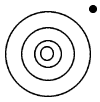
Issue No. 3 *January 1999*

DISTANT EKOs



The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

ekonews@boulder.swri.edu www.boulder.swri.edu/ekonews

CONTENTS

NEWS & ANNOUNCEMENTS

There was quite a rush of new EKO discoveries announced since the previous issue of the *Distant EKOs* Newsletter:

1998 KD66, 1998 KE66, 1998 KF66, 1998 KG66, 1998 FS144,
1998 UR43, 1998 US43, 1998 WG24, 1998 WH24, 1998 WV24,
1998 WW24, 1998 WX24, 1998 WY24, 1998 WZ24, 1998 WA25, 1998 WA31.

Note that 1998 FS114 was discovered by high school students via NSF's Hands-On Universe Program. Details are at: `http://www.nsf.gov/od/lpa/news/press/pr9879.htm`

Also, a new Centaur was discovered: 1998 QM107.

Current number of EKOs: 84
Current number of Centaurs: 9

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The current summary list of Distant Objects is available on MPEC 1998-X26 at:
`http://cfa-www.harvard.edu/mpec/J98/J98X26.html`

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Here is some exciting news about an EKO discovered last year:

It appears that 1997 SZ10 may be the first confirmed EKO in the 1:2 mean mean-motion resonance with Neptune. Based on the original discovery and early follow-up observations as reported in M.P.E.C. 1997-S16 (`http://cfa-www.harvard.edu/cfa/ps/mpec/J97/J97S16.html`), it was assumed that 1997 SZ10 was in the 2:3 resonance. However, recent recovery observations made in October and December (M.P.E.C. 1998-Y09, `http://cfa-www.harvard.edu/mpec/J98/J98Y09.html`) showed that the object was almost 12 arcminutes from the predicted position given by the 2:3 orbit. These new data indicate that 1997 SZ10 is almost certainly in the 1:2 resonance instead (the only other alternative being that, with its perihelion near Neptune's orbit, it would rapidly become unstable). Preliminary orbital models show that several sets of 1:2-resonant orbital elements consistent with the augmented span of observations are stable for at least 1 billion years. This is an excellent example of how second-opposition observations are essential for determining the true orbits of EKOs, as well as for ensuring that the objects can be found again in future years.

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Lynne Allen and Gary Bernstein provide a nice web page with movies showing EKOs moving across CCD images: `http://www.astro.lsa.umich.edu/users/garyb/WWW/KBO/`.

PAPERS ACCEPTED TO JOURNALS

IR Kuiper Belt Constraints

Vigdor L. Teplitz[1], S. Alan Stern[2], John D. Anderson[3], Doris Rosenbaum[1], Randall J. Scalise[1], and Paul Wentzler[1]

[1] Physics Department, Southern Methodist University, Dallas, TX 75275

[2] Southwest Research Institute, Boulder, CO 80302

[3] Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109

We compute the temperature and IR signal of particles of radius a and albedo α at heliocentric distance R, taking into account the emissivity effect, and give an interpolating formula for the result. We compare with analyses of COBE DIRBE data by others (including recent detection of the cosmic IR background) for various values of heliocentric distance, R, particle radius, a, and particle albedo, α. We then apply these results to a recently-developed picture of the Kuiper belt as a two-sector disk with a nearby, low-density sector ($40 < R < 50-90$ AU) and a more distant sector with a higher density. We consider the case in which passage through a molecular cloud essentially cleans the Solar System of dust. We apply a simple model of dust production by comet collisions and removal by the Poynting-Robertson effect to find limits on total and dust masses in the near and far sectors as a function of time since such a passage. Finally we compare Kuiper belt IR spectra for various parameter values. Results of this work include: (1) numerical limits on Kuiper belt dust as a function of (R, a, α) on the basis of 4 alternative sets of constraints including those following from recent discovery of the cosmic IR background by Hauser et al. (1998); (2) application to the two-sector Kuiper belt model finding mass limits and spectrum shape for different values of relevant parameters including dependence on time elapsed since last passage through a molecular cloud cleared the outer Solar System of dust; (3) strict limits on the mass of the far sector far under that of the "Kuiper extrapolation" (over 100 $M_\oplus$) if its material has low values for inclination and eccentricity; and (4) potential use of spectral information to determine time since last passage of the Sun through a giant molecular cloud.

