Issue No. 109 *June 2017*

DISTANT EKOs

The Kuiper Belt Electronic Newsletter

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NEWS & ANNOUNCEMENTS

There were 12 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2013 SA100, 2013 SZ99, 2013 UQ15, 2013 US15, 2014 QF442, 2014 TF86, 2014 UH225, 2014 UK225, 2014 UL225, 2014 UM225, 2015 RT245, 2016 SS46

and 11 new Centaur/SDO discoveries:

2013 UR15, 2014 HY195, 2014 QG442, 2014 RS63, 2014 UJ225, 2015 RU245, 2015 RV245, 2015 RW245, 2016 QP85, 2017 GY8, 2017 KZ31

Objects recently assigned numbers:

2003 HY56 = (488644)
2012 VU113 = (491767)
2012 VV113 = (491768)
2014 FW = (492338)
2014 YZ49 = (493480)
2016 EX = (494158)

Deleted/Re-identified objects:

2010 TR19 = 2014 QA442

Current number of TNOs: 1815 (including Pluto)
Current number of Centaurs/SDOs: 706
Current number of Neptune Trojans: 17

Out of a total of 2538 objects:

711 have measurements from only one opposition
705 of those have had no measurements for more than a year
344 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

All Planetesimals Born near the Kuiper Belt Formed as Binaries

Wesley C. Fraser[1], Michele T. Bannister[1], Rosemary E. Pike[2], Michael Marsset[1,3], Megan E. Schwamb[4], JJ Kavelaars[5], Pedro Lacerda[1], David Nesvorny[6], Kathryn Volk[7], Audrey Delsanti[3], Susan Benecchi[8], Matthew J. Lehner[2], Keith Noll[9], Brett Gladman[10], Jean-Marc Petit[11], Stephen Gwyn[12], Ying-Tung Chen[2], Shiang-Yu Wang[2], Mike Alexandersen[2], Todd Burdullis[13], Scott Sheppard[14], and Chad Trujillo[15]

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The cold classical Kuiper Belt Objects have low inclinations and eccentricities (Brown 2001, Kavelaars et al. 2009), and are the only Kuiper Belt population suspected to have formed in-situ (Parker & Kavelaars 2010). Compared to the dynamically excited populations which exhibit a broad range of colours, and a low ∼10% binary fraction (Noll 2008), cold classical objects typically possess red optical colours (Gulbis et al. 2006), with ∼30% of the population found in binary pairs (Grundy et al. 2011); the origin of these differences remains unclear (Benecchi et al. 2009,Fraser& Brown 2012). We report the detection of a population of blue coloured, tenuously-bound binaries residing amongst the cold classical objects. Here we show that widely separated binaries can survive push-out into the cold classical region during the early phases of Neptune's migration (Nesvorny 2015). The blue binaries may be contaminants, originating at ∼38 AU, and could provide a unique probe of the formative conditions in a region now nearly devoid of objects. The idea that the blue objects, which are predominantly binary, are products of push-out requires that planetesimals form entirely as multiples. Plausible formation routes include planetesimal formation via pebble accretion (Shannon et al. 2016) and subsequent binary production through dynamical friction (Goldreich et al. 2002), and binary formation during the collapse of a cloud of solids (Nesvorny et al. 2010).

Published in: Nature Astronomy, 1, 88 (2017 April 4)

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or on the web at https://arxiv.org/abs/1705.00683

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TNOs are Cool: A Survey of the Transneptunian Region XII. Thermal Light Curves of Haumea, 2003 VS_2 and 2003 AZ_{84} with Herschel Space Observatory-PACS

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Time series observations of the dwarf planet Haumea and the Plutinos 2003 VS_2 and 2003 AZ_{84} with Herschel/PACS are presented in this work. Thermal emission of these trans-Neptunian objects (TNOs) were acquired as part of the *TNOs are Cool* Herschel Space Observatory key programme. We search for the thermal light curves at 100 and 160 μm of Haumea and 2003 AZ_{84}, and at 70 and 160 μm for 2003 VS_2 by means of photometric analysis of the PACS data. The goal of this work is to use these thermal light curves to obtain physical and thermophysical properties of these icy Solar System bodies. When a thermal light curve is detected, it is possible to derive or constrain the object thermal inertia, phase integral and/or surface roughness with thermophysical modeling. Haumea's thermal light curve is clearly detected at 100 and 160 μm. The effect of the reported dark spot is apparent at 100 μm. Different thermophysical models were applied to these light curves, varying the thermophysical properties of the surface within and outside the spot. Although no model gives a perfect fit to the thermal observations, results imply an extremely low thermal inertia (< 0.5 J m^{-2} s$^{-1/2}$ K^{-1}, hereafter MKS) and a high phase integral (> 0.73) for Haumea's surface. We note that the dark spot region appears to be only weakly different from the rest of the object, with modest changes in thermal inertia and/or phase integral. The thermal light curve of 2003 VS_2 is not firmly detected at 70 μm and at 160 μm but a thermal inertia of 2 ± 0.5 MKS can be derived from these data. The thermal light curve of 2003 AZ_{84} is not firmly detected at 100 μm. We apply a thermophysical model to the mean thermal fluxes and to all the Herschel/PACS and Spitzer/MIPS thermal data of 2003 AZ_{84}, obtaining a close to pole-on orientation as the most likely for this TNO. For the three TNOs, the thermal inertias derived from light curve analyses or from the thermophysical analysis of the mean thermal fluxes confirm the generally small or very small surface thermal inertias of the TNO population, which is consistent with a statistical mean value $\Gamma_{\rm mean} = 2.5 \pm 0.5$ MKS.

To appear in: Astronomy & Astrophysics
For preprints, contact psantos@iaa.es
or on the web at https://doi.org/10.1051/0004-6361/201630354
and at https://arxiv.org/abs/1705.09117

The Dust-to-Ices Ratio in Comets and Kuiper Belt Objects

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Comet 67P/Churyumov-Gerasimenko (67P hereinafter) is characterized by a dust transfer from the southern hemi-nucleus to the night-side northern dust deposits, which constrains the dust-to-ices mass ratio inside the nucleus to values a factor of 2 larger than that provided by the lost mass of gas and non-volatiles. This applies to all comets because the gas density in all night comae cannot prevent the dust fallback. Taking into account Grain Impact Analyser and Dust Accumulator (GIADA) data collected during the entire Rosetta mission, we update the average dust bulk density to $\rho_D = 785^{+520}_{-115}$ kg m^{-3} that, coupled to the 67P nucleus bulk density, confirms an average dust-to-ices mass ratio $\delta = 7.5$ inside 67P. The improved dust densities are consistent with a mixture of $(20 \pm 8)\%$ of ices, $(4 \pm 1)\%$ of Fe sulphides, $(22 \pm 2)\%$ of silicates and $(54 \pm 5)\%$ per cent of hydrocarbons, on average volume abundances. These values correspond to solar chemical abundances, as suggested by the elemental C/Fe ratio observed in 67P. The ice content in 67P matches that inferred in Kuiper belt objects, (20±12)% on average volume abundance and suggests a water content in all trans-Neptunian objects lower than in CI chondrites. The 67P icy pebbles and the dust collected by GIADA have a microporosity of $(49 \pm 5)\%$ and $(59 \pm 8)\%$, respectively.

Published in: Monthly Notices of the Royal Astronomical Society, 469, S45-S49
For reprints, contact `fulle@oats.inaf.it`

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.

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⋆ Titles of conference presentations
⋆ 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:

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