

Bibliography

- A'Hearn, M. F. and Deep Impact Project Team (1999). Deep Impact (Invited). *AAS/Division for Planetary Sciences Meeting*.
- A'Hearn, M. F., Millis, R. L., Schleicher, D. G., Osip, D. J., and Birch, P. V. (1995). The ensemble properties of comets: Results from narrowband photometry of 85 comets, 1976-1992. *Icarus*, **118**, 223–270.
- Aikawa, Y. and Herbst, E. (1999). Molecular evolution in protoplanetary disks. Two-dimensional distributions and column densities of gaseous molecules. *A&A*, **351**, 233–246.
- Aikawa, Y., Umebayashi, T., Nakano, T., and Miyama, S. M. (1999). Evolution of Molecular Abundances in Protoplanetary Disks with Accretion Flow. *ApJ*, **519**, 705–725.
- Allamandola, L. J., Sandford, S. A., Tielens, A. G. G. M., and Herbst, T. M. (1992). Infrared spectroscopy of dense clouds in the C-H stretch region - Methanol and 'diamonds'. *ApJ*, **399**, 134–146.
- Alman, D. A. and Ruzic, D. N. (2000). A Model of Hydrocarbon Reactions in Low Temperature Hydrogen Plasmas. Conference Poster.
- Altenhoff, W. J., Bieging, J. H., Butler, B., Butner, H. M., Chini, R., Haslam, C. G. T., Kreysa, E., Martin, R. N., Mauersberger, R., McMullin, J., Muders, D., Peters, W. L., Schmidt, J., Schraml, J. B., Sievers, A., Stumpff, P., Thum, C., von Kap-Herr, A., Wiesemeyer, H., Wink, J. E., and Zylka, R. (1999). Coordinated radio continuum observations of comets Hyakutake and Hale-Bopp from 22 to 860 GHz. *A&A*, **348**, 1020–1034.
- Ashihara, O. (1975). The Electron Energy Loss Rates by Polar Molecules. Report 530, Inst. Space and Aeronautical Science, University of Tokyo.
- Baldet, F. (1926). Ph.D. thesis, Observatoire Meudon, Paris.
- Bar-Nun, A. (1979). Acetylene formation on Jupiter - Photolysis or thunderstorms. *Icarus*, **38**, 180–191.
- Benkhoff, J. and Huebner, W. F. (1995). Influence of the vapor flux on temperature, density, and abundance distributions in a multicomponent, porous, icy body. *Icarus*, **114**, 348–354.

- Bird, M. K., Huchtmeier, W. K., Gensheimer, P., Wilson, T. L., Janardhan, P., and Lemme, C. (1997). Radio detection of ammonia in comet Hale-Bopp. *A&A*, **325**, L5–L8.
- Biver, N., Bockelée-Morvan, D., Colom, P., Crovisier, J., Germain, B., Lellouch, E., Davies, J. K., Dent, W. R. F., Moreno, R., Paubert, G., Wink, J., Despois, D., Lis, D. C., Mehringer, D., Benford, D., Gardner, M., Phillips, T. G., Gunnarsson, M., Rickman, H., Winnberg, A., Bergman, P., Johansson, L. E. B., and Rauer, H. (1997). Long-term Evolution of the Outgassing of Comet Hale-Bopp From Radio Observations. *Earth Moon and Planets*, **78**, 5–11.
- Blamont, J. E. and Festou, M. (1974). Observation of the comet Kohoutek /1973f/ in the resonance light /A2 Sigma plus - X2 Pi/ of the OH radical. *Icarus*, **23**, 538–544.
- Bockelée-Morvan, D., Lis, D. C., Wink, J. E., Despois, D., Crovisier, J., Bachiller, R., Benford, D. J., Biver, N., Colom, P., Davies, J. K., Gérard, E., Germain, B., Houde, M., Mehringer, D., Moreno, R., Paubert, G., Phillips, T. G., and Rauer, H. (2000). New molecules found in comet C/1995 O1 (Hale-Bopp). Investigating the link between cometary and interstellar material. *A&A*, **353**, 1101–1114.
- Boehnhardt, H., Birkle, K., Fiedler, A., Jorda, L., Peschke, S., Rauer, H., Schulz, R., Schwehm, G., Thomas, N., Tozzi, G., and West, R. (1999). Dust Morphology Of Comet Hale-Bopp (C/1995 O1): I. Pre-Perihelion Coma Structures In. *Earth Moon and Planets*, **78**, 179–187.
- Bohlin, R. C., Holm, A. V., Harris, A. W., and Gry, C. (1990). The ultraviolet calibration of the Hubble Space Telescope. IV - Absolute IUE fluxes of Hubble Space Telescope standard stars. *ApJS*, **73**, 413–439.