To appear in: The Astrophysical Journal, Vol. 516 #1 (1999)

For preprints contact `teplitz@phyvms.physics.smu.edu`

or on the web at `http://xxx.lanl.gov/abs/astro-ph/9807207`

PAPERS RECENTLY SUBMITTED TO JOURNALS

Migration of trans-Neptunian objects to the Earth

S.I. Ipatov[1]

[1] Institute of Applied Mathematics, Moscow

Submitted to: Celest. Mech. and Dyn. Astron.

For preprints, contact ipatov@spp.keldysh.ru

CONFERENCE CONTRIBUTIONS

Physical Properties of TNO 1996 TO66

C.E. Delahodde[1], **O.R. Hainaut**[1], **H. Boehnhardt**[1], **E. Dotto**[2], **R.M. West**[3], **and M.A. Barucci**[2]

[1] European Southern Observatory - La Silla - Chile

[2] Observatoire de Paris - Meudon - France

[3] European Southern Observatory - Garching - Germany

To appear in: "Minor Bodies in the Outer Solar System"

For preprints contact ohainaut@eso.org

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Colors of TNOs with the ESO Very Large Telescope — Early results

O.R. Hainaut[1], **H. Boehnhardt**[1], **and R.M. West**[2]

[1] European Southern Observatory - La Silla - Chile

[2] European Southern Observatory - Garching - Germany

To appear in: "Minor Bodies in the Outer Solar System"

For preprints contact ohainaut@eso.org

BOOKS

Pluto and Charon

Edited by S. A. Stern and D. J. Tholen

University of Arizona Press, Space Science Series (`http://www.uapress.arizona.edu/catalogs/spasci/spasci.htm`)
ISBN 0-8165-1840-8; 756 pages; Published 1997

This volume provides a comprehensive review of the Pluto-Charon system. Some 17 chapters by over 50 contributing authors cover all aspects of the system, from discovery to the modern day, and from bulk properties, to surfaces and interiors, to atmospheric structure, composition, and dynamics. The volume also provides historical perspectives on Pluto-Charon research and discuss the population of the trans-Neptunian region and the origin of the Pluto-Charon binary.

The book is listed at US$90.00, and may be ordered through the publisher's website at: `http://www.uapress.arizona.edu/`.

The following lists the sections and chapters of the book:

CONFERENCE PROCEEDINGS

There are a number of Kuiper belt-related conference proceedings that have appeared recently in the Astronomical Society of the Pacific Conference Series. Of the currently published books (volumes 1–151), the following contain chapters relevant to the Kuiper belt:

Volume 107 Completing the Inventory of the Solar System
Volume 122 From Stardust to Planetesimals
Volume 148 Origins
Volume 149 Solar System Formation and Evolution

Complete tables of contents of these volumes are given on the next few pages.

Ordering information is as follows:
Volumes 1–113: US$30.60 for ASP members, US$34.00 for non-members.
Volumes 114+: US$46.80 for ASP members, US$52.00 for non-members.
Postage per book: US$6.00 within USA; US$9.00 in Canada/Mexico; all other countries US$6.00 by surface mail, US$15.00 airmail.

Order from:
Astronomical Society of the Pacific
Conference Series
390 Ashton Avenue
San Francisco, CA 94112-1722, USA
Fax: 415-337-5205
E-mail: `catalog@aspsky.org`

More information and the full listing for the Series can be found at:
`http://www.aspsky.org/html/confser/confer.html`.

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Completing the Inventory of the Solar System

Edited by T. Rettig and J. M. Hahn

Astronomical Society of the Pacific Conference Series Vol. 107
ISBN 1-886733-27-9; 394 pages; Published 1996

These are the proceedings of a meeting held at Lowell Observatory in Flagstaff in June 1994. The intention of the meeting was "to provide an opportunity for the planetary science community to develop a better understanding of this inventory" and its formation.

