Building the NEOWISE and NEOCam Survey Simulators and Thermal Fitting Pipelines

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WISE/NEOWISE is the largest infrared survey of solar system asteroids and comets, having submitted over 3.1 million observations of almost 190,000 objects since its prime cryogenic mission (Jan. 2010 – Sept. 2010), extended mission (Oct. 2010 – Jan. 2011), and the subsequent reactivation as the NEOWISE mission (Dec. 2013 - present). During the cryogenic phase observations were collected in four bandpasses (3.4, 4.6, 12 and 22 μm), while for most of the extended and reactivated mission observations were collected in the two shortest bandpasses (3.4 and 4.6 μm). This large data set has allowed for detailed studies of the physical properties of the populations of the inner solar system, such as near-Earth asteroids (Mainzer et al. 2011, 2012, 2014), main-belt asteroids (Masiero et al. 2011, 2012, 2014, 2018), Hilda asteroids (Grav et al. 2012) and Jovian Trojan asteroids (Grav et al. 2011, 2012). We will discuss the NEOWISE survey simulator and thermal fitting pipeline that have been used to perform these studies and how we use the data available to determine diameter, visible and nearinfrared albedo, and other important parameters.

The Near-Earth Object Camera (NEOCam) is a mission aimed to make significant strides in discovering, tracking and characterizing the near-Earth asteroid and comet population (Mainzer et al. 2015). This next-generation infrared survey will have two midthermal bandpasses (4-5.2 and 6-10 μm), which allow for detection of an estimated 300,000 near-earth asteroids, several million main-belt asteroids, and thousands of short- and long-period comets. We will discuss the survey cadence and the expected data quality and quantity, as well as the NEOCam Survey Simulator and Thermal Fitting Pipeline that are currently being developed to derive physical properties and debiased population statistics for the small bodies in the inner solar system.