

NAME: Gordon Chin

PRESENT POSITION: NASA/Goddard Space Flight Center, AST, Stellar Studies  
Code 693.1 Planetary Systems Branch  
Laboratory for Extraterrestrial Physics

RESEARCH AREA: Submillimeter receiver technology, submillimeter optically-pumped laser development, acousto-optic spectrometer development.  
Cometary Studies: Observation and excitation calculation of molecular infrared and millimeter transitions in cometary atmospheres.  
Experimental control of chaotic systems - computational physics.

EXPERIENCE: 1998-Current: Member of the NSF Oversight Committee for the NRAO Millimeter Array Project.

1998: Principal Investigator for a proposed Discovery-Class Mission VESPER, Venus Sounder for Planetary Exploration, selected for Feasibility Study for Discovery 7 Implementation.

1994: Small Explorer Program Scientist -Detailed to NASA HQ part-time. Responsible for the scientific and technical evaluation of proposals for the second set of Small Explorer missions.

1989-Current: Project Scientist for the Submillimeter Wave Astronomy Satellite (SWAS) - SWAS is a Small Explorer mission that will employ cooled Schottky submillimeter heterodyne receivers to observe water, oxygen,  $^{13}\text{CO}$ , and neutral carbon (CI) in the interstellar medium. The satellite will survey interstellar cloud complexes at these spectral lines to investigate the process of star formation. The mission plans several years observing duration.

1979-Current: Astrophysicist, GSFC

1977-1979: NAS-NRC Postdoctoral Research Fellow, GSFC

AWARDS: 1997 Goddard Performance Award  
1996 Goddard Special Act Award  
1995 Goddard Special Act Group Award, SWAS I&T Team  
1995 Goddard Performance Award  
1994 NASA Exceptional Achievement Medal  
1993 Goddard Performance Award  
1989 Goddard Performance Award

EDUCATION: 1995 - Goddard Leadership Educational Series (GLES)  
1977 - Ph.D. - Physics, Columbia University  
1974 - M. Phil. - Physics, Columbia University  
1972 - M.A. - Physics, Columbia University  
1970 - B.A. - Physics, Columbia College

