

Laura Holt

Curriculum Vitæ

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Education

- 2005 **Bachelor of Arts**, *St. Cloud State University*, summa cum laude.
Mathematics
- 2005 **Bachelor of Science**, *St. Cloud State University*, summa cum laude.
Physics
- 2013 **Doctor of Philosophy**, *University of Colorado Boulder*.
Atmospheric Science

Professional Experience

- 2016– **Research Scientist**, *NorthWest Research Associates*, Boulder, CO.
- 2017– **Graduate Faculty Appointment**, *University of Colorado Boulder / ATOC*, Boulder, CO.
- 2014–2016 **Postdoctoral Research Scientist**, *NorthWest Research Associates*, Boulder, CO.
- 2013–2014 **Postdoctoral Research Scientist**, *University of Colorado Boulder / Laboratory for Atmospheric and Space Physics*, Boulder, CO.
- 2007–2013 **Graduate Research Assistant**, *University of Colorado Boulder / Laboratory for Atmospheric and Space Physics*, Boulder, CO.
- 2005–2006 **Product Development Engineer**, *Colorlink, Inc.*, Boulder, CO.
- 2003–2005 **Undergraduate Research Assistant**, *St. Cloud State University*.
- 2002–2003 **Astronomical Observatory Manager**, *St. Cloud State University*.

Research Interests

- Middle atmosphere dynamics
- Modeling and observations of gravity waves
- Global circulation and transport
- Global climate modeling
- Global high-resolution atmospheric modeling

Current Projects

- ★ PI of NASA New (Early Career) Investigator Program in Earth Science: Southern Hemisphere Gravity Wave Sources and Effects on Circulation, Transport, and Ozone, 2018–2022
- ★ PI of NASA Aura Science: Effects of Orography on Regional Gravity Wave Breaking, Mixing, Chemical Tracers, Transport, and Circulation, 2020–2023
- ★ Co-I of NASA Modeling, Analysis, and Prediction Program: High-resolution GEOS-5 studies: Improving the representation of atmospheric waves for reduced model biases and improved seasonal predictability on regional and global scales, 2017–2022
- ★ Co-I/Institutional PI of NASA DRIVE Science Center: Wave-induced Atmospheric Variability Enterprise, 2020–2022

Honors, leadership, and service

- 2020- **SPARC Gravity Wave Activity Co-lead**
- 2018- **American Meteorological Society Middle Atmosphere Committee**
- 2013 **IAGA Young Scientist Award**
- 2012 **Best Poster Presentation–ATOC Student Poster Conference**
- 2011 **Best Student Paper–3rd Annual International HEPPA Workshop**
- 2008 **NSF Graduate Research Fellowship Honorable Mention**

