SIZE AND ALBEDO DISTRIBUTIONS OF NEAR-EARTH ASTEROIDS OBSERVED BY NEOWISE

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NEOWISE Introduction and Survey Statistics

NEOWISE spacecraft pre-launch
Credit: NEOWISE/NASA/JPL

- Near-Earth Object Wide-field Infrared Survey Explorer or NEOWISE (Mainzer et al. 2014)
  - Extended part of the WISE mission (Wright et al. 2010)
- Two-band (3.4 and 4.6 micron) all-sky thermal infrared survey
- Since its reactivation in 2013, NEOWISE has detected tens of thousands of minor planets in the solar system
- NEOWISE's 9th data released on March 2023!
- Dataset overview
  - Total NEO detections: 5686
  - Total unique NEOs: 3705
  - Total number of thermally selected fits > 2198

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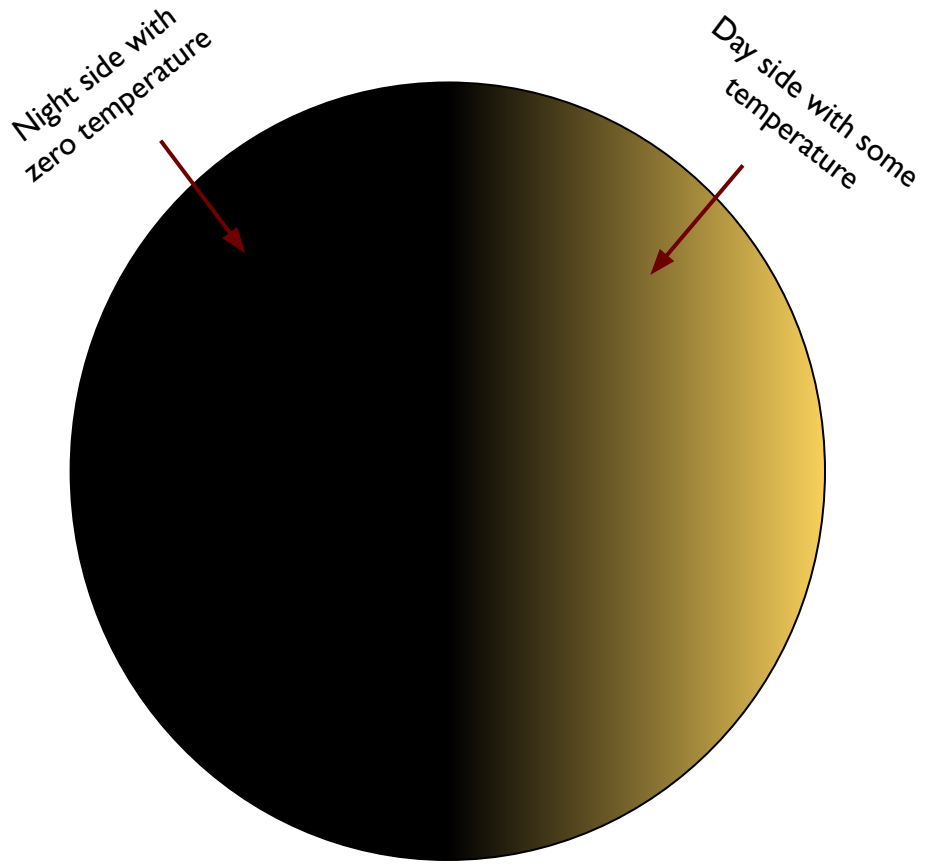
NEATM model



NEATM temperature approximations
(this is a general example)

- Near-Earth Asteroid Thermal Model (Harris 1998)
- Asteroid = idealized sphere
- Beaming parameter to account for surface roughness, thermal conductivity, period, etc.
- Computationally efficient
  - Scalar minimization
- We fit —
  - Diameter and albedo for 2-band data
  - Diameter, albedo, and beaming for >2-band data

