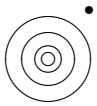
Issue No. 76 *August 2011*

DISTANT EKOs



The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

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CONTENTS

NEWS & ANNOUNCEMENTS

A new moon has been discovered around Pluto. This fourth Plutonian satellite is designated "S/2011 (134340) 1" or "P4" until it receives a permanent name. P4 orbits at 59,000 km in what appears to be a circular or near circular orbit in Pluto's equatorial plane, and is at or near the 5:1 resonance with Charon. It's fainter brightness indicates its size is much smaller than either Nix or Hydra — likely just 14-40 km in diameter.
CBET 2769: `http://www.cbat.eps.harvard.edu/cbet/cbet002769.txt`
See also:
`http://hubblesite.org/newscenter/archive/releases/2011/23`
`http://pluto.jhuapl.edu/news_center/news/20110720.php`

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As everyone who receives this newsletter likely knows, the New Horizons spacecraft will fly past Pluto in 2015, after which, if the Kuiper Belt Objects align, it also will be able to visit one or more destinations beyond Pluto. These additional targets have yet to be discovered and among those hunting for them are members of the public using the IceHunters.org website.
The IceHunters citizen science site, created by Dr Pamela L. Gay and Cory Lehan (Southern Illinois University) enables anyone with an internet connection and keen eyes to help researchers map out one small section of the Kuiper Belt. Citizen Scientists using the site are shown subtracted images and mark the blobs and streaks left in these residual images by moving objects such as Kuiper Belt Objects and asteroids, and by objects that vary in light like variable stars.
Since its June 22 launch, more than 5000 people have joined the IceHunters community. Together, this population has viewed more than 5 million image "cut outs". These images – sized for display on a computer or iPad – are subsections of larger images obtained with various ground-based telescopes. Users periodically receive feedback on what they have discovered and which of their objects remain on the candidate list for future exploration.
While 5 million images views may seem like a lot, this number represents only about one third of the data scientists hope to view by fall. If you want to help discover the next targets for the New Horizons mission, click over to `http://www.icehunters.org` You can also connect to IceHunters on Twitter @icehunters and on Facebook.

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Related to the Petit et al. paper in this issue presenting the full data release of the Canada-France Ecliptic Plane Survey (CFEPS), supplementary details are available at `http://www.cfeps.net` . On this web page one can find the full data set of CFEPS (astrometry and photometry, orbit classification) in electronic form and a description of objects of particular interest discovered in the course of the CFEPS project. Also available at that website is the synthetic model of the Kuiper belt as derived in the paper and in Gladman et al. (2011; *The Resonant Transneptunian Populations*, submitted to AJ) and a survey simulator that will allow you to to make comparisons of models of the Kuiper Belt to real detections in a survey. On that web page, you also have the opportunity to leave comments or ask questions.

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There were 13 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2004 HN79, 2004 HP79, 2004 KK19, 2004 KL19, 2004 KM19, 2004 OQ15, 2004 PY117, 2004 QG29, 2004 VE131, 2004 VF131, 2005 JK186, 2006 BR284, 2006 JZ81

and 21 new Centaur/SDO discoveries:

2004 HO79, 2004 HQ79, 2004 MW8, 2004 OR15, 2004 OS15, 2004 QH29, 2004 VG131, 2004 VH131, 2005 CG81, 2005 CH81, 2005 LC54, 2005 RH52, 2006 BS284, 2006 WG206, 2010 VE21, 2010 VX11, 2010 XZ78, 2011 MM4, 2011 OD16, 2011 OF45, 2011 ON45

Reclassified objects:

2004 KV18 (Centaur → NTrojan)
2004 KZ18 (TNO → SDO)
2004 VU130 (TNO → SDO)
2010 TJ (TNO → SDO)
2010 TR19 (TNO → SDO)
2010 TY53 (TNO → SDO)
2010 VR11 (SDO → TNO)
2011 FX62 (Centaur → SDO)

Deleted/Re-identified objects:

(66452) 1999 OF4 = 2004 QF29
2002 CZ248 = 2006 CK69
2005 CC79 = 2011 FX62

Current number of TNOs: 1229 (including Pluto)
Current number of Centaurs/SDOs: 319
Current number of Neptune Trojans: 8

Out of a total of 1556 objects:

613 have measurements from only one opposition
575 of those have had no measurements for more than a year
310 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

The Canada-France Ecliptic Plane Survey - Full Data Release: The Orbital Structure of the Kuiper Belt

J-M. Petit[1,3], J.J. Kavelaars[2], B.J. Gladman[3], R.L. Jones[2,3], J.Wm. Parker[4], C. Van Laerhoven[3,5], P. Nicholson[6], G. Mars[7], P. Rousselot[1], O. Mousis[1], B. Marsden[8,11] A. Bieryla[4], M. Taylor[9], M.L.N. Ashby[8], P. Benavidez[10], A. Campo Bagatin[10], and G. Bernabeu[10]

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[11]Deceased

We report the orbital distribution of the trans-neptunian objects (TNOs) discovered during the Canada-France Ecliptic Plane Survey (CFEPS), whose discovery phase ran from early 2003 until early 2007. The follow-up observations started just after the first discoveries and extended until late 2009.

We obtained characterized observations of 321 sq.deg. of sky to depths in the range g ∼23.5–24.4 AB mag. We provide a database of 169 TNOs with high-precision dynamical classification and known discovery efficiency. Using this database, we find that the classical belt is a complex region with sub-structures that go beyond the usual splitting of inner (interior to 3:2 mean-motion resonance [MMR]), main (between 3:2 and 2:1 MMR), and outer (exterior to 2:1 MMR). The main classical belt (a=40–47 AU) needs to be modeled with at least three components: the 'hot' component with a wide inclination distribution and two 'cold' components (stirred and kernel) with much narrower inclination distributions. The hot component must have a significantly shallower absolute magnitude (H_g) distribution than the other two components.

With 95% confidence, there are 8000^{+1800}_{-1600} objects in the main belt with $H_g \leq 8.0$, of which 50% are from the hot component, 40% from the stirred component and 10% from the kernel; the hot component's fraction drops rapidly with increasing H_g. Because of this, the apparent population fractions depend on the depth and ecliptic latitude of a trans-neptunian survey. The stirred and kernel components are limited to only a portion of the main belt, while we find that the hot component is consistent with a smooth extension throughout the inner, main and outer regions of the classical belt; in fact, the inner and outer belts are consistent with containing only hot-component objects. The $H_g \leq 8.0$ TNO population estimates are 400 for the inner belt and 10,000 for the outer belt to within a factor of two (95% confidence).

We show how the CFEPS Survey Simulator can be used to compare a cosmogonic model for the the orbital element distribution to the real Kuiper belt.

To appear in: The Astronomical Journal

For preprints, contact `petit@obs-besancon.fr`
or on the web at `http://www.cfeps.net/publications`

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A Southern Sky and Galactic Plane Survey for Bright Kuiper Belt Objects

Scott S. Sheppard[1], Andrzej Udalski[2], Chad Trujillo[3], Marcin Kubiak[2], Grzegorz Pietrzynski[2], Radoslaw Poleski[2], Igor Soszynski[2], Michal K. Szymanski[2] and Krzysztof Ulaczyk[2]

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About 2500 square degrees of sky south of declination -25 degrees and/or near the galactic plane were surveyed for bright outer solar system objects. This survey is one of the first large scale southern sky and galactic plane surveys to detect dwarf planets and other bright Kuiper Belt objects in the trans-Neptunian region. The survey was able to obtain a limiting R-band magnitude of 21.6. In all, 18 outer solar system objects were detected, including Pluto which was detected near the galactic center using optimal image subtraction techniques to remove the high stellar density background. Fourteen of the detections were previously unknown trans-Neptunian objects, demonstrating that the southern sky had not been well-searched to date for bright outer solar system objects. Assuming moderate albedos, several of the new discoveries from this survey could be in hydrostatic equilibrium and thus be considered dwarf planets. Combining this survey with previous surveys from the northern hemisphere suggests that the Kuiper Belt is nearly complete to around 21st magnitude in the R-band. All the main dynamical classes in the Kuiper Belt are occupied by at least one dwarf planet sized object. The 3:2 Neptune resonance, which is the innermost well-populated Neptune resonance, has several large objects while the main outer Neptune resonances such as the 5:3, 7:4, 2:1, and 5:2 do not appear have any large objects. This indicates that the outer resonances are either significantly depleted in objects relative to the 3:2 resonance or have a significantly different assortment of objects than the 3:2 resonance. For the largest objects ($H < 4.5$ mag), the scattered disk population appears to have a few times more objects than the main Kuiper Belt population, while the Sedna population could be several times more than that of the main Kuiper Belt.

Published in: The Astronomical Journal, 142, 98 (2011 October)
For preprints, contact sheppard@dtm.ciw.edu
or on the web at http://arxiv.org/abs/1107.5309

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New Insights on Ices in Centaur and Transneptunian Populations

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A Large Program (LP) has been carried out at ESO-VLT using almost simultaneously the UT1, UT2 and UT4 telescopes (Cerro Paranal, Chile). The aim of this Large Program was to obtain simultaneous visible and near-IR spectroscopic measurements (using FORS, ISAAC and SINFONI instruments) with a S/N ratio as high as possible for almost all objects among different dynamical groups observable within the VLT capability.

In this paper we present results on the second half of the Large Program which includes new near-infrared spectroscopy data of 20 objects. For 12 of them for which we had obtained the complete spectral range ($V+J+H+K$ bands), we apply a radiative transfer model to the entire spectral range to constrain their surface composition.

We also present an analysis of all near-IR spectral data available on TNOs and Centaurs from both the complete LP and the literature. An overview for a total sample of 75 objects is thus carried out analyzing the ice content with respect to the physical and dynamical characteristics. The major new results are: (i) all objects classified as BB class seem to have icy surfaces; (ii) the possible presence of CH_3OH has primarily been detected on very red surfaces (RR class objects) and (iii) the majority of Centaurs observed multiple times have an heterogeneous composition.

Published in: Icarus, 214, 297, (2011 July)
For preprints, contact Antonella.Barucci@obspm.fr

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Characterization of Seven Ultra-Wide Trans-Neptunian Binaries

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The low-inclination component of the Classical Kuiper Belt is host to a population of extremely widely-separated binaries. These systems are similar to other Trans-Neptunian binaries (TNBs) in that the primary and secondary components of each system are of roughly equal size. We have performed an astrometric monitoring campaign of a sample of seven wide-separation, long-period TNBs and present the first-ever well-characterized mutual orbits for each system. The sample contains the most eccentric (2006 CH_{69}, $e_m = 0.9$) and the most widely-separated, weakly bound (2001 QW_{322}, $a/R_H \simeq 0.22$) binary minor planets known, and also contains the system with lowest-measured mass of any TNB (2000 CF_{105}, $M_{sys} \simeq 1.85 \times 10^{17}$ kg). Four systems orbit in a prograde sense, and three in a retrograde sense. They have a different mutual inclination distribution compared to all other TNBs, preferring low mutual-inclination orbits. These systems have geometric r-band albedos in the range of 0.09–0.3, consistent with radiometric albedo estimates for larger solitary low-inclination Classical Kuiper Belt objects, and we limit the plausible distribution of albedos in this region of the Kuiper Belt. We find that gravitational collapse binary formation models produce a similar orbital distribution to that currently observed, which along with a confluence of other factors supports formation of the cold Classical Kuiper Belt *in situ* through relatively rapid gravitational collapse rather than slow hierarchical accretion. We show that these binary systems are sensitive to disruption via collisions, and their existence suggests that the size distribution of TNOs at small sizes remains relatively shallow.

To appear in: The Astrophysical Journal
For preprints, contact alexhp@cfa.harvard.edu
or on the web at http://arxiv.org/abs/1108.2505

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A Change in the Lightcurve of Kuiper Belt Contact Binary (139775) 2001 QG298

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New observations show that the light curve of Kuiper belt contact binary (139775) $2001\,QG_{298}$ has changed substantially since the first observations in 2003. The 2010 light curve has a peak-to-peak photometric of range $\Delta m_{2010} = 0.7 \pm 0.1$ mag, significantly lower than in 2003, $\Delta m_{2003} = 1.14 \pm 0.04$ mag. This change is most simply interpreted if $2001\,QG_{298}$ has an obliquity near 90°. The observed decrease in Δm is caused by a change in viewing geometry, from equator-on in 2003 to nearly 16° (the orbital angular distance covered by the object between the observations) off the equator in 2010. The 2003 and 2010 light curves have the same rotation period and appear in phase when shifted by an integer number of full rotations, also consistent with high obliquity. Based on the new 2010 light curve data, we find that $2001\,QG_{298}$ has an obliquity $\varepsilon = 90° \pm 30°$. Current estimates of the intrinsic fraction of contact binaries in the Kuiper belt are debiased assuming that these objects have randomly oriented spins. If, as $2001\,QG_{298}$, Kuiper belt object contact binaries tend to have large obliquities, a larger correction is required. As a result, the abundance of contact binaries may be larger than previously believed.

Published in: The Astronomical Journal, 142, 90 (2011 September)
For preprints, contact `lacerda.pedro@gmail.com`
or on the web at `http://arxiv.org/abs/1107.3507v1`

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Wind-Shearing in Gaseous Protoplanetary Disks and the Evolution of Binary Planetesimals

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One of the first stages of planet formation is the growth of small planetesimals and their accumulation into large planetesimals and planetary embryos. This early stage occurs much before the dispersal of most of the gas from the protoplanetary disk. Due to their different aerodynamic properties, planetesimals of different sizes and shapes experience different drag forces from the gas during this time. Such differential forces produce a wind-shearing (WISH) effect between close by, different-sized planetesimals. For any two planetesimals, a WISH radius can be considered at which the differential acceleration due to the wind becomes greater than the mutual gravitational pull between the planetesimals. We find that the WISH radius could be much smaller than the gravitational shearing radius by the star (the Hill radius). In other words, during the gas-phase of the disk, WISH could play a more important role than tidal perturbations by the star. Here, we study the WISH radii for planetesimal pairs of different sizes and compare the effects of wind and gravitational shearing (drag force versus gravitational tidal force). We then discuss the role of WISH for the stability and survival of binary planetesimals. Binaries are sheared apart by the wind if they are wider than their WISH radius. WISH-stable binaries can also inspiral, and possibly coalesce, due to gas drag. Here, we calculate the WISH radius and the gas-drag-induced merger timescale, providing stability and survival criteria for gas-embedded binary planetesimals. Our results suggest that even WISH-stable binaries may merge in times shorter than the lifetime of the gaseous disk. This may constrain currently observed binary planetesimals to have formed far from the star or at a late stage after the dispersal of most of the disk gas. We note that the WISH radius may also be important for other processes such as planetesimal erosion and planetesimal encounters and collisions in a gaseous environment.

Published in: The Astrophysical Journal, 733, 56 (2011 May 20)
Preprints available on the web at `http://arxiv.org/abs/1103.1629`

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The Spectrum of (136199) Eris between 350 and 2350 nm: Results with X-Shooter

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Context. X-Shooter is the first second-generation instrument for the ESO-Very Large Telescope. It is a spectrograph covering the entire 300–2480 nm spectral range at once with a high resolving power. These properties enticed us to observe the well-known trans-Neptunian object (136199) Eris during the science verification of the instrument. The target has numerous absorption features in the optical and near-infrared domain that have been observed by different authors, showing differences in these features' positions and strengths.

Aims. Besides testing the capabilities of X-Shooter to observe minor bodies, we attempt to constrain the existence of super-volatiles, e.g., CH_4, CO and N_2, and in particular we try to understand the physical-chemical state of the ices on Eris' surface.

Methods. We observed Eris in the 300–2480 nm range and compared the newly obtained spectra with those available in the literature. We identified several absorption features, measured their positions and depth, and compare them with those of the reflectance of pure methane ice obtained from the optical constants of this ice at 30 K to study shifts in these features' positions and find a possible explanation for their origin.

Results. We identify several absorption bands in the spectrum that are all consistent with the presence of CH_4 ice. We do not identify bands related to N_2 or CO. We measured the central wavelengths of the bands and compared to those measured in the spectrum of pure CH_4 at 30 K finding variable spectral shifts.

Conclusions. Based on these wavelength shifts, we confirm the presence of a dilution of CH_4 in other ice on the surface of Eris and the presence of pure CH_4 that is spatially segregated. The comparison of the centers and shapes of these bands with previous works suggests that the surface is heterogeneous. The absence of the 2160 nm band of N_2 can be explained if the surface temperature is below 35.6 K, the transition temperature between the alpha and beta phases of this ice. Our results, including the reanalysis of data published elsewhere, point to a heterogeneous surface on Eris.

Published in: Astronomy & Astrophysics 532, A130 (2011 August)

For preprints, contact `aalvarez@eso.org`

or on the web at `http://arxiv.org/abs/1107.1708`

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Microwave Emission from the Edgeworth-Kuiper Belt and the Asteroid Belt Constrained from the Wilkinson Microwave Anisotropy Probe

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Objects in the Edgeworth-Kuiper Belt and the main asteroid belt should emit microwaves that may give rise to extra anisotropy signals in the multipole of the cosmic microwave background (CMB) experiment. Constraints are derived from the absence of positive detection of such anisotropies for $\ell \lesssim 50$, meaning the total mass of Edgeworth-Kuiper Belt objects is smaller than 0.2 $M_\oplus$. This limit is consistent with the mass extrapolated from the observable population with the size of $a \gtrsim 15$ km, assuming that the small-object population follows the power law in size $dN/da \sim a^{-q}$ with the canonical index expected for collisional equilibrium, $q \simeq 3.5$, with which 23% of the mass is ascribed to objects smaller than are observationally accessible down to grains. A similar argument applied to the main asteroid belt indicates that the grain population should not increase more quickly than $q \simeq 3.6$ toward smaller radii, if the grain population follows the power law that continues to observed asteroids with larger radii. Both cases are at or only slightly above the limit that can be physically significant, implying the importance of further tightening the CMB anisotropy limit, which may be attained with observation at higher radio frequencies.

Published in: The Astrophysical Journal, 736, 122 (2011 August 1)
Preprints available on the web at `http://arxiv.org/abs/1011.4796`

PAPERS RECENTLY SUBMITTED TO JOURNALS

Small Particles in Pluto's Environment: Effects of the Solar Radiation Pressure

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Submitted to: Astronomy & Astrophysics
For preprints, contact `pos09032@feg.unesp.br`
or online at `http://arxiv.org/abs/1108.0712`

CONFERENCE CONTRIBUTIONS

What follows is a list of Kuiper belt-related presentations at the upcoming EPSC-DPS meeting that will run 2011 October 2-7 in Nantes, France. This list was collected from my search through the program; my apologies for any presentations I overlooked. The Session Program is available at:
`http://meetingorganizer.copernicus.org/epsc-dps2011/sessionprogramme`

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Oral Session SB12 : Centaurs and Trans-Neptunian Objects
Monday, October 3, 08:30-10:00 / 13:30-17:00
Terre Room

- 08:30 — *The Compositional Classes of the Kuiper Belt* (W. Fraser, M. Brown, and K. Batygin)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1326-1.pdf`
- 08:45 — *A compositional interpretation of TNOs taxonomy* (C. M. Dalle Ore, D. P. Cruikshank, T. L. Roush, and J. P. Emery)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-44.pdf`
- 09:00 — *Ices in Centaurs and Transneptunians* (M. A. Barucci)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-473.pdf`
- 09:15 — *The scattered disk and hot belt, two sides of the same coin?* (JJ Kavelaars, JM Petit, BJ Gladman, L Jone, J Parker, and M Taylor)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1318.pdf`
- 09:30 — *Reality and origin of the Kernel of the classical Kuiper Belt* (J.-M. Petit, B. Gladman, J.J. Kavelaars, R.L. Jones, and J. Parker)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-722.pdf`
- 09:45 — *Retaining the Primordial Cold Classical Kuiper Belt During a Transient Phase of Dynamical Instability* (K. Batygin, M. E. Brown, and F. C. Fraser)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1154.pdf`
- 13:30 — *An Oort cloud origin for exceptional TNOs?* (C. Shankman, B. Gladman, and N. Kaib)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-633-1.pdf`
- 13:45 — *Born-big TNOs and the shallow size distribution of faint objects in the Edgeworth-Kuiper belt* (A. Campo Bagatin and P.G. Benavidezz)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-601.pdf`
- 14:00 — *TNOs are Cool: Thermophysical modeling of a sample of 20 classical KBOs using Herschel/PACS* (E. Vilenius, Th. Mueller, C. Kiss, A. Pal, P. Santos-Sanz, M. Rengel, P. Hartogh, S. Protopapa, M. Mueller, M. Mommert, J. Stansberry, E. Lellouch, H. Boehnhardt, R. Duffard, J.L. Ortiz, A. Thirouin, F. Henry, A. Delsanti, S. Fornasier, and D. Hestroffer)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1299.pdf`
- 14:15 — *TNOs are Cool: A Survey of the Transneptunian Region - Physical Characterization of 16 Plutinos using PACS observations* (M. Mommert, A. W. Harris, T. G. Müller, J. Stansberry, E. Lellouch, H. Böhnhardt, A. Delsanti, R. Duffard, S. Fornasier, P. Hartogh, F. Henry, C. Kiss, M. Mueller, A. Pal, S. Protopapa, P. Santos-Sanz, N. Szalai, M. Rengel, and E. Vilenius)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-906-1.pdf`
- 14:30 — *Sub-millimeter observations of Centaurs and TNOs from the Herschel space telescope* (S. Fornasier, T. Lim, T. Mueller, E. Lellouch, P. Panuzzo, P. Santos-Sanz, E. Vilenius, H. Boehnhardt, J. Stansberry, A. Delsanti, F. Henry, C. Kiss, A. Pal, R. Duffard, A. Barucci, and E. Dotto)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-712-1.pdf`
- 14:45 — *Thermal lightcurve observations of TNOs with Herschel* (P. Santos-Sanz)
  `http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1099.pdf`

- 15:30 — *Binary Constraints on Kuiper Belt Collisions* (D. Nesvorný, D. Vokrouhlicky, W. F. Bottke, and K. Noll)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1376.pdf
- 15:45 — *A Change in the Lightcurve of Contact Binary 2001 QG298* (P. Lacerda)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-814.pdf
- 16:00 — *2007 TY430: An Ultra-Red, High Albedo, Low Density, Wide, Equal Sized Plutino Binary* (S. Sheppard, D. Ragozzine, and C. Trujillo)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1309.pdf
- 16:15 — *Mutual Inclinations of Ultra-Wide Trans-Neptunian Binaries* (A. Parker, J. Kavelaars, J.-M. Petit, L. Jones, B. Gladman, and J. Parker)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1350.pdf
- 16:30 — *Search For Small Trans-Neptunian Objects Using COROT Asteroseismology Lightcurves* (C.-Y. Liu, A. Doressoundiram, F. Roques, M. Auvergne, and H.-K. Chang)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-614-1.pdf
- 16:45 — *Constraints on the Kuiper belt dust in the outer Solar System* (Ch. Vitense, A.V. Krivov, H. Kobayashi, and T. Löh)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-489-1.pdf

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Poster Session SB12 : Centaurs and Trans-Neptunian Objects
Attendance Times: Monday, Oct 3, 17:30-19:00
Display Times: Monday, Oct 3, 08:30 - Wednesday, Oct 5, 10:30

- P344 — *Infrared Spectra and Optical Constants of Hydrocarbon Ices Relevant to TNO Surfaces* (M. H. Moore, R. F. Ferrante, R. L. Hudson, and W.J. Moore)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-45-1.pdf
- P345 — *TAOS: An Occultation Survey of the Outer Solar System* (M. J. Lehner)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-355.pdf
- P346 — *A Photometric System for Detection of Water and Methane Ices on Kuiper Belt Objects* (C. Trujillo, S. Sheppard, and E. Schaller)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-545.pdf
- P347 — *Pristine ices on TNOs and Centaurs* (F. Merlin, M.A. Barucci, E. Quirico, C. de Bergh, and A. Alvarez Candal)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-736.pdf
- P348 — *Study of time-series photometry of several Transneptunian Objects.* (A. Thirouin, J.L. Ortiz, A. Campo Bagatin, P. Pravec, N. Morales, and R. Duffard)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-747.pdf
- P349 — *An overview of the large TNOs: a fast-changing ranking among the 100 largest bodies of our Solar System* (J. Poncy)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-950.pdf
- P350 — *Miosotys, a new instrument to search for trans-Neptunian stellar occultations* (A. Doressoundiram, C-Y Liu, F. Roques, H-K Chang, I. C. Shih, F. Dauny, and Y. Boissel)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-980.pdf
- P351 — *Mind the gap: investigating why the physical and orbital properties of 'hot' and 'cold' Classical KBOs mismatch* (N. Peixinho and O. Miloni)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1011-1.pdf
- P352 — *The Relative Sizes of Transneptunian Binaries: Evidence for Different Populations from a Homogeneous Data Set* (K. Noll, W. Grundy, S. Benecchi, and H. Levison)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1029.pdf

- P353 — *The capture and release of Trojan asteroids by the giant planets during the solar system history* (P. S. Lykawka and J. Horner)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1246.pdf
- P354 — *Stratospheric Observatory for Infrared Astronomy (SOFIA) for Planetary Science and the Kuiper Belt* (W. Reach)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1626.pdf
- P355 — *Observations of Trans-Neptunian Objects at True Opposition* (A. Verbiscer, N. Chanover, J. Holtzman, A. Hagen, L. Zernow, and K. Orr)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1682.pdf
- P356 — *Surface Properties of Neutral TNOs* (S. Sonnett, K. Meech, and G. Sarid)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1681.pdf
- P357 — *A Tale of Two TNOs* (D. Rabinowitz, M. E. Schwamb, E. Hadjiyska, P. Rojo, and S. Tourtellottee)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1642.pdf
- P358 — *The sky distribution of TNOs as seen by HST* (C. I. Fuentes, D. Trilling, and M. Holman)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-757.pdf
- P359 — *Photometry of TNOs and Centaurs in support of a Herschel Key Programme* (D. Perna, E. Dotto, M.A. Barucci, E. Mazzotta Epifani, M. Dall'Ora, and E. Vilenius)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-961.pdf
- P360 — *A New NOAO Survey Program: Mutual Orbits and Masses of Kuiper Belt Binaries* (W.M. Grundy, S.D. Benecchi, M.W. Buie, K.S. Noll, S.B. Porter, H.G. Roe, J.A. Stansberry, and C.A. Trujillo)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1078.pdf
- P361 — *First Results from the La Silla-QUEST KBO Survey: Probing the High Inclination Kuiper Belt* (M.E. Schwamb, D.L. Rabinowitz, S. Tourtellotte, R. Brasser, and E. I. Hadjiyska)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1094.pdf
- P362 — *First Small-Body Occultation Attempts from the Stratospheric Observatory for Infrared Astronomy* (M. J. Person, E. W. Dunham, T. Bida, A. S. Bosh, P. Collins, S. E. Levine, G. Mandushev, B. Taylor, T. Tilleman, A. M. Zangari, S. ZoonematKermani, and C. A. Zuluaga)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1374.pdf
- P363 — *Physical Properties of the Haumea Family from Herschel* (J.A. Stansberry, T.G. Mueller, J.-L. Ortiz, P. Santos-Sanz, E. Vilenius, E. Lellouch, C. Kiss and the "TNOs are Cool" Herschel Key Programme Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1437.pdf
- P364 — *Laboratory spectra of N2 and CH4 mixtures: Applications to Observations of TNOs* (R. M. E. Mastrapa, J. C. Cook, D. W. White, M. T. Berry, and S. A. Sandford)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1586.pdf

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Poster Session SB16 : Late poster session "Small Bodies"
Attendance Times: Monday, Oct 3, 17:30-19:00
Display Times: Monday, Oct 3, 08:30 - Wednesday, Oct 5, 10:30

- P390 — *The Double-Double Pluto-Charon and Pluto-Hydra Predicted Stellar Occultations of June 2011* (J. M. Pasachoff, B. A. Babcock, S. Pandey, D. Amrhein, M. J. Person, A. A. S. Gulbis, A. S. Bosh, C. A. Zuluaga, S. Sallum, D. J. Tholen, R. Lucas, M. Kakkala, J. Ciotti, S. Plunkett, N Hiraoka, W. Best, E. J. Pilger, M. Miceli, and S. Levine)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1821-1.pdf

- P397 — *Measured Pluto-Charon Offset from the Stellar Occultations of 23 June 2011* (C. A. Zuluaga, M. J. Person, A. S. Bosh, S. E. Levine, A. A. S. Gulbis, A. M. Zangari, J. M. Pasachoff, B. A. Babcock, S. Pandey, D. Amrhein, S. Sallum and the MIT-Williams Occultation Consortium Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1866.pdf

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Oral Session GP7/SB1 : Planetary Rings
Tuesday, October 4, 08:30-15:00
Neptune Room

- 09:00 — *Limits on Pluto's Ring System from the June 12 2006 Stellar Occultation* (H. Throop, R. G. French, K. Shoemaker, C. R. Ruhland, L. A. Young, and C. B. Olkin)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1640.pdf

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Oral Session SB15/PD2 : The dwarf planets of the outer solar system
Tuesday, October 4, 13:30-17:00
Terre Room

- 13:30 — *Size, density, albedo and atmosphere limit of dwarf planet Eris from a stellar occultation*(B. Sicardy, J. L. Ortiz, M. Assafin, E. Jehin, A. Maury, E. Lellouch, R. Gil-Hutton, F. Braga-Ribas, F. Colas, J. Lecacheux, F. Roques, P. Santo Sanz, T. Widemann, N. Morales, A. Thirouin, J.I.B. Camargo, R. Vieira-Martins, M. Gillon, J. Manfroid, R. Behrend and the Eris occultation Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-137-8.pdf
- 13:45 — *The stellar occultation by Makemake on 2011 April 23*(J. L. Ortiz, B. Sicardy, M. Assafin, A. Alvarez-Candal, V. D. Ivanov, J. Camargo, S. Littlefair, E. Unda-Sanzana, E. Jehin, F. Braga-Ribas, E. Lellouch, N. Morales, J. Licandro, R. Gil-Hutton, R. Duffard, J. P. Colque, G. Tancredi, J. Mafroid, A. Thirouin, J. Lecacheux and the The Makemake occultation Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-704.pdf
- 14:00 — *Stellar Occultations by TNOs: the January 08, 2011 by (208996) 2003 AZ84 and the May 04, 2011 by (50000) Quaoar*(F. Braga-Ribas, B. Sicardy, J.L. Ortiz, E. Jehin, J.I.B. Camargo, M. Assafin, R. Behrend, E. Unda-Sanzana, J.P. Colque, N. Morales, G. Tancredi, S. Roland, S. Bruzzone, R. Salvo, L. Almenares, M. Emilio, W. Schoenell, R. Gil-Hutton, A. Milone, C. Jacques and the The Quaoar occultation Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1060-1.pdf
- 14:15 — *Investigating Pluto's lower atmosphere from a central-flash stellar occultation* (C. B. Olkin, L. A. Young, R. G. French, M. W. Buie, and E. F. Young)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-334.pdf
- 14:30 — *The wind, temperature, and surface pressure on Pluto from a Pluto general circulation model* (A.M. Zalucha and A.A.S. Gulbis)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1225.pdf
- 14:45 — *Modeling 3-D global atmosphere-surface interactions on contemporary Pluto* (T. Michaels and L. A. Young)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1613.pdf
- 15:30 — *The evolution of the Pluto system* (S. Peale, W. H. Cheng, and M. H. Lee)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-665-1.pdf
- 15:45 — *Dynamical evolution of Haumea collisional family: Clues on the collision physics, new family members and implications for the outer solar system* (P. S. Lykawka, J. Horner, A. M. Nakamura, and T. Mukai)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-891.pdf

- 16:00 — *Analysis of High Resolution Spectra of Eris: Possible Evidence for Cold Phase CH4 Ice* (J. Cook)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1279-1.pdf
- 16:15 — *EVLA Observations of Pluto, Charon, Makemake, Quaoar, and 2002 TC302 at 0.9 cm Wavelength* (B.J. Butler, M.A. Gurwell, and A. Moullet)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1670.pdf
- 16:30 — *Makemake: A truly exotic TNO!* (T. Mueller, J. Stansberry, E. Lellouch, C. Kiss, T. Lim, S. Fornasier, P. Santos Sanz, A. Pal, E. Vilenius, A. Delsanti, R. Duffard, P. Hartogh, F. Henry, M. Mommert, M. Mueller, J. L. Ortiz, and N. Szalai)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1416.pdf
- 16:45 — *The X-Shooter spectrum of (136199) Eris* (A. Alvarez-Candal, N Pinilla-Alonso, J. Licandro, J. Cook, E. Mason, T. Roush, D. Cruikshank, F. Gourgeot, E. Dotto, and D. Perna)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-524.pdf

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Poster Session SB15/PD2 : The dwarf planets of the outer solar system
Attendance Times: Tuesday, October 4, 17:30-19:00
Display Times: Monday, Oct 3, 08:30 - Wednesday, Oct 7, 10:30

