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## **THE NEAR-EARTH OBJECT SURVEYOR MISSION**

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## **ABSTRACT**

The Near-Earth Object Surveyor (NEOS) mission is a NASA observatory dedicated to finding, tracking, and characterizing potentially hazardous asteroids and comets. NEOS is designed to address the George E. Brown Survey Act, the law that obligates NASA to find more than 90% of near-Earth objects (NEOs) larger than 140 m. NEOS is a dedicated facility that is optimized for detection of potentially hazardous asteroids (PHAs) and comets by operating at the thermal infrared wavelengths at which such objects are bright regardless of their visible albedos. The NEOS instrument consists of a 50-cm three-mirror anastigmat telescope collecting images every 30 seconds in two channels (4.0-5.2  $\mu\text{m}$ , denoted NC1, and 6-10  $\mu\text{m}$ , denoted NC2) simultaneously. The observatory surveys on either side of the Sun between 45-120 deg solar longitude in order to maximize sensitivity to PHAs in the most hazardous, Earth-like orbits from its vantage point in a halo orbit around the Sun-Earth L1 Lagrange point (SEL1). The SEL1 orbit offers the advantage of a cold, stable thermal environment and close, rapid, and constant data rates over the 5-year baseline mission. The NEOS instrument is cooled to its operating temperatures purely passively using reflective shields and radiators.

The NEOS mission's survey cadence is optimized for PHA discovery, collecting a set of 4 observations spanning roughly 6-10 hours (denoted a "tracklet"), followed by a second tracklet roughly 12-13 days later. This cadence, coupled with the sensitivity of the NEOS instrument, enables discovery of the majority of the PHAs larger than

140 m within 5 years or less. Should a target of particular interest be discovered, it is possible to pause the nominal survey pattern and collect additional follow up observations. The nominal survey field of regard covers the 45-120 deg solar longitude region and +/-40 deg of latitude, although the Observatory can safely observe from ecliptic pole to pole.

Data will be processed using techniques rooted in the experience of the NEOWISE mission but augmented to accommodate the anticipated increase in detections for the NEOS mission. Tracklet data for candidate moving objects will be transferred to the Minor Planet Center daily, and deliveries of images, extracted source lists, and derived physical properties of minor planets detected by the NEOS mission will be delivered to NASA's Infrared Science Archive (IRSA) hosted by IPAC/Caltech and the NASA Planetary Data System every six months.

The NEOS project successfully completed its mission Preliminary Design Review on September 22, 2022, and the project passed its Key Decision Point C review on November 29, 2022. The project has been approved to move into its critical design phase by NASA. Launch is scheduled for no later than June 2028.