

Issue No. 38

November 2004

DISTANT EKOs
The Kuiper Belt Electronic Newsletter



Edited by: Joel Wm. Parker

ekonews@boulder.swri.edu

www.boulder.swri.edu/ekonews

CONTENTS

News & Announcements	2
Abstracts of 13 Accepted Papers	3
Titles of 4 Other Papers of Interest	10
Conference Information	11
Description and Contents of 1 Book	12
Newsletter Information	14

NEWS & ANNOUNCEMENTS

2003 VB12 officially has been named Sedna. MPEC 2004-S73 contains a MPC editorial about naming practices and policy:

<http://cfa-www.harvard.edu/cfa/ps/mpec/K04/K04S73.html>

.....
There were 24 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2003 QF113, 2004 OJ14, 2004 PA108, 2004 PB108, 2004 PR107, 2004 PS107,
2004 PT107, 2004 PU107, 2004 PV107, 2004 PW107, 2004 PX107, 2004 PY107,
2004 PZ107, 2004 OK14, 2004 OL14, 2004 PB112, 2004 PC112, 2004 PD112,
2004 PE112, 2004 PF112, 2004 PY111, 2004 PZ111, 2004 TE282, 2004 TF282

and 2 new Centaur/SDO discoveries:

2004 PA112, 2004 RT9

Reclassified objects:

2004 OJ14 (TNO → SDO)
1999 CG119 (SDO → TNO)
2004 PB112 (TNO → SDO)
2004 PD112 (TNO → SDO)

Objects recently assigned numbers:

2002 GZ32 = (95626)
1999 RZ215 = (91554)
2002 GX32 = (95625)
1998 HK151 = (91133)
1998 US43 = (91205)

Objects recently assigned names:

2003 VB12 = Sedna

Current number of TNOs: 822 (and Pluto & Charon, and 12 other TNO binary companions)

Current number of Centaurs/SDOs: 151

Current number of Neptune Trojans: 1

Out of a total of 974 objects:

466 have measurements from only one opposition

371 of those have had no measurements for more than a year

198 of those have arcs shorter than 10 days

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

**The Meudon Multicolor Survey (2MS) of Centaurs and
Trans-Neptunian Objects: Extended Dataset and Status on the
Correlations Reported**

**A. Doressoundiram¹, N. Peixinho¹, C. Ducet², O. Mousis³,
M.A. Barucci¹, J.-M. Petit³, and C. Veillet⁴,**

¹ LESIA, Observatoire de Paris, F-92195 Meudon Principal Cedex, France

² DSM/DAPNIA/SAP, CEA-Saclay, 91191 Gif-sur-Yvette cedex, France

³ Observatoire de Besançon, B.P. 1615, 25010 Besançon Cedex, France

⁴ Canada-France-Hawaii Telescope Corporation, PO Box 1597, Kamuela HI-96743, USA

We present here the latest $B - V$, $V - R$ and $R - I$ color measurements obtained with the CFH12K mosaic camera of the 3.6-m Canada-France-Hawaii Telescope (CFHT). This work is the latest extension of the Meudon Multicolor Survey (2MS) and extends the total number of Centaurs and trans-Neptunian objects (TNOs) in the dataset to 71. With this large and homogeneous dataset, we performed relevant statistical analyses to search for correlations with physical and orbital parameters and interrelations with related populations (cometary nuclei and irregular satellites). With a larger dataset, we confirm the correlations found for the classical TNOs in our previous survey: some colors are significantly correlated with perihelion distance and inclination. The only exception is with the eccentricity. However, results strongly depend on which objects are considered Classical, and with a dynamically more restricted definition these correlations are no longer present. We also find that strongly significant trends with orbital parameters are not detected for Centaurs, Plutinos or Scattered disk objects (SDOs).