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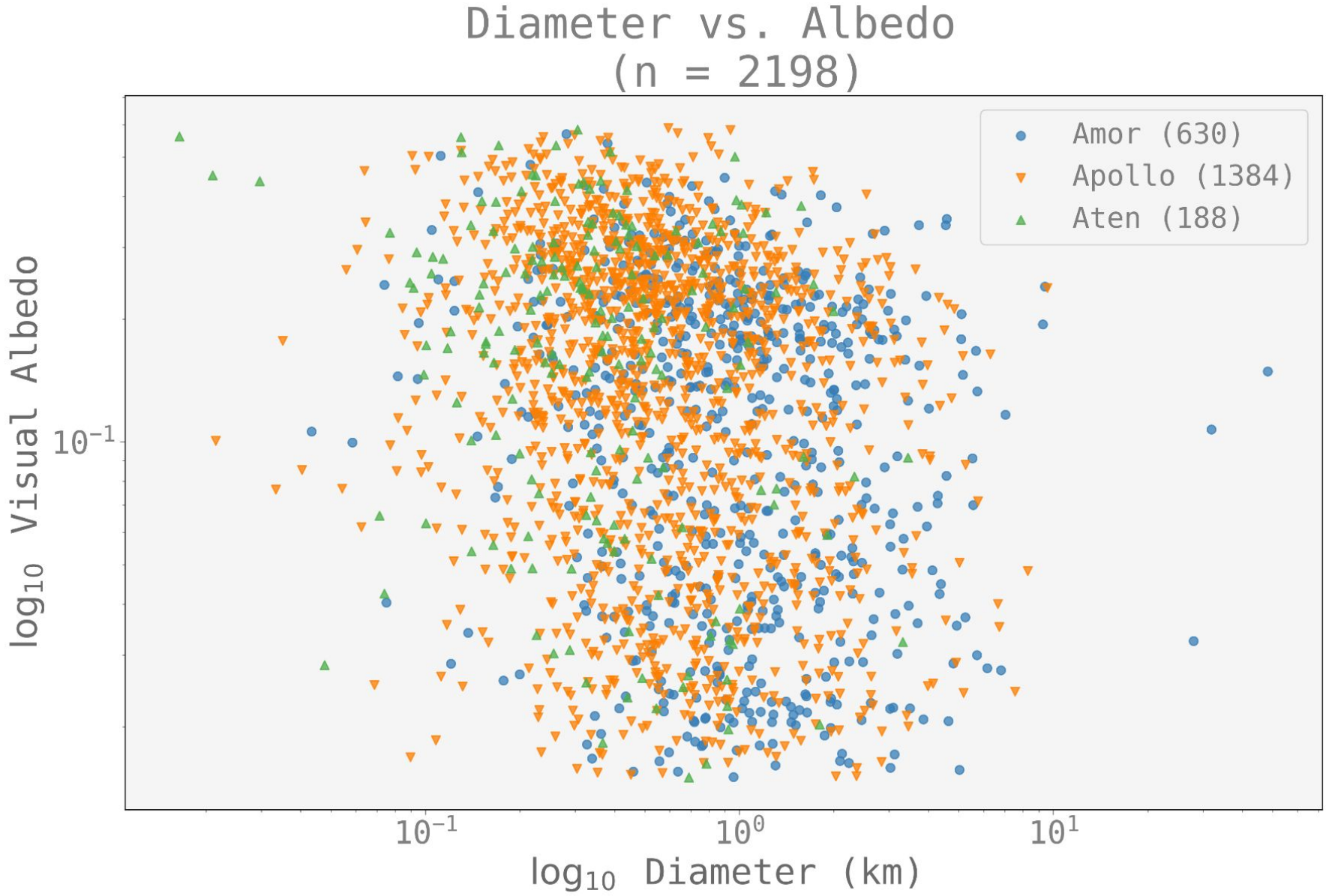
Results



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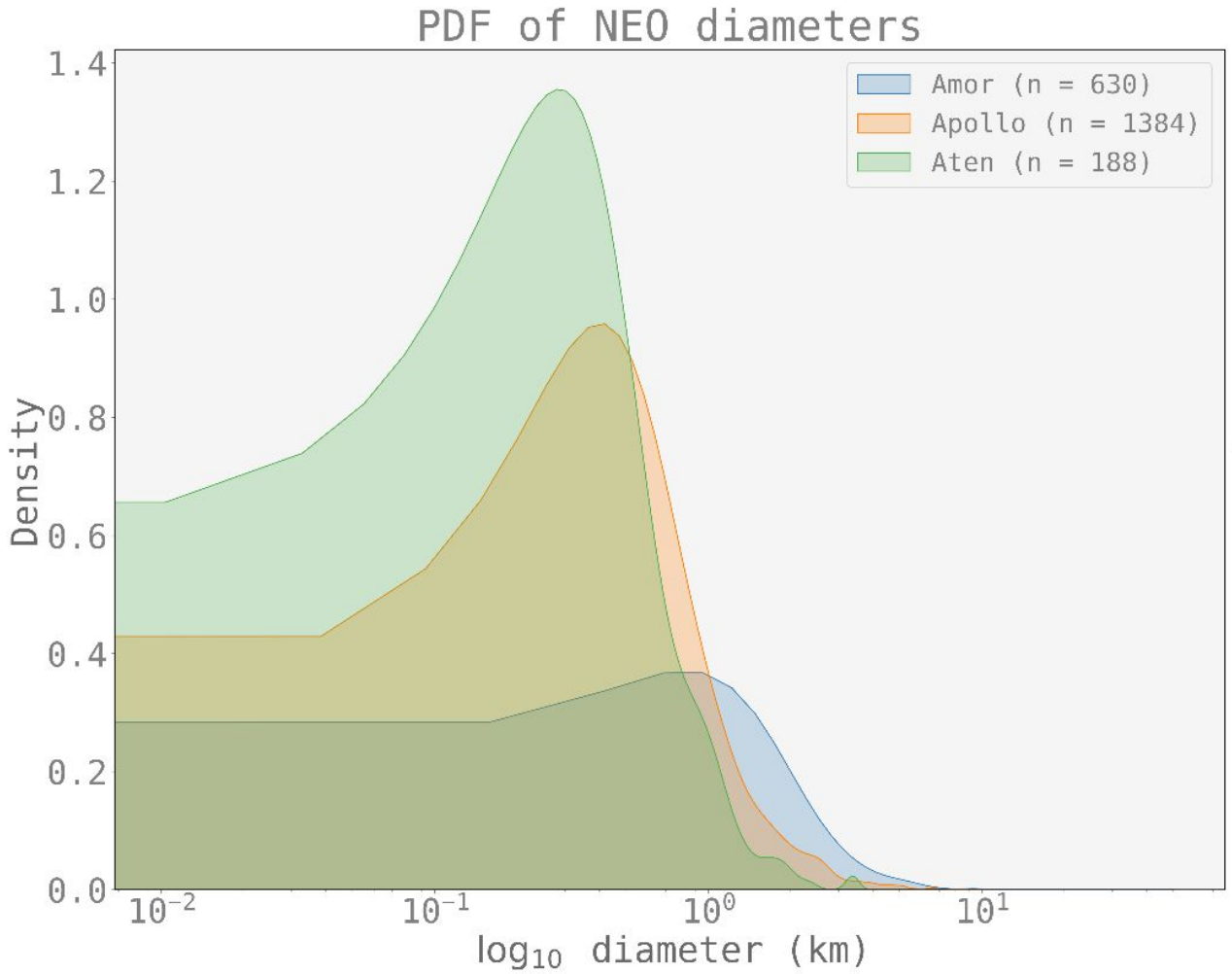

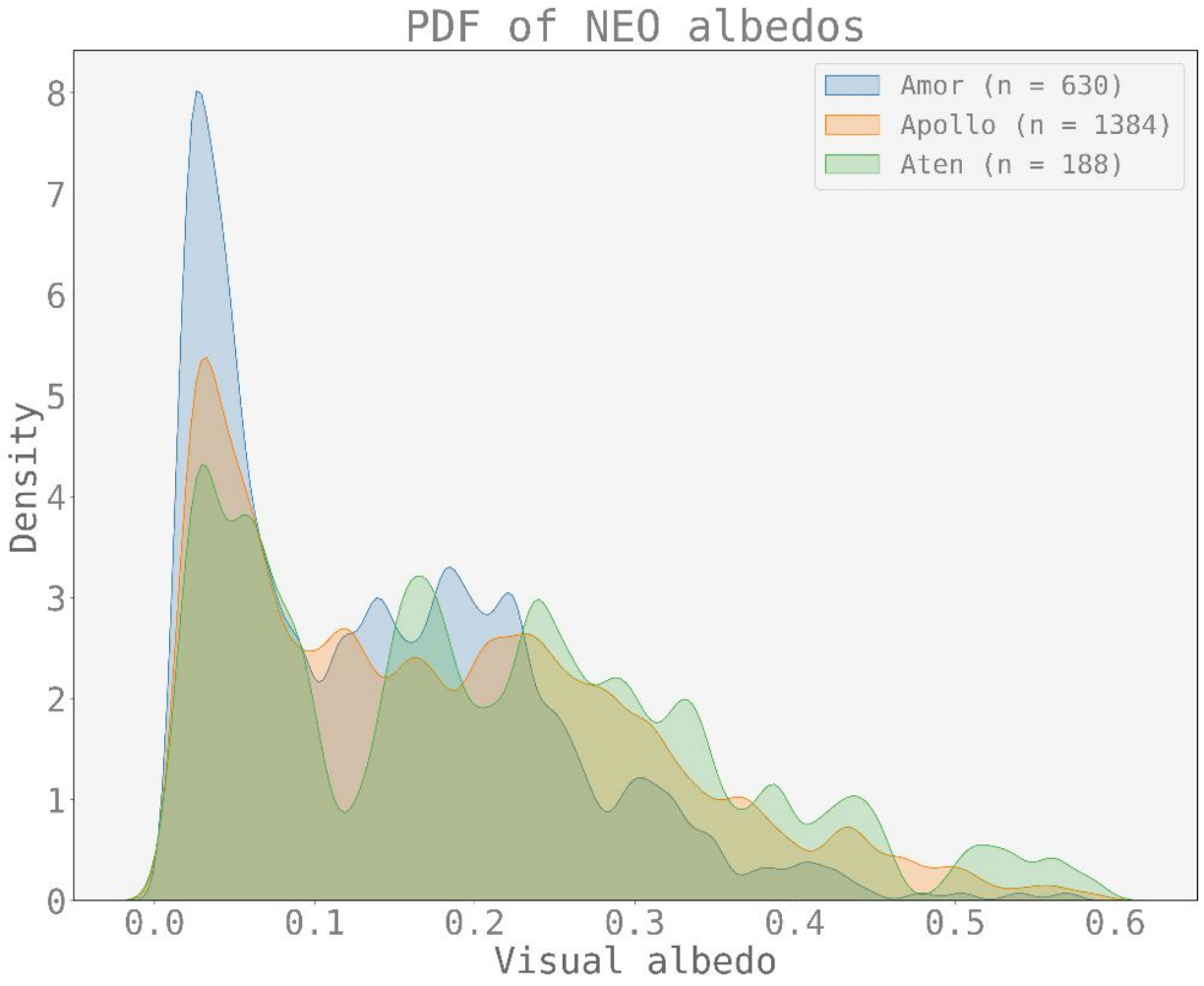

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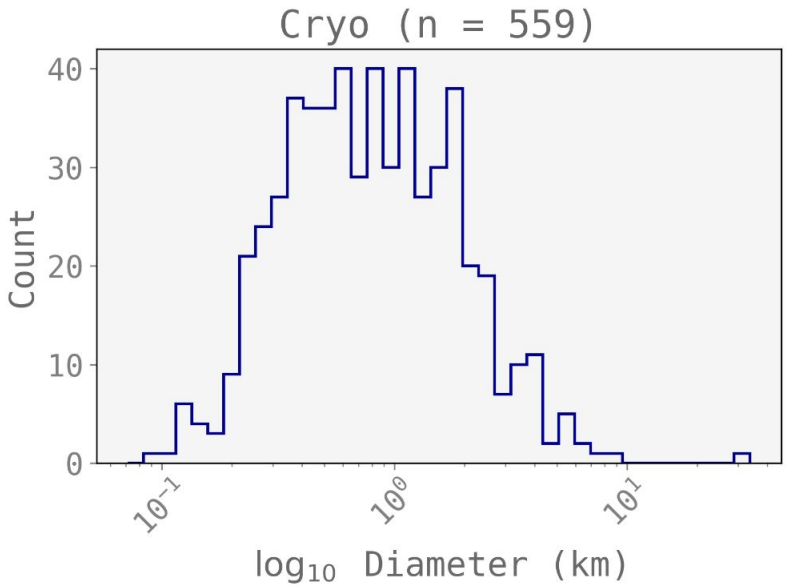

