phase 2 recommendations (dec. 2023) are online here: https://pstn-055.lsst.io

Survey Cadence Optimization Committee Updates

The open questions still to be addressed (starting with ones less important to us):

- Filter swapping schemes: is it better to switch *u* and *z* or switch *u, z,* and *y*?
- Rolling cadence: rolling affects the uniformity of static data releases, some science cases strongly prefer uniformity. How should this be addressed?
- Details of filter balance, exact footprint, and rolling scheme for the Galactic Plane/Bulge
- Details of the Deep Drilling Field (DDF) survey and coverage of Euclid Deep Field South

Survey Cadence Optimization Committee Updates

The open questions more relevant to SSSC:

- 2x15 vs 1x30 second exposures: Can’t decide on this until commissioning, but SCOC will have to reassess how extra time is distributed if 1x30 works
- Filter-specific exposure times: need more information about the system characteristics to explore whether it’s beneficial to adjust exposure times according to performance/throughput
- Target of Opportunity (ToO) strategy
- Early Science: year-1 specific strategy, including a plan for template generation

Survey Cadence Optimization Committee Updates

- In February 2023, the SCOC decided to prioritize:
  - Making progress on the DDF strategy
  - Discussing the issue of uniform co-adds (there's a subcommittee and a slack channel for this – so far nothing super critical for SSSC)
- Other areas with some progress expected soonish:
  - Different filter swapping schemes are being simulated
  - Galactic plane cadence
  - ToO workshop planning
- Solicited feedback from the SCs on the outstanding cadence issues

Survey Cadence Optimization Committee Updates

- In April 2023 the early science team met with the SCOC, we discussed template generation and some potential metrics for that
  - E.g., looking at when a template would become available if we specify needing N visits above X SNR threshold to make a template
- At the May 2023 SCOC meeting, we discussed progress on the uniformity question and got some updates to the OpSims (now at v3.2)

Opsim Updates

From v2.0 to v3.0 (changes recommended in PSTN-055)

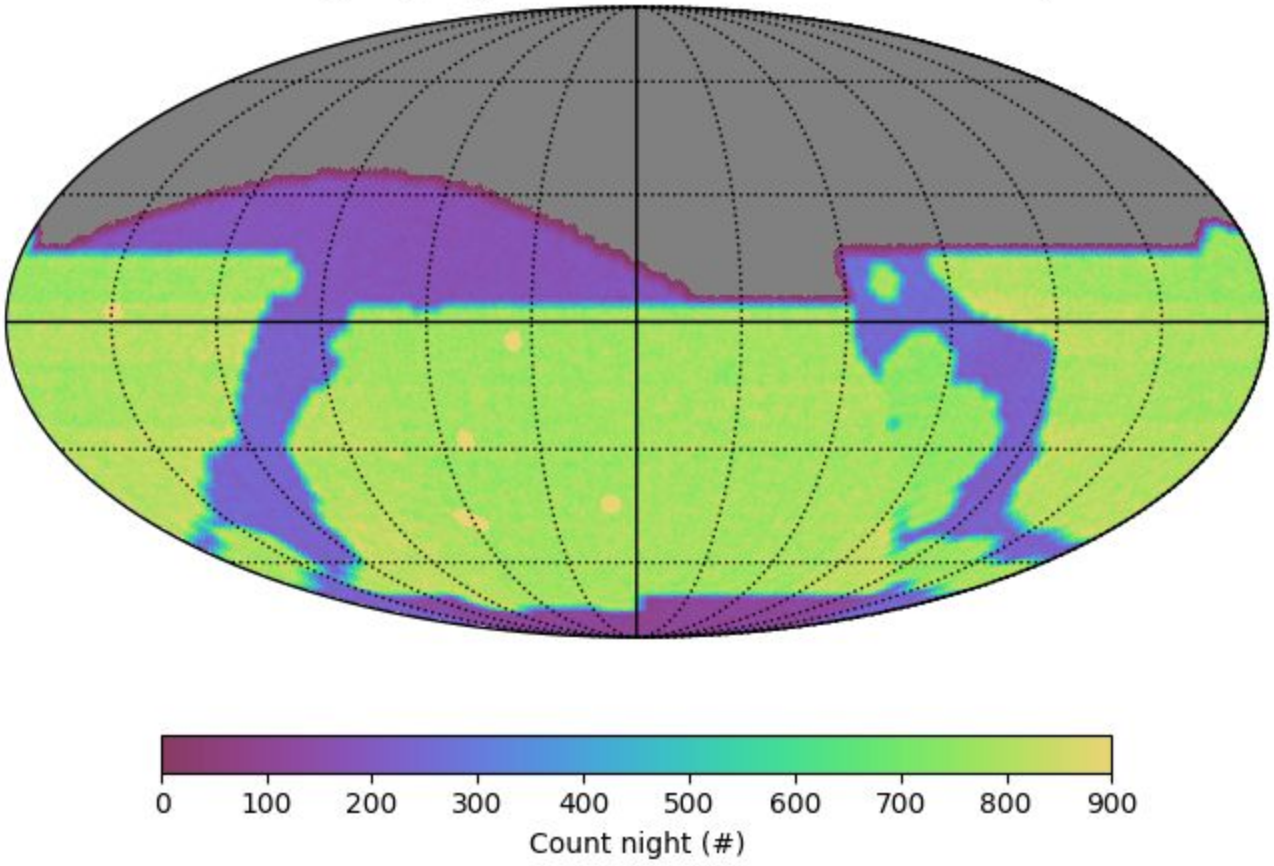
- Keep footprint from v2, keep filter balance (outside of Galactic Plane + South Celestial Pole), keep rolling cadence, keep most visits in pairs (33 minutes)
- Addition of near-sun twilight survey (1 night on / 3 off, 15s visits in r, i or z)
- Addition of a small fraction of late-triplet visits
- Spend more time on DDFs, including 20 year depth on COSMOS

- Result: fewer (but still above SRD minimum) visits per pointing in WFD but sequencing is slightly improved in general for solar system object discovery

Opsim updates

V3.0 - v3.2 (pending approval)

- Tiny extension of footprint to include Euclid
- Move start date of simulated survey
- Modifications in how some scheduler code works (with negligible impacts on cadence)
- Move some u and g band visits into first year (for template coverage)
- *Filter swap change from loading/unloading u + z to either u + y or u + z or y*.
- Push near-sun twilight survey even closer to the sun / higher airmass
    - Improves potential Aylo'Chaxnim discovery dramatically, closer to initial white paper request on airmass/solar elongation limits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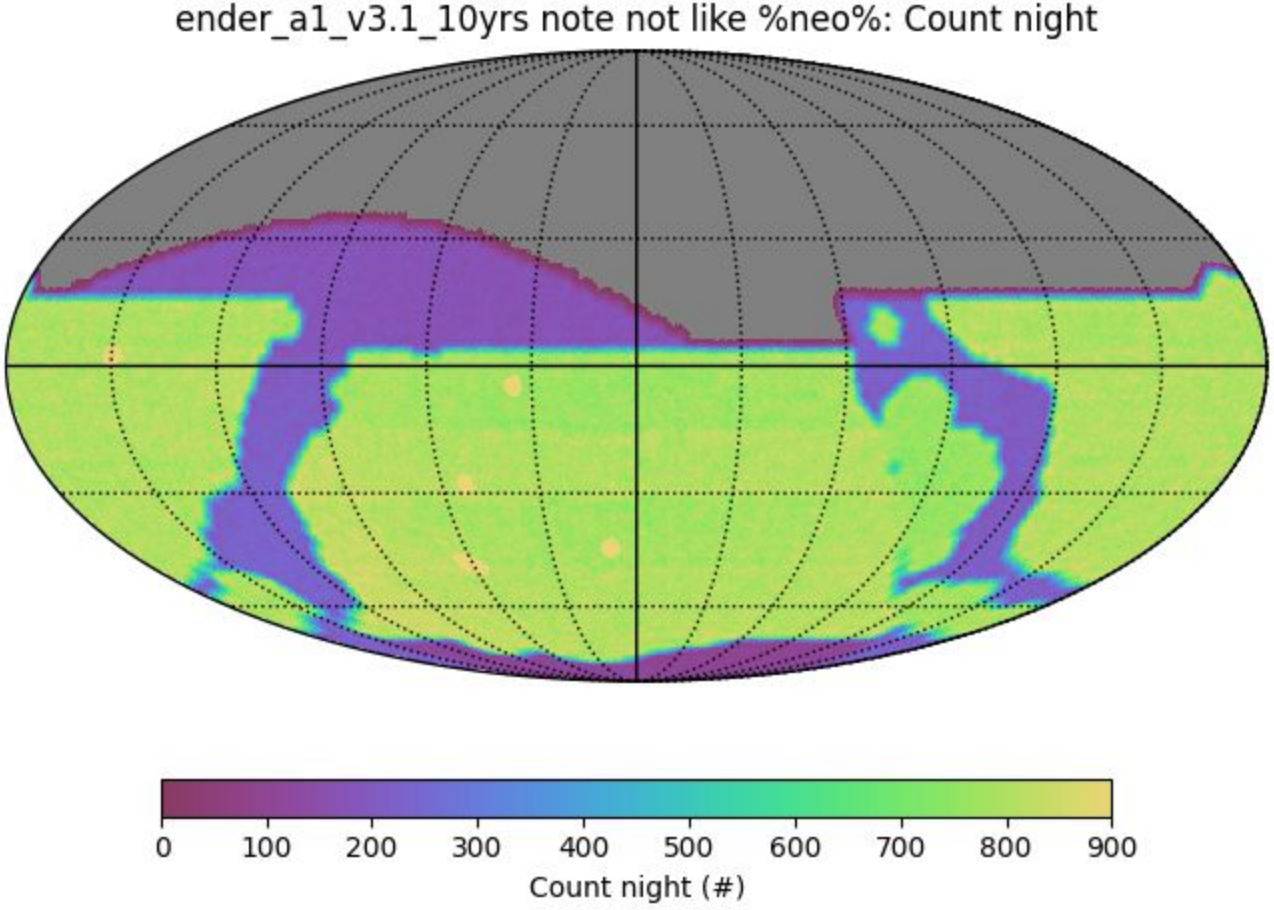
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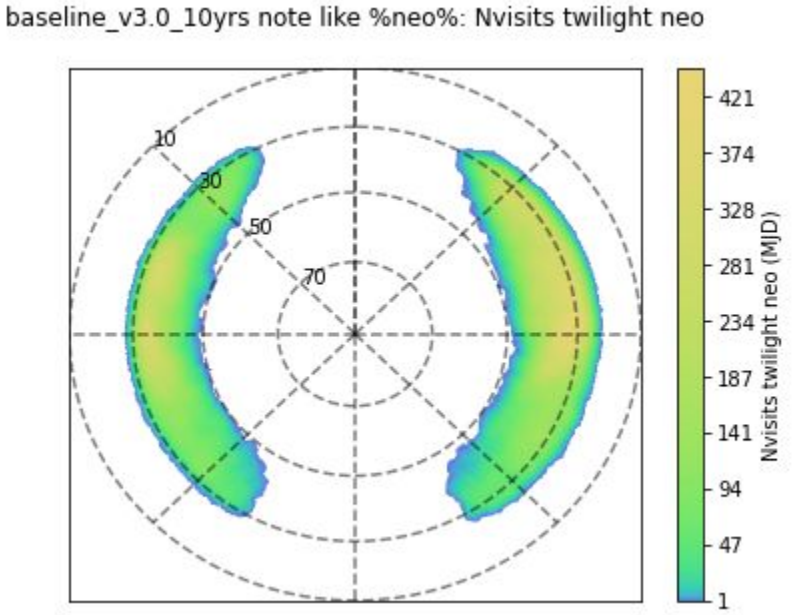
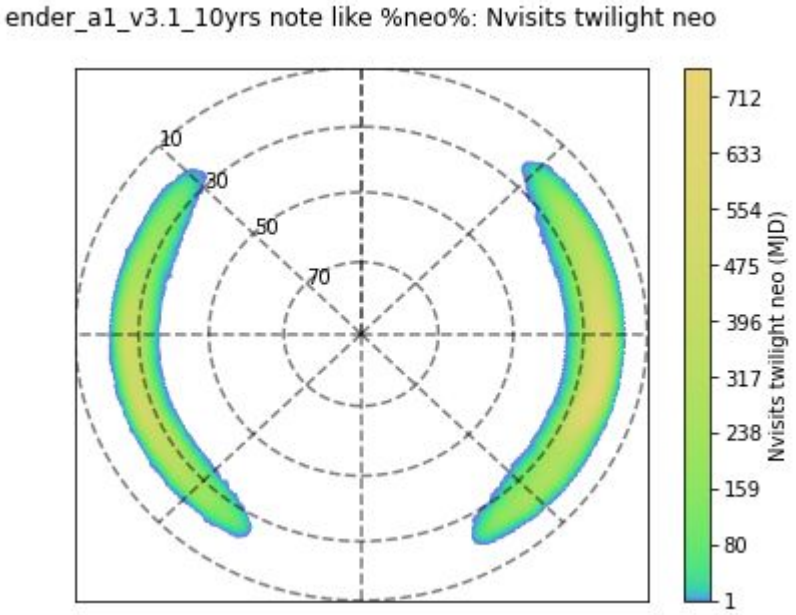
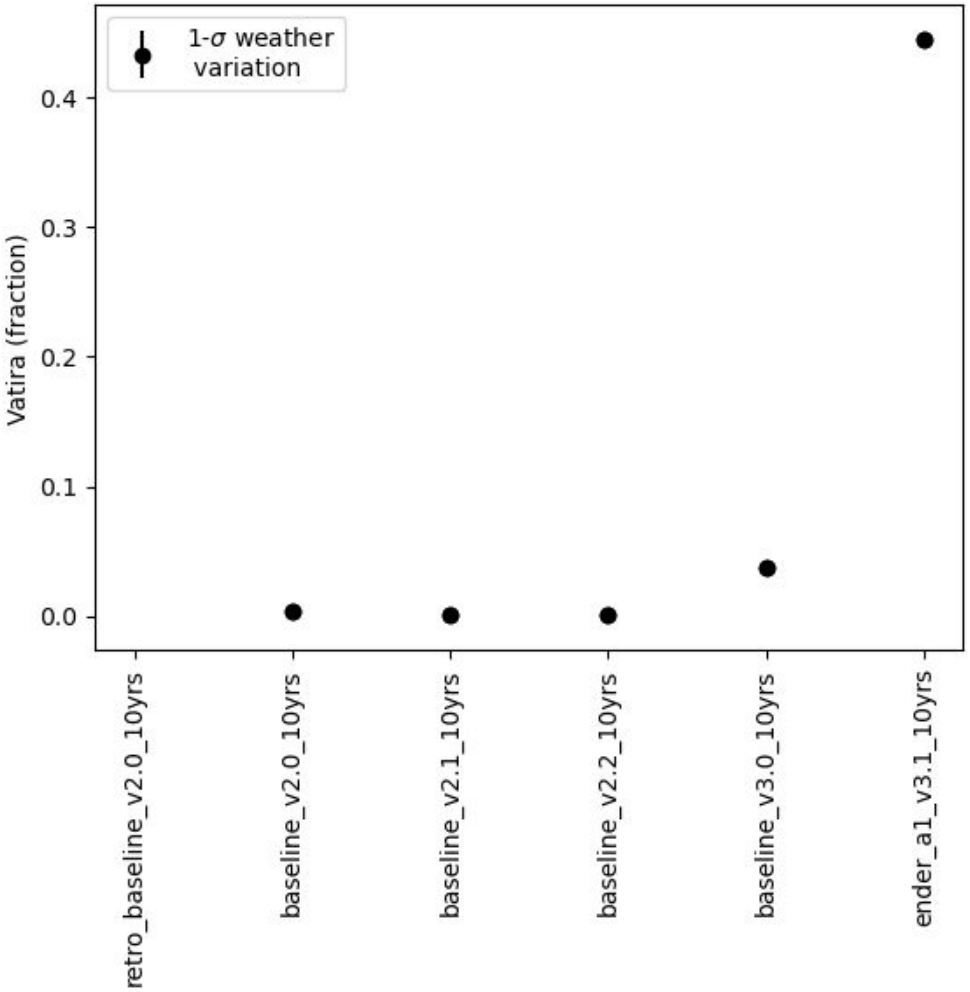
- **Details of near-sun twilight survey: move visits closer to the sun / higher airmass**
- **Adopt an airmass limit of 2.5 instead of 2.0, allows lower solar elongation coverage**



