

## Jan Josef Sojka

**Title:** Professor

**Date and Place of Birth:** 4/12/50, Duns, Scotland

**Nationality:** British

### **Education:**

B.Sc., Physics, Edinburgh University, Scotland, 1972

Ph.D., (Auroral Suprathermal Electrons), University College London, University of London, 1976.

### **Professional Experience:**

1975–1978 Research Assistant, Mullard Space Science Laboratory, University College London

1978–1980 Post Doctoral Fellow, Department of Physics, Utah State University

1980–1982 Research Assistant Professor, Department of Physics, Utah State University

1982–1986 Research Associate Professor, Department of Physics, Utah State University

1983– Assistant Director, Center for Atmospheric and Space Sciences, Utah State University

1986–1986 Research Professor, Department of Physics, Utah State University

1986–1988 Associate Professor, Department of Physics, Utah State University

1988– Professor, Department of Physics, Utah State University

1998–2005 Director, Bear Lake Observatory

2005– Department Head, Department of Physics, Utah State University

### **Scientific Societies and Professional Committees:**

Member, American Geophysical Union, 1979–

Member, Center for Atmospheric and Space Sciences, 1978–

Member, NASA Thermal Plasma Working Group, 1979–1990

Member, Sigma Pi Sigma, 1981–

Program Chairman, Yosemite Conference, 1982, “Origins of Plasmas and Electric Fields in the Magnetosphere”

Guest Investigator, NASA Dynamics Explorer Project, 1984–1990.

Member, COSPAR sub-commission D.2 on the physics of Thermal Plasma Regions in the Magnetosphere, 1985–1990

Member, NASA Proposal Evaluation Panel for the NASA-ESA SOHO and Cluster Satellite Missions, 1987

Member, NASA Peer Review Panel for the NASA Sub-Orbital Program, 1989

Program Director, Get Away Special (GAS) program at Utah State University, 1989–

Co-Associate Director, Rocky Mountain Space Grant Consortium, 1989–2010  
Joint Chairman, NSF CEDAR PRIMO Working Group, 1990-98  
Joint Chairman, NSF CEDAR HLPS Working Group, 1991-2000  
Member, NASA IMI STDT Committee, 1993-1995  
Member, NASA SMEX Science Review Board, 1993  
Member, British Antarctic Survey, Upper Atmospheric Review Panel, 1995-2000  
Guest Editor, Radio Science Special Section on the Second HLPS Workshop, 1997  
Joint Chairman, NSF CEDAR GIFTS Working Group, 1998-2000  
Joint Chairman, NASA SEC Geospace Electrodynamic Connection STDT, 1998-2005  
Member, NASA Sun-Earth Connection Advisory Subcommittee, 1998-2001  
Member, NASA SEC Roadmap Committee, 1999  
Guest Editor, Radio Science Special Section on the Third HLPS Workshop, 1999  
Member, NSF National Space Weather Review Panel, 2000  
Member, CEDAR Science Steering Committee, 2001-2005  
Member of NSF CISM Science Advisory Board, 2002-2011  
Co-Chairman, CAWSES Theme 4: Sun-Earth Climatology, 2003-2007  
Chairman, CEDAR Science Steering Committee, 2005-2007  
Guest Editor, COSPAR Space Research, 2004-2005  
President Elect, AGU SPA Section, 2008-2010  
USU Trustee, Utah NASA Space Grant Consortium, 2010-  
President, AGU SPA Section, 2010-2012

**Awards:**

D. Wynne Thorne Research Award at Utah State University, 1999.  
Utah Professor of the Year by the Carnegie Foundation for the Advancement of Teaching,  
2002.

**Advisor Activity:**

PhD Students:

|                  |          |
|------------------|----------|
| Jennifer Meehan  | PhD 2017 |
| Janelle Jenniges | PhD 2015 |
| Ariel Acebal     | PhD 2008 |
| Brian Lundberg   | PhD 2008 |
| Cesar Noguera    | PhD 2007 |
| David Byers      | PhD 2005 |
| Chris Smithro    | PhD 2004 |
| Trey Cade        | PhD 2002 |
| Clark Groves     | PhD 2002 |
| Devin Della-Rose | PhD 1999 |

**MS Students:**

|                    |    |      |
|--------------------|----|------|
| Andrew Auman       | MS | 2008 |
| Trey Cade          | MS | 1993 |
| Steven Cahanin     | MS | 1995 |
| Peter Citrone      | MS | 1991 |
| Tom Froonincks     | MS | 1991 |
| Paul Gifford       | MS | 1995 |
| Kelly Hand         | MS | 1988 |
| Gary Huffines      | MS | 1990 |
| Martin Loveless    | MS | 1993 |
| Jiang-Ping Lu      | MS | 1991 |
| Ned Penley         | MS | 1991 |
| Tumkur Raghuram    | MA | 1996 |
| Andrew Sexton      | MA | 1992 |
| Mahesh Subramanium | MA | 1996 |

**Patents:**

Sounding transformation and recognition (with D. D. Rice, and D. C. Thompson), US Patent No.: 7,541,967, US Patent Office, 2009.

## J. J. Sojka

### Publication List

1. Sojka, J. J., An investigation of suprathermal electrons in the auroral zone, Ph.D. Thesis, University of London, England, 1976.
2. Basto, R. A., W. J. Raitt, and J. J. Sojka, A high resolution, low energy electrostatic analyser for rocket payloads, *Planet. Space Sci.*, 24, 115–129, 1976.
3. Sojka, J. J., W. J. Raitt, and A. D. Johnstone, Suprathermal electron fluxes during various phases of auroral substorms, *ESA*, SP115, 227–240, 1976.
4. Raitt, W. J., and J. J. Sojka, Field-aligned suprathermal electron fluxes below 270 km in the auroral zone, *Planet. Space Sci.*, 25, 5–13, 1977.
5. Johnson, J. F., J. J. Sojka, and G. L. Wrenn, Thermal/suprathermal plasmas observed by the S-302 experiment on GEOS-1, *Space Science Reviews*, 22, 567–580, 1978.
6. Sojka, J. J., W. J. Raitt, and R. W. Schunk, High-latitude plasma convection: Predictions for EISCAT and Sondre Stromfjord, *Geophys. Res. Lett.*, 6, 877–880, 1979.
7. Sojka, J. J., W. J. Raitt, and R. W. Schunk, Effect of displaced geomagnetic and geographic poles on high-latitude plasma convection and ionospheric depletions, *J. Geophys. Res.*, 84, 5943–5951, 1979.
8. Wrenn, G. L., J. F. E. Johnson, and J. J. Sojka, Stable ‘pancake’ distributions of low energy electrons in the plasma trough, *Nature*, 279, 512–514, 1979.
9. Johnstone, A. D., and J. J. Sojka, A beam/plasma interaction in the high-altitude auroral ionosphere, *Planet. Space Sci.*, 28, 467–474, 1980.
10. Sojka, J. J., W. J. Raitt, and K. D. Hunt, Calculation of escape trajectories for particle beams emitted from spacecraft, Center for Atmospheric and Space Sciences, Utah State University Report, 1980.
11. Sojka, J. J., R. W. Schunk, and W. J. Raitt, A plasma convection model, Center for Atmospheric and Space Sciences, Utah State University Report, 1980.
12. Sojka, J. J., W. J. Raitt, and R. W. Schunk, A comparison of model predictions for plasma convection in the northern and southern polar regions, *J. Geophys. Res.*, 85, 1762–1768, 1980.
13. Sojka, J. J., J. C. Foster, W. J. Raitt, R. W. Schunk, and J. R. Doupnik, High-latitude convection: Comparison of a simple model with incoherent scatter observations, *J. Geophys. Res.*, 85, 703–709, 1980.
14. Horne, R. B., P. J. Christiansen, M. P. Gough, K. G. Ronnmark, J. F. E. Johnson, J. Sojka, and G. L. Wrenn, ECH waves – a comparison between theory and observations made by GEOS I, *Nature*, 294, 338, 1981.
15. Johnson, J. F. E., and J. J. Sojka, Electrostatic analyser measurements made in a laboratory ‘ionospheric’ plasma, *J. Phys. E: Sci. Instrum.*, 14, 432–438, 1981.
16. Johnstone, A. D., J. J. Sojka, W. Gibbons, B. K. Madahar, and L. J. C. Woolliscroft, An intense wave/particle event in the auroral ionosphere, *Geophys. Res. Lett.*, 8, 389–392, 1981.
17. Raitt, W. J., R. W. Schunk, and J. J. Sojka, Modeling the high latitude ionosphere, Proceedings of the AGARD meeting, “The Physical Basis of the Ionosphere on Solar-Terrestrial Systems,” AGARD–CP–295, 9.1–9.14, 1981.

18. Schunk, R. W., W. J. Raitt, and J. J. Sojka, High-latitude ionospheric model: First step towards a predictive capability, Proceedings of IES Symposium, 1981.
19. Singh, N., R. W. Schunk, and J. J. Sojka, Energization of ionospheric ions by electrostatic hydrogen cyclotron waves, *Geophys. Res. Lett.*, *8*, 1249–1252, 1981.
20. Sojka, J. J., W. J. Raitt, and R. W. Schunk, A theoretical study of the high-latitude winter F region at solar minimum for low magnetic activity, *J. Geophys. Res.*, *86*, 609–621, 1981.
21. Sojka, J. J., W. J. Raitt, and R. W. Schunk, Theoretical predictions for ion composition in the high-latitude winter F-region for solar minimum and low magnetic activity, *J. Geophys. Res.*, *86*, 2206–2216, 1981.
22. Sojka, J. J., W. J. Raitt, and R. W. Schunk, Plasma density features associated with strong convection in the winter high-latitude F region, *J. Geophys. Res.*, *86*, 6968–6916, 1981.
23. Wrenn, G. L., J. F. E. Johnson, and J. J. Sojka, The supra-thermal plasma analysers on the ESA GEOS satellites, *Space Sci. Inst.*, *5*, 271–293, 1981.
24. Horne, R. B., P. J. Christiansen, M. P. Gough, K. Ronnmark, J. F. E. Johnson, G. L. Wrenn, and J. J. Sojka, ECH wave dispersion – the effects of suprathermal electron distributions, *Adv. Space Res.*, *1*, 353–359, 1981.
25. Schunk, R. W., and J. J. Sojka, Ionospheric hot spot at high latitudes, *Geophys. Res. Lett.*, *9*, 1045–1048, 1982.
26. Schunk, R. W., and J. J. Sojka, Ion temperature variations in the daytime high-latitude F region, *J. Geophys. Res.*, *87*, 5169–5183, 1982.
27. Singh, N., R. W. Schunk, and J. J. Sojka, Cyclotron resonance effects on stochastic acceleration of light ionospheric ions, *Geophys. Res. Lett.*, *9*, 1053–1056, 1982.
28. Sojka, J. J., A user's guide to space shuttle orbit attitude interpretation, Center for Atmospheric and Space Sciences, Utah State University Report, 1982.
29. Sojka, J. J., and R. W. Schunk, Analysis and interpretation techniques for the 'RIMS' experiment on DE-A, Center for Atmospheric and Space Sciences, Utah State University Report, 1982.
30. Sojka, J. J., and R. W. Schunk, Predicted diurnal variations of electron density for three high-latitude incoherent scatter radars, *Geophys. Res. Lett.*, *9*, 143–146, 1982.
31. Sojka, J. J., R. W. Schunk and W. J. Raitt, Seasonal variations of the high-latitude F region for strong convection, *J. Geophys. Res.*, *87*, 187–198, 1982.
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33. Sojka, J. J., Origins of plasmas and electric fields in the magnetosphere, (J. Sojka, Editor) 1982 Yosemite Conference Extended Abstracts, printed by Utah State University, 1982.
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35. 34b. Li, W., J. J. Sojka, and W. J. Raitt, A study of plasmaspheric density distributions for diffusive equilibrium conditions, Scientific Report, Air Force Geophysics Laboratory, Hanscom AFB, Massachusetts, AFGL-TR-83-0088, 1983.
36. Norris, A. J., J. F. E. Johnson, J. J. Sojka, G. L. Wrenn, N. Cornilleau-Wehrlin, S. Perraut, and A. Roux, Experimental evidence for the acceleration of thermal electrons by ion cyclotron waves in the magnetosphere, *J. Geophys. Res.*, *88*, 889–898, 1983.

37. Richards, P. G., R. W. Schunk, and J. J. Sojka, Large-scale counterstreaming of H<sup>+</sup> and He<sup>+</sup> along plasmaspheric flux tubes, *J. Geophys. Res.*, *88*, 7879–7886, 1983.
38. Singh, N., R. W. Schunk, and J. J. Sojka, Preferential perpendicular acceleration of heavy ionospheric ions by interactions with electrostatic hydrogen cyclotron waves, *J. Geophys. Res.*, *88*, 4055–4066, 1983.
39. Sojka, J. J., The quest for magnetospheric thermal electrons, Center for Atmospheric and Space Sciences, Utah State University Report, 1983.
40. Sojka, J. J., and R. W. Schunk, A theoretical study of the high latitude *F* region's response to magnetospheric storm inputs, *J. Geophys. Res.*, *88*, 2112–2122, 1983.
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47. Wrenn, G. L., J. J. Sojka, and J. F. E. Johnson, Thermal protons in the morning magnetosphere: Filling and heating near the equatorial plasmopause, *Planet. Space Sci.*, *32*, 351–363, 1984.
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52. Sojka, J. J., and R. W. Schunk, A theoretical study of the global *F* region for June solstice, summer maximum, and low magnetic activity, *J. Geophys. Res.*, *90*, 5285–5298, 1985.
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55. Rasmussen, C. E., R. W. Schunk, J. J. Sojka, V. B. Wickwar, O. De La Beaujardiere, J. Foster, J. Holt, D. S. Evans, and E. Nielsen, Comparison of simultaneous Chatanika and Millstone Hill observations with ionospheric model predictions, *J. Geophys. Res.*, *91*, 6986–6998, 1986.
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64. Sojka, J. J., and R. W. Schunk, Magnetospheric control of the bulk ionospheric plasma, Proceedings of the AGARD/NATO Symposium on, “The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications,” The Hague, The Netherlands, AGARD–CP–406, 2.1–2.13, 1987.
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66. Sojka, J. J., R. W. Schunk, and M. D. Bowline, Modeled ionospheric Te profiles at mid-latitudes for possible IRI application, *Adv. Space Res.*, *7*, 107–110, 1987.
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69. Rasmussen, C. E., J. J. Sojka, R. W. Schunk, V. B. Wickwar, O. de la Beaujardiere, J. Foster, and J. Holt, Comparison of simultaneous Chatanika and Millstone Hill temperature measurements with ionospheric model predictions, *J. Geophys. Res.*, *93*, 1922–1932, 1988.

