Delores J. Knipp

Professional Address:

Smead Aerospace Engineering Sciences Department
429 UCB, University of Colorado Boulder
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Education:

1986 - 1989 University of California, Los Angeles
Ph.D*. in Atmospheric Science (emphasis, Space and Upper Atmosphere Physics)*
Dissertation Title: Quantifying and reducing uncertainty in the Assimilative Mapping of Ionospheric Electrodynamics Procedure
M.S*. in Atmospheric Science (emphasis, Space and Upper Atmosphere Physics), 1987*

1983 - 1984 University of Missouri
M.S*. in Atmospheric Science (emphasis, Remote Sensing)*

1972 - 1976 University of Missouri
B.S*. in Agriculture (emphasis Atmospheric Science, cum laude)*

Current Positions and Appointments:

Research Professor, Smead Aerospace Engineering Sciences Department
Member Colorado Center for Astrodynamics Research
Member Space Weather Technology Research and Education Center
Graduate Course Instructor in Aerospace Environment
Principle Investigator Space Environment Data Analysis Group
2013 - Present University of Colorado, Boulder, CO

Senior Research Associate, High Altitude Observatory
2008 – present National Center for Atmospheric Research

Adjunct Professor of Atmospheric Science
College of Agriculture, Food and Natural Resources
2017 – present University of Missouri, Columbia

Previous Positions and Professional Experience:

Visiting Professor, Aerospace Engineering Sciences Department
2009-2013 University of Colorado, Boulder, CO

Senior Research Associate NOAA Space Weather Prediction Center
2009 - 2010 National Research Council, resident at NOAA

Professor of Physics
1996 - 2008 US Air Force Academy (USAFA)
Physics Department Director of Operations and Director of Meteorology;
Initiated Space Physics and Atmospheric Research Center at USAFA
Taught: Astronomy, Physics, and Meteorology at all undergrad levels
Member of AF Multi University Research Initiative Team
1977 - 1999 US Air Force Officer, Meteorologist, Physicist

Research Interests:

Prof. Knipp's research focuses on the space environment and the atmospheric and solar events that disturb it. She works with students to investigate methods for: 1) specifying satellite drag; 2) describing how structures on the Sun produce disturbances in near-Earth space; 3) improving scientific use of space environment measurements from DoD, NASA and international space missions; 4) inter-comparing measurements from research and commercial satellites with an eye toward making broader use of commercial satellite 'housekeeping' data to monitor environmental conditions in near-Earth space. 5) estimating the conductivity of Earth's upper atmosphere. She also studies historical space weather events to understand the impacts these events have had on society and the US military. Prof. Knipp is participating in a current AFOSR-sponsored Multi University Research Initiative entitled: Next Generation Advances in Ionosphere-Thermosphere Coupling at Multiple Scales for Environmental Specification and Prediction

Editorships:

Editor in Chief for the American Geophysical Union's ***Space Weather-the International Journal of Research and Applications*** (2014-2019); Editor (2020)
Guest editor for Journal of Atmospheric and Solar Terrestrial Physics (2000-2001)

Memberships in Professional Societies:

American Geophysical Union (AGU)
American Meteorological Society (AMS)

Participation in other Professional Societies:

American Institute of Aeronautics and Astronautics (AIAA),
International Union of Geodesy and Geophysics (IUGG)
Japan Geoscience Union (JpGU); International Astronomical Union (IAU)
European Geoscience Union (EGU); American Astronomical Society (AAS)

Recent Professional Service Activities:

2020 -2021 Member European Space Weather Symposium Medal Committee
2020-2021 Smead Aerospace Engineering Department Inclusive Culture Committee
2020 Search Committee Member for NCAR High Altitude Observatory Director
2019-2021 Chair Coupling Energetic & Dynamics of Atmospheric Regions (CEDAR) Science Steering Committee
2019 Member Next Step Space Weather Benchmarks Working Group (Ionizing Radiation)
2019 Convener AGU Chapman Conference on Forecasting Space Weather Including Extremes
2017-2021 AMS Ad Hoc Committee on Space Weather Certification
2017-2018: Participant in Solar Week (March & October) MultiVerse UC Berkeley outreach
2017 Invited Plenary Speaker on Space Weather at 230th AAS Meeting
2015-2016 Portfolio Review Committee, National Science Foundation (NSF) Geospace Section, Division of Atmospheric and Geospace Sciences
2012-2103: Convener and Instructor for 1st AMS Space Weather Short Course
2005 – 2006: Member of the National Space Weather Program Assessment Committee

