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DISTANT EKOs

The Kuiper Belt Electronic Newsletter

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NEWS & ANNOUNCEMENTS

There were 11 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2003 UY413, 2014 HX209, 2014 JC92, 2015 KU178, 2016 SH57, 2016 SJ56, 2016 SQ55, 2016 SQ58, 2016 SZ57, 2019 RO4, 2018 MF13

and 12 new Centaur/SDO discoveries:

2012 GT41, 2013 CJ118, 2015 HA197, 2016 SA56, 2016 SU55, 2018 RR2, 2019 CJ3, 2019 GN22, 2019 QQ8, 2019 TL8, 2019 UH12, 2019 UO14

Reclassified objects:
- 2015 SV20 (SDO → Centaur)
- 2017 YK3 (Centaur → TNO)
- 2007 RL314 (TNO → SDO)
- 2010 RD188 (TNO → SDO)
- 2003 US292 (SDO → TNO)
- 2010 PK66 (SDO → TNO)
- 2014 OL394 (SDO → TNO)
- 2018 AZ18 (SDO → TNO)

Objects recently assigned numbers:
- 2013 AP183 = (542258)
- 2013 MY11 = (542889)
- 2015 TG387 = (541132)

Objects recently assigned names:
- 2007 UK126 = G!kún||'hòmdímà
- 2014 GE45 = Zhulong
- 2014 MU69 = Arrokoth

Deleted/Re-identified objects:
- 2005 JZ185 = 2015 KU178
- 2010 TF182 = 2015 SO20
- 2010 TO182 = 2011 UK411
- 2010 TQ182 = 2014 UM33
- 2014 CH5 = 2014 DO143
- 2014 OZ391 = 2015 PN291
- 2019 CR
- 2016 GR206

Current number of TNOs: 2416
Current number of Centaurs/SDOs: 1085
Current number of Neptune Trojans: 24

Out of a total of 3525 objects:
- 670 have measurements from only one opposition
  - 667 of those have had no measurements for more than a year
    - 364 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

OSSOS XII: Variability Studies of 65 Trans-Neptunian Objects using the Hyper-Suprime Camera

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We present variability measurements and partial light curves of Trans-Neptunian Objects (TNOs) from a two-night pilot study using Hyper Suprime-Cam (HSC) on the Subaru Telescope (Maunakea, Hawai'i, USA). Subaru's large aperture (8-m) and HSC's large field of view (1.77 deg^2) allow us to obtain measurements of multiple objects with a range of magnitudes in each telescope pointing. We observed 65 objects with $m_r = 22.6$–25.5 mag in just six pointings, allowing 20–24 visits of each pointing over the two nights. Our sample, all discovered in the recent Outer Solar System Origins Survey (OSSOS), span absolute magnitudes $H_r = 6.2$–10.8 mag and thus investigates smaller objects than previous light curve projects have typically studied. Our data supports the existence of a correlation between light curve amplitude and absolute magnitude seen in other works, but does not support a correlation between amplitude and orbital inclination. Our sample includes a number of objects from different dynamical populations within the trans-Neptunian region, but we do not find any relationship between variability and dynamical class. We were only able to estimate periods for 12 objects in the sample and found that a longer baseline of observations is required for reliable period analysis. We find that 31 objects (just under half of our sample) have variability $\Delta_{\rm mag}$ greater than 0.4 mag during all of the observations; in smaller 1.25 hr, 1.85 hr and 2.45 hr windows, the median $\Delta_{\rm mag}$ is 0.13, 0.16 and 0.19 mags, respectively. The fact that variability on this scale is common for small TNOs has important implications for discovery surveys (such as OSSOS or the Large Synoptic Survey Telescope) and color measurements.

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or on the web at `http://adsabs.harvard.edu/abs/2019ApJS..244...19A`

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Trans-Neptunian Objects Found in the First Four Years of the Dark Energy Survey

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We present a catalog of 316 trans-Neptunian bodies (TNOs) detected from the first four seasons ("Y4" data) of the *Dark Energy Survey* (*DES*). The survey covers a contiguous 5000 deg^2 of the southern sky in the *grizY* optical/NIR filter set, with a typical TNO in this part of the sky being targeted by 25-30

Y4 exposures. This paper focusses on the methods used to detect these objects from the ≈60,000 Y4 exposures, a process made challenging by the absence of the few-hour repeat observations employed by TNO-optimized surveys. Newly developed techniques include: transient/moving object detection by comparison of single-epoch catalogs to catalogs of "stacked" images; quantified astrometric error from atmospheric turbulence; new software for detecting TNO linkages in a temporally sparse transient catalog, and for estimating the rate of spurious linkages; and use of faint stars to determine the detection efficiency vs magnitude in all exposures. Final validation of the reality of linked orbits uses a new "sub-threshold confirmation" test, wherein we demand the object be detectable in a stack of the exposures in which the orbit indicates an object should be present, but was not individually detected. This catalog contains all validated TNOs which were detected on ≥ 6 unique nights in the Y4 data, and is complete to $r \lesssim 23.3$ mag with virtually no dependence on orbital properties for bound TNOs at distance 30 AU $< d <$ 2500 AU. The catalog includes 245 discoveries by *DES*, 139 not previously published. The final *DES* TNO catalog is expected to yield > 0.3 mag more depth, and arcs of > 4 years for nearly all detections.

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For preprints, contact pedrobe@sas.upenn.edu
or on the web at https://arxiv.org/abs/1909.01478

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Dynamical Evidence for an Early Giant Planet Instability

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The dynamical structure of the Solar System can be explained by a period of orbital instability experienced by the giant planets. While a late instability was originally proposed to explain the Late Heavy Bombardment, recent work favors an early instability. Here we model the early dynamical evolution of the outer Solar System to self-consistently constrain the most likely timing of the instability. We first simulate the dynamical sculpting of the primordial outer planetesimal disk during the accretion of Uranus and Neptune from migrating planetary embryos during the gas disk phase, and determine the separation between Neptune and the inner edge of the planetesimal disk. We performed simulations with a range of (inward and outward) migration histories for Jupiter. We find that, unless Jupiter migrated inwards by 10 AU or more, the instability almost certainly happened within 100 Myr of the start of Solar System formation. There are two distinct possible instability triggers. The first is an instability that is triggered by the planets themselves, with no appreciable influence from the planetesimal disk. About half of the planetary systems that we consider have a self-triggered instability. Of those, the median instability time is ∼4 Myr. Among self-stable systems – where the planets are locked in a resonant chain that remains stable in the absence of a planetesimal's disk – our self-consistently sculpted planetesimal disks nonetheless trigger a giant planet instability with a median instability time of 37-62 Myr for a reasonable range of migration histories of Jupiter. The simulations that give the latest instability times are those that invoked long-range inward migration of Jupiter from 15 AU or beyond; however these

simulations over-excited the inclinations of Kuiper belt objects and are inconsistent with the present-day Solar System. We conclude on dynamical grounds that the giant planet instability is likely to have occurred early in Solar System history.

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or on the web at https://arxiv.org/abs/1912.10879
and at https://doi.org/10.1016/j.icarus.2019.113605

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Calibration of the Angular Momenta of the Minor Planets in the Solar System

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Aims. We aim to determine the relative angle between the total angular momentum of the minor planets and that of the Sun-planets system, and to improve the orientation of the invariable plane of the solar system.

Methods. By utilizing physical parameters available in public domain archives, we assigned reasonable masses to 718041 minor planets throughout the solar system, including near-Earth objects, main belt asteroids, Jupiter trojans, trans-Neptunian objects, scattered-disk objects, and centaurs. Then we combined the orbital data to calibrate the angular momenta of these small bodies, and evaluated the specific contribution of the massive dwarf planets. The effects of uncertainties on the mass determination and the observational incompleteness were also estimated.

Results. We determine the total angular momentum of the known minor planets to be 1.7817×10^{46} g cm^2 s^{-1}. The relative angle α between this vector and the total angular momentum of the Sun-planets system is calculated to be about 14.74°. By excluding the dwarf planets Eris, Pluto, and Haumea, which have peculiar angular momentum directions, the angle α drops sharply to 1.76°; a similar result applies to each individual minor planet group (e.g., trans-Neptunian objects). This suggests that, without these three most massive bodies, the plane perpendicular to the total angular momentum of the minor planets would be close to the invariable plane of the solar system. On the other hand, the inclusion of Eris, Haumea, and Makemake can produce a difference of 1254 mas in the inclination of the invariable plane, which is much larger than the difference of 9 mas induced by Ceres, Vesta, and Pallas as found previously. By taking into account the angular momentum contributions from all minor planets, including the unseen ones, the orientation improvement of the invariable plane is larger than 1000 mas in inclination with a 1σ error of $\sim 50 - 140$ mas.

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Available on the web at http://adsabs.harvard.edu/abs/2019A%26A...630A..68L

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Long-term Orbital Dynamics of Trans-Neptunian Objects

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This article reviews the different mechanisms affecting the orbits of trans-Neptunian objects, ranging from internal perturbations (planetary scattering, mean-motion resonances, secular effects) to external perturbations (galactic tides, passing stars). We outline the theoretical tools that can be used to model and study them, focussing on analytical approaches. We eventually compare these mechanisms to the observed distinct populations of trans-Neptunian objects and conclude on how they participate to the sculpting of the whole distribution.

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Three Dimensional Structure of Mean Motion Resonances Beyond Neptune

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We propose a semianalytical method for the calculation of widths, libration centers and small amplitude libration periods of the mean motion resonances k_p:k in the framework of the circular restricted three body problem valid for arbitrary eccentricities and inclinations. Applying the model to the trans Neptunian region (TNR) we obtain several atlas of resonances between 30 and 100 au showing their domain in the plane (a, e) for different orbital inclinations. The resonance width may change substantially when varying the argument of the perihelion of the resonant object and in order to take into account these variations we introduce the concept of resonance fragility. Resonances 1:k and 2:k are the widest, strongest, most isolated ones and with lower fragility for all interval of inclinations and eccentricities. We discuss about the existence of high k_p:k resonances. We analyze the distribution of the resonant populations inside resonances 1:1, 2:3, 3:5, 4:7, 1:2 and 2:5. We found that the populations are in general located near the regions of the space (e, i) where the resonances are wider and less fragile with the notable exception of the population inside the resonance 4:7 and in a lesser extent the population inside 3:5 which are shifted to lower eccentricities.

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or on the web at https://arxiv.org/abs/1912.04676
The Resonance Atlas and codes are available at http://www.fisica.edu.uy/~gallardo/atlas/

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A Study of the High-inclination Population in the Kuiper Belt – III. The 4:7 Mean Motion Resonance

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The high-inclination population in the 4:7 mean motion resonance (MMR) with Neptune has also substantial eccentricities ($e \geq 0.1$), with more inclined objects tending to occupy more eccentric orbits. For this high-order resonance, there are two different resonant modes. The principal one is the eccentricity-type mode, and we find that libration is permissible for orbits with $e \geq e_c^0$, where the critical eccentricity e_c^0 increases as a function of increasing inclination i. Correspondingly, we introduce a limiting curve $e_c^0(i)$, which puts constraints on the (e, i) distribution of possible 4:7 resonators. We then perform numerical simulations on the sweep-up capture and long-term stability of the 4:7 MMR, and the results show that the simulated resonators are well-constrained by this theoretical limiting curve. The other 4:7 resonant mode is the mixed-(e, i)-type, and we show that stable resonators should exist at $i \geq 20°$. We predict that the intrinsic number of these mixed-(e, i)-type resonators may provide a new clue into the Solar system's evolution, but, so far, only one real object has been observed resonating in this mode.

To appear in: Monthly Notices of the Royal Astronomical Society

Preprints available on the web at `https://arxiv.org/abs/1912.11174`

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The HST Lightcurve of (486958) 2014 MU_{69}

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We report Hubble Space Telescope (HST) lightcurve observations of the *New Horizons* spacecraft encounter Kuiper Belt object (KBO) (486958) 2014 MU_{69} acquired near opposition in July 2017. In order to plan the optimum flyby sequence the *New Horizons* mission planners needed to learn as much as possible about the target in advance of the encounter. Specifically, from lightcurve data, encounter timing could be adjusted to accommodate a highly elongated, binary, or rapidly rotating target. HST astrometric (Porter et al. 2018) and stellar occultation (Buie et al. 2018) observations constrained MU69's orbit and diameter (21-41 km for an albedo of 0.15-0.04), respectively. Photometry from the astrometric dataset suggested a variability of ≥0.3 mags, but they did not determine the period or provide shape information. To that end we strategically spaced 24 HST orbits over 9 days to investigate rotation periods from approximately 2-100 hours and to better constrain the lightcurve amplitude. Until *New Horizons* detected MU69 in its optical navigation images beginning in August 2018, this HST lightcurve campaign provided the most accurate photometry to date. The mean variation in our data is 0.15 magnitudes which suggests that MU69 is either nearly spherical (a:b axis ratio of 1:1.15), or its pole vector is pointed near the line of sight to Earth; this interpretation does not preclude a near-contact binary or bi-lobed object. However, image stacks do conclude that MU69 does not have a binary companion ≥2000 km with a sensitivity to 29th magnitude (an object a few km in size for an albedo of 0.04-0.15). Our data are not of sufficient signal to noise to uniquely determine the period or amplitude, however, they did provide the necessary information for spacecraft planning. We report with confidence that MU69 is not both rapidly rotating and highly elongated (which we define as a lightcurve amplitude ≥0.5 magnitude). Since this paper is being published post fly-by, we note that our results are consistent with the fly-by imagery and orientation of MU69 (Stern et al. 2019). The combined dataset also suggests that within the KBO lightcurve literature there are likely other objects which share a geometric configuration like MU69 resulting in an underestimate of the contact binary fraction for the Cold Classical Kuiper Belt.

