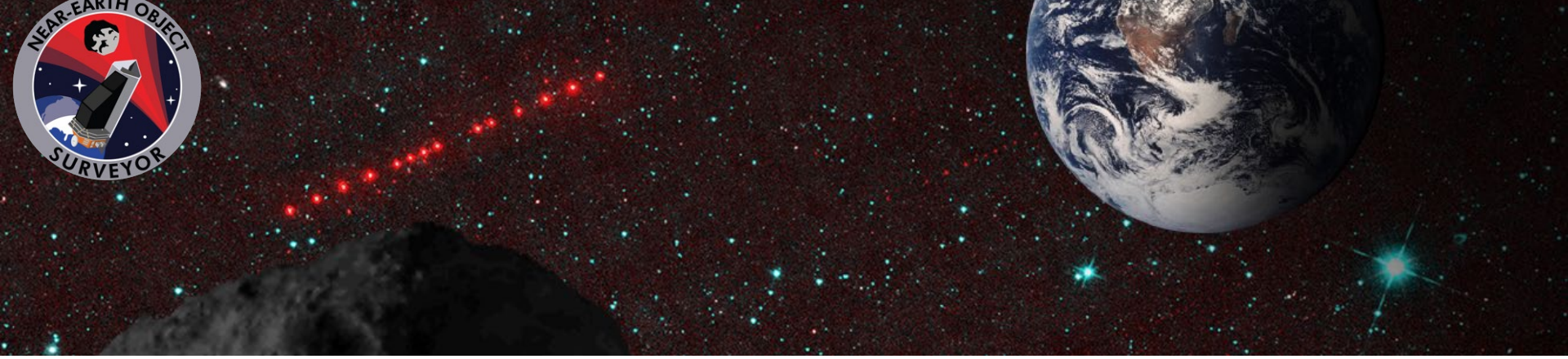

The Near-Earth Object (NEO) Surveyor

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NEO Surveyor Survey Data System Lead Scientist

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NEO Surveyor Project Overview

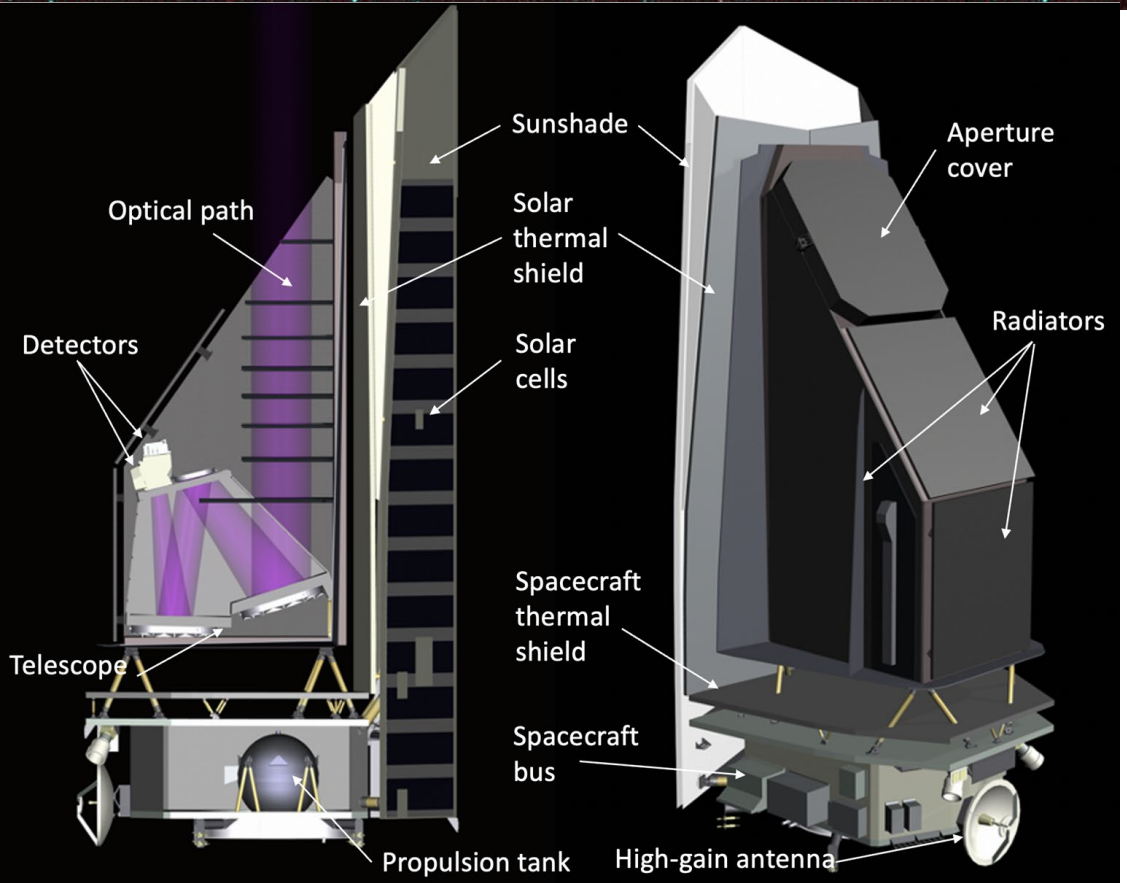
Salient features:

- NEO Surveyor is a planetary defense mission that entered Phase C on November 29, 2022
- Key NASA priority to detect, track, and characterize impact hazards from asteroids and comets
- Will make significant progress toward George E. Brown, Jr. NEO Survey Act (Public Law 109-55, Sec. 321). Responds to National Research Council's report Defending Planet Earth (2010), U.S. National NEO Preparedness Strategy (2023), Planetary Decadal Survey (2022)
- Program Exec: Andrea Riley. Program Scientist: Mike Kelley. Mission Manager:

Driving Science goals:

- Identify at least 2/3 of potentially hazardous asteroids >140 m in effective spherical diameter within 5-year baseline mission (Goal: ≥90% completeness within 10-12 years)
- Collect and verify sufficient observations in order to calculate the frequency of impacts from asteroids >50 m in effective spherical diameter & comets
- Collect and verify sufficient observations in order to derive physical and orbital characteristics of specific objects of interest

Mission Architecture



Observatory will survey from halo orbit at L1 for 5 years with 12-year goal.

Launch readiness date - Sept 2027.

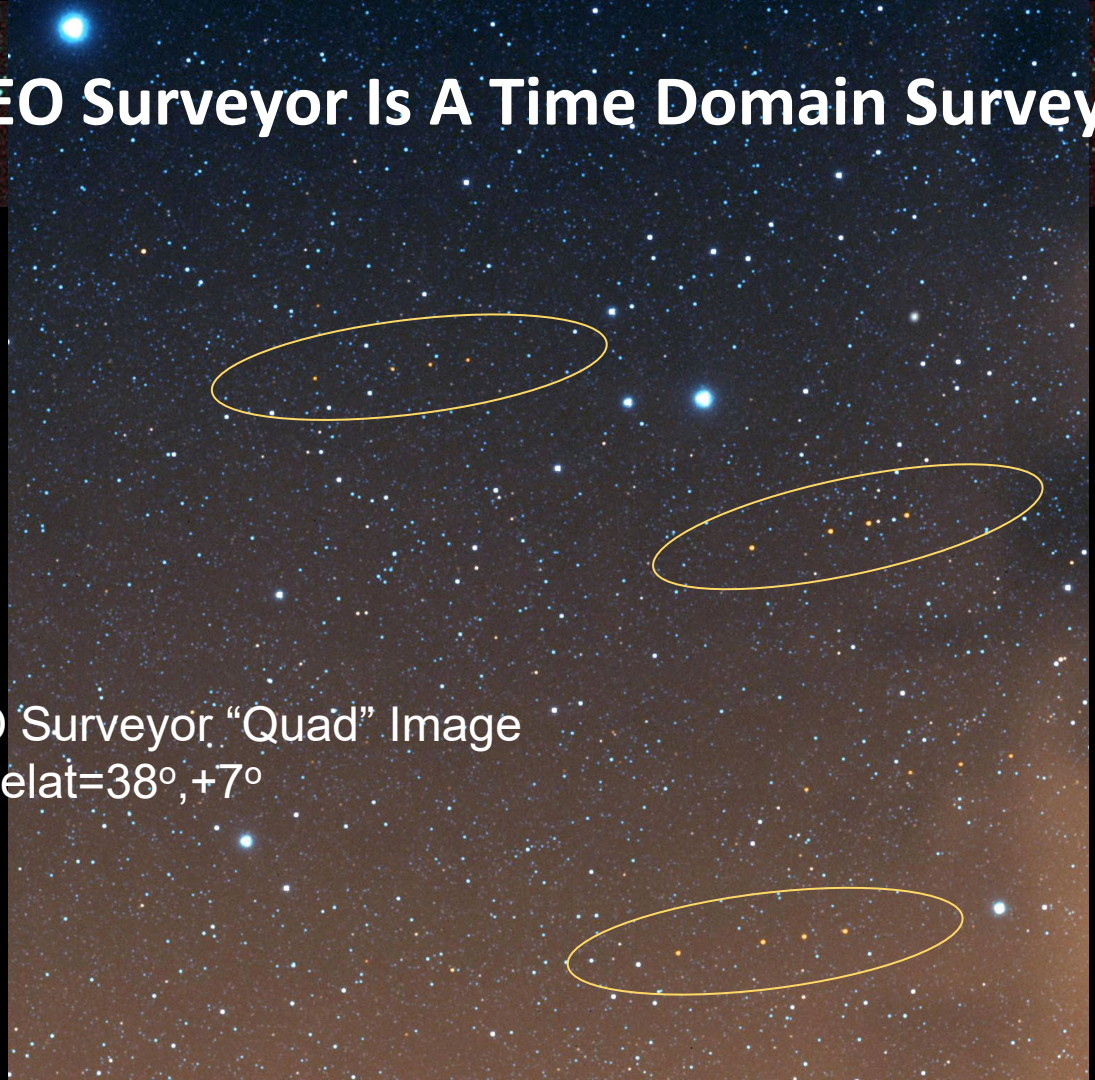
Instrument is passively cooled

- 50-cm telescope
- 2 IR channels imaging simultaneously
- 4-5.2 um (NC1) and 6-10 um (NC2)
- Each channel - 1x4 2kx2k HgCdTe mosaic
- Field of view 11 sq deg
- Sensitivity:
  - <110/280 uJy 5-sigma in 3min @ 8um @ 120/45 deg from Sun
  - <65/120 uJy 5-sigma in 3min @4.6um @120/45 deg from Sun

