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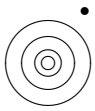
DISTANT EKOs



The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

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

CONTENTS

NEWS & ANNOUNCEMENTS

There were *no* new TNO discoveries announced since the previous issue of *Distant EKOs* and just 1 new Centaur/SDO discovery:

2011 RS

Reclassified objects:

2010 PU75 (TNO → SDO)
2010 RF43 (TNO → SDO)

Current number of TNOs: 1227 (including Pluto)
Current number of Centaurs/SDOs: 322
Current number of Neptune Trojans: 8

Out of a total of 1557 objects:

608 have measurements from only one opposition
584 of those have had no measurements for more than a year
311 of those have arcs shorter than 10 days

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

PAPERS ACCEPTED TO JOURNALS

Rotational Fission of Trans-Neptunian Objects. The Case of Haumea.

J.L. Ortiz[1], A. Thirouin[1], A. Campo Bagatin[2,3], R. Duffard[1], J. Licandro[4], D.C. Richardson[5], P. Santos-Sanz[1,6], N. Morales[1] and P.G. Benavidez[2,3]

[1] Instituto de Astrofísica de Andalucía - CSIC, Apt 3004, 18008 Granada, Spain

[2] Departamento de Fisica, Ingenieria de Sistemas y teoria de la Señal, Universidad de Alicante, PO Box 99, 03080 Alicante, Spain

[3] Instituto de Física Aplicada a las Ciencias y la Tecnología, Universidad de Alicante, PO Box 99, 03080 Alicante, Spain

[4] Instituto de Astrofisica de Canarias, C/ Via Lactea sn La Laguna, Tenerife, Spain

[5] Department of Astronomy, University of Maryland, College Park, MD 20742-2421, USA

[6] Observatoire de Paris, LESIA-UMR CNRS 8109, 5 place Jules Janssen F-92195 Meudon cedex, France

We present several lines of evidence based on different kinds of observations to conclude that rotational fission has likely occurred for a fraction of the known Trans-Neptunian Objects (TNOs). It is also likely that a number of binary systems have formed from that process in the trans-neptunian belt. We show that Haumea is a potential example of an object that has suffered a rotational fission. Its current fast spin would be a slight evolution of a primordial fast spin, rather than the result of a catastrophic collision, because the percentage of objects rotating faster than 4 hours would not be small in a maxwellian distribution of spin rates that fits the current TNO rotation database. On the other hand, the specific total angular momentum of Haumea and its satellites falls close to that of the high size ratio asteroid binaries, which are thought to be the result of rotational fissions or mass shedding. We also present N-body simulations of rotational fissions applied to the case of Haumea, which show that this process is feasible, might have generated satellites, and might have even created a "family" of bodies orbitally associated to Haumea. The orbitally associated bodies may come from the direct ejection of fragments according to our simulations, or through the evolution of a proto-satellite formed during the fission event. Also, the disruption of an escaped fragment after the fission might create the orbitally related bodies. If any of those mechanisms are correct, other rotational fission families may be detectable in the trans-neptunian belt in the future, and perhaps even TNO pairs might be found (pairs of bodies sharing very similar orbital elements, but not bound together).

To appear in: Monthly Notices of the Royal Astronomical Society
For preprints, contact ortiz@iaa.es
or on the web at http://arxiv.org/abs/1110.3637

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Analysis of the Orbit of the Centaur Asteroid 2009 HW77

I. Wlodarczyk[1], K. Cernis[2], and I. Eglitis[3]

[1] Chorzow Astronomical Observatory (MPC 553), Al. Planetarium 4, Chorzow 41500, Poland; Rozdrazew Astronomical Observatory, Powstancow Wlkp. 34, Rozdrazew 63708, Poland

[2] Institute of Theoretical Physics and Astronomy, Vilnius University, Gostauto 12, Vilnius 01108, Lithuania

[3] Institute of Astronomy, University of Latvia, Raina 19, Riga 1586, Latvia

We present the time evolution of orbital elements of the Centaur asteroid 2009 HW77, discovered by KC and IE, forwards and backwards in time over a 10-Myr period. The dynamical behaviour is analysed using three software packages: the ORBFIT, the SWIFT and the MERCURY integrators. Changes in the orbital elements of 2009 HW77 clones are calculated using the classification of Horner et al. It is shown that close approaches to the giant planets significantly change the asteroid orbit. Our computations made with the SWIFT software and with the MERCURY software give similar results. The half-life is about 5 Myr in both the forward and backward integrations. Moreover, our computations suggest that the Centaur asteroid will be temporarily locked as a periodic asteroid connected with Jupiter with a Tisserand parameter smaller than 3. Hence it is dynamically similar to the Jupiter Family Comets. The mean duration in this state is about 82 kyr, but the behaviour and lifetime depend on whether capture occurs after a few hundred thousand years or a few hundred million years. Several clones of this dynamically interesting Centaur asteroid are temporarily locked up to four times as periodic asteroids connected with Jupiter, after which they are ejected from the Solar system. According to Bailey and Malhotra, asteroid 2009 HW77 may belong to the diffusing class of Centaurs, which can evolve into Jupiter Family Comets.

To appear in: Monthly Notices of the Royal Astronomical Society
For preprints, contact `astrobit@ka.onet.pl`

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Are There Rings Around Pluto?

J.J. Rawal[1] and B. Nikouravan[2,3]

[1] 1The Indian Planetary Society (IPS) B-201, Lokmanya Tilak Road, Borivali (W), Mumbai - 400092, India

[2] Department of Physic, Islamic Azad University (IAU)-Varamin - Pishva Branch, Iran

[3] University of Malaya, 50603 Kuala Lumpur, Malaysia

Considering effects of tidal plus centrifugal stress acting on icy-rocks and the tensile strength thereof, icy-rocks being in the density range (1–2.4) g cm^{-3} which had come into existence as collisional ejecta (debris) in the vicinity of Pluto at the time when Pluto-Charon system came into being as a result of a giant impact of a Kuiper Belt Object on the primordial Pluto, it is shown, here, that these rocks going around Pluto in its vicinity are under slow disruption generating a stable ring structure consisting of icy-rocks of diameters in the range (20–90) km, together with fine dust and particles disrupted off the rocks, and spread all over the regions in their respective Roche Zones, various Roche radii being in $\sim$1/2 three-body mean motion resonance. Calculations of gravitational spheres of influence of Pluto which turns out to be 4.2×10^6 km for prograde orbits and 8.5×10^6 km for retrograde orbits together with the existence of Kuiper Belt in the vicinity of Pluto assure that there may exist a few rocks (satellites)/dust rings/sheets so far undiscovered moving in prograde orbits around the planet and few others which are distant ones and move around Pluto in the region between 4.2×10^6 km and 8.5×10^6 km in retrograde orbits.

Published in: International Journal of Fundamental Physical Sciences, 1, 6 (2011 June)
Preprints on the web at `http://arxiv.org/abs/1109.1614`

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Origin of Craters on Phoebe: Comparison with Cassini's Data

R.P. Di Sisto[1] and A. Brunini[1]

[1] Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, Paseo del Bosque S/N (1900), La Plata, Argentina. IALP-CONICET

Phoebe is one of the irregular satellites of Saturn. The images taken by the Cassini-Huygens spacecraft have allowed us to analyze its surface and the craters on it.

We study the craters on Phoebe produced by both Centaur objects from the Scattered Disk (SD) and plutinos that have escaped from the 3:2 mean motion resonance with Neptune and compare our results with the observations by Cassini.

We use previously developed simulations of trans-Neptunian Objects and a method that allows us to derive the number of craters and the cratering rate on Phoebe.

We determine the number of craters and the largest crater on Phoebe produced by Centaurs in the present configuration of the Solar System. We obtain a present normalized rate of encounters of Centaurs with Saturn of $\dot{F} = 7.1 \times 10^{-11}$ per year, from which we can infer the current cratering rate on Phoebe for each crater diameter.

Our study and comparison with observations suggest that the main crater features on Phoebe are unlikely to have been produced in the present configuration of the Solar System but that they must have been created instead when the SD were depleted in the early Solar System. If this is indeed what happened and the craters were produced when Phoebe was a satellite of Saturn, then it must have been captured, very early on in the evolution of the Solar System.

Published in: Astronomy & Astrophysics, 534, A68 (2011 October)
For preprints, contact romina@fcaglp.unlp.edu.ar
or on the web at http://arxiv.org/abs/1108.3808

PAPERS RECENTLY SUBMITTED TO JOURNALS

Icy Planet Formation at 15–150 AU: A Correlation Between the Maximum Radius and the Slope of the Size Distribution for Transneptunian Objects

S.J. Kenyon[1] and B.C. Bromley[2]

[1] Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138, USA

[2] Department of Physics, University of Utah, 201 JFB, Salt Lake City, UT 84112, USA

Submitted to: The Astronomical Journal
For preprints, contact skenyon@cfa.harvard.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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