

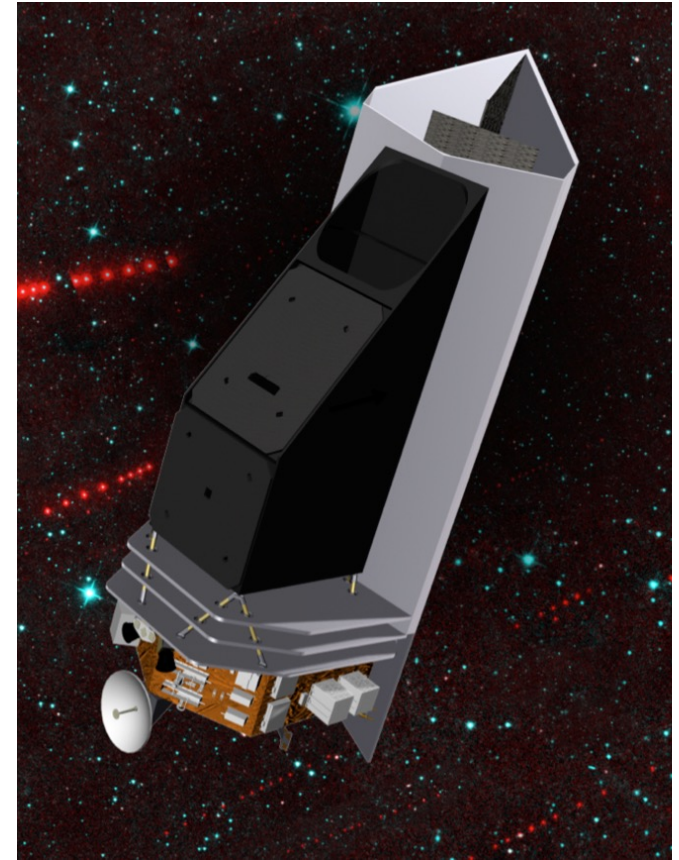
NEO Surveyor Cadence and Simulations

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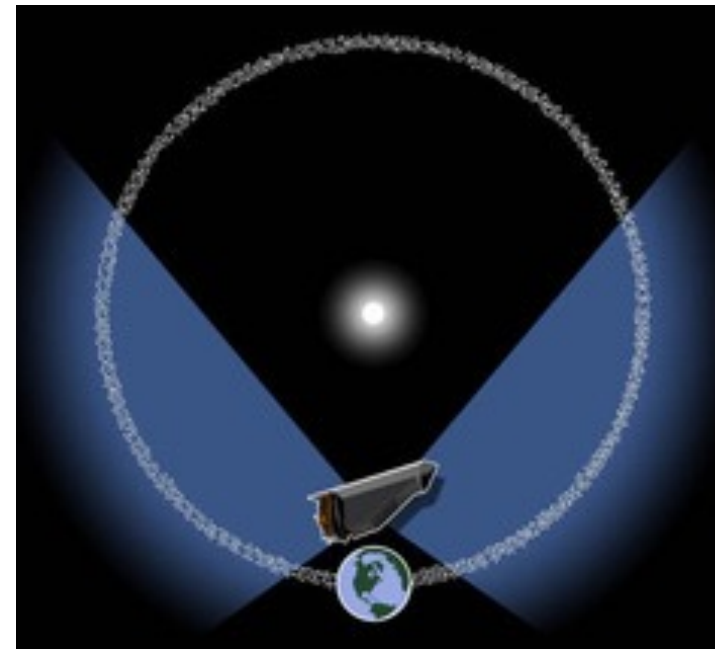
What is NEO Surveyor?

- 50-cm telescope going to L1
- 2 infrared chips imaging simultaneously
 - ~4-5.2 microns & ~6-10 microns
- Nominal launch 2026
- Objectives: discover, track, and characterize hazardous Near-Earth Objects > 140m
- Passively cooled (no cryogen)
- Led by PDCO, A. Mainzer as survey director
- Images & photometry will be publicly available through IRSA every ~6 months

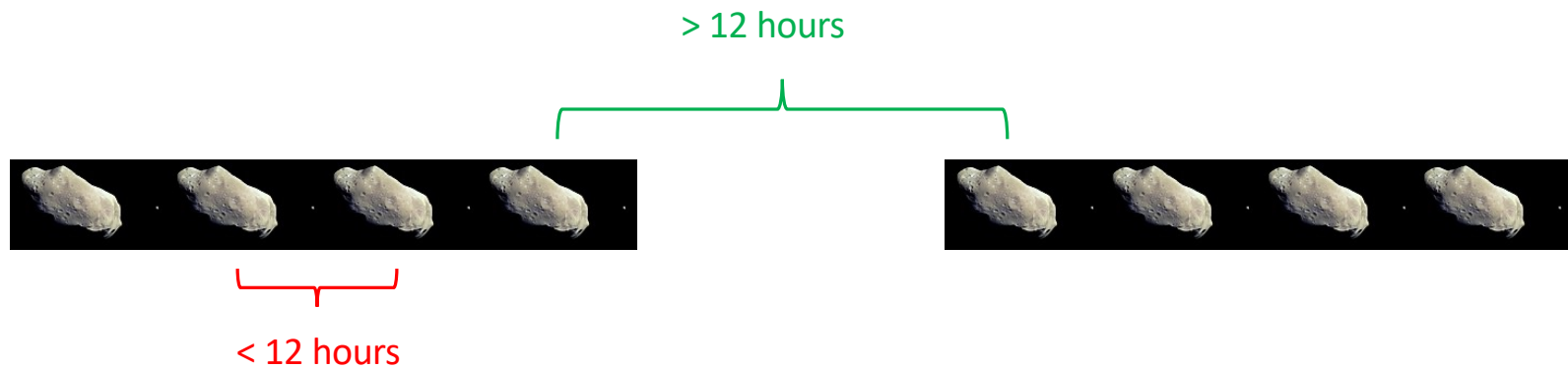


Nominal Survey Region & Pattern

- 5-year survey planned, longer possible
- Nominal scanned field-of-regard:
 - $\pm 40^\circ$ ecliptic latitude
 - $45\text{-}120^\circ$ solar elongation
- ~ 11 days to complete scan cycle
- ~ 4 asteroid detections within ~ 8 hours, then another “quad” ~ 11 days later
- All discoveries will receive self-follow up
- Interruptions possible for particularly challenging targets of opportunity



When do we consider an object recovered?

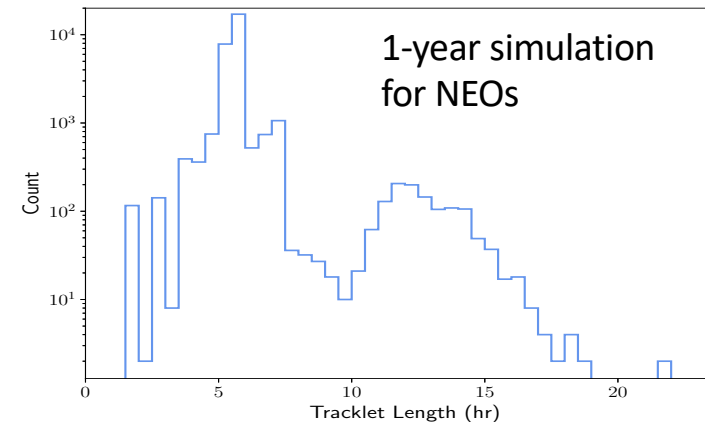
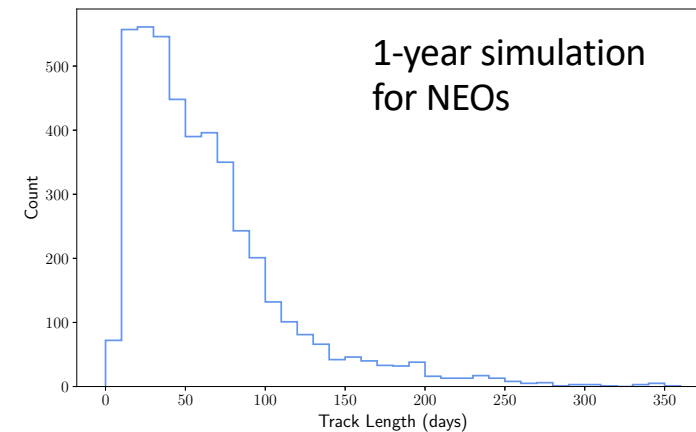