We also make for the first time reliable statistical comparison between TNOs and related populations (e.g., Centaurs, irregular satellites, Short Period Comets, i.e. SPCs). We find that 1) the colors of SPCs do not match either their TNO or Centaur precursors, and this suggests that some process modifies the surface of SPCs at entry into the inner solar system. The only exception concerns colors of SDOs from which we could statistically assess that SPCs and SDOs could be drawn from a same single parent distribution. 2) Not surprisingly, Centaurs are compatible with each of the Edgeworth-Kuiper belt dynamical groups at a highly significant level except with the SDOs. 3) Centaurs colors still present a strong dichotomy between a neutral/slightly red group (e.g. Chiron) and a very red group (e.g. Pholus). 4) The irregular satellite population is not compatible with any of the Centaur, Plutino or Classical populations; however, the similarity of their color properties with SDOs suggests that both groups can be extracted from the same parent distribution. However, due to the small number of Centaurs and SDOs these conclusions cannot be taken as definitive.

To appear in: Icarus

For preprints, contact `Alain.Doressoundiram@obspm.fr`

or on the web at `http://calys.obspm.fr/~pcorps/TNO/`

.....

Spectral Characteristics and Modeling of the Trans-neptunian Object (55565) 2002 AW197 and the Centaurs (55576) 2002 GB10 and (83982) 2002 GO9. ESO Large Program on TNOs and Centaurs.

A. Doressoundiram¹, M.A. Barucci¹, G.P. Tozzi², F. Poulet³,
H. Boehnhardt⁴, C. de Bergh¹, and N. Peixinho¹

¹ LESIA, Observatoire de Paris, F-92195 Meudon Principal Cedex, France

² INAF, Osservatorio astrofisico di Arcetri, Largo E. Fermi 5, I-50125 Firenze, Italy

³ Institut d'Astrophysique Spatiale, Université Paris-Sud, 91405 Orsay Cedex, France

⁴ Max-Planck-Institute for Astronomy, Koenigstuhl 17, D-69117 Heidelberg, Germany

We present in this paper first results on broadband photometry (*JHK* filters) and low-dispersion infrared spectroscopy performed at ESO Very Large Telescope (VLT) for the transneptunian object (55565) 2002 AW197 and Centaurs (55576) 2002 GB10 and (83982) 2002 GO9. These observations were obtained in the framework of ESO's Large Program on 'Physical Studies of TNOs and Centaurs'. All the spectra are characterized by a strong red visible-near infrared slope. There is no clear detection of water ice, except for the Centaur (83982) 2002 GO9.

Analysis of these visible-near infrared reflectance spectra with radiative transfer models are compatible with a surface composed of intimate mixtures of organics compounds (Triton tholins, amorphous carbon) and contaminated water ice, although other possibilities exist.

To appear in: Planetary and Space Science

For preprints, contact Alain.Doressoundiram@obspm.fr

or on the web at <http://calys.obspm.fr/~pcorps/TNO/>

.....

The Drag Induced Resonant Capture for Kuiper Belt Objects

Ing-Guey Jiang¹ and Li-Chin Yeh²

¹ Institute of Astronomy, National Central University, Chung-Li, Taiwan

² Department of Mathematics, National Hsinchu Teachers College, Hsin-Chu, Taiwan

It has been an interesting question that why there are one-third of Kuiper Belt Objects (KBOs) trapped into the 3:2 resonance but, in contrast, only several KBOs are claimed to be associated with the 2:1 resonance. In a model proposed by Zhou et al. (2002), the stochastic outward migration of the Neptune could reduce the number of particles in the 2:1 resonance and thus the objects in the 3:2 resonance become more distinct. As a complementary study, we investigate the effect of proto-stellar discs on the resonance capture. Our results show that the gaseous drag of a proto-stellar disc can trap KBOs into the 3:2 resonance rather easily. In addition, no objects are captured into the 2:1 resonance in our simulation.

To appear in: MNRAS Letters

For preprints, contact jiang@astro.ncu.edu.tw

or on the web at <http://www.arXiv.org/abs/astro-ph/0410426>

Formation of Planetesimals in the Trans-Neptunian Region of the Protoplanetary Disk

A.B. Makalkin¹ and I.N. Ziglina¹

¹ Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, ul. Bol'shaya Gruzinskaya 10, Moscow, 123995 Russia