- Boice, D. C. (2000). Estimate for the reaction rates for the photodissociation of C₂H₅. Personal communication.
- Boice, D. C., Huebner, W. F., Keady, J. J., Schmidt, H. U., and Wegmann, R. (1986). A Model of Comet P/Giacobini-Zinner. *Geophys. Res. Lett.*, **13**(4), 381–384.
- Boice, D. C., Huebner, W. F., Keady, J. J., Schmidt, H. U., and Wegmann, R. (1998). A Model of Comet P / Giacobini-Zinner (GRL 13(4) 1986). In *Comet Encounters*, pages 206+.
- Boudin, N., Schutte, W. A., and Greenberg, J. M. (1998). Constraints on the abundances of various molecules in interstellar ice: laboratory studies and astrophysical implications. *A&A*, **331**, 749–759.
- Brooke, T. Y., Tokunaga, A. T., Weaver, H. A., Crovisier, J., Bockelée-Morvan, D., and Crisp, D. (1996). Detection of acetylene in the infrared spectrum of Comet Hyakutake. *Nature*, **383**, 606–608.

- Bunch, T. E., Wilson, M. A., and Pohorille, A., editors (1998). *Computer Modeling of the Thermal Conductivity of Cometary Ice*.
- Burki, G., Rufener, F., Burnet, M., Richard, C., Blecha, A., and Bratschi, P. (1995). The atmospheric extinction at the E.S.O. La Silla observatory. *A&AS*, **112**, 383+.
- Bus, S. J., A'Hearn, M. F., Schleicher, D. G., and Bowell, E. (1991). Detection of CN emission from (2060) Chiron. *Science*, **251**, 774–777.
- Calvert, J. G. and Pitts, J. N. (1966). *Photochemistry*. John Wiley & Sons, New York.
- Cochran, A. L. (1985). A re-evaluation of the Haser model scale lengths for comets. *AJ*, **90**, 2609–2614.
- Cochran, A. L., Cochran, W. D., Barker, E. S., and Storrs, A. D. (1991). The development of the CO(+) coma of Comet P/Schwassmann-Wachmann 1. *Icarus*, **92**, 179–183.
- Cochran, A. L., Barker, E. S., Ramseyer, T. F., and Storrs, A. D. (1992). The McDonald Observatory Faint Comet Survey - Gas production in 17 comets. *Icarus*, **98**, 151–162.
- Combi, M. (2002). Hale-Bopp: what makes a big comet different? Coma dynamics: observations and theory. IAU Colloquium No. 186: COMETARY SCIENCE AFTER HALE-BOPP.
- Connors, R. E., Roebber, J. L., and Weiss, K. (1974). Photolysis of C₂N₂. *Journal of Chemical Physics*, **60**, 5011+.
- Cottin, H., Gazeau, M. C., and Raulin, F. (1999). Cometary organic chemistry: a review from observations, numerical and experimental simulations. *Planet. Space Sci.*, **47**, 1141–1162.
- Cremonese, G., Boehnhardt, H., Crovisier, J., Rauer, H., Fitzsimmons, A., Fulle, M., Licandro, J., Pollacco, D., Tozzi, G. P., and West, R. M. (1997). Neutral sodium from comet Hale-Bopp: a third type of tail. *ApJ*, **490**, L199–L202.
- Crovisier, J. (1987). Rotational and vibrational synthetic spectra of linear parent molecules in comets. *A&AS*, **68**, 223–258.
- Crovisier, J. (1994). Photodestruction rates for cometary parent molecules. *J. Geophys. Res.*, **99**, 3777–3781.
- Crovisier, J. (1997). Infrared Observations Of Volatile Molecules In Comet Hale-Bopp. *Earth Moon and Planets*, **79**, 125–143.
- Crovisier, J. (2000). Upper limit for the production rate of propyne (CH₃CCH) in Comet Hale-Bopp from IRAM observations on March 18, 1997. Personal communication.

- Crovisier, J. and Encrenaz, T. (1983). Infrared fluorescence of molecules in comets – The general synthetic spectrum. *A&A*, **126**, 170–182.
- Crovisier, J. and Encrenaz, T. (2000). *Comet Science*. Cambridge.
- Crovisier, J., Biver, N., Bockelée-Morvan, D., Colom, P., Despois, D., Lis, D., Rauer, H., and The Team For Target-of-Opportunity Radio Observations of Comets (2000). Molecular observations in comets: Constraints to planetary systems formation. In *IAU Symposium*, volume 202.
- Danks, A., Encrenaz, T., Bouchet, P., Lebertre, T., Chalabaev, A., and Epchtein, N. (1986). Observation of an emission feature at 3.4 microns in the spectrum of Comet Halley. In *ESLAB Symposium on the Exploration of Halley's Comet. Volume 3: Posters*, volume 3, pages 103–106.