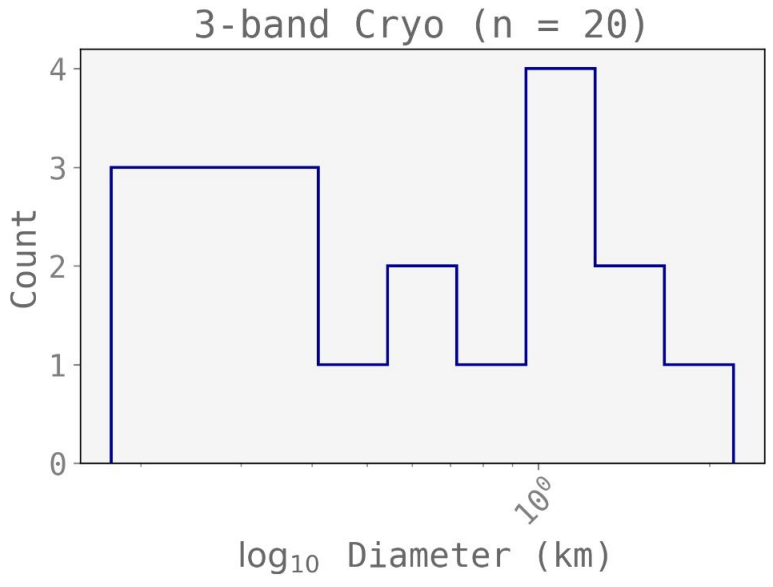

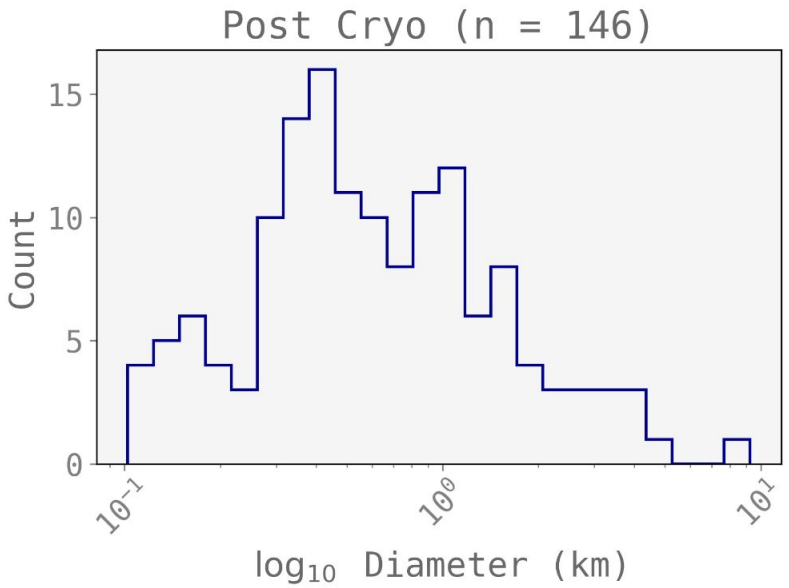

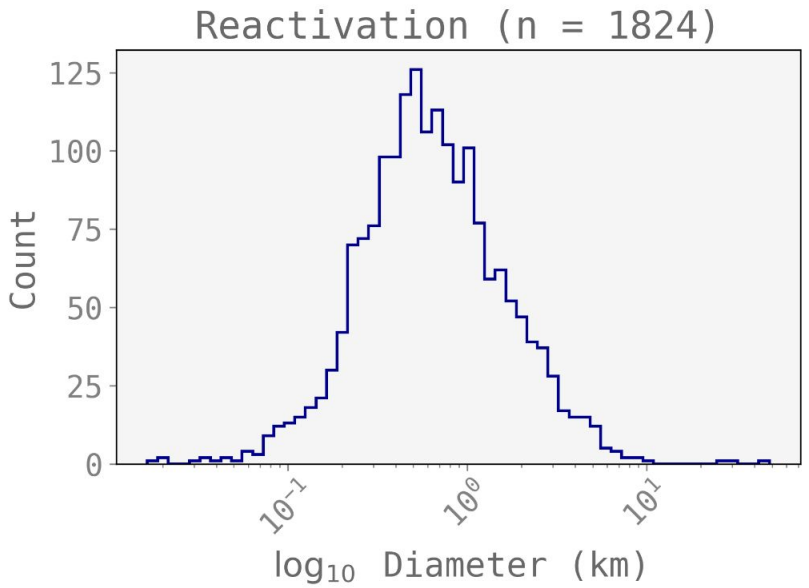

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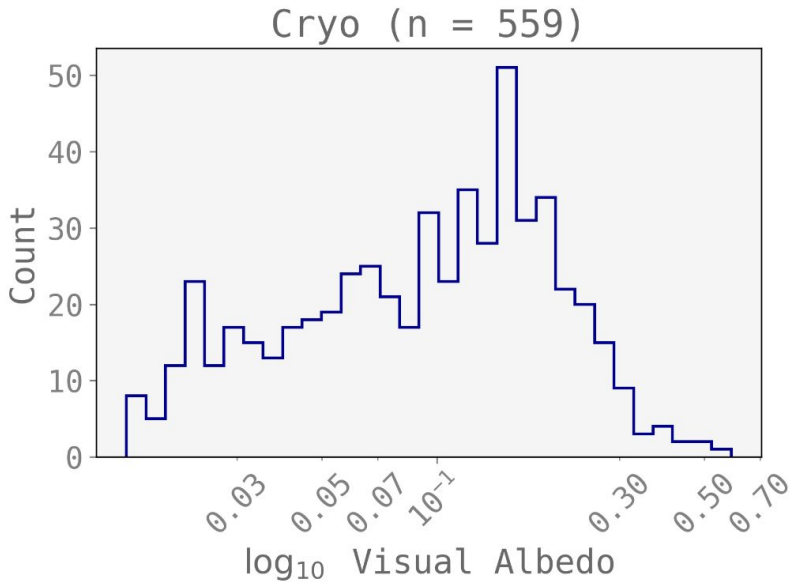

