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Education

- Ph.D., 2002, Atmospheric Science, University of Alabama in Huntsville
- M.S., 2002, Computer Science, University of Alabama in Huntsville
- M.S., 1998, Environmental Chemistry, RCEES, Chinese Academy of Sciences
- B.S., 1995, Environmental Chemistry, Nankai University, China

Research Interests

- Remote sensing of atmospheric trace gases (e.g., ozone profile, tropospheric ozone, SO₂), aerosols, and clouds, data validation and analysis
- Atmospheric radiative transfer modeling and instrument calibration
- Tropospheric chemistry studies integrating satellite measurements, chemical transport models, and in situ observations
- Investigation of chemical, radiative, and biological effects of natural and human activities on air quality and climate change

Work Experience

- 1.2009-current, Associate research scientist, Goddard Earth Sciences and Technology Center, University of Maryland, Baltimore County
- 5.2007-12.2008, Assistant research scientist, Goddard Earth Sciences and Technology Center, University of Maryland, Baltimore County
- 5.2007-current, Research Associate, Harvard-Smithsonian Center for Astrophysics
- 2004–5.2007, Research Scientist, Harvard-Smithsonian Center for Astrophysics
- 2003, Visiting Scientist, Harvard-Smithsonian Center for Astrophysics
- 1998–2002, Research Assistant, University of Alabama in Huntsville
- 6.1999–8.1999, Intern, Raytheon ITSS, Lanham, MD
- 1996–1998, Research Assistant, RCEES, Chinese Academy of Sciences

Peer-Reviewed Publications

1. Pittman, J.V., L.L. Pan, J.C. Wei, F.W. Irion, **X. Liu**, E.S. Maddy, C.D. Barnet, K. Chance, R.S. Gao, Evaluation of AIRS, IASI, and OMI ozone profile retrievals in the extratropical tropopause region using in situ aircraft measurements, submitted to **J. Geophys. Res.**, 2009.
2. Yang, K., **X. Liu**, N.A. Krotkov, A.J. Krueger, S.A. Carn, Estimating the altitude of volcanic sulfur dioxide plumes from space borne hyper-spectral UV measurements, **Geophys. Res. Lett.**, 36, L10803, doi:10.1029/2009GL038025, 2009.
3. Liu, Y., Y. Wang, **X. Liu**, Cai, Z., and K. Chance, Tibetan middle tropospheric ozone minimum in June discovered from GOME, **Geophys. Res. Lett.**, 36, L05814, doi:10.1029/2008GL037056, 2009.

