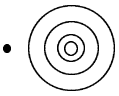
Issue No. 30 *July 2003*

DISTANT EKOs



The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

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

CONTENTS

NEWS & ANNOUNCEMENTS

The discovery that 1999 RZ_{253} is a binary TNO was announced in IAUC 8143 by Noll et al.. At discovery, the components had a separation of 0.21 arcsec (~6,300 km at 41.55 AU).
IAUC: `http://cfa-www.harvard.edu/iauc/08100/08143.html`

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An international workshop entitled "The First Decadal Review of the Edgeworth-Kuiper-Belt: Towards New Frontiers" was held in Antofagasta, Chile between March 11–14, 2003. The proceedings of this meeting will be published in late 2003 as a special, hardbound, issue of the journal "Earth, Moon and Planets". This volume will contain many of the papers presented at the workshop plus several additional papers solicited to ensure that as far as possible this volume is indeed a "decadal review" of the subject. Copies of this issue will be available from Kluwer by prior arrangement. If you wish to review the contents of the issue, and download preprints, please visit the proceedings status board at: `http://www.roe.ac.uk/~jkd/workshop.html`. If you want further information on getting a copy of the proceedings please send a minimalist e-mail to lead editor John Davies at `jkd@roe.ac.uk`. Once ordering information is available brief details will be sent to those who replied and posted on the proceedings status board. Post facto details of the meeting, including conference photos, etc. can be found from `http://tno.ucn.cl/`

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There was 1 new TNO discovery announced since the previous issue of *Distant EKOs*:

2003 GM53

and 1 new SDO discovery:

2003 FH129

Reclassified objects:
2002 GZ31 (TNO → SDO)

Objects recently assigned numbers:
1997 CQ29 = (58534)
1999 CL158 = (59358)
2000 CH105 = (60454)
2000 CM114 = (60458)
2000 EC98 = (60558)
2000 EE173 = (60608)
2000 FD8 = (60620)
2000 FE8 = (60621)
2001 BL41 = (63252)
2003 FX128 = (65489)

Objects recently assigned names:
1998 QM107 = Pelion
1998 SG35 = Okyrhoe
1998 TF35 = Cyllarus
1999 HU11 = Deucalion
1999 UG5 = Elatus
2000 EB173 = Huya
2001 PT13 = Thereus

Current number of TNOs: 676 (and Pluto & Charon, and 9 other TNO binary companions)
Current number of Centaurs/SDOs: 128
Current number of Neptune Trojans: 1

Out of a total of 805 objects:
391 have measurements from only one opposition
288 of those have had no measurements for more than a year
144 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 Secular Evolution of the Primordial Kuiper Belt

J. Hahn[1]

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A model that rapidly computes the secular evolution of a gravitating disk-planet system is developed. The disk is treated as a nested set of gravitating rings, with the rings'/planets' time-evolution being governed by the classical Laplace-Lagrange solution for secular evolution but modified to account for the disk's finite thickness h. The Lagrange planetary equations for this system yield a particular class of spiral wave solutions, usually denoted as apsidal density waves and nodal bending waves. There are two varieties of apsidal waves—long waves and short waves. Planets typically launch long density waves at the disk's nearer edge or else at a secular resonance in the disk, and these waves ultimately reflect downstream at a more distant disk edge or else at a Q-barrier in the disk, whereupon they return as short density waves. Planets also launch nodal bending waves, and these have the interesting property that they can stall in the disk, that is, their group velocity plummets to zero upon approaching a region in the disk that is too thick to support the continued propagation of bending waves.

The rings model is used to compute the secular evolution of a Kuiper Belt having a variety of masses, and it is shown that the early massive Belt was very susceptible to the propagation of low-amplitude apsidal and nodal waves launched by the giant planets. For instance, these waves typically excited orbits to $e \sim \sin i \sim 0.01$ in a primordial Kuiper Belt of mass $M_{KB} \sim 30$ Earth-masses. Although these orbital disturbances are quite small, the resulting fractional variations in the disk's surface density due to the short density waves is usually large, typically of order unity. This epoch of apsidal and nodal wave propagation probably lasted throughout the Belt's first $\sim 10^7$ to $\sim 5 \times 10^8$ years, with the waves being shut off between the time when the large $R > 100$ km KBOs first formed and when the Belt was subsequently eroded and stirred up to its present configuration.