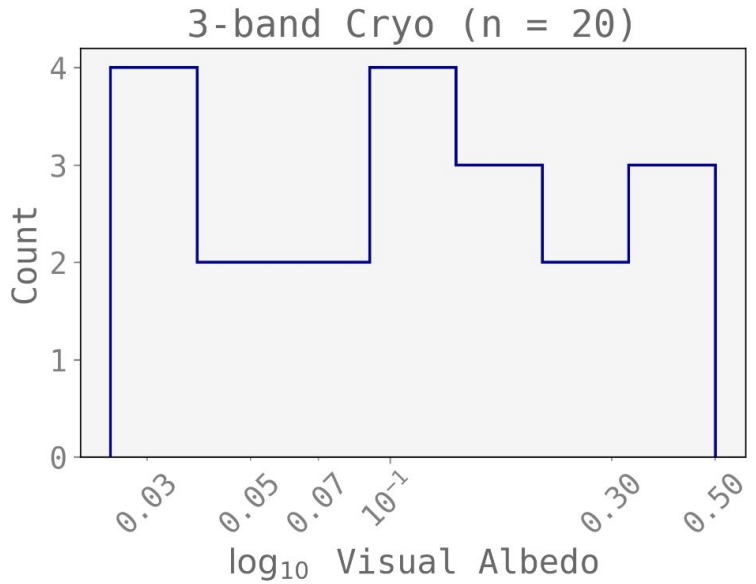

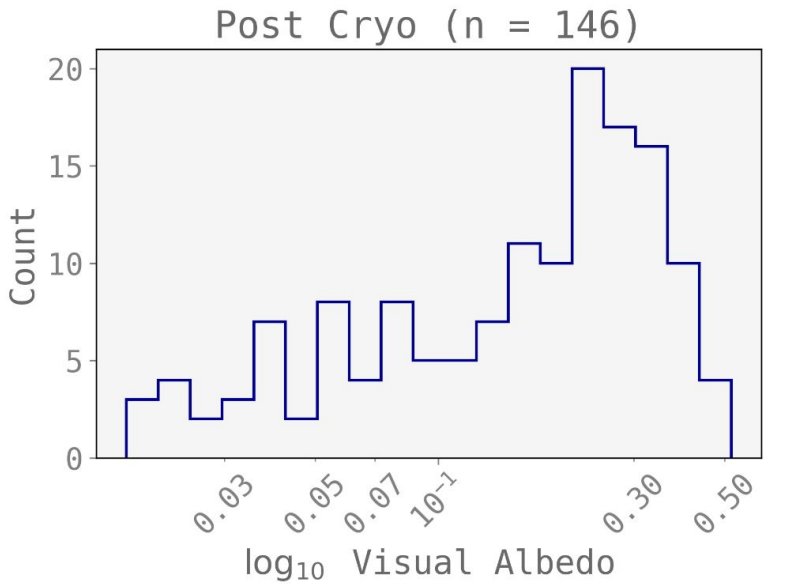

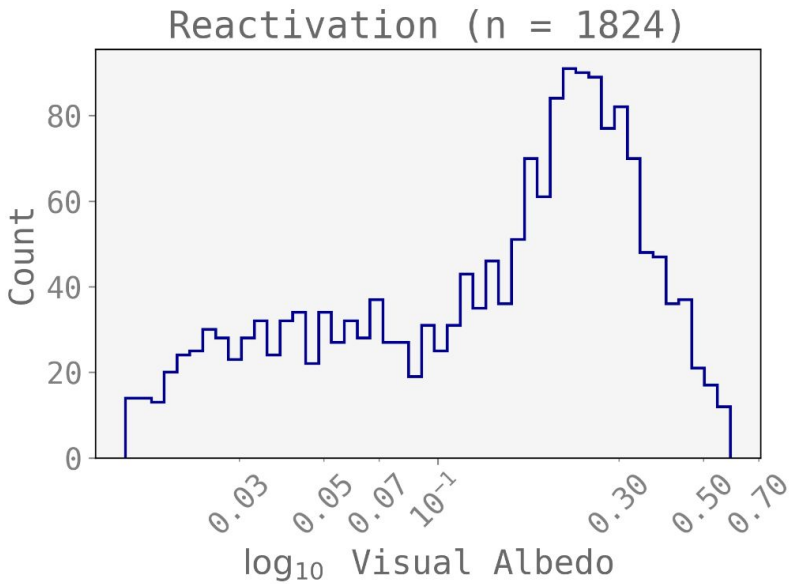

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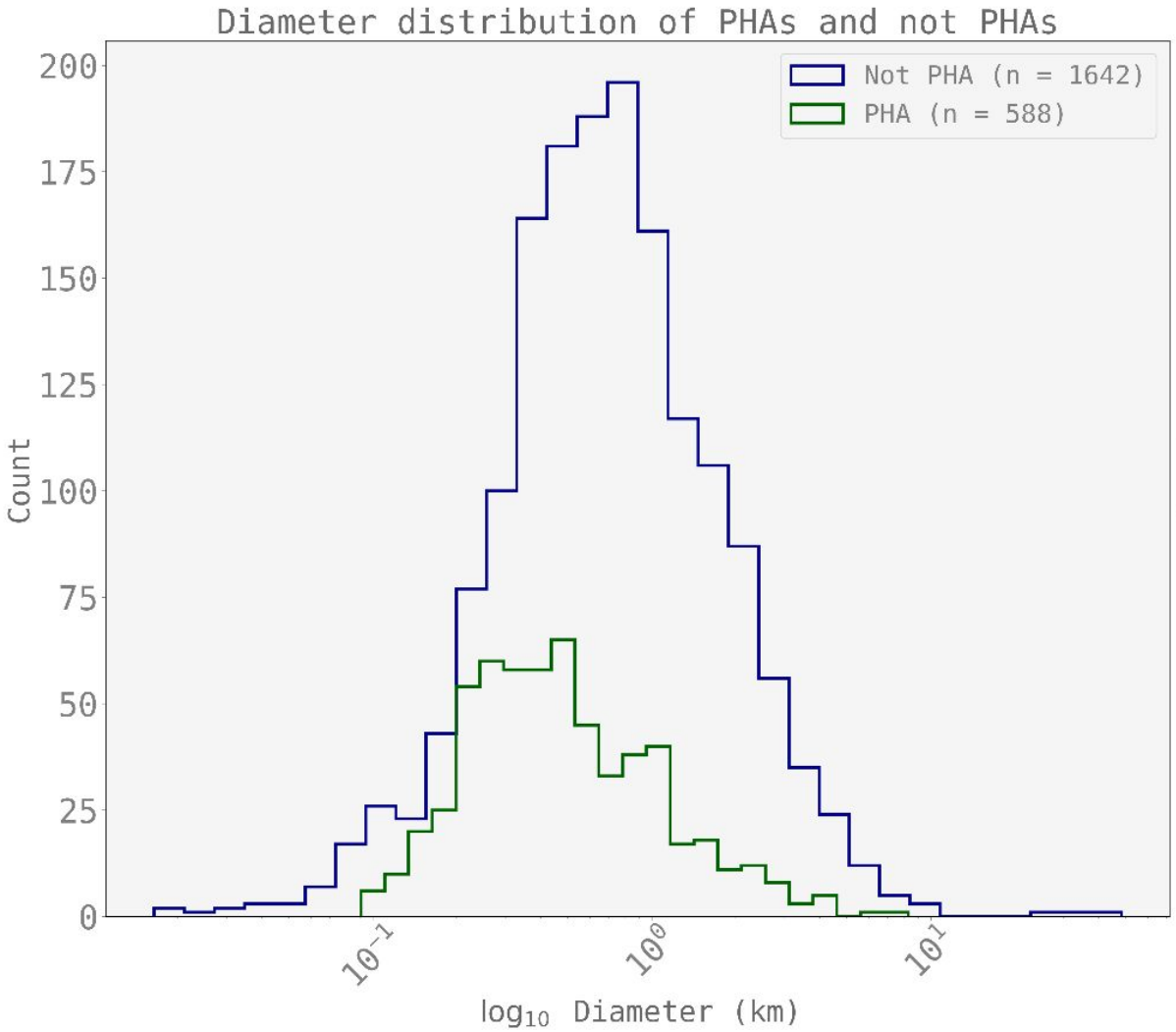

