

Issue No. 43

November 2005

DISTANT EKOs
The Kuiper Belt Electronic Newsletter



Edited by: Joel Wm. Parker

ekonews@boulder.swri.edu

www.boulder.swri.edu/ekonews

CONTENTS

News & Announcements	2
Abstracts of 2 Accepted Papers	3
Titles of 4 Submitted Papers	4
Description and Contents of 1 Book	5
Newsletter Information	6

NEWS & ANNOUNCEMENTS

The big news since the previous issue of the Newsletter is the multiplicity of large TNOs:

.....
Two's company, three's a crowd...

In IAUC 08625, Hal Weaver, Alan Stern, et al. announced the discovery of two more satellites around Pluto, making it a quadruple system. The observations were made with HST; the separations of the two new satellites are on the order of 2 arcsec from Pluto, with magnitudes of $V \sim 23.0$ and 23.4 mag. Initial analysis indicates the two new satellites are in nearly circular orbits in Pluto's equatorial plane, with semi-major axes around 49,500 and 64,700 km, corresponding to orbital periods of approximately 25.5 and 38.2 days, respectively.

IAUC: <http://cfa-www.harvard.edu/iauc/08600/08625.html>

HST press release: <http://hubblesite.org/newscenter/newsdesk/archive/releases/2005/19/>

More information at: www.boulder.swri.edu/plutonews

.....
In IAUC 8610, Mike Brown et al. announced the discovery that 2003 UB313 is a binary. The satellite K'-band magnitude was 4.43 mag fainter than the primary and at a separation of 0.53 arcsec. [A preprint of the submitted paper is listed in this issue of the newsletter.]

IAUC: <http://cfa-www.harvard.edu/iauc/08600/08610.html>

More information at: <http://www.gps.caltech.edu/~mbrown/planetlila/moon/index.html>

.....
There were 12 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2005 PK21, 2005 PL21, 2005 PM21, 2005 PN21, 2005 PO21, 2005 PP21, 2005 PQ21,
2005 PR21, 2005 PS21, 2005 PT21, 2005 PU21, 2005 TN74

and no new Centaur/SDO discoveries.

Current number of TNOs: 913 (and Pluto & Charon & two friends, and 14 other TNO binary companions)

Current number of Centaurs/SDOs: 153

Current number of Neptune Trojans: 2

Out of a total of 1068 objects:

499 have measurements from only one opposition

414 of those have had no measurements for more than a year

206 of those have arcs shorter than 10 days

(for more details, see: http://www.boulder.swri.edu/ekonews/objects/recov_stats.gif)

Detection of Six Transneptunian Binaries with NICMOS: A High Fraction of Binaries in the Cold Classical Disk

Denise C. Stephens¹ and Keith S. Noll²

¹ Johns Hopkins University, Bloomberg 245, 3701 San Martin Dr. Baltimore, MD 21218, USA

² Space Telescope Science Institute, 3700 San Martin Dr., Baltimore, MD 21218, USA

We have analyzed a homogeneous set of observations of eighty-one transneptunian objects obtained with the NIC2 camera on the Hubble Space Telescope with the goal of identifying partially resolved binaries. Using PSF-fitting we have identified six likely binaries in addition to the three new binaries already found in this data set. We find that $11 \pm 2^5\%$ of transneptunian objects are binaries at separation and brightness limits of the NIC2 camera. The identification of these new binaries significantly increases the known lower limit to the binary fraction among transneptunian objects. The origin of such a high fraction of binaries remains to be determined. Most interestingly, detectable binaries appear to be about four times more common among the cold classical disk than in the dynamically excited populations.

To appear in: The Astronomical Journal

For preprints, contact `stephens@pha.jhu.edu`

.....