- Dello Russo, N., Mumma, M. J., DiSanti, M. A., Magee-Sauer, K., Novak, R., and Rettig, T. W. (2000). Water Production and Release in Comet C/1995 O1 Hale-Bopp. *Icarus*, **143**, 324–337.
- Dello Russo, N., Mumma, M. J., DiSanti, M. A., Magee-Sauer, K., and Novak, R. (2001). Ethane Production and Release in Comet C/1995 O1 Hale-Bopp. *Icarus*, **153**, 162–179.
- Despois, D., Crovisier, J., Bockelee-Morvan, D., Gerard, E., and Schraml, J. (1986). Observations of hydrogen cyanide in comet halley. *A&A*, **160**, L11–+.
- Donati, G. B. (1864). Schreiben des Herrn Prof. Donati an den Herausgeber. *Astronomische Nachrichten*, **62**, 378+.
- Douglas, A. E. (1951). Laboratory Studies of the λ 4050 Group of Cometary Spectra. *ApJ*, **114**, 466–+.
- Enzian, A. (1997). *Ph.D. Thesis*, pages 10+.
- ESO (1993). *THE ESO USERS MANUAL 1993*. ESO.
- Fahr, A. and Nayak, A. (1996). Temperature dependent ultraviolet absorption cross section of propylene, methylacetylene and vinylacetylene. *Chemical Physics*, **203**, 351–358.
- Fahr, A., Hassanzadeh, P., and Atkinson, D. B. (1998). Ultraviolet absorption spectrum and cross-sections of vinyl (C_3H_2) radical in the 225-238nm region. *Chemical Physics*, **236**, 43–51.
- Festou, M. C., Rickman, H., and West, R. M. (1993). Comets. I - Concepts and observations. *A&A Rev.*, **4**, 363–447.
- Fink, U. and Disanti, M. A. (1990). The production rate and spatial distribution of H_2O for Comet P/Halley. *ApJ*, **364**, 687–698.

- Fink, U., Combi, M. R., and Disanti, M. A. (1991). Comet P/Halley - Spatial distributions and scale lengths for C₂, CN, NH₂, and H₂O. *ApJ*, **383**, 356–371.
- Fitzsimmons, A., Cartwright, I. M., Pollacco, D., and Green, D. W. E. (1996). Comet C/1995 O1 (Hale-Bopp). *IAU Circ.*, **6361**, 2+.
- Flammer, K. R., Mendis, D. A., and Shapiro, V. D. (1997). Interaction of the Solar Wind with Comet Hale-Bopp: Global Interaction and Microphysics. *ApJ*, **482**, 1021+.
- Fuke, K. and Schnepf, O. (1979). Absorption and magnetic circular dichroism spectra of allene. *Chem. Phys.*, **38**, 211–216.
- Gail, H.-P. (2002). Radial mixing in protoplanetary accretion disks. III. Carbon dust oxidation and abundance of hydrocarbons in comets. *A&A*, **390**, 253–265.
- Gear, C. W. (1971). *Numerical Initial Value Problems in Ordinary Differential Equations*. Prentice Hall, Englewood Cliffs, New Jersey.
- Giguere, P. T. and Huebner, W. F. (1978). A model of comet comae. I - Gas-phase chemistry in one dimension. *ApJ*, **223**, 638–654.
- Gladstone, G. R., Allen, M., and Yung, Y. L. (1996). Hydrocarbon photochemistry in the upper atmosphere of Jupiter. *Icarus*, **119**, 1–52.
- Glinski, R. J., Post, E. A., and Anderson, C. M. (2001). Fiberoptic Array Spectroscopy of NH₂ in Comet Hale-Bopp: Nature of the Rotational Energy Distributions. *ApJ*, **550**, 1131–1139.
- Greenstein, J. L. (1958). High-resolution spectra of Comet MRKOS (1957d). *ApJ*, **128**, 106–106.
- Häberli, R. M., Gombosi, T. I., DeZeeuw, D. L., Combi, M. R., and Powell, K. G. (1997). Modeling of Cometary X-rays Caused by Solar Wind Minor Ions. *Science*, **276**, 939–942.
- Halpern, J. B., Miller, G. E., and Okabe, H. (1988). The UV photochemistry of cyanoacetylene. *Journal of Photochemistry and Photobiology A:Chemistry*, **42**, 63–72.
- Hamai, S. and Hirayama, F. (1979). Fluorescence of acetylenic hydrocarbons. *Journal of Chemical Physics*, **71**, 2934–2939.
- Hamuy, M., Suntzeff, N. B., Heathcote, S. R., Walker, A. R., Gigoux, P., and Phillips, M. M. (1992). Southern spectrophotometric standards, 1. *PASP*, **104**, 533–555.