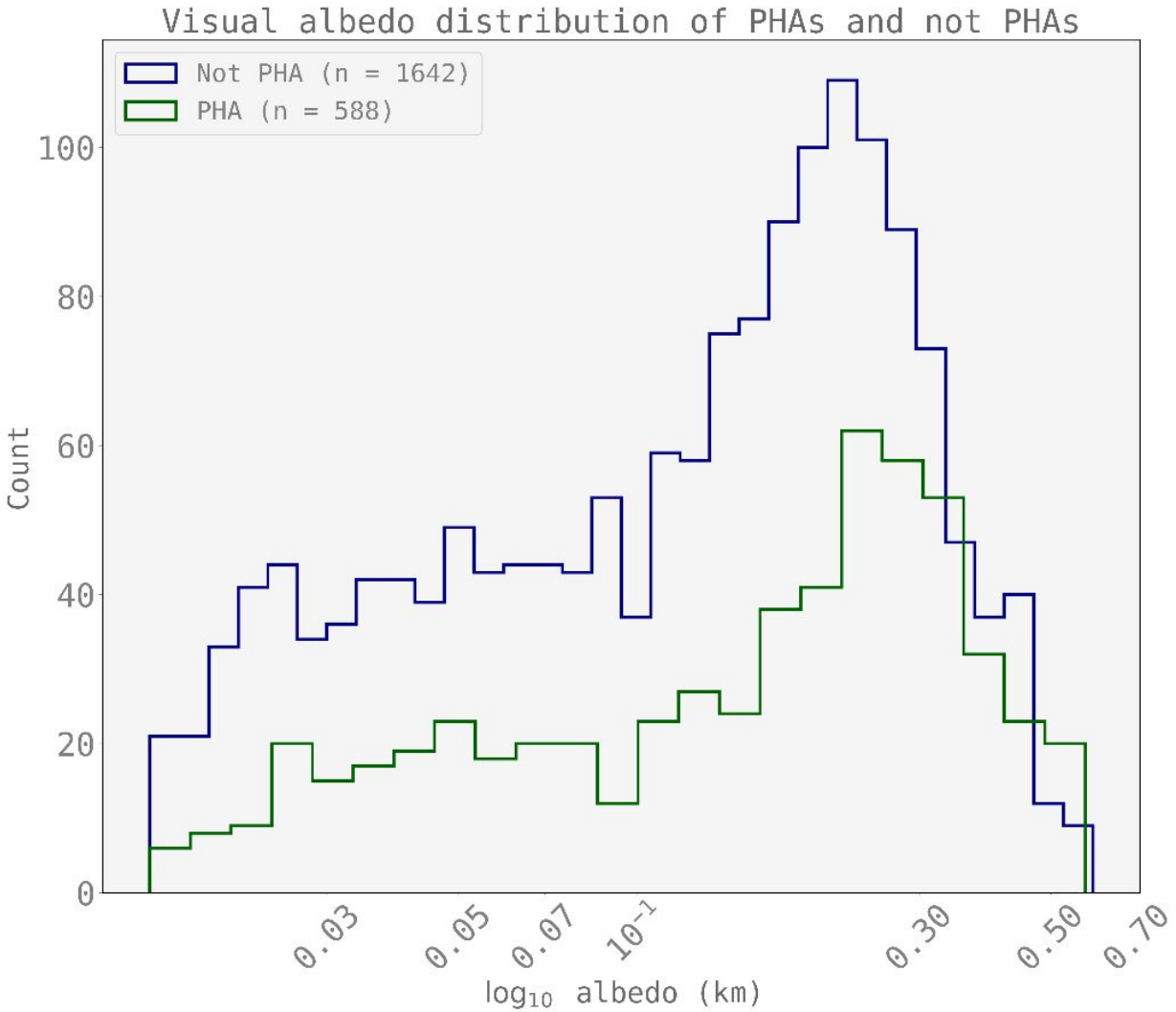

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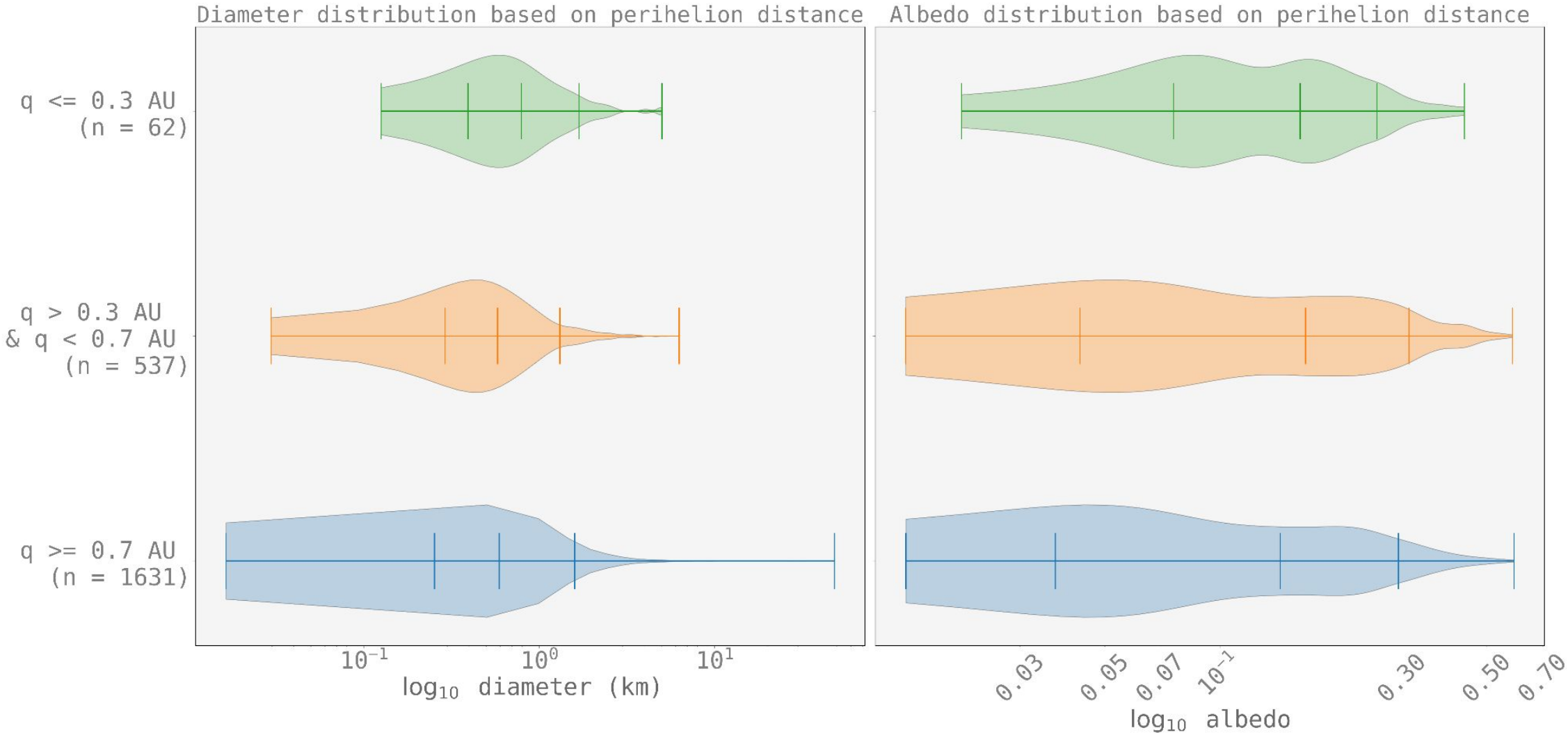