Recent Refereeing and Reviewing:

Journals: *Advances in Space Science; Journal of Atmospheric and Solar Terrestrial Physics*
Acta Geophysica; Geophysical Research Letters (AGU)
International Astronomical Union; Journal Geophysical Research-Space Physics (AGU)

Journal of Space Weather and Space Climate; Space Weather Journal (AGU)
Agencies: NASA, NSF and AFOSR proposals, Canada Foundation for Innovation (2017) Science Foundation of Ireland (2019), UK Natural Environment Research Council (2020)

Awards and Honors:

2019 International Marcel Nicolet Medal for Space Weather and Space Climate
2019 Michael J. Buonsanto 20th Annual Memorial Lecture, MIT Haystack
2019 Fellow of the American Meteorological Society
2017 NSF Coupling Energetic and Dynamics of Atmospheric Regions (CEDAR) Prize Lecture
2013 American Geophysical Union Citation for Excellence in Refereeing
2008 USAF Academy Professor of the Year 2008

Supervision:

Supervisor of numerous junior and mid-level Air Force officers and civilians 1984-2008
Post-Doctoral Supervisee: Dr. Kelly Ann Drake, 2008-2009
Doctoral Students: Ryan McGranaghan, PhD (2016), Yining Shi, PhD (2019)
Ph D candidate: Ms Valerie Bernstien (MS, 2019)
MS Students: Ms Sierra Flynn (2017); Mr Alberto Cruz (2018) and Ms Bagyashree Waghule (present)
Undergraduate: Ms Kaiya Wahl, Discovery Learning Apprentice (REU) present
Early Career Visiting Scientist: Dr. Zheng Li, Nanjing University/NCAR 2017-2018
Project supervision for numerous graduate students at CU (2013-2021)
More than a dozen Research Experience for Undergraduate students at USAFA and CU

Publications and Presentations:

Textbooks

Knipp D. J. Understanding Space Weather and the Physics Behind It, McGraw Hill, 2011, now in 2nd Edition as e-book by Space Technology Series: http://store.spacetechnologyseries.com/ebooks/17-understanding-space-weater-and-the-physics-behind-it.html

Teaching Materials

Simulating Satellite Orbits and Atmospheric Drag - Teaching Materials Collection (https://nagt.org/nagt/teaching_resources/teachingmaterials/11311.html
This activity was selected for the On the Cutting-Edge Exemplary Teaching Collection.

Peer-reviewed

PEER-REVIEWED JOURNAL ARTICLES

1. Knipp DJ, Bernstein V, Wahl K & Hayakawa H (2021). Timelines as a tool for learning about space weather storms. J. Space Weather Space Clim., 2021, 11, 29. https://doi.org/10.1051/swsc/2021011.
2. Zhu, Q., Deng, Y., Maute, A., Kilcommons, L., Knipp, D., & Hairston, M. (2021). ASHLEY: A new empirical model for the high-latitude electron precipitation and electric field. *Space Weather*, 19, e2020SW002671. https://doi.org/10.1029/2020SW002671
3. Hayakawa H, Hattori K, Pevtsov AA, Ebihara Y, Shea MA, McCracken KG, Daglis IA, Bhaskar A, Ribeiro P, Knipp DJ (2021). The intensity and evolution of the extreme solar and geomagnetic storms in 1938 January. Astrophys J 909: 197.https://doi.org/10.3847/1538-4357/abc427.