70. Schunk, R. W., and J. J. Sojka, Ionospheric climate and weather modeling, *EOS*, 69, 153, 1988.
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75. Sojka, J. J., A two dimensional electric field mission, Utah State University, CASS Report, #89–5–2, 1989.
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79. Sojka, J. J., and R. W. Schunk, Theoretical study of the seasonal behavior of the global ionosphere at solar maximum, *J. Geophys. Res.*, 94, 6739–6749, 1989.
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91. Sojka, J. J., Latest developments in the display of large-scale ionospheric and thermospheric data sets, *Adv. Space Res.*, 12, 51–58, 1992.
92. Sojka, J. J., M. Bowline, R. W. Schunk, J. D. Craven, L. A. Frank, J. R. Sharber, J. D. Winningham, and L. H. Brace, Ionospheric simulation compared with Dynamics Explorer observations for November 22, 1981, *J. Geophys. Res.*, 97, 1245-1256, 1992.
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97. Sojka, J. J., M. D. Bowline, R. W. Schunk, D. T. Decker, C. E. Valladares, R. Sheehand, D. N. Anders, and R. A. Heelis, Modeling polar cap F-region patches using time varying convection, *Geophys. Res. Lett.*, 20, 1783-1786, 1993.
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101. Pantalos, G. M., M. K. Sharp, S. J. Woodruff, R. D. Lorange, T. E. Bennett, M. W. Lemons, and J. J. Sojka, Characterization of fluid physics effects on cardiovascular response to microgravity [G-572] *NASA Conference Publication for the 1993 Shuttle Small Payloads Symposium*, Annapolis, MD, 1994.
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103. Sojka, J. J., Imaging magnetospheric convection in the ionosphere, *Proceedings of the Second International Conference on Substorms, University of Alaska, Fairbanks*, (ed. Kan, Crowen, and Akasofu), 289-296, 1994.
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105. Sojka, J. J., Driving ionospheric models in real time, *Solar-Terrestrial Predictions - IV*, proceedings of a Workshop at Ottawa, Canada (ed. J. Hruska et al.), 393, 1994.
106. Sojka, J. J., and R. W. Schunk, Ionospheric modeling of climatology and weather (with R. W. Schunk), *1993 Ionospheric Effects Symposium*, (ed. J. M. Goodman), 343-352, 1994.

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## Papers Presented at Scientific Meetings

1. Effect of displaced geomagnetic and geographic poles on high latitude plasma convection and ionospheric depletions, (with R. W. Schunk and W. J. Raitt), AGU Fall Meeting, San Francisco, California; *EOS*, 60, 915, 1979.
2. High latitude convection: Comparison of simple model with incoherent scatter observations, (with W. J. Raitt, R. W. Schunk, J. C. Foster, and J. R. Doupnik), AGU Fall Meeting, San Francisco, California; *EOS*, 60, 915, 1979.
3. A theoretical study of the high-latitude winter  $F$ -region at solar minimum for low magnetic activity, (with W. J. Raitt and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 61, 1059, 1980.
4. Theoretical predictions for ion composition in the high-latitude winter  $F$ -region for solar minimum and low magnetic activity, (with W. J. Raitt and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 61, 1059, 1980.
5. High-latitude ionospheric model: First step towards a predictive capability, (with W. J. Raitt and R. W. Schunk), Presented at the symposium on the "Effect of the Ionosphere on Radiowave Systems," Alexandria, Virginia, April 14–16, 1981.
6. Seasonal variations of the high-latitude  $F$ -region for strong convection, (with R. W. Schunk and W. J. Raitt), AGU Fall Meeting, San Francisco, California; *EOS*, 62, 1011, 1981.
7. Mapping electrostatic potentials from the ionosphere to the inner magnetosphere, (with J. C. Foster, P. M. Banks, and J. R. Doupnik), AGU Fall Meeting, San Francisco, California; *EOS*, 62, 1012, 1981.
8. The polar  $F$ -region response to a magnetospheric storm, (with R. W. Schunk), Presented at the XXIV COSPAR, Ottawa, Ontario, Canada, May 16–June 2, 1982.
9. Thermal plasma heating at the plasmopause and ionospheric plasma in the late morning magnetosphere, (with G. L. Wrenn and J. F. E. Johnson), Presented at the XXIV COSPAR, Ottawa, Ontario, Canada, May 16–June 2, 1982.
10. The response of the high latitude  $F$ -region to an idealized magnetospheric storm, *Invited Talk*, (with R. W. Schunk), Presented at, "Theory Institute in Solar Terrestrial Physics," Boston College, Massachusetts, August 9–26, 1982.
11. Stochastic acceleration of ionospheric ions by a coherent wave, (with N. Singh and R. W. Schunk), Presented at, "Theory Institute in Solar Terrestrial Physics," Boston College, Massachusetts, August 9–26, 1982.
12. Polar ion streams, (with J. H. Waite, J. F. E. Johnson, J. L. Green, C. R. Chappell, and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 63, 1073, 1982.
13. Patterns of magnetospheric convection derived from Chatanika and Millstone Hill radar observations, (with J. C. Foster and W. L. Oliver), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 64, 277, 1983.
14. Comparison of model high-latitude electron densities with Millstone Hill observations, (with R. W. Schunk, J. V. Evans, J. M. Holt, and R. Wand), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 64, 278, 1983.
15. Pertinent characteristics of the topside ionosphere in its role as a source of magnetospheric plasma, *Invited Talk*, (with R. W. Schunk), IAGA, Scientific Assembly, August 15–17, Hamburg, West Germany; *IAGA Bulletin*, 48, 323, 1983.

16. The global ionosphere for quiet conditions: A model study, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 64, 777, 1983.
17. Problems with deducing plasma convection patterns from multiple radar observations, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 64, 777, 1983.
18. EISCAT velocity patterns for theoretical convection models, (with H. Rishbeth), Presented at the "Thermosphere Dynamics Workshop II," Beltsville, Maryland, October 3–5, 1984.
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20. A theoretical study of the global  $F$ -region for June solstice and low magnetic activity, (with R. W. Schunk), *Invited Talk*, Presented at the, "2nd International School for Space Simulation," Kauai, Hawaii, February 4–15, 1985.
21. Modeling of the polar ionosphere, (with C. E. Rasmussen and R. W. Schunk), Presented at the, "2nd International School for Space Simulation," Kauai, Hawaii, February 4–15, 1985.
22. Comparison of simultaneous Chatanika and Millstone Hill observations with ionospheric model predictions, (with C. E. Rasmussen, R. W. Schunk, V. B. Wickwar, O. de la Beaujardiere, J. C. Foster, J. M. Holt, D. S. Evans, and E. Nielsen), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 66, 327, 1985.
23. A model of the global ionosphere, (with R. W. Schunk), *Invited Review*, North American Radio Science Meeting (U. R. S. I.), Vancouver, British Columbia, Canada, June 17–21, 1985.
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32. First results from a comparison of the USU global ionospheric model and ground-based ionospheric measurements in the southern hemisphere, (with T. Berkey and M. Jarvis), Presented at, “Nineteenth Meeting: Scientific Committee on Antarctic Research (SCAR) Workshop on Antarctic Middle and Upper Atmosphere Physics,” San Diego, California, June 16–20, 1986.
  33. Ionosphere’s response to an auroral storm based upon the Dynamics Explorer SAI and LAPI data bases, (with R. W. Schunk, L. A. Frank, J. D. Craven, J. D. Winningham, and J. R. Sharber), Presented at, “Modeled Ionospheric Te Profiles at High Latitudes for Possible IRI Application,” (COSPAR XXVI – SCOSTEP), Toulouse, France, June 30–July 11, 1986.
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  39. Theoretical study of the high latitude ionosphere’s response to multi-cell convection patterns, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 67, 1137, 1986.
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50. Modeling ionospheric density structures, (with R. W. Schunk), *Invited Talk*, Presented at the National Radio Science Meeting, Boulder, Colorado, January 5–8, 1988.
51. The flow of plasma in the solar-terrestrial environment, *Invited Talk*, (with R. W. Schunk, A. R. Barakat, H. G. Demars, T.-Z. Ma, C. E Rasmussen, H. Thiemann, and W.-H. Yang), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 69, 423, 1988.
52. A three-dimensional time-dependent model of the polar wind, (with R. W. Schunk), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 69, 429, 1988.
53. Modeling ionospheric density structures and dynamic auroral features, (with R. W. Schunk), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 69, 431, 1988.
54. A test of the applicability of magnetospheric convection models for northward IMF conditions, (with N. C. Maynard, R. W. Schunk, J. P. Heppner, and L. A. Brace), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 69, 415, 1988.
55. Dynamics Explorer auroral image pixel compression, (with M. Bowline, P. Israelsen, and R. W. Harris), Presented at the Scientific Data Compression Workshop, Snowbird, Utah, May 3–5, 1988.
56. Modeling ionospheric density structures, (with R. W. Schunk), AGARD Symposium on, “Ionospheric Structure and Variability on a Global Scale and Interaction with Atmosphere, Magnetosphere,” Munich, West Germany, May 16–20, 1988.
57. A real-time high latitude ionospheric specification model, (with R. E. Daniell, L. D. Brown, D. N. Anderson, and R. W. Schunk), Presented at the 1988 Cambridge Workshop in Theoretical Geoplasma Physics on, “Polar Cap Dynamics and High Latitude Ionospheric Turbulence,” Cambridge, Massachusetts, June 13–17, 1988.
58. Global polar wind variations during changing magnetospheric conditions, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 69, 1340, 1988.
59. Theoretical study of the seasonal behavior of the global ionosphere at solar maximum, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 69, 1349, 1988.
60. A parameterized analytic model of the high latitude ionosphere, (with R. E. Daniell, L. D. Brown, D. N. Anderson, and R. W. Schunk), National Radio Science Meeting, Boulder, Colorado, January 4–6, 1989.



61. Ionospheric specification model, (with R. W. Schunk), Third Quarterly Meeting of the Air Weather Services (AWS) Ionospheric Specification Modeling Group, Houston, Texas, April 18–19, 1989.
62. *F*-region physics and chemistry, *Invited Talk*, Presented at the Summer Institute on Atmospheric Sciences, NASA, Goddard Space Flight Center, June 21, 1989.
63. Global polar wind variations driven by magnetospheric processes, (with R. W. Schunk), IAGA Scientific Assembly, Exeter, England; July 24–August 4, *IAGA Bulletin*, 53, 309, 1989.
64. Auroral imaging and atmospheric modeling, *Invited Talk*, Presented at the Future Magnetospheric Physics Missions Workshop, Southwest Research Institute, San Antonio, Texas, November 16–18, 1989.
65. Recent achievements in computer modeling of the ionosphere, *Invited Talk*, Presented at the University of Texas at Dallas, Center for Space Sciences, November 20, 1989.
66. 2-DEF: A two-dimensional electric field mission, Presented at the meeting to discuss the NASA–SPD Strategic Implementation Study, San Francisco, California, December 3, 1989.
67. Modeling of annual variations in plasmaspheric density, (with C. E. Rasmussen and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 70, 1247, 1989.
68. The longitude dependence of the dayside *F*-region trough: A detailed model-observation comparison, (with R. W. Schunk and J. A. Whalen), AGU Fall Meeting, San Francisco, California; *EOS*, 70, 1248, 1989.
69. Dynamics Explorer 1 and 2 data-TDIM study for 22 November 1981, (with M. D. Bowline, R. W. Schunk, J. D. Craven, L. A. Frank, J. Sharber, J. D. Winningham, and J. P. Heppner), AGU Fall Meeting, San Francisco, California; *EOS*, 70, 1248, 1989.
70. Temporal variations of the polar wind, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 70, 1249, 1989.
71. A parameterized version of the USU high latitude ionospheric model, (with R. E. Daniell, L. D. Brown, W. G. Whartenby, D. N. Anderson, and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 70, 1248, 1989.
72. A high latitude ionospheric specification model (HLISM), (with D. N. Anderson, J. A. Whalen, S. Basu, R. E. Daniell, L. D. Brown, W. G. Whartenby, and R. W. Schunk), National Radio Science Meeting, Boulder, Colorado, January 3–5, 1990.
73. Ionospheric dependence and sensitivity on the solar EUV flux, (with R. W. Schunk), Presented at the Quarterly Space Model Development Review Meeting, Peterson Air Force Base, Colorado Springs, Colorado, January 29, 1990.
74. Ionospheric variations, (with R. W. Schunk), *Invited Review*, Presented at the SUNDIAL Workshop, New Orleans, Louisiana, April 4–9, 1990.
75. USU TDIM PRIMO simulations, *Invited Talk*, Presented at the CEDAR Workshop, Boulder, Colorado, June 12–15, 1990.
76. Ionospheric forecast model, (with R. W. Schunk), Presented at the *Ionospheric Specification Model Quarterly Review*, Boston, Massachusetts, May 14, 1990.
77. Approaches to ionospheric modeling, simulation, and prediction, (with R. W. Schunk), *Invited Review*, 28th COSPAR Meeting, The Hague, The Netherlands, June 25–July 6, 1990.

