

Xianglei Huang

Professor

Department of Climate and Space Science and Engineering (CLaSP)
(Renamed from the Department of Atmospheric, Oceanic, and Space Sciences, AOSS)
The University of Michigan, Ann Arbor, MI 48109-2143
Phone: (734) 936-0491 Fax: (734) 936-0503
xianglei@umich.edu <http://huang.engin.umich.edu>

Degrees

- **California Institute of Technology** July 1998—June 2004
 - Ph.D. in Planetary Science, minor in Applied Computation
 - M.S. in Planetary Science, June 2000
- **University of Science and Technology of China (USTC)** Sep. 1992—June 1997
 - B.S. in Atmospheric Physics and Environmental Sciences (*cum laude*)

Employment

- **University of Michigan, Dept. of Climate and Space Science and Engineering (former Dept. of Atmos., Oceanic, and Space Sciences)**
 - Professor with tenure* Sep 2020 - Present
 - Associate Professor with tenure* Sep 2012-Aug 2020
 - Assistant Professor* Sep 2006-Aug 2012
- **Princeton University, Program in Atmospheric and Oceanic Sciences**
 - Visiting Research Scholar (on sabbatical leave from Univ. of Michigan)* Sep 2013-Dec 2013
 - Associate Research Scholar* June 2006-August 2006
 - AOS Postdoctoral Research Associate* July 2004-June 2006
- **California Institute of Technology** July 1998-June 2004
 - Graduate Research Assistant in the Division of Geological and Planetary Sciences*
- **The University of Maine at Orono** January 1998—June 1998
 - Graduate Research Assistant*
- **University of Science and Technology of China** September 1996-December 1997
 - Research Assistant*

Research Expertise: Being trained at Caltech/JPL for Ph.D. and Princeton/GFDL for postdoc, I have balanced expertise in space-borne observations and climate modeling. I am specialized in (1) atmospheric radiation and its application in both satellite remote sensing and climate modeling, (2) spectrally resolved measurements and its application in climate studies, (3) cloud-radiation-climate interactions, (4) radiative couplings between atmosphere and surface, and (4) climate and weather studies related to renewable

energy.

Satellite Mission and Science Team Involvements

- **Co-Investigator** of Libera, the first Earth Venture Continuity Mission by NASA (scheduled launch 2027)
- **Co-Investigator** of The Polar Radiant Energy in the Far Infrared Experiment (PREFIRE), an Earth Venture Instrument Mission by NASA (scheduled launch Fall 2023)
- **Oversea Co-Investigator** of The Far-infrared Outgoing Radiation Understanding and Monitoring (FORUM), the 9th Earth Explorer Mission by European Space Agency (ESA) (scheduled launch 2026)
- **Member of radiation working group for NASA AOS mission formulation** (2020-present)
- **Member of the science definition team** for CLARREO mission, NASA (selected in November 2010)
- **Member of the NASA AIRS science team** (Through NASA Terra/Aqua re-compete program, 2011-present)
- **Member of the NASA MODIS science team** (Through NASA Terra/Aqua re-compete program, 2014-2017)
- **Associate Member of the CERES science team**
- **Member of the Advisory Panel for AIRS L-1 radiance product** (2019-present)

Earth System Modeling Involvements

- **University PI** (2015-present) selected for participation in the DoE E3SM model development
 - Lead a multi-institute team to improve the radiation scheme in the E3SM for better treatments of surface-atmosphere radiative coupling.

Renewable Energy Application Involvements

- **Winner of [The American-Made Solar Forecasting Prize](https://www.energy.gov/eere/solar/american-made-solar-forecasting-prize)** (<https://www.energy.gov/eere/solar/american-made-solar-forecasting-prize>)
 - Developed a hybrid machine-learning-based forecast scheme for ground solar irradiance prediction with a lead time of 24-48 hours. Won the DoE-sponsored 2022 American-Made Solar Forecasting Prize competition.

Professional Services

- **Commissioner** of International Radiation Commission (IRC), the oldest of the ten commissions of International Association of Meteorology and Atmospheric Sciences (Dec 2020-present)
- **Editor** of *Journal of Climate* (July 2018 – present)
- **Chair** of Atmospheric Radiation Committee of the American Meteorological Society (Jan 2019 – December 2021)
- **Member** of Atmospheric Radiation Committee of the American Meteorological Society (January-December 2018)
- **Member** of Satellite Meteorology, Oceanography, and Climate Committee of the American Meteorological Society (January 2016-December 2017)
- **Associate Editor** of *Journal of Climate* (2010-2018)
- **Associate Editor** of *Journal of Atmospheric and Oceanic Technology* (2007-2010)
- **Panelist** for various NASA annual ROSES (Research Opportunity in Space and Earth Sciences) program elements
 - November 2008/March 2010/February 2014/August 2014/January 2021/September 2021/November 2021

- **Panelist** for DOE Merit Review Program for the Office of Energy Efficiency & Renewable Energy, July 2012
- **Panelist** for DOE Review Panel for the Lawrence Livermore National Laboratory Scientific Focus Area, August 2015
- **Peer reviewer** for *Nature Geosciences*, *Journal of Climate*, *Journal of the Atmospheric Sciences*, *Journal of Geophysical Research-Atmospheres*, *Geophysical Research Letters*, *Atmospheric Chemistry and Physics*, *Theoretical and Applied Climatology*, *IEEE Transactions on Geoscience and Remote Sensing*, *Journal of Applied Meteorology*, and *Journal of Atmospheric and Oceanic Technology*, *Journal of the Meteorological Society of Japan*, *Atmospheric Measurement Techniques*, etc.
- Mail-in **reviewer** for proposals to NASA, NSF, British NERC (Natural Environment Research Council), *University of Basilicata (Italy)*, New Zealand Antarctic Research Institute, and Kuwait Foundation for the Advancement of Sciences
- Mail-in **reviewer** for conference abstracts to IGARSS (IEEE International Geoscience & Remote Sensing Symposium), 2009 and 2010
- **Chair** of Hyperspectral Imaging and Sounding of Environment (HISE) 2015 conference organized by OSA (Optical Society of America), Arrowhead, California.
- **Convener and chair** of special sessions in AGU (American Geophysical Union) meetings
 - “*Innovative Applications of Satellite and Ground Observations in Evaluating General Circulation Models*” Fall 2008 meeting, San Francisco, California (primary convener).
 - “*Variability and Predictability of Weather and Climate Hazards on Intraseasonal to Interannual Time Scales*”, Spring 2009 Joint Assembly, Toronto, Canada (co-convener).
 - “*Innovative Applications of Satellite and Ground Observations in Evaluating Large-Scale Models: Beyond the Resemblance Test*”, Fall 2010 meeting, San Francisco, California (primary convener).
 - “*Variability and Predictability of Weather and Climate Extremes*”, Fall 2010 meeting, San Francisco, California (co-convener).
 - “*Frontiers of the Radiation Parameterizations in the Climate and Weather Models*”, Fall 2015 meeting, San Francisco, California (primary convener and chair).
 - “*Arctic Energy Balance and Relevant Atmosphere and Surface Processes: Current Understanