

## RESUME – Xian Lu

### PERSONAL DATA

Assistant Professor  
Department of Physics and Astronomy  
302A Kinard Laboratory  
Clemson University  
Clemson, SC 29634  
864/656-4204

### EDUCATION

Ph.D., University of Illinois at Urbana-Champaign, 2011, Atmospheric Sciences  
Master, Wuhan University, China, 2006, Space Physics  
B.S., Wuhan University, China, 2003, Electrical Engineering

### PROFESSIONAL EXPERIENCE (List most recent affiliation first.)

Clemson University, 2016-, Assistant Professor of Physics and Astronomy  
Univ. of Colorado Boulder, 2012–16, Research Scientist (3yrs) & Postdoc Visiting Fellow (1yr)  
Embry-Riddle Aeronautical University, 2011–12, Postdoctoral Researcher  
University of Illinois at Urbana-Champaign, 2006–11, Graduate Research Assistant,  
High Altitude Observatory (HAO), NCAR, 2010–11, Graduate Student Visitor

### MEMBERSHIPS

Member, American Geophysical Union, AGU, (2007- )

### PUBLICATIONS

#### Refereed Journal Publications

Lu, X., X. Chu, H. Li, C. Chen, J. Smith, S. Vadas (2017), Statistical characterization of high-to-medium frequency mesoscale gravity waves by lidar-measured vertical winds and temperatures in the MLT, *J. Atmos. Solar-Terr. Phys.*, 162,3-15 doi:10.1016/j.jastp.2016.10.009.

Zhao, J., X. Chu, C. Chen, X. Lu, W. Fong, Z. Yu, R. Michael Jones, B. R. Roberts, and A. Dörnbrack (2017), Lidar observations of stratospheric gravity waves from 2011 to 2015 at McMurdo (77.84°S, 166.69°E), Antarctica: 1. Vertical wavelengths, periods, and frequency and vertical wave number spectra, *J. Geophys. Res. Atmos.*, 122, 5041-5062, doi:10.1002/2016JD026368.

Chen, C., X. Chu, J. Zhao, B. R. Roberts, Z. Yu, W. Fong, X. Lu, J. A. Smith (2016), Lidar observations of persistent inertia-gravity waves with periods of 3–10 h in the Antarctic middle and upper atmosphere at McMurdo, *J. Geophys. Res. Space Physics.*, doi:10.1002/2015JA022127.

Chu, X., J. Zhao, **X. Lu**, V. L. Harvey, R. M. Jones, C. Chen, W. Fong, Z. Yu, B. Roberts (2017), A. Dornbrack, Lidar observations of stratospheric gravity waves from 2011 to 2015 at McMurdo, Antarctica: Part II. Potential energy densities, lognormal distributions, and seasonal variations, *J. Geophys. Res. Atmos.*, accepted.

**Lu, X.**, X. Chu, C. Chen, V. Nguyen, A. Smith (2017), First observations of short-period eastward propagating planetary waves from the stratosphere to the lower thermosphere (110 km) in winter Antarctica, *Geophys. Res. Lett.*, submitted.

### **Prior to Clemson**

**Lu, X.**, S. D. Zhang, Radiosonde observation of planetary waves in the lower atmosphere over the center China (2005), *Chinese Journal of Space Physics*, 25(6), 529-535.

**Lu, X.**, A. Z. Liu, G. R. Swenson, T. Li, T. Leblanc, and I. S. McDermid (2009), Gravity wave propagation and dissipation from the stratosphere to the lower thermosphere, *J. Geophys. Res.*, 114, D11101, doi:10.1029/2008JD010112.

**Lu, X.**, A. Z. Liu, J. Oberheide, Q. Wu, T. Li, Z. H. Li, G. R. Swenson, S. J. Franke (2011), Seasonal variability of the diurnal tide in the mesosphere and lower thermosphere over Maui, HI (20.7° N, 156.3° W), *J. Geophys. Res.*, 116, D17103, doi:10.1029/2011JD015599.

Li, Z., A. Z. Liu, X. Lu, G. R. Swenson, and S. J. Franke (2011), Gravity wave characteristics from OH airglow imager over Maui, *J. Geophys. Res.*, 116, D22115, doi:10.1029/2011JD015870.

**Lu, X.**, H.-L. Liu, A. Z. Liu, J. Yue, J. M. McInerney, and Z. Li (2012), Momentum budget of the migrating diurnal tide in the Whole Atmosphere Community Climate Model at vernal equinox, *J. Geophys. Res.*, 117, D07112, doi:10.1029/2011JD017089.

Li, T., A. Z. Liu, **X. Lu**, Z. Li, S. J. Franke, G. R. Swenson, and X. Dou (2012), Meteor-radar observed mesospheric semi-annual oscillation (SAO) and quasi-biennial oscillation (QBO) over Maui, Hawaii, *J. Geophys. Res.*, 117, D05130, doi:10.1029/2011JD016123.

**Lu, X.**, X. Chu, T. Fuller-Rowell, L. Chang, W. Fong and Z. Yu (2013), Eastward propagating planetary waves with periods of 1–5 days in the winter Antarctic stratosphere as revealed by MERRA and lidar, *J. Geophys. Res. Atmos.*, 9565–9578, doi:10.1002/jgrd.50717.

Liu, A. Z., **X. Lu**, and S. J. Franke (2013), Diurnal variation of gravity wave momentum flux and its forcing on the diurnal tide, *J. Geophys. Res. Atmos.*, 118, doi:10.1029/2012JD018653.

Chen, C., X. Chu, A. J. McDonald, S. L. Vadas, Z. Yu, W. Fong, and **X. Lu** (2013), Inertia-gravity waves in Antarctica: A case study with simultaneous lidar and radar measurements at McMurdo/Scott Base(77.8S, 166.7E), *J. Geophys. Res. Atmos.*, 118, doi:10.1002/jgrd.50318.

Friedman, J. S., X. Chu, C. Brum and **X. Lu** (2013), Observation of a thermospheric descending layer of neutral K over Arecibo, *J. Atmos. Solar- Terr. Phys.*, 10.1016/j.jastp.2013.03.002.

Yue, J., J. Xu, L. Chang, Q. Wu, H.-L. Liu, **X. Lu**, J. Russell (2013), Global structure and seasonal variability of the migrating terdiurnal tide in the mesosphere and lower thermosphere, *J. Atmos. Solar-Terr. Phys.*, 105-106, 10.1016/j.jastp.2013.10.010.

Huang, K. M., A. Z. Liu, **X. Lu**, Z. Li, Q. Gan, Y. Gong, C. M. Huang, F. Yi, and S. D. Zhang (2013), Nonlinear coupling between quasi 2 day wave and tides based on meteor radar observations at Maui, *J. Geophys. Res. Atmos.*, 118, doi:10.1002/jgrd.50872.

Fong, W., **X. Lu**, X. Chu, T. J. Fuller-Rowell, Z. Yu, B. R. Roberts, C. Chen, C. S. Gardner, and A. J. McDonald (2014), Winter temperature tides from 30 to 110 km at McMurdo (77.8°S, 166.7°E), Antarctica: Lidar observations and comparisons with WAM, *J. Geophys. Res. Atmos.*, 119, doi:10.1002/2013JD020784.

**Lu, X.**, X. Chu, W. Fong, C. Chen, Z. Yu, B. R. Roberts, and A. J. McDonald (2015a), Vertical evolution of potential energy density and vertical wave number spectrum of Antarctic gravity waves from 35 to 105 km at McMurdo (77.8°S, 166.7°E), *J. Geophys. Res. Atmos.*, 120, 2719–2737. doi: 10.1002/2014JD022751.

**Lu, X.**, C. Chen, W. Huang, J. A. Smith, X. Chu, T. Yuan, P.-D. Pautet, M. J. Taylor, J. Gong, and C. Y. Cullens (2015b), A coordinated study of 1 h mesoscale gravity waves propagating from Logan to Boulder with CRRL Na Doppler lidars and temperature mapper, *J. Geophys. Res. Atmos.*, 120, doi:10.1002/2015JD023604.

Fong, W., X. Chu, **X. Lu**, C. Chen, T. J. Fuller-Rowell, M. Codrescu, and A. Richmond (2015), Lidar and CTIPE model studies of the fast amplitude growth of the diurnal temperature ‘tides’ in the Antarctic winter lower thermosphere and relationship with the aurora, *Geophys. Res. Lett.*, doi: 10.1002/2014GL062784

Chen, C., X. Chu, J. Zhao, B. R. Roberts, Z. Yu, W. Fong, **X. Lu**, J. A. Smith (2016), Lidar observations of persistent inertia-gravity waves with periods of 3–10 h in the Antarctic middle and upper atmosphere at McMurdo, *J. Geophys. Res. Space Physics.*, 10.1002/2015JA022127.

### **Conference Proceedings (Peer-Reviewed)**

#### **Prior to Clemson**

**Lu, X.**, C. Chen, W. Huang, J. A. Smith, J. Zhao, X. Chu, T. Yuan, P. D. Pautet, M. J. Taylor, Simultaneous observations of mesoscale gravity waves over the central US with CRRL Na Doppler lidars and USU temperature mapper, *Proceedings of the 27th International Laser Radar Conference*, July 2015, New York.

Fong, W., X. Chu, **X. Lu**, T. J. Fuller-Rowell, M. Codrescu, A. D. Richmond, Z. Yu, B. Roberts, and C. Chen, Winter temperature and tidal structures from 2011 to 2014 at McMurdo station: Observations from Fe Boltzmann temperature and Rayleigh lidar, *Proceedings of the 27th International Laser Radar Conference*, July 2015, New York.

Chen, C., X. Chu, W. Fong, **X. Lu**, A. J. McDonald, D. Pautet, and M. J. Taylor, Antarctic wave dynamics mystery discovered by lidar, radar and imager, *Proceedings of the 27th International Laser Radar Conference*, July 2015, New York.

Chu, X., Z. Yu, W. Fong, C. Chen, J. Zhao, I. F. Barry, J. A. Smith, **X. Lu**, W. Huang, and C. S. Gardner, From Antarctica lidar discoveries to OASIS exploration, *Proceedings of the 27th International Laser Radar Conference*, July 2015, New York.

Chen, C., X. Chu, Z. Yu, W. Fong, A. J. McDonald, **X. Lu**, and W. Huang, Lidar and radar investigation of inertia gravity wave intrinsic properties at McMurdo, Antarctica, *Proceedings of the 26th International Laser Radar Conference*, June 2012, Greece.

### **Research Reports**

Lu, X., et al., “Signatures of Energy Dissipation in the Magnetosphere-Ionosphere-Thermosphere Coupled System”, *Final report for NASA grant NNX15AW12G*, September 2017.

Lu, X., X., Chu and T. Fuller-Rowell, “CEDAR: Exploration of Lower-atmosphere Wave Forcing, Vertical Wave Coupling and Their Impacts on the Ionosphere and Thermosphere Variability Using WAM, Lidar and ISR”, *Third-year Annual Report for NSF award 1343106*, January, 2017.

Lu, X., et al., “Signatures of Energy Dissipation in the Magnetosphere-Ionosphere-Thermosphere Coupled System”, *Annual report for NASA grant NNX15AW12G*, October 2016.

Lu, X., X., Chu and T. Fuller-Rowell, “CEDAR: Exploration of Lower-atmosphere Wave Forcing, Vertical Wave Coupling and Their Impacts on the Ionosphere and Thermosphere Variability Using WAM, Lidar and ISR”, *Second-year Annual Report for NSF award 1343106*, March, 2016.

Lu, X., X., Chu and T. Fuller-Rowell, “CEDAR: Exploration of Lower-atmosphere Wave Forcing, Vertical Wave Coupling and Their Impacts on the Ionosphere and Thermosphere Variability Using WAM, Lidar and ISR”, *First-year Annual Report for NSF award 1343106*, January 2015.

### **PRESENTATIONS**

**Lu, X.**, X. Chu, C. Chen, V. Nguyen, A. Smith, J. Oberheide (2017), Observation and Modeling of Eastward Propagating Planetary Waves from the Stratosphere to the Lower Thermosphere (30–110 km) over Winter Antarctica, CEDAR workshop, Keystone, Colorado, June.

Geraghty, I., X. Chu, J. Zhao, C. Chen, **X. Lu** (2017), Multi-Year Survey of Persistent Gravity Wave Parameters in the Mesosphere and Lower Thermosphere at McMurdo (77.6 °S, 166.7 °E), Antarctica, CEDAR workshop, Keystone, Colorado, June.

Zhao, J., X. Chu, C. Chen, **X. Lu**, S. L. Vadas, E. Becker, W. Fong, Z. Yu, R. M. Jones, A. Dörnbrack (2017), Coupling by Gravity Waves Through the Middle and Upper Atmosphere in Antarctica: Are Dominant Stratospheric Gravity Waves the Direct Source of Persistent Gravity Waves in the MLT?, CEDAR Workshop, Keystone, Colorado, June.

**Lu, X.**, L. Hurd, W. Krier, L. Kilcommons, D. Knipp, X. Chu, Tim Fuller-Rowell (2017), Neutral temperature responses to the geomagnetic storms: observations versus modeling, International Meridian Circle Program Workshop, talk, Qingdao, China, May.

**Lu, X.**, X. Chu, H. Li, C. Chen, J. A. Smith, S. Vadas, H. Liu (2016), High-to-medium frequency mesoscale gravity waves in vertical winds and temperatures in the MLT & Comparison with high-resolution WACCM, International Symposium on the Whole Atmosphere, Tokyo, Japan, September.

**Lu, X.**, H. Li, X. Chu, C. Chen, J. A. Smith, S. Vadas, H. Liu (2016), High-to-medium frequency gravity waves in lidar vertical winds and temperatures in the MLT & Comparison with high-resolution WACCM, invited talk, CEDAR workshop, Boulder, CO, June.

**Lu, X.**, C. Chen, X. Chu, V. Nguyen, Planetary Waves from the Stratosphere to the Lower Thermosphere in Antarctica (2016), invited talk, CEDAR Workshop, Boulder, CO, June.

**Lu, X.**, H. Li, X. Chu, C. Chen, J. A. Smith, S. Vadas, H. Liu, Statistical characterization of high-to-medium frequency gravity waves by lidar-measured vertical winds and temperatures in the MLT & Comparison with high-Resolution WACCM (2016), poster, CEDAR Workshop, Boulder, CO, June.

**Lu, X.**, X. Chu, C. Chen, W. Fong, T. Fuller-Rowell, W. Huang, J. A. Smith (2015), talk, Science lecture, McMurdo, Antarctica.

**Lu, X.**, X. Chu, C. Chen, W. Fong, T. Fuller-Rowell, W. Huang, J. A. Smith (2015), talk, Science lecture, McMurdo, Antarctica.

**Lu, X.**, H. Li, C. Chen, W. Huang, J. A. Smith, X. Chu, D. Pautet, T. Yuan, M. Taylor (2015), High to medium frequency mesoscale gravity waves over the central US using CRRL Na lidars and USU AMTM, invited talk, CEDAR, Seattle, WA.

**Lu, X.**, X. Chu, C. Chen, V. Nguyen (2015), Lidar, satellite and modeling studies of the baroclinic planetary waves from the stratosphere to the lower thermosphere in winter Antarctica, poster, CEDAR, Seattle, WA.

**Lu, X.**, C. Chen, W. Huang, J. A. Smith, X. Chu, T. Yuan, D. Pautet, M. Taylor (2015), A coordinated study of 1-h mesoscale gravity waves propagating from Logan to Boulder with CRRL Na Doppler lidars and temperature mapper, poster, CIRES Rendezvous, Boulder, CO.

**Lu, X.**, X. Chu, C. Chen, V. Nguyen (2015), Lidar and satellite studies of the vertical coupling of eastward propagating planetary waves with periods of 1-5 days from the stratosphere to the lower thermosphere in the winter Antarctic, 12<sup>th</sup> LPMR, Boulder, CO

H. Li, **Lu, X.**, C. Chen, W. Huang, J. Smith, X. Chu, D. Pautet, T. Yuan, M. J. Taylor (2015), Statistical study of high to medium frequency mesoscale gravity waves over the central US using CRRL Na lidars and temperature mapper, poster, CEDAR, Seattle, WA

Chen, C., X. Chu, J. Zhao, **X. Lu**, J. Smith, A. Dornbrack (2015), A correlation study on sources of inertia-gravity waves observed with lidar in the Antarctic middle and upper atmosphere at McMurdo, poster, AGU, San Francisco, CA.

Chen, C., X. Chu, W. Fong, **X. Lu** (2015), A statistical study of the 4-9 h waves in the Antarctic middle and upper atmosphere observed by lidar, 12<sup>th</sup> LPMR, Boulder, CO.

Chen, C., X. Chu, W. Fong, **X. Lu** (2015), A statistical study of the 4-9 h waves in the Antarctic middle and upper atmosphere observed by lidar, CEDAR, Seattle, WA.

Fong, W., X. Chu, **X. Lu**, Z. Yu, B. Roberts, C. Chen, J. Zhao, I. Barry, W. Huang, Z. Wang, T. Fuller-Rowell, A. D. Richmond, M. Codrescu, C. S. Gardner (2015), First climatology of temperature structure from 0 to 110 km during 2011-2014 and mechanism study of winter temperature tides of fast amplitude growth above 100 km at McMurdo (77.8S, 166.7E), Antarctica, CEDAR, Seattle, WA.

**Lu, X.**, C. Chen, W. Huang, J. Zhao, X. Chu, T. Yuan, D. Pautet, Y. Zhao, M. Taylor, C. Y. Cullens, J. Gong (2014). A coordinated study of 1-h mesoscale gravity wave propagating from Logan to Boulder, poster, AGU, San Francisco, CA.

Fong, W. C, X. Chu, **X. Lu**, C. Chen, Z. Yu, T. J. Fuller-Rowell, A. Richmond, M. Codrescu (2014), Joule Heating, Particle Precipitation and Dynamical Heating as Possible Tidal Sources in the Antarctic Winter Lower Thermosphere, poster, AGU, San Francisco, CA.

Huang, W, X. Chu, C. Gardner, J. D. Carrillo-Sanchez, W. Feng, J. M. C. Plane, D. Nesvorny, John A. Smith, **X. Lu**, W. Fong, Z. Yu, C. Chen and I. F. Barry (2014). Direct measurements of vertical Fe, Na and heat fluxes in the MLT by lidar at Boulder: Implications for the Velocity of Cosmic Dust Entering the Atmosphere, poster, AGU, San Francisco, CA.

Agner, R., A. Liu, J. Du, **X. Lu** (2014). Gravity Wave Effects On Short-Term Tidal Variability In WACCM/eCMAM, talk, AGU, San Francisco, CA.

Chu, X., Z. Yu, W. Fong, C. Chen, J. Zhao, W. Huang, X. Lu, T. J. Fuller-Rowell, A. D. Richmond, A. J. Gerrard, A. T. Weatherwax and C. S. Gardner (2014). Plasma-Neutral Coupling on the Dark and Bright Sides of Antarctica, talk, AGU, San Francisco, CA.

Fuller-Rowell, T. J., M. Fedrizzi, T. W. Fang, M. Codrescu, C. Negrea, **X. Lu**, F. Wu (2014). Modeling Thermospheric Dynamics Under all Solar, Geomagnetic, and Lower Atmosphere Conditions. invited talk, AGU.

**Lu, X.**, J. Zhao, X. Chu, D. Pautet, M. Taylor, T. Yuan (2014), A coordinated study of 1-h gravity wave propagating from Logan to Boulder using two Na Doppler lidars and a temperature mapper, poster, CEDAR, Seattle, WA.

**Lu, X.**, X.Z. Chu, Z. B. Yu, W. C. Fong, C. Chen (2014), Vertical evolution of gravity wave potential energy density and vertical wavenumber spectrum from 30 to 110 km at McMurdo (77.8S, 166.7 E), Antarctica, poster, CEDAR, Seattle, WA.

Fong W., **X. Lu**, X. Chu, C. Chen, T. Fuller-Rowell, M. Codrescu, Z. Yu, B. Roberts, C. S. Gardner, and A. McDonald (2014), Lidar observations and modeling studies of winter temperature tides at McMurdo station (77.8S, 166.7E), Antarctica, poster, CEDAR, Seattle, WA.

**Lu, X.**, X. Chu, Z. Yu, W. C. Fong (2014), Vertical Evolution of Gravity Wave Potential Energy and Wavenumber Spectra from 30 to 110 km observed by an Fe lidar at

McMurdo (77.8°S, 166.7°E), Antarctica, talk, 40<sup>th</sup> COSPAR Scientific Assembly 2014, Moscow, Russia.

