

Curriculum Vitae

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EDUCATION

Ph.D. (2003)	Geophysics / Atmospheric Chemistry	Dept. of Earth and Planetary Sciences, Harvard University, MA
Ph.D. (1998)	(no specification)	Dept. of Civil and Structural Engineering, Hong Kong Polytechnic University
M.Sc. (1993)	Atmospheric Physics / Boundary-Layer Meteorology	Center of Environmental Sciences, Peking University, P.R. China
B.Sc. (1990)	Atmospheric Physics	Department of Geophysics, Peking University, P.R. China

PROFESSIONAL EXPERIENCE

2004-present	Senior Research Scientist, National Institute of Aerospace at NASA Langley Research Center, Hampton, VA;
09/2005-03/2006	Visiting Scientist, GFDL/NOAA, Princeton, New Jersey;
2003-2004 (Nov)	Staff Scientist, National Institute of Aerospace at NASA Langley Research Center, Hampton, VA;
2002-present	Referee for Journal of Geophysical Research, Geophysical Research Letters, Atmospheric Environment, Journal of Applied Meteorology, Advances in Space Research, International Journal of Climatology; Review panelist for NASA ROSES (ACMAP); Proposal reviewer for National Science Foundation, the Netherland Council for Earth and Life Sciences;
2002 (Sep-Dec)	Staff Scientist, ICASE, NASA Langley Research Center, Hampton, VA;
1998 - 2002	Research Assistant, Division of Engineering and Applied Sciences and Department of Earth and Planetary Sciences, Harvard University, MA;
1999 - 2000	Teaching Fellow (Spring 1999, Fall 2000), Harvard University: EPS5 Introduction to Environmental Science: Atmosphere, Ocean & Biosphere.
1995 - 1997	Special Research/Teaching Assistant, Dept. of Civil and Structural Engineering, The Hong Kong Polytechnic University, Hong Kong;
1996 (Sep-Nov)	Attached to Ozone and Water Vapor group at CMDL/NOAA (with Sam Oltmans).

MEMBERSHIP AND AWARDS

2005-	Listee, Who's Who in the World (2006), Who's Who in America (2005-2006, 2009);
2003-present	Member, American Meteorological Society;
1995-present	Member, American Geophysical Union;
1993-1994	Dong-Gang Scholarship, Peking University, P.R. China;
1990-1991	Guang-Hua Prize, Peking University, P.R. China.

MODELING WORK EXPERIENCE

- 2003 - present
- Study the radiative effects of clouds (including the effect of different cloud overlap assumptions) on global tropospheric chemistry using GEOS-CHEM;
 - Examine the constraints from radionuclide tracers on transport and wet scavenging processes using the NASA Global Modeling Initiative (GMI) CTM;
 - Study the synergistic impact of aerosols and clouds on global and regional tropospheric photochemistry using the GMI CTM;
 - Contribute to the development of the regional component of the NASA Langley / University of Wisconsin Regional Air Quality Modeling System (RAQMS_N) and apply the model to the INTEX-A aircraft campaign, studying the impact of convection and lightning on upper tropospheric chemistry.
 - Improve the representation of the effect of clouds on tropospheric chemistry in the NOAA GFDL AM2 chemistry-climate model;
 - Examine cloud and trace gases associations using RAQMS_N and GEOS-CHEM;
 - For more details about my current research, please visit <http://research.nianet.org/~hyl/>.
- 1997 - 2002
- Developed the wet deposition scheme and contributed to the development of the GEOS-CHEM global 3-D model of tropospheric chemistry;
 - Tested the wet deposition scheme by simulating aerosol tracers (²¹⁰Pb and ⁷Be);
 - Analyzed the aircraft-observed correlations between ²¹⁰Pb, ⁷Be, and ozone;
 - Investigated sources of tropospheric ozone along the Asian Pacific Rim using the techniques of tagged tracer (O_x) and sensitivity tests;
 - Examined transport pathways for Asian pollution outflow using tagged CO and O₃ simulations.

FIELD WORK EXPERIENCE

- March-April 2001 Provided chemical tracer forecasts in the field (Hong Kong, and in-house at Harvard) for the NASA TRACE-P aircraft mission;
- 1995 - 1997 Prepared and launched more than 100 ECC ozonesondes (in collaboration with the Hong Kong Observatory);
- 1995 - 1997 Installed and operated the Brewer Ozone Spectrophotometer #115 at Hong Kong;
- 1995 - 1997 On regular duty at the Hong Kong Air Quality Monitoring Station;
- July-August 1991 Made tethersonde launchings and involved in meteorological tower measurements in northwestern China (Sino-Japan HEIHE project of land-air interaction, and environmental assessment for national factory No.404).

COMPUTER SKILLS

- Language: FORTRAN, IDL, C, BASIC, HTML
- Operating system: UNIX, LINUX, MS Windows, PC DOS
- Software: Vis5D, MS Office (Word, Excel, Powerpoint), FrameMaker, etc.

CONFERENCES / SEMINARS

- Global Modeling Initiative (GMI) Science Team Meeting, NASA GSFC, Greenbelt, MD, May 11-12, 2009.
- Oral presentation, the 4th GEOS-Chem Users' Meeting, Harvard University, Cambridge, MA, April 7-10, 2009 (Liu, H., D. Considine, et al., Using beryllium-7 to assess stratosphere-to-troposphere transport in global models).
- NASA GEO-CAPE Science Definition Planning Workshop, University of North Carolina at Chapel Hill, NC, August 18-20, 2008.
- NASA ASCENDS Science Definition Planning Workshop, University of Michigan, Ann Arbor, July 23-25, 2008.
- Oral presentation, GMI Science Team Meeting, University of California at Irvine, March 17-19, 2008 (Liu, H., D. Considine, R.M. Yantosca, and D.J. Jacob, ²¹⁰Pb and ⁷Be simulations with DAO, GISS-II', fvGCM, GEOS4-DAS and GEOS5-DAS meteorological fields)
- Poster presentation, AGU Fall Meeting, San Francisco, CA, Dec. 10-14, 2007 (Liu, H., and D. Considine, Using beryllium-7 to assess cross-tropopause transport in global models)
- Oral presentation, GMI Science Team Meeting, NASA GSFC, Greenbelt, Maryland, June 13-15, 2007 (Liu, H., M. Chin, and D. Considine, Synergistic impact of aerosols and clouds on photochemistry in GMI: A first look. Presented by Dr. Considine in Liu's absence)
- NASA INTEX-B Science Team Meeting, Virginia Beach, Virginia, March 6-8, 2007.
- Oral presentation, NASA Global Modeling Initiative (GMI) Science Team Meeting, NASA GSFC, October 11-13, 2006 (Liu, H. and D. Considine, Lead-210 and beryllium-7 simulations with GMI);
- Oral presentation, CCSM Chemistry-Climate Working Group Meeting, NCAR, March 22, 2006 (Liu, H. and L. Horowitz, Lead-210 and beryllium-7 simulations with the new GFDL global atmosphere model AM2);
- Oral presentation, GMI Science Team Meeting, Georgia Institute of Technology, Atlanta, January 11, 2006 (Liu, H., L.W. Horowitz, et al., Radionuclide simulations with the new GFDL global atmosphere model AM2: An update).
- Poster presentation, American Geophysical Union (AGU) Fall Meeting, December 5-9, 2005 (Liu, H. et al., Radiative effect of clouds on tropospheric chemistry: Sensitivity to cloud vertical distributions and optical properties, Paper No. A51C-0062);
- Seminar, the National Institute of Aerospace (NIA) informal seminar series, Hampton, Virginia, August 3, 2005 (Liu, H., et al., Radiative effect of clouds on tropospheric chemistry and sensitivity to cloud vertical distribution and optical properties);
- Seminar, Geophysical Fluid and Dynamics Laboratory (GFDL) / NOAA, Princeton, New Jersey, June 27, 2005 (Liu, H., et al., Sensitivity of tropospheric chemistry simulations to cloud vertical distributions and optical properties);

