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DISTANT EKOs

The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

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CONTENTS

NEWS & ANNOUNCEMENTS

There were 343 new TNO discoveries announced since the previous issue of *Distant EKOs* (this plus the 164 added in that past issue is a 25% increase in the number of known TNOs in one fell swoop!):

2004 VU131, 2004 VV131, 2013 JX67, 2013 UR22, 2015 GA57, 2015 GA58, 2015 GA59, 2015 GB57, 2015 GB58, 2015 GB59, 2015 GC57, 2015 GC58, 2015 GC59, 2015 GD57, 2015 GD58, 2015 GD59, 2015 GE56, 2015 GE57, 2015 GE58, 2015 GE59, 2015 GF56, 2015 GF57, 2015 GF58, 2015 GF59, 2015 GG56, 2015 GG57, 2015 GG58, 2015 GG59, 2015 GH56, 2015 GH57, 2015 GH58, 2015 GH59, 2015 GJ56, 2015 GJ57, 2015 GJ58, 2015 GJ59, 2015 GK56, 2015 GK57, 2015 GK58, 2015 GL56, 2015 GL57, 2015 GL58, 2015 GM56, 2015 GM57, 2015 GM58, 2015 GN56, 2015 GN57, 2015 GN58, 2015 GO55, 2015 GO56, 2015 GO57, 2015 GO58, 2015 GP55, 2015 GP56, 2015 GP57, 2015 GP58, 2015 GQ55, 2015 GQ56, 2015 GQ57, 2015 GQ58, 2015 GR55, 2015 GR56, 2015 GR57, 2015 GR58, 2015 GS55, 2015 GS56, 2015 GS57, 2015 GS58, 2015 GT55, 2015 GT56, 2015 GT57, 2015 GT58, 2015 GU56, 2015 GU57, 2015 GU58, 2015 GV56, 2015 GV57, 2015 GV58, 2015 GW56, 2015 GW57, 2015 GW58, 2015 GX56, 2015 GX57, 2015 GX58, 2015 GY56, 2015 GY57, 2015 GY58, 2015 GZ56, 2015 GZ57, 2015 GZ58, 2015 HZ196, 2015 KA175, 2015 KA176, 2015 KB175, 2015 KB176, 2015 KC175, 2015 KC176, 2015 KD175, 2015 KD176, 2015 KE175, 2015 KF175, 2015 KG175, 2015 KH175, 2015 KJ174, 2015 KJ175, 2015 KK174, 2015 KK175, 2015 KL174, 2015 KL175, 2015 KM174, 2015 KM175, 2015 KN174, 2015 KN175, 2015 KO175, 2015 KP174, 2015 KP175, 2015 KQ175, 2015 KR175, 2015 KS174, 2015 KS175, 2015 KT175, 2015 KU175, 2015 KV175, 2015 KW174, 2015 KW175, 2015 KX175, 2015 KY175, 2015 KZ174, 2015 KZ175, 2015 ML150, 2015 RA280, 2015 RA281, 2015 RB280, 2015 RB281, 2015 RC280, 2015 RC281, 2015 RD280, 2015 RD281, 2015 RE280, 2015 RE281, 2015 RF279, 2015 RF280, 2015 RF281, 2015 RG280, 2015 RG281, 2015 RH280, 2015 RH281, 2015 RJ278, 2015 RJ280, 2015 RJ281, 2015 RK278, 2015 RK280, 2015 RK281, 2015 RL279, 2015 RL280, 2015 RL281, 2015 RM278, 2015 RM279, 2015 RM280, 2015 RM281, 2015 RN278, 2015 RN279, 2015 RN280, 2015 RN281, 2015 RO278, 2015 RO279, 2015 RO280, 2015 RO281, 2015 RP278, 2015 RP279, 2015 RP280, 2015 RP281, 2015 RQ278, 2015 RQ279, 2015 RQ280, 2015 RR278, 2015 RR279, 2015 RR280, 2015 RS279, 2015 RS280, 2015 RT278, 2015 RT279, 2015 RT280, 2015 RU279, 2015 RU280, 2015 RV279, 2015 RV280, 2015 RW278, 2015 RW279, 2015 RW280, 2015 RX278, 2015 RX279, 2015 RX280, 2015 RY278, 2015 RY279, 2015 RY280, 2015 RZ279, 2015 RZ280, 2015 VA169, 2015 VA170, 2015 VA171, 2015 VA172, 2015 VA173, 2015 VB169, 2015 VB170, 2015 VB171, 2015 VB173, 2015 VC168, 2015 VC169, 2015 VC170, 2015 VC171, 2015 VC172, 2015 VC173, 2015 VD169, 2015 VD170, 2015 VD171, 2015 VD172, 2015 VD173, 2015 VE169, 2015 VE170, 2015 VE171, 2015 VE172, 2015 VE173, 2015 VF168, 2015 VF169, 2015 VF170, 2015 VF171, 2015 VF172, 2015 VF173, 2015 VG167, 2015 VG169, 2015 VG170, 2015 VG171, 2015 VG172, 2015 VG173, 2015 VH167, 2015 VH168, 2015 VH169, 2015 VH170, 2015 VH171, 2015 VH172, 2015 VH173, 2015 VJ167, 2015 VJ169, 2015 VJ170, 2015 VJ171, 2015 VJ172, 2015 VJ173, 2015 VK167, 2015 VK169, 2015 VK170, 2015 VK171, 2015 VK172, 2015 VK173, 2015 VL167, 2015 VL169, 2015 VL170, 2015 VL171, 2015 VL172, 2015 VL173, 2015 VM167, 2015 VM169, 2015 VM170, 2015 VM171, 2015 VM172, 2015 VM173, 2015 VN167, 2015 VN169, 2015 VN170, 2015 VN171, 2015 VN172, 2015 VN173, 2015 VO169, 2015 VO170, 2015 VO171, 2015 VO172, 2015 VO173, 2015 VP167, 2015 VP168, 2015 VP169, 2015 VP170, 2015 VP171, 2015 VP172,