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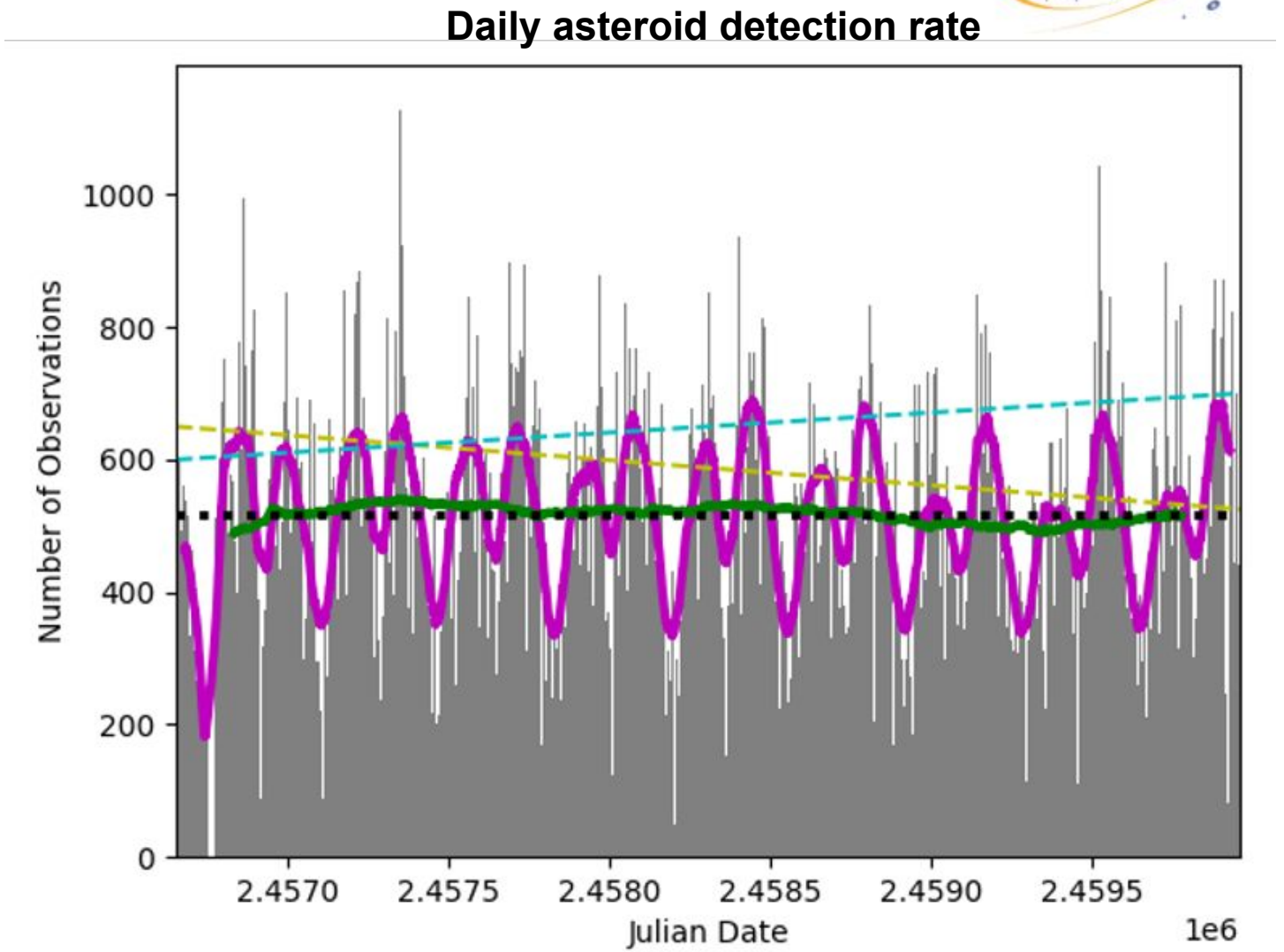
Future of NEOWISE

- Data quality remains good
- Solar activity is increasing due to the solar cycle → more atmospheric drag
- Re-entry date ~ May, 2025
- Thermal and pointing control will remain within bounds for another year



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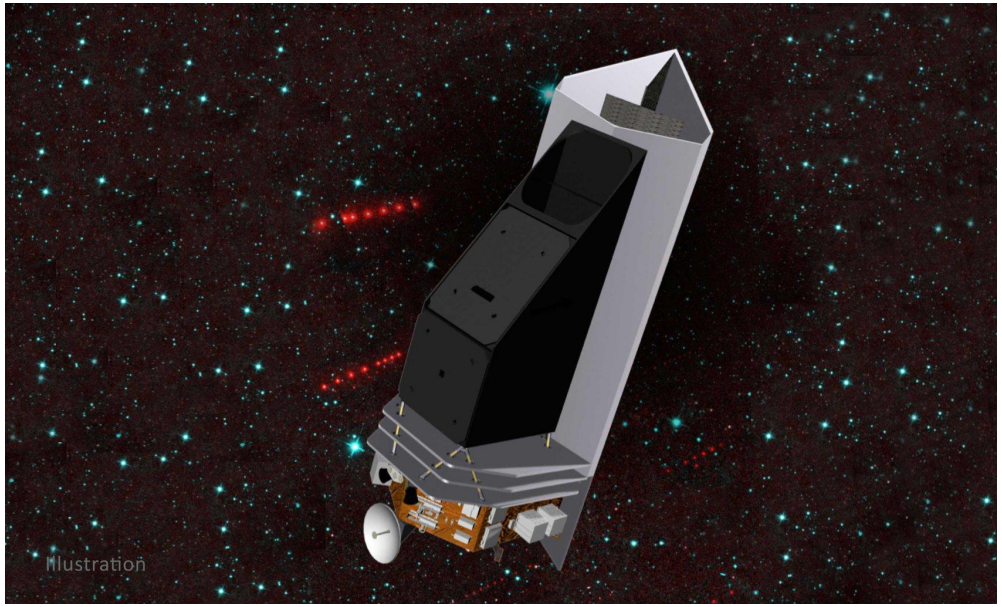
Current and future prospects

- We aim to refine the NEATM characterized NEOs
  - Refitting fast rotating asteroids
  - Comparison using non-IR constrained data
  - Synthetic population testing
  - For objects with multi-epoch observations → MCMC-based TPM
- Preparing the data analysis pipeline for NEOS



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