We consider the formation of comet-like and larger bodies in the trans-Neptunian region of the protoplanetary gas-dust disk. Once the particles have reached 1–10 cm in size through mutual collisions, they compact and concentrate toward the midplane of the disk to form a dust subdisk there. We show that after the subdisk has reached a critical density, its inner, equatorial layer that, in contrast to the two subsurface layers, contains no shear turbulence can be gravitationally unstable. The layer breaks up into $\sim 10^{12}$ cm clumps whose small fragments ($\sim 10^9$ cm) can rapidly contract to form bodies ~ 10 km in size. We consider the sunward drift of dust particles at a velocity that decreases with decreasing radial distance as the mechanism of radial contraction and compaction of the layer that contributes to its gravitational instability and the formation of larger (~ 100 km) planetesimals. Given all of the above processes, it takes $\sim 10^6$ yr for planetesimals to form, which is an order of magnitude shorter than the lifetime of the gas-dust protoplanetary disk. We discuss peculiarities of the structure of planetesimals.

Published in: *Solar System Research*, **38**, 288

The Scattered Disk Population as a Source of Oort Cloud Comets: Evaluation of its Current and Past Role in Populating the Oort Cloud

Julio A. Fernández¹, Tabaré Gallardo¹, and Adrián Brunini²

¹ Departamento de Astronomía, Facultad de Ciencias, Iguá 4225, 11400 Montevideo, Uruguay

² Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, Paseo del Bosque, 1900 La Plata, and Instituto Astrofísico de La Plata, CONICET, Argentina

We have integrated the orbits of the 76 scattered disk objects (SDOs), discovered through the end of 2002, plus 399 clones for 5 Gyr to study their dynamical evolution and the probability of falling in one of the following end states: reaching Jupiter's influence zone, hyperbolic ejection, or transfer to the Oort cloud. We find that nearly 50% of the SDOs are transferred to the Oort cloud, from which about 60% have their perihelia beyond Neptune's orbit ($31 < q < 36$ AU) at the moment of reaching the Oort cloud. This shows that Neptune acts as a dynamical barrier, scattering most of the bodies to near-parabolic orbits before they can approach or cross Neptune's orbit in non-resonant orbits (that may allow their transfer to the planetary region as Centaurs via close encounters with Neptune). Consequently, Neptune's dynamical barrier greatly favors insertion in the Oort cloud at the expense of the other end states mentioned above. We found that the current rate of SDOs with radii $R > 1$ km incorporated into the Oort cloud is about 5 yr^{-1} , which might be a non-negligible fraction of comet losses from the Oort cloud (probably around or even above 10%). Therefore, we conclude that the Oort cloud may have experienced and may be even experiencing a significant renovation of its population, and that the trans-neptunian belt — via the scattered disk — may be the main feeding source.

To appear in: *Icarus*

For preprints, contact Julio A. Fernández, julio@fisica.edu.uy

A Signature of Planetary Migration: The Origin of Asymmetric Capture in the 2:1 Resonance

Ruth A. Murray-Clay¹ and Eugene I. Chiang^{1,2}

¹ Center for Integrative Planetary Sciences, Astronomy Dept., University of California, Berkeley, CA 94720, USA

² Alfred P. Sloan Research Fellow

The spatial distribution of Kuiper belt objects (KBOs) in 2:1 exterior resonance with Neptune constrains that planet's migration history. Numerical simulations demonstrate that fast planetary migration generates a larger population of KBOs trailing rather than leading Neptune in orbital longitude. This asymmetry corresponds to a greater proportion of objects caught into asymmetric resonance such that their resonance angles, ϕ , librate about values $> \pi$ (trailing) as opposed to $< \pi$ (leading). We provide, for the first time, an explanation of this phenomenon, using physical, analytic, and semi-analytic arguments. Central to our understanding is how planetary migration shifts the equilibrium points of the superposed direct and indirect potentials. Symmetric libration, in which ϕ librates about $\sim \pi$, precedes capture into asymmetric resonance. As a particle transitions from symmetric to asymmetric libration, if ϕ exceeds its value, ψ , at the unstable point of asymmetric resonance, then the particle is caught into trailing resonance, while if $\phi < \psi$, the particle is caught into leading resonance. The probability that the KBO is caught into trailing resonance is determined by the fraction of time it spends with $\phi > \psi$ while in symmetric libration. This fractional time increases with faster migration because migration not only shifts ψ to values $< \pi$, but also shifts the stable point of symmetric libration to values $> \pi$. Smaller eccentricities prior to capture strengthen the effect of these shifts. Large capture asymmetries appear for exponential timescales of migration, τ , shorter than $\sim 10^7$ yr. The observed distribution of 2:1 KBOs (2 trailing and 7 leading) excludes $\tau \leq 10^6$ yr with 99.65% confidence.