Publications

Published, Refereed Articles

1. Laura A. Holt, Colby M. Brabec, and M. Joan Alexander. Exploiting high-density zonal-sampling of HIRDLS profiles near near 60°S to investigate missing drag in chemistry-climate models. *J. Geophys. Res.: Atmospheres*, 2023. <https://doi.org/10.1029/2022JD037398>.
2. Lawrence Coy, Paul A. Newman, Andrea Molod, Steven Pawson, M. Joan Alexander, and Laura A. Holt. Seasonal prediction of the quasi-biennial oscillation. *J. Geophys. Res.: Atmospheres*, 2022. <https://doi.org/10.1029/2021JD036124>.
3. Christopher G. Kruse, M. Joan Alexander, Lars Hoffmann, Annelize van Niekerk, Inna Polichtchouk, Julio Bacmeister, Laura Holt, Riwal Plougonven, Petr Sacha, Corwin Wright, Kaoru Sato, Ryosuke Shibuya, Sonja Gisinger, Manfred Ern, Catrin Meyer, and Olaf Stein. Observed and modeled mountain waves from the surface to the mesosphere near the drake passage. *J. Atmos. Sci.*, 2022. <https://doi.org/10.1175/JAS-D-21-0252.1>.
4. John P. McCormack, V. Lynn Harvey, Nicholas Pedatella, Dai Koshin, Kaoru Sato, Lawrence Coy, Shingo Watanabe, Cora E. Randall, Fabrizio Sassi, and Laura A. Holt. Intercomparison of middle atmospheric meteorological analyses for the Northern Hemisphere winter 2009–2010. *Atmos. Chem. Phys.*, 2021. <https://doi.org/10.5194/acp-2021-224>.
5. Corwin J. Wright, Neil P. Hindely, M. Joan Alexander, Laura A. Holt, and Lars Hoffmann. Using vertical phase differences to better resolve 3D gravity wave structure. *Atmos. Meas. Tech.*, 14:5873–5886, 2021. <https://doi.org/10.5194/amt-14-5873-2021>.
6. James A. Anstey, Isla R. Simpson, Jadwiga H. Richter, Hiroaki Naoe, Masakazu Taguchi, Federico Serva, Lesley J. Gray, Neal Butchart, Kevin Hamilton, Scott Osprey, Omar Bellprat, Peter Braesicke, Andrew C. Bushell, Chiara Cagnazzo, Chih-Chieh Chen, Hye-Yeong Chun, Rolando R. Garcia, Laura Holt, Yoshio Kawatani, Tobias Kerzenmacher, Young-Ha Kim, Francois Lott, Charles McLandress, John Scinocca, Timothy N. Stockdale, Stefan Versick, Shingo Watanabe, Kohei Yoshida, and Seiji Yukimoto. Teleconnections of the quasi-biennial oscillation in a multi-model ensemble of QBO-resolving models. *Quart. J. Roy. Meteor. Soc.*, 2021. <https://doi.org/10.1002/qj.4048>.
7. Laura A. Holt, François Lott, Rolando R. Garcia, George N. Kiladis, Yuan-Ming Cheng, James A. Anstey, Peter Braesicke, Andrew C. Bushell, Neal Butchart, Chiara Cagnazzo, Chih-Chieh Chen, Hye-Yeong Chun, Yoshio Kawatani, Tobias Kerzenmacher, Young-Ha Kim, Charles McLandress, Hiroaki Naoe, Scott Osprey, Jadwiga H. Richter, Adam A. Scaife, John Scinocca, Federico Serva, Stefan Versick, Shingo Watanabe, Kohei Yoshida, and Seiji Yukimoto. An evaluation of tropical waves and wave forcing of the QBO in the QBOi models. *Quart. J. Roy. Meteor. Soc.*, 2020. <https://doi.org/10.1002/qj.3827>.
8. Anne K. Smith, Laura A. Holt, Rolando R. Garcia, James A. Anstey, Federico Serva, Neal Butchart, Scott Osprey, Andrew C. Bushell, Yoshio Kawatani, Young-Ha Kim, François Lott, Peter Braesicke, Chiara Cagnazzo, Chih-Chieh Chen, Hye-Yeong Chun, Leslie J. Gray,

Tobias Kerzenmacher, Hiroaki Naoe, Jadwiga Richter, Stefan Versick, Verena Schenzinger, Shingo Watanabe, and Kohei Yoshida. The equatorial stratospheric semiannual oscillation and time-mean winds in QBOi models. *Quart. J. Roy. Meteor. Soc.*, 2020. <https://doi.org/10.1002/qj.3690>.