4. Maute, A., Richmond, A. D., Lu, G., Knipp, D. J., Shi, Y., & Anderson, B. (2021). Magnetosphere-ionosphere coupling via prescribed field-aligned current simulated by the TIEGCM. *Journal of Geophysical Research: Space Physics*, 126, e2020JA028665. https://doi.org/10.1029/2020JA028665
5. Bernstein Valerie, Marcin Pilinksi and Delores Knipp, (2020) Evidence for Drag Coefficient Modeling Errors near and Above the Oxygen-to-Helium Transition, Journal of Spacecraft and Rockets 0:0, pp. 1–18, https://doi.org/10.2514/1.A34740
6. Haonan Wu, Xian Lu, Gang Lu, Xinzhao Chu, Wenbin Wang, Zhibin Yu, Liam M. Kilcommons, Delores J. Knipp, Boyi Wang, Yukitoshi Nishimura, Importance of regional-scale auroral precipitation and electrical field variability to the storm-time thermospheric temperature enhancement and inversion layer (TTEIL) in the Antarctic E region, *Journal of Geophysical Research: Space Physics*, 125, e2020JA028224. https://doi.org/10.1029/2020JA02822
7. Hayakawa, Hisashi, Frédéric Clette, Toshihiro Horaguchi, Tomoya Iju, Delores J. Knipp, Huixin Liu and Takashi Nakajima, Sunspot Observations by Hisako Koyama: 1945 – 1996, (2020), Monthly Notices Of The Royal Astronomical Society, 492, (3), Pages 4513 4527 , https://doi.org/10.1093/mnras/stz3345
8. Hayakawa, Hisashi, Paulo Ribeiro, José M. Vaquero, María Cruz Gallego, Delores J. Knipp, Florian Mekhaldi, Ankush Bhaskar, Denny M. Oliveira, Yuta Notsu, Víctor M. S. Carrasco, Ana Caccavari, Bhaskara Veenadhari, Shyamoli Mukherjee, and Yusuke Ebihara (2020), The Extreme Space Weather Event in 1903 October/November: An Outburst from the Quiet Sun, *The Astrophysical Journal Letters*, 888(2), https://doi.org/10.3847/2041-8213/ab6a18
9. Shi, Y., Knipp, D. J., Matsuo, T., Kilcommons, L., & Anderson, B. (2020). Modes of (FACs) variability and their hemispheric asymmetry revealed by inverse and assimilative analysis of iridium magnetometer data. *Journal of Geophysical Research: Space Physics*, 125, e2019JA027265. https://doi.org/10.1029/2019JA027265
10. Shi, Y., Knipp, D. J., Matsuo, T., Kilcommons, L., & Anderson, B. (2020). Event studies of high-latitude FACs with inverse and assimilative analysis of AMPERE magnetometer data. *Journal of Geophysical Research: Space Physics*, 125, e2019JA027266. https://doi.org/10.1029/2019JA027266
11. Zhu, Q., Deng, Y., Richmond, A., Maute, A., Chen, Y.-J., Hairston, M., et al. (2020). Impacts of binning methods on high-latitude electrodynamic forcing: Static versus boundary-oriented binning methods. *Journal of Geophysical Research: Space Physics*, 125, e2019JA027270. https://doi.org/10.1029/2019JA027270
12. Shi, Y., Oliveira, D. M., Knipp, D. J., Zesta, E., Matsuo, T., & Anderson, B. (2019). Effects of Nearly Frontal and Highly Inclined Interplanetary Shocks on High-latitude Field-aligned Currents (FACs). *Space Weather*, 17, 1659– 1673. https://doi.org/10.1029/2019SW002367
13. Wu, Q., Knipp, D., Liu, J., Wang, W., Varney, R., Gillies, R., et al (2019). HIWIND observation of summer season polar cap thermospheric winds. *Journal of Geophysical Research: Space Physics*, 124, 9270– 9277. https://doi.org/10.1029/2019JA027258
14. Li, Z., Knipp, D., Wang, W., Shi, Y., Wang, M., Su, Y., & Li, J. (2019). An EOFs Study of Thermospheric Nitric Oxide Flux Based on TIEGCM simulations. *Journal of Geophysical Research: Space Physics*, 124, 9695– 9708. https://doi.org/10.1029/2019JA027004
15. Lin, C. Y., Deng, Y., Knipp, D. J., Kilcommons, L. M., & Fang, X. (2019). Effects of Energetic Electron and Proton Precipitations on Thermospheric Nitric Oxide Cooling during shock-led Interplanetary Coronal Mass Ejections. *Journal of Geophysical Research: Space Physics*, 124, 8125-8137. https://doi.org/10.1029/2019JA027089
16. Hayakawa, H., Ebihara, Y., Willis, D. M., Toriumi, S., Iju, T., Hattori, K., et al (2019). Temporal and spatial evolutions of a large sunspot group and great auroral storms around the Carrington event in 1859. *Space Weather, 17, 1553-1569.* https://doi.org/10.1029/2019SW002269