Fong, W. C., **X. Lu**, X. Chu, C. Chen, T. J. Fuller-Rowell, M. Codrescu, Z. Yu, B. Roberts, C. S. Gardner, A. J. McDonald (2014), Winter temperature tides from 30 to 110 km at McMurdo (77.8S, 166.7E), Antarctica: Lidar observations and mechanism study of fast amplitude growth above 100 km by CTIPe model, talk, 40th COSPAR Scientific Assembly 2014, Moscow, Russia.

Chu, X., W. C. Fong, Z. Yu, C. Chen, W. Huang, **X. Lu**, J. Zhao, C.S. Gardner, A. McDonald, T. J. Fuller-Rowell, S. Vadas (2013), Three-year Lidar Observational Studies of Physics and Chemistry in the Polar Mesosphere and Lower Thermosphere at McMurdo, Antarctica, talk, 40<sup>th</sup> COSPAR Scientific Assembly 2014, Moscow, Russia.

**Lu, X.**, W. C. Fong, C. Chen, X. Chu, T.J. Fuller-Rowell, Z. Yu, C.S. Gardner, A. McDonald, S. Vadas (2013), Lidar Observations of Wave Dynamics in Winter Antarctica Near the Turbopause Region, poster, AGU, San Francisco, CA.

Chu, X., Z. Yu, W. C. Fong, C. Chen, W. Huang, **X. Lu**, C.S. Gardner, A. McDonald, T.J. Fuller-Rowell, S. Vadas (2013), New Discoveries Resulted from Lidar Investigation of Middle and Upper Atmosphere Temperature, Composition, Chemistry and Dynamics at McMurdo, Antarctica, poster, AGU, San Francisco, CA.

Friedman, J. S., X.Z. Chu, C. Brum, **X. Lu**, C. Kerr, and J. Fentzke (2013), Observation of a Thermospheric Descending Layer of Neutral K over Arecibo, AGU, San Francisco, CA.

**Lu, X.**, X. Chu, W. C. Fong, T. Fuller-Rowell, Z. Yu, L. Chang, B. Roberts (2013), Transient propagating planetary waves and thermal tides in the winter Antarctica, invited talk, CEDAR, Boulder, CO.

**Lu, X.**, X. Chu, W. C. Fong, T. Fuller-Rowell, Z. Yu, L. Chang (2013), Thermal tides and eastward propagating planetary waves in the winter Antarctica, poster, CEDAR, Boulder, CO.

Chen, C., X. Chu, **X. Lu**, W.C. Fong, Z. Yu, B. Roberts, A.J. McDonald, S. Vadas (2013), A study on the inertia-gravity waves in Antarctic winter MLT using Fe lidar and MR radar, poster, CEDAR, Boulder, CO.

Friedman, J. S., C. Kerr, C. Brum, X.Z. Chu and **X. Lu**, J. Fentzke (2013), Metal atom layers in the thermosphere over Arecibo, talk, CEDAR, Boulder, CO.

Kerr, C., Friedman, J. S., X.Z. Chu, C. Brum, and **X. Lu**, J. Fentzke (2013), Thermospheric neutral metal layers present opportunity for further study using lidar observations, poster, CEDAR, Boulder, CO.

**Lu, X.**, X. Z. Chu, T. J. Fuller-Rowell, W. C. Fong, Z. B. Yu, L. Chang (2013), Thermal tides and eastward propagating planetary waves in the winter Antarctic, poster, CIRES Rendezvous, Boulder, CO.

**Lu, X.**, X. Z. Chu, T. J. Fuller-Rowell, W. C. Fong, Z. B. Yu, L. Chang, (2013), Thermal tides and eastward propagating planetary waves in the winter Antarctic, invited talk, ANGIN Workshop, Tokyo, Japan.

Liu, A. Z., R. Agner, Z. Li, **X. Lu**, S. Franke (2013), Seasonal and diurnal variation of gravity wave momentum flux, talk, ANGWIN Workshop, Tokyo, Japan,

Yue, J., J. Xu, L. Chang, Q. Wu, H. L. Liu, X. Lu (2013), Climatology of the migrating terdiurnal tide from SABER, TIDI and TIME-GCM, invited talk, HAO tea meeting, Boulder, CO.