4. Hayashida, S., N. Urita, K. Noguchi, **X. Liu**, and K. Chance, Spatiotemporal variation in tropospheric column ozone over East Asia observed by GOME and ozonesondes, **Scientific Online Letters on the Atmosphere**, 4, 117–120, doi:10.2151/sola.2008-030.
5. Cai, Z., Y. Wang, **X. Liu**, X. Zheng, K. Chance, Y. Liu, Validation of GOME ozone profiles and tropospheric column ozone with ozonesonde over China, **Chinese J. Appl. Meteorol. Sc.**, in press, 2009.
6. Kaminski, J. W., L. Neary, J. Struzewska, J. C. McConnell, A. Lupu, J. Jarosz, K. Toyota, S. L. Gong, J. Côté, **X. Liu**, K. Chance, and A. Richter, GEM-AQ, an on-line global multiscale chemical weather system: model description and evaluation of gas phase chemistry processes, **Atmos. Chem. Phys.**, 8, 3255-3281, 2008.
7. SAYS-LOPEZ, A., K. Chance, **X. Liu**, T.P. Kurosu and S.P. Sander, First observations of iodine oxide from space, **Geophys. Res. Lett.**, 34(12), L12812, doi:10.1029/2007GL030111, 2007.
8. **Liu, X.**, K. Chance, C.E. Sioris, and T.P. Kurosu, Impact of using different ozone cross sections on ozone profile retrievals from GOME ultraviolet measurements, **Atmos. Chem. Phys.**, 7, 3571-3578, 2007.
9. **Liu, X.**, K. Chance, T.P. Kurosu, Improved ozone profile retrievals from GOME data with degradation correction in reflectance, **Atmos. Chem. Phys.**, 7, 1575-1583, 2007.
10. Noguchi, K., N. Urita, S. Hayashida, **X. Liu**, and K. Chance, Validation and comparison of tropospheric column ozone derived from satellite measurements over Japan, **Scientific Online Letters on the Atmosphere**, 3, 041-044, doi:10.2151/sola.2007-011, 2007.
11. Sauvage, B., R.V. Martin, A. van Donkelaar, **X. Liu**, L. Jaegle, P.I. Palmer, and K. Chance, Remote sensed and in situ constraints on processes affecting tropical tropospheric ozone, **Atmos. Chem. Phys.**, 7, 815-838, 2007.
12. Worden, J., **X. Liu**, K. Bowman, K. Chance, R. Beer, A. Eldering, M. Gunson, H. Worden, Improved tropospheric ozone profile retrievals using OMI and TES radiances, **Geophys. Res. Lett.**, 34(1), L01809, 10.1029/2006GL027806, 2007.
13. Meijer, Y. J., D. P. J. Swart, R. J. van der A, F. Baier, P. K. Bhartia, G. E. Bodeker, K. Chance, T. Erbertseder, L. E. Flynn, F. del Frate, S. Godin-Beekmann, G. Hansen, O. P. Hasekamp, A. Kaifel, H. M. Kelder, B. J. Kerridge, J.-C. Lambert, J. Landgraf, X. Liu, I. S. McDermid, M. D. Müller, R. F. van Oss, Y. Pachepsky, V. Rozanov, R. Siddans, S. Tellmann, M. Weber, and C. Zehner, Evaluation of nine different GOME ozone profile algorithms, **J. Geophys. Res.**, 111 (D21), D21306, 10.1029/2005JD006778, 2006.
14. **Liu, X.**, K. Chance, C.E. Sioris, T.P. Kurosu, M.J. Newchurch, Intercomparison of GOME, ozonesonde, and SAGE-II measurements of ozone: Demonstration of the need to homogenize available ozonesonde datasets, **J. Geophys. Res.**, 101(D14), D114305, 10.1029/2005JD006718, 2006.
15. Sioris, C.E., L.J. Kovalenko, C.A. McLinden, R.J. Salawitch, M. Van Roozendael, F. Goutail, M. Dorf, K. Pfeilsticker, K. Chance, C. von Savigny, **X. Liu**, J.P. Pommereau, and J. Frerick, Latitudinal and vertical distribution of bromine monoxide and inorganic BrO in the lower stratosphere from SCIAMACHY limb scatter measurements, **J. Geophys. Res.**, 101(D14), D14301, 10.1029/2005JD006479, 2006, 2006.
16. **Liu, X.**, K. Chance, C.E. Sioris, M.J. Newchurch, T.P. Kurosu, Tropospheric ozone profiles from a ground-based ultraviolet spectrometer: a new retrieval method, **Appl. Opt.**, 45(10), 2352-2359, 2006.

17. **Liu X.**, K. Chance, C.E. Sioris, T.P. Kurosu, R.J.D. Spurr, R.V. Martin, M. Fu, J.A. Logan, D.J. Jacob, P.I. Palmer, M.J. Newchurch, I. Megretskaia, R. Chatfield, First directly-retrieved global distribution of tropospheric column ozone: comparison with the GOES-CHEM model, **J. Geophys. Res.**, 111(D2), D02308, 10.1029/2005JD006564, 2006.
18. **Liu X.**, K. Chance, C.E. Sioris, R.J.D. Spurr, T.P. Kurosu, R.V. Martin, M.J. Newchurch, Ozone profile and tropospheric ozone retrieval from GOME: Algorithm description and validation, **J. Geophys. Res.**, 110(D20), D20307, 10.1029/2005JD006240, 2005.
19. **Liu X.**, C.E. Sioris, K.V. Chance, T.P. Kurosu, M.J. Newchurch, R.V. Martin, P.I. Palmer, Mapping tropospheric ozone profiles from an airborne UV/Visible spectrometer, **Appl. Opt.**, 44(16), 3312-3319, 2005.
20. **Liu X.**, M.J. Newchurch, R. Loughman, and P.K. Bhartia, Errors resulting from assuming opaque Lambertian cloud surfaces in TOMS ozone retrieval, **J. Quant. Spectro. & Radiat. Transfer**, 85, 337-365, 2004.
21. **Liu X.**, J. Wang, and S.A. Christopher, Shortwave direct radiative forcing of dust aerosols over the Atlantic Ocean, **Int. J. Rem. Sensing**, 24, 5147-5160, 2003.
22. **Liu X.**, M.J. Newchurch, and J.H. Kim, Occurrence of ozone anomalies over cloudy areas in TOMS data, **Atmos. Chem. and Phys.**, 3, 1113-1129, 2003.
23. Wang, J., **X. Liu**, S.A. Christopher, J.S. Reid, E. Reid, and H. Maring, The Effect of Non-Sphericity on GOES-8 Dust Aerosol Retrievals during PRIDE, **Geophys. Res. Lett.**, 30(24), 229310.1029/2003GL018697, 2003.
24. Newchurch, M.J., D. Sun, J.H. Kim, **X. Liu**, Tropical tropospheric ozone derived using Clear-Cloudy Pairs (CCP) of TOMS measurements, **Atmos. Chem. and Phys.**, 3, 683-695, 2003.
25. Newchurch, M.J., **X. Liu**, J.H. Kim, and P.K. Bhartia, On the accuracy of TOMS retrievals over tropical cloudy regions, **J. Geophys. Res.**, 106, 32,315-3227, 2001.
26. Newchurch, M.J., **X. Liu**, and J.H. Kim, Lower tropospheric ozone derived from TOMS near mountainous regions, **J. Geophys. Res.**, 106, 23,403-20,412, 2001.

Projects and Support

- Principal Investigator, Investigate the global distribution of tropospheric ozone measured by the OMI and GOME-2 instruments using the GMI chemistry transport model, NASA ROSES2009 ACPMAP, 2010-2012, pending.
- Co-Investigator (PIs, Dr. Nickolay Krotkov and Dr. Kai Yang), Emission and transport of tropospheric SO₂: studies of impacts on air quality and radiative forcing by combining satellite observations and GEOS-Chem modeling, NASA ROSES2009 ACPMAP, 2010-2012, pending.
- Co-Investigator (PI, Dr. Jun Wang), AERONET skylight retrievals using polarimetric measurements: toward physically consistent validation of APS aerosol products, NASA ROSES2009 GLORY Science Team, 2010-June 2011, pending.
- Participation in the GEO-CAPE sensitivity studies for retrieving tropospheric ozone, 2009.
- Principal Investigator, Quantification of atmospheric processes controlling tropospheric ozone: observations of tropospheric ozone from OMI, GOME, and TES in conjunction with a global 3-D tropospheric chemistry and transport model, NASA New Investigator Program in Sun-Earth System Science, 01.01.2008- 12.31.2009.
- OMI instrumental calibration from OMI core funding (PI: Dr. P.K. Bhartia)

- Co-Investigator (PI, Dr. Kelly Chance), Implementation and assessment of ozone profiling and tropospheric ozone measurements for the OMI on EOS AURA, 07.01.2006-06.30.2009.
- Co-Investigator (PI, Dr. Kelly Chance), SAO Membership in the NPP Science Team: Tropospheric Ozone, Trace Gases, and Development of Climate Data Records, 2008-2010.

Presentations (2007-current)

- Liu, X., M. Schoeberl, P.K. Bhartia, K. Chance, J. Ziemke, Tropospheric ozone retrievals from backscattered data, ACC workshop on air quality, Frascati, Italy, June 15-17, 2009.
- Liu, X., Comparison of Total Ozone Column from the OMT03, OMDOAO3, and the Ozone Profile Retrieval Algorithm, OMI science team weekly meeting, March 26, 2009.
- Liu, X., OMI Ozone Profile Retrievals and Validation of Ozone Profiles and Stratospheric Ozone Column with MLS, OMI science team weekly meeting, April 16, 2009.
- Zhang, L., D.J. Jacob, X. Liu, J. Logan, Intercomparison of tropospheric ozone measurements from TES and OMI, TES science team meeting, Boulder, Colorado, February 23-25, 2009.
- Salawitch, R., et al., Reconciling aircraft, ground-based, and satellite observations of BrO during ARCTAS, ARCTAS science team meeting, Virginia Beach, Virginia, January 28, 2009.
- Chance K., T.P. Kurosu, X. Liu, C.R. Nowlan, Global pollution monitoring from Geostationary orbit instrument and spectroscopic requirements, 89(53), Fall Meet. Suppl., Abstract A51G-0182, 2008.
- Salawitch, R., et al., Airborne, Ground-Based, and Satellite Measurements of BrO during ARCTAS and ARCPAC, AGU Fall science team meeting, San Francisco, CA, 2008.
- Flynn, L., et. al., Enhanced operational methods in the NOAA Umkehr ground-based network for the future OMPS validation, AGU Fall science team meeting, San Francisco, CA, 2008.
- Martin, R., L. Lamsal, A. van Donkelaar, X. Liu, Satellite remote sensing of a multipollutant air quality health index, AURA science team meeting, Columbia, MD, October 30th, 2008.
- Chatfield, R., V. Fong, X. Liu, M. Schoeberl, I. Stajner, K. Wargon, S. Oltmans, A. Thompson, How well do UV methods see the lower troposphere? AURA science team meeting, Columbia, MD, October 27th, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, B.R. Bojikov, and ozonesonde providers, Estimation of ozone profile and tropospheric ozone from OMI, AURA science team meeting, Columbia, MD, October 28th, 2008.
- Zhang, L., D.J. Jacob, X. Liu, J. Logan, Intercomparison of tropospheric ozone measurements from TES and OMI – a new method using a chemical transport model as comparison platform, AURA science team meeting, Columbia, MD, October 28th, 2008.
- P.K. Bhartia and X. Liu, Retrieval of lower tropospheric ozone from OMI, AURA science team meeting, Columbia, MD, October 27th, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, B.R. Bojikov, and ozonesonde providers, Monitoring of tropospheric ozone from OMI, 7th CMAS conference, Chapel Hill, NC, October 7th, 2008.
- Biazar, A. P., R. T. McNider, K. Doty, M.J. Newchurch, L. Wang, Y. Park, X. Liu, D.W. Byun, S. J. Roselle, Examining the impact of satellite cloud correction together with the

