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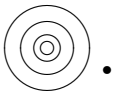
DISTANT EKOs



The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

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

CONTENTS

NEWS & ANNOUNCEMENTS

There were 4 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2008 UA332, 2008 UB332, 2008 SO266, 2008 SP266

and 4 new Centaur/SDO discoveries:

2008 UZ331, 2008 YB3, 2008 QY40, 2007 OR10

Reclassified objects:

2008 OG19 (TNO → SDO)

Objects recently assigned numbers:

2005 UQ513 = 202421

Current number of TNOs: 1093 (including Pluto)
Current number of Centaurs/SDOs: 242
Current number of Neptune Trojans: 6

Out of a total of 1341 objects:

557 have measurements from only one opposition
543 of those have had no measurements for more than a year
288 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

New BVRI photometry Results on Kuiper Belt Objects from the ESO VLT

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Photometric surveys of trans-Neptunian objects (TNOs) and Centaurs have suggested possible correlations between some orbital parameters and surface colors of classical objects, scattered disk objects (SDOs), and Centaurs. However, larger sample sizes are needed in order to corroborate or rule out the possible correlations and find some possible new ones. We use VLT-FORS images through $BVRI$ filters of 32 Kuiper Belt Objects (KBOs) and obtain their colors after proper reduction and calibration. We study the possible correlations merging these new measurements with the VLT published results from the ESO large program and with the latest published results of the Meudon Multicolor Survey via non-parametric statistical tests. We obtain a large dataset of 116 objects (classical, SDOs and Centaurs) and, in addition to confirming most of the correlations and conclusions reached in the literature, some possible new correlations are found. The most interesting ones are some correlations of color vs. orbital parameters for the different dynamical groups. We find that some correlations in the classical group, as well as the (dynamically) cold and hot subgroups depend on the size of the objects. As a by-product of our study, we were able to identify new candidates for light curve studies and found that ∼55% of the objects showed variability above 0.15 mags. This is a higher value than what is found in other studies. Since our sample contains smaller objects than samples from other studies, this result might be an indication that the smaller TNOs are more elongated than the larger ones.

To appear in: Astronomy and Astrophysics
For preprints, contact psantos@iaa.es
or on the web at http://arxiv.org/abs/0812.4525

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Visible and Near-infrared Colors of TNOs and Centaurs from the Second ESO Large Program

F.E. DeMeo[1], S. Fornasier[1,2], M.A. Barucci[1], D. Perna[1,3,4], S. Protopapa[5], A. Alvarez-Candal[1], A. Delsanti[1], A. Doressoundiram[1], F. Merlin[1], and C. de Bergh[1]

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[5] Max Planck Institute for Solar System Research, Lindau, Germany

Aims. We investigate color properties and define or check taxonomic classifications of objects observed in our survey.

Methods. All observations were performed between October 2006 and September 2007 at the European Southern Observatory 8 m Very Large Telescope, UT1 and UT2 at the Paranal Observatory

in Chile. For visible photometry, we used the FORS1 instrument, and for near-infrared, ISAAC. Taxonomic classifications from the Barucci system were assigned using G-mode analysis.

Results. We present photometric observations of 23 TNOs and Centaurs, nine of which have never been previously observed. Eighteen of these objects were assigned taxonomic classifications: six BB, four BR, two RR, and six that are given two or more categories due to insufficient data. Three objects that had been previously observed and classified, changed classes most likely due to surface variation: 26375 (1999 DE9), 28978 (Ixion), and 32532 (Thereus). Two objects, 47932 (2000 GN171) and 54598 (Bienor) had absolute magnitude values that were significantly different from previously published results, attributed to extreme lightcurve amplitudes.

Published in: Astronomy & Astrophysics, 493, 283 (2009 January)

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Time-Resolved Near-Infrared Photometry of Extreme Kuiper Belt Object Haumea

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We present time-resolved near-infrared (J and H) photometry of the extreme Kuiper belt object (136108) Haumea (formerly 2003 EL61) taken to further investigate rotational variability of this object. The new data show that the near-infrared peak-to-peak photometric range is similar to the value at visible wavelengths, $\Delta m_R = 0.30 \pm 0.02$ mag. Detailed analysis of the new and previous data reveals subtle visible/near-infrared color variations across the surface of Haumea. The color variations are spatially correlated with a previously identified surface region, redder in $B-R$ and darker than the mean surface. Our photometry indicates that the $J-H$ colors of Haumea ($J-H = -0.057 \pm 0.016$ mag) and its brightest satellite Hi'iaka ($J-H = -0.399 \pm 0.034$ mag) are significantly ($>9\sigma$) different. The satellite Hi'iaka is unusually blue in $J-H$, consistent with strong 1.5 μm water-ice absorption. The phase coefficient of Haumea is found to increase monotonically with wavelength in the range $0.4 < \lambda\,(\mu\mathrm{m}) < 1.3$. We compare our findings with other Solar system objects and discuss implications regarding the surface of Haumea.

