WISE Observations of Comets, Centaurs, & Scattered Disk Objects

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The Wide-Field Infrared Survey Explorer (WISE) was launched on December 14 of 2009. WISE imaged more than 99% of the sky in the mid-infrared for a 9-month mission lifetime. In addition to its primary goals of detecting the most luminous infrared galaxies and the nearest brown dwarfs, WISE detected over 155500 of Solar System bodies, 33700 of which were previously unknown. Most of the new objects were main Belt asteroids [1], and particular emphasis was on the discovery of Near Earth Asteroids (NEAs; [2]). Hundreds of Jupiter Trojans have been imaged by WISE as well [3]. However, a substantial number of Centaurs, Scattered Disc Objects (SDOs), & cometary objects, were observed and discovered.

Comets: The comets observed by WISE included significant numbers on both dynamically long and short-period orbits. Over 120 comets have been imaged by WISE, and the mission has made 20 cometary discoveries, including 3 discoveries of activity in known bodies.

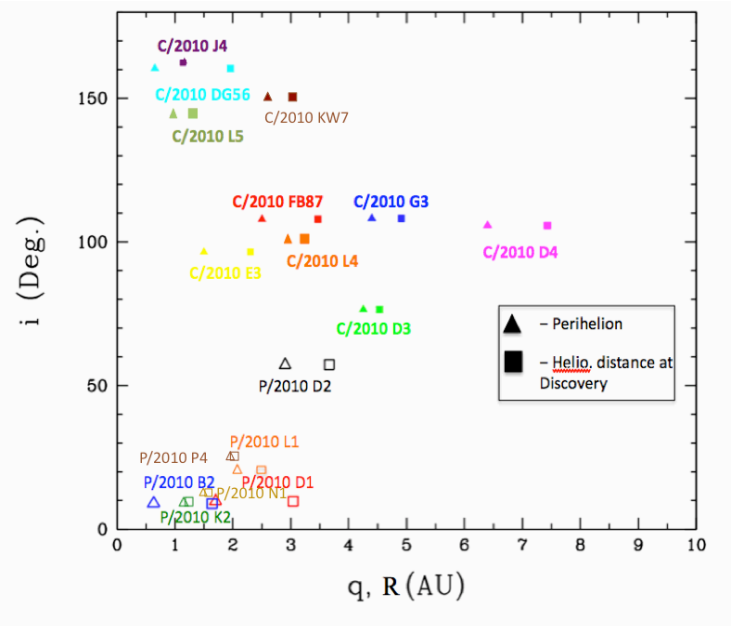

Figure 1: 17 comets were discovered by and named for the WISE mission. The inclination, perihelion distance (q), & discovery heliocentric distance (R) of these comets are shown on the plot.

Observations of comets in the WISE thermal-IR bands are being used to:

- provide comet nucleus size constraints ,
- estimate coma dust temperature and particle size distributions,
- derive comet trail grain sizes and β parameters.

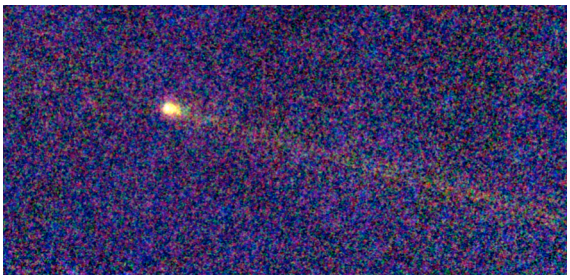

Figure 2: 103P/Hartley 2, imaged by WISE on May 10th. Dust particle size distributions in the coma dust indicated smaller grains dominated. Note also the presence of a faint trial in front of the comet as well as after. Fits to the trail provide constraints on β & dust grain size which are consistent with larger cm sizes in the trail [4].

Centaurs & SDOs: The Outer Solar System objects detected by WISE include several categories. Solar system objects in general were most easily detected in the 12 μm band, as its noise characteristics were better, and the closer objects had their thermal emission peaks nearest to this band pass. Objects beyond 3 AU, however, were best detected in the longest wavelength band (22 μm), owing to their thermal peak shifting long-ward of the 12 μm band. Most outer solar-system object detections were made during the cryogenic mission when the longest-wavelength band was functioning. Size detection thresholds for WISE were on the order of a few km radii at Jupiter distances, and radii of tens of km at distances near Saturn. Therefore, it was likely that a handful of Centaurs would be seen by WISE. In fact, at least 16 known Centaurs were detected, and an additional 3 were discovered, along with 2 Scattered Disk Objects (SDOs; with semi-major axes > 30AU). This population of objects was detected out to distances of 16 AU. As most objects were imaged roughly 10 times over the course of 1.5-2 days, the repeated imaging of these bodies provided rotational information, like variations in projected size. Additionally, several Centaurs are known to be active. WISE imaging of these Centaurs, such as Echeclus and Chiron, provide constraints on their dust sizes and mass-ejection rates.

We will present our initial analyses of these observations.

References: [1]Masiero et al. 2010. WISE Albedos for Tens of Thousands of Main Belt Asteroids. BAAS 42, 1072. [2]Mainzer et al. WISE Solar System Science. 2010. BAAS 42, 1016. [3]Grav et al. 2010. WISE Observations of the Jupiter Trojan Clouds. BAAS 42, 1072. [4]Bauer et al. 2010. Wise Views of the Outer Solar System: Comets, Centaurs & SDOs. BAAS 42, 949.

Additional Information: This publication makes use of data products from the Wide-field Infrared Survey Explorer, which is a joint project of the University of California, Los Angeles, and the Jet Propulsion Laboratory/California Institute of Technology, funded by the National Aeronautics and Space Administration. This publication also makes use of data products from NEOWISE, which is a project of the Jet Propulsion Laboratory/California Institute of Technology, funded by the Planetary Science Division of the National Aeronautics and Space Administration.