assimilation of satellite-derived ozone and aerosol products in improving air quality model predictions, 7th CMAS conference, Chapel Hill, North Carolina, October 7th, 2008.

- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, B.R. Bojikov, Monitoring of tropospheric ozone from OMI, 7th CMAS conference, Chapel Hill, NC, October 7th, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, B.R. Bojikov, R.J.D. Spurr, Validation of OMI ozone profiles and tropospheric ozone retrievals, Quadrennial Ozone Symposium, Tromso, Norway, June 29-July 5, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, B.R. Bojikov, R.J.D. Spurr, Validation of OMI ozone profiles and tropospheric ozone retrievals, OMI Science Team Meeting, Helsinki, Finland, June 24-27, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, B.R. Bojikov, L. Zhang, R.J.D. Spurr, Monitoring of tropospheric ozone from OMI, *Eos Trans. AGU*, 89(23), Jt. Assem. Suppl., Abstract A33A-13.
- Kurosu, T.P., X. Liu, E.D. Celarier, K. Chance, Air Quality Observations from the Ozone Monitoring Instrument on EOS/Aura - HCHO and CHO-CHO, *Eos Trans. AGU*, 89(23), Jt. Assem. Suppl., Abstract A23A-05.
- Saiz-Lopez, A., Boxe, C.S., Sander, S.P., Chance, K., Kurosu, T.P., Liu, X., Mahajan, A., Plane, J.M.C, Iodine chemistry in the polar boundary layer, EGU General Assembly 2008, April 17.
- Newchurch, M., A. Pour-Biazar, M. Khan, B. Koshak, U. Nair, K. Fuller, L. Wang, Y. Park, R. Williams, X. Liu, S. Christopher, J. Kim, Improving air quality forecasts with AURA observations, *Eos Trans. AGU*, 89(23), Jt. Assem. Suppl., Abstract A23A-03
- Liu, X., Ozone Profiles and Tropospheric Ozone Retrievals from UV measurements, Invited Talk, University of Maryland, College Park, College Park, MD, March 14, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, L. Zhang, R.J.D. Spurr, Ozone profile and tropospheric ozone retrieval from OMI, OMI blue team review meeting, March 7, 2008.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, and J. Ziemke (2008), Intercomparison of HIRDLS and MLS ozone profiles with OMI data, paper presented at HIRDLS science team meeting, Boulder, Colorado, January 29-30, 2007.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, Combining OMI and MLS to Improve Tropospheric Ozone Retrievals for Air Quality Applications, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A52D-06, 2007.
- Kulawik, S.S, X. Liu, J.R. Worden, K. Chance, K. Bowman, Optimally combining ozone from Tropospheric Emission Spectrometer (TES) and Ozone Monitoring Instrument (OMI) data, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A33C-1403, 2007.
- Ziemke, J.R., X. Liu, P.K. Bhartia, Identification of stratospheric waves in ozone in the tropics from OMI high spectral resolution measurements, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A43D-1576, 2007.
- Chance, K., T.P. Kurosu, X. Liu, D.O. Neil, J.J. Szykman, J. Fishman, R.B. Pierce, J.H. Crawford, D. Edwards, G. Floey, R. Scheffe, Global Monitoring of Tropospheric Pollution from Geostationary Orbit, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A54C-02, 2007.
- Bhartia, P.K., J. Gleason, O. Torres, N. Krotkov, X. Liu, J. Ziemke, S. Chandra, P. Levelt, Air Quality Research and Applications Using AURA OMI Data, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A52D-02, 2007.

- Saiz-Lopez, A., C.S. Boxe, K. Chance, T. P. Kurosu, X. Liu, A. Mahajan, J. M. Plane, S. P. Sander, Iodine: The missing halogen of polar tropospheric chemistry, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract A41G-02, 2007.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, Validation of OMI UV radiances and ozone profiles with MLS data, OMI Weekly Science Team Meeting, November 8, 2007.
- T.P. Kurosu, K. Chance, X. Liu, I. DeSmedt, M. van Roozaendael, A. Richter, S. Kuhl, OMI HCHO, BrO, OCLO, Validation Status and Outlook, URA science team meeting, Pasadena, CA, October 1-5, 2007.
- Liu, X., P.K. Bhartia, K. Chance, T.P. Kurosu, R.J.D. Spurr, Validation of OMI UV radiances and ozone profiles with MLS data, AURA science team meeting, Pasadena, CA, October 1-5, 2007.
- Susan S. Kulawik, Xiong Liu, John R. Worden, Kelly Chance, Kevin Bowman, and the TES team, Optimally combining ozone from TES and OMI data, AURA science team meeting, Pasadena, CA, October 1-5, 2007.
- Liu, X., Ozone Profiles and Tropospheric Ozone Retrievals from UV measurements, Invited Talk, University of Alabama In Huntsville, Huntsville, AL, October 10, 2007.
- Liu, X., Ozone Profiles and Tropospheric Ozone Retrievals from UV measurements, NASA GSFC Code 613.3, Branch Lunch Talk, Greenbelt, MD, September 13, 2007.
- Kelly Chance, Thomas P. Kurosu, Xiong Liu, Doreen O. Neil, James, J. Szykman, Jack Fishman, R. Bradley Pierce, James H. Crawford, David Edwards, Gary Foley, and Rich Scheffe, Global monitoring of tropospheric pollution from Geo-stationary orbit, Gordon conference of Atmospheric Chemistry, Big Sky, MT, August 26-31, 2007.
- Liu, X., Ozone Profiles and Tropospheric Ozone Retrievals from UV measurements, Invited Talk, JPL, Pasadena, CA, August 13, 2007.
- Liu, X., K. Chance, L. Zhang, T.P. Kurosu, J.R. Worden, K.W. Bowman, Pawan K. Bhartia, and D.J. Jacob, Ozone Profiles and Tropospheric Ozone Retrievals from OMI, OMI International Science Team Meeting 2007, UMBC, Baltimore, MD, June 5-8, 2007.
- Liu, X., K. Chance, and T.P. Kurosu, An eight-year record of ozone profiles and tropospheric ozone from GOME, Envisat Symposium 2007, Montreux, Switzerland, April 23-27, 2007.
- Liu, X., L. Zhang, K. Chance, J.R. Worden, K.W. Bowman, T.P. Kurosu, D.J. Jacob, Cross-evaluation of OMI, TES and GEOS-Chem tropospheric ozone, 3rd GEOS-Chem Users' Meeting, Cambridge, MA, April 11-13, 2007.

Professional Organization and Activities

- American Geophysical Union
- Member on OMI, OMPS and GEO-CAPE Science Teams
- Reviewer for *JGR*, *GRL*, *Atmospheric Environment*, *Applied Optics*, *JQSRT*, *International Journal Remote Sensing*, *Canadian Journal of Physics*, *Atmospheric Science Letters*, *IEEE TGRS*, *Advances in Atmospheric Science*

Honors

- 2009, NASA OMI Science Team Group Achievement Award
- 2007, 2008, 2010, Who's who in America

- 2006, NASA New Investigator Program Award
- 2006, Early Career and New Faculty Scientist travel award for AQRS Workshop
- 1998-2002, UAH Dean's List
- 1996, Yi Li Da Scholarship, Graduate School of Chinese Academy of Sciences
- 1993, Nankai Scholarship, Nankai University, Tianjin, China

Computer Skills

- Programming languages: Proficient in Fortran 77/90, C/C++, IDL, Shell Scripting
- Operating systems: Windows, Unix, and Linux