78. Comparison of the USU ionospheric model with the UCL self-consistent ionospheric-thermospheric model, (with R. W. Schunk, D. Rees, T. J. Fuller-Rowell, and R. J. Moffett), 28th COSPAR Meeting, The Hague, The Netherlands, June 25–July 6, 1990.
79. Combined ionospheric model derived from CCIR and USA data, (with R. W. Schunk, L. Bossey, S. Pallaschke, K. Rawer, and H. Thiemann), 28th COSPAR Meeting, The Hague, The Netherlands, June 25–July 6, 1990.
80. Model and observation comparison of the universal time and IMF dependence of the ionospheric polar hole, (with R. W. Schunk, W. R. Hoegy, and J. M. Grebowsky), 28th COSPAR Meeting, The Hague, The Netherlands, June 25–July 6, 1990.
81. A small satellite constellation for “imaging” magnetospheric electrodynamics, (with F. Redd), 28th COSPAR Meeting, The Hague, The Netherlands, June 25–July 6, 1990.
82. Simulations of the high-latitude ionosphere for a wide range of conditions, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 71, 1502, 1990.
83. *F*-region’s dependence on temporal and spectral structure in the solar EUV flux, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 71, 1482, 1990.
84. High-latitude ionospheric simulations for a wide range of conditions, (with R. W. Schunk), Presented at the First Annual Conference on Prediction and Forecasting of Radio Propagation at High-Latitudes for C3 Systems, Monterey, California, February 12–14, 1991.
85. High-latitude ionospheric specification model (HLISM), (with R. E. Daniell, L. D. Brown, D. N. Anderson, J. A. Whalen, and R. W. Schunk), First Annual Conference on Prediction and Forecasting of Radio Propagation at High-Latitudes for C3 Systems, Monterey, California, February 12–14, 1991.
86. Simulation of radio wave propagation through a realistically structured ionosphere, (with R. W. Schunk and P. Citrone), First Annual Conference on Prediction and Forecasting of Radio Propagation at High-Latitudes for C3 Systems, Monterey, California, February 12–14, 1991.
87. A first-principle derivation of the high latitude TEC distribution, (with D. J. Crain, R. W. Schunk, and P. H. Doherty), AGU Spring Meeting, Baltimore, Maryland; *EOS*, 72, 213, 1991.
88. Ion composition in the auroral *F*-region: Comparison of EISCAT data and ionospheric model predictions, (with R. W. Schunk and C. Lathuillere), EISCAT Workshop, Finland, June, 1991.
89. USU TDIM PRIMO Simulations, CEDAR Workshop, Boulder, Colorado, June, 1991.
90. Materials for Lightweight Structures in Space (with D. Lester and M. Blair), Thiokol Corporation, Brigham City, Utah, August, 1991.
91. Dynamic changes in the ionosphere - thermosphere system during major magnetic disturbances, (with R. W. Schunk), Presented on our behalf by D. J. Crain at the 20th General Assembly of the IUGG, Vienna, Austria, August 11–24, 1991.
92. Influence of the ionospheric conductance on the feature of the field-aligned current associated with a distorted two-cell convection during northward IMF, (with L. Zhu and R. W. Schunk), Presented at the 20th General Assembly of the IUGG, Vienna, Austria, August 11–24, 1991.
93. Comparison of observed and modeled electron densities from different regions of the globe, (with V. B. Wickwar and R. W. Schunk), Presented at the 20th General Assembly of the IUGG, Vienna, Austria, August 11–24, 1991.

94. A parameterized study of polar cap arcs, (with D. J. Crain, L. Zhu, and R. W. Schunk), AGU Fall Meeting, San Francisco, California, *EOS*, 72, 365, 1991.
95. Ionosphere – magnetosphere coupling processes at high latitudes, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California, *EOS*, 72, 363, 1991.
96. Geomagnetic and solar activity control of the F-region bottom-side composition, (with R. W. Schunk), AGU Fall Meeting, San Francisco, California, *EOS*, 72, 368, 1991.
97. A time-dependent model of polar cap arcs, (with L. Zhu, D. J. Crain, and R. W. Schunk), AGU Fall Meeting, San Francisco, California, *EOS*, 72, 356, 1991.
98. Ionosphere-magnetosphere coupling processes at high latitudes, (with R. W. Schunk), *Invited Talk*, AGU Chapman Conference on ‘Micro and Meso Scale Phenomena in Space Plasmas,’ February 17-22, 1992; Kauai, Hawaii.
99. Driving Ionospheric Models in Real Time, International Space Weather Forecast Meeting, Ottawa, Ontario, Canada, May, 1992.
100. Magnetospheric Shortcoming in Ionospheric Magnetospheric Coupling: An Ionospheric Prospective, International Space Weather Forecast Meeting, Ottawa, Ontario, Canada, May, 1992.
101. A Time-Dependent Model of Polar Cap Arcs, NSF High Latitude Plasma Structures Workshop, Peaceful Valley, Colorado, June, 1992.
102. Review of Ne and Te discrepancies between observations and model calculations in the F region (with V. B. Wickwar and R. W. Schunk), presented at the 29th Plenary Meeting of COSPAR, September 1, 1992, Washington, D.C.
103. F-region electron temperatures, electron heating rates, and electron heat fluxes (with D. J. Della-Rose\*, V. B. Wickwar, and R. W. Schunk), presented at the 29th Plenary Meeting of COSPAR, September 1, 1992, Washington, D.C.
104. Present Day Problems in Developing and Ionospheric Forecast Capability, National Oceanic and Atmospheric Administration/Space Environment Laboratory, Boulder, Colorado, September, 1992.
105. The lower ionosphere, *Invited Tutorial* (with R. W. Schunk), presented at the Chapman Conference on the ‘Upper Mesosphere and Lower Thermosphere,’ November 16-18, 1992, Pacific Grove, California.
106. Derivation of topside heat fluxes using incoherent scatter radar observations (with D. Della-Rose\*, V. B. Wickwar, and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 73, 416, 1992.
107. UT control of Ne patches in the polar ionosphere (with M. D. Bowline and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS*, 73, 416, 1992.
108. Parameterization of the volume emission, production, and heating rates for low energy Gaussian and Maxwellian electron spectra (with D. Crain, R. W. Schunk, and L. Zhu), AGU Fall Meeting, San Francisco, California; *EOS*, 73, 426, 1992.
109. Reflection of Alfvén waves at an inhomogeneous ionosphere (with L. Zhu, R. W. Schunk, and D. Crain), AGU Fall Meeting, San Francisco, California; *EOS*, 73, 414, 1992.
110. Simulation of Ne patches in the polar ionosphere (with R. W. Schunk and M. D. Bowline), AGU Fall Meeting, San Francisco, California; *EOS*, 73, 414, 1992.
111. Alternative Materials for space Application: Bubbles in Space, Department of Materials Science and Engineering, University of Utah, Salt Lake City, Utah, December, 1992.
112. TDIM Validation (with R. W. Schunk), presented at the National Radio Science Meeting, January 5-8, 1993, Boulder, Colorado.

113. Ionospheric modeling of climatology and weather, *Invited Talk* (with R. W. Schunk), presented at the Ionospheric Effects Symposium 1993, May 4-6, 1993, Alexandria, Virginia.
114. New weather models of the high-latitude ionosphere for patch and sun-aligned arc formation, *Invited Talk* (with R. W. Schunk), 24th General Assembly of URSI, August 25 - September 2, 1993; Kyoto, Japan.
115. Storm time ionospheric forecasting, *Invited Talk* (with R. W. Schunk), 24th General Assembly of URSI, August 25-September 2, 1993; Kyoto, Japan.
116. High resolution ionospheric response to time-dependent magnetospheric parameters (with D. J. Crain, L. Zhu, and R. W. Schunk), AGU Fall Meeting, San Francisco, California; EOS Supplement, 74, 456, 1993.
117. Model study of multiple polar cap arcs: Spacing and occurrence (with L. Zhu, R. W. Schunk, and D. J. Crain), AGU Fall Meeting, San Francisco, California; EOS Supplement, 74, 456, 1993.
118. Ionospheric response to traveling convection twin vortices (with L. Zhu and R. W. Schunk), AGU Fall Meeting, San Francisco, California; EOS Supplement, 74, 463, 1993.
119. Patches in the polar ionosphere: Plasma source variability (with M. Bowline and R. W. Schunk), AGU Fall Meeting, San Francisco, California, EOS Supplement, 74, 463, 1993.
120. Patches and scintillations in the polar ionosphere: UT and seasonal dependence (with St. Basu, S. Basu, and R. W. Schunk), AGU Fall Meeting, San Francisco, California, EOS Supplement, 74, 94, 1993.
121. Model-observation comparisons that show the polar cap patch UT dependence in winter (with R. W. Schunk, M. D. Bowline and E. J. Weber), AGU Fall Meeting, San Francisco, California, EOS Supplement, 74, 94, 1993.
122. Imaging magnetospheric convection in the ionosphere, *Invited Presentation*, presented at the Second International Conference on Substorms, University of Alaska, Fairbanks, Alaska, March 7-11, 1994.
123. Recent progress and outstanding issues in modeling polar ionospheric structures: An Overview, *Invited Seminar* for the Physics and Astronomy Department, University of Calgary, March 18, 1994.
124. Modeling of polar F-layer patches and auroral arc dynamics, *Invited Seminar* for the Institute of Space and Atmospheric Studies, University of Saskatchewan, March 21, 1994.
125. Modeling polar cap F region patches: A review of the last two years (with D. T. Decker, C. E. Valladares, D. N. Anderson, and R. W. Schunk), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.
126. Relationship of theoretical patch climatology to polar cap patch observations (with M. D. Bowline and R. W. Schunk), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.
127. Ionospheric signatures of traveling convection vortices (with L. Zhu and R. W. Schunk), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.

128. High resolution ionospheric response to a weak midnight sector sun-aligned polar cap arc (with D. J. Crain, R. W. Schunk, L. Zhu, and R. Doe), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.
129. A model-observation study of multiple polar cap arcs (with L. Zhu, C. E. Valladares, R. W. Schunk, and D. J. Crain), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.
130. Macroscale modeling and mesoscale observations of plasma density structures in the polar cap (with S. Basu, S. Basu, and R. W. Schunk), Second Joint Workshop for CEDAR HLPS/STEP GAPS, 27-29 June 1994, Lyons, Colorado.
131. Results from theoretical models for IRI (with R.W. Schunk), *Invited Talk*, 30th COSPAR Scientific Assembly, 11-21 July 1994, Hamburg, Germany.
132. Simulations of ionospheric and thermospheric structure at high latitudes (with R. W. Schunk), *Invited Talk*, 30th COSPAR Scientific Assembly, 11-21 July 1994, Hamburg, Germany.
133. Ambiguity in multi-instrument technique identification of polar cap F region patches (with R. W. Schunk, M. D. Bowline, and D. J. Crain), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 75, 496, 1994.
134. A model study of horizontal electrojets associated with sun-aligned polar cap arcs (with L. Zhu, R. W. Schunk, and D. J. Crain), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 75, 497, 1994.
135. An examination of the global heat flux associated with low energy electron precipitation (with D. J. Crain and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 75, 497, 1994.
136. Hemispherical asymmetries in the thermosphere inferred from the ionospheric seasonal anomaly (with M. D. Bowline and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 75, 505, 1994.
137. Signatures of traveling convection vortices (with L. Zhu and R. W. Schunk), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 75, 550, 1994.
138. Ionospheric-thermospheric science: A key element of a National Space Weather Program (with R. W. Schunk), *Invited Talk*, AGU Spring Meeting, Baltimore, Maryland; *EOS Supplement*, 76, 257, 1995.
139. Bill Hanson's appreciation of instrument performance will be sorely missed in the National Space Weather arena (with R. W. Schunk), AGU Spring Meeting, Baltimore, Maryland; *EOS Supplement*, 76, 214, 1995.
140. Simulations of mesoscale ionospheric structures at high latitudes (with R. W. Schunk), AGU Spring Meeting, Baltimore, Maryland; *EOS Supplement*, 76, 214, 1995.
141. Ionospheric/thermospheric space weather issues (with R. W. Schunk), *Invited Tutorial*, CEDAR Meeting, 29 June 1995, Boulder, Colorado.
142. The coupled ionospheric-thermospheric forecast model (CITFM): Backbone for real-time operational space weather forecasting (with W. Borer, D. Anderson, T. Fuller-Rowell, and R. W. Schunk), presented at the NRL Workshop on Space Weather: Needs, Capabilities and Science, 19-22 September 1995, Washington, DC.
143. Storm simulation using a hybrid coupled ionosphere-thermosphere forecast model (with W. S. Borer, D. N. Anderson, J. V. Eccles, R. W. Schunk, and T.-Z. Fuller-Rowell), AGU Fall Meeting, San Francisco, California; *EOS Supplement*, 76, 442, 1995.