At least 4 viable detections +
<= 12 hours between pairs =
tracklet

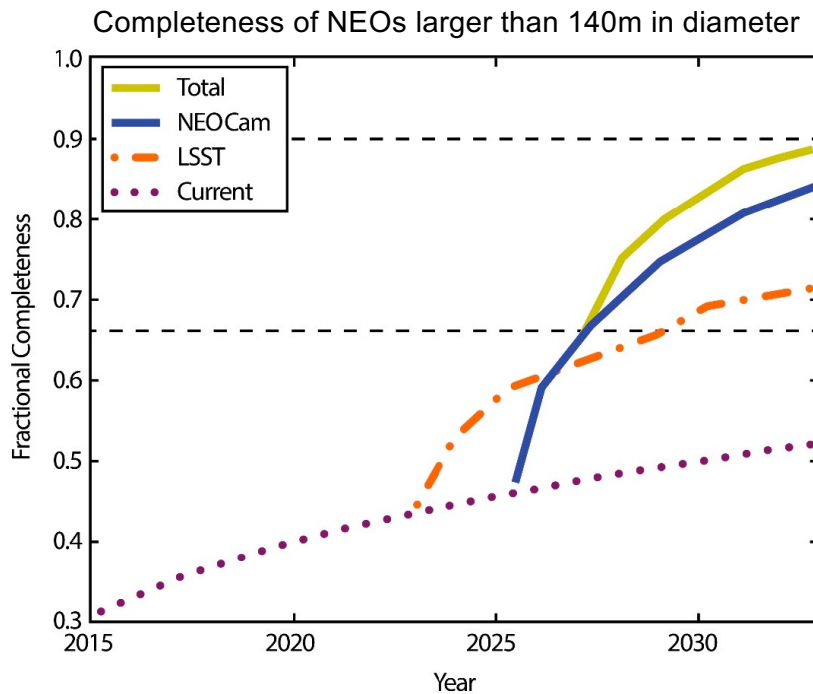
At least 2 **tracklets** +
>= 12 hours apart in time +
no more than a 30-day gap between tracklets =
track, at which point an object is considered
"recovered"

Simulating the survey for NEOs

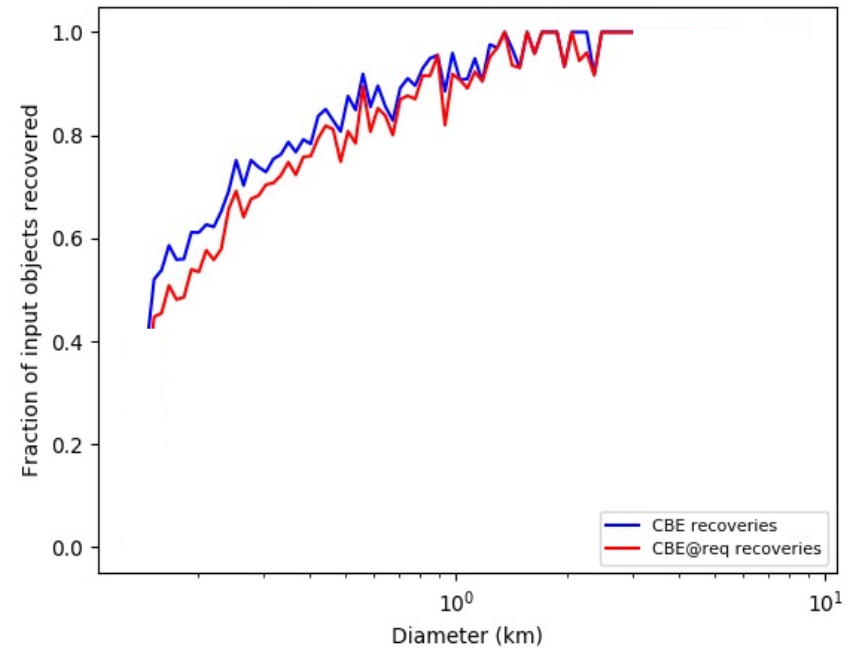
- Simulator purpose:
 - Evaluate survey efficiency
 - Optimize survey design
 - Help debias
- User defines field of regard, hardware properties, sensitivity, overheads, etc.
- Transferrability: spacecraft, survey, and telescope properties defined external to pipeline.



Completeness for the NEO & PHA populations



We will recover 2/3 of PHAs ~2 years into the survey; more if efforts are combined with the Vera Rubin Observatory



Smaller & more distant (colder) objects are harder to detect

Preliminary Results from the Simulator

- ~300,000 NEOs (currently ~25,000 known)
- ~10,000 comets (currently ~7,000 known)
- Millions of MBAs (currently ~900,000 known)
- ~75% of NEOs \geq 140m in diameter in first 5 years, ~85% in 10 years
- ~80% of PHAs in first 5 years, ~92% in 10 years
- Likely better orbital, physical, and rotational characterization of previous discoveries in an extended mission
- Completeness is higher if combined with another sensitive ground-based survey like Vera Rubin