- Oral presentation, Global Modeling Initiative (GMI) Science Team Meeting, NASA GSFC, Greenbelt, Maryland, June 6-8, 2005 (Liu, H., et al., Sensitivity of tropospheric chemistry simulations to cloud vertical distributions and optical properties);
- Seminar, NASA Goddard Space Flight Center, Greenbelt, Maryland, January 10, 2005 (Liu, H., et al., Radiative and scavenging effect of clouds on tropospheric chemistry and relevant issues for the Global Modeling Initiative);
- Oral presentation, AGU Fall Meeting, San Francisco, California, December 13-17, 2004 (Liu, H., J.H. Crawford, G. Chen, R.B. Pierce, P. Norris, S.E. Platnick, C. Kittaka, and R.M. Yantosca, Radiative effect of clouds on tropospheric chemistry in a global three-dimensional chemical transport model, Paper No.A41C-06);
- Poster presentation, 13th Conference on Satellite Meteorology and Oceanography, Norfolk, Virginia, September 20-23, 2004 (Liu, H., R.B. Pierce, J.H. Crawford, C. Kittaka, J. Al-Saadi, S.E. Platnick, P. Norris, A. Olaleye, G.J. Tripoli, and R.M. Yantosca, Cloud optical depth from UW-NMS and GEOS-DAS and comparisons with MODIS and ISCCP satellite observations, Paper #79241);
- Oral presentation, AGU Fall Meeting, San Francisco, California, December 8-12, 2003 (Liu, H., D.J. Jacob, J.E. Dibb, A.M. Fiore, and R.M. Yantosca, Constraints on the sources of tropospheric ozone from ^{210}Pb - ^7Be - O_3 correlations, Paper No.A21B-08);
- Oral presentation, the First GEOS-CHEM Users' Meeting, Harvard University, June 2-3, 2003 (GEOS-CHEM activities at the National Institute of Aerospace @ NASA Langley);
- Seminar, the National Institute of Aerospace (NIA) informal seminar series, Hampton, Virginia, May 2, 2003 (Liu, H. et al., Asian outflow of ozone pollution to the western Pacific: Origin and Pathways);
- Seminar, Pacific Northwest National Laboratory, April 8, 2002 (Liu, H., D.J. Jacob, L.Y. Chan, S.J. Oltmans, I. Bey, R.M. Yantosca, J.M. Harris, B.N. Duncan, and R.V. Martin, Sources of tropospheric ozone along the Asian Pacific Rim: An analysis of ozonesonde observations);
- Seminar, NASA Langley Research Center, March 18, 2002 (Liu, H., D.J. Jacob, L.Y. Chan, S.J. Oltmans, I. Bey, R.M. Yantosca, J.M. Harris, B.N. Duncan, and R.V. Martin, Sources of tropospheric ozone along the Asian Pacific Rim: An analysis of ozonesonde observations);
- Seminar, Nicholas School of the Environment, Duke University, March 8, 2002 (Liu, H., D.J. Jacob, L.Y. Chan, S.J. Oltmans, I. Bey, R.M. Yantosca, J.M. Harris, B.N. Duncan, and R.V. Martin, Sources of tropospheric ozone along the Asian Pacific Rim: An analysis of ozonesonde observations);
- Poster presentation, TRACE-P data workshop #1, Norfolk, Virginia, November 13-16, 2001 (Liu, H., D.J. Jacob, I. Bey, R.M. Yantosca, B.N. Duncan, and G.W. Sachse, Transport pathways for Asian pollution outflow over the Pacific: Interannual and seasonal variations);
- Oral presentation, TRACE-P simulation workshop, NCAR, Boulder, December 4-6, 2000 (Liu, H., D.J. Jacob, I. Bey, and R.M. Yantosca, Transport pathways for Asian pollution outflow over the western Pacific);