17. Wu, Q., Knipp, D., Liu, J., Wang, W., Häggström, I., Jee, G., et al. (2019). What do the new 2018 HIWIND thermospheric wind observations tell us about high-latitude ion-neutral coupling during daytime? *Journal of Geophysical Research: Space Physics*, 124, 6173– 6181. https://doi.org/10.1029/2019JA026776
18. Li, Z., Knipp, D., & Wang, W. (2019). Understanding the behaviors of thermospheric Nitric Oxide cooling during the 15 May 2005 geomagnetic storm. *Journal of Geophysical Research: Space Physics*, 124. https://doi.org/10.1029/2018JA026247
19. Knipp, D. J., Fraser, B. J., Shea, M. A., & Smart, D. F. (2018). On the little-known consequences of the 4 August 1972 ultra-fast coronal mass ejecta: Facts, commentary, and call to action. *Space Weather*, 16, 1635–1643. https://doi.org/10.1029/2018SW002024
20. Li, Z., Knipp, D., Wang, W., Sheng, C., Qian, L., & Flynn, S. (2018). A comparison study of NO cooling between TIMED/SABER measurements and TIEGCM simulations. *Journal of Geophysical Research: Space Physics*, 123. https://doi.org/10.1029/2018JA025831
21. Lu, Y., Deng, Y., Sheng, C., Kilcommons, L., & Knipp, D. J. (2018). Poynting flux in the dayside polar cap boundary regions from DMSP F15 satellite measurements. *Journal of Geophysical Research: Space Physics*, 123. https://doi.org/10.1029/2018JA025309
22. Flynn, S., Knipp, D. J., Matsuo, T., Mlynczak, M. & Hunt, L. (2018). Understanding the Global Variability in Thermospheric Nitric Oxide Flux Using Empirical Orthogonal Functions (EOFs). *Journal of Geophysical Research: Space Physics*, 123. https://doi.org/10.1029/2018JA025353
23. Knipp, D. J. (2018). The Reprise Special Collection for the 2001 Space Weather Monograph. *Space Weather*, 16. https://doi.org/10.1002/2018SW001807
24. Mlynczak, M. G., Knipp, D. J., Hunt, L. A., Gaebler, J., Matsuo, T., Kilcommons, L. M. & Young, C. L. (2018). Space-Based Sentinels for Measurement of Infrared Cooling in the Thermosphere for Space Weather Nowcasting and Forecasting. *Space Weather*, 16. https://doi.org/10.1002/2017SW001757
25. Hayakawa, Hishasi, Kiyomi Iwahashi, Yusuke Ebihara, Harufami Tamazawa, Kazunari Shibata, Delores J. Knipp, Akito Davis Kawamura, Kentaro Hattori, Kumiko Mase, Ichiro Nakanishi, Hiroaki Isobe (2017), Long-Lasting Extreme Magnetic Storm Activities in 1770 Found in Historical Documents, *Astrophys. J. Lett., 850,* https://doi.org/10.3847/2041-8213/aa9661
26. Knipp, D., Liu, H., & Hayakawa, H. (2017). Ms. Hisako Koyama: From amateur astronomer to long-term solar observer. Space Weather, *15, 1215–1221 https://doi.org/10.1002/2017SW001704*
27. Eriksson, S., M. Maimaiti, J. B. H. Baker, K. J. Trattner, D. J. Knipp, *and* F. D. Wilder (2017), Dual **E** × **B** flow responses in the dayside ionosphere to a sudden IMF By rotation, *Geophys. Res. Lett., 44, 6525–6533, doi:10.1002/2017GL073374.*
28. Kilcommons, L., Redmon, R. J., Knipp, and D. J. (2017). A New DMSP Magnetometer Dataset and Estimates of Field Aligned Currents in Dynamic Auroral Boundary Coordinates, *J. Geophys. Res. Space Physics, 122, 9068–9079, doi:10.1002/2016JA023342.*
29. Redmon, Robert, Liam Kilcommons, William Denig, and Delores Knipp, New DMSP Database of Precipitating Auroral Electrons and Ions, (2017), *J. Geophys. Res. Space Physics, 122, 9056–9067, doi:10.1002/2016JA023339.*
30. Knipp, D. J. (2017), Essential science for understanding risks from radiation for airline passengers and crews, *Space Weather, 15, 549–552, doi:10.1002/2017SW001639.*
31. Knipp, D. J., D. V. Pette, L. M. Kilcommons, T. L. Isaacs, A. A. Cruz, M. G. Mlynczak, L. A. Hunt and C. Y. Lin (2017), Thermospheric Nitric Oxide Response to Shock-led Storms, *Space Weather, 15, 325–342, doi:10.1002/2016SW001567.*

