EPSC Abstracts
Vol. 6, EPSC-DPS2011-1094, 2011
EPSC-DPS Joint Meeting 2011
© Author(s) 2011

First Results from the La Silla-QUEST KBO Survey: Probing the High Inclination Kuiper Belt

M. E. Schwamb(1,2), D. L. Rabinowitz(2), S. Tourtellotte(3), R. Brasser(4), E. I. Hadjiyska(2)
(1)Yale Center for Astronomy & Astrophysics, Yale University, (2) Department of Physics, Yale University, (3), Department of Astronomy, Yale University (4) Observatoire De La Cote D'Azur (megan.schwamb@yale.edu)

Abstract

We present the first results from the La Silla-QUEST survey, a wide-field survey using the 1.0-m ESO Schmidt Telescope at La Silla Observatory. The goal of this survey is to find the largest and brightest members of the Kuiper belt in the Southern hemisphere down to a limiting magnitude of ~21.5 in R. With the majority of our sky coverage, south of -20 degrees ecliptic latitude, our survey probes the high inclination Kuiper belt. The discovery of 2008 KV42, a Kuiper belt object (KBO) with a perihelion near Uranus and an extreme inclination of 104 degrees, suggests a population of bodies on similar orbits with high inclinations compared to typical KBOs and Centaurs. Our survey is sensitive to such orbits. We highlight our survey detections, including the detection of the new high-inclination object 2010 WG9. We discuss the implications for a population of high-inclination (nearly perpendicular) orbits in the Kuiper belt, placing constraints on the size and distribution of such a population.

2. Introduction

The last decade has seen the discovery of the largest Kuiper belt objects (KBOs) of comparable and even larger size than Pluto. The inventory of dwarf planets in the Kuiper belt is incomplete. To date wide-field surveys [2][3][5][6][7][9][10] searching for these brightest members of the Kuiper belt all have been conducted from telescopes in the Northern hemisphere. Although telescopes from the Northern hemisphere can reach declinations as south as -25 degrees, the Southern hemisphere has to date remained virtually unexplored with the largest KBOs with inclinations typically greater than 10 degrees spend the majority of their orbital period off the ecliptic. The southern sky is the last unexplored frontier of the solar system with potentially 1-2 new dwarf planet-sized bodies awaiting discovery.

In order to find the largest and brightest members of the Kuiper belt, we are engaged in a three-year observational campaign to survey the southern skies using the newly robotized ESO 1.0-m Schmidt Telescope located at La Silla Observatory in Chile equipped with the refurbished QUEST large-area CCD camera [1][8], with an effective field of view of 8.3 square degrees. We have surveyed over ~10,000 square degrees to date south of the ecliptic to a depth of R magnitude ~21.5. We present the first results of the La Silla-QUEST survey and discuss our detections.

2. Probing the High Inclination Kuiper belt

The discovery of 2008 KV42 [4], an object with a semimajor axis well within the Kuiper belt with a perihelion near Uranus and an inclination of 104 degrees, an orbit essentially perpendicular to the ecliptic, suggests a population of bodies on similar orbits with extreme inclinations compared to typical KBOs and Centaurs (typically with inclinations less than 30 degrees). Neptune appears unable to scatter low inclination KBOs on to such high inclination orbits. Oort cloud objects can easily achieve these high inclinations, but the processes that affect their orbits suggest they quickly move onto interactions with Jupiter and Saturn as they evolve in towards the inner solar system and would not be locked in lower semimajor axis orbits near Neptune and Uranus. With the majority of our sky coverage residing at ecliptic latitudes southward of -20 degrees, our survey probes the high inclination Kuiper belt, and is sensitive to such orbits.

3. Summary

We have discovered a new member of this high-inclination population. With the discovery of 2010 WG9, having a semimajor axis of 53.8 AU, inclination of 70 degrees, and a perihelion of 18.7 AU, there are now three known objects (see Table 1)

with perihelia near Uranus and inclinations greater than 60 degrees but with semimajor axes typical of KBOs. These objects are metastable gravitationally interacting and scattering off of Uranus and Neptune with lifetimes of hundreds of million years, suggesting there must be a source population feeding this unstable reservoir [4]. We discuss the origins and implications for such a high-inclination population in the Kuiper belt. In particular we place constraints on the size and distribution of this high-inclination population.

Table 1: Orbits of known members

Designation	*a* (AU)	*i* (degrees)	*q* (AU)
2010 WG9	53.8	70.2	18.8
2008 KV42	41.8	103.5	21.2
2002 XU93	66.6	77.9	21.0

Acknowledgements

MES is supported by an NSF Astronomy and Astrophysics Postdoctoral Fellowship under award AST-1003258

References

[1] Baltay, C. et al., 2007, PASP, 119, 1278

[2] Brown, M. E. 2008, *Solar System Beyond Neptune*, ed. M. A. Barucci et al. (Tucson, AZ: Univ. of Arizona Press) 335

[3] Elliot, J. L., et al., 2005, AJ, 129, 1117

[4] Gladman, B., et al., 2009, ApJL, 697, L91

[5] Kavelaars, J. J., et al, 2009, AJ, 137, 4917

[6] Larsen, J. A, et al., 2001, AJ, 121, 562

[7] Larsen, J. A, et al., 2007, AJ, 133, 1247

[8] Rabinowitz, D. L., et al., 2011, ApJ, 732, 51

[9] Schwamb, M.E., et al. 2010, ApJ, 720,1691

[10] Trujillo, C. A. & Brown, M. E. 2003, Earth Moon and Planets, 92, 99