9. Jadwiga H. Richter, Neal Butchart, Yoshio Kawatani, Andrew A. Bushell, Laura A. Holt, Federico Serva, James A. Anstey, Isla R. Simpson, Scott Osprey, Kevin Hamilton, Peter Braesicke, Chiara Cagnazzo, Chih-Chieh Chen, Rolando R. Garcia, Leslie J. Gray, Tobias Kerzenmacher, François Lott, Charles McLandress, Hiroaki Naoe, John Scinocca, Timothy N. Stockdale, Stefan Versick, Shingo Watanabe, Kohei Yoshida, and Seiji Yukimoto. Response of the quasi-biennial oscillation to a warming climate in global climate models. *Quart. J. Roy. Meteor. Soc.*, 2020. <https://doi.org/10.1002/qj.3749>.
10. Neil P. Hindley, Corwin J. Wright, N. D. Smith, Lars Hoffmann, Laura A. Holt, M. Joan Alexander, T. Moffat-Griffin, and N. J. Mitchell. Gravity waves in the winter stratosphere over the Southern Ocean: high-resolution satellite observations and 3-D spectral analysis. *Atmos. Chem. Phys.*, 19:15377–15414, 2019. <https://doi.org/10.5194/acp-19-15377-2019>.
11. Neal Butchart, James A. Anstey, Kevin Hamilton, Scott Osprey, Charles McLandress, Andrew C. Bushell, Yoshio Kawatani, Young-Ha Kim, Francois Lott, John Scinocca, Timothy N. Stockdale, Martin Andrews, Omar Bellprat, Peter Braesicke, Chiara Cagnazzo, Chih-Chieh Chen, Hye-Yeong Chun, Mikhail Dobrynin, Rolando R. Garcia, Javier Garcia-Serrano, Lesley J. Gray, Laura Holt, Tobias Kerzenmacher, Hiroaki Naoe, Holger Pohlmann, Jadwiga H. Richter, Adam A. Scaife, Verena Schenzinger, Federico Serva, Stefan Versick, Shingo Watanabe, Kohei Yoshida, , and Seiji Yukimoto. Overview of experiment design and comparison of models participating in phase 1 of the SPARC Quasi-Biennial Oscillation initiative (QBOi). *Geosci. Model Dev.*, 11:1009–1032, 2018. <https://doi.org/10.5194/gmd-11-1009-2018>.
12. Laura A. Holt, M. Joan Alexander, Lawrence Coy, Andrea Molod, William M. Putman, Steven Pawson, and Chuntao Liu. An evaluation of gravity waves and gravity wave sources in the Southern Hemisphere in a 7-km global climate simulation. *Quart. J. Roy. Meteor. Soc.*, 143:2481–2495, 2017. doi:10.1002/qj.3101.
13. Lars Hoffmann, R. Spang, A. Orr, M. Joan Alexander, Laura A. Holt, and O. Stein. A ten-year satellite record of gravity wave activity in the lower stratosphere to study polar stratospheric cloud formation. *Atmos. Chem. Phys. Discuss.*, 17:2901–2920, 2017. doi:10.5194/acp-2016-757.
14. Laura A. Holt, M. Joan Alexander, Lawrence Coy, Andrea Molod, William M. Putman, and Steven Pawson. Tropical waves and the quasi-biennial oscillation in a 7-km global climate simulation. *J. Atmos. Sci.*, 73:3771–3783, 2016. doi:10.1175/JAS-D-15-0350.1.
15. Cora E. Randall, V. Lynn Harvey, Laura A. Holt, Dan R. Marsh, Doug Kinnison, Bernd Funke, and Peter F. Bernath. Simulation of energetic particle precipitation effects during the 2003–2004 Arctic winter. *J. Geophys. Res. Sp. Phys.*, 120, 2015. doi:10.1002/2015JA021196.
16. Bernd Funke, Manuel López-Puertas, Laura A. Holt, Cora E. Randall, Gabriele P. Stiller, and Thomas von Clarmann. Hemispheric distributions and interannual variability of NO_y produced by energetic particle precipitation in 2002–2012. *J. Geophys. Res.*, 119:13565–13582, 2014. doi:10.1002/2014JD022423.
17. Anne K. Smith, Manuel López-Puertas, Bernd Funke, M. Garcia-Comas, Martin G. Mlynczak, and Laura A. Holt. Nighttime ozone variability in the high latitude winter mesosphere. *J. Geophys. Res.*, 119:13547–13564, 2014. doi:10.1002/2014JD021987.