## Publications

- 1977 "Observations of CO Emission from a Dense Cloud; Associated with the Supernova Remnant IC443, ", R.H. Cornett, G. Chin and G.R. Knapp, *Astron. & Astrophys.*, **54**, p. 889.
- 1977 "The Molecular Complexes in Orion", M. Kutner, K. Tucker, Chin and P. Thaddeus, *Ap. J.*, **215**, p. 521.
- 1978 "Atomic and Molecular Observations of the Rho Ophiuchi Dark Cloud", Myers, Ho, Schnep, Chin, Pankonin and Winnberg, *Ap. J.*, **222**, p. 864.
- 1979 "Search for H<sub>2</sub> Emissions at 2.1  $\mu$ m in Ten Southern Hemisphere Sources", N.S. Scoville, D. Y. Gezari, G. Chin, and R.R. Joyce, *Ast. J.*, **84**, P. 1571
- 1980 "Vibrationally Excited Silicon Monoxide Masers", D. Buhl, G. Chin, D. Glenar, T. Kostiuk, M.J. Mumma and F.J. Lovas, *Proceedings IAU Symposium No. 87 on Interstellar Molecules*.
- 1980 "A 10 Micron Heterodyne Receiver for Ultra-High Resolution Astronomical Spectroscopy", D. Buhl, G. Chin, J. Faris, T. Kostiuk, M.J. Mumma and D. Zipoy, *Proceedings IAU Symposium No. 87 on Interstellar Molecules*, p.633.
- 1980 "Design and Performance of Acousto-Optic Spectrometer for Use with Heterodyne Receivers", G. Chin and D. Buhl, *Proceedings Heterodyne Systems Technology Conference*, Williamsburg, VA.
- 1980 "Direct Observation of the Failure of Local Thermodynamic Equilibrium in the CO<sub>2</sub> (001) State in the Lower Atmosphere of Mars", M.J. Mumma, D. Buhl, G. Chin, D. Deming, F. Espenak, T. Kostiuk, *Proceedings IAU Symposium No. 96*.
- 1980 "Acousto-Optic Spectrometers for Radio Astronomy", G. Chin, D. Buhl and J.M. Florez, *International Optical Computing Conference, SPIE*, **231**.
- 1981 "The Discovery of Natural Gain Amplification in the 10  $\mu$ m CO<sub>2</sub> Laser Bands on Mars: A Natural Laser", M.J. Mumma, D. Buhl, G. Chin, D. Deming, F. Espenak, T. Kostiuk and D. Zipoy, *Science*, **212**, p. 45.
- 1981 "Bulk and Integrated Acousto-Optic Spectrometers for Radio Astronomy", G. Chin D. Buhl and J.M. Florez, *Optical Information Processing for Aerospace Application*, NASA Conference Reference 2207, p. 85.
- 1981 "433 Micron Laser Heterodyne Observations of Galactic CO from Mauna Kea", D. Buhl, G.A. Koepf, G. Chin, N. McAvoy, H.R. Fetterman, D. D. Peck, B.J. Clifton, P. E. Tannenwald, P.F. Goldsmith and N.R. Erickson, *Infrared Astronomy, SPIE*, **280**.
- 1981 "Infrared Heterodyne Spectroscopy", M.J. Mumma, T. Kostiuk, D. Buhl, G.Chin, *Infrared Astronomy, SPIE*, **280**, p.111.
- 1982 "Infrared Heterodyne Spectroscopy", M.J. Mumma, T. Kostiuk, D. Buhl, G.Chin, *Infrared Astronomy, Optical Engineering*, **21**, p. 313.
- 1982 "CO (J=6 $\rightarrow$ 5) Distribution in Orion and Detection in other Galactic Sources", G.A. Koepf, D. Buhl, G. Chin, D.D. Peck, H.R. Fetterman, B.J. Clifton and P.E. Tannenwald, *Ap. J.*, **260**, p. 584.
- 1982 "The Excitation and Distribution of CO (J=6 $\rightarrow$ 5) Emission in the Orion Nebula", D. Buhl, G. Chin, G.A. Koepf, D.D. Peck and H.R. Fetterman, *Submillimeter Wave Astronomy*, Cambridge University Press.
- 1984 "Molecular Astronomy using Heterodyne Detection at 691 GHz", D.D. Peck, H.R. Fetterman, D. Buhl, G. Chin and S. Petuchowski, *International Journal of Infrared and Millimeter Waves*, **Vol. 5 No. 3**, p 329.
- 1984 "Vibrational and Rotational Excitation of CO in Comets: Part I. Non-Equilibrium Calculations. Part II. Results of the Calculation for Standard Bright Comet, Comet IRAS-Aracki-Alcock, and Comet Halley", G. Chin and H.A. Weaver, *NASA TM 86122*.
- 1984 "Vibrational and Rotational Excitation of CO in Comets: Non-Equilibrium Calculations", G. Chin and H.A. Weaver, *Ap. J.*, **285**, p. 858.