32. Knipp, D. J., et al. (2016), The May 1967 great storm and radio disruption event: Extreme space weather and extraordinary responses, *Space Weather*, 14, 614–633, doi:10.1002/2016SW001423.
33. Zhang, B., W. Wang, Q. Wu, D. Knipp, L. Kilcommons, O. J. Brambles, J. Liu, M. Wiltberger, J. G. Lyon, and I. Häggström (2016), Effects of magnetospheric lobe cell convection on dayside upper thermospheric winds at high latitudes, *Geophys. Res. Lett.*, 43, 8348–8355, doi:10.1002/2016GL069834.
34. McGranaghan, R., D. J. Knipp, and T. Matsuo (2016), High-latitude ionospheric conductivity variability in three dimensions, *Geophys. Res. Lett.,* 43, 7867–7877, doi:10.1002/2016GL070253.
35. McGranaghan, R. M., D. J. Knipp, T. Matsuo, and E. Cousins (2016) Optimal interpolation analysis of high-latitude ionospheric Hall and Pedersen conductivities: Application to assimilative ionospheric electrodynamics reconstruction, *J. Geophys. Res. Space Physics*, 121, 4898–4923, doi:10.1002/2016JA022486.
36. Rastätter Lutz, Ja Soon Shim, Maria M. Kuznetsova, Liam M. Kilcommons, Delores J. Knipp, Mihail Codrescu, Tim Fuller-Rowell, Barbara Emery, Daniel R. Weimer, Russell Cosgrove, Michael Wiltberger, Joachim Raeder, Wenhui Li, Gábor Tóth, and Daniel Welling (2016), GEM-CEDAR challenge: Poynting flux at DMSP and modeled Joule heat, *Space Weather*, 14, doi:10.1002/2015SW001238.
37. McGranaghan, R., D. J. Knipp, T. Matsuo, H. Godinez, R. J. Redmon, S. C. Solomon, and S. K. Morley (2015), Modes of high-latitude auroral conductance variability derived from DMSP energetic electron precipitation observations: Empirical orthogonal function analysis, *J. Geophys. Res. Space Physics*, 120, 11,013–11,031, doi:10.1002/2015JA021828.
38. Knipp, D. J. (2015), Synthesis of Geomagnetically Induced Currents: Commentary and Research, *Space Weather*, 13, 727–729, doi:10.1002/2015SW001317.
39. Knipp, D. J. (2015), Forward to space weather collection on geomagnetically induced currents: Commentary and research, *Space Weather*, 13, 742–746, doi:10.1002/2015SW001318.
40. Knipp, D. J., and D. A. Biesecker (2015), Changing of the guard: Satellite will warn Earth of solar storms, *Eos*, 96, doi:2015EO026579.
41. Redmon, R. J., J. V. Rodriguez, J. C. Green, D. Ober, G. Wilson, D. Knipp, L. Kilcommons, and R. McGuire (2015), Improved Polar and Geosynchronous Satellite Data Sets Available in Common Data Format at the Coordinated Data Analysis Web, *Space Weather*, 13, 254–256. doi:10.1002/2015SW001176.
42. Deng, Y., C. Sheng, Y.-J. Su, M. R. Hairston, D. Knipp, C. Y. Huang, D. Ober, R. J. Redmon, and R. Coley (2015), Correlation between Poynting flux and soft electron precipitation in the dayside polar cap boundary regions, *J. Geophys. Res. Space Physics*, 120, 9102–9109, doi:10.1002/2015JA021075.
43. Matsuo, T., D. J. Knipp, A. D. Richmond, L. Kilcommons, and B. J. Anderson (2015), Inverse procedure for high-latitude ionospheric electrodynamics: Analysis of satellite-borne magnetometer data, *J. Geophys. Res. Space Physics*, 120, 5241–5251, doi:10.1002/2014JA020565.2.
44. McGranaghan, R., D. J. Knipp, S. C. Solomon, and X. Fang (2015), A fast, parameterized model of upper atmospheric ionization rates, chemistry, and conductivity. *J. Geophys. Res. Space Physics*, 120, 4936–4949. doi: 10.1002/2015JA021146.
45. Knipp, D. J., L. M. Kilcommons, J. Gjerloev, R. J. Redmon, J. Slavin, and G. Le, (2015) A Large-Scale View of Space Technology 5 Magnetometer Response to Solar Wind Drivers, *Earth and Space Science*, DOI: 10.1002/2014EA000057