144. A systematic modeling study of ground magnetic signatures of traveling convection vortices (with L. Zhu, P. G. Gifford, and R. W. Schunk), AGU Fall Meeting, San Francisco, California; EOS Supplement, 76, 440, 1995.
145. Using RINEX TEC observations to determine weather effects in the mid-latitude ionosphere (with R. W. Schunk, D. J. Crain, and P. H. Doherty), AGU Fall Meeting, San Francisco, California; EOS Supplement, 76, 446, 1995.
146. Storm-enhanced density structures in the polar ionosphere (with M. D. Bowline, R. W. Schunk, and J. C. Foster), AGU Fall Meeting, San Francisco, California; EOS Supplement, 76, 449, 1995.
147. Comparison of observed high latitude F-region climatological variability with models (with J. M. Grebowsky, R. W. Schunk, and D. Bilitza), AGU Fall Meeting, San Francisco, California; EOS Supplement, 76, 449, 1995.
148. Driving a physical ionospheric model with magnetospheric MHD Model Outputs (with R. W. Schunk, M. D. Bowline, J. Chen, J. Fedder, and S. Slinker), AGU Spring Meeting, Baltimore, Maryland, May 20-24, 1996.
149. Polar ionosphere's response to combined magnetospheric and thermospheric dynamics (with R. W. Schunk and D. J. Crain) AGU Spring Meeting, Baltimore, Maryland, May 20-24, 1996.
150. Developments in polar cap patch physics (with R. W. Schunk), presented at the Australian Institute of Physics, 'APPLEPHYS' Meeting, Hobart, Australia, July 1-5, 1996.
151. Effect of convection vortices on the ionosphere (with L. Zhu and R. W. Schunk), presented at the 31st COSPAR Scientific Assembly, Birmingham, UK, July 14-21, 1996.
152. Effects of thermospheric gravity waves on the polar ionosphere (with R. W. Schunk and D. Crain) at the 31<sup>st</sup> COSPAR Scientific Assembly, Birmingham, UK, July 14-21, 1996.
153. Spatial resolution needed for global ionospheric/thermospheric weather modeling (with R. W. Schunk), presented at the 31st COSPAR Scientific Assembly, Birmingham, UK, July 14-21, 1996.
154. Theoretical storm variability in the ionosphere (with R. W. Schunk), presented at the 31st COSPAR Scientific Assembly, Birmingham, UK, July 14-21, 1996.
155. Ionospheric simulation driven by magnetospheric MHD inputs: Comparison with empirical input simulations and observations (with M. D. Bowline, R. W. Schunk, J. Chen, J. Fedder, and S. Slinker), AGU Fall Meeting, San Francisco, CA, December 15-19, 1996.
156. Model study of the global ionospheric response to auroral substorms: Preliminary results (with L. Zhu, R. W. Schunk, and M. D. Bowline), AGU Fall Meeting, San Francisco, CA, December 15-19, 1996.
157. Ionospheric features during northward interplanetary magnetic field (with R. W. Schunk and M. D. Bowline), AGU Fall Meeting, San Francisco, CA, December 15-19, 1996.
158. High resolution modeling of the 3-dimensional airglow structure of polar cap auroral arcs (with D. J. Crain, L. Zhu, R. W. Schunk, and R. Doe), AGU Fall Meeting, San Francisco, CA, December 15-19, 1996.
159. Ionospheric simulation driven by magnetospheric MHD inputs: A case study for 14 January 1988 (with R. W. Schunk, M. D. Bowline, J. Chen, J. Fedder, and S. Slinker), AGU Fall Meeting, San Francisco, CA, December 15-19, 1996.

160. Comparison of measured F-region ion composition climatological variability with models (with J. M. Grebowsky, R. E. Erlandson, R. W. Schunk, and D. Bilitza), IRI Workshop 97, Kuehlungsborn, Germany, May 26-30, 1997.
161. Dynamical effects of ionospheric conductivity on the formation of polar cap arcs (with L. Zhu, R. W. Schunk, and D. J. Crain), Third Joint Workshop for CEDAR HLPS/STEP GAPS, Lyons, Colorado, June 15-17, 1997.
162. Determination of patches:  $N_mF_2$  versus 630 nm (with M. D. Bowline, R. W. Schunk, and D. J. Crain), Third Joint Workshop for CEDAR HLPS/STEP GAPS, Lyons, Colorado, June 15-17, 1997.
163. Comparison of global ionosphere-polar wind modeling with measurements (with R. W. Schunk), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
164. Ionospheric response to an auroral substorm (with L. Zhu, R. W. Schunk, and M. D. Bowline), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
165. Gradient drift instability growth rates from global-scale modeling of the polar ionosphere (with R. W. Schunk, M. Subramaniam\*\*, and L. Zhu), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
166. Ionospheric model status: The present day capabilities to predict the state of the ionosphere (with R. W. Schunk), *Invited Talk*, 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
167. Interhemispheric comparison of TDIM E- and F-region ionospheres on 14 January 1988 (with R. W. Schunk, M. D. Bowline, J. Chen, J. Fedder, and S. Slinker), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
168. Comparison of measured F-region ion composition climatological variability with models (with J. M. Grebowsky, R. E. Erlandson, R. W. Schunk, and D. Bilitza), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
169. Magnetosphere-ionosphere coupling model of polar cap arcs and its requirement for global-scale polar cap measurements (with L. Zhu, R. W. Schunk, and D. Crain), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
170. Optimizing the observational coverage needed to drive physically-based models of the thermosphere and ionosphere (with T. J. Fuller-Rowell), 8th Scientific Assembly of IAGA, Uppsala, Sweden, August 4-15, 1997.
171. Space weather on the ground versus in the ionosphere, *Invited lecture*, presented at the Canadian Corporation of Universities Space Science (CCUSS) Lecture Series, University of Western Ontario, London, Ontario, Canada, November 10-14, 1997.
172. Is there a relationship between the average polar cap ionosphere and morphology and the IMF? (with J. M. Grebowsky, R. W. Schunk, and R. E. Erlandson), presented at the AGU Fall Meeting, San Francisco, CA, December 8-12, 1997.
173. Modeling ionosphere response during a rapid change in the convection electric field observed by SuperDARN on 13 November 1996 (with M. D. Bowline, R. W. Schunk, R. A. Greenwald, and J. M. Ruohoniemi), presented at the AGU Fall Meeting, San Francisco, CA, December 8-12, 1997.
174. Ionospheric sensitivity to large vertical neutral winds in the auroral polar boundary observed at Mawson, Antarctica (with R. W. Schunk, J. L. Innis, P. A. Greet, and P. L. Dyson), presented at the AGU Fall Meeting, San Francisco, CA, December 8-12, 1997.

175. Effect of particle precipitation with various hardness on ground magnetic signatures of traveling convection vortices, (with L. Zhu and R. W. Schunk), presented at the AGU Fall Meeting, San Francisco, CA, December 8-12, 1997.
176. Can storm morphology be empirically modeled? (with R. W. Schunk), presented at the National Radio Science Meeting, Boulder, Colorado, January 4-7, 1998.
177. Approaches to first principles modeling of ionosphere-magnetosphere coupling, *Invited Review* (with R. W. Schunk), presented at the 1998 NSF CEDAR Workshop, Boulder, Colorado, June 7-12, 1998.
178. Plasma modeling status of M-I coupling: An ionospheric perspective (with R. W. Schunk), *Invited Talk*, 1998 CEDAR Meeting, Boulder, CO, June 7-12, 1998.
179. Need for Ionosonde Measurements in Space Weather Modeling, *Invited Tutorial*, presented at the International Dynasonde Workshop held at Utah State University, Logan, Utah, June 15-18, 1998.
180. Ionospheric weather resulting from the magnetosphere's response to CMEs (with R. W. Schunk), *Invited Talk*, presented at the 1998 Cambridge Symposium Workshop on Multi-scale Phenomena II in Space Plasma, Lisbon Portugal, June 22 - July 3, 1998.
181. Ionosphere-thermosphere weather driven by solar wind disturbances (with R. W. Schunk), presented at the 1998 Cambridge Symposium Workshop on Multi-scale Phenomena II in Space Plasma, Lisbon Portugal, June 22 - July 3, 1998.
182. Description and simulations with the Time Dependent Ionosphere Model (TDIM), presented at the Belgian Institute for Space Aeronomy, Brussels, Belgium, July 8, 1998.
183. Simulations of ionospheric dynamics for 13 November 1996. I. Driven by observations of the magnetospheric convection and auroral precipitation (with R. W. Schunk, M. D. Bowline, J. B. Sigworth, L. A. Frank, R. A. Greenwald, and J. M. Ruohoniemi), AGU Fall Meeting, San Francisco, CA; December 6-10, 1998.
184. Simulations of ionospheric dynamics for 13 November 1996. II. Driven by an MHD simulation of magnetospheric convection and auroral precipitation (with M. D. Bowline, R. W. Schunk, J. Chen, S. Slinker, and J. Fedder), AGU Fall Meeting, San Francisco, CA; December 6-10, 1998.
185. Ionospheric sensitivity to geomagnetic temporal variability on time scales less than that of the Kp (ap) geomagnetic indices (with D. J. Della-Rose, R. W. Schunk, and L. Zhu), AGU Fall Meeting, San Francisco, CA; December 6-10, 1998.
186. Relationship between the hardness of particle precipitation and the spacing of multiple polar cap arcs (with L. Zhu and R. W. Schunk), AGU Fall Meeting, San Francisco, CA; December 6-10, 1998.
187. Physical modeling of M-I coupling: Global scale issues (with R. W. Schunk), *Invited Talk*, National Radio Science Meeting, Boulder, CO, January 4-8, 1999.
188. Ionospheric assimilation models (with R. W. Schunk), *Invited Talk*, National Radio Science Meeting, Boulder, CO, January 4-8, 1999.
189. Advances in ionospheric modeling (with R. W. Schunk), *Invited Talk*, 37th AIAA Aerospace Sciences Meeting, Reno, NV, January 11-14, 1999.
190. Correctness of coupled models of the high and mid-latitude ionosphere (with R. W. Schunk), IUGG Meeting, Birmingham, England, July 18-30, 1999.



191. Specification of ionospheric weather: A space weather model development (with M. David, R. W. Schunk, and L. Zhu), AGU Fall Meeting, San Francisco, CA, December 13-17, 1999.
192. Model study of the ionosphere-originated field-aligned currents and electric field structures (with L. Zhu and R. W. Schunk), AGU Fall Meeting, San Francisco, CA, December 13-17, 1999.
193. Assimilation of ionospheric measurements into a mid-latitude physics model (with D. Thompson and R. W. Schunk), AGU Fall Meeting, San Francisco, CA, December 13-17, 1999.
194. Ionospheric data quality issues for ionospheric measurements: A GAIM strategy (with R. W. Schunk and D. Thompson), National Radio Science Meeting, Boulder, CO, January 4-8, 2000.
195. Magnetosphere-ionosphere coupling from ionospheric perspectives, AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
196. Ionospheric data assimilation (with R. W. Schunk and L. Scherliess), AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
197. Ionospheric storm simulation driven by AMIE output, magnetospheric MHD output, and by empirical models, with data comparisons (with C. M. Groves\*\*, R. W. Schunk, B. A. Emery, and D. J. Knipp), AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
198. GEC mission rationale for space-time resolution and scale characterization of electrodynamic processes within the ionospheric conductivity layer (with R. A. Heelis), AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
199. Solar EUV and auroral generation of the F-region tongue of ionization (with M. David, R. W. Schunk, and R. A. Heelis), AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
200. Theoretical modeling of global ground magnetic disturbance patterns of substorms (with L. Zhu and R. W. Schunk), AGU Fall Meeting, San Francisco, CA, December 15-19, 2000.
201. Ionospheric specification and forecast modeling (with L. Scherliess and R. W. Schunk), 39th AIAA Aerospace Sciences Meeting, Reno, NV, January 8-11, 2001.
202. Disruption of HF Communications over the Polar Region: Progress toward understanding, specification, and forecasting (with R. W. Schunk), presented at the International Space Weather Workshop, Boston, MA, June 7-8, 2001.
203. Refuelable Atmospheric Dipper and Planetary Landing Concept, presented at the 37th AIAA/ASME/SAE/ASEE JPC Conference, Salt Lake City, UT, July 8-11, 2001.
204. Ionosphere (TDIM) Driven by Magnetosphere (NRL-MHD), *Invited Talk*, presented at the CCMC Workshop, Maui, Hawaii, October 29 - November 2, 2001.
205. The Center for Space Weather Community Metrics?, presented at the CCMC Workshop, Maui, Hawaii, October 29 - November 2, 2001.
206. Defining structure in tongues of ionization (with C. M. Groves\*\*, R. W. Schunk, and D. J. Knipp), presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.
207. Model study of magnetic disturbances during substorms (with L. Zhu, R. W. Schunk, and J. Liang), presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.

208. A global 3-D Kalman filter for ionospheric data assimilation in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.
209. Ionospheric impact of magnetospheric ring current polarization electric fields (with M. David, C. M. Groves, R. W. Schunk, and J. C. Foster), presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.
210. Will data assimilation techniques open a new frontier for aeronomy? (with R. W. Schunk), *Invited Talk*, presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.
211. Global assimilation of ionospheric measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. Howe), presented at the AGU Fall Meeting, San Francisco, CA, December 10-14, 2001.
212. Ionospheric tomography and data assimilation models (with L. Scherliess and R. W. Schunk), presented at the International Union of Radio Science, Boulder, Colorado, January 9-12, 2002.
213. Development of a physics-based reduced state Kalman filter for the ionosphere in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the International Union of Radio Science, Boulder, Colorado, January 9-12, 2002.
214. Determining a 'break-even' point for Kalman data assimilation in the ionosphere (with R. W. Schunk, L. Scherliess, and D. C. Thompson), presented at the International Union of Radio Science, Boulder, Colorado, January 9-12, 2002.
215. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. Howe), presented at Space Weather Week, Boulder, Colorado, April 16-19, 2002.
216. Ionospheric assimilation techniques for ARGOS LORAAS tomographically reconstructed equatorial electron density profiles (with R. W. Schunk, V. Eccles, S. Thonnard, and S. McDonald), presented at the Ionospheric Effects Symposium 2002, Alexandria, VA, May 7-9, 2002.
217. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. Howe), presented at the Ionospheric Effects Symposium 2002, Alexandria, VA, May 7-9, 2002.
218. Development of a physics-based reduced state Kalman filter for the ionosphere in GAIM (with L. Scherliess, R. W. Schunk, and D. Thompson), presented at the Ionospheric Effects Symposium 2002, Alexandria, VA, May 7-9, 2002.
219. A physics-based Kalman filter for the ionosphere (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the COSPAR Meeting, Houston, Texas, October 16-18, 2002.
220. A modeling study of the ionospheric response to SAPS (with M. David, R. W. Schunk, J. C. Foster, and H. B. Vo), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
221. The closure of the Hall currents during substorms and its ground magnetic effects (with L. Zhu and R. W. Schunk), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.