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2015 VT173, 2015 VU167, 2015 VU168, 2015 VU169, 2015 VU170, 2015 VU171,
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2015 VW172, 2015 VX167, 2015 VX168, 2015 VX169, 2015 VX170, 2015 VX171,
2015 VX172, 2015 VY167, 2015 VY168, 2015 VY169, 2015 VY170, 2015 VY171,
2015 VY172, 2015 VZ168, 2015 VZ169, 2015 VZ170, 2015 VZ171, 2015 VZ172

and 63 new Centaur/SDO discoveries:

2015 GA56, 2015 GB56, 2015 GC56, 2015 GD56, 2015 GM55, 2015 GN55, 2015 GU55,
2015 GV55, 2015 GW55, 2015 GX55, 2015 GY55, 2015 GZ55, 2015 KC174,
2015 KD174, 2015 KE174, 2015 KF174, 2015 KG174, 2015 KH174, 2015 KO174,
2015 KQ174, 2015 KR174, 2015 KT174, 2015 KU174, 2015 KV174, 2015 KX174,
2015 KY174, 2015 RA279, 2015 RB279, 2015 RC279, 2015 RD279, 2015 RE279,
2015 RG279, 2015 RH278, 2015 RH279, 2015 RJ279, 2015 RL278, 2015 RS278,
2015 RU278, 2015 RV278, 2015 RZ278, 2015 VA168, 2015 VB168, 2015 VD167,
2015 VD168, 2015 VE167, 2015 VE168, 2015 VF167, 2015 VG168, 2015 VJ168,
2015 VK168, 2015 VL168, 2015 VM168, 2015 VN168, 2015 VO167, 2015 VO168,
2015 VQ167, 2015 VR167, 2015 VS167, 2015 VT167, 2015 VZ167, 2016 QU89,
2016 QV89, 2018 VG18,

and 4 new Neptune Trojan discoveries:

2015 RW277, 2015 VV165, 2015 VW165, 2015 VX165

Objects recently assigned numbers:

2015 AN281 = (523780)
2015 BD518 = (523782)
2015 BG518 = (523783)
2015 BJ518 = (523784)
2015 CM3 = (523785)
2015 DV224 = (523787)
2015 FN345 = (523789)
2015 HP9 = (523790)
2015 HT171 = (523791)
2015 OV79 = (523793)
2015 RR245 = (523794)
2016 NM56 = (523797)
2017 CX33 = (523798)
2017 KZ31 = (523800)

Deleted/Re-identified objects:

2001 FL193
2001 FH193 = 1997 GA45

Current number of TNOs: 2442 (including Pluto)
Current number of Centaurs/SDOs: 857
Current number of Neptune Trojans: 22

Out of a total of 3321 objects:
698 have measurements from only one opposition
692 of those have had no measurements for more than a year
368 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 Albedos, Sizes, Colors and Satellites of Dwarf Planets Compared with Newly Measured Dwarf Planet 2013 FY27

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2013 FY27 is the ninth intrinsically brightest Trans-Neptunian Object (TNO). We used ALMA at thermal wavelengths and Magellan in the optical to determine 2013 FY27's size and albedo for the first time and compare it to other dwarf planets. We found 2013 FY27 has a geometric albedo of $p_V = 0.17^{+0.045}_{-0.030}$ and effective diameter of $D = 765^{+80}_{-85}$ km. This puts 2013 FY27 in the transition region between the largest TNOs that have higher albedos and densities than smaller TNOs. No short-term light curve was found, with variations $< 0.06 \pm 0.02$ mags over hours and days. The Sloan colors of 2013 FY27 are $g - r = 0.76 \pm 0.02$ and $r - i = 0.31 \pm 0.03$ mags, giving a moderately red color. This is different than the neutral or ultra-red colors found for the ten largest TNOs, making 2013 FY27 one of the largest moderately red TNOs, which are only seen, and in abundance, at diameters less than 800 km. This suggests something different might be associated with TNOs larger than 800 km. Moderately red colors might indicate old or ice poor surfaces with TNOs larger than 800 km having fresher or more volatile rich surfaces. TNOs larger than 800 km could be more differentiated, giving them different surface compositions. A satellite at 0.17 arcsec and 3.0 ± 0.2 mags fainter than 2013 FY27 was found through Hubble Space Telescope observations. Almost all the largest TNOs have satellites, which now includes 2013 FY27. Assuming a similar albedo, the satellite is ~ 186 km in diameter, making the primary $D = 742^{+78}_{-83}$ km.

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or on the web at http://adsabs.harvard.edu/abs/2018AJ....156..270S

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Absolute Colours and Phase Coefficients of Trans-Neptunian Objects: $H_V - H_R$ and Relative Phase Coefficients

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The trans-Neptunian objects (TNOs) are small Solar System bodies at large distances from the Sun. As such, their physical properties are difficult to measure. Accurate determination of their physical parameters is essential to model and theorize the actual composition and distribution of the population, and to improve our understanding of the formation and evolution of the Solar System. The objective of this work is to construct phase curves in two filters, V and R, of a large TNO sample obtaining absolute magnitudes (H) and phase coefficients (β), and study possible relations between them and other physical parameters (orbital elements, sizes, and albedos). We used our own data, together with data from the literature, to create the phase curves assuming an overall linear trend. We obtained new magnitudes for 28 TNOs, 28 in the V filter and 36 in the R filter. These magnitudes, together with data from the literature, allowed us to obtain absolutes magnitudes, 114 in the V filter and 113 in the R filter, of which 106 have both. From the search for correlations, we found a strong anticorrelation between $H_V - H_R$ and $\Delta\beta = \beta_V - \beta_R$, which is probably more related to surface structure than to composition or size of the objects.