46. McGranaghan, R., D. J. Knipp, R. L. McPherron, and L. A. Hunt (2014), Impact of equinoctial high-speed stream structures on thermospheric responses, *Space Weather*, 12, 277–297, doi:10.1002/2014SW001045.
47. Knipp, D. J., T. Matsuo, L. Kilcommons, A. Richmond, B. Anderson, H. Korth, R. Redmon, B. Mero, and N. Parrish (2014), Comparison of magnetic perturbation data from LEO satellite constellations: Statistics of DMSP and AMPERE, *Space Weather*, 12, doi:10.1002/2013SW000987.
48. Tobiska, W. K., D. Knipp, W. J. Burke, D. Bouwer, J. Bailey, D. Odstrcil, M. P. Hagan, J. Gannon, *and* B. R. Bowman *(*2013*),* The ANEMOMILOS prediction methodology for Dst*, Space Weather,* 11*,* 490–508*,* doi:10.1002/swe.20094
49. Deng, Y., T. J. Fuller-Rowell, A. J. Ridley, D. Knipp, and R. E. Lopez (2013), Theoretical study: Influence of different energy sources on the cusp neutral density enhancement, *J. Geophys. Res. Space Physic*s, 118, 2340–2349, doi:10.1002/jgra.50197.
50. Knipp, D., L. Kilcommons, L. Hunt, M. Mlynczak, V. Pilipenko, B. Bowman, Y. Deng, and K. Drake (2013), Thermospheric damping response to sheath-enhanced geospace storms, *Geophys. Res. Lett.*, 40, doi:10.1002/grl.50197.
51. Deng, Y., Y. Huang, S. Solomon, L. Qian, D. Knipp, D. R. Weimer, and J.-S. Wang (2012), Anomalously low geomagnetic energy inputs during 2008 solar minimum, J. Geophys. Res., 117, A09307, doi:10.1029/2012JA018039
52. Knipp, D., S. Eriksson, L. Kilcommons, G. Crowley, J. Lei, M. Hairston, and K. Drake, (2011), Extreme Poynting flux in the dayside thermosphere: Examples and statistics, *Geophys. Res. Lett.*, 38, L16102, doi:10.1029/2011GL048302.
53. Li, W., D. Knipp, J. Lei, and J. Raeder, (2011) The relation between dayside local Poynting flux enhancement and cusp reconnection, *J. Geophys. Res.*, 116, A08301, doi:10.1029/2011JA016566.
54. Crowley, G., D. J. Knipp, K. A. Drake, J. Lei, E. Sutton, and H. Lühr, (2010) Thermospheric density enhancements in the dayside cusp region during strong B_Y conditions, *Geophys. Res. Lett., 37*, L07110, doi:10.1029/2009GL042143.
55. Sutton, E. K., J. M. Forbes, and D. J. Knipp, (2009) Rapid response of the thermosphere to variations in Joule heating, *J. Geophys. Res.*, 114, A04319, doi:10.1029/2008JA013667.
56. Gross, N. A., N. Arge, R. Bruntz, A. G. Burns, W. J. Hughes, D. Knipp, J. Lyon, S. McGregor, M. Owens, G. Siscoe, S. C. Solomon, and M. Wiltberger, (2009) Space Physics Concepts for Graduate Students: An Activities-Based Approach, *EOS*, Vol 90, p. 13-14, 13 January 2009
57. Turner, N., E. J. Mitchell and D. J. Knipp, Energetics of Magnetic Storms Driven by Corotating Interaction Regions: A Study of Geoeffectiveness, *AGU Monograph of Geoeffectiveness*, American Geophysical Union, Washington, D. C. doi: 10.1029/167GM11
58. Knipp, D. J., E. T. Patterson, J. H. Head, T. A. Summers, A. Franz, and E. L. Zirbel, Simulating the Physics of Realistic Satellite Orbits in the Undergraduate Classroom, (2005) *The Physics Teacher*, The Physics Teacher **43**, 452; https://doi.org/10.1119/1.2060645
59. McHarg, M., F. Chun, D. Knipp, G. Lu, B. Emery, and A. Ridley (2005), High-latitude Joule heating response to IMF inputs, *J. Geophys. Res.*, *110*, A08309, doi:10.1029/2004JA010949, 2005
60. Knipp, D. J., T. Welliver, M. G. McHarg, F. K Chun. W. K. Tobiska and D. Evans, Climatology of extreme upper atmospheric heating events*, Advances in Space Research* 36, 2506-2510, 2005, doi:10.1016/j.asr.2004.02.019
61. Knipp, D. J., W. K. Tobiska and B. A. Emery, Solar Direct and Indirect Thermospheric Heating Sources for Solar Cycles 21-23, *Solar Physics*, 224:495-505, 2004, https://doi.org/10.1007/s11207-005-6393-4

