

Issue No. 41

June 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 4 Accepted Papers	3
Titles of 5 Other Papers of Interest	5
Conference Information	6
Newsletter Information	7

NEWS & ANNOUNCEMENTS

MPEC H21 announced the discovery of a Neptunian trojan (1:1 resonance) by Sheppard, Trujillo, and Jewitt. The object 2004 UP10 is the second known Neptunian trojan (2001 QR322 being the first).

MPEC: <http://cfa-www.harvard.edu/mpec/K05/K05H21.html>

.....
There were 20 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2005 ER318, 2005 GA187, 2005 GB187, 2005 GC187, 2005 GD187, 2005 GE187,
2005 GF187, 2005 GW186, 2005 GX186, 2005 GY186, 2005 GZ186, 2004 SB60,
2004 SC60, 2005 EW318, 2005 EX318, 2005 GX206, 2005 GY206, 2005 GZ206,
2005 JA175, 2005 JZ174

and 1 new Neptunian Trojan discovery:

2004 UP10

Reclassified objects:

2004 DJ71 (TNO → SDO)
2003 GF55 (SDO → TNO)
2005 EB299 (Centaur → TNO)
2001 KE77 (SDO → TNO)
2003 LG7 (TNO → SDO)

Current number of TNOs: 886 (and Pluto & Charon, and 12 other TNO binary companions)

Current number of Centaurs/SDOs: 151

Current number of Neptune Trojans: 2

Out of a total of 1039 objects:

500 have measurements from only one opposition

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

203 of those have arcs shorter than 10 days

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

Near-Infrared Spectrum of Low-Inclination Classical Kuiper Belt Object (79360) 1997 CS₂₉

W.M. Grundy¹, M.W. Buie¹, and J.R. Spencer²

¹ Lowell Observatory, 1400 W. Mars Hill Rd., Flagstaff AZ 86001, USA

² Southwest Research Institute, 1050 Walnut St. #429, Boulder CO 80302, USA

The “Cold Classical” Kuiper Belt is the only part of the Kuiper Belt where objects show distinct color statistics from the rest of the transneptunian population. Cold Classical orbits are also likely to have been among the least dynamically perturbed since the time of accretion. As such, Cold Classical objects are especially interesting targets for compositional investigation by means of near-infrared spectroscopy. In this paper we report the first published infrared spectrum of a likely member of this unique class of objects. A 1.4 to 2.5 μm spectrum of the Cold Classical candidate object (79360) 1997 CS₂₉ obtained at Keck 1 is spectrally featureless.

To appear in: The Astronomical Journal

For preprints, contact W.Grundy@lowell.edu

.....

Near-Infrared Surface Properties of the Two Intrinsically Brightest Minor Planets: (90377) Sedna and (90482) Orcus

C.A. Trujillo¹, M.E. Brown², D.L. Rabinowitz³, and T.R. Geballe¹

¹ Gemini Observatory, Northern Operations Center, 670 North A’ohoku Place, Hilo, HI 96720, USA

² California Institute of Technology, Division of Geological and Planetary Sciences, MS 150-21, Pasadena, CA 91125, USA

³ Yale University, Yale Center for Astronomy and Astrophysics, P.O. Box 208121, New Haven, CT 06520-8121, USA

We present low resolution K band spectra taken at the Gemini 8 meter telescope of (90377) Sedna and (90482) Orcus (provisional designations 2003 VB₁₂ and 2004 DW, respectively), currently the two minor planets with the greatest absolute magnitudes (i.e. the two most reflective minor planets). We place crude limits on the surface composition of these two bodies using a Hapke model for a wide variety of assumed albedos. The unusual minor planet (90377) Sedna was discovered on November 14, 2003 UT at roughly 90 AU with 1.6 times the heliocentric distance and perihelion distance of any other bound minor planet. It is the first solar system object discovered between the Kuiper Belt and the Oort Cloud, and may represent a transition population between the two. The reflectance spectrum of (90377) Sedna appears largely featureless at the current signal-to-noise ratio, suggesting a surface likely to be highly processed by cosmic rays. For large grain models (100 micron to 1 cm) we find that (90377) Sedna cannot have more than 70% surface fraction of water ice or more than 60% surface fraction of methane ice to 3σ confidence. Minor planet (90482) Orcus shows strong water ice absorption corresponding to less than 50% surface fraction for grain models 25 micron and larger. Orcus cannot have more than 30% of its surface covered by large (100 mm to 1 cm) methane grains to 3σ confidence.