The following lists the sections and chapters of the book:

Asteroids

- Meteoroids: An Item in the Inventory (*Ceplecha, Z.*)
- Searching For Vulcanoids (*Campins, H., Davis, D.R., Weidenschilling, S.J., Magee, M., &*)
- Infrared Observations of Distant Asteroids (*Davies, J.K., Tholen, D.J., & Ballantyne, D.R.*)
- Near–Earth Object Surveying in the late 20th Century (*Scotti, J.V.*)
- High Ecliptic Latitude Asteroid and Comet Surveying With the Catalina Schmidt (*Spahr, T.B., Hergenrother, C.W., Larson, S.M., & Campins, H.*)
- Navy Prototype Optical Interferometer: Applications and Limitations to Solar System Observations (*White, N.M. & Mozurkewich, D.*)

Circumplanetary Dust, Rings, and the Three-Body Problem

- Unusual Dynamics of Circumplanetary Dust (*Horanyi, M.*)
- A New Insight in Uranus Rings: A Wavelet Analysis of the Voyager 2 Data (*Petit, J.M. & Bendjoya, P..*)
- The Solar System's Lagrangian Points in the Framework of the Relativistic Restricted Three–Body Problem (*Maindl, T.I.*)

Planets X

- Struggles to Find the Ninth Planet (*Tombaugh, C.W.*)
- Pluto and Planets X (*Standish, E.M.*)

Comets

- Comet Taxonomy (*Levison, H.F.*)
- Searches for Planets and Comets (*Marsden, B.G.*)
- The Historical Development and Status of Kuiper Disk Studies (*Stern, S.A.*)
- On the Dynamical Lifetimes of Planet–Crossing Objects (*Dones, L., Levison, H.F., & Duncan, M.*)
- Enlarging the Solar System: the Kuiper Belt (*Luu, J. & Jewitt, D.*)
- The Plutinos (*Jewitt, D. & Luu, J.*)
- Jupiter Gravity Assist Trajectories to Objects in the Kuiper Belt (*Bender, D.F.*)
- The Oort Cloud (*Weissman, P.R.*)
- Small Comets (SCs): An Unstudied Population in the Solar System Inventory (*Brandt, J.C., A'Hearn, M.F., Randall, C.E., Schleicher, D.G., Shoemaker, E.M., & Stewart, A.I.F.*)
- The IHW Large–Scale Phenomena Network and Observations of Comets to Support the ULYSSES Mission (*Petersen, C.C. & Brandt, J.C.*)
- Analysis of Preimpact Hubble Space Telescope Images to Determine the Nature of Comet Shoemaker–Levy 9 Fragments (*Rettig, T.W., Mumma, M.J., Disanti, M., Sobczak, G.J., & Hahn, J.M.*)

Planetary Origins

- Planetary Accretion (*Ward, W.R.*)
- Solar Nebula, Resulting in the Lack of a Planet in the Kuiper Belt (*Ruzmaikina, T.V.*)
- Looking Beyond – The Search for Other Planetary Systems (*Cochran, W.D.*)

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From Stardust to Planetesimals

Edited by Y.J. Pendleton and A.G.G.M. Tielens

Astronomical Society of the Pacific Conference Series Vol. 122
ISBN 1-886733-42-2; 480 pages; Published 1997

These are the proceedings of a meeting focused on the processes involved in the evolution from stardust to planetesimals, bringing together astronomers interested in star- and planet-formation, planetary scientists studying the early solar system, and meteoriticists and laboratory scientists interested in meteorites and interplanetary dust particles.

The following lists the sections and chapters of the book:

The Composition of Comets

- Organic Volatiles in Comets: Their Relation to Interstellar Ices and Solar Nebula Material *M.J. Mumma*
- Chemistry and Mineralogy of Comet Halley's Dust *H. Schulze, J. Kissel & E.K. Jessberger*
- Organic Components of Cometary Dust *M.N. Fomenkova*
- Ice Bombardment of Comets *G. Strazzulla*
- From Planetesimals to Planets: Contributions of Icy Planetesimals to Planetary Atmospheres *T.C. Owen*

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Origins

Edited by C.E. Woodward, J.M. Shull, & H.A. Thronson, Jr.

Astronomical Society of the Pacific Conference Series Vol. 148
ISBN 1-886733-68-6; 482 pages; Published 1998

These are the proceedings of a meeting held in Estes Park, Colorado in May 1997, with the intention to bring together an interdisciplinary group of astronomers, planetary scientists, exobiologists, and atmospheric physicists to share ideas and examine various aspects of "origins" (galaxies, stars, planets, and life).