Fong, W., C. Chen, **X.Lu**, C., X. Chu, Z.B. Yu, B. Roberts, A.J. McDonald, S. L. Vadas (2012), First results on temperature tides and two concurrent inertia-gravity waves from 30 to 110 km in the Winter at McMurdo (77.8°S), Antarctica, poster, AGU, San Francisco, CA.

Chu, X., C. Chen, Z. Yu, W. Fong, B. Roberts, **X.Lu**, T. J. Fuller-Rowell, S. L. Vadas, A.J. McDonald, C. S. Gardner (2012), Gravity waves from 30 to 155 km observed by an Fe lidar at McMurdo, Antarctica, invited talk, AGU, San Francisco, CA.

Lu, **X.**, H. L. Liu, A. Z. Liu, J. Yue, Q. Wu, G. Swenson, J. Oberheide, S. J. Franke, The seasonal variation of the diurnal tide based on meteor radar, TIMED observations and WACCM4 (2011), poster, IUGG, Melbourne, Australia.

Liu, A. Z., **X. Lu**, S. J. Franke (2011), Tidal modulation of gravity waves in the mesopause region, talk, IUGG, Melbourne, Australia.

**Lu, X.**, H. L. Liu, A. Z. Liu, J. Yue, Momentum budget analysis of the migrating diurnal tide in WACCM4: effects of gravity wave forcing and advection (2011), Invited talk, Boulder, CO.

**Lu, X.**, H. L. Liu, A. Z. Liu, J. Yue, S. J. Franke (2011), Momentum budget analysis on the migrating diurnal tide in WACCM4, talk, AGU Chapman on Gravity waves, Honolulu, HI.

Swenson, G. R, F. Vargas, A. Z. Liu, **X. Lu**, Z. Li, C. S. Gardner (2011), Observations of High Frequency GWs observed in mesospheric airglow, and the implication to the GW imposed zonal stress and the residual circulation, talk, AGU Chapman on Gravity waves, Honolulu, HI.

Chen, C., X. Chu, W.C. Fong, Z.B. Yu, A.J. McDonald, **X. Lu** (2011), Lidar and radar investigation of gravity wave characteristics, propagation and dissipation from the stratosphere to the lower thermosphere over McMurdo, Antarctica, poster, AGU, San Francisco, CA.

Li, Z., A. Z. Liu, S. J. Franke, G. R. Swenson, **X. Lu** (2011), Gravity wave characteristics observed with airglow imager at the Andes Lidar Observatory, poster, AGU, San Francisco, CA.

**Lu, X.**, A. Z. Liu, Z. H. Li, G. R. Swenson, S. J. Franke, Preliminary results on mean wind, diurnal and semidiurnal tides, and 2-day wave in Cerro Pachon, Chile (30°S, 70°W) and the comparison with Urbana, IL (40°N, 88°W) and Maui, Hawaii (21°N, 156°W) (2010), poster, AGU, San Francisco, CA.

Li, Z., A. Z. Liu, **X. Lu**, G. R. Swenson (2010), Gravity wave characteristic and momentum flux observed over Maui, poster, AGU, San Francisco, CA.



**Lu, X.**, A. Z. Liu, Z. H. Li, G. R. Swenson, S. J. Franke, Preliminary results on mean wind, diurnal and semidiurnal tides, and 2-day wave in Cerro Pachon, Chile (30°S, 70°W) and the comparison with Urbana, IL (40°N, 88°W) and Maui, Hawaii (21°N, 156°W) (2010), invited talk, CEDAR, Santa Fe, NM.

**Lu, X.**, Z. H. Li, A. Z. Liu, G. R. Swenson, S. J. Franke, Tidal modulation of gravity wave activities in the mesosphere and lower thermosphere in Maui, HI (20.7° N, 156.3° W) (2010), poster, CEDAR, Boulder, CO.

Liu, A. Z. Liu, **X. Lu**, S. J. Franke (2009), Tides and gravity wave interactions in the mesopause region over Maui, Hawaii, poster, AGU, San Francisco, CA.

**Lu, X.**, A. Z. Liu, S. J. Franke (2009), The seasonal and intraseasonal variation of the diurnal tide in the mesosphere and lower thermosphere observed by meteor radar over Maui, HI (20.7° N, 156.3° W), poster, CEDAR, Saint Fe, NM.