18. Scott M. Bailey, Brentha Thurairajah, Cora E. Randall, Laura A. Holt, David E. Siskind, V. Lynn Harvey, Karthik Venkataramani, Mark E. Hervig, Pingping Rong, and James M. Russell, III. A multi tracer analysis of thermosphere to stratosphere descent triggered by the 2013 Stratospheric Sudden Warming. *Geophys. Res. Lett.*, 2014. doi:10.1002/2014GL059860.
19. Laura A. Holt, Cora E. Randall, Ethan D. Peck, Daniel R. Marsh, Anne K. Smith, and V. Lynn Harvey. The influence of major sudden stratospheric warmings and elevated stratopause events on the effects of energetic particle precipitation in WACCM. *J. Geophys. Res.*, 118:11,636–11,646, 2013. doi:10.1002/2013JD020294.
20. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Ellis E. Remsberg, Gabriele P. Stiller, Bernd Funke, Peter F. Bernath, and Kaley A. Walker. Atmospheric effects of energetic particle precipitation in the Arctic winter 1978–1979 revisited. *J. Geophys. Res.*, 117, 2012. doi:10.1029/2011JD016663.
21. Laura A. Holt and Kevin L. Haglin. Short-lived phi mesons. *J. Phys. G: Nuclear and Part. Phys.*, 31(4), 2005. doi:10.1088/0954-3899/31/4/030.

Non-refereed Articles / Conference Proceedings / Presentations / Seminars

1. Laura A. Holt, M. Joan Alexander, Anne K. Smith, and Colby M. Brabec. Effects of Vertical Mixing from Orographic Gravity Wave Breaking on Circulation and Chemical Transport in the Stratosphere. Talk, *SPARC GW Symposium 2022*, Frankfurt, Germany, March 2022.
2. Laura A. Holt, M. Joan Alexander, Anne K. Smith, and Colby M. Brabec. Effects of Vertical Mixing from Orographic Gravity Wave Breaking on Circulation and Chemical Transport in the Stratosphere. Talk, *AMS Annual Meeting 2022*, Virtual Meeting, January 2022.
3. Laura A. Holt, Joan Alexander, and Colby Brabec. Investigating the missing gravity wave drag in the Southern Hemisphere via satellite observations. **Invited Talk**, *JpGU-AGU Joint Meeting 2020*, Virtual Meeting, July 2020.
4. Laura A. Holt, Joan Alexander, Larry Coy, and Bill Putman. Diagnosing orographic gravity wave drag and effects on circulation using satellite observations and high-resolution simulations. Poster, *AGU Annual Meeting*, San Francisco, CA, December 2019.
5. M. Joan Alexander and Laura A. Holt. The Quasi-Biennial Oscillation and its influence at the surface. *US CLIVAR Variations, Spring 2019*, 17(1):20–26, 2019.
6. M. Joan Alexander, Julio Bacmeister, Manfred Ern, Sonja Gisinger, Lars Hoffmann, Laura A. Holt, Chris Kruse, Riwal Plougonven, Inna Polichtouk, Petr Sacha, Kaoru Sato, R. Shibuya, Annelize van Niekerk, and Corwin Wright. Seeking new quantitative constraints on orographic gravity wave stress and drag to satisfy emerging needs in seasonal-to-subseasonal and climate prediction—An update from the SPARC gravity wave activity. *SPARC Newsletter*, 53:31–36, 2019. <http://www.sparc-climate.org/publications/newsletter>.
7. Laura A. Holt, Joan Alexander, Larry Coy, Bill Putman, and Steven Pawson. Gravity wave effects on circulation: Insights from high-resolution modeling studies. **Invited seminar**, *GMAO Fall 2019 Seminar Series*, NASA Goddard, November 2019.
8. Laura A. Holt, Joan Alexander, Lars Hoffmann, Larry Coy, Steven Pawson, and Bill Putman. Gravity wave impacts on circulation and transport: Insights from high-resolution models and observations. **Invited speaker**, *5th MS-GWAVES Workshop*, IAP, Kühlungsborn, Germany, March 2019.
9. Laura A. Holt, Joan Alexander, Lars Hoffmann, Larry Coy, Bill Putman, and Neil Hindley. Satellite estimates of momentum fluxes from high-impact gravity wave events in the stratosphere and their effects on circulation. **Talk**, *AMS Annual Meeting 2019*, Phoenix, AZ, January 2019.