- Hamuy, M., Suntzeff, N. B., Heathcote, S. R., Walker, A. R., Gigoux, P., and Phillips, M. M. (1994). Southern spectrophotometric standards, 2. *PASP*, **106**, 566–589.
- Haser, L. and Swings, P. (1957). Sur la possibilité d'une fluorescence cométaire excitée par la raie d'émission Lyman α solaire. *Annales d'Astrophysique*, **20**, 52+.

- Herbst, E. (1983). Ion-molecule syntheses of interstellar molecular hydrocarbons through C₄H - Toward molecular complexity. *ApJS*, **53**, 41–53.
- Herzberg, G. (1945). *Molecular Spectra and Molecular Structure II: Infrared and Raman Spectra of Polyatomic Molecules*. Van Nostrand Reinhold, New York.
- Herzberg, G. (1966). *Molecular Spectra and Molecular Structure III: Electronic Spectra and Electronic Structure of Polyatomic Molecules*. Van Nostrand Reinhold, New York.
- Hiraoka, K., Takayama, T., Euchii, A., Handa, H., and Sato, T. (2000). Study of the Reactions of H and D Atoms with Solid C₂H₂, C₂H₄, and C₂H₆ at Cryogenic Temperatures. *ApJ*, **532**, 1029–1037.
- Huebner, W. F. and Benkhoff, J. (1999). From Coma Abundances to Nucleus Composition. *Space Science Reviews*, **90**, 117–130.
- Huebner, W. F. and Keady, J. J. (1984). First-flight escape from spheres with R(-2) density distribution. *A&A*, **135**, 177–180.
- Huebner, W. F., Keady, J. J., Boice, D. C., Schmidt, H. U., and Wegmann, R. (1987). *Chemico-Physical models of cometary atmospheres*, pages 431–441. Vardya, M. S. and Tarafdar, S. P.
- Huebner, W. F., Keady, J. J., and Lyon, S. P. (1992). Solar photo rates for planetary atmospheres and atmospheric pollutants. *Ap&SS*, **195**, 1–289.
- Huebner, W. F. e. (1990). *Physics and Chemistry of Comets*. Astronomy and Astrophysics Library. Springer Verlag.
- Huggins, W. (1867). Note on the Spectrum of Comet II. 1867 . *MNRAS*, **27**, 288+.
- Irvine, W. M. (1999). The Composition of Interstellar Molecular Clouds. *Space Science Reviews*, **90**, 203–218.
- Jackson, W. M. (1976). The photochemical formation of cometary radicals. *J. Photochem.*, **5**, 107–118.
- Jackson, W. M., Anex, D. S., Continetti, R. E., Balko, B., and Lee, Y. T. (1991). Molecular beam studies of the photolysis of allene and the secondary photodissociation of the C₃H_x fragments. *Journal of Chemical Physics*, **95**(10), 7327–7336.
- Jackson, W. M., Bao, Y., Urdahl, R. S., Song, X., Gosine, J., and Lu, C. (1992). Cometary Implications of Recent Laboratory Experiments on the Photochemistry of the C₂H and C₃H₂ Radicals. In *ACM Proceedings*.
- Jackson, W. M., Blunt, V., Lin, H., Green, M., Olivera, G., Fink, W. H., Bao, Y., Urdahl, R. S., Mohammad, F., and Zahedi, M. (1996). Non-Adiabatic Interactions in Excited C₂H Molecules and Their Relationship to C₂ Formation in Comets. *Ap&SS*, **236**, 29–47.

- Jewitt, D. and Matthews, H. (1999). Particulate Mass Loss from Comet Hale-Bopp. *AJ*, **117**, 1056–1062.
- Job, V. A. and King, G. W. (1966). Ultraviolet spectra of Cyanoacetylene. *Journal of Molecular Spectroscopy*, **19**, 155.
- Kührt, E., Keller, H. U., and Lorenz, E. (1995). Interpretation of surface temperatures and activity of KOSI samples. *Planet. Space Sci.*, **43**, 333–340.
- Kawakita, H. and Watanabe, J. (1998). NH_2 and Its Parent Molecule in the Inner Coma of Comet Hyakutake (C/1996 B2). *ApJ*, **495**, 946+.
- Kawakita, H. and Watanabe, J. (2002). Revised Fluorescence Efficiencies of Cometary NH_2 : Ammonia Abundance in Comets. *ApJ*, **572**, L177–LL180.
- Keady, J. J. (2001). Total electron impact dissociation rate of C_3H_4 . Personal communication.
- Keller, H. U. and Thomas, G. E. (1973). Determination of the Solar Lyman-Alpha Flux Independent of Calibration by Ultraviolet Observations of Comet Bennett. *ApJ*, **186**, L91–+.