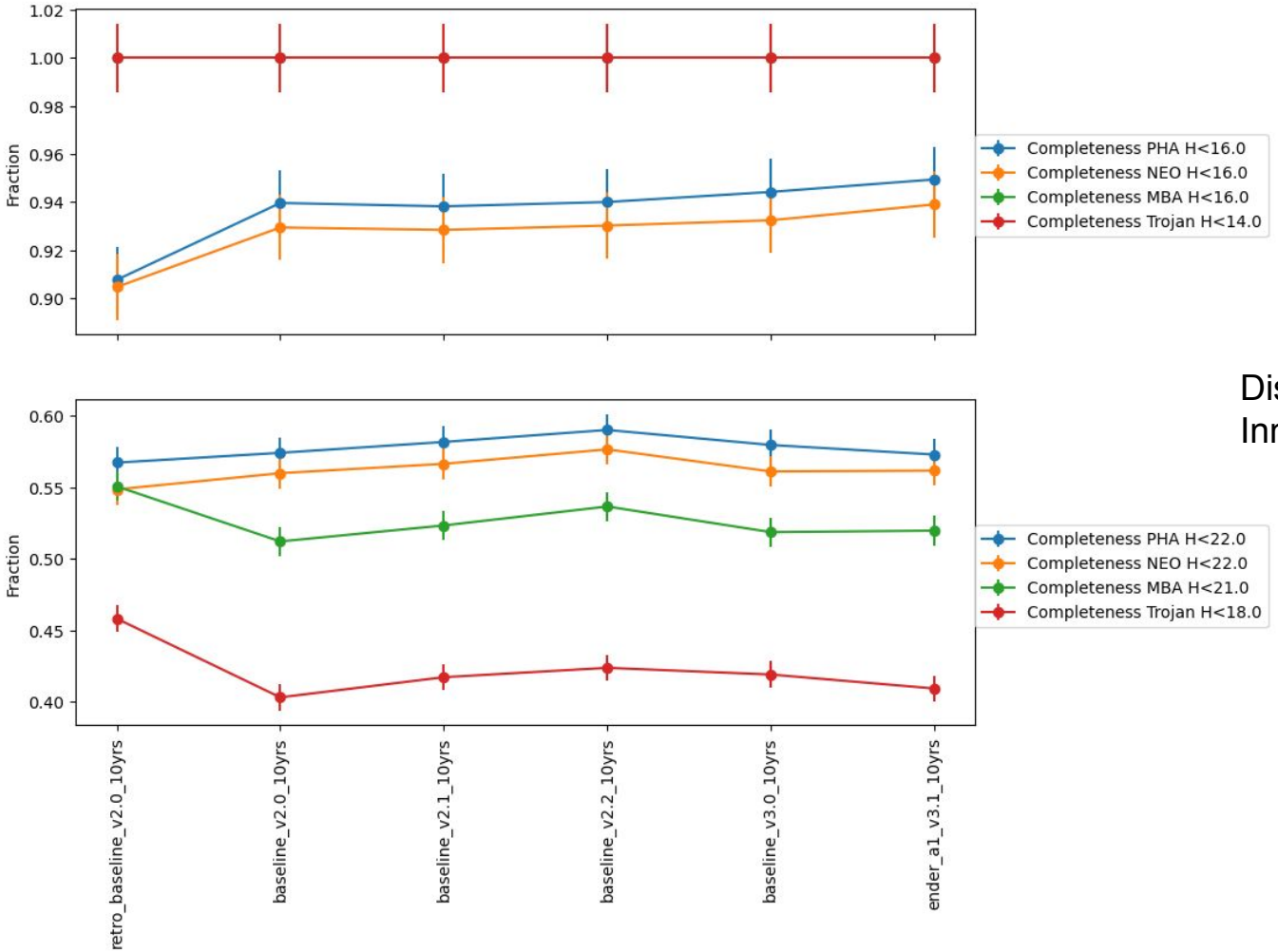


Lower solar elongation angle observations for interior solar system objects
(46k 1x15s visits in v3.0, 52k in new version)