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or on the web at `http://adsabs.harvard.edu/abs/2018MNRAS.481.1848A`

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Colors of Centaurs Observed by the Subaru/Hyper Suprime-Cam and Implications for Their Origin

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Centaurs have orbits between Jupiter and Neptune and are thought to originate from the trans-Neptunian region. Observations of surface properties of Centaurs and comparison with those of trans-Neptunian objects (TNOs) would provide constraints on their origin and evolution. We analyzed imaging data of nine known Centaurs observed by the Hyper Suprime-Cam (HSC) installed on the Subaru Telescope with the g- and i-band filters. Using the data available in the public HSC data archive, as well as those obtained by the HSC Subaru Strategic Program (HSC-SSP) by the end of 2017 June, we obtained the $g-i$ colors of the nine Centaurs. We compared them with those of known TNOs in the HSC-SSP data obtained by T. Terai et al. (2018, PASJ, 70, S40). We found that the color distribution of the nine Centaurs is similar to that of those TNOs with high orbital inclinations, but distinct from those TNOs with low orbital inclinations. We also examined correlations between the colors of these Centaurs and their orbital elements and absolute magnitude. The Centaurs' colors show a moderate positive correlation with semi-major axis, while no significant correlations between the color and other orbital elements or absolute magnitude were found for these Centaurs. On the other hand, recent studies on Centaurs with larger samples show interesting correlations between their color and absolute magnitude or orbital inclination. We discuss how our data fit in these previous studies, and also discuss implications of these results for their origin and evolution.

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or on the web at `http://adsabs.harvard.edu/abs/2018PASJ...70..116S`

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Haumea's Thermal Emission Revisited in the Light of the Occultation Results

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A recent multi-chord occultation measurement of the dwarf planet (136108) Haumea (Ortiz et al. 2017) revealed an elongated shape with the longest axis comparable to Pluto's mean diameter. The chords also indicate a ring around Haumea's equatorial plane, where its largest moon, Hi'iaka, is also located. The Haumea occultation size estimate (size of an equal-volume sphere) $D_{equ} = 2 \cdot (a \cdot b \cdot c)^{1/3} = 1595\,\mathrm{km}$ is larger than previous radiometric solutions (equivalent sizes in the range between 1150 and 1350 km), which lowers the object's density to about $1.8\,\mathrm{g/cm^3}$, a value closer to the densities of other large TNOs. We present unpublished and also reprocessed Herschel and Spitzer mid- and far-infrared measurements. We compare 100- and 160-μm thermal lightcurve amplitudes - originating from Haumea itself - with models of the total measured system fluxes (ring, satellite, Haumea) from $24 - 350\,\mu$m. The combination with results derived from the occultation measurements allows us to reinterpret the object's thermal emission. Our radiometric studies show that Haumea's crystalline water ice surface must have a thermal inertia of about $5\,\mathrm{J\,K^{-1}\,m^{-2}s^{-1/2}}$ (combined with a root mean square of the surface slopes of 0.2). We also have indications that the satellites (at least Hi'iaka) must have high geometric albedos $\gtrsim$0.5, otherwise the derived thermal amplitude would be inconsistent with the total measured system fluxes at 24, 70, 100, 160, 250, and $350\,\mu$m. The high albedos imply sizes of about 300 and 150 km for Hi'iaka and Namaka, respectively, indicating unexpectedly high densities $>1.0\,\mathrm{g\,cm^{-3}}$ for TNOs this small, and the assumed collisional formation from Haumea's icy crust. We also estimated the thermal emission of the ring for the time period 1980-2030, showing that the contribution during the Spitzer and Herschel epochs was small, but not negligible. Due to the progressive opening of the ring plane, the ring emission will be increasing in the next decade when JWST is operational. In the MIRI $25.5\,\mu$m band it will also be possible to obtain a very high-quality thermal lightcurve to test the derived Haumea properties.