- Oral presentation, GEOS-CHEM chemical forecast workshop, DAO/GSFC, Sept. 7, 2000 (Liu, H., D.J. Jacob, I. Bey, and R.M. Yantosca, Transport pathways for Asian pollution outflow over the western Pacific).
- The First TRACE-P Science Team Meeting, Hampton, Virginia, June 26-28, 2000;
- Oral presentation, AGU Spring Meeting, Boston, June 1-4, 1999 (Liu, H., D.J. Jacob, I. Bey, R.M. Yantosca, and D.M. Koch, Three-dimensional simulation of ^{210}Pb and ^7Be in the Harvard-DAO tropospheric chemistry model, Paper No.A21E-11);
- Poster presentation, XVIII Quadrennial Ozone Symposium, L'Aquila, Italy, September 1996 (L.Y. Chan, H.Y. Liu, K.S. Lam, and T. Wang, Observations of total column ozone and vertical ozone distribution at subtropical Hong Kong, Abstract #c-d9).

RESEARCH GRANTS

- **Principal Investigator**, *Effects of Global Change on Asian Pollution Outflow and Long-Range Transport* (Co-Is: L.W. Horowitz, A.M. Fiore, D.B. Considine; Collaborators: L.J. Donner, J.M. Rodriguez, J. Fishman), A research proposal submitted to NASA ROSES-2008, Modeling and Analysis Program (MAP), Funding Opportunity Number: NNH08ZDA001N-MAP, May 23, 2008. Funded for FY10-FY13.
- **Co-Investigator**, *Studies of Scavenging and Transport Uncertainties for the MAP Program: Using the Global Modeling Initiative CTM* (PI: David Considine; Co-Is: M. Natarajan, C. Merterns, H. Liu; Collaborator: Steven Pawson), A research proposal submitted to NASA ROSES-2008, Modeling and Analysis Program (MAP), Funding Opportunity Number: NNH08ZDA001N-MAP, May 23, 2008. Funded for FY10-FY13.
- **Principal Investigator**, *Toward Improved Representation of the Effects of Clouds on Tropospheric Chemistry in the GFDL AM2 Chemistry-Climate Model* (Collaborators: L.W. Horowitz, A.M. Fiore, P. Ginoux, L. Donner, V. Ramaswamy, and J.H. Crawford), proposal submitted to the University Corporation for Atmospheric Research (UCAR), May 2005. Funded for September 2005 – March 2006 (visiting scientist at GFDL/NOAA).
- **Principal Investigator**, *Constraints from AURA Observations on the Impact of Convection and Lightning on Upper Tropospheric Chemistry* (Co-Is: Jim H. Crawford, Robert B. Pierce, Matthew H. Hitchman, Gregory J. Tripoli), August 2004, funded for FY06-FY08. (in response to NASA Research Announcement NNH04ZYS004N)
- **Co-Investigator**, *Studies of Near Tropopause Ozone, Very Short-Lived Species, and Tropospheric Physical Processes for the Global Modeling Initiative* (PI: David B. Considine, Co-Is: Malcolm Ko, Mary M. Kleb, Hongyu Liu, Murali Natarajan, and Jennifer Olson), October-November 2004, funded for FY05-FY08. (in response to NASA Research Announcement NNH04ZYS008N)

- **Co-Investigator**, *Aerosol Radiative Forcing and Effects on Tropospheric Chemistry: Modeling and Uncertainty Analysis in the GMI Framework* (PI: Mian Chin, Co-Is: Hongyu Liu, Bryan Duncan, Huisheng Bian, and Thomas Diehl), October-November 2004, funded for FY06-FY08. (in response to NASA Research Announcement NNH04ZYS008N)

JOURNAL PUBLICATIONS

- **Liu, H.**, D.B. Considine, et al., Using beryllium-7 to assess stratosphere-to-troposphere transport in global models, *J. Geophys. Res.*, manuscript in preparation, 2009.
- **Liu, H.**, J.H. Crawford, D.B. Considine, S.E. Platnick, P. Norris, B.N. Duncan, R.B. Pierce, G. Chen, and R.M. Yantosca, Sensitivity of photolysis frequencies and key tropospheric oxidants in a global model to cloud vertical distributions and optical properties, 114, doi:10.1029/2008JD011503, *J. Geophys. Res.*, 2009.
- **Liu, H.**, J.H. Crawford, R.B. Pierce, P. Norris, S.E. Platnick, G. Chen, J.A. Logan, R.M. Yantosca, M. Evans, C. Kittaka, Y. Feng, and X. Tie, Radiative effect of clouds on tropospheric chemistry in a global three-dimensional chemical transport model, *J. Geophys. Res.*, 111(D20303), doi:10.1029/2005JD006403, 2006.
- Considine, D.B., D.J. Bergmann, and **H. Liu**, Sensitivity of Global Modeling Initiative chemistry and transport model simulations of radon-222 and lead-210 to input meteorological data, *Atmos. Chem. Phys.*, 5, 3389-3406, 2005.
- **Liu, H.**, D.J. Jacob, J.E. Dibb, A.M. Fiore, and R.M. Yantosca, Constraints on the sources of tropospheric ozone from ^{210}Pb - ^7Be - O_3 correlations, *J. Geophys. Res.*, 109, doi:10.1029/2003JD003988, 2004.
- Fiore, A., D. Jacob, **H. Liu**, R.M. Yantosca, T.D. Fairlie, and Q. Li, Variability in surface ozone background over the United States: Implications for air quality policy, *J. Geophys. Res.*, 108(D24), 4787, doi:10.1029/2003JD003855, 2003.
- Oltmans, S.J., B.J. Johnson, J.M. Harris, A.M. Thompson, **H. Liu**, H. Vomel, C.Y. Chan, T. Fujimoto, V.G. Brackett, W.L. Chang, J.-P. Chen, J.H. Kim, L.Y. Chan, and H.-W. Chang, Tropospheric ozone over the North Pacific from ozonesonde observations, *J. Geophys. Res.*, 109(D15), D15S01, 10.1029/2003JD003466, 2004.
- Li, Q., D.J. Jacob, T.D. Fairlie, **H. Liu**, R.M. Yantosca, and R.V. Martin, Stratospheric versus pollution influences on ozone at Bermuda: Reconciling past analyses, *J. Geophys. Res.*, 10.1029/2002JD00213, 2002.
- **Liu, H.**, D.J. Jacob, I. Bey, R.M. Yantosca, B.N. Duncan, and G.W. Sachse, Transport pathways for Asian pollution outflow over the Pacific: Interannual and seasonal variations, *J. Geophys. Res.*, 108(D20), 8786, doi:10.1029/2002JD003102, 2003.
- Martin, R.V., D.J. Jacob, J.A. Logan, I. Bey, R.M. Yantosca, A.C. Staudt, Q. Li, A.M. Fiore, B.N. Duncan, **H. Liu**, P. Ginoux, and V. Thouret, Global model analysis of TOMS and in-situ

- observations of tropical tropospheric ozone, *J. Geophys. Res.*, 107(D18), 4351, 10.1029/2001JD001480, 2002.
- **Liu, H.**, D.J. Jacob, L.Y. Chan, S.J. Oltmans, I. Bey, R.M. Yantosca, J.M. Harris, B.N. Duncan, and R.V. Martin, Sources of tropospheric ozone along the Asian Pacific Rim: An analysis of ozonesonde observations, *J. Geophys. Res.*, 107(D21), 4573, 10.1029/2001JD002005, 2002.
 - Li, Q., D.J. Jacob, J.A. Logan, I. Bey, R.M. Yantosca, **H. Liu**, R.V. Martin, A.M. Fiore, B.D. Field, B. N. Duncan, and V. Thouret, A tropospheric ozone maximum over the Middle East, *Geophys. Res. Lett.*, 28, 3235-3238, 2001.
 - Bey, I., D.J. Jacob, R.M. Yantosca, J.A. Logan, B.D. Field, A.M. Fiore, Q. Li, **H. Liu**, L.J. Mickley, and M.G. Schultz, Global modeling of tropospheric chemistry with assimilated meteorology: Model description and evaluation, *J. Geophys. Res.*, 106, 23,073-23,096, 2001.
 - **Liu, H.**, D.J. Jacob, I. Bey, and R.M. Yantosca, Constraints from ^{210}Pb and ^7Be on wet deposition and transport in a global three-dimensional chemical tracer model driven by assimilated meteorological fields, *J. Geophys. Res.*, 106, 12,109-12,128, 2001.
 - Chan, L.Y., C.Y. Chan, **H.Y. Liu**, S.A. Christopher, S.J. Oltmans, and J.M. Harris, A case study on the biomass burning in southeast Asia and enhancement of tropospheric ozone over Hong Kong, *Geophys. Res. Lett.*, 27, 1479-1482, 2000.
 - **Liu, H.Y.**, W.L. Chang, S.J. Oltmans, L.Y. Chan and J.M. Harris, On springtime high ozone events in the lower troposphere from southeast Asian biomass burning, *Atmos. Environ.*, 33, 2403-2410, 1999.
 - Chan, L.Y., **H.Y. Liu**, K.S. Lam, T. Wang, S.J. Oltmans, and J.M. Harris, Analysis of the seasonal behavior of tropospheric ozone at Hong Kong, *Atmos. Environ.*, 32, 159-168, 1998.

OTHER PUBLICATIONS

- **Liu, H.**, L.W. Horowitz, M.S. Reddy, P. Ginoux, D.B. Considine, and M. Zhao, Lead-210 and beryllium-7 simulations with the new GFDL global atmosphere model AM2. A technical report submitted to University Corporation for Atmospheric Research (UCAR), Boulder, Colorado, May 31, 2006.
- **Liu, H.**, R.B. Pierce, J.H. Crawford, P. Norris, C. Kittaka, J.A. Al-Saadi, S.E. Platnick, A. Olaleye, G.J. Tripoli, and R.M. Yantosca, Cloud optical depth from UW-NMS and GEOS-DAS and comparisons with MODIS and ISCCP satellite observations, Extended Abstract, 13th Conference on Satellite Meteorology and Oceanography, Norfolk, VA, September 20-23, 2004.
- **Liu, H.**, Asian outflow of ozone and carbon-monoxide to the Pacific: Origins and pathways, PhD thesis, Dept. of Earth and Planetary Sciences, Harvard University, Cambridge, MA, 2003. (Advisor: Prof. Daniel J. Jacob)
- Li, Q., D.J. Jacob, I. Bey, R. M. Yantosca, B.D. Field, **H. Liu**, J. A. Logan, A. M. Fiore, R. V. Martin, and B. N. Duncan, Sources of ozone over the North Atlantic and

trans-Atlantic transport of pollution: A global model perspective, *IGACtivities Newsletter*, NARE special issue, No. 24, p12-16, August 2001.

- Lam, K.S., T. Wang, L.Y. Chan, and **H.Y. Liu**, Observation of surface ozone and carbon monoxide at a coastal site in Hong Kong, in *Atmospheric Ozone*, XVIII Quadrennial Ozone Symposium, R.D. Bojkov and G. Visconti (Eds), Vol.1, 395-398, 1998.
- Chan, L.Y., **H.Y. Liu**, K.S. Lam, and T. Wang, Observations of total column ozone and vertical ozone distribution at subtropical Hong Kong, in *Atmospheric Ozone*, XVIII Quadrennial Ozone Symposium, R.D. Bojkov and G. Visconti (Eds), Vol.1, 107-110, 1998.
- **Liu, H.Y.**, Variation of total ozone and characteristics of vertical ozone distribution over Hong Kong, PhD thesis, Dept. of Civil and Structural Engineering, The Hong Kong Polytechnic University, Hong Kong, 1998. (Supervisors: Dr. L.Y. Chan and Dr. K.S. Lam)
- **Liu, H.Y.**, Application of Maximum Entropy Method in the calculation of turbulence spectrum and a study of coherent structures in the surface layer, MSc thesis, Center of Environmental Sciences, Peking University, P.R. China, 1993. (Advisor: Prof. Aichen Zhang)
- **Liu, H.Y.**, Similarities and differences in the turbulent mixing below and above the forest-net canopy, BSc thesis, Dept. of Geophysics, Peking University, P.R. China, 1990. (Advisor: Prof. Aichen Zhang)