- 1984 "Radioastronomical Observations of Comets IRAS-Araki-Alcock (1983d), and Sugano-Saigigusa-Fujikawa (1983e)," W. M. Irvine, Z. Abraham, M. A'Hearn, W. Altenhoff, C. H. Anderson, J Bally, W. Batria, A. Baudry, D. Bockelee-Morvan, G. Chin, J. Crovisier, I. DePater, D. Despois, L. Ekelund, E. Gerard, T. Hasegawa, C. Heiles, J. M. Hollis, W.Huchtmeier, N. Kaifu, R. Levreault, C. R. Masson, P. Palmer, M. Perault, L. J. Rickard, A. I. Sargent, E. Scalise, F. P. Schloerb, J. Schmidt, A. A. Stark, M. Stevens, P. Stumpff, E. C. Sutton, D. Swade, M. Skyes, B. turner, C. Wade, M. Walmsley, J. Webber, A. Winnberg, A. Wooten, *Icarus* (ISSN0019-1035), vol. 60, Oct. 1984, p. 215-220. Research supported by the Naturvetenskapliga Forskningsradet, NASA, and NSF.
- 1984 "NASA Applications for Acousto-Optic Spectrometers", G. Chin, *Optical Technology for icrowave Applications, SPIE*, **477**, p. 128.
- 1984 "Acousto-Optic Spectrometers: Noise Contribution and System Considerations", G. Chin, *NASA X-693-84-9*.
- 1985 "An Attempt to Observe Mass Loss from  $\alpha$  Lyra with the VLA", J.M. Hollis, G. Chin, Robert L. Brown, *Ap. J.*, **294**, 646.
- 1986 "Wide Field and Diffraction Limited Array Camera for SIRTf", Fazio, Koch, Melnick, Tresch-Fienberg, Willner, Gezari, Lamb, Shu, Chin, Silverberg, Mather, Hoffman, Woolf, Pipher, Forrest, and McCreight, *Instrumentation for Remote Sensing from Space, SPIE*, **589**, p. 229.
- 1987 "Optically Pumped Submillimeter Gas Lasers and the Prospects for Constructing Space-Qualifiable LO Systems", G. Chin, *International Journal of Infrared and Millimeter Waves*, **Vol. 8 No. 10**, p. 1219.
- 1987 "High Throughput Bit-Slice Front-End Processor for the New Goddard 10  $\mu$ m 58 x 62 Array Camera", G. Chin and D.Y. Gezari, *Infrared Astronomy with Arrays, Proceedings of the Workshop on Ground-based Astronomical Observations with Infrared Array Detector*, ed. Wynn-Williams and E.E. Becklin, University of Hawaii, p. 160.
- 1989 "Real Time Processor for Array Speckle Interferometry", G. Chin, J. Florez, R. Borelli, W. Fong, J. Miko, C. Trujillo, *IEEE Transactions on Nuclear Science*, **vol. 37, No. 1**, p. 958.
- 1990 "Fiber-Coupled High Resolution Infrared Array Spectrometer for the Kuiper Airborne Observatory", D.A. Glenar, D. Reuter, M.J. Mumma, G. Chin, G. Wiedemann, D.E. Jennings, K. Forrest, and H.A. Weaver, "Astronomical Telescopes & Instrumentation for the 21st Century in Astronomy VII", edited by D.L. Crawford, **SPIE Proceedings Series, vol. 1235**, Tucson, AZ, February 13-17, 1990, p. 933. Category: Instrumentation and Photography.
- 1990 "Intra-Cavity Pumped FIR Laser System," G. Chin, and H. Davé, *Submillimeter Astronomy, Proceedings of the Kona Symposium on Millimetre and Submillimetre Astronomy*, edited by Graeme D. Watt and Adrian Webster, Kluwer Academic Publishers, **vol. 151**, p. 65.
- 1990 "Comet Austin (1989c1)" M.J. Mumma, S. Hoban, M. DiSanti, D. Reuter, F. Espenak, G. Chin, D. Glenar, and H.A. Weaver, *International Astronomical Union Cir. (USA) No. 5012*.
- 1991 "Limit on the CH<sub>4</sub>/CO Ratio in Comet Levy(1990c), and comparisons with other comets," H. A. Weaver, G. Chin, T. Y. Brooke, A. T. Tokunaga, T. R. Geballe, In Lunar and Planetary Inst., Abstracts for the International Conference on Asteroids, Comets, Meteors 1991 p 233 (SEE N91-25982 17 90). Category: Astrophysics
- 1991 "Discovery of a Doppler-Limited CO Line in the Upper Atmosphere of Venus: A New Dynamical Probe," D. Buhl, G. Chin, and J. Goldstein, *Ap.J. (Lett)*, **369**, L17. Category: Lunar and Planetary Exploration; Venus
- 1991 "A Sensitive Upper Limit on the Methane Abundance in Comet Levy (1990c)," T.Y. Brooke, A.T. Tokunaga, H.A. Weaver, G. Chin, and T.R. Geballe, *Ap.J. (Lett)*, **372**, L113.