To appear in: The Astrophysical Journal (2005 January 20)

For preprints, contact rmurray@astro.berkeley.edu

or on the web at <http://astron.berkeley.edu/~rmurray/publications.html>

<http://www.arXiv.org/abs//astro-ph/0410086>

.....

Regarding the Accretion of 2003 VB12 (Sedna) and Like Bodies in Distant Heliocentric Orbits

S. Alan Stern¹

¹ Dept. of Space Studies, Southwest Research Institute, 1050 Walnut Street, Suite 400, Boulder, CO 80302, USA

Recently, Brown et al. (2004) reported the exciting discovery of an ~ 800 km radius object, (90377) Sedna, on a distant, eccentric orbit centered at ~ 490 AU from the Sun. Here we undertake a first look exploring the feasibility of accreting this object and its possible cohorts between 75 AU (Sedna's perihelion distance) and 500 AU (Sedna's semi-major axis distance) from the Sun. We find such accretion possible in a small fraction of the age of the solar system, if such objects were initially on nearly circular orbits in this region, and if the solar nebula extended outward to distances far beyond the Kuiper Belt. If Sedna did form in situ, it is likely to be accompanied by a cohort of other large bodies in this region of the solar system.

To appear in: The Astronomical Journal

For preprints, contact astern@swri.edu

or on the web at <http://arxiv.org/abs/astro-ph/0404525>

.....

Origin and Orbital Distribution of the Trans-Neptunian Scattered Disc

A. Morbidelli¹, V.V. Emel'yanenko², and H.F. Levison³

¹ Observatoire de la Côte d'Azur, Boulevard de l'Observatoire, B.P. 4229, 06304 Nice Cedex 4, France

² South Ural University, Lenina 76, Chelyabinsk 454080, Russia

³ Southwest Research Institute, 1050 Walnut St, Suite 400, Boulder, CO 80302, USA

We revisit the scenario proposed by Duncan and Levison in the late 1990s on the origin of the trans-Neptunian scattered disc. According to this scenario, the current scattered disc population is the remnant of a much more massive population that formed at the beginning of the Solar system, presumably when Neptune grew in mass. In order to compute the expected orbital distribution of the scattered disc bodies in the framework of this model, we have integrated the evolution of several thousands of test particles over the age of the Solar system, and looked at the orbital distribution of those surviving after more than 2×10^9 yr from their first scattering event. In order to compare this model distribution with the observed distribution, we have modelled the observational biases by generalizing a method originally introduced recently by Trujillo and Brown. Once the biases are taken into account, the model distribution matches the observed distribution fairly well. The most significant discrepancy is that the observed perihelion distance distribution is somewhat skewed towards larger perihelion distances than our model predicts. This is possibly due to the effects of planet migration (which tends to raise perihelion distances as recently shown by Gomes), which is not taken into account in our simulations.

To appear in: Monthly Notices of the Royal Astronomical Society

For preprints, contact `morby@obs-nice.fr`

or on the web at http://www.obs-nice.fr/morby/Ref_list.html

The Edge of the Kuiper Belt: The Planet X Scenario

M.D. Melita¹, I.P. Williams¹, S.J. Collander-Brown², and A. Fitzsimmons²

¹ Astronomy Unit, School of Mathematical Sciences, Queen Mary, University of London, UK

² School of Maths and Physics, APS Division, Queens University Belfast, UK

Our goal is to determine whether or not the observed sudden termination of the Edgeworth-Kuiper Belt can be the result of perturbations from a hypothetical planet. We investigate the effects that such an object would produce on the primordial orbital distribution if the trans-Neptunian objects, for a range of masses and orbital parameters of the hypothetical planet. In this numerical investigation, the motion of the hypothetical planet was influenced by the existing planets but not by its interaction with the disk. We find that no set of parameters produce results that match the observed data. Dynamical interaction with the disk is likely to be important so that the orbit of the hypothetical planet changes significantly during the integration interval. This is also discussed. The overall conclusion is that none of the models for the hypothetical planet that were investigated can reproduce the observed features of the Edgeworth-Kuiper belt starting from any probable primordial