To appear in: The Astronomical Journal
For preprints, contact `lacerda.pedro@gmail.com`
or on the web at `http://www.ifa.hawaii.edu/~pedro/papers.html`

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High Albedos of Low Inclination Classical Kuiper Belt Objects

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We present observations of thermal emission from fifteen transneptunian objects (TNOs) made using the Spitzer Space Telescope. Thirteen of the targets are members of the Classical population:

six dynamically hot Classicals, five dynamically cold Classicals, and two dynamically cold inner Classical Kuiper Belt Objects (KBOs). We fit our observations using thermal models to determine the sizes and albedos of our targets finding that the cold Classical TNOs have distinctly higher visual albedos than the hot Classicals and other TNO dynamical classes. The cold Classicals are known to be distinct from other TNOs in terms of their color distribution, size distribution, and binarity fraction. The Classical objects in our sample all have red colors yet they show a diversity of albedos which suggests that there is not a simple relationship between albedo and color. As a consequence of high albedos, the mass estimate of the cold Classical Kuiper Belt is reduced from approximately 0.01 Earth masses to approximately 0.001 Earth masses. Our results also increase significantly the sample of small Classical KBOs with known albedos and sizes from 21 to 32 such objects.

To appear in: Icarus
For preprints, contact brucker@lowell.edu
or on the web at http://arxiv.org/abs/0812.4290

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Mutual Orbits and Masses of Six Transneptunian Binaries

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We present Hubble Space Telescope observations of six binary trans-neptunian systems: 2000 QL_{251}, 2003 TJ_{58}, 2001 XR_{254}, 1999 OJ_4, (134860) 2000 OJ_{67}, and 2004 PB_{108}. The mutual orbits of these systems are found to have periods ranging from 22 to 137 days, semimajor axes ranging from 2360 to 10500 km, and eccentricities ranging from 0.09 to 0.55. These orbital parameters enable estimation of system masses ranging from 0.2 to 9.7 $\pm$ 10^{18} kg. For reasonable assumptions of bulk density (0.5 to 2.0 g cm^3), the masses can be combined with visible photometry to constrain sizes and albedos. The resulting albedos are consistent with an emerging picture of the dynamically "Cold" Classical sub-population having relatively high albedos, compared with comparably-sized objects on more dynamically excited orbits.

To appear in: Icarus
Preprints available at http://arxiv.org/abs/0812.3126

OTHER PAPERS OF INTEREST

Epsilon Eridani's Planetary Debris Disk: Structure and Dynamics based on Spitzer and CSO Observations

D. Backman[1], M. Marengo[2], K. Stapelfeldt[3], K. Su[4], D. Wilner[2], C.D. Dowell[3], D. Watson[5], J. Stansberry[4], G. Rieke[4], T. Megeath[2,6], G. Fazio[2], and M. Werner[3]

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[5] University of Rochester, USA

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Spitzer and Caltech Submillimeter Observatory (CSO) images and spectrophotometry of ϵ Eridani at wavelengths from 3.5 to 350 μm reveal new details of its bright debris disk. The 350 μm map confirms the presence of a ring at r =11–28 arcsec (35–90 AU) observed previously at longer sub-mm wavelengths. The *Spitzer* mid- and far-IR images do not show the ring, but rather a featureless disk extending from within a few arcsec of the star across the ring to $r \sim 34$ arcsec (110 AU).

The spectral energy distribution (SED) of the debris system implies a complex structure. A model constrained by the surface brightness profiles and the SED indicates that the sub-mm ring emission is primarily from large ($a \sim 135$ μm) grains, with smaller ($a \sim 15$ μm) grains also present in and beyond the ring. The *Spitzer* IRS and MIPS SED-mode spectrophotometry data clearly show the presence of spatially compact excess emission at $\lambda \gtrsim 15$ μm that requires the presence of two additional narrow belts of dust within the sub-mm ring's central void. The innermost belt at $r \sim 3$ AU is composed of silicate dust.

A simple dynamical model suggests that dust produced collisionally by a population of about 11 $M_\oplus$ of planetesimals in the sub-mm ring could be the source of the emission from both in and beyond the sub-mm ring. Maintaining the inner belts and the inner edge to the sub-mm ring may require the presence of three planets in this system including the candidate radial velocity object.

Published in: Astrophysical Journal, 690, 1522 (2009 January 10)

For preprints, contact dbackman@sofia.usra.edu

or on the web at http://arxiv.org/abs/0810.4564

and http://www.iop.org/EJ/abstract/0004-637X/690/2/1522

CONFERENCE INFORMATION

Spring AGU Session on Dwarf Planets and The Kuiper Belt

AGU Joint Assembly
2009 May 24-27
Toronto, Canada

[This announcement taken from the Planetary Exploration Newsletter (`http://planetarynews.org/`)]

The Session P02, "Physical Attributes of Dwarf Planets in our Solar System and Others", will be held at the AGU 2009 Joint Assembly in Toronto, Canada on May 24-27, 2009 (for more information about the AGU meeting, see: `http://www.agu.org/meetings/ja09/`). We welcome suggestions for topics and invited speakers. *The AGU abstract deadline is March 4, 2009.*

The session description follows:
Dwarf Planets are increasingly being recognized as an important category of planets in our solar system, and are widely expected to be common in other planetary systems as well. As a newly recognized class of planets, they illuminate our knowledge of the origins and evolution of planetary bodies in general, with particular relevance to mid-stage planetary accretion models, the evolution of large planetary satellites, and the general formation paths of satellite systems surrounding asteroid and planets. This session will review and present new results concerning the physical attributes of dwarf planets in the asteroid and Kuiper Belts, and look to more general properties of such bodies that may apply in other planetary systems.

The Conveners of this session are:
Andy Cheng [`andy.cheng@jhuapl.edu`]
Alan Stern [`alan@boulder.swri.edu`]
William B. McKinnon [`mckinnon@wustl.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 ... ??

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`