To appear in: Astrophysical Journal, 627 (2005 July 10)

For preprints, contact trujillo@gemini.edu

or on the web at <http://xxx.lanl.gov/abs/astro-ph/0504280>

.....

The Surface of the Transneptunian Object 90482 Orcus

C. de Bergh¹, A. Delsanti^{1,2}, G.P. Tozzi³, E. Dotto⁴, A. Doressoundiram¹, and
M.A. Barucci¹

¹ LESIA, Observatoire de Paris, 5 place Jules Janssen, 92195 Meudon, France

² Institute for Astronomy, 2680 Woodlawn Drive, Honolulu, Hawaii 96822, USA

³ INAF, Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, 50125 Firenze, Italy

⁴ INAF, Osservatorio Astronomico di Roma, via Frascati 33, 00040 Monteporzio Catone (Roma), Italy

In April 2004, we obtained visible and near-infrared spectroscopy and photometry of the Transneptunian Object (TNO) 90482 Orcus (2004 DW) with the European Southern Observatory (ESO) 8-m telescopes of the Very Large Telescope (VLT) in Chile. This object, discovered on February 17, 2004, is one of the largest known TNOs, and it belongs to the dynamical class of Plutinos. The high signal-to-noise ratio visible spectrum recorded on April 11, 2004, is nearly flat, in good agreement with the *BVRI* photometry we obtained the same night and with photometric measurements from Rabinowitz et al. (2004). The near-infrared spectra (*J*, *H*, and *K* bands) were obtained on April 11, 12, and 21, 2004. Relatively strong absorptions attributed to water ice were detected around 1.5 and 2 microns. We compare these data with spectra of Orcus obtained at the 3.56-m Telescopio Nazionale Galileo (TNG) by Fornasier et al. (2004a). Only two of the TNOs observed so far exhibit stronger water ice absorptions in their spectra than Orcus. Attempts to model the entire visible-near infrared spectrum yield tentative fits with mixtures of water ice and carbonaceous compounds.

To appear in: Astronomy & Astrophysics

For preprints, contact Catherine.deBergh@obspm.fr

.....

Taxonomy of Centaurs and Trans-Neptunian Objects

M.A. Barucci¹, I.N. Belskaya², M. Fulchignoni³, and M. Birlan⁴

¹ LESIA, Observatoire de Paris, 92195 Meudon Principal Cedex, France

² Institute of Astronomy of Kharkiv National University, 61022 Kharkiv, Ukraine

³ LESIA, Observatoire de Paris, and Universit Denis Diderot Paris 7, 2 Place Jussieu, 75005 Paris, France

⁴ IMCCE, Observatoire de Paris, 77 Avenue Denfert-Rochereau, 75014 Paris, France

Trans-Neptunian Objects (TNOs) and Centaurs display the widest color diversity in comparison to other small Solar system bodies. The investigation of their properties can help in understanding the evolution of these objects. In this paper we propose a classification scheme based on multivariable statistical analysis of a homogeneous, high quality set of $B - V$, $V - R$, $V - I$ and $V - J$ colors indices. Analyzing a sample of 51 objects and using a high confidence level, four groups have been identified and named : BB, BR, IR and RR. The group BB contains objects with neutral color, RR those with very red color, while the others have intermediate behavior. We extended the analysis of other 84 objects for which three colors are available obtaining a preliminary classification. A tentative interpretation of these groups in terms of surface characteristics is given.

To appear in: The Astronomical Journal (2005 September)

For preprints, contact antonella.barucci@obspm.fr

OTHER PAPERS OF INTEREST

Planar Resonant Periodic Orbits in Kuiper Belt Dynamics

George Voyatzis¹ and Thomas Kotoulas¹

¹ University of Thessaloniki, Department of Physics GR-541 24 Thessaloniki, Greece

Preprints on the web at <http://arxiv.org/abs/astro-ph/0502579>

Origin of the Orbital Architecture of the Giant Planets of the Solar System

K. Tsiganis¹, R. Gomes^{1,2}, A. Morbidelli¹, and H.F. Levison^{1,3}

¹ Observatoire de la Cte d' Azur, CNRS, BP 4229, 06304 Nice Cedex 4, France

² GEA/OV/UFRJ and ON/MCT, Ladeira do Pedro Antonio, 43-Centro 20.080-090, Rio de Janeiro, RJ, Brazil

³ Department of Space Studies, Southwest Research Institute, 1050 Walnut Street, Suite 400, Boulder, Colorado 80302, USA

Published in: Nature, 435, 459 (2005 May 26)

For preprints, contact hal@boulder.swri.edu

or on the web at http://www.obs-nice.fr/morby/Ref_list.html

Chaotic Capture of Jupiter's Trojan Asteroids in the Early Solar System

A. Morbidelli¹, and H. F. Levison^{1,3}, K. Tsiganis¹, and R. Gomes^{1,2}

¹ Observatoire de la Cte d' Azur, CNRS, BP 4229, 06304 Nice Cedex 4, France

² GEA/OV/UFRJ and ON/MCT, Ladeira do Pedro Antonio, 43-Centro 20.080-090, Rio de Janeiro, RJ, Brazil

³ Department of Space Studies, Southwest Research Institute, 1050 Walnut Street, Suite 400, Boulder, Colorado 80302, USA

Nature, 435, 462 (2005 May 26)

For preprints, contact hal@boulder.swri.edu

or on the web at http://www.obs-nice.fr/morby/Ref_list.html

Origin of the Cataclysmic Late Heavy Bombardment Period of the Terrestrial Planets

R. Gomes^{1,2}, H. F. Levison^{1,3}, K. Tsiganis¹, and A. Morbidelli¹

¹ Observatoire de la Cte d' Azur, CNRS, BP 4229, 06304 Nice Cedex 4, France

² GEA/OV/UFRJ and ON/MCT, Ladeira do Pedro Antonio, 43-Centro 20.080-090, Rio de Janeiro, RJ, Brazil

³ Department of Space Studies, Southwest Research Institute, 1050 Walnut Street, Suite 400, Boulder, Colorado 80302, USA

Nature, 435, 466 (2005 May 26)

For preprints, contact hal@boulder.swri.edu

or on the web at http://www.obs-nice.fr/morby/Ref_list.html

Cometary D:H Ratios and the Formation of the Solar System

J. Horner¹ and O. Mousis²

¹ Physikalisches Institut, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland

² Observatoire de Besançon, CNRS-UMR 6091, BP 1615, 25010 Besançon Cedex, France

Submitted to: Monthly Notices of the Royal Astronomical Society

For preprints, contact horner@phim.unibe.ch

CONFERENCE INFORMATION

New Horizons 2 Community Workshop

Wednesday, 2005 June 8th, 7:00 pm
Southwest Research Institute, Boulder, Colorado, USA

The New Horizons 2 (NH2) Uranus-KB mission plans for a new science team, selected competitively by NASA. A workshop will be held from 7:00–9:00 pm on Wednesday, June 8th, which is the evening before the Boulder OPAG (Outer Planets Assessment Group) meeting. The goals of the NH2 workshop will be to ask for input to NH2 mission objectives, present the results of the NH2 study done this spring by NASA, and solicit desirable science team attributes for NH2.

The workshop will be held at the Southwest Research Institute's Department of Space Studies, located at 1050 Walnut Street, Suite 400. This is just 4 blocks from OPAG's Boulderado hotel site; see <http://www.boulder.swri.edu/officeinfo.html> for maps. Food and drinks will be provided.

Interested participants should contact Carrie Chavez at cchavez@mail.arc.nasa.gov to register.

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`