10. Laura A. Holt, François Lott, Rolando Garcia, Young-Ha Kim, and Yoshio Kawatani. Evaluation of resolved equatorial waves and wave-driving of the QBO in the QBOi models. **Talk**, *SPARC General Assembly 2019*, Kyoto, Japan, October 2019.
11. Laura A. Holt, Joan Alexander, and Dave Ortland. Effects of high-impact orographic gravity wave events on extratropical stratospheric circulation and transport. **Invited talk**, *EGU General Assembly 2018*, Vienna, Austria, April 2018.
12. Laura A. Holt, Joan Alexander, Larry Coy, Bill Putman, and Alvaro de la Camara. Evaluation of gravity wave forcing of the winter stratosphere circulation in high-resolution GEOS simulations. Poster, *EGU General Assembly 2018*, Vienna, Austria, April 2018.
13. Laura A. Holt, Joan Alexander, Lawrence Coy, Bill Putman, Andrea Molod, and Steven Pawson. Gravity wave sources in the Southern Hemisphere in a global mesoscale model. **Invited talk**, *Modeling Imbalance in the Atmosphere and Ocean*, Banff, Alberta, CA, February 2018.
14. Laura A. Holt, Joan Alexander, and Dave Ortland. Extratropical stratospheric tracer transport: Effects of high-impact orographic gravity wave events. Poster, *98th AMS Annual Meeting*, Austin, TX, January 2018.
15. Laura A. Holt, François Lott, Rolando Garcia, and Young-Ha Kim. QBOi core paper 4: Equatorial waves. Talk, *Joint SPARC Dynamics & Observations Workshop: QBOi, FISAPS & SATIO-TCS*, Kyoto, Japan, October 2017.
16. Laura A. Holt, Joan Alexander, Lawrence Coy, Andrew Molod, William Putman, and Steven Pawson. Gravity waves in the Southern Hemisphere extratropical winter in the 7-km GEOS-5 Nature Run. Talk, *AMS 19th Conference on Middle Atmosphere*, Portland, OR, June 2017.
17. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. Gravity waves in the global 7-km geos-5 nature run. Seminar, *ACOM Seminar, NCAR*, Boulder, CO, May 2017.
18. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, and Steven Pawson. Gravity waves in the Southern Hemisphere extratropical winter in the 7-km GEOS-5 Nature Run. Talk, *AGU Fall Meeting*, San Francisco, CA, December, 2016.
19. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. The QBO in GEOS-5: MERRA-2 and the Nature Run. Talk, *SPARC QBOi and Tropical S-RIP Workshop: The QBO and its Global Impacts - Past, Present and Future*, Oxford, United Kingdom, September 2016.
20. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. Gravity waves in the 7-km GEOS-5 Nature Run: Evaluation of global momentum fluxes, tropical waves and the QBO, and Southern Hemisphere sources. Talk, *SPARC Gravity Wave Symposium*, Pennsylvania State University, State College, PA, May 2016.
21. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. Gravity waves in the GEOS-5 Nature Run. Seminar, *GMAO Spring 2016 Seminar Series*, NASA Goddard, April 2016.
22. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. Tropical waves and QBO dynamics in a 7-km global climate simulation. Poster, *AMS 96th annual meeting*, New Orleans, LA, January 2016.
23. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. QBO dynamics in a 7-km global climate simulation. Talk,

Composition and Transport in the Tropical Troposphere and Lower Stratosphere Meeting, Boulder, CO, July 2015.