Lightcurves of 20–100 kilometer Kuiper Belt Objects using the Hubble Space Telescope

David E. Trilling¹ and Gary M. Bernstein²

¹ Steward Observatory, University of Arizona, 933 N. Cherry Avenue Tucson, AZ 85721, USA

² Department of Physics and Astronomy, University of Pennsylvania, David Rittenhouse Laboratory, 209 S. 33rd St., Philadelphia, PA 19104, USA

We report high precision photometry of three small and one larger Kuiper Belt Objects (KBOs) obtained with the Advanced Camera for Surveys onboard the Hubble Space Telescope (ACS/HST). The three small bodies are the smallest KBOs for which lightcurve measurements are available. 2003 BF₉₁ has a diameter of 20 kilometers (assuming 10% albedo) and a 1.09 magnitude, 9.1-hour lightcurve that is feasibly explained by the rotation of an elongated, coherent body that is supported by material strength and best imagined as an icy outer Solar System analog to asteroid (243) Ida. Two other small KBOs, 2003 BG₉₁ and 2003 BH₉₁ (diameters 31 and 18 km, with albedo 10%), exhibit an unremarkable lightcurve and no detectable photometric variation, respectively. For the larger KBO 2000 FV₅₃ (116 km diameter, assuming 10% albedo) we strongly detect a non-sinusoidal periodic (7.5 hours) brightness variation with a very small amplitude (0.07 mag). This KBO may be nearly spherical, a result that might not be unusual in the Kuiper Belt but would be remarkable among outer Solar System satellites of similar size.

Lightcurves may be caused by variations in albedo or shape, and we carry out a study of possible physical states and bulk densities under the assumptions of both fluid equilibrium and finite, non-zero internal friction. Under most assumptions, the densities for these KBOs are likely to be in the range $1\text{--}2 \text{ g cm}^{-3}$, and a plausible solution for 2000 FV₅₃ is a rubble pile of this density that is held slightly out of the minimum-energy shape by internal friction among constituent blocks that are

relatively small. Our interpretation of 2000 FV₅₃ as a pulverized but essentially primordial object and 2003 BF₉₁ as a collisional fragment is consistent with models of collisional timescales in the outer Solar System. We compile all published KBO lightcurve data to date and compare our results to the larger population.

To appear in: The Astronomical Journal

Preprints available on the web at <http://arxiv.org/abs/astro-ph/0510454>

PAPERS RECENTLY SUBMITTED TO JOURNALS

Discovery of a Planetary-sized Object in the Scattered Kuiper Belt **M.E. Brown¹, C.A. Trujillo², and D.L. Rabinowitz³**

¹ Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA

² Gemini Observatory, 670 North A'ohoku Place, Hilo, HI 96720, USA

³ Department of Physics, Yale University, New Haven, CT 06520, USA

Submitted to: The Astrophysical Journal letters

For preprints, contact mbrown@caltech.edu

or on the web at <http://arxiv.org/abs/astro-ph/0508633>

Photometric Observations Constraining the Size, Shape, and Albedo of 2003 El61, a Rapidly Rotating, Pluto-Sized Object in the Kuiper Belt

**David L. Rabinowitz¹, Kristina Barkume², Michael E. Brown², Henry Roe²,
Michael Schwartz³, Suzanne Tourtellotte⁴, and Chad Trujillo⁵**

¹ Yale University, Yale Center for Astronomy & Astrophysics, P.O. Box 208121, New Haven, CT, USA 06520-8121

² Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA

³ Tenagra Observatory, C2 Box 292, Nogales, Arizona, 85621, USA

⁴ Yale University, Astronomy Department, P.O. Box 208121, New Haven CT 06520-8121, USA

⁵ Gemini Observatory, 670 North Aohoku Place, Hilo, HI 96720, USA

Submitted to: The Astrophysical Journal

For preprints, contact david.rabinowitz@yale.edu

or on the web at <http://arxiv.org/abs/astro-ph/0509401>

Satellites of the Largest Kuiper Belt Objects

**M.E. Brown¹, M.A. van Dam², A.H. Bouchez^{2,3}, D. LeMignant², R.D. Campbell²,
J.C.Y. Chin², A. Conrad², S.K. Hartman², E.M. Johansson², R.E. Lafon²,
D.L. Rabinowitz⁴, P.J. Stomski², D.M. Summers², C.A. Trujillo⁵, and P.L. Wizinowich²**

¹ Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA

² W.M. Keck Observatory, 65-1120 Mamalahoa Highway, Kamuela, HI 96743, USA

³ Caltech Optical Observatories, California Institute of Technology, Pasadena, CA 91125, USA

⁴ Department of Physics, Yale University, New Haven, CT 06520, USA

⁵ Gemini Observatory, 670 North A'ohoku Place, Hilo, HI 96720, USA

Submitted to: Astrophysical Journal Letters

For preprints, contact mbrown@caltech.edu

or on the web at <http://arxiv.org/abs/astro-ph/0510029>

The Methane Ice Rich Surface of the Large TNO 2005 FY₉: A Pluto-twin in the Trans-neptunian Belt?

