Issue No. 45 *March 2006*

DISTANT EKOs

The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

ekonews@boulder.swri.edu www.boulder.swri.edu/ekonews

CONTENTS

NEWS & ANNOUNCEMENTS

In IAUC 8636, Mike Brown et al. announced the discovery of a second satellite around the TNO 2003 EL61. The satellite K'-band magnitude was 4.6 mag fainter than the primary and at a separation of 0.3 arcsec.
IAUC: `http://cfa-www.harvard.edu/iauc/08600/08636.html`
More information at: `http://www.gps.caltech.edu/~mbrown/2003EL61`

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In CBET 401, Noll et al. report a satellite around the Centaur?/SDO? 2002 CR46. The satellite magnitude was 1.2 mag fainter than the primary and at a separation of 0.11 arcsec.
CBET: `http://cfa-www.harvard.edu/iau/cbet/000400/CBET000401.txt`

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SpaceRef.com announced the addition of a new PlutoToday website covering news of Pluto, Charon, and other Kuiper Belt Objects. See: `http://www.plutotoday.com`

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There were 8 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2005 VA123, 2005 VZ122, 2005 XN113, 2006 AK98, 2006 AL98, 2006 AM98, 2006 AN98, 2006 AO98

and 1 new Centaur/SDO discovery:

2005 VB123

Objects recently assigned names:
2000 EC98 = Echeclus

Current number of TNOs: 931 (including Pluto)
Current number of Centaurs/SDOs: 161
Current number of Neptune Trojans: 5
Current number of satellites: 19 around 16 objects

Out of a total of 1097 objects:
505 have measurements from only one opposition
442 of those have had no measurements for more than a year
220 of those have arcs shorter than 10 days
(for more details, see: `http://www.boulder.swri.edu/ekonews/objects/recov_stats.gif`)

PAPERS ACCEPTED TO JOURNALS

The Trans-neptunian Object UB313 is Larger than Pluto

F. Bertoldi[1,2], W. Altenhoff[2], A. Weiss[2], K.M. Menten[2], and C. Thum[3]

[1] Argelander Institute for Astronomy, University of Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany

[2] Max-Planck-Institute for Radioastronomy, Auf dem Hgel 69, D-53121 Bonn, Germany

[3] IRAM, 300 rue de la Piscine, 38406 Saint Martin d'Hères, France

The most distant known object in the Solar System, 2003 UB313 (97 AU from the Sun), was recently discovered near its aphelion. Its high eccentricity and inclination to the ecliptic plane, along with its perihelion near the orbit of Neptune, identify it as a member of the 'scattered disk'. This disk of bodies probably originates in the Kuiper belt objects, which orbit near the ecliptic plane in circular orbits between 30 and 50 AU, and may include Pluto as a member. The optical brightness of 2003 UB313, if adjusted to Pluto's distance, is greater than that of Pluto, which suggested that it might be larger than Pluto. The actual size, however, could not be determined from the optical measurements because the surface reflectivity (albedo) was unknown. Here we report observations of the thermal emission of 2003 UB313 at a wavelength of 1.2 mm, which in combination with the measured optical brightness leads to a diameter of $3,000 \pm 300 \pm 100$ km. Here the first error reflects measurement uncertainties, while the second derives from the unknown object orientation. This makes 2003 UB313 the largest known trans-neptunian object, even larger than Pluto (2,300 km). The albedo is $0.60 \pm 0.10 \pm 0.05$, which is strikingly similar to that of Pluto, suggesting that the methane seen in the optical spectrum causes a highly reflective icy surface.