The following lists the chapters and sections of the book:

The Formation and Origins of Galaxies

- The CMBR and the Seeds of Galaxies (*Wright, E.L.*)
- Simulating Cosmic Structure Formation (*Weinberg, D.H., et al.*)
- The Formation of Disk Galaxies at $z > 3$ (*Storrie-Lombardi, L.J.*)
- The Discovery of Primeval Galaxies and the Epoch of Galaxy Formation (*Pettini, M., et al.*)
- The Hubble Deep Field and the Early Evolution of Galaxies (*Madau, P.*)
- Origins of Clusters and the Intracluster Medium (*Donahue, M.*)
- Starbursts: Lessons for the Origin and Evolution of Galaxies and the Intergalactic Medium (*Heckman, T.M.*)

The Formation of Stars

- Observations and Theory of Dynamical Triggers for Star Formation (*Elmegreen, B.G.*)
- The IMF in the Milky Way and Magellanic Clouds (*Garmany, C.D.*)
- Observations of Star Formation: The Role of Embedded Clusters (*Lada, E.A.*)
- The Theory of Star Formation and the Initial Mass Function (*Adams, F.C.*)
- Observations of Circumstellar Disks (*Chandler, C.J.*)
- Pre-Main Sequence Binaries: Formation, Evolution, and Interaction with Disks (*Ghez, A.M.*)
- The Sun's Kuiper Belt and Its Surrounding Disk (*Stern, S.A.*)

The Future Origins Missions and the NASA Strategic Plan

- SIRTF: Linking the Great Observatories with the Origins Program (*Bicay, M.D., & Werner, M.W.*)
- The COROT Mission: From Structure of Stars to Origin of Planetary Systems (*Schneider, J., et al.*)
- Far Ultraviolet Astronomy and Origins: The FUSE Mission (*Moos, W., et al.*)

The Formation and Origins of Planets

- The Origin of Protoplanetary Disks (*Boss, A.P.*)
- The Birth of Planetary Systems (*Lissauer, J.J.*)
- On Planet Formation & Migration (*Ward, W.R.*)
- Extrasolar Planets Observed (*Marcy, G.W., et al.*)

The Origins of Life

- Origins of Atmospheres (*Zahnle, K.*)
- Organic Chemistry: From the Interstellar Medium to the Solar System (*Sandford, S.A., et al.*)
- Earth's Early Biosphere and its Environment (*Des Marais, D.J.*)
- Origin and Early Evolution of Life: Deciphering the molecular record(*Gogarten, J.P.*)
- Life in the Planetary Context (*McKay, C.P.*)

The Impact of New Evidence of Extra-Terrestrial Origins

- Search for Extra-Solar Life through Planetary Spectroscopy (*Lager, A., et al.*)

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Solar System Formation and Evolution

Edited by D. Lazzaro, R. Vieira Martins, S. Ferraz-Mello, & J. Fernandez

Astronomical Society of the Pacific Conference Series Vol. 149
ISBN 1-886733-52-X; 194 pages; Published 1998

These are the proceedings of a meeting held in Rio de Janeiro in November 1997, focused on studies of the formation of the Solar System, and on what can be deduced about its evolution through studies of its current structure and composition.

The following lists the chapters of the book:

- Formation of Planetary Systems (*Lissauer, J.J.*)
- Extra-Solar planets (*Sicardy, B.*)
- Indication of Disk Accretion on Low Mass Pre Main Sequence Stars (*Batalha, C. & Dewulsky, K.*)
- Orbital Resonances and Chaos in the Solar System (*Malhotra, R.*)
- Chaos, Diffusion, Escape and Permanence of Resonant Asteroids in Gaps and Groups (*Ferraz-Mello, S., Nesvorny, D., & Michtchenko, T.A.*)
- The Structure of the Kuiper Belt and the Origin of Jupiter-Family Comets (*Morbidelli, A.*)
- Origin and evolution of the Oort cloud (*Fernandez, J.A. & Brunini, A.*)
- Comets Hale-Bopp (1995 O1) and Hyakutake (1996 B2): Records of Presolar Chemistry and more (*Campins, H.*)
- What can be learned from asteroids surveys? (*Tancredi, G.*)
- Tidal Stresses on Europa: Celestial Mechanics Meets Geology (*Greenberg, R., Geissler, P., Hoppa, G., Tufts, B.R., & Durda, D.*)
- Dynamics of Planetary Rings (*Nicholson, P. D.*)
- Nonthermal Radio Emissions of the Solar System (*Chian, A.C.-L.*)

CONFERENCE INFORMATION

30th Lunar and Planetary Science Conference

1999 March 15-19
Houston, TX, USA

`http://cass.jsc.nasa.gov/meetings/LPSC99/`

The four-and-a-half day conference will be organized by topical symposia and problem-oriented sessions. And, of course, there will be the chili cookoff and barbecue dinner on March 17.