222. Ionospheric sensitivity to different representations of spectra (with C. Smithtro, R. W. Schunk, and J. Lean), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
223. Penetration electric field observations and modeling in the pre-noon mid-latitude ionosphere (with S. M. Nolin, D. J. Della-Rose\*\*, R. W. Schunk, M. David, and F. T. Berkey), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
224. Data assimilation into physics-based models via Kalman filters (with L. Scherliess and R. W. Schunk), *Invited Talk*, presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
225. Resolving MIT electrodynamic processes by analyzing GEC data streams (with R. W. Schunk, M. David, L. Zhu, and T. J. Fuller-Rowell), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
226. A physics-based Kalman filter for the ionosphere in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the 2002 Fall AGU Meeting, San Francisco, California, December 6-10, 2002.
227. Ionospheric data assimilation (with L. Scherliess, R. W. Schunk, and D. Thompson), presented at the EGS-AGU-EUG Joint Assembly, Nice, France, April 6-11, 2003.
228. How will GEC resolve MIT structures? (with R. W. Schunk, M. David, and T. J. Fuller-Rowell), presented at the EGS-AGU-EUG Joint Assembly, Nice, France, April 6-11, 2003.
229. Initial validation of 3-D ionospheric plasma densities in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the EGS-AGU-EUG Joint Assembly, Nice, France, April 6-11, 2003.
230. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. M. Howe), presented at Space Weather Week, Boulder, Colorado, May 19-22, 2003.
231. Initial validation of 3-D ionospheric plasma densities in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at Space Weather Week, Boulder, Colorado, May 19-22, 2003.
232. GAIM validation and steps toward a storm-time VTEC empirical model (with E. A. Arajuo-Pradere, T. J. Fuller-Rowell, P. S. Spencer, L. Scherliess, D. C. Thompson, and R. W. Schunk), presented at Space Weather Week, Boulder, Colorado, May 19-22, 2003.
233. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. M. Howe), *Invited Talk*, presented at the CEDAR Meeting, Longmont, Colorado, June 17-20, 2003.
234. Ionospheric data assimilation in GAIM (with L. Scherliess, R. W. Schunk, and D. C. Thompson), *Invited Talk*, presented at the IUGG 2003 General Assembly, Sapporo, Japan, June 30-July 11, 2003.
235. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. M. Howe), presented at the IUGG 2003 General Assembly, Sapporo, Japan, June 30-July 11, 2003.

236. Improvements in global ionospheric specification using ionospheric occultation measurements (with P. C. Anderson, P. R. Straus, L. Scherliess, and R. W. Schunk), presented at the IUGG 2003 General Assembly, Sapporo, Japan, June 30-July 11, 2003.
237. New insights into a thermospheric wind influence on the high-latitude F-region (with R. W. Schunk, M. David, and A. van Eyken), presented at the EISCAT Workshop, SRI, Palo Alto, California, August 22-28, 2003.
238. Mid-latitude ISR observations at Millstone Hill raise questions about how modelers describe the thermospheric wind (with M. David, R. W. Schunk, and J. M. Holt), presented at the EISCAT Workshop, SRI, Palo Alto, California, August 22-28, 2003.
239. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the CCMC Workshop, Maui, Hawaii, October 28-31, 2003.
240. Ionospheric data assimilation (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the CCMC Workshop, Maui, Hawaii, October 28-31, 2003.
241. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. M. Howe), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
242. Hazards of coupling models of different physical and regional properties: Sun-Earth EUV link (with R. W. Schunk, M. David, and C. Smithtro\*\*), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
243. Active role of the ionosphere in M-I coupling (with L. Zhu, and R. W. Schunk), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
244. Comparison of 30-day continuous EISCAT Svalbard ISR data with an ionospheric model driven by SuperDARN convection patterns (with M. David, R. W. Schunk, R. A. Greenwald, and T. van Eyken), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
245. Observation and modeling of ionospheric dynamics during major solar flares (with C. Smithtro\*\*, T. Berkey, D. Thompson, and R. W. Schunk), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
246. The USU GAIM data assimilation model for the ionosphere (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the 2003 Fall AGU Meeting, San Francisco, California, December 8-12, 2003.
247. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, D. N. Anderson, M. Codrescu, C. Minter, T. J. Fuller-Rowell, R. A. Heelis, M. Hairston, and B. M. Howe), presented at the Symposium on Space Weather, American Meteorological Society, Seattle, Washington, January 11-15, 2004.
248. Global Assimilation of Ionospheric Measurements (USU GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the Air Force Weather Agency, Omaha, Nebraska, March 17, 2004.
249. USU GAIM: The need for real-time neutral wind measurements (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the Passive Optics Workshop, Boulder, Colorado, April 8, 2004.

250. Global Assimilation of Ionospheric Measurements: USU GAIM (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at Space Weather Week, Boulder, Colorado, April 16, 2004.
251. Data assimilation studies of the equatorial ionosphere using the USU GAIM model (with R. W. Schunk, L. Scherliess, and D. C. Thompson), presented at the 2004 AGU Joint Assembly Meeting, Montreal, Canada, May 17-21, 2004.
252. Assessing a low-latitude ionosphere model driven with data-determined  $E \times B$  drifts (with J. V. Eccles, D. Anderson, A. Anghel, and C. Valladares), presented at the 2004 AGU Joint Assembly Meeting, Montreal, Canada, May 17-21, 2004.
253. A ground-based array to observe geospace electrodynamics during adverse space weather conditions (with J. V. Eccles, and D. Rice), presented at the 2004 AGU Joint Assembly Meeting, Montreal, Canada, May 17-21, 2004.
254. Real-time specification and forecasting for HF links during disturbed conditions (with D. Rice, R. D. Hunsucker, and J. Eccles), presented at the 2004 AGU Joint Assembly Meeting, Montreal, Canada, May 17-21, 2004.
255. The Get Away Special Program at USU, presented at the 85<sup>th</sup> Annual Meeting, American Association for the Advancement of Science Pacific Division, Utah State University, Logan, Utah, June 14, 2004.
256. TDIM model studies for the October-November 2002 HLPS campaign (with L. Zhu, M. David, and R. W. Schunk), presented at the CEDAR Workshop, Santa Fe, New Mexico, June 28-30/July 1, 2004.
257. Mid-latitude plasma structures (MLPS): An ionospheric theory/model perspective, presented at the CEDAR Workshop, Santa Fe, New Mexico, June 28-30/July 1, 2004.
258. Ionospheric data assimilation and forecasting methods (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the 2004 CEDAR Workshop, Santa Fe, New Mexico, June 27-July 2, 2004.
259. Data sources for ionospheric data assimilation models (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the 2004 CEDAR Workshop, Santa Fe, New Mexico, June 27-July 2, 2004.
260. TDIM model studies for the October-November 2002 HLPS campaign (with R. W. Schunk, L. Zhu, and M. David), presented at the 2004 CEDAR Workshop, Santa Fe, New Mexico, June 27-July 2, 2004.
261. USU GAIM: A global ionospheric data assimilation model (with R. W. Schunk, L. Scherliess, and D. C. Thompson), presented at the Asia Oceania Geosciences Society Meeting, Singapore, July 5-9, 2004.
262. Specifications of the global ionosphere using the USU GAIM data assimilation model (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
263. Multiple arcs: Evidence for an active ionospheric role in M-I coupling? (with L. Zhu), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
264. Coordinated month-long ionospheric observations of multiple ionospheric parameters (with R. Van Eyken, R. Greenwald, J. Holt, and R. Heelis), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
265. Propagating polar wind jets (with R. W. Schunk, and H. G. Demars), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.

266. USU GAIM: A global ionospheric data assimilation model (with R. W. Schunk, L. Scherliess, and D. C. Thompson), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
267. Recent developments in ionosphere-thermosphere modeling with an emphasis on solar variability (with C. G. Smithro\*\*, and R. W. Schunk), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
268. GEC-a mission to explore the coupling between the lower boundary of geospace and the magnetosphere (with J. Grebowsky, R. Heelis, and C. Wu), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
269. Multiple arcs: Evidence for an active ionospheric role in M-I coupling? (with L. Zhu), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
270. Propagating polar wind jets (with R. Schunk, and H. Demars), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
271. Specification of the global ionosphere using the USU GAIM data assimilation model (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the Committee on Space Research (COSPAR) Meeting, Paris, France, July 18-25, 2004.
272. USU global ionospheric data assimilation model (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the Space Weather Symposium, Optical Science and Technology, SPIE 49<sup>th</sup> Annual Meeting, Denver, Colorado, August 2-6, 2004.
273. Global assimilation of ionospheric measurements (USU GAIM): Overview (August 23) and Validation (August 24) (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the SUMMIT-II Meeting at the Air Force Weather Agency, Omaha, Nebraska, August 23-24, 2004.
274. Validation of the USU GAIM data assimilation model of the ionosphere for operational use (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the National Radio Science Meeting, Boulder, Colorado, January 5-8, 2005.
275. Some effects of the Halloween ionospheric storm on mid-latitude HF systems (with R. D. Hunsucker, D. Rice, J. J. Sojka, and J. V. Eccles), presented at the National Radio Science Meeting, Boulder, Colorado, January 5-8, 2005.
276. Modeling the Halloween ionospheric storm impact at middle latitudes (with D. Rice, J. V. Eccles, and R. D. Hunsucker), presented at the National Radio Science Meeting, Boulder, Colorado, January 5-8, 2005.
277. HF beacon networks for ionospheric mapping (with D. Rice, J. V. Eccles, and R. D. Hunsucker), presented at the National Radio Science Meeting, Boulder, Colorado, January 5-8, 2005.
278. Extreme longitudinal variability of plasma structuring in the equatorial ionosphere on a magnetically quiet equinoctial day (with S. E. McDonald, Sunanda Basu, Santi Basu, K. Groves, C. E. Valladares, L. Scherliess, D. C. Thompson, R. W. Schunk, and L. Zhu), presented at the Ionospheric Effects Symposium, May 35, 2005, Alexandria, Virginia.
279. An operational data assimilation model of the global ionosphere (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the Ionospheric Effects Symposium, May 35, 2005, Alexandria, Virginia.
280. Validation of the Ionosphere Forecast Model (IFM) using the TOPEX TEC measurements (with L. Zhu, G. Jee\*\*, L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the Ionospheric Effects Symposium, May 35, 2005, Alexandria, Virginia.

281. Observation and modeling of mid-latitude ionospheric dynamics during solar x-ray flares (with C. Smithtro\*\*, T. Berkey, D. C. Thompson, and R. W. Schunk), presented at the Ionospheric Effects Symposium, May 35, 2005, Alexandria, Virginia.
282. Does the mid-latitude ionosphere exist during superstorms? presented at the 2005 Joint Assembly of the American Geophysical Union, May 23-27, 2005, New Orleans, Louisiana.
283. Comparison of the USU GAIM ionospheric plasma densities with Arecibo ISR observations (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the 2005 Joint Assembly of the American Geophysical Union, May 23-27, 2005, New Orleans, Louisiana.
284. An operational data assimilation model of the global ionosphere (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), *Invited Talk*, presented at the 10<sup>th</sup> IAGA Scientific Assembly, July 18-29, 2005, Toulouse, France,
285. The USU GAIM physics-based data assimilation model of the ionosphere (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the 10<sup>th</sup> IAGA Scientific Assembly, July 18-29, 2005, Toulouse, France,
286. Aeronomy: Challenges of Data Assimilation (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), *Invited Talk*, presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
287. Initializing the TING model with GAIM electron densities during a geomagnetic storm (with G. Jee\*\*, W. Wang, A. G. Burns, S. Solomon, L. Scherliess, D. Thompson, and R. W. Schunk), presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
288. Ionospheric indices based on GPS TEC (with C. Noguera, R. W. Schunk, and D. C. Thompson), presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
289. Active role of the ionosphere in the electrodynamic M-I coupling (with L. Zhu and R. W. Schunk), presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
290. The longitude dependence of the mid-latitude ionospheric effect of large geomagnetic storms (with M. David and R. W. Schunk), presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
291. Comparison of nighttime UV radiances from the USU GAIM data assimilation model with limb scan observations from the LORAAS and SSULI instruments (with L. Scherliess, R. W. Schunk, D. C. Thompson, L. Zhu, P. Dandenaault, S. A. Budzien, and S. E. Thonnard), presented at the Fall Meeting of the American Geophysical Union, December 5-9, 2005, San Francisco, California.
292. Mid-latitude thermosphere-ionosphere storm response: An aeronomy frontier (with R. Heelis), presented at the Fall Meeting of the American Geophysical Union, December 5-9 2005, San Francisco, California.
293. Data assimilation models for ionospheric specifications and forecasts (with R. W. Schunk, L. Scherliess, D. Thompson, and L. Zhu) presented at Space Weather Week, 25-28 April, F, Boulder, Colorado.
294. Wavelet decomposition of magnetometer measurements to enable separation of non-linear M-I currents (with P. Kokoszka, L. Zhu, and I. Maslova\*\*), presented at the 20 Years of Nonlinear Dynamics in Geosciences Meeting, 11-16 June 2006, Rhodes, Greece.
295. Modeling ionospheric weather and climate using month-long ISR observations (with M. David, A. Acebal\*\*, and R. W. Schunk), presented at the CEDAR Workshop, 19-23 June 2006, Santa Fe, New Mexico.