Published in: Nature, 439, 563 (2006 February 2)

For reprints, contact bertoldi@astro.uni-bonn.de

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The Albedo, Size, and Density of Binary Kuiper Belt Object (47171) 1999 TC_{36}

J.A. Stansberry[1], W.M. Grundy[2], J.L. Margot[3], D.P. Cruikshank[4], J.P. Emery[5], G.H. Rieke[1], and D.E. Trilling[1]

[1] University of Arizona, Steward Observatory, Tucson AZ 85721, USA

[2] Lowell Observatory, Flagstaff AZ 86001, USA

[3] Cornell University, Department of Astronomy, Ithaca NY 14853, USA

[4] NASA Ames Research Center, Moffet Field CA 94035, USA

[5] SETI Institute, Mountain View CA 94043, USA

We measured the system-integrated thermal emission of the binary Kuiper Belt Object (47171) 1999 TC_{36} at wavelengths near 24 and 70 μm using the *Spitzer* space telescope. We fit these data and the visual magnitude using both the Standard Thermal Model and thermophysical models. We find that the effective diameter of the binary is 405 km, with a range of 350–470 km, and the effective visible geometric albedo for the system is 0.079 with a range of 0.055–0.11. The binary orbit, magnitude contrast between the components, and system mass have been determined from HST data (Margot et al., 2004; 2005a; 2005b). Our effective diameter, combined with that system mass, indicate an average density for the objects of 0.5 g/cm^3, with a range 0.3–0.8 g/cm^3. This density is low compared to that of materials expected to be abundant in solid bodies in the trans-Neptunian region, requiring 50–75% of the interior of (47171) 1999 TC_{36} be taken up by void space.

This conclusion is not greatly affected if (47171) 1999 TC_{36} is "differentiated" (in the sense of having either a rocky or just a non-porous core). If the primary is itself a binary, the average density of that (hypothetical) triple system would be in the range 0.4–1.1 g/cm^3, with a porosity in the range 15–70%.

To appear in: Astrophysical Journal, 643 (2006 May)
For preprints, contact stansber@as.arizona.edu
or on the web at http://arxiv.org/abs/astro-ph/0602316

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Combined Modeling of Thermal Evolution and Accretion of Trans-Neptunian Objects – Occurrence of High Temperatures and Liquid Water

Rainer Merk[1] and Dina Prialnik[1]

[1] Department of Geophysics and Planetary Sciences, Tel Aviv University, P.O.B. 39040, Tel Aviv 61390, Israel

We have calculated the early thermal evolution of Trans-Neptunian Objects by means of a thermal evolution code that takes into account simultaneous accretion. The set of coupled partial differential equations for ^{26}Al radioactive heating, transformation of amorphous to crystalline ice and melting of water ice was solved numerically for small porous icy (cometary-like) bodies growing to final radii between 2 km and 32 km and accreting between 20 AU and 44 AU. Accretion within a swarm of gravitationally interacting small bodies was calculated self-consistently with a simple accretion algorithm and thermal evolution of a typical member of the swarm was tracked in a parameter-space survey. We find that including accretion in numerical modeling of thermal evolution leads to a broad variety of thermally processed icy bodies and that the early occurrence of liquid water and extended crystalline ice interiors may be a very common phenomenon. The pristine nature of small icy bodies becomes thus restricted to a particular set of initial conditions. Generally, long-period comets should be more thermally affected than short-period ones.

To appear in: Icarus
For preprints, contact merkrain@post.tau.ac.il

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Water Ice on the Satellite of Kuiper Belt Object 2003 EL61

K.M. Barkume[1], M.E. Brown[1], and E.L. Schaller[1]

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

We have obtained a near-infrared spectrum of the brightest satellite of the large Kuiper Belt object 2003 EL61. The spectrum has absorption features at 1.5 and 2.0 μm, indicating that water ice is present on the surface. We find that the satellites absorption lines are much deeper than water ice features typically found on Kuiper Belt objects. We argue that the unusual spectrum indicates that the satellite was likely formed by impact and not by capture.