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Available online at `https://doi.org/10.1016/j.icarus.2018.11.011`
or at `https://arxiv.org/abs/1811.09476`

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Ring Dynamics around Non-Axisymmetric Bodies with Application to Chariklo And Haumea

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Dense and narrow rings have been discovered recently around the small Centaur object Chariklo and the dwarf planet Haumea, while being suspected around the Centaur Chiron, although this point is debated. They are the first rings observed in the Solar System elsewhere than around giant planets. In contrast to giant planets, gravitational fields of small bodies may exhibit large non-axisymmetric terms that create strong resonances between the spin of the object and the mean motion of ring particles. Here we show that modest topographic features or elongations of Chariklo and Haumea explain why their rings are relatively far away from the central body, when scaled to those of the giant planets. Resonances actually clear on decadal timescales an initial collisional disk that straddles the corotation resonance (where the particles' mean motion matches the spin rate of the body). Quite generically, the disk material inside the corotation radius migrates onto the body, while the material outside the corotation radius is pushed outside the 1/2 resonance, where the particles complete one revolution while the body completes two rotations. Consequently, the existence of rings around non-axisymmetric bodies requires that the 1/2 resonance resides inside the Roche limit of the body, favouring faster rotators for being surrounded by rings.

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For preprints, contact `bruno.sicardy@obspm.fr`

or on the web at `https://www.nature.com/articles/s41550-018-0616-8`

and `https://rdcu.be/bbGIO`

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Ongoing Resurfacing of KBO Eris by Volatile Transport in Local, Collisional, Sublimation Atmosphere Regime

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Kuiper belt object (KBO) Eris is exceptionally bright with a greater visible geometric albedo than any other known KBO. Its infrared reflectance spectrum is dominated by methane, which should form tholins that darken the surface on timescales much shorter than the age of the Solar System. Thus one or more ongoing processes probably maintain its brightness. Eris is predicted to have a primarily nitrogen atmosphere that is in vapor pressure equilibrium with nitrogen-ice and is collisional (not ballistic). Eris's eccentric orbit is expected to result in two atmospheric regimes: (1) a period near perihelion when the atmosphere is global (analogous to the atmospheres of Mars, Triton, and Pluto) and (2) a period near aphelion when only a local atmosphere exists near the warmest region (analogous to the atmosphere of Io). A numerical model developed to simulate Eris's thermal and volatile evolution in the local atmosphere regime is presented. The model conserves energy, mass, and momentum while maintaining vapor pressure equilibrium. It is adaptable to other local, collisional, sublimation atmospheres, which in addition to Io and Eris, may occur on several volatile-bearing KBOs. The model was applied for a limiting case where Eris is fixed at aphelion and has an initial nitrogen-ice mass everywhere equal to the precipitable column of nitrogen in Pluto's atmosphere during the New Horizons encounter (the resultant mass if the Pluto atmosphere collapsed uniformly onto the surface). The model results indicate that (1) transport of nitrogen in the local, collisional, sublimation atmosphere regime is significant, (2) changes of Eris's albedo or color from nitrogen transport may be observable, and (3) uniform collapse of a global, nitrogen atmosphere likely cannot explain Eris's anomalous albedo in the present epoch. Seasonal volatile transport remains a plausible hypothesis to explain Eris's anomalous albedo and geologic processes that renew Pluto's brightest surfaces, such as convection and glaciation, may also be operating on Eris.

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Available online at `https://doi.org/10.1016/j.icarus.2018.10.028`
or at `http://arxiv.org/abs/1811.02677`

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Return to the Kuiper Belt: Launch Opportunities from 2025 to 2040

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Preliminary spacecraft trajectories for 45 Kuiper Belt objects (KBOs) and Pluto suitable for launch between 2025 and 2040 are presented. These 46 objects comprise all objects with H magnitude <4.0 or that have received a name from the International Astronomical Union as of May 2018. Using a custom Lambert solver, trajectories are modeled after the New Horizons mission to Pluto-Charon, which consisted of a fast launch with a Jupiter gravity assist. In addition to searching for Earth-Jupiter-KBO trajectories, Earth-Saturn-KBO trajectories are examined, with the option to add on a flyby to either Uranus or Neptune. With a single Jupiter gravity assist, all 45 KBOs and Pluto can be reached within a 25 year maximum mission duration. A more limited number can be reached when non-Jupiter flybys are added, and the KBOs that can be reached via these alternate routes are listed. In most cases, a single Jupiter flyby is the most efficient way to get to the Kuiper Belt, but the science return from revisiting Saturn, Uranus, or Neptune may add substantial value to a mission, and so alternate flybys should be considered.

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For preprints, contact `azangari@boulder.swri.edu`
or on the web at `https://arxiv.org/abs/1810.07811`
and `https://doi.org/10.2514/1.A34329`

PAPERS RECENTLY SUBMITTED TO JOURNALS

Trans-Neptunian Objects and Centaurs at Thermal Wavelengths

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The thermal emission of transneptunian objects (TNO) and Centaurs has been observed at mid- and far-infrared wavelengths, with the biggest contributions coming from Spitzer and Herschel, and the brightest ones also at sub-millimeter and millimeter wavelengths. These measurements allowed to determine the sizes and albedos for almost 180 objects, and densities for about 25 multiple systems. The derived very low thermal inertias show evidence for a decrease at large heliocentric distances and for high-albedo objects, which indicates porous and low-conductivity surfaces. The radio emissivity was found to be low (ϵ_r=0.70±0.13) with possible spectral variations in a few cases. The general increase of density with object size points to different formation locations or times. The mean albedos increase from about 5-6% (Centaurs, Scattered-Disk Objects) to 15% for the Detached objects, with distinct cumulative albedo distributions for hot and cold classicals. The color-albedo separation in our sample is evidence for a compositional discontinuity in the young Solar System. The median albedo of the sample (excluding dwarf planets and the Haumea family) is 0.08, the albedo of Haumea family members is close to 0.5, best explained by the presence of water ice. The existing thermal measurements remain a treasure trove at times where the far-infrared regime is observationally not accessible.

Submitted to: "The Trans-Neptunian Solar System"
(Eds: Prialnik, Barucci & Young)
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OTHER PAPERS OF INTEREST

The Scattered Disc of HR 8799

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HR 8799 is a young F0-type star with four directly imaged giant planets and two debris belts, one located exterior and another one interior to the region occupied by the planetary orbits. Having an architecture similar to that of our Solar System, but also revealing dissimilarities such as high masses of planets, a huge radial extent and a high mass of the outer debris belt, HR 8799 is considered to be a benchmark to test formation and evolution models of planetary systems. Here we focus on the outer debris ring and its relation to the planets. We demonstrate that the models of the outer disc, proposed previously to reproduce Herschel observations, are inconsistent with the ALMA data, and vice versa. In an attempt to find a physically motivated model that would agree with both observational sets, we perform collisional simulations. We show that a narrow planetesimal belt and a radiation pressure induced dust halo cannot account for the observed radial brightness profiles. A single, wide planetesimal disc does not reproduce the data either. Instead, we propose

a two-population model, comprising a Kuiper-Belt-like structure of a low-eccentricity planetesimal population ("the classical Kuiper Belt") and a high-eccentricity population of comets ("scattered disc"). We argue that such a structure of the exo-Kuiper belt of HR 8799 could be explained with planet migration scenarios analogous to those proposed for the Kuiper Belt of the Solar System.

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or on the web at `http://adsabs.harvard.edu/abs/2019MNRAS.483..332G`

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A Northern Ecliptic Survey for Solar System Science

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[9] University of Edinburgh, Edinburgh, UK
[10] Brigham Young University, Provo, UT, USA
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Making an inventory of the Solar System is one of the four fundamental science requirements for the Large Synoptic Survey Telescope (LSST). The current baseline footprint for LSST's main Wide-Fast-Deep (WFD) Survey observes the sky below 0° declination, which includes only half of the ecliptic plane. Critically, key Solar System populations are asymmetrically distributed on the sky: they will be entirely missed, or only partially mapped, if only the WFD occurs. We propose a Northern Ecliptic Spur (NES) mini survey, observing the northern sky up to +10° ecliptic latitude, to maximize Solar System science with LSST. The mini survey comprises a total area of ∼5800 deg^2/604 fields, with 255 observations/field over the decade, split between *g,r,* and *z* bands. Our proposed survey will 1) obtain a census of main-belt comets; 2) probe Neptune's past migration history, by exploring the resonant structure of the Kuiper belt and the Neptune Trojan population; 3) explore the origin of Inner Oort cloud objects and place significant constraints on the existence of a hypothesized planet beyond Neptune; and 4) enable precise predictions of KBO stellar occultations. These high-ranked science goals of the Solar System Science Collaboration are only achievable with this proposed northern survey.

Submitted to: The LSST Cadence Optimization White Paper Call
For preprints, contact: `mschwamb.astro@gmail.com`
or on the web at `https://arxiv.org/abs/1812.01149`

CONFERENCE INFORMATION

Thermal Models for Planetary Science III

2019 February 20-22
Hungarian Academy of Sciences, Budapest, Hungary

We'd like to announce a workshop on "Thermal Models for Planetary Science III" (TherMoPS III), which follows up on the discussions and results of TherMoPS I (Beaulieu sur Mer, France, 2008 September 15-17) and TherMoPS II (Puerto de la Cruz, Tenerife, Spain, 2015 June 3-5). The main topic is the modelling and interpretation of thermal emission measurements of small bodies in our Solar System: The targets include all kind of small bodies without atmospheres (near-Earth objects, main-belt objects, trans-Neptunian objects, satellites, our Moon). Thermal comprise ground-based, airborne, and space measurements (remote observations), as well as measurements from interplanetary missions (in-situ observations), covering the wavelengths from near-IR to the submm/mm/cm range, and also relevant laboratory measurements.

The workshop is organised by the Small Bodies Near And Far (SBNAF) team.

Registration for the workshop is open.

For more information, visit the meeting website at `http://thermops2019.hu/`

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Centaur Exploration Workshop: The Roots of Activity

2019 March 6-8
University of Central Florida, Florida Space Institute, Orlando, FL, USA

A workshop addressing the scientific importance and space exploration relevance of active centaurs, with a specific focus on mapping knowledge gaps and paths forward. The impetus is two-fold: Advance our understanding of how small bodies originate, evolve and become active beyond Jupiter's orbit; Planning of exploration strategies – Both Earth-based observations and Space-based measurements – aimed at representative objects of the Centaur population.

Solicited discussion topics – Structure, Composition, Dynamics, Activity – will be framed as perceived knowledge gaps, related to both individual properties and population trends. Short abstracts (500 words or less) are requested from those interested in contributing presentation or facilitating discussion sessions. We plan to offer both in-person and virtual participation options and strongly encourage the inclusion of early career researchers (including graduate students and postdoctoral researchers).

NOI, registration, and abstract submission are now open.
Registration and abstract submission are due by January 7, 2019.
In-person participation will be capped - Consider registering early and submitting an abstract.
Online participation will be available - Will require registration and notice of acceptance.

For more information, please check the workshop website: `https://cew2019.arc.nasa.gov`
Questions? Please contact the organizers:
Gal Sarid (`gal.sarid@ucf.edu`) and Maria Womack (`womack@usf.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 papers submitted, in press, or recently published in refereed journals
⋆ 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:

`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`