Li, T., A. Z. Liu, **X. Lu**, S. Franke, G. R. Swenson, T. Leblanc, I.S. McDermid (2009), Observations of mesospheric semi-annual oscillation and quasi-biennial oscillation over Hawaii, talk, AGU, San Francisco, CA.

Liu, A. Z., **X. Lu**, S. Franke (2009), Tides and Gravity Wave Interactions in the Mesopause Region over Maui, Hawaii, poster, AGU, San Francisco, CA.

**Lu, X.**, A. Z. Liu, S. J. Franke (2009), Seasonal variability and dissipation of tides in the mesopause region over Maui, Hawaii, IAGA Conference, Sopron, Hungary.

Swenson, G. R., A. Z. Liu, C. Carlson, **X. Lu**, T. Mangogna, Z. Li (2008), Large amplitude dynamic events near the mesopause observed in Na lidar measured wind, temperature, and density, poster, AGU, San Francisco, CA.

**Lu, X.**, A. Z. Liu, Characteristics of quasi-monochromatic gravity waves and wave saturation observed by Na Lidar in the mesopause region (2008), poster, CEDAR, Midway, UT.

**Lu, X.**, A. Z. Liu, G. R. Swenson, T. Li (2007), Simultaneous observation of gravity waves in temperature by using Rayleigh lidar and Sodium lidar, poster, CEDAR, Saint Fe, NM.

**Lu, X.**, A. Z. Liu, G. R. Swenson, T. Li (2007), Simultaneous observation of gravity waves in temperature by using Rayleigh lidar and Sodium lidar, poster, AGU, San Francisco, CA.

### **HONORS AND AWARDS**

CIRES Visiting Fellowship, University of Colorado at Boulder (2012–2013)

Graduate Student Visiting Fellowship, Advanced Study Program, NCAR (2010–2011)

Second Prize Scholarship & Endorsed Graduate Student, Wuhan University (2003)

Second Prize Scholarship, Wuhan University (2002)

Third Prize Scholarship, Wuhan University (2001)

### **SPONSORED RESEARCH**

“Signatures of energy dissipation in the magnetosphere-ionosphere-thermosphere (MIT) Coupled system”, NASA, PI, \$ 228,765, 2016-17

“CEDAR: Exploration of lower-atmosphere wave forcing, vertical wave coupling and their impacts on the ionosphere and thermosphere variability using WAM, lidar and ISR”, NSF, PI, \$311,418, 2014-17

Collaborative Research: Antarctic Research: Characterizing Gravity Waves and their Effects on the Antarctic Ozone Layer, NSF, Co-I, \$ 329,725, 2015-19

### **OTHER SPONSORED ACTIVITY**

Travel Grant, ISWA SCOSTEP/VarSITI by University of Tokyo, \$600, (2016)

Travel Grant, ANGWIN Workshop by NIPR in Japan, \$2500, (2013)

Travel Grant, AGU Gravity Workshop, \$1000 (2011)

### **Current GRADUATE STUDENT ADVISING**

Haonan Wu (PhD Candidate)

### **TEACHING**

#### **Courses Taught (Beginning Spring 2017)**

PHYS 4200, Atmospheric Physics, Spring 2017

PHYS 2900, Physics Research, Spring 2017

PHYS 4410 (001, 002), Electricity and Magnetism, Fall 2017

PHYS 6410, Electricity and Magnetism, Fall 2017

PHYS 2900, Physics Research, Fall 2017

### **UNIVERSITY AND PUBLIC SERVICE**

#### **Committees**

Member, Research Committee (2017-)

Member, Qualify Exam Committee (2017-)

Member, Graduate Committee (2017-)

#### **Other Service**

Paper reviewer for *Geophysical Research Letters*, *Journal of Atmospheric Sciences*, *Journal of Geophysical Research*, *Journal of Atmospheric and Solar-Terrestrial Physics*, *Annales Geophysicae*, *Radio Sciences*, *IET Science Measurement & Technology*, *Chinese Journal of Geophysics*, *Journal of Atmospheric and Oceanic Technology*, and *Studia Geophysica et Geodaetica*.

Proposal reviewer for NSF, NASA and United States-Israel Binational Science Foundation (BSF)

Proposal panelist for national funding agencies including NSF and NASA.

***September 2017.***