- Keller, H. U., Arpigny, C., Barbieri, C., Bonnet, R. M., Cazes, S., Coradini, M., Cosmovici, C. B., Delamere, W. A., Huebner, W. F., Hughes, D. W., Jamar, C., Malaise, D., Reitsema, H. J., Schmidt, H. U., Schmidt, W. K. H., Seige, P., Whipple, F. L., and Wilhelm, K. (1986). First Halley multicolour camera imaging results from Giotto. *Nature*, **321**, 320–326.
- Knollenberg, J. (1993). *Modellrechnungen zur Staubverteilung in der inneren Koma von Kometen unter spezieller Berücksichtigung der HMC-Daten der Giotto-Mission*. Ph.D. thesis, Georg-August-Universität zu Göttingen.
- Krasnopolsky, V. (1997a). On the Nature of Soft X-Ray Radiation in Comets. *Icarus*, **128**, 368–385.
- Krasnopolsky, V., Mumma, M. J., Abbott, M., Flynn, B. C., Meech, K. J., Yeomans, D. K., Feldman, P. D., and Cosmovici, C. B. (1997). Detection of soft x-rays and a sensitive search for noble gases in comet hale-bopp(c/1995 o1). *Science*, **277**, 1488–1491.
- Krasnopolsky, V. A. (1991). C_2 and CN parents in comet P/Halley. *A&A*, **245**, 310–315.
- Krasnopolsky, V. A. (1997b). X-Rays in Hale-Bopp and Other Comets: Theory and Observations. *American Astronomical Society Meeting*, **29**, 1259+.
- Krasnopolsky, V. A. and Tkachuk, A. Y. (1991). TKS-Vega experiment - NH and NH_2 bands in Comet Halley. *AJ*, **101**, 1915–1919.

- Kurucz, R. L., Furenlid, I., Brault, J., and Testerman, L., editors (1984). *Solar Flux Atlas from 296 to 1300 nm*. Number 1 in Technical report. National Solar Observatory Atlas, second edition.
- Lämmerzahl, P., Gebhard, J., Grün, E., and Klees, G. (1995). Gas release from ice/dust mixtures: results from eleven KOSI experiments. *Planet. Space Sci.*, **43**, 363–373.
- Lahuis, F. and van Dishoeck, E. F. (2000). ISO-SWS spectroscopy of gas-phase C₂H₂ and HCN toward massive young stellar objects. *A&A*, **355**, 699–712.
- Larson, S. M. (1980). CO⁺ in comet Schwassmann-Wachmann 1 near minimum brightness. *ApJ*, **238**, L47–+.
- Le Teuff, Y. H., Millar, T. J., and Markwick, A. J. (2000). The UMIST database for astrochemistry 1999. *A&AS*, **146**, 157–168.
- Lias, S. G., Collin, G. J., Rebert, R. E., and Ausloos, P. (1970). Photolysis of ethane at 11.6–11.8 eV. *Journal of Chemical Physics*, **52**, 1841–1851.
- Lii, J. H. and Allinger, N. L. (1992). Intensities of Infrared Bands in Molecular Mechanics (MM3). *Journal of Computational Chemistry*, **13**, 1138.
- Lis, D. C., Gardner, M., Phillips, T. G., Bockelee-Morvan, D., Biver, N., Crovisier, J., Rauer, H., Colom, P., Gautier, D., Despois, D., Mumma, M. J., Disanti, M. A., dello Russo, N., Magee-Sauer, K., Novak, R., Fomenkova, M., and Zanotta, M. V. (1997). Comet C/1995 O1 (Hale-Bopp). *IAU Circ.*, **6573**, 1+.
- Lisse, C. M., Dennerl, K., Englhauser, J., Harden, M., Marshall, F. E., Mumma, M. J., Petre, R., Pye, J. P., Ricketts, M. J., Schmitt, J., Trumper, J., and West, R. G. (1996). Discovery of X-Ray and extreme ultraviolet emission from C/1996 Hyakutake B2. *Science*, **274**, 205–209.
- Marconi, M. L. and Mendis, D. A. (1983). The Atmosphere of a Dirty-Clathrate Cometary Nucleus: A Two-Phase, Multifluid Model. *ApJ*, **273**, 381.
- McNesby, J. R. and Okabe, H. (1965). Vacuum Ultraviolet Photochemistry. *Journal of Chemical Physics*, **15**, 157–240.
- Mebel, A. M., Jackson, W. M., Chang, A. H. H., and Lin, S. H. (1998). Photodissociation dynamics of propyne and allene: A view from ab initio calculations of the C₃H_n (n=1–4) species and the isomerization mechanism for C₃H₂. *Journal of the American Chemical Society*, **120**, 5751–5763.