24. Laura A. Holt, Joan Alexander, Lawrence Coy, William Putman, Andrea Molod, Steven Pawson, and Max Suarez. Representation of gravity waves in the 7-km resolution GEOS-5 Nature Run. Talk, *QBO Modeling and Reanalyses Workshop*, Victoria, BC, March 2015.
25. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Jeff France, James M. Russell, III, Jerry Lumpe, Scott M. Bailey, and Mark Hervig. SH PMCs in 2014 linked to NH surface cold air outbreaks. Talk, *AGU Fall Meeting*, San Francisco, CA, December 2014.
26. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Jeff France, James M. Russell, III, Jerry Lumpe, Scott M. Bailey, and Mark Hervig. SH PMCs in 2014 linked to NH surface cold air outbreaks. Poster, *ATOC Poster Conference*, Boulder, CO, November 2014.
27. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Jeff France, James M. Russell, III, Jerry Lumpe, Scott M. Bailey, and Mark Hervig. SH PMCs in 2014 linked to NH surface cold air outbreaks. Talk, *AIM 22nd Science Team Meeting*, Boulder, CO, November 2014.
28. V. Lynn Harvey, Cora E. Randall, Jeff France, Ethan D. Peck, Laura A. Holt, and Katelynn Greer. Middle Atmosphere WACCM Studies at CU. Talk, *19th Annual CESM Workshop*, Breckenridge, CO, June 2014.
29. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Jeff France, and Josh Pettit. Recent Results from the Middle Atmosphere Group at CU Boulder. Talk, *Visiting Scientist Seminar*, Department of Meteorology, Stockholm University, Sweden, May 2014.
30. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Scott M. Bailey, and Brentha Thurairajah. Indirect effect of EPP and sudden stratospheric warming events in observations. Poster, *5th International HEPPA Workshop in conjunction with SPARC/SOLARIS*, Kongresshaus Baden-Baden, Germany, May 2014.
31. Scott M. Bailey, Brentha Thurairajah, Cora E. Randall, Laura Holt, David E. Siskind, C. Y. Cullens, V. L. Harvey, K. Venkataramani, M. E. Hervig, P. Rong, and James M. Russell, III. SOFIE observations of gravity wave activity and thermosphere to stratosphere descent triggered by the 2013 Stratospheric Sudden Warming. Poster, *5th International HEPPA Workshop in conjunction with SPARC/SOLARIS*, Kongresshaus Baden-Baden, Germany, May 2014.
32. Bernd Funke, Manuel López-Puertas, Thomas von Clarmann, Gabriele P. Stiller, Laura A. Holt, and Cora E. Randall. Hemispheric distributions and inter-annual variability of NO_y produced by Energetic Particle Precipitation in 2002-2012 as measured by MIPAS. Poster, *5th International HEPPA Workshop in conjunction with SPARC/SOLARIS*, Kongresshaus Baden-Baden, Germany, May 2014.
33. Laura A. Holt, Cora E. Randall, Ethan D. Peck, Daniel R. Marsh, Anne K. Smith, V. Lynn Harvey, Scott Bailey, and Brentha Thurairajah. Impact of sudden stratospheric warming events on energetic particle precipitation effects. Talk, *AGU Fall Meeting*, San Francisco, CA, December 2013.
34. Scott M. Bailey, Brentha Thurairajah, Cora E. Randall, Laura Holt, David E. Siskind, M. E. Hervig, and James M. Russell, III. Transport of Polar Winter Lower-Thermospheric Nitric Oxide to the Stratosphere. Poster, *AGU Fall Meeting*, San Francisco, CA, December 2013.
35. Laura A. Holt, Cora E. Randall, and V. Lynn Harvey. Energetic particle precipitation effects observed by ACE-FTS. Talk, *ACE 10th Anniversary Science Team Meeting*, October, 2013.