296. Two perspectives of our understanding of the ionosphere from ionospheric scientists and the FAA (with R. W. Schunk, D. C. Thompson, L. Scherliess, and D. Rice), presented at the Brigham Young University Physics Department Colloquium Series, 18 October 2006, Provo, Utah.
297. Day-to-day variability in the post-sunrise F-layer at Millstone Hill during three month-long ISR campaigns (with M. David, R. W. Schunk, and J. M. Holt), presented at the Fall AGU Meeting, 11-15 December 2006, San Francisco, California.
298. Ionospheric/thermospheric variability at middle latitudes obtained from the global assimilation of ionospheric measurements (GAIM) model (with L. Scherliess, D. C. Thompson, and R. W. Schunk), presented at the Fall AGU Meeting, 11-15 December 2006, San Francisco, California.
299. An ionospheric metric study using operational models (with R. W. Schunk, D. C. Thompson, L. Scherliess, and T. Harris), presented at the Fall AGU Meeting, 11-15 December 2006, San Francisco, California.
300. The operational USU GAIM model (with D. C. Thompson, L. Scherliess, and R. W. Schunk), presented at the Fall AGU Meeting, 11-15 December 2006, San Francisco, California.
301. Combining ionospheric observations and models to better understand severe ionospheric weather, presented at the Chapman Conference on Mid-Latitude Ionospheric Dynamics and Disturbances, 3-6 January 2007, Yosemite National Park, California.
302. USU GAIM: An operational data assimilation model of the ionosphere (with L. Scherliess, R. W. Schunk, and D. C. Thompson), presented at the American Meteorological Society (AMS) Fourth Symposium on Space Weather, 14-18 January 2007, San Antonio, Texas.
303. How the nation benefits from student full participation in the space venture, presented at a briefing to a NASA Science Definition Team Meeting on Student Collaboration, 10-11 May 2007, Washington, DC.
304. SuperDARN – Polar DARN, presented at the CEDAR Workshop, 24-29 June 2007, Santa Fe, New Mexico.
305. Time dependent ionospheric model (TDIM) predictions for IPY campaign, presented at the CEDAR Workshop, 24-29 June 2007, Santa Fe, New Mexico.
306. IPY campaign agenda (with C. Heinselman, T. van Eyken, and J. Holt), presented at the CEDAR Workshop, 24-29 June 2007, Santa Fe, New Mexico.
307. Separation of atmospheric-ionospheric current signatures from magnetospheric current signatures during storm periods (with L. Zhu, P. Kokoszka, A. Jach\*\*, and Z. Xu), presented at the IAGA/IUGG Meeting, 2-13 July 2007, Perugia, Italy.
308. Discussion of model's inadequate spatial distribution of energy into the thermosphere during storms (with R. Heelis), presented at the IAGA/IUGG Meeting, 2-13 July 2007, Perugia, Italy.
309. Ionospheric storm dependence upon the magnitude of the Earth's magnetic field (with M. David and R. W. Schunk), presented at the Fall American Geophysical Meeting, 10-14 December 2007.
310. Using PFISR to enable high-latitude modeling to separate climate and weather in ionospheric variability studies (with M. David and R. W. Schunk), presented at the Fall American Geophysical Meeting, 10-14 December 2007.



311. Seamless ocean-atmosphere model - effect of upward propagating waves on the thermosphere and ionosphere (with L. C. Gardner, L. Scherliess, D. C. Thompson, and R. W. Schunk), presented at the American Meteorological Society, 20-25 January 2008, New Orleans, Louisiana.
312. Global Assimilation of Ionospheric Measurements (GAIM) (with L. Scherliess, R. W. Schunk, D. C. Thompson, and L. Zhu), presented at the Air Force Weather Agency, 5 March 2008, Omaha, Nebraska.
313. Solar minimum ionospheric variability at high latitudes: Challenges for our models, presented at the Fourteenth Annual RF Ionospheric Interactions Workshop, 22-25 April 2008, Boulder Colorado.
314. Data assimilation models for ionospheric specifications and forecasts (with L. Scherliess, D. C. Thompson, R. W. Schunk, and L. Zhu), *Invited Talk*, presented at Space Weather Workshop, 29 April - 2 May 2008, Boulder, Colorado.
315. Effect of lower atmospheric waves on the ionosphere and thermosphere (with L. Gardner, L. Scherliess, D. C. Thompson, and R. W. Schunk), presented at the 2008 Ionospheric Effects Symposium, 13-15 May 2008, Alexandria, Virginia.
316. Upper ionosphere effects on the assimilation of GPS slant TEC (with D. C. Thompson, L. Scherliess, and R. W. Schunk), presented at the 2008 Ionospheric Effects Symposium, 13-15 May 2008, Alexandria, Virginia.
317. Data assimilation models for space weather (with L. Scherliess, D. C. Thompson, R. W. Schunk, and L. Zhu), *Invited Talk*, presented at the workshop on "Solar Variability, Earth's Climate and the Space Environment," 1-6 June 2008, Bozeman, Montana.
318. IPY ionospheric challenge: The ionospheric energy equations, presented at the CEDAR Workshop, 16-21 June 2008, Midway, Utah.
319. USU TDIM comparisons with IPY ISR observations, presented at the CEDAR Workshop, 16-21 June 2008, Midway, Utah.
320. Effect of lower atmosphere waves on the thermosphere (with L. Gardner, L. Scherliess, D. C. Thompson and R. W. Schunk), *Invited Talk*, presented at the CEDAR Workshop, 16-21 June 2008, Midway, Utah.
321. Ionosphere-thermosphere perturbations due to lower atmospheric waves (with L. Gardner, L. Scherliess, D. C. Thompson, and R. W. Schunk), *Invited Talk*, presented at the 37<sup>th</sup> COSPAR Scientific Assembly, 13-20 July 2008, Montreal, Quebec, Canada.
322. The operational USU GAIM model (with D. C. Thompson, L. Scherliess, and R. W. Schunk), presented at the Fall AGU Meeting, 15-19 December 2008, San Francisco, California.
323. Wave coupling between the lower and upper atmosphere (with L. C. Gardner, L. Scherliess, D. C. Thompson, R. W. Schunk, D. E. Siskind, S. D. Eckerman, D. P. Drob, and K. Hoppel), presented at the Fall AGU Meeting, 15-19 December 2008, San Francisco, California.
324. Storm-time mid-latitude dayside TEC enhancements: Longitudinal dependence (with M. David, R. W. Schunk, and R. A. Heelis), presented at the Fall AGU Meeting, 15-19 December 2008, San Francisco, California.
325. Statistical wavelet analysis and index development of the magnetosphere-ionosphere current system observed by terrestrial magnetometers (with L. Zhu, P. Kokoszka, A. Jach\*\*, I. Maslova\*\*, and Z. Xu), presented at the Fall AGU Meeting, 15-19 December 2008, San Francisco, California.

326. Heating events in the polar ionosphere-thermosphere during the IPY (with C. Heinselman, and T. van Eyken), presented at the Fall AGU Meeting, 15-19 December 2008, San Francisco, California.
327. Effect of waves from the lower atmosphere on the thermosphere and ionosphere (with R. W. Schunk, L. C. Gardner, L. Scherliess, and D. C. Thompson), presented at the American Meteorological Society, January 11-15, 2009, Phoenix, Arizona.
328. Ionosphere data assimilation models for specification and forecasts (with R. W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu), presented at the American Meteorological Society, January 11-15, 2009, Phoenix, Arizona.
329. Thermosphere-ionosphere perturbations due to lower atmospheric waves (with R.W. Schunk, L. Gardner, L. Scherliess, and D. C. Thompson), presented at the WACCM meeting by Aaron Ridley, March 6, 2009, Boulder, Colorado.
330. Effects of the magnetosphere and lower atmosphere on the ionosphere-thermosphere system (with R. W. Schunk, L. Gardner, L. Scherliess, D. C. Thompson, J. J. Sojka, and L. Zhu), *Invited Talk*, presented at the Space Weather Workshop, April 28 - May 1, 2009, Boulder, Colorado.
331. PFISR observations of ionosphere and joule heating during CIRs (with M. Nicholls, C. Heinselman, and J. Kelly), presented at the Spring AGU Meeting, 24-27 May 2009, Toronto, Canada.
332. The current status and challenges for upper atmosphere models (with L. Gardner, L. Scherliess, D. C. Thompson, R. W. Schunk, and L. Zhu), *Invited Talk*, presented at the Spring AGU Meeting, 24-27 May 2009, Toronto, Canada.
333. USU-GAIM data reconstructions of the ionosphere (with L. Gardner, L. Scherliess, D. C. Thompson, R. W. Schunk, and L. Zhu), *Invited Talk*, presented at the CEDAR Meeting, June 27-July 3, 2009, Santa Fe, New Mexico.
334. Long-term evolution of the geospace climate, presented at the Heliophysics III Summer School, 22-29 July 2009, Boulder, Colorado.
335. The IPY ionosphere: An extreme solar minimum?, *Invited Talk*, presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
336. Non-Equatorial ionospheric gradients, *Invited Talk*, presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
337. Operational space weather models: Trials, tribulations and rewards (with R. W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
338. A milestone in commercial space weather: USTAR Center for Space Weather (with W. K. Tobiska, R. W. Schunk, D. C. Thompson, L. Scherliess, L. Zhu, and L. Gardner), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
339. Estimation of sq variation by means of multi-resolution and principal component analyses (with I. Maslova\*\*, P. Kokoszka, and L. Zhu), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
340. Dayside mid-latitude F-region enhancements during small or moderate geomagnetic disturbances (with M. David), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
341. Analysis of the 2007 year CIR events using the WINDMI model: Energy distribution and ring current evolution (with S. Patra\*\*, E. A. Spencer, W. Horton, and M. L. Mays), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.

342. High latitude M-I coupling during the current solar minimum: Observations with PFISR (with P. G. Richards, M. J. Nicolls, and C. J. Heinselman), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
343. CubeSat constellations for measurements of high latitude energy input (with C. Swenson, M. F. Larsen, and C. S. Fish), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
344. Study of the topside ionosphere using radio occultation data (with D. C. Thompson, L. Scherliess, and R. W. Schunk), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
345. Study of the ring current variability with the use of ground-based magnetometer measurements and new statistical technique: Preliminary results (with L. Zhu, R. W. Schunk, Z. Xu, and P. Kokoszka), presented at the Fall AGU Meeting, 14-18 December 2009, San Francisco, California.
346. Ionosphere specifications and forecasts (with R. W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu) presented at the ORION Conference, 12-14 January 2010, Dayton, Ohio.
347. Data assimilation models for space weather application (with R.W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu), presented at the 90<sup>th</sup> American Meteorological Society Annual Meeting, 17-21 January 2010, Atlanta, Georgia.
348. Practical 27-day plus space weather forecasting (with R. W. Schunk), presented at the 90<sup>th</sup> American Meteorological Society Annual Meeting, 17-21 January 2010, Atlanta, Georgia.
349. The USU USTAR space weather center (with W. K. Tobiska, and R. W. Schunk), presented at the 90<sup>th</sup> American Meteorological Society Annual Meeting, 17-21 January 2010, Atlanta, Georgia.
350. Advanced commercial space weather products from the USU Space Weather Center, (with W. K. Tobiska, H. C. Carlson, R. W. Schunk, J. J. Sojka, D. C. Thompson, L. Scherliess, L. Zhu, and L. Gardner), presented at Space Weather Week, 27-30 April 2010, Boulder, Colorado.
351. Operational data assimilation models for ionospheric application, (with R. W. Schunk, L. Scherliess, D. C. Thompson, J. J. Sojka, and L. Zhu), presented at Space Weather Week, 27-30 April 2010, Boulder, Colorado.
352. Introductory Lecture II: An overview of space storms, presented at the Heliophysics Summer School IV, 28 July - 4 August 2010, Boulder, Colorado.
353. Comprehensive ionospheric polar and auroral observations for solar minimum of cycle 23/24 (with M. Nicolls, A. Van Eyken, and C. Heinselman), presented at the 38<sup>th</sup> COSPAR Scientific Assembly 2010, 18-25 July, Bremen, Germany.
354. Coupling of the auroral and polar ionosphere to the solar wind during the extended solar minimum (with R. W. Schunk, M. Nicolls, A. van Eyken, and C. Heinselman), presented at the 38<sup>th</sup> COSPAR Scientific Assembly 2010, 18-25 July 2010, Bremen, Germany.
355. Commercializing space weather using GAIM, (with W. K. Tobiska, R.W. Schunk, H. C. Carlson, D. C. Thompson, L. Scherliess, L. Zhu, and L. Gardner), presented at the 38<sup>th</sup> COSPAR Scientific Assembly 2010, 18-25 July 2010, Bremen, Germany.