To appear in: The Astrophysical Journal
Preprints on the web at `http://www.lpi.usra.edu/science/hahn/web/stuff/rings/ms.pdf`
and `http://arxiv.org/abs/astro-ph/0305602/`

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Photometry of the Kuiper-Belt Object 1999 TD_{10} at Different Phase Angles

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[2] Institut d'Astrophysique Spatiale, Bâtiment 121, Université Paris-Sud, 91405 Orsay Cedex, France

[3] Leiden Observatory, University of Leiden, Postbus 9513, NL-2300 RA Leiden, Netherlands

[4] Instituto de Astrofísica de Andalucia, CSIC, Apt 3004, 18080 Granada, Spain

We present photometric observations of the Kuiper-Belt object 1999 TD_{10} at different phase angles and for three different broad band filters (B, V and R). This object was observed with the Danish 1.54-m telescope of ESO in Chile during six different observing nights corresponding to a phase angle of 0.30°, 0.37°, 0.92°, 3.43°, 3.48° and 3.66°. Extra observations were obtained in September 2002 with the VLT UT1/FORS1 combination to confirm that 1999 TD_{10} does not exhibit any cometary activity, and in October 2001 with the Sierra Nevada Observatory 1.50-m telescope in order to add relative magnitudes to improve the determination of the rotation period. The observations are compatible with a single-peaked rotational lightcurve with a 7h 41.5mn±0.1mn period or a double-peaked lightcurve with a 15h 22.9mn±0.1mn period. If a single-peaked rotational lightcurve is assumed the amplitude is 0.51 ± 0.03, 0.49 ± 0.05 and 0.60 ± 0.09 magnitude for the R, V and B bands, respectively. We present the phase curve obtained when assuming that the lightcurve is single-peaked. This phase curve reveals clearly an increase of about 0.3 magnitude and of similar importance for the three bands when phase angle decreases from 3.7° to 0.3°. The phase curve reveals a linear increase of the brightness with the decreasing phase angle and, consequently, does not permit a modeling of the opposition surge. Nevertheless, the poor repartition of the observational data does not permit a firm conclusion concerning the presence or absence of an opposition surge on the phase angle range covered by our data. Complementary observations are needed.

To appear in: Astronomy & Astrophysics
For preprints, contact philippe.rousselot@obs-besancon.fr

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Quaoar and the Edgeworth-Kuiper Belt

David W. Hughes[1]

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The smaller members of the solar system hold vital clues as to the composition, history and evolution of the whole. I review the history of discovery of the Edgeworth-Kuiper belt and outer solar-system bodies, and suggest that Pluto, Charon and the newly discovered Quaoar are just the largest members of this belt. Their size distribution indicates that the total mass of the belt might only be two to three times the mass of Pluto. The planetary solar system ends here. Smaller members of the belt are probably the source of the short-period comets. Our ignorance of this frontier region is a handicap to understanding our planetary system as a whole.

Published in: Astronomy & Geophysics 44, 3.21 (2003 June)
For preprints, contact D.Hughes@sheffield.ac.uk

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The Rotational and Physical Properties of the Centaur (32532) 2001 PT_{13}

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We present observations of the Centaur (32532) 2001 PT_{13} taken between September 2000 and December 2000. A multi-wavelength lightcurve was assembled from V-, R- and J-band photometry measurements. Analysis of the lightcurve indicates that there are two peaks of slightly different brightness, a rotation period of 0.34741±0.00005 day, and a maximum photometric range of 0.18 mag. We obtained $VRJHK$ colors ($V-R = 0.50\pm0.01, V-J = 1.69\pm0.02, V-H = 2.19\pm0.04$, and $V-K = 2.30\pm0.04$) that are consistent with the grey KBO/Centaur population. The $V-R$ color shows no variation as a function of rotational phase; however, we cannot exclude the possibility that rotational variations are present in the $R-J$ color. Assuming a 4% albedo, we estimate that 2001 PT_{13} has an effective diameter of 90 km and a minimum axial ratio a/b of 1.18. We find no evidence of a coma and place an upper limit of 15 g sec^{-1} on the dust production rate.

To appear in: Icarus
For preprints, contact `farnham@astro.umd.edu`
or on the web at `http://zinfandel.as.utexas.edu/~farnham/pubs.html`

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Photometry of Pluto in the Last Decade and Before: Evidence for Volatile Transport?

B.J. Buratti[1], J.K. Hillier[2], A. Heinze[1], M.D. Hicks[1], K.T. Tryka[1], J. Ward[1], M. Garske[1], J. Young[1], and J. Atienza-Rosel[3]

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[3] Department of Physics and Astronomy, California State University, Los Angeles, CA 90032, USA