Published in: Icarus, 171, 516 (2004 October)

For preprints, contact `M.D.Melita@qmul.ac.uk`

Sculpting the Outer Edgeworth-Kuiper Belt: Stellar Encounter Followed by Planetary Perturbations

M.D. Melita¹, J.D. Larwood¹, and I.P. Williams¹

¹ Astronomy Unit, School of Mathematical Sci., Queen Mary, Univ. of London, Mile End Road, London E1 4NS, UK

We consider a close stellar fly-by as an explanation for the abrupt termination of the Classical Edgeworth-Kuiper Belt at around 50 AU from the Sun, and also for the high values of orbital excitation observed. By the use of numerical simulations we study a scenario in which a close stellar fly-by truncates the trans-Neptunian cometary population as a result of strong gravitational perturbations. The results from some representative cases are compared with the presently observed distribution of EKBOs. Our findings suggest that -when observational biases are taken into account- this scenario can reproduce some features of the observed distribution. However, although it is clear that fly-by models are able to generate high values of eccentricity and orbital inclination in the outer particle distribution, this comes at the expense of preserving any low eccentricity particle orbits. The nearly vertical distribution of eccentricities over semimajor axis found at around 48 AU in the EKB cannot be modeled by the use of a stellar fly-by encounter alone. Hence we consider long timescale planetary perturbations and collisional self-interactions that act on the perturbed distribution after a fly-by encounter, and which have the potential to provide a more complete description of the EKBO distribution. However, even when these have been taken into account, the transport of objects from 'hot' to 'cold' orbits may not be sufficient to cover the range of semimajor axes that are observed in the later. Thus, an alternative origin for the low inclination and eccentricity orbits seems likely. The effect of such an encounter on the inner Oort cloud is studied, and we conclude that comets in very large and elongated orbits can be transported to the trans-Neptunian region by this mechanism.

To appear in: Icarus

For preprints, contact M.D.Melita@qmul.ac.uk

.....

On the Chaotic Orbits of Disc-Star-Planet Systems

Ing-Guey Jiang¹ and Li-Chin Yeh²

¹ Institute of Astronomy, National Central University, Chung-Li, Taiwan

² Department of Mathematics, National Hsinchu Teachers College, Hsin-Chu, Taiwan

Following Tancredi, Sanchez and Roig (2001)'s criteria of chaos, two ways of setting initial velocities are used in the numerical surveys to explore the possible chaotic and regular orbits for the disc-star-planet systems. We find that the chaotic boundary does not depend much on the disc mass for Type I initial condition, but can change a lot for different disc masses for Type II initial condition. A few sample orbits are further studied. Both Poincare surface of section and the Lyapounov Exponent Indicator are calculated and they are consistent with each other. We also find that the influence from the disc can change the locations of equilibrium points and the orbital behaviors for both types of initial conditions. Because the chaotic orbits are less likely to become the stable resonant orbits, we conclude that the proto-stellar disc shall play important roles for the capture and depletion histories of resonant orbits of both Asteroid Belt and Kuiper Belt during the formation of Solar System.

Published in: The Astronomical Journal, 128, 923 (2004 August)

For preprints, contact jiang@astro.ncu.edu.tw

or on the web at <http://www.arXiv.org/abs/astro-ph/0404408>

.....

Peripheral Structures of Planetary Systems

A.V. Tutukov¹ and M.A. Smirnov¹

¹ Institute of Astronomy, Russian Academy of Sciences, Pyatnitskaya ul 48, Moscow, 119017 Russia

We analyze the conditions for the formation and time evolution of peripheral comet structures of solar-type planetary systems. In the Solar system, these include the Kuiper belt, the Oort cloud, the comet spear, and the Galactic comet ring that marks the Galactic orbit of the Sun. We consider the role of the viscosity of a protoplanetary gas-dust disk, major planets, field stars, globular clusters, giant molecular clouds, and the Galactic gravitational field in the formation of these peripheral structures marked by comets and asteroids. We give a list of the closest past and future passages of neighboring stars through the solar Oort cloud that perturb the motion of its comets and, thus, contribute to the enhancement of its cometary activity, on the one hand, and to the replenishment of the solar comet spear with new members, on the other hand.