- Mehring, D., Colom, P., Benford, D., Bockelee-Morvan, D., Despois, D., Paubert, G., Germain, B., Biver, N., Crovisier, J., Gautier, D., Gerard, E., Rauer, H., Lis, D. C., Phillips, T. G., Moreno, R., Davies, J. K., Dent, W. R. F., Owens, A., Oosterbroek, T., Orr, A., Parmar, A. N., Antonelli, L. A., Fiore, F., Maccarone, M. C., and Piro, L. (1997). Comet C/1995 O1 (Hale-Bopp). *IAU Circ.*, **6614**, 1+.

- Meier, R., Owen, T. C., Jewitt, D. C., Matthews, H. E., Senay, M., Biver, N., Bockelee-Morvan, D., Crovisier, J., and Gautier, D. (1998). Deuterium in Comet C/1995 O1 (Hale-Bopp): Detection of DCN. *Science*, **279**, 1707+.
- Moore, M. H. and Hudson, R. L. (1998). Infrared Study of Ion-Irradiated Water-Ice Mixtures with Hydrocarbons Relevant to Comets. *Icarus*, **135**, 518–527.
- Moses, J. (2000). Photodissociation rate coefficients. personal communication.
- Mumma, M. J., Weaver, H. A., Larson, H. P., Williams, M., and Davis, D. S. (1986). Detection of water vapor in Halley's comet. *Science*, **232**, 1523–1528.
- Mumma, M. J., DiSanti, M. A., Dello Russo, N., Fomenkova, M., Magee-Sauer, K., Kaminski, C. D., and Xie, D. X. (1996). Detection of Abundant Ethane and Methane, Along with Carbon Monoxide and Water, in Comet C/1996 B2 Hyakutake: Evidence for Interstellar Origin. *Science*, **272**, 1310–1314.
- Mumma, M. J., DiSanti, M. A., Dello Russo, N., Magee-Sauer, K., and Rettig, T. W. (2000). Detection of CO and Ethane in Comet 21P/Giacobini-Zinner: Evidence for Variable Chemistry in the Outer Solar Nebula. *ApJ*, **531**, L155–L159.
- Mumma, M. J., Dello Russo, N., DiSanti, M. A., Magee-Sauer, K., Novak, R. E., Brittain, S., Rettig, T., McLean, I. S., Reuter, D. C., and Xu, L. (2001). Organic Composition of C/1999 S4 (LINEAR): A Comet Formed Near Jupiter? *Science*, **292**, 1334–1339.
- Nakayama, T. and Watanabe, K. (1964). Absorption and photoionization coefficients of acetylene, propyne and 1-butyne. *Journal of Chemical Physics*, **40**, 558–561.
- Notesco, G., Laufer, D., and Bar-Nun, A. (1997). NOTE: The Source of the High C₂H₆/CH₄ Ratio in Comet Hyakutake. *Icarus*, **125**, 471–473.
- Oke, J. B. (1990). Faint spectrophotometric standard stars. *AJ*, **99**, 1621–1631.
- Olivera, J. J., Stagat, R. W., and Green, A. E. S. (1972). Studying the dynamics of a cometary coma. *J. Geophys. Res.*, **77**, 4797.
- Owens, A., Parmar, A., Oosterbroek, T., Orr, A., Antonelli, L. A., Fiore, F., Schultz, R., Tozzi, G. P., Maccarone, M. C., and Piro, L. (1998). Evidence for dust related x-ray emission from comet c/1995 o1 (hale-bopp). *ApJ*, **492**, L47–L51.
- Pang, K. D., Ajello, M., J., and Franklin, B. (1987). Electron impact excitation cross section studies of methane and acetylene. *J.Chem.Phys.*, **86**, 2750–2764.
- Pouilly, B., Robbe, J. M., Schamps, J., and Roueff, E. (1983). Photolytic reaction coefficients. *Journal Physics B:Atomic molecular Physics*, **16**, 437.

- Press, W. H., Teukolsky, S. A., Vetterling, W., and Flannery, B. P. (1992). *Numerical Recipes in C, The Art of Scientific Computing*, chapter 4.3. Cambridge University Press, second edition.
- Rabalais, J. W., McDonald, J. M., Scherr, V., and McGlynn, S. P. (1971). Electronic spectroscopy of isoelectronic molecules. II. Linear triatomic groupings containing sixteen valence electrons. *Chemistry Review*, **71**, 73–108.
- Rauer, H. (2002). Remote observations of cometary volatiles and implications on comet nuclei. In M. F. A'Hearn, editor, *IAU Coll. 168, Cometary nuclei in space and time*.