To appear in: Astrophysical Journal Letters
For preprints, contact barkume[@]caltech.edu
or on the web at http://www.gps.caltech.edu/~barkume/publications.html

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A Brief History of Trans-Neptunian Space

E. Chiang[1], Y. Lithwick[1], R. Murray-Clay[1], M. Buie[2], W. Grundy[2], and M. Holman[3]

[1] UC Berkeley, USA

[2] Lowell Observatory, USA

[3] Harvard-Smithsonian Center for Astrophysics, USA

The Edgeworth-Kuiper belt encodes the dynamical history of the outer solar system. Kuiper belt objects (KBOs) bear witness to coagulation physics, the evolution of planetary orbits, and external perturbations from the solar neighborhood. We critically review the present-day belt's observed properties and the theories designed to explain them. Theories are organized according to a possible time-line of events. In chronological order, epochs described include (1) coagulation of KBOs in a dynamically cold disk, (2) formation of binary KBOs by fragmentary collisions and gravitational captures, (3) stirring of KBOs by Neptune-mass planets ("oligarchs"), (4) eviction of excess oligarchs, (5) continued stirring of KBOs by remaining planets whose orbits circularize by dynamical friction, (6) planetary migration and capture of Resonant KBOs, (7) creation of the inner Oort cloud by passing stars in an open stellar cluster, (8) *in situ* coagulation of Neptune Trojans, and (9) collisional comminution of the smallest KBOs. Recent work underscores how small, collisional, primordial planetesimals having low velocity dispersion permit the rapid assembly of ∼5 Neptune-mass oligarchs at distances of 20–40 AU. We explore the consequences of such a picture. We propose that Neptune-mass planets whose orbits cross into the Kuiper belt for up to ∼40 Myr help generate the high-perihelion members of the hot Classical disk and Scattered belt. By contrast, raising perihelia by sweeping secular resonances during Neptune's migration might fill these reservoirs too inefficiently when account is made of how little primordial mass might reside in bodies large enough to be observable. These and other frontier issues in trans-Neptunian space are discussed quantitatively.

To appear in: Protostars and Planets V (eds. B. Reipurth, D. Jewitt, and K. Keil)

For preprints, contact `echiang@astron.berkeley.edu`

or on the web at `http://xxx.lanl.gov/astro-ph/0601654`

PAPERS RECENTLY SUBMITTED TO JOURNALS

The Surface of 2003 EL61 in the Near Infrared

C.A. Trujillo[1], M.E. Brown[2], K.M. Barkume[2], E.L. Schaller[2], and D.L. Rabinowitz[3]

[1] Gemini Observatory, 670 N. A'ohoku Place, Hilo, HI 96720, USA

[2] California Institute of Technology, Div. of Geological and Planetary Sciences, M/C 150-21, Pasadena CA 91125, USA

[3] Yale Center for Astronomy and Astrophysics, Physics Department, Yale University, P.O. Box 208121, New Haven, Connecticut 06520-8121, USA

Submitted to: The Astrophysical Journal

For preprints, contact trujillo@gemini.edu

or on the web at http://arxiv.org/abs/astro-ph/0601618

OTHER PAPERS OF INTEREST

Pluto's Moon System: Survey of the Phase Space I

I. Nagy[1], A. Suli[1], and B. Erdi[1]

[1] Department of Astronomy, Eötvös University, Pázmány Péter sétány 1/A, H-1117 Budapest, Hungary

For preprints, contact i.nagy@astro.elte.hu

or on the web at http://arxiv.org/abs/astro-ph/0602543

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Orbit Observation Properties of Kuiper Belt Objects

X. Wu, Q. Nie, and Y. Yang

Journal of Hebei Normal University, Natural Science Edition, 29, 572-577

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Orbital Migration and the Period Distribution of Exoplanets

A. Del Popolo[1], N. Ercan[1], and I.S. Yesilyurt[1]

[1] Bogazici University, Physics Department, 80815 Bebek, Istanbul, Turkey

Published in: Astronomy & Astrophysics 436, 363-372

For preprints, contact antonino.delpopolo@boun.edu.tr

CONFERENCE CONTRIBUTIONS

Solar System Binaries

Keith S. Noll[1]

[1] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA

To appear in: Asteroids, Comets, Meteors 2005; Proceedings IAU Symposium No. 229

For preprints, contact noll@stsci.edu

or on the web at http://arxiv.org/abs/astro-ph/0603122

The *Distant EKOs* 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 LaTeX 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 EKOs* 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.

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Moving ... ??

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`ekonews@boulder.swri.edu`