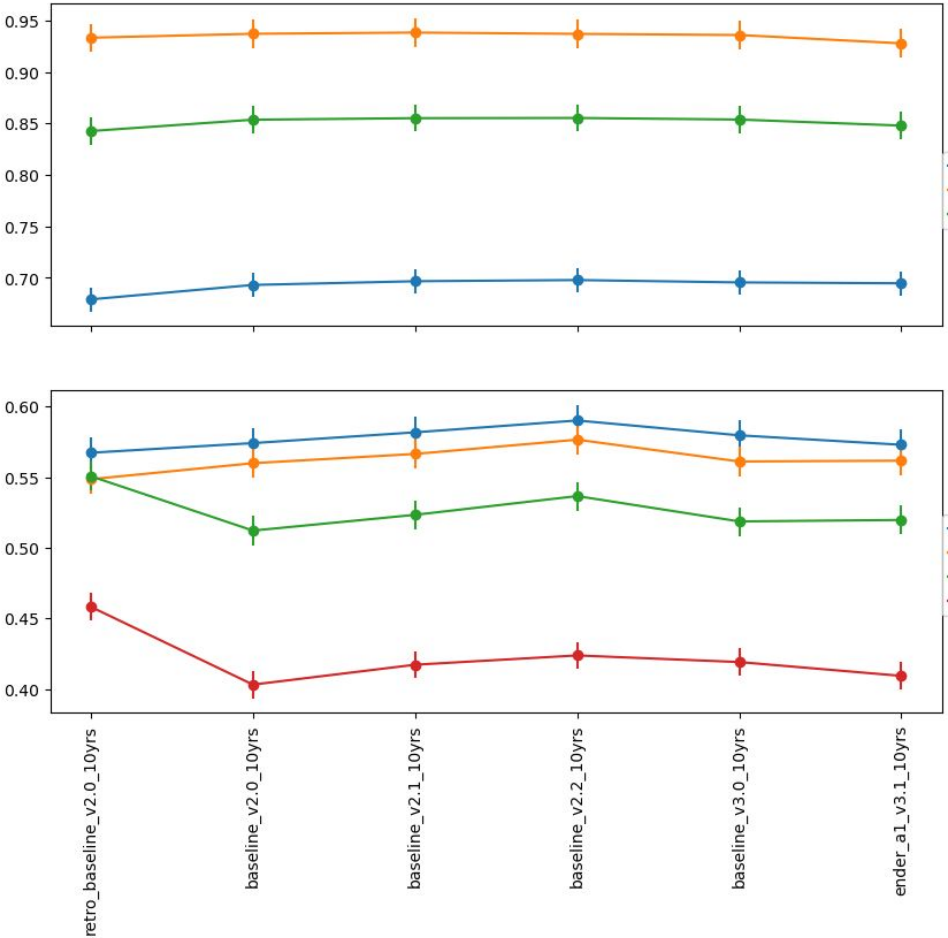


'Aylo'chaxnim (formerly Vatira, aka inner solar system objects) detection gets a huge boost