- Rauer, H., Arpigny, C., Boehnhardt, H., Colas, F., Crovisier, J., Jorda, L., Küppers, M., Manfroid, M., Rembor, K., and Thomas, N. (1997). Optical observations of Comet Hale-Bopp (C/1995 O1) at large heliocentric distances before perihelion. *Science*, **275**.
- Rauer, H., Helbert, J., Arpigny, C., Benkhoff, J., Bockelée-Morvan, D., Boehnhardt, H., Colas, J., Crovisier, J., Hainaut, O., Jorda, L., Kueppers, M., Manfroid, J., Thomas, N., and Weiler, M. (2002). Long-term optical spectrophotometric monitoring of comet hale-bopp (c/1995 o1). submitted.
- Rousselot, P., Hill, S. M., Burger, M. H., Brain, D. A., Laffont, C., and Moreels, G. (2000). Theoretical Modeling of the C₂ Fluorescence Spectrum in Comet Hale-Bopp. *Icarus*, **146**, 263–269.
- Rousselot, P., Arpigny, C., Rauer, H., Cochran, A. L., Gredel, R., Cochran, W. D., Manfroid, J., and Fitzsimmons, A. (2001). A fluorescence model of the C₃ radical in comets. *A&A*, **368**, 689–699.
- Schleicher, D. G. (1983). *The fluorescence of cometary OH and CN*. Ph.D. thesis, Maryland Univ., College Park.
- Schmidt, H. U., Wegmann, R., Huebner, W. F., and Boice, D. C. (1988). Cometary gas and plasma flow with detailed chemistry. *Comput. Phys. Commun.*, **49**, 17–59.
- Seiferlin, K., Kömle, N. I., Kargl, G., and Spohn, T. (1996). Line heat-source measurements of the thermal conductivity of porous H₂O ice, CO₂ ice and mineral powders under space conditions. *Planet. Space Sci.*, **44**, 691–704.
- Seki, K. (1985). ?? Ph.D. thesis, University of Tokyo.
- Senay, M. C. and Jewitt, D. (1994). Coma Formation Driven by Carbon-Monoxide Release from Comet SCHWASSMANN-WACHMANN:1. *Nature*, **371**, 229+.
- Shimizu, M. (1976a). The structure of cometary atmospheres. I - Temperature distribution. *Ap&SS*, **40**, 149–155.
- Shimizu, M. (1976b). The structure of cometary atmospheres. II - Ion distribution. *Ap&SS*, **40**, 243–251.

- Soderblom, L. A., Boice, D. C., Britt, D. T., Brown, R. H., Buratti, B. J., Hicks, M. D., Nelson, R. M., Oberst, J., Sandel, B. R., Stern, S. A., Thomas, N., and Yelle, R. V. (2001). Observations of Comet 19P/Borrelly from the Miniature Integrated Camera and Spectrometer (MICAS) aboard Deep Space 1 (DS1). *AAS/Division for Planetary Sciences Meeting*.
- Sorkhabi, O., Blunt, V. M., Lin, H., A'Hearn, M. F., Weaver, H. A., Arpigny, C., and Jackson, W. M. (1997). Using photochemistry to explain the formation and observation of C₂ in comets. *Planet. Space Sci.*, **45**, 721–730.
- Stern, S. A., Slater, D. C., Festou, M. C., Parker, J. W., Gladstone, G. R., A'Hearn, M. F., and Wilkinson, E. (2000). The Discovery of Argon in Comet C/1995 O1 (Hale-Bopp). *ApJ*, **544**, L169–L172.
- Stief, J. L., DeCarlo, V. J., and Payne, W. A. (1971). Photolysis of propyne at 1470 Å. *Journal of Chemical Physics*, **54**, 1913–1918.
- Stief, L. J., Donn, B., Glicker, S., Gentieu, E. P., and Mentall, J. E. (1972). Photochemistry and Lifetimes of Interstellar Molecules. *ApJ*, **171**, 21+.
- Stoer, J. and Bulirsch, R. (1980). *Introduction to Numerical Analysis*, chapter 3.4–3.5. Springer-Verlag.
- Sutcliffe, L. H. and Walsh, A. D. (1952). The Absorption Spectrum of Allene in the Vacuum Ultra-violet. *Journal of the Canadian Chemical Society*.
- Swings, P. (1965). Cometary spectra. (george darwin lecture). *QJRAS*, **6**, 28.
- Swings, P. and Haser, L. (1956). *Atlas of representative cometary spectra*. [Louvain, Impr. Ceuterick, 1956].
- Swings, P., Elvey, C. T., and Babcock, H. W. (1941). The Spectrum of Comet Cunningham, 1940C. *ApJ*, **94**, 320+.
- Taylor, B. J. (1984). An augmented system of secondary standards for bright-star spectrophotometry. *ApJS*, **54**, 259–270.
- Thorstensen, J. (1993). *Notes on Skycalc*. Dartmouth College, 4 edition.
- Tokunaga, A. T., Brooke, T. Y., Weaver, H. A., Crovisier, J., and Bockelee-Morvan, D. (1996). Comet C/1996 B2 (Hyakutake). *IAU Circ.*, **6378**, 1+.
- Turnshek, D. A., Bohlin, R. C., Williamson, R. L., Lupie, O. L., and Koornneef, J. (1990). An atlas of Hubble Space Telescope photometric, spectrophotometric, and polarimetric calibration objects. *AJ*, **99**, 1243–1261.
- Weaver, H. A., Brooke, T. Y., Chin, G., Kim, S. J., Bockelee-Morvan, D., and Davies, J. K. (1997). Infrared Spectroscopy of Comet Hale-Bopp. *Earth, Moon and Planets*, **78**, 71–80.

- Weaver, H. A., Chin, G., Bockelée-Morvan, D., Crovisier, J., Brooke, T. Y., Cruikshank, D. P., Geballe, T. R., Kim, S. J., and Meier, R. (1999a). An Infrared Investigation of Volatiles in Comet 21P/Giacobini-Zinner. *Icarus*, **142**, 482–497.
- Weaver, H. A., Feldman, P. D., A’Hearn, M. F., Arpigny, C., Brandt, J. C., and Stern, S. A. (1999b). Post-Perihelion HST Observations of Comet Hale-Bopp (C/1995 O1). *Icarus*, **141**, 1–12.
- Wegmann, R. (1995). MHD model calculations for the effect of interplanetary shocks on the plasma tail of a comet. *A&A*, **294**, 601–614.
- Wegmann, R., Schmidt, H. U., Lisse, C. M., Dennerl, K., and Englhauser, J. (1998). X-rays from comets generated by energetic solar wind particles. *Planet. Space Sci.*, **46**, 603–612.
- Weiler, M. (2002). Staubproduktionsraten des Kometen Hale-Bopp. Master’s thesis, Technische Universität Berlin.
- Werner, M. W., Becklin, E. E., Gatley, I., Matthews, K., Neugebauer, G., and Wynn-Williams, C. G. (1979). An infrared study of the NGC 7538 region. *MNRAS*, **188**, 463–479.
- West, G. A. (1975). *Cyanide Radical Molecular Electronic and Vibrational Chemical Laser: Hydrogen Cyanide Polyatomic Chemical Laser*. Ph.D. thesis, University of Wisconsin.
- Whittet, D. C. B., Schutte, W. A., Tielens, A. G. G. M., Boogert, A. C. A., de Graauw, T., Ehrenfreund, P., Gerakines, P. A., Helmich, F. P., Prusti, T., and van Dishoeck, E. F. (1996). An ISO SWS view of interstellar ices: first results. *A&A*, **315**, L357–L360.
- Wodtke, A. M. and Lee, Y. T. (1985). Photodissociation of acetylene at 193.3nm. *Journal of Chemistry and Physics*, **89**, 4744–4751.
- Woodney, L., McMullin, J., A’Hearn, M., Samarasinha, N., Bird, M. K., Janardhan, P., Gemsheimer, P., Huchtmeier, W., and Wilson, T. L. (1997). Comet C/1995 O1 (Hale-Bopp). *IAU Circ.*, **6607**, 1+.
- Wu, C. Y. R. (2000). Cross section of C₂H₂ at cryogeniclow temperatures. Personal communication.
- Wu, C. Y. R., Chien, T. S., Liu, G. S., Judge, D. L., and Caldwell, J. J. (1989). Photoabsorption and direct dissociation cross sections of C₂H₂ in the 1530-1930 Å region: A temperature dependent study. *J. Chem. Phys.*, **91**, 272–280.
- Wyckoff, S., Heyd, R. S., and Fox, R. (1999). Unidentified Molecular Bands in the Plasma Tail of Comet Hyakutake (C/1996 B2). *ApJ*, **512**, L73–L76.
- Yamamoto, T. (1981). On the photochemical formation of CN, C₂, and C₃ radicals in cometary comae. *The Moon and the Planets*, **24**, 453–463.

- Yung, Y. L., Allen, M., and Pinto, J. P. (1984). Photochemistry of the atmosphere of Titan: Comparison between model and observations. *Astrophys.J.Suppl.Ser.*, **55**, 465–506.
- Zwickl, R. D., Baker, D. N., Bame, S. J., Feldman, W. C., Fuselier, S. A., Huebner, W. F., McComas, D. J. M., and Young, D. T. (1986). Three Component Plasma Electron Distribution in the Intermediate Ionized Coma of Comet Giacobini-Zinner. *Geophys. Res. Lett.*, **13**, 401.

