

WISE Views of Centaurs & Scattered Disk Objects

J. M. Bauer(1,2), R. Walker(3), A. Mainzer(1), E. Blauvelt(1), J. Masiero(1), T. Grav(4), R. Cutri(2), J. Dailey(1), C. M. Lisse(5), Y. R. Fernandez(6), K. J. Meech(7), R. McMillan(8), D. Tholen(7), E. L. Wright(8), and the WISE Team, (1) Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, (2) Infrared Processing and Analysis Center, California Institute of Technology, (3) Monterey Institute for Research in Astronomy, (4) Department of Physics and Astronomy, Johns Hopkins University, (5) Applied Physics Laboratory, Johns Hopkins University, (6) Department of Physics, University of Central Florida, (7) Institute for Astronomy, University of Hawaii, Manoa, (8) Lunar and Planetary Laboratory, University of Arizona, (9) Department of Physics and Astronomy, University of California, Los Angeles. (bauer@scn.jpl.nasa.gov / Fax: +1-818-3934445)

Abstract

The Wide Field Infrared Survey Explorer surveyed most of the sky in the Mid-Infrared from January through September of 2010. In addition to 120 comets, more than 30 Centaurs and Scattered Disc Objects (SDOs) were observed and discovered. We will present preliminary results from the analysis of these outer solar system bodies.

1. Introduction

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 at 4 band-passes, centered at 3.4, 4.6, 12 and 22 μm [1]. 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 [2], and particular emphasis was on the discovery of Near Earth Asteroids (NEOs/NEAs). Hundreds of Jupiter Trojans have been imaged by WISE as well, as well as over 120 comets. However, the longest wavelength channels allowed detection of objects in the outer solar system, beyond 5AU, including members the transient Centaur population, whose orbits in the giant planet region are stable for at most tens of millions of years [3]. A total of 32 Centaurs, and Scattered Disc Objects (SDOs) were observed, including 6 discoveries, by the WISE spacecraft. We will present preliminary results from the analysis of these outer solar system bodies.

2. Detections

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. Figure 1 shows the perihelion distances of the objects detected beyond 5.2 AU.

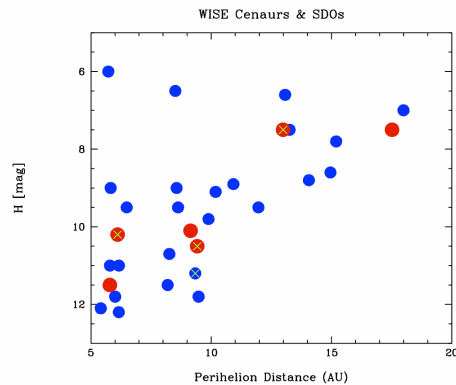


Figure 1: Centaurs & SDOs observed by WISE. H values listed by the MPC are shown as a function of perihelion distance for the fitted orbit. Red dots

indicate a WISE-discovered object. The SDOs are marked with a green “x” overlay.

3. Discoveries

A total of 6 objects were discovered beyond 5.2 AU by the WISE spacecraft, evenly split between Centarus and SDOs. These bodies, listed in Table 1 along with their orbital semi-major axis, eccentricity, and inclination, were reported to the Minor Planet Center within 10 days of their detection by WISE. In addition, 1 object discovered by WISE with an orbit in the giant planet region, but with perihelion distance < 5.2 , is listed and shown in italics.

Table 1: WISE Outer Solar System Discoveries

Preliminary Designation	a [AU]	e	i (°)
2010 LJ109	13.5	0.33	25
2010 FH92	24.4	0.76	62
2010 KR59	29.8	0.56	20
2010 GW147	196	0.97	100
2010 NV1	291	0.97	141
2010 BK118	408	0.99	144
<i>2010 LX90</i>	<i>5.7</i>	<i>0.55</i>	<i>6</i>

4. Analysis

We will present preliminary analysis of the Centaurs and SDOs, including diameter estimates, albedo distributions and analyses of the rotational variation seen over the course of the WISE observations.

Acknowledgements

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.

References

[1] Wright et al. 2010. The Wide-field Infrared Survey Explorer (WISE): Mission Description and Initial On-orbit Performance. *ApJ*, 140, 1868-1881.

[2] Mainzer, A.; Bauer, J.; Grav, T.; Masiero, J.; Cutri, R.M.; et al., “Preliminary Results from NEOWISE: An Enhancement to the Wide-field Infrared Survey Explorer for Solar System Science”, 2011, *ApJ*, 731, 53.

[3] Horner, J., Evans, N. W., & Bailey, M. E. 2004. “Simulations of the population of Centaurs – I. The bulk statistics.” *MNRAS*, 354, 798.