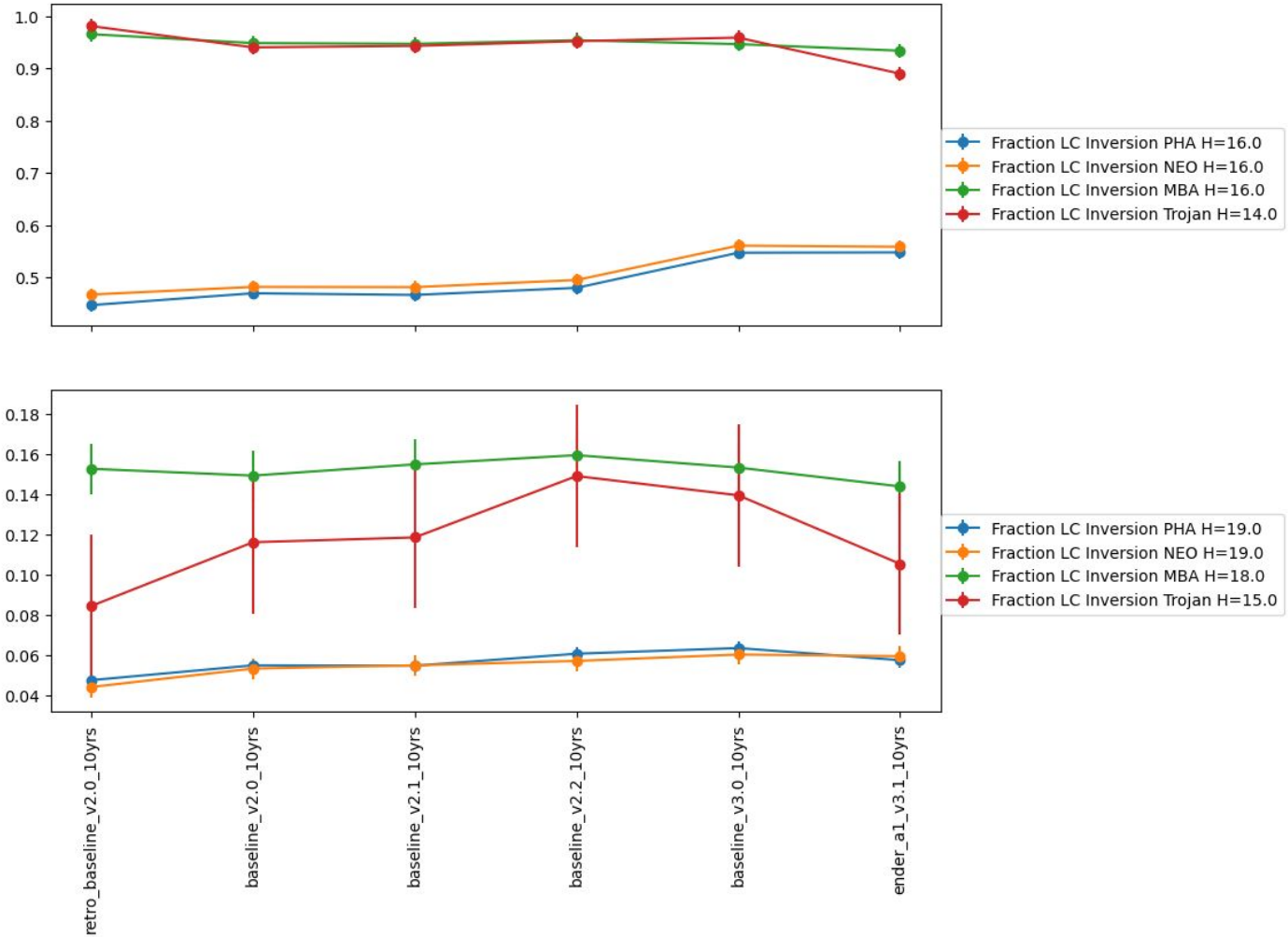
Metric = discoveries via quads in 1 night, for large objects