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The Color and Binarity of (486958) 2014 MU_{69} and Other Long-Range *New Horizons* Kuiper Belt Targets

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The Hubble Space Telescope (HST) measured the colors of eight Kuiper Belt Objects (KBOs) that will be observed by the *New Horizons* spacecraft including its 2019 close fly-by target the Cold Classical KBO (486958) 2014 MU_{69}. We find that the photometric colors of all eight objects are red, typical of the Cold Classical dynamical population within which most reside. Because 2014 MU_{69} has a similar color to that of other KBOs in the Cold Classical region of the Kuiper Belt, it may be possible to use the upcoming high-resolution New Horizons observations of 2014 MU_{69} to draw conclusions about the greater Cold Classical population. Additionally, HST found none of these KBOs to be binary within separations of ∼0.06 arcsec (∼2000 km at 44 AU range) and $\Delta m \leq 0.5$. This conclusion is consistent with the lower fraction of binaries found at relatively wide separations. A few objects appear to have significant photometric variability, but our observations are not of sufficient signal-to-noise or time duration for further interpretation.

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The Changing Rotational Light-curve Amplitude of Varuna and Evidence for a Close-in Satellite

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From CCD observations carried out with different telescopes, we present short-term photometric measurements of the large trans-Neptunian object Varuna in 10 epochs, spanning around 19 years. We observe that the amplitude of the rotational light-curve has changed considerably during this period of time from 0.41 to 0.55 mag. In order to explain this variation, we constructed a model in which Varuna has a simple triaxial shape, assuming that the main effect comes from the change of the aspect angle as seen from Earth, due to Varuna's orbital motion in the 19-year time span. The best fits to the data correspond to a family of solutions with axial ratios b/a between 0.56 and 0.60. This constrains the pole orientation in two different ranges of solutions presented here as maps. Apart from the remarkable variation of the amplitude, we have detected changes in the overall shape of the rotational light-curve over shorter time scales. After the analysis of the periodogram of the residuals to a 6.343572 h double-peaked rotational light-curve fit, we find a clear additional periodicity. We propose that these changes in the rotational light-curve shape are due to a large and close-in satellite whose rotation induces the additional periodicity. The peak-to-valley amplitude of this oscillation is in the order of 0.04 mag. We estimate that the satellite orbits Varuna with a period of 11.9819 h (or 23.9638 h), assuming that the satellite is tidally locked, at a distance of $\sim$ 1300 km (or $\sim$ 2000 km) from Varuna, outside the Roche limit.

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The Complex Rotational Light Curve of (385446) Manwë-Thorondor, a Multicomponent Eclipsing System in the Kuiper Belt

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Kuiper Belt Object (385446) Manwë-Thorondor is a multiobject system with mutual events predicted to occur from 2014 to 2019. To detect the events, we observed the system at 4 epochs (UT 2016 Aug 25