Photometric observations of Pluto in the BVR filter system were obtained in 1999 and in 1990–1993, and observations in the 0.89 μm methane absorption band were obtained in 2000. Our 1999 observations yield lightcurve amplitudes of $0.30\pm0.01, 0.26\pm0.01$, and 0.21 ± 0.02 and geometric albedos of $0.44\pm0.04, 0.52\pm0.03$, and 0.58 ± 0.02 in the B, V, and R filters, respectively. The low-albedo hemisphere of Pluto is slightly redder than the higher albedo hemisphere. A comparison of our results and those from previous epochs shows that the lightcurve of Pluto changes substantially through time. We developed a model that fully accounts for changes in the lightcurve caused by changes in the viewing geometry between the Earth, Pluto, and the Sun. We find that the observed changes in the amplitude of Pluto's lightcurve can be explained by viewing geometry rather than by volatile transport. We also discovered a measurable decrease since 1992 of ∼0.03 magnitudes in the amplitude of Pluto's lightcurve, as the model predicts. Pluto's geometric albedo does not appear to be currently increasing, as our model predicts, although given the uncertainties in both the model and the measurements of geometric albedo, this result is not firm evidence for volatile transport. The maximum of methane-absorption lightcurve occurs near the minimum of the BVRlightcurves. This result suggests that methane is more abundant in the brightest regions of Pluto. Pluto's phase coefficient exhibits a color dependence, ranging from 0.037 ± 0.001 in the B filter to 0.032 ± 0.001

in the R filter. Pluto's phase curve is most like those of the bright, recently resurfaced satellites Triton and Europa. Although Pluto shows no strong evidence for volatile transport now (unlike Triton), it is important to continue to observe Pluto as it moves away from perihelion.

Published in: Icarus 162, 172 (2003 March)
For preprints, contact B. Buratti bonnie.buratti@jpl.nasa.gov

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PAPERS RECENTLY SUBMITTED TO JOURNALS

Ices on the Surface of (50000) Quaoar

M.E. Brown[1] and C.A. Trujillo[1]

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

Submitted to: The Astrophysical Journal Letters

Preprints on the web at www.gps.caltech.edu/~mbrown/papers/

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Particle Pile-ups and Planetesimal Formation

A.N. Youdin[1] and E.I. Chiang[1]

[1] Department of Astronomy, UC Berkeley, Berkeley, CA 94720, USA

Submitted to: The Astrophysical Journal

For preprints, contact echiang@astron.berkeley.edu

or on the web at http://astron.berkeley.edu/~echiang/ppp/ppp.html

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Survival of Trojan-Type Companions of Neptune during Primordial Planet Migration

Steve Kortenkamp[1,2], Renu Malhotra[1], and Tatiana Michtchenko[3]

[1] Lunar and Planetary Lab, University of Arizona, Tucson, USA

[2] Planetary Science Institute, Tucson, USA

[3] Instituto de Astronomia, Universidade de São Paulo, São Paulo, Brasil

Submitted to: Icarus

For preprints, contact kortenka@lpl.arizona.edu

or on the web at http://arXiv.org/abs/astro-ph/0305572

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KBO Binaries: Are They Really Primordial?

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[1] Observatoire de Besançon, B.P. 1615, 25010 Besançon cedex, France

Submitted to: Icarus

Preprints on the web at http://arxiv.org/abs/astro-ph/0305156

CONFERENCE INFORMATION

Occultation Studies of the Kuiper Belt Population

A workshop in conjunction with the DPS meeting
2003 September 1
Monterey, CA, USA

`http://www.its.caltech.edu/ asante/kbo.html`

This is a mini-workshop to discuss the scientific potential related to occultation studies of the Kuiper Belt population involving both targeted and blind-field surveys. The workshop will allow opportunities to update current observational programs and to address future directions in this field. A main aspect of the workshop will be to discuss the scientific case for a space-based KBO search either as a dedicated small-explorer mission or as part of a similar mission to understand the outer Solar system.

The workshop is organized by Charles Alcock, Matt Lehner, and Asantha Cooray. If you are interested in contributing to this workshop, please contact Asantha Cooray: `asante@caltech.edu`

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Finding KBO Flyby Targets for the New Horizons Mission

A workshop in conjunction with the DPS meeting
2003 September (day TBD)
Monterey, CA, USA

`http://www.lowell.edu/users/spencer/nhkbosearch/`

The New Horizons mission is proceeding toward a planned 2006 launch, and 2015 or 2016 flyby of Pluto. One or more flybys of Kuiper Belt Objects are planned after the Pluto flyby, but suitably-placed KBOs must first be found. Please attend the planned workshop during the upcoming Monterey DPS meeting if you are interested in hearing updated information about the search, or if you are interested in helping. Check the DPS meeting web site `http://dps03.arc.nasa.gov/` for workshop date and time.

See `http://www.lowell.edu/users/spencer/nhkbosearch/` for more information, or contact the workshop organizer John Spencer: `John.Spencer@lowell.edu`

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.

Distant EKOs 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 EKOs* is not a substitute for peer-reviewed journals.

Moving ... ??

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`ekonews@boulder.swri.edu`