Discovery completeness,
Inner Solar System

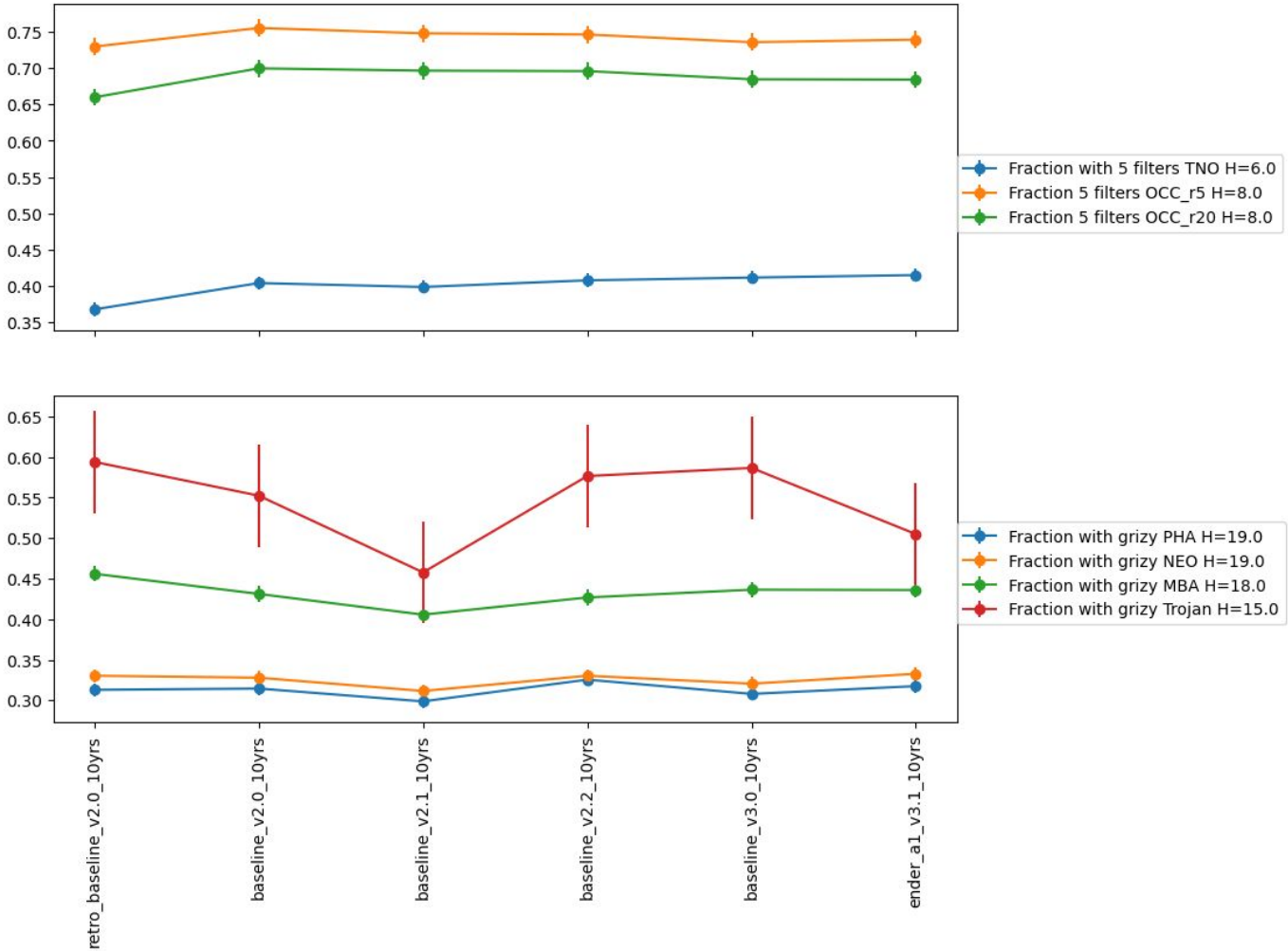


Discovery completeness,
Outer Solar System



Characterization inner solar system (lightcurve inversion)

Note: error based on larger result comparing weather variations or sqrt(fraction * 5000)



Characterization outer solar system
(5 bands/4 colors)

Movie:

https://epyc.astro.washington.edu/~lynnej/opsim_downloads/ender_a1_v3.1_10yrs__N_Visits.mp4

(number of visits in 30 day intervals - left/cumulative, right/30 days)

MAF results:

http://astro-lsst-01.astro.washington.edu:8081/