356. Data assimilation models for space weather, (with L. Scherliess, R. W. Schunk, J. J. Sojka, D. C. Thompson, and L. Zhu, presented at the ACCEHS 2010 Workshop, 16-18 August 2010, Boulder, Colorado.
357. Global assimilation of ionospheric measurements (USU-GAIM) (with R. W. Schunk, L. Scherliess, D. C. Thompson, J. J. Sojka, and L. Zhu), Air Force Weather Agency, October 2010, Omaha, Nebraska.
358. Ionospheric data assimilation models for physics and applications, (with R. W. Schunk, L. Scherliess, J. J. Sojka, D. C. Thompson, L. Zhu), *Invited Talk*, presented at the Meeting of the Americas, 8-12 August 2010, Fox do Iguassu, Brazil.
359. Ionospheric sensitivity to SDO-EVE spectral variability, (with R. W. Schunk, and M. David), *Invited Talk*, presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
360. Possibility and demonstration of 27-Day ionosphere forecasting (with R. W. Schunk, M. Nicholls, and C. Heinselman) presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
361. Long term space weather forecasting: Parameters and accuracy needed for the ionosphere/thermosphere, (with R. W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu), presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
362. The ISS as a launch platform for phenomena of interest, (with C. Swensen, C. S. Fish\*\*, E. M. Strombert, B. Lloyd, and T. Neilson), presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
363. Global, real-time ionosphere specification for end-user communication and navigation products, (with W. K. Tobiska, H. C. Carlson, R. W. Schunk, D. C. Thompson, L. Scherliess, L. Zhu, and L. Gardner), presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
364. CEDAR Electrodynamics Thermosphere Ionosphere (ETI) challenge for systematic assessment of ionospheric models, (with J.-S. Shim, M. M. Kuznetsova, L. Rastaetter, M. Hesse, D. Bilitza, M. Codrescu, B. A. Emery, B. T. Foster, T. J. Fuller-Rowell, J. D. Huba, A. J. Mannucci, A. J. Ridley, R. W. Schunk, D. C. Thompson, D. N. Anderson, J. L. Chau, J. M. Forbes, E. K. Sutton, and B. Rideout), presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
365. Equatorial-PRIMO (Problems Related to Ionosphere Models and Observations), (with T-Z. Fang, D. Anderson, T. Fuller-Rowell, R. Akmaev, M. Codrescu, G. Millward, J. Sojka, L. Scherliess, V. Eccles, J. Retterer, J. Huba, G. Joyce, A. Richmond, A. Maute, G. Crowley, A. Ridley, and G. Vichare), presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
366. Mid-latitude dayside ionospheric response to storm-time electric fields, (with M. David, J. J. Sojka, R. W. Schunk, and M. Liemohn, presented at the Fall AGU Meeting, 13-17 December 2010, San Francisco, California.
367. Data assimilation models for ionosphere specifications and forecasts, (with R. W. Schunk, L. Scherliess, D. C. Thompson, and L. Zhu), presented at the American Meteorological Society Meeting, 23-27 January 2011, Seattle, Washington.
368. Global, real-time, ionosphere specification for end-user communication and navigation products, (with W. K. Tobiska, H. C. Carlson, R. W. Schunk, L. Scherliess, L. Zhu,

- and L. C. Gardner), presented at the American Meteorological Society Meeting, 23-27 January 2011, Seattle, Washington.
369. Commercial space weather products for real-time and forecast applications, (with R. W. Schunk, L. Scherliess, A. R. Barakat, L. Gardner, L. Zhu, W. K. Tobiska, D. Hansen\*\*, J. Meehan\*\*, L. Pedersen\*\*, E. Hunsaker, J. Fulgham\*, V. Eccles, D. Rice, D. Bouwer, R. Shelley, J. Bailey, J. Yoshii, B. Burke, P. Hagan, D. Knipp, presented at the Space Weather Workshop, 26-29 April 2011, Boulder, Colorado.
  370. New space weather products for HF radio, GPS navigation, and aviation, (with J. Meehan\*\*, D. Hansen\*\*, L. Pederson\*\*, W. K. Tobiska, R. W. Schunk, H. Carlson, V. Eccles, D. Rice, E. Hunsaker, J. Fulgham\*, L. Heaton\*, L. Gardner, L. Scherliess, L. Zhu, C. Tschan, D. Bouwer, R. Shelley), poster, presented at the Space Weather Workshop, 26-29 April 2011, Boulder, Colorado.
  371. The Altitude Dependence of the Earth's Ionosphere on the Solar Extreme Ultraviolet Spectrum, presented at the LWS/SDO Workshop, 1-5 May 2011, Squaw Valley, California.
  372. Global assimilation of ionospheric measurements (USU GAIM) (with R. W. Schunk, L. Scherliess, L. Gardner, J. J. Sojka, and L. Zhu) presented to the TDIM Decadal Survey Working Group via telecon from the Atlanta Airport, May 12, 2011.
  373. EISCAT Svalbard Radar (ESR) Year Long IPY Observations: A Model Climate Variability Study, (with M. David, R. W. Schunk, A. P. van Eyken, M. Codrescu, T. Fuller-Rowell, M. Gedrizzi, T. Span, A. Aylward, A. Ridley, D. Pawlowski, P.-L. Blelly, G. Crowley, R. Liu, and B. Zhang), presented at the AGU Chapman Conference on Modeling the Ionosphere/Thermosphere System, 9-12 May 2011, Charleston, South Carolina.
  374. Equatorial-PRIMO (Problems Related to Ionospheric Models and Observations), (with T. W. Fang, D. Ancerson, T. Fuller-Rowell, R. Akmaev, M. Codrescu, G. Millward, G. Crowley, A. Ridley, and G. Vichare), presented at the AGU Chapman Conference on Modeling the Ionosphere/Thermosphere System, 9-12 May 2011, Charleston, South Carolina.
  375. Ionospheric flare modeling: A new paradigm, poster (with R. W. Schunk, T. Woods, and F. Eparvier), presented at the AGU Chapman Conference on Modeling the Ionosphere/Thermosphere System, 9-12 May 2011, Charleston, South Carolina.
  376. Systematic assessment of ionosphere/thermosphere models using metrics, (with J. Shim, M. Kuznetsova, L. Rastatter, M. Hesse, D. Bilitza, M. Codrescu, B. Emery, B. Foster, T. Fuller-Rowell, J. Huba, A. Ridley, R. W. Schunk, D. Thompson, D. Weimer, D. Anderson, J. Chau, J. M. Forbes, E. Sutton, and B. Ridout), presented at the AGU Chapman Conference on Modeling the Ionosphere/Thermosphere System, 9-12 May 2011, Charleston, South Carolina.
  377. A storm-time F-region density enhancement feature predicted by the TDIM/HEIDI model, (with M. David, R. W. Schunk, and M. W. Liemohn), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
  378. Studying the space weather features of the high-latitude ionosphere by using a Physics-based data assimilation model and observational data from ground magnetometer arrays, (with L. Zhu, R. W. Schunk, L. Scherliess, and J. V. Eccles), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.

379. Ionospheric change and solar EUV irradiance, *Invited Talk*, (with M. David, J. B. Jensen\*, and R. W. Schunk), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
380. Substitution of ionospheric data for GPS TEC data in GAIM-GM: A regional study, poster (with R. W. Schunk, L. C. Gardner, L. Scherliess, D. Rice, W. K. Tobiska, L. E. Heaton\*, and J. A. Fulgham\*), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
381. Engaging undergraduates in innovative science outreach, poster (with L. Johnson\*, D. Ball\*, D. Peak, S. L. Larson, M. Larson, and J. J. Sojka), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
382. Dst prediction from CIR events during 2008 using synthesized signals derived from Soho, STEREO, and ACE observations, (with E. A. Spencer, T. Andriyas, and M. L. Mays), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
383. Heliophysics, poster (with M. Austin, M. Guhathakurta, A. Bhattacharjee, D. W. Longcope, C. J. Schrijver, and G. L. Siscoe), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
384. The International Space Station as a launch platform for CubeSats to study space weather, poster (with C. S. Fish\*\*, and C. Swenson), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
385. Na lidar investigation of sporadic Na layer and its correlation with sporadic E layer detected by ionosonde, poster (with T. Yuan, V. Semejyan, and D. Rice), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
386. A storm-time F-region density enhancement feature predicted by the TDIM/HEIDI model, poster (with M. David, R. W. Schunk, and M. W. Liemohn), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
387. Ionosphere-related products for communications and navigation, (with W. K. Tobiska, R. W. Schunk, L. C. Gardner, L. Scherliess, and L. Zhu), presented at the Fall AGU Meeting, 5-9 December 2011, San Francisco, California.
388. The Living with a Star (LWS) Heliophysics Summer School (HSS), presented at the NASA Community Coordinated Modeling Center (CCMC) Workshop, 16-20 January 2012, Key Largo, Florida.
389. New space weather data sources and products for communication and navigation systems (with J. Meehan\*\*, D. Hansen\*\*, W. K. Tobiska, J. Fulgham\*, R. W. Schunk, J. J. Sojka, L. Scherliess, L. Zhu, C. Tschan, D. Bouwer, and R. Shelley) presented at the American Meteorological Society Meeting, 22-26 January 2012, New Orleans, LA.
390. Data assimilation models for ionosphere, thermosphere and electrodynamics applications and science studies (with R. W. Schunk, L. Scherliess, L. C. Gardner, J. J. Sojka, and L. Zhu), presented at the American Meteorological Society Meeting, 22-26 January 2012, New Orleans, LA.
391. Ionosphere-related products for communication and navigation (with W. K. Tobiska, R. Schunk, J. J. Sojka, H. Carlson, L. Gardner, L. Scherliess, and L. Zhu), presented at the American Meteorological Society Meeting, 22-26 January 2012, New Orleans, LA.
392. The effect of space environment on wireless communication devices' performance, (with J. R. Dennison, L. Hillyard, and J. J. Sojka) presented at Utah Research on Capitol Hill, 25 January 2012, Salt Lake City, Utah.

393. The Ionosphere, presented at the Heliophysics Summer School, 31 May - 7 June, 2012, Boulder, CO.
394. Inferring limitations of numerical models, *Tutorial Talk*, presented at the CEDAR Workshop, 23-29 June 2012, Santa Fe, NM.
395. Solar EUV irradiance variations and their impact on Earth (with L. Scherliess, J. J. Sojka, R. W. Schunk, and M. David), presented at the 39<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly, 14-22 July 2012, Mysore, India.
396. Solar variability and its effect on the ionosphere/thermosphere at low and mid-latitudes obtained from the GAIM-Physics based Data Assimilation Model (GAIM-FP) (with L. Scherliess, J. J. Sojka, and R. W. Schunk), presented at the 39<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly, 14-22 July 2012, Mysore, India.
397. Studying the space weather variability of the high-latitude ionosphere by using a physics-based data assimilation model (with L. Zhu, R. W. Schunk, L. Scherliess, J. J. Sojka, and V. Eccles), presented at the 39<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly, 14-22 July 2012, Mysore, India.
398. Data assimilation models for ionosphere, thermosphere and electrodynamics studies (with R. W. Schunk, J. V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu), presented at the 39<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly, 14-22 July 2012, Mysore, India.
399. Using SDO-EVE satellite data to model for the first time how large solar flares influence the Earth's ionosphere (with J. B. Jensen\*, J. J. Sojka, R. W. Schunk, M. David, T. Woods, and F. Eparvier) presented at the American Physical Society Meeting, 26-27 October 2012, Socorro, NM.
400. Why the Solar EUV is important for Earth's ionosphere and thermosphere (with J. J. Sojka, J. Jensen\*, M. David, R. W. Schunk, T. Woods, F. Eparvier, S. Gonzales, and M. Sulzer), presented at the 2012 SDO EVE Science Conference, 30 October - 1 November 2012, Yosemite National Park, CA.
401. Ensemble modeling with data assimilation models: A new strategy for space weather science, specifications and forecasts (with R. W. Schunk, L. Scherliess, J. V. Eccles, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. Mannucci, B. D. Wilson, A. Komjathy, C. Wang, G. Rosen, W. K. Tobiska, R. K. Schaefer, and L. J. Paxson), presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
402. Space weather forecasting: An enigma, *Invited Talk*, presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
403. The new era in operational forecasting (with W. K. Tobiska, R. W. Schunk, J. J. Sojka, H. C. Carlson, L. C. Gardner, L. Scherliess, L. Zhu, J. V. Eccles, D. D. Rice, D. Bouwer, J. J. Bailey, D. J. Knipp, J. G. Blake, J. Rex, R. Fuschino, C. J. Mertens, B. Gersey, R. Wilkins, and W. Atwell) presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
404. 8/9 February 2012 SDO-EVE and Arecibo ISR ionospheric campaign (with J. J. Sojka, M. David, J. Jensen\*, R. W. Schunk, T. N. Woods, F. Eparvier, M. P. Sulzer, and S. A. Gonzales) presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
405. A reassessment of the PRIMO recommendations for adjustments to mid-latitude ionospheric models (with M. David, J. J. Sojka, and R. W. Schunk) presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.