- 1991 "Integrated Terahertz Corner-Cube Antennas and Receivers," S.G. Gearhart, C.C. Ling, G.M. Rebeiz, G. Chin, and H. Davé, *Proceedings of the Second International Symposium on Space Terahertz Technology*, Jet Propulsion Laboratory, Pasadena, CA, February 26-28 1991, p. 57.
- 1991 "802 GHz Integrated Horn Antennas Imaging Array," W.Y. Ali-Ahmad, G.M. Rebeiz, H. Davé, and G. Chin, *International Journal of Infrared and Millimeter Waves*, **Vol. 12, No. 5**, p. 481. Category: Instrumentation and Photography
- 1991 "Integrated 119  $\mu\text{m}$  linear corner-cube array," C.C. Ling, G.M. Rebeiz, H. Davé, and G. Chin, *IEEE Microwave and Guided Waves Letter*, **Vol. 1, No. 7**, p 155. Category: Electronics and Electrical Engineering
- 1991 "NASA's Small Explorer Program," D.N., Baker, G. Chin, and R.F, Pfaff, Jr., *Physics Today*, December 1991, p. 44.
- 1991 "Report of the Heterodyne Submillimeter-Wave Sensors Panel," Robert Wilson *et al.*, *Workshop Proceedings: Sensor Systems for Space Astrophysics in the 21st Century*, ed. Barbara Wilson, JPL Publication 91-24, Vol. 2. p. 50.
- 1992 "Optically Pumped Submillimeter Laser Heterodyne Receivers: Astrophysical; Observations and Recent Technical Developments," G. Chin, invited paper, *Proceedings of the IEEE, Special Issue on Terahertz Technology.*, November 1992, **vol. 80, no. 11**, p. 1788--1799.
- 1992 "Large Area Bolometers for THz Power Measurements," Curtis C. Ling, Joseph C. Landry, Hemant Davé, Gordon Chin, and Gabriel Rebeiz, *IEEE Transactions on Microwave and Techniques*, Vol. 42. No. 4, April 1994, p. 758-760.
- 1992 "Slot-line end fire antennas for THz frequencies," H. Ekstroem, S. Gearhart, P.R. Acharya H. Dave, G. Rebeiz, S. Jacobsson, E. Kollberg, G. Chin, In Michigan Univ., The Third International Symposium on Space Terahertz Technology: *Symposium Proceedings p 280-290 (SEE N93-27726 10-31)*. Category: *Communications and Radar*
- 1992 "Optically pumped submillimeter laser heterodyne receivers- Astrophysical observations and recent technical developments," Gordon Chin, *IEEE, Proceedings (ISSN 0018-9219)*, *vol. 80, no. 11, p. 1788-1799*. Category: *Lasers and Masers*
- 1993 "Radio Observations Spatial and Temporal Variations in the Mesospheric Winds of Venus," David Buhl, Jeffrey J. Goldstein, Gordon Chin, *Amer. Astron. Soc. Meeting*, 183, #25.05.
- 1994 "Observations of Global Changes in the Wind Dynamics of the Venus Mesosphere: A Doppler Study of the 1.3 mm CO Line," D. Buhl, J.J. Goldstein, and G. Chin, submitted to *Icarus*.
- 1994 "A Submillimeter Wave Platelet Horn Array: Fabrication and Performance," R.W. Haas, S. Raman, G. Rebeiz, W. R. McGrath, G. Chin, and H. Davé, *Fifth International Symposium on Space Terahertz Technology*, Ann Arbor, MI.
- 1994 "Large area bolometers for THz power measurements," C. C.. Ling, J. C. Landry, Davee Hemant Chin, Gordon, Rebeiz, *Gabriel, IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480)*, *vol.42, no.4, pt.2, p.758-760*. Category: *Instrumentation and Photography*
- 1995 "Convolution Connection Paradigm Neural Network Enables Linear System Theory-Based Image Enhancement," W. E. Blass, S. L. Mahan, and G. Chin, *International Journal of Imaging Systems and Technology*, Vol. 6, 1995, pp. 350-357.
- 1996 "Stabilizing Lead Salt Diode Lasers: Understanding and Controlling Chaotic Frequency Emission, *Science*, Vol. 274, November 29, 1996, pp. 1498-1501.
- 1997 "High Resolution Infrared Spectroscopy of Comet Hale-Bopp," T. Y. Brooke, H. A. Weaver, G. Chin, S. J. Kim, *Amer. Astron. Soc. Meeting #29, #34.03*.
- 1997 "The Methane Abundance in Comet Hyakutake (C/1996 B2)," H. A. Weaver, T. Y. Brooke, M. A. Disanti, M. J. Mumma, A. Tokunaga, G. Chin, M. F. A'Hearn, T. C. Owen, C. M. Lisse, *Amer. Astron. Soc., DPS Meeting #29, #34.05*.