Spacecraft is based on Ball BCP2000 heritage

- 3-axis stabilized spacecraft
- Ejectable cover is the only deployment

NEO Surveyor Is A Time Domain Survey

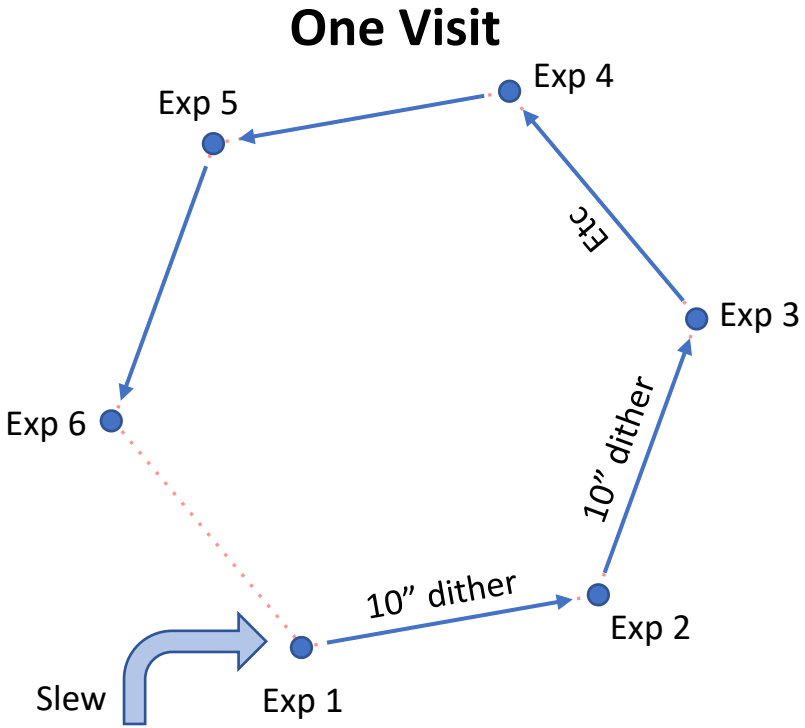


Simulated NEO Surveyor “Quad” Image
0.8°x0.8° elon,elat=38°,+7°

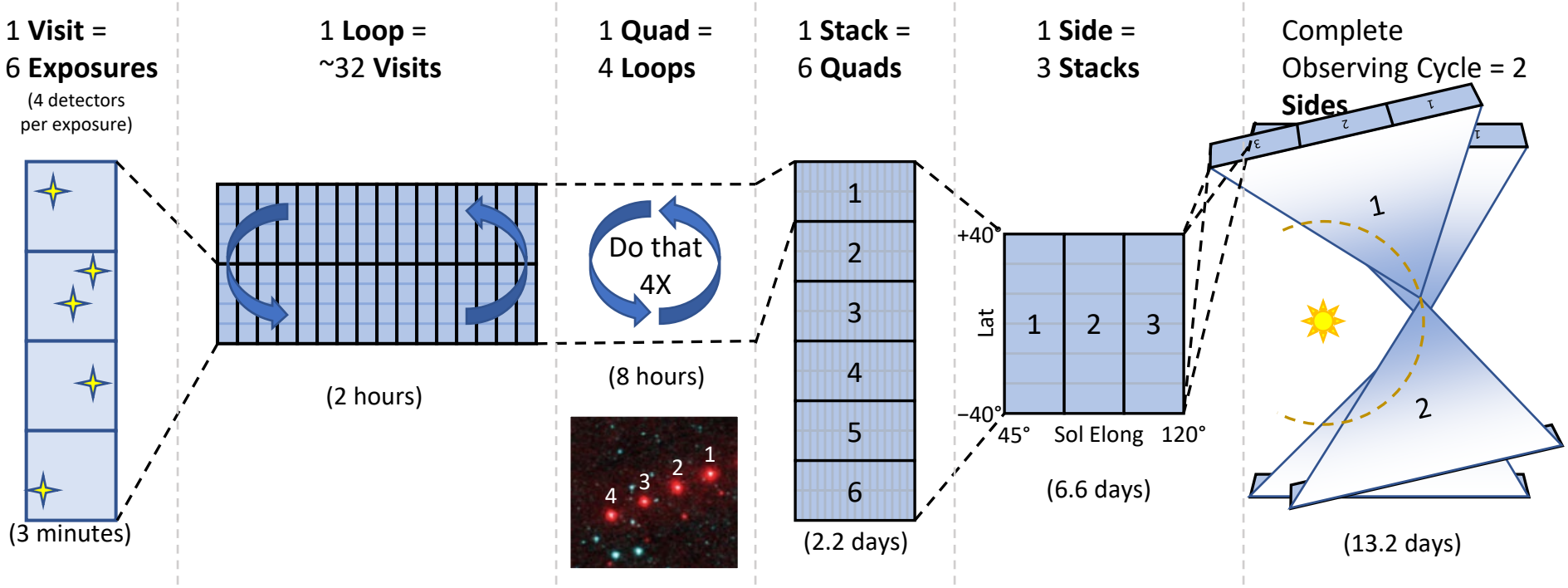
4.6 microns
4.6 + 8 microns
8 microns

”Visit” is Fundamental Unit of Observation

- Visit is comprised of 6 dithered 30 sec Exposures
  - Each Exposures produces a pair of images in NC1 and NC2 bands that are downlinked
  - 10 arcsec dither move (~ 3 pixels) between each Exposure
  - Net 180 sec exposure time/Visit
- The 6 dithered Exposures:
  - All are downlinked
  - Enable building the required survey sensitivity by coadding in ground processing
  - Provide resilience to cosmic ray strikes, bad/noisy pixels
  - Provide the opportunity to detect very fast-moving objects