Published in: Solar System Research, 38, 279

.....

On the Collisional Disruption of Porous Icy Targets Simulating Kuiper Belt Objects

I. GIBLIN¹, D.R. DAVIS¹, and E.V. RYAN²

¹ Planetary Science Institute, 1700 E. Ft. Lowell Rd., #106, Tucson, AZ 85719-2395, USA

² New Mexico Institute of Mining and Technology, 801 Leroy Plaza, Socorro, NM 87801, USA

We present results from 27 impact experiments using porous (porosity ranging from 0.39 to 0.54) ice targets and solid ice projectiles at impact speeds ranging from 90 to 155 m/s. These targets were designed to simulate Kuiper Belt Objects (KBOs) in structure. We measured a specific energy for shattering, Q_S^* , of 2.1×10^5 erg/g for those snowball targets hit by intact ice projectiles; this is of the same order as that measured for solid ice targets. The fragment mass distribution follows a power law, although the exponent is not simply related to the largest fragment size as assumed by fragmentation models. We provide the first measurement of the three-dimensional mass-velocity distribution for disrupted ice targets and find that fragment speeds range from ~ 2 to ~ 20 m/s. The fraction of collisional kinetic energy that is partitioned into ejecta speeds is between 1 and 15% (although it should be noted that the lower limit is more reliable than the upper).

Published in: Icarus, 171, 487 (2004 October)

For preprints, contact giblin@psi.edu

OTHER PAPERS OF INTEREST

Accounting for Source Uncertainties in Analyses of Astronomical Survey Data

Thomas J. Loredo¹

¹ Center for Radiophysics and Space Research, 104 Space Sciences Building, Cornell University, Ithaca, NY 14853-6801

To appear in: Bayesian Inference And Maximum Entropy Methods In Science And Engineering

Preprints on the web at <http://arxiv.org/abs/astro-ph/0409387>

.....

Solar System Science with SKA

B.J. Butler¹, D.B. Campbell², I. de Pater³, and D.E. Gary⁴

¹ NRAO, Socorro, NM, USA

² Cornell University, Ithaca, NY, USA

³ University of California at Berkeley, Berkeley, CA, USA

⁴ New Jersey Institute of Technology, Newark, NJ, USA

To appear in: Science with the Square Kilometer Array (eds. C. Carilli and S. Rawlings, New Astronomy Reviews)

Preprints on the web at <http://arxiv.org/abs/astro-ph/0409220>

.....

Optical Design of the Discovery Channel Telescope

Malcolm J. MacFarlane¹ and Edward W. Dunham²

¹ Goodrich Corp., USA

² Lowell Observatory, USA

Proceedings of the SPIE, 5489, 796 (2004 October)

Abstract on the web at

http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2004SPIE.5489..796M

.....

The Possible Belts for Extrasolar Planetary Systems

I.-G. Jiang¹, M. Duncan², and D.N.C. Lin³

¹ Institute of Astronomy, National Central University, Chung-Li, Taiwan

² Department of Physics, Queen's University, Kingston, ON K7L 3N6, Canada

³ UCO/Lick Observatory, University of California, Santa Cruz, CA 95064, USA

Revista Mexicana de Astronomía y Astrofísica (Serie de Conferencias), 21, 217

For preprints, contact jiang@astro.ncu.edu.tw

or on the web at <http://www.astroscu.unam.mx/rmaa/RMxAC..21/>

CONFERENCE INFORMATION

By the time you receive this issue, the DPS meeting in Louisville, Kentucky will be already underway from 2004 November 7–12. The program list is at:

<http://www.aas.org/publications/baas/v36n4/dps2004/SL.htm>

and the block schedule is at:

<http://www.aas.org/publications/baas/v36n4/dps2004/dps04block.htm>

Below is a listing of the Kuiper belt related sessions:

- **Session 3. Kuiper Belt I: Observations**

Oral, Monday, November 8, 2004, 10:30–12:00

<http://www.aas.org/publications/baas/v36n4/dps2004/S30.htm>

- **Session 8. Kuiper Belt II: Binaries and Dynamics**

Oral, Tuesday, November 9, 2004, 8:30–10:00

<http://www.aas.org/publications/baas/v36n4/dps2004/S80.htm>

- **Session 11. Pluto, Triton, and TNO Surfaces**

Oral, Tuesday, November 9, 2004, 10:30–12:00

<http://www.aas.org/publications/baas/v36n4/dps2004/S110.htm>

- **Session 17. Kuiper Belt II: Binaries and Dynamics Posters, Tuesday, November 9, 2004**

<http://www.aas.org/publications/baas/v36n4/dps2004/S170.htm>

BOOKS

Icy Worlds of the Solar System

Edited by Pat Dasch

Cambridge University Press, August 2004

<http://titles.cambridge.org/catalogue.asp?isbn=0521640482>

Contents

- **Introduction** (Jonathan I. Lunine)
- **The history and significance of ice on Earth** (Robert Bindshadler)
 - The water planet
 - Early glaciations
 - Ice sheets, sea level, and climate
 - Ice sheet response
 - Snow and sea ice
 - Ice sheets and weather
 - Metamorphism of snow into ice
 - Climate tape recorder
 - Ice sheet facies
 - Ice sheet motion
 - Ice shelves
 - Ice landscaping
 - Meteorite catchers
 - Summary
- **Ice on Mercury and the Moon** (Bryan Butler)
 - Mercury
 - The Moon
 - Future missions
- **How the Earth got its atmosphere** (Tobias Owen)
 - How planets keep their atmospheres
 - Why small planets have different atmospheres
 - Frigid worlds, atmospheric evolution, and cosmic time travel
 - The sources of atmospheres: problems with meteorites
 - The sources of atmospheres: icy planetesimals?
 - Solar Composition Icy Planetesimals (SCIPs): a new type of icy planetesimal
 - The sources of atmospheres: a rocky component?
 - The importance of impact erosion
 - Tests of the model
- **The frozen landscape of Mars** (Michael T. Mellon)
 - Mars: yesterday and today
 - Polar deposits
 - Seasons bring change
 - Shapes in the polar landscape
 - Deep in the ice cap
 - The sky above
 - The permafrost below

Buried ice from the past
Running water from frozen ground
Moving ice
At the limits of vision
Impact craters in the permafrost?
Climate change
An elusive resource
Hazards of living on ice
Life?
The future

- **The ice moons of Sol** (Paul M. Schenk)

Moon madness
Water! Water!
Organic stews?
Energy to spare
Ice worlds — Oceanus Amokium?
Triton
It's a not-so small world after all

- **Triton, Pluto, and beyond** (John A. Stansberry)

Pluto's story
Triton and the Trans-Neptunian objects (TNOs)
Triton and Pluto: twin siblings of a distant Sun
Geology recorded in water ice "rock"
Tidal evolution and giant impacts
Kuiper Belt objects: cousins to Triton and Pluto
Triton and Pluto today
Nitrogen, methane, and atmospheres
Ice transport and seasons
The fate of Pluto's atmosphere
Not yet explored

- **Comets: ices from the beginning of time** (Dale P. Cruikshank)

What are comets?
The interstellar medium, and the death of stars
Comets are formed
The composition of comets
Special properties of water ice
What comets are made of
Comet dust
Where do comets come from?
Space missions to comets
Conclusion

The *Distant EKO*s Newsletter is dedicated to provide researchers with easy and rapid access to current work regarding the Kuiper belt (observational and theoretical studies), directly related objects (e.g., Pluto, Centaurs), and other areas of study when explicitly applied to the Kuiper belt.

We accept submissions for the following sections:

- ★ Abstracts of accepted papers
- ★ Titles of submitted (but not yet accepted) papers and conference articles
- ★ Thesis abstracts
- ★ Short articles, announcements, or editorials
- ★ Status reports of on-going programs
- ★ Requests for collaboration or observing coordination
- ★ Table of contents/outlines of books
- ★ Announcements for conferences
- ★ Job advertisements
- ★ General news items deemed of interest to the Kuiper belt community

A L^AT_EX 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 EKO*s 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 EKO*s 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 EKO*s 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`