- 1997 “Infrared Spectroscopy of Comet Hale-Bopp,” H. A. Weaver, T. Y. Brooke, S. J. Kim, D. Bockelee-Morvan, J. K. Davies, *Earth, Moon, and Planets*, v. 78, Issue 1/3, p. 71-80 (1997).
- 1998 “Infrared Spectroscopy of Comet Hale-Bopp,” H. A. Weaver, T. Y. Brooke, G. Chin, S. J. Kim, D. Bocklée-Morvan, J. K. Davies, accepted for publication in “*Earth, Moon, and Planets*,” *Special Issue of the International Hale-Bopp Conference in Tenerife, 1998*.
- 1998 “Controlling Chaotic Systems with Occasional Proportional Feedback,” L. R. Senesac, W. E. Blass, G. Chin, J. J. Hillman, J. V. Lobell, accepted for publication, *Review of Scientific Instruments*, March 1999.
- 1998 “Spectroscopy of Comet Hale-Bopp in the Infrared,” T. Y. Brooke, H. A. Weaver, G. Chin S. J. Kim. Amer. Astron. Soc, DPS meeting #30, #31.P12
- 1998 “The VESPER Mission to Venus,” M. Allen, G. Chin, *Amer. Astron. Soc., DPS meeting #30, #48.P08*.
- 1998 “Infrared Excitation of Ethane in Comet Hale-Bopp,” S. J. Kim, H. A. Weaver, G. Chin T. Y. Brooke, *Amer. Astron. Soc., DPS meeting #30, #29.P13*.
- 1998 “First Results from the Submillimeter Wave Astronomy Satellite (SWAS),” G. J. Melnick, J. R. Stauffer, M. Ashby, E. Bergin, A. Dalgarno, G. G. Fazio, S. Kleiner, R. Plume, P. Thaddeus, V. Tolls, Z. Wang, Y. Zhang, N. Erickson, J. Howe, R. Snell, P. Goldsmith, M. Harwit, D. J. Hollenbach, D. G. Koch, D. Neufeld, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting # 193, #72.01*.
- 1999 “Hyperspectral AO Observations of Solar System Objects,” J. J. Hillman, D. A. Glenar, G. Chin, N. J. Chanover, W. E. Blass, S. L. Mahan, M. LeLouarn, ESO Conference and Workshop Proceedings, vol. 56, Edited by Domenico Bonaccini, p.225.
- 1999 “Controlling chaotic systems with occasional proportional feedback,” L. R. Senesac, W. E. Blass, G. Chin, J. J. Hillman, J. V. Lobell, *Review of Scientific Instruments*, Volume 70, Issue 3, March 1999, pp.1719-1724.
- 1999 “The Submillimeter Wave Astronomy Satellite (SWAS),” Results from the First Six Months of Operations,” G. J. Melnick, J. R. Stauffer, M. L. Ashby, E. Bergin, S. Kleiner, B. Patten, R. Plume, V. Tolls, Z. Wang, Y. Zhang, N. Erickson, J. Howe, R. Snell, P. Goldsmith, M. Harwit, D. G. Koch, D. A. Neufeld, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc., Meeting 194, #47.08*.
- 1999 “Comet C/1999 H1 (Lee),” H. Weaver, W. Vacca, N. Biver, S. Kim, D. Bockelee-Morvan, J. Crovisier, T. Brooke, G. Chin, J. Davies, *IAU Circ.*, 7198, 1 (1999). Edited by Green, D. W. E. (IAUC Homepage).
- 1999 “Infrared Investigation of Parent Molecules in Comet C/Lee (1999 H1),” H. A. Weaver, J. K. Davis, T. Kerr, W. Vacca, N. Biver, D. Bockelee-Morvan, J. Crovisier, T. Y. Brooke, G. Chin, S. J. Kim, *Amer. Astron. Soc., DPS meeting #31, 32.05*
- 1999 “Implications of SWAS Observations for Water Abundance and Velocity Structure in Molecular Clouds,” M. L. Ashby, E. A. Bergin, R. Plume, J. M. Carpenter, G. J. Melnick, J. R. Stauffer, S. C. Kleiner, B. M. Patten, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, J. E. Howe, R. L. Snell, D. A. Neufeld, D. G. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Society Meeting 195, #84.03*.
- 1999 “SWAS [CI] Observations towards the High Latitude Cloud MCLD 123.5+24.9,” F. Bensch, M. L. Ashby, E. A. Bergin, J. Carpenter, S. C. Kleiner, G. J. Melnick, B. M. Patten, R. Plume, J. R. Stauffer, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, J. E. Howe, R. L. Snell, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195, #84.02*
- 1999 “SWAS Observations of 492 GHz [CI] and 551 GHz <sup>13</sup>CO Emission from Molecule Cloud Cores,” J. E. Howe, N. R. Erickson, R. L. Snell, M. L. Ashby, E. A. Bergin, S. C. Kleiner, G. J. Melnick, B. M. Patten, R. Plume, J. R. Stauffer, V. Tolls, Z. Wang, Y. F. Goldsmith, M. Harwit, M. J. Kaufman, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195, #84.01*

- 1999 "Implications for Interstellar Chemistry and Star Formation," E. A. Bergin, G. J. Melnick, J. R. Stauffer, M. L. Ashby, S. C. Kleiner, B. M. Patten, R. Plume, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, J. E. Howe, R. L. Snell, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, *Amer. Astron. Soc. Meeting 195*, #63.07.
- 1999 "Solar System Observations: Mars, Jupiter, Saturn and Comet C/1999 H1 (Lee)," M. A. Gurwell, E. Lellough, D. A. Neufeld, G. J. Melnick, J. R. Stauffer, M. L. Ashby, E. A. Bergin, S. C. Kleiner, B. M. Patten, P. Plume, V. Tolls, Z. Wang, Y.F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, J. E. Snell, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc., Meeting 195*, #63.06.
- 1999 "SWAS Mapping of Photon Dominated Regions," R. Plume J E. Howe, F. Bensch, M. J. Kaufman, G. J. Melnick, J. R. Stauffer, M. L. Ashby, E. A. Bergin, S. C. Kleiner, B. M. Patten, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, R. L. Snell, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron Soc., Meeting 195*, #63.05.
- 1999 "Molecular Oxygen Abundance in Interstellar Clouds," P. F. Goldsmith, M. L. Ashby, E. A. Bergin, S. C. Kleiner, G. J. Patten, R. Plume, J. R. Stauffer, V. Tolls, Z. Wang, Y. F. Zhang, M. Harwit, N. R. Erickson, J. E. Howe R. L. Snell, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195*, #63.04.
- 1999 "Water in Shocks and Outflows," D. A. Neufeld, G. J. Melnick, J. R. Stauffer, M. L. Ashby, E. A. Bergin, S. C. Kleiner, B. M. Patten, R. Plume, V. Tolls, Z. Wang, Y. F. Zhang, P. E. Goldsmith, M. Harwit, N. R. Erickson, J. E. Howe, R. L. Snell, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195*, #63.03.
- 1999 "Water in Molecular Clouds," R. L. Snell, J. E. Howe, N. R. Erickson, M. L. Ashby, E.A. Bergin, S. C. Kleiner, G. J. Melnick, B. M. Patten, R. Plume, J. R. Stauffer, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195*, #63.02.
- 1999 "SWAS Mission Overview and Data Release Plans," G. J. Melnick, J. R. Stauffer, M. L. Ashby, E. A. Bergin, S. C. Kleiner, B. Patten, R. Plume, V. Tolls, Z. Wang, Y. F. Zhang, P. F. Goldsmith, M. Harwit, N. R. Erickson, J. E. Howe, R. L. Snell, D. A. Neufeld, D. G. Koch, R. Schieder, G. Winnewisser, G. Chin, *Amer. Astron. Soc. Meeting 195*, #63.01.
- 1999 "An Infrared Investigation of Volatiles in Comet 21P/Giacobini-Zinner," H. A. Weaver, G. Chin, D. Bockelee-Morvan, J. Crovisier, T. Y. Brooke, D. P. Cruikshank, T. R. Geballe, S. J. Kim, R. Meier, *Icarus, Volume 142, Issue Icarus*, pp.482-497.
- 2000 "The Submillimeter Wave Astronomy Satellite: Science Objectives and Instrument Description," G. J. Melnick, J. R. Stauffer, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No.2, Part 2, L77, 2000, August.
- 2000 "Observations of Water Vapor toward Orion BN/KL," G. J Melnick, M L. N. Ashby, R. Plume, E. A. Bergin, D. A. Neufeld, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D. G. Koch, B. M. Patten, R. Schieder, R. L. Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, *Ap. J. (Lett)*, Vol 539, No.2, Part 2, L87, 2000 August.
- 2000 "Submillimeter Wave Astronomy Satellite Observations of Extended Water Emission in Orion," R. L. Snell, J. E. Howe, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, S. C. Kleiner, D. G. Koch. D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, G. J. Melnick, *Ap. J. (Lett)*, Vol. 539, No.2, Part 2, L93, 2000 August.
- 2000 "The Distribution of Water Emission in M17SW." R L Snell, J. E. Howe, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, J. R.

- Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang and G. J. Melnick, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L97, 2000 August.
- 2000 “Water Abundance in Molecular Cloud Cores,” R. L. Snell, J. E. Howe, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, J. R. Stauffer V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, and G. J. Melnick, *Ap. J. (Lett)*, Vol 539, No.2, Part 2, L101, 2000 August.
- 2000 “Observations of Interstellar Water Vapor in Outflow Regions,” D. A. Neufeld, R. L. Snell, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, S. C. Kleiner, D. g. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, and G. J. Melnick, *Ap. J. (Lett)*, Vol., 539, No. 2, Part 2, L107, 2000 August.
- 2000 “Observations of Absorption by Water Vapor toward Sagittarius B2,” D. A. Neufeld, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D. G. Koch, B. M. Patten, R. Plume, R. Schieder, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, and G. J. Melnick, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L111, 2000 August.
- 2000 “An Analysis of Water Line Profiles in Star Formation Regions Observed by the *Submillimeter Wave Astronomy Satellite*,” M. L. N. Ashby, E. A. Bergin, R. Plume, J. M. Carpenter, D. A. Neufeld, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D. G. Koch, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, and G. J. Melnick, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L115, 2000 August.
- 2000 “Water Abundance and Velocity Structure in S140, P Oph A, and B335,” M. L. N. Ashby, E. A. Bergin, R. Plume, J. M. Carpenter, G. J. Melnick, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Schieder, R/ L/ Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, and Y. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No. 2 Part 2, L119, 2000 August.
- 2000 “O<sub>2</sub> in Interstellar Molecular Clouds,” P. F. Goldsmith, G. J. Melnick, E. A. Bergin, J. E. Howe, R. L. Snell, D. A. Neufeld, M. Harwit, M. L. N. Ashby, B. M. Patten, S. C. Kleiner, R. Plume, J. R. Stauffer, V. Tolls, Z. Wang, Y. F. Zhang, N. R. Erickson, D. G. Koch, R. Schieder, G. Winnewisser, and G. Chin, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L123, 2000 August.
- 2000 “Implications of *Submillimeter Wave Astronomy Satellite* Observations for Interstellar Chemistry and Star Formation,” E. A. Bergin, G.J. Melnick, J. R. Stauffer, M, L. N. Ashby, G. Chin, R. Erickson, F. Goldsmith, Harwit, J. E. owe, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, V. Tolls, Z. Wang, G. Winnewisser, and. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L123, 2000 August.
- 2000 “Large-scale <sup>13</sup>CO  $J = 5 \rightarrow 4$ ) and [C I ] Mapping of Orion A,” R. Plume, F. Bensch, J. E. Howe, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, S. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Schieder, R L. Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, K. Reynolds, R. Joyce, C. Tavoletti, G. Jack, C. J. Rodkey, and G. J. Melnick, *Ap. J. (Lett)*, Vol. 539, No.2, Part 2, L123, 2000, August.
- 2000 “Extended [C I ] and <sup>13</sup>C O (5  $\rightarrow$ 4) Emission in M17SW,” J. E. Howe, M. L. N. Ashby, E. A. Bergin, G. Chin, N. R. Erickson, P. F. Goldsmith, M, Harwit, D. J. Hollenbach, M. J. Kaufman, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, Y. F. Zhang, and Y. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L123, 2000 August.
- 2000 “*Submillimeter Wave Astronomy Satellite* Observations of the Martian Atmosphere: Temperature and Vertical Distribution of Water Vapor,” M. A. Gurwell, E. A. Bergin, G.

- J. Melnick, M. L. N. Ashby, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, S. C. Kleiner, D.G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, J. R. Stauffer, V. Tolls, Z. Wang, G. Winnewisser, and Y. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L123, 2000 August.
- 2000 “Submillimeter Wave Astronomy Satellite Observations of Jupiter and Saturn: Detection of 557 GHz<sub>z</sub> Water Emission from the Upper Atmosphere,” E. a. Bergin, E. Lellouch, M. Harwit, M. A. Gurwell, G. J. Melnick, M. L. N. Ashby, G. Chin, N. R. Erickson, P. F. Goldsmith, J. E. Howe, S. C. Kleiner, D. G. Koch, D. A. Neufeld, B. M. Patten, R. Plume, R. Schieder, R. L. Snell, J. R. Stauffer, v. Tolls, Z. Wang, G. Winnewisser, and Y. F. Zhang, *Ap. J. (Lett)*, Vol. 539, No. 2, Part 2, L123, 2000, August.
- 2000 “Submillimeter Wave Astronomy Satellite Observations of Water Vapor toward Comet C/1999 H1 (Lee),” D. A. Neufeld, J. R. Stauffer, E. A. Bergin, S. C. Kleiner, B. M. Patten, Z. Wang, M. L. N. Ashby, G. Chin, N. R. Erickson, P. F. Goldsmith, M. Harwit, J. E. Howe, D. G. Koch, R. Plume, R. Schieder, R. L. Snell, V. Tolls, G. Winnewisser, Y. F. Zhang, and G. J. Melnick, *Ap. J. (Lett)*, Vol539, No. 2 Part 2, L123, 2000 August