406. Pre-IGY ionosphere over Washington DC (with D. D. Rice, J. J. Sojka, J. V. Eccles, and R. D. Hunsucker) presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
407. Studying the space weather variability of the high-latitude ionosphere by using a physics-based data assimilation model (with L. Zhu, L. Scherliess, J. V. Eccles, and J. J. Sojka) presented at Fall AGU Meeting, 2-7 December 2012, San Francisco, CA.
408. Ionospheric activity of historical events (with L. Heaton\*, and J. J. Sojka) poster, presented 7<sup>th</sup> Annual Utah Conference on Undergraduate Research (UCAR), 22 February 2013.
409. Using SDO-EVE satellite data to model for the first time how large solar flares influence the Earth's ionosphere (with J. B. Jensen\*, J. J. Sojka, M. David, R. W. Schunk, T. Woods, and F. G. Eparvier) poster, presented 7<sup>th</sup> Annual Utah Conference on Undergraduate Research (UCAR), 22 February 2013.
410. EVE and the E-Layer, *Invited Talk*, (with J. J. Sojka, R. W. Schunk, T. N. Woods, and F. G. Eparvier) presented at 2013 LWS/SDO Science Workshop, 3-8 March 2013, Cambridge, MD.
411. Resolving ionospheric E-region modeling challenges: The solar photon flux dependence (with J. Jensen\*, J. J. Sojka, M. David, K. Tobiska, R. W. Schunk, T. Woods, and F. Eparvier) presented at American Physical Society April Meeting 2013, 13-16 April 2013, Denver, CO.
412. Ensemble Modeling with data assimilation models: A new strategy for space weather specifications and forecasts (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. J. Mannucci, B. D. Wilson, A. Komjathy, C. Wang, and G. Rosen), presented at the Space Weather Workshop, 16-19 April 2013, Boulder, CO.
413. A multimodel ensemble data assimilation approach to specify ionospheric weather (with X. Pi, A. J. Mannucci, B. D. Wilson, A. Komjathy, M. Butala, V. Akopian, R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at the CEDAR Meeting, 22-28 June 2013, Boulder, CO.
414. E-Region developments and E-region assimilation challenges (with J. J. Sojka, J. B. Jensen\*, M. David, and R. W. Schunk) presented at the CEDAR Meeting, 22-28 June 2013, Boulder, CO.
415. A multimodel ensemble data assimilation approach to specify ionospheric weather (with X. Pi, A. J. Mannucci, B. D. Wilson, A. Komjathy, M. Butala, V. Akopian, R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at the International Beacon Satellite Symposium, 8-14 July 2013, Bath, United Kingdom.
416. E-region developments and E-region assimilation challenges (with J. J. Sojka, J. B. Jensen\*, M. David, R. W. Schunk, T. Woods, F. Eparvier, M. Sulzer, and S. Gonazlez) presented at the International Beacon Satellite Symposium, 8-14 July 2013, Bath, United Kingdom.
417. A multimodel ensemble prediction system to specify ionospheric storms (with Z. Pi, A. J. Mannucci, B. D. Wilson, A. Komjathy, M. D. Butala, V. Akopian, C. Wang, G. Rosen, R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
418. Solar extreme ultraviolet and X-ray irradiance measurements for thermosphere and ionosphere studies, *Invited Talk* (with T. N. Woods, A. Caspi, P. C. Chamberline, F. G.



- Eparvier, A. R. Jones, J. J. Sojka, S. C. Solomon, and R. A. Viereck) presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
419. Heliophysics (with M. Austin, M. Guhathakurta, C. J. Schrijver, F. Bagenal, and J. J. Sojka) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  420. The neutral wind in ionospheric modeling: The month-long ISR campaign at Millstone Hill, October 2002 (with M. David, J. J. Sojka, R. W. Schunk, and J. M. Holt) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  421. Using multiple data types in the USU GAIM data assimilation models (with L. C. Gardner, R. W. Schunk, L. Scherliess, D. D. Rice, J. J. Sojka, and L. Zhu) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  422. The Washington DC ionosphere: A six decade overview (with D. D. Rice, J. J. Sojka, and J. V. Eccles) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  423. Using a multimodel ensemble prediction system (MEPS) to study the ionosphere-thermosphere-electrodynamics system (with R. W. Schunk, L. Scherliess, J. V. Eccles, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. J. Mannucci, B. D. Wilson, A. Komjathy, and C. Wang) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  424. New advances in observations around the turbopause (with J. J. Sojka, T. Yuan, T. N. Woods, F. G. Eparvier, M. P. Sulzer, N. Aponte, S. A. Gonzalez, and M. J. Nicolls) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  425. Investigation of dynamic behind the seasonal variations of Es and sporadic Na layer near the turbopause of aurora free zone (with T. Yuan, J. J. Sojka, N. Criddle, X. Cai\*\*, and D. Rice) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  426. Terminator field-aligned current system: A new finding from model-assimilated data set (MADS) (with L. Zhu, R. W. Schunk, L. Scherliess, J. J. Sojka, L. C. Gardner, J. V. Eccles, and D. Rice) poster, presented at the Fall AGU Meeting, 8-13 December 2013, San Francisco, CA.
  427. Multimodel ensemble prediction system for space weather applications (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at the ION Meeting, 27-29 January 2014, San Diego, CA.
  428. Ionospheric reconstruction for various solar, seasonal, and geomagnetic conditions obtained from the Global Assimilation of Ionospheric Measurements – Gauss Markov (GAIM-GM) model (with L. C. Gardner, R. W. Schunk, L. Scherliess, L. Zhu, and J. J. Sojka) presented at the ION Meeting, 27-29 January 2014, San Diego, CA.
  429. Ensemble modeling with data assimilation models: A new strategy for space weather science, specifications and forecasts (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at the American Meteorological Society Meeting, 2-6 February 2014, Atlanta, GA.
  430. Ensemble modeling with data assimilation models: A new strategy for space weather science, specifications and forecasts (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu, X. Pi, A. J. Mannucci, M. Butala, B. D. Wilson, A. Komjathy, C. Wang, and G. Rosen) Presented at the CCMC 2014 Workshop, 1 April 2014, Annapolis, MD.

431. Ensemble modeling with data assimilation models: A new strategy for space weather science, specifications and forecasts (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu, X. Pi, A. J. Mannucci, M. Butala, B. D. Wilson, A. Komjathy, C. Wang, and G. Rosen) presented at the LWS Heliophysics Science Technical Interchange Meeting, 20-22 May 2014, Ames Research Center, CA.
432. Progress in resolving X-class flare E-region issues (with J. J. Sojka, M. Lewis, M. David, R. W. Schunk, T. Woods, F. Eparvier, and M. Nicolls) presented at 2014 Living with a Star (LWS) Science Meeting, 2-6 November 2014, Portland, OR.
433. A Multimodel ensemble data assimilation approach to specify ionospheric weather (with L. Scherliess, R. W. Schunk, L. C. Gardner, L. Zhu, J. V. Eccles, J. J. Sojka, X. Pi, M. D. Butala, A. J. Mannucci, B. D. Wilson, A. Komjathy, C. Wang, and G. Rosen) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
434. Assessment of modeling capability for reproducing storm impacts on TEC (with J.-S. Shim, M. M. Kuznetsova, L. Rastsetter, D. Bilitza, M. Codrescu, A. J. Coster, B. Emery, M. Foerster, B. Foster, T. J. Fuller-Rowell, J. D. Huba, L. P. Gonchaerenko, A. J. Mannucci, A. A. Namgaladze, X. Pi, B. E. Prokhorov, A. Ridley, L. Scherliess, R. W. Schunk, J. J. Sojka, L. Zhu) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
435. How uncertainties in the neutral wind affect ionospheric modeling (with M. David, J. J. Sojka, and R. W. Schunk) presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
436. Impact of X-class flares on the polar ionosphere (with J. J. Sojka, M. Lewis\*, M. David, R. W. Schunk, M. J. Nicolls, T. N. Woods, and F. Eparvier) presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
437. Multimodel ensemble prediction system (MEPS) for the ionosphere-thermosphere-electrodynamics system (with R.W. Schunk, L. Scherliess, J. V. Eccles, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. J. Mannucci, M. Butala, B.D. Wilson, A. Komjathy, C. Wang, and G. Rosen) presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
438. Study of ionospheric storms using global assimilative ionospheric models (with X. Pi, M. D. Butala, A. J. Mannucci, B. D. Wilson, A. Komjathy, C. Wang, G. Rosen, R. W. Schunk, L. Scherliess, J. V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA,
439. Terminator field-aligned current system: Its dependencies on solar, seasonal, and geomagnetic conditions (with L. Zhu, R. W. Schunk, V. Eccles, L. Scherliess, J. J. Sojka, and L. C. Gardner) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
440. The USU-GAIM data assimilation models for ionospheric specifications and forecasts (with L. Scherliess, R. W. Schunk, L. C. Gardner, L. Zhu, and J. J. Sojka) presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
441. Data assimilation models for space weather specifications and forecasts (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, and L. Zhu) presented at American Meteorological Society Meeting, 3-8 January 2015.
442. Evaluating Midlatitude fall-off dependencies of the high latitude convection pattern (with J. Jenniges\*\*, J. J. Sojka, and R. Heelis) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.

443. Promoting scientist communications through graduate summer school in heliophysics and space physics (with N. Gross, K. Schriver, F. Bagenal, J. J. Sojka, and M. Wiltberger) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
444. Online chapman layer calculator for simulating the ionosphere with undergraduate and graduate students (with N. Gross, P. Withers, and J. J. Sojka) poster, presented at Fall AGU Meeting, 15-19 December 2014, San Francisco, CA.
445. Physics and Center for Atmospheric & Space Sciences (CASS), the same and yet different! (with L. Scherliess) *Invited Talk*, presented at SDL-USU Technical Lecture Series, 11 February 2015, Space Dynamics Laboratory, Logan, UT.
446. The missing solar irradiance spectrum: 1 to 7 nm (with M. Lewis\*, M. David, and R. Schunk) presented at Fall AGU Meeting, 14-18 December 2015, San Francisco, CA.
447. The polar cap tongue of ionization: A survey of GPS TEC mappings from 2000 to 2014 (with M. David, J. J. Sojka, and R. Schunk) poster, presented at Fall AGU Meeting, 14-18 December 2015, San Francisco, CA.
448. Terminator field-aligned current system: Its dependencies on solar, seasonal, and geomagnetic conditions (with L. Zhu, R. Schunk, V. Eccles, L. Scherliess, J. J. Sojka, and L. Gardner) poster, presented at Fall AGU Meeting, 14-18 December 2015, San Francisco, CA.
449. Quantitative evaluation of ionosphere models for reproducing regional TEC during geomagnetic storms (with J-S. Shim, M. Kuznetsova, L. Rastaetter, D. Bilitza, M. Codrescu, A. Coster, B. Emery, B. Foster, T. Fuller-Rowell, L. Goncharenko, J. Huba, C. Mitchell, A. Ridley, M. Fedrizzi, L. Scherliess, R. Schunk, J. J. Sojka, and L. Zhu) poster, presented at Fall AGU Meeting, 14-18 December 2015, San Francisco, CA.
450. Modeling the ionosphere-thermosphere-electrodynamics system for space weather specifications, forecasts, and applications (with R. Schunk, L. Scherliess, V. Eccles, L. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. Mannucci, M. Butala, B. Wilson, A. Komjathy, C. Wang, and G. Rosen), presented at Fall AGU Meeting, 14-18 December 2015, San Francisco, CA.
451. Defining the space atmosphere interaction region (SAIR) (with J. J. Sojka, M. David, and R. W. Schunk), presented at Fall AGU Meeting 12-16 December 2016, San Francisco, CA.
452. Effects of the altitude variations of the equatorial vertical drifts on the ionospheric dynamics, (with L. Zhu, R. W. Schunk, J. V. Eccles, L. Scherliess, L. C. Gardner and J. J. Sojka), presented at Fall AGU Meeting 12-16 December 2016, San Francisco, CA.
453. Ionospheric storm reconstruction with a multimodel ensemble prediction system (MEPS) of data assimilation models high latitude dynamics (with J. V. Eccles, R. W. Schunk, L. Scherliess, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. J. Mannucci, A. Komjathy, C. Wang, and G. Rosen)), presented at Fall AGU Meeting 12-16 December 2016, San Francisco, CA.
454. Auroral oval “images” in GPS TEC maps (M. David, J. J. Sojka, R. W. Schunk, A. J. Coster, and M. J. Nicolls), presented at Fall AGU Meeting 12-16 December 2016, San Francisco, CA.
455. Ionospheric storm reconstructions with a Multimodel Ensemble Prediction System (MEPS) of data assimilation models mid and low latitude dynamics (with R. W. Schunk, L. Scherliess, V. Eccles, L. C. Gardner, J. J. Sojka, L. Zhu, X. Pi, A. J.

- Mannucci, A. Komjathy, C. Wang, and G. Rosen), presented at Fall AGU Meeting 12-16 December 2016, San Francisco, CA.
456. Ensemble inversion method for ISISII topside ionograms (with D. D. Rice, J. J. Sojka, J. V. Eccles, H. G. James, C. Torre, and R. F. Benson), presented at Ionospheric Effects Symposium (IES) 9-11 May 2017, Alexandria, VA.
  457. Terrestrial ionosphere(s): Local ionospheric processes, and terrestrial ionospheres (J. J. Sojka), presented at Heliophysics Summer School XI, 1-8 August 2017, Boulder, CO.
  458. Terrestrial ionosphere(s): Global I/T system (J. J. Sojka), presented at Heliophysics Summer School XI, 1-8 August 2017, Boulder, CO.
  459. Non-diffusive polar topside electron density profiles during geomagnetic storms (with D. D. Rice, J. J. Sojka, J. V. Eccles, H. G. James, and R. F. Benson, presented at 2017 URSI General Assembly and Scientific Symposium (GASS), 19-26 August 2017, Montreal, Canada.
  460. Earth's ionosphere – Our window to space (with J. J. Sojka, M. Negale\*\*, J. C. Mohica Decena\*, B. Johnson\*), *Invited talk*, presented at National Diversity in STEM Conference (SACNAS), 19-21 October 2017, Salt Lake City, UT.
  461. Inferring polar ion outflows from topside ionograms (with J. J. Sojka, D. D. Rice, J. V. Eccles, R. W. Schunk, M. David, H. G. James, and R. F. Benson), presented at Fall AGU Meeting 11-15 December 2017, New Orleans, LA.

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