- P365 — *Millimeter-wave Imaging of the Pluto-Charon System* (M. Gurwell, B. Butler, and A. Moullet)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-271-2.pdf
- P366 — *Models of planet's origin and distribution of planetary distances and orbits in the Solar System based on the statistical theory of spheroidal bodies* (A.M. Krot)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-466.pdf
- P367 — *Dynamical evolution of the escaping ejecta from the Nix and Hydra surfaces* (P. M. Pires dos Santos, S. M. Giuliatti Winter, and R. Sfair)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-565-1.pdf
- P368 — *The surface and thermal history of Orcus* (A. Delsanti, A. Guilbert-Lepoutre, F. Merlin, J. Bauer, B. Yang, and K.J. Meech)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-999.pdf
- P369 — *The 22 May 2011 Pluto occultation - observed* (J.M. Pasachoff)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1784.pdf
- P370 — *Longitudinal and temporal variability of Pluto* (S. Protopapa, H. Boehnhardt, L. Barrera, W. M. Grundy, D. P. Cruikshank, J. M. Sunshine, L. M. Feaga, and M. F. A' Hearn)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-512.pdf
- P371 — *A search for dwarf planets in the southern hemisphere sky* (M. T. Bannister, M. E. Brown, B. P. Schmidt, R. McNaught, G. Garrad, S. Larson, and E. Beshore)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-317.pdf
- P372 — *A Combined Fluid and Kinetic Model of Pluto's Extended Exosphere* (JT Erwin, OJ Tucker, and RE Johnson)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-652-1.pdf
- P373 — *Occultations by Pluto and Charon observed by the PHOT team, 2011 June 23 and 27* (L.A. Young and the PHOT (Portable High-speed Occultation Telescope) Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1341-1.pdf
- P374 — *Sedna, Eris and Quaoar: physical properties of prominent trans-Neptunian objects, based on Herschel observations* (C. Kiss, A. Pál, T. Müller, P. Santos-Sanz, E. Vilenius, N. Szalai, E. Lellouche, and H. Böhnhardt)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1124.pdf

- P375 — *Evolution of the N2 frost distribution on Triton during thousands of terrestrial years* (M. Vangvichith and Mr. Forget)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1164.pdf
- P376 — *A 3D model of Pluto's atmosphere* (M. Vangvichith, F. Forget, and R. Wordsworth)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1165.pdf
- P377 — *Search for Pluto's aerosols: simultaneous IR and visible stellar occultation observations* (E.F. Young, L.A. Young, M.W. Buie, C.B. Olkin, R.R. Howell, R.G. French, L. Salas, K. Shoemaker, W. Fukunaga, A. Vengel, D.J. Tholen, and L.H. Wasserman)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1403.pdf
- P378 — *Dynamical atmospheric modeling of condensation flows on an N2 frost covered body* (C. Miller, N. J. Chanover, and J. R. Murphy)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1482.pdf
- P379 — *Hydra stellar occultation of 2011 June 27* (M. W. Buie, D. J. Tholen, L. H. Wasserman, B. Sicardy, L. A. Young, E. F. Young, W. Ryan, E. Ryan, K. Walsh, T. Widemann, F. Vachier, W. Beisker, T. Hall, J. Dire, C. K. Erickson, C. Nance, and M. Person)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1715.pdf
- P380 — *Long-term dynamical stability of the Haumea (2003 EL61) collisional family* (K. Volk and R. Malhotra)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-346-1.pdf
- P381 — *High-contrast observations of the Haumea system* (C. Dumas)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1528-1.pdf

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Poster Session OA10 : Ways to Effectively Communicate Science to the Media, Students, the Public, and through Social Media: A Three-Part Workshop Series
Attendance Times: Tuesday, Oct 4, 17:30-19:00
Display Times: Monday, Oct 3, 08:30 - Wednesday, Oct 5, 10:30

- P407 — *Communicating Herschel Key Programs in Solar System Studies to the Public* (M. Rengel, P. Hartogh, T. Müller, "HssO" Team, and "TNOs are Cool" Team)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-883-1.pdf

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Poster Session PD3/EO9 : Tides, migration, resonances and chaos in planetary systems
Attendance Times: Wednesday, Oct 5, 17:30-19:00
Display Times: Wednesday, Oct 5, 14:00 - Friday, Oct 7, 19:00

- P407 — *Libration amplitude distributions of resonant Kuiper belt objects* (K. Volk and R. Malhotra)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1517.pdf

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Oral Session OA6 : Amateur Astronomy Contribution to Planetary Sciences
Friday, October 7, 10:30-12:00
Mars Room

- 13:30 — *Observations of Stellar Occultations by Dwarf Planets and TNOs – International Campaigns* (W. Beisker, K.-L. Bath, B Sicardy, F Colas, M Assafin, CP Heidmann, M Daehne, D Herald, J de Jong, M Mugrauer, M Mommert, E Guenther, R Behrend, S Kowollik, and S Mottola)
  http://meetingorganizer.copernicus.org/EPSC-DPS2011/EPSC-DPS2011-1244-1.pdf

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⋆ Short articles, announcements, or editorials
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⋆ Requests for collaboration or observing coordination
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