36. Laura A. Holt, Cora E. Randall, Ethan D. Peck, Daniel R. Marsh, Anne K. Smith, and V. Lynn Harvey. Major SSW events and energetic particle precipitation effects. Talk, *IAGA Meeting*, Merida, Mexico, August 2013.
37. Laura A. Holt, Cora E. Randall, Ethan D. Peck, Daniel R. Marsh, Anne K. Smith, and V. Lynn Harvey. Sudden stratospheric warming impact on energetic particle precipitation effects. Talk, *CEDAR Workshop*, Boulder, CO, June 2013.
38. V. Lynn Harvey, Laura A. Holt, Cora E. Randall, Ethan D. Peck, Anne K. Smith, and Daniel R. Marsh. Stratospheric sudden warming effects on the descent of EPP-NO_x in WACCM. Talk, *International Space Science Institute Meeting*, Bern, Switzerland, March 2013.
39. Laura A. Holt, Cora E. Randall, Matthias Brakebusch, Anne K. Smith, and Daniel R. Marsh. Effects of gravity wave tuning on transport of EPP-NO_x in WACCM. Poster, *ATOC Student Poster Conference*, Boulder, CO, November 2012. **Best Poster—Atmospheric Dynamics.**
40. Laura A. Holt. Using WACCM to study the effects of energetic particle precipitation on the atmosphere. Seminar, *NOAA Space Weather Prediction Seminar*, November 2012.
41. Laura A. Holt, Cora E. Randall, Matthias Brakebusch, Anne K. Smith, and Daniel R. Marsh. Transport of NO_x created by energetic particle precipitation in WACCM. Poster, *4th International HEPPA Workshop in conjunction with SPARC/SOLARIS*, Boulder, CO, October 2012.
42. Laura A. Holt, Cora E. Randall, Anne K. Smith, and Daniel R. Marsh. Modeling energetic particle precipitation and transport with WACCM. **Invited** talk, *CEDAR Workshop*, Santa Fe, NM, June 2012.
43. Laura A. Holt, Cora E. Randall, Anne K. Smith, and Daniel R. Marsh. Transport of NO_x created by energetic particle precipitation in WACCM. Poster, *CEDAR Workshop*, Santa Fe, NM, June 2012.
44. Laura A. Holt, Cora E. Randall, Anne K. Smith, and Daniel R. Marsh. Transport of NO_x created by energetic particle precipitation in WACCM. Poster, *17th Annual CESM Workshop*, Breckenridge, CO, June 2012.
45. Laura A. Holt, Cora E. Randall, and V. Lynn Harvey. Transport of NO_x created by energetic particle precipitation from the mesosphere-lower thermosphere to the stratosphere. Poster, *WCRP Open Science Conference*, October 2011.
46. Laura A. Holt, Cora E. Randall, and V. Lynn Harvey. Descent in the polar mesosphere and stratosphere using WACCM. Poster, *CEDAR Workshop*, Santa Fe, NM, June 2011.
47. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, and Christoph Hoffmann. Descent in the polar mesosphere and stratosphere using WACCM. Poster, *3rd HEPPA Workshop*, Granada, Spain, May 2011. **Best Student Paper.**
48. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Bernd Funke, and Gabriele P. Stiller. Energetic particle precipitation effects on the Northern Hemisphere stratosphere observed by LIMS. Poster, *AGU Fall Meeting*, San Francisco, CA, December 2009.
49. Laura A. Holt, Cora E. Randall, V. Lynn Harvey, Gabriele P. Stiller, Bernd Funke, Manuel López-Puertas, and Ellis E. Remsberg. Energetic particle precipitation effects observed in LIMS data. Poster, *AGU Fall Meeting*, San Francisco, CA, December 2008.