and 26, 2017 Jul 22 and 25, 2017 Nov 9, and 2018 Oct 6) in g, r, and VR bands using the 4-m SOAR and the 8.1-m Gemini South telescopes at Cerro Pachón, Chile and Lowell Observatory's 4.3-m Discovery Channel Telescope at Happy Jack, Arizona. These dates overlap the uncertainty range (±0.5 d) for four inferior events (Thorondor eclipsing Manwë). We clearly observe variability for the unresolved system with a double-peaked period 11.88190±0.00005 h and ∼0.5 mag amplitude together with much longer-term variability. Using a multicomponent model, we simultaneously fit our observations and earlier photometry measured separately for Manwë and Thorondor with the Hubble Space Telescope. Our fit suggests Manwë is bilobed, close to the "barbell" shape expected for a strengthless body with density ∼0.8 g/cm^3 in hydrostatic equilibrium. For Manwë, we thereby derive maximum width to length ratio ∼0.30, surface area equivalent to a sphere of diameter 190 km, geometric albedo 0.06, mass $1.4 \times 10^1$8 kg, and spin axis oriented ∼75 deg from Earth's line of sight. Changes in Thorondor's brightness by ∼0.6 mag with ∼300-d period may account for the system's long-term variability. Mutual events with unexpectedly shallow depth and short duration may account for residuals to the fit. The system is complex, providing a challenging puzzle for future modeling efforts.

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Phase Curves from the Kuiper Belt: Photometric Properties of Distant Kuiper Belt Objects Observed by New Horizons

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Prior to its close encounter with the Kuiper belt object (KBO) (486958) 2014 MU_{69} on 1 January 2019, NASA's *New Horizons* spacecraft observed other KBOs from distances greater than 0.1 AU at solar phase angles far larger than those attainable from Earth. The expanded range in phase angle afforded by these distant KBO (DKBO) observations enables comparisons between their phase functions and those of other Solar System objects. Here we present extended *New Horizons* phase angle coverage of plutino (15810) Arawn (1994 JR_1) to 131°, resonant KBO 2012 HE_{85} to 64°, scattered disk KBO 2011 HK_{103} to 124°, hot classical (515977) 2012 HZ_{84} to 73°, and cold classical KBOs 2011 HJ_{103} and 2011 JY_{31} to 27° and 122°, respectively. In general, DKBO solar phase curves have slopes (i.e. phase coefficients) and shapes (with corresponding phase integrals q) similar to those of other dark, small Solar System objects including comet nuclei, asteroids, and satellites. Until stellar occultations by these DKBOs provide information about their size, geometric albedos p (and Bond albedos $A = pq$) must be inferred from the median albedos measured by thermal radiometry for each dynamical class. Bond albedos for these DKBOs range from 0.01 to 0.04. Cold classical JY_{31} has a slightly lower slope and higher phase integral than the other DKBOs, and its slope and phase integral come closest to matching those of cold classical MU_{69}, suggesting that cold classical KBOs share surface scattering characteristics that are distinct from those of other KBOs.

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29P/Schwassmann-Wachmann 1, A Centaur in the Gateway to the Jupiter-family Comets

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Jupiter-family comets (JFCs) are the evolutionary products of trans-Neptunian objects (TNOs) that evolve through the giant planet region as Centaurs and into the inner solar system. Through numerical orbital evolution calculations following a large number of TNO test particles that enter the Centaur population, we have identified a short-lived dynamical Gateway, a temporary low-eccentricity region exterior to Jupiter through which the majority of JFCs pass. We apply an observationally based size distribution function to the known Centaur population and obtain an estimated Gateway region population. We then apply an empirical fading law to the rate of incoming JFCs implied by the the Gateway region residence times. Our derived estimates are consistent with observed population numbers for the JFC and Gateway populations. Currently, the most notable occupant of the Gateway region is 29P/Schwassmann-Wachmann 1 (SW1), a highly active, regularly outbursting Centaur. SW1's present-day, very-low-eccentricity orbit was established after a 1975 Jupiter conjunction and will persist until a 2038 Jupiter conjunction doubles its eccentricity and pushes its semimajor axis out to its current aphelion. Subsequent evolution will likely drive SW1's orbit out of the Gateway region, perhaps becoming one of the largest JFCs in recorded history. The JFC Gateway region coincides with a heliocentric distance range where the activity of observed cometary bodies increases significantly. SW1's activity may be typical of the early evolutionary processing experienced by most JFCs. Thus, the Gateway region, and its most notable occupant SW1, are critical to both the dynamical and physical transition between Centaurs and JFCs.