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63. Chun, F. K., D. J. Knipp, M. G. McHarg, J. R. Lacey, G. Lu, and B. A. Emery, Joule heating patterns as a function of polar cap index, *J. Geophys. Res.*, *107*(A7), 10.1029/2001JA000246, 200
64. Shiokawa, K., Y. Otuska, T. Ogawa, N. Balan, K. Igarashi, A. J. Ridley, D. J. Knipp, A. Saito and K. Yumoto, A large scale traveling ionospheric disturbance during the magnetic storm of September 15, 1999, *J. Geophys. Res,* Vol 107, SIA 5-1 to SIA 5-11, 2001JA000245, 2002
65. Knipp, D. J. and C.-H. Lin, B. A. Emery, J. M. Ruohoniemi, and D. S. Evans, "Hemispheric asymmetries in ionospheric electrodynamics during the solar wind void of 11 May 1999," *G R L.,* 27, 4013, 2000.
66. Habash-Krause, L., B. K. Dichter, D. J. Knipp, and K. P. Ray, The Relationship Between DSCS III Sunlit Surface Charging and Geomagnetic Activity Indices, *IEEE Trans. Nuclear Sci*., 47, 2224, 2000, DOI: 10.1109/23.903757
67. Crowley, G. A. J. Ridley, D. Deist, S. Wing, D. J. Knipp, B. A. Emery, J. Foster, R. Heelis and M. Hairston and B. W. Reinisch, "The transformation of high-latitude ionospheric F-region patches into Blobs during the March 21, 1990 storm, *J. Geophys. Res., 105, 5215,* 2000.
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69. Chun, F. K., D. J. Knipp, M. G. McHarg, G. Lu, B. A. Emery, S. Vennerstrøm, and O. A. Troshichev, Polar cap index as a proxy for hemispheric Joule heating, *Geophys. Res. Lett., 26 (8),* 1101-1104, 1999.
70. Emery, B. A., C. Lathuillere, P. G. Richards, R. G. Roble, M. J. Buonsanto, D. J. Knipp, P. Wilkinson, D. P. Sipler and R. Niciejewski, Time dependent thermospheric neutral response to the 2-11 November 1993 storm period, *J. Atmos. Solar Terr. Phys., 61*, 329-350, 1999.
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