For further information call the LPI Publications and Program Services Department (logistics: 281-486-2158; abstracts: 281-486-2161; registration: 281-486-2142)

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European Geophysical Society XXIV General Assembly

1999 April 19-23
The Hague, The Netherlands

`http://www.mpae.gwdg.de/EGS/egsga/denhaag99/denhaag99.htm`

This meeting includes 16 sessions on various planetary topics. The abstract deadline was December 15, but most conveners are accepting late papers. Abstracts should be submitted to the EGS and to the individual convener of the session to which you are proposing a contribution. The program for the Planetary and Solar System Sciences sessions is available at:
`http://www.mpae.gwdg.de/EGS/egsga/denhaag99/ps.htm`

Further information about the conference may be obtained at the following address:
EGS Office, Max-Planck-Str. 13, 37191, Katlenburg-Lindau, Germany.
Tel: +49-5556-1440 Fax: +49-5556-4709
E-mail: `egs@copernicus.org`

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1999 Gordon Research Conference on Origins of Solar Systems

June 13-18, 1999
New England College, Henniker, New Hampshire, USA

`http://www.grc.uri.edu/`

This interdisciplinary meeting will feature sessions on: Extrasolar Planet Detection; Solar System Constraints; Debris Disks and the Kuiper Belt; Planet Formation by Collisional Accumulation; Brown Dwarfs; Giant Planets; Orbital Migration; Protoplanetary Disks and Gaseous Protoplanets;

and Future Detections. Contributed papers in the form of poster talks are welcomed. Sponsors: Lunar and Planetary Institute and the NASA Origins of Solar Systems Research Program. See the Web Site at `http://www.grc.uri.edu/`

Further information about the conference may be obtained from the Chair, Alan Boss (DTM, Carnegie Institution of Washington, 5241 Broad Branch Road, NW, Washington, DC 20015-1305, USA; E-mail: `boss@dtm.ciw.edu`) or from the Vice-Chair, David Stevenson (Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA; E-mail: `djs@gps.caltech.edu`). Requests for poster talks should be sent to the Vice-Chair.

JOB ANNOUNCEMENTS

The AAS Job Register (`http://www.aas.org/JobRegister/aasjobs.html`) has the most complete and up-to-date listing of astronomy jobs. Here are a selected few jobs I gleaned from the list that may be of interest to Kuiper belt scientists. For brevity, I have omitted the job descriptions, but you can follow the links given below, or from the *Distant EKOs* job page at `http://www.boulder.swri.edu/ekonews/jobs.html`.

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Post Doctoral Position for Planetary Science

Space Research & Planetary Sciences of the Physikalisches Institut at the University of Bern, Switzerland

`http://www.cx.unibe.ch/phim/internal/ind_positions.html`

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Faculty Position in Observational Astronomy

University of Cambridge, Institute of Astronomy

`http://www.ast.cam.ac.uk/IoA/vacancies/obsast231198.html`

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Professorial Appointment in Ground-Based Observational Astronomy

California Institute of Technology, Division of Physics, Mathematics and Astronomy

`http://www.pma.caltech.edu/fellowship/gbobsastro.html`

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Professorial Appointment in Earth and Planetary Sciences

California Institute of Technology, Division of Geological and Planetary Sciences

`http://www.gps.caltech.edu/positions/epsciences.html`

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Assistant Professor of Planetary Science

California Institute of Technology, Division of Geological and Planetary Sciences

`http://www.gps.caltech.edu/positions/ps_asst_prof.html`

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Assistant Professor

University of Toronto

http://www.astro.utoronto.ca/jobs.html

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Visiting Assistant Professor in Planetary/Solar System Astronomy

Colgate University, Department of Physics and Astronomy

http://departments.colgate.edu/physics/

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Assistant Professor (2 positions: one tenure-track, one fixed-term)

St. Cloud State University

http://www.aas.org/JobRegister/no10363.html

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Faculty Position in Astronomy

Institute of Astronomy, National Central University, Taiwan

http://www.aas.org/JobRegister/no10382.html

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Faculty Positions

University of Arizona, Steward Observatory

http://www.aas.org/JobRegister/no10384.html

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Faculty Position

Calvin College

http://www.calvin.edu/academic/phys/postns.html

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 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 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 is deleted from the mailing list. All address changes, submissions, and other correspondence should be sent to:

`ekonews@boulder.swri.edu`