J. Licandro^{1,2}, N. Pinilla-Alonso^{3,2}, M. Pedani³,
E. Oliva³, G.P. Tozzi⁴, and W.M. Grundy⁵

¹ Isaac Newton Group, P.O.Box 321, E-38700, Santa Cruz de La Palma, Tenerife, Spain

² Instituto de Astrofísica de Canarias, c/Vía Láctea s/n, E38205, La Laguna, Tenerife, Spain

³ Fundación Galileo Galilei & Telescopio Nazionale Galileo, P.O.Box 565, E-38700, S/C de La Palma, Tenerife, Spain

⁴ INAF-Osservatorio Astrofisico di Arcetri, Largo e Fermi 5, 50125, Firenze, Italy

⁵ Lowell Observatory, 1400 West Mars Hill Road, Flagstaff, AZ 86001-4470, USA

Submitted to: Astronomy & Astrophysics Letters

For preprints, contact `licandro@ing.iac.es`

BOOKS

Pluto and Charon: Ice Worlds on the Ragged Edge of the Solar System

S. Alan Stern and Jacqueline Mitton

John Wiley & Sons

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-3527405569.html>

The second edition of this book has expanded material and a new chapter, reflecting new understanding of Pluto since 1997 and the New Horizons mission.

Chapters:

Prologue: Encounter!

Introduction

Chapter 1: New Frontier

Chapter 2: First Facts

Chapter 3: A Distant Dance

Chapter 4: The Importance of Snow

Chapter 5: Building a Binary Planet

Chapter 6: Ice Fields and Ice Dwarfs

Chapter 7: Everest

Chapter 8: New Horizons

Chapter 9: Where No One Has Gone Before

Appendix: A Chronology of Major Events in the Exploration of Pluto Further Reading

The *Distant EKO*s Newsletter is dedicated to provide researchers with easy and rapid access to current work regarding the Kuiper belt (observational and theoretical studies), directly related objects (e.g., Pluto, Centaurs), and other areas of study when explicitly applied to the Kuiper belt.

We accept submissions for the following sections:

- ★ Abstracts of accepted papers
- ★ Titles of submitted (but not yet accepted) papers and conference articles
- ★ Thesis abstracts
- ★ Short articles, announcements, or editorials
- ★ Status reports of on-going programs
- ★ Requests for collaboration or observing coordination
- ★ Table of contents/outlines of books
- ★ Announcements for conferences
- ★ Job advertisements
- ★ General news items deemed of interest to the Kuiper belt community

A L^AT_EX template for submissions is appended to each issue of the newsletter, and is sent out regularly to the e-mail distribution list. Please use that template, and send your submission to:

`ekonews@boulder.swri.edu`

The *Distant EKO*s Newsletter is available on the World Wide Web at:

`http://www.boulder.swri.edu/ekonews`

Recent and back issues of the newsletter are archived there in various formats. The web pages also contain other related information and links.

*Distant EKO*s is not a refereed publication, but is a tool for furthering communication among people interested in Kuiper belt research. Publication or listing of an article in the newsletter or the web page does not constitute an endorsement of the article's results or imply validity of its contents. When referencing an article, please reference the original source; *Distant EKO*s is not a substitute for peer-reviewed journals.

Moving ... ??

If you move or your e-mail address changes, please send the editor your new address. If the newsletter bounces back from an address for three consecutive issues, the address will be deleted from the mailing list. All address changes, submissions, and other correspondence should be sent to:

`ekonews@boulder.swri.edu`