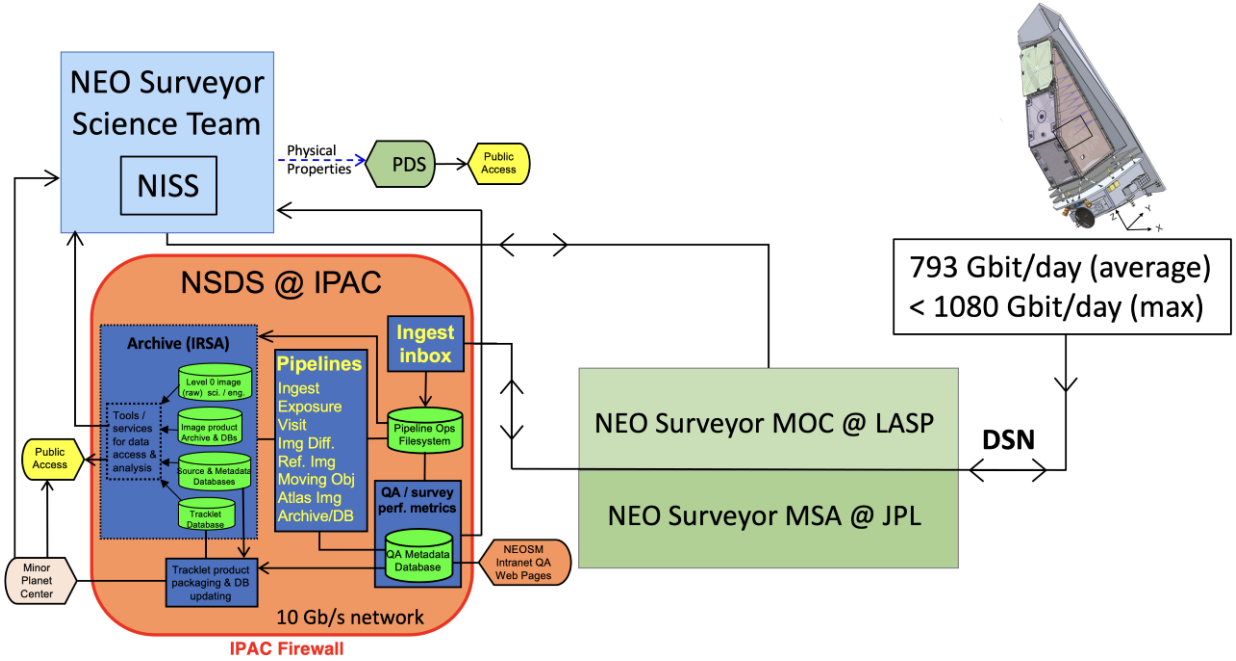


Repetitive Survey Cadence Optimized to Find Potentially Hazardous Asteroids



Each fixed point on the sky visited 5-6 times over ~75 day observing season

NEO Surveyor Survey Data System (NSDS) developed and operated by IPAC/Caltech



Data downlink once per day via DSN

- NSDS Functions:
  - Calibrate Exposure and Visit image data
  - Multiband source extraction, photometry and astrometry
  - Image differencing to identify moving object (transient) candidates
  - ML-based detection classification
  - Moving object tracklet generation
  - Science data quality assurance
  - Data archiving and distribution
- NSDS leverages heritage from 2MASS, WISE/NEOWISE, and ZTF data systems

NEO Surveyor Data Products and Delivery Schedule

Moving Object Tracklets

Position-time pairs of linked detections of candidate solar system objects

Delivered daily to the MPC within 72 hrs of observation *beginning 1 month after end of IOC (best effort)*

NSDS

Visit/Exposure Image Sets and Source Extractions

Calibrated intensity images, noise maps, bit masks from each Visit/Exposure

Photometry and astrometry of all sources detected on Visit/Exposure images

Released every 6 months via IRSA *beginning 7 months after end of IOC*

NSDS

Moving Object Database

Photometry, astrometry, orbits, and derived physical parameters for solar system objects detected by NEOS and confirmed by the MPC.

Released every 6 months via the PDS *beginning 12 months after end of IOC*

Sci. Team

Static Sky Atlas Image Sets

Coadded intensity images, noise and coverage maps generated by combining previous year's data

Released annually via IRSA *beginning 17 months after end of IOC*

NSDS