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Database on Detected Stellar Occultations by Small Outer Solar System Objects

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Observation of stellar occultation by objects of the Solar System is a powerful technique that allows measurements of size and shape of the small bodies with accuracies in the order of the kilometre. In addition, the occultation star probes the surroundings of the object, allowing the study of putative rings/debris or atmosphere around it. Since 2009, more than 60 events by trans-Neptunian and Centaur objects have been detected, involving more than 34 different bodies. Some remarkable results were achieved, such as the discovery of rings around Chariklo and Haumea, or the high albedo of Eris, the lack of global atmosphere around Makemake and the discovery of the double shape of 2014 MU_{69}, among others. After the release of Gaia catalogues, predictions became more accurate, leading to an increasing number of successful observations of occultation events. To keep track of the results achieved with this technique, we created a database to gather all the detected events worldwide. The database is presented as an electronic table (http://occultations.ct.utfpr.edu.br/), where the main information obtained from any occultation by small outer solar system objects are listed. The structure and term definitions used in the database are presented here, as well as some simple statistics that can be done with the available results.

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PAPERS RECENTLY SUBMITTED TO JOURNALS

Col-OSSOS: Compositional Homogeneity of Three Binaries Found in the Outer Solar System Origins Survey

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The surface characterization of Trans-Neptunian Binaries (TNBs) is key to understanding the mechanisms involved in their formation and, therefore, the properties of the disk of planetesimals from which these objects formed. In the optical wavelengths, it has been demonstrated that most equal-sized component systems share similar colors, suggesting they have the same composition. The color homogeneity of binary pairs contrasts with the overall diversity of colors in the Kuiper belt, which was interpreted as evidence that Trans-Neptunian Objects (TNOs) formed from a locally homogeneous and globally heterogeneous protoplanetary disk. In this paradigm, binary pairs must have formed early, before the dynamically excited TNOs were scattered out from their formation location. The latter inferences, however, relied on the assumption that the matching colors of the binary components imply matching composition. Here, we test this assumption by examining the component-resolved photometry of three TNBs found in the Outer Solar System Origins Survey (OSSOS) across the full visible and near-infrared wavelength range. We report similar colors within 2σ deviation for the binary pairs suggestive of similar reflectance spectra and hence surface composition. This supports previous assertions made about TNO formation and the properties of the original disk of planetesimals. We however stress that several small TNOs, including at least one binary, are known to exhibit substantial spectral variability in the near-infrared, implying color equality of binary pairs is likely to be violated in some cases.

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CONFERENCE INFORMATION

COSPAR Session 20-B1.3: Results from the Exploration of the Kuiper Belt by NASA's New Horizons Mission

43rd COSPAR Scientific Assembly
August 15-22, 2020
Sydney, Australia

We call your attention and invite contributed talks for the COSPAR-2020 session on "Results from the Exploration of the Kuiper Belt by NASA's New Horizons Mission."

This session will review and extend the scientific results obtained from the exploration of KBO 2014 MU69 (Arrokoth) by NASA's New Horizons mission. Topics will include the color, composition, bulk properties, geology and origin of MU69, including its cratering record, with the objective of understanding the formation of Kuiper Belt planetesimals. The session will also examine the loss of primordial volatiles from MU69, its space weathering evolution, the Kuiper Belt radiation and dust environment, and observations of dwarf planets and other KBOs to assess satellite populations, phase curves, rotational lightcurves, and shapes, and to otherwise place MU69 in context.

On behalf of this special session's conveners and scientific organizing committee: Alan Stern, Dale Cruikshank, Michele Bannister, Cynthia Conrad, JJ Kavelaars, Alessandro Morbidelli, Catherine Olkin, Bernard Schmitt, Kelsi Singer, John Spencer, Anne Verbiscer, Harold Weaver

Meeting website: `https://www.cospar-assembly.org`

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X Planetary Science Workshop

March 9-13, 2020
Punta del Este and Maldonado, Uruguay

The Planetary Science Workshops emerged in 1999 as working meetings between researchers, professors and university students, with the objective of exchanging ideas and advances in the area of planetary sciences in Latin America. Since its inception, these workshops have been expanding their theme and growing in number of participants. The topics cover physics, dynamics, and astrophysical observations of solar system bodies, formation and evolution of planetary systems, extrasolar planets, space missions in the solar system and instrumentation and monitoring projects.

The X Planetary Science Workshop will take place 2020 March 9-13 at the Maldonado Headquarters of the Eastern Regional University Center (CURE), a few minutes from the center of the cities of Punta del Este and Maldonado, Uruguay.

Meeting website: `http://tcp2020.cure.edu.uy`

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:

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Recent and back issues of the newsletter are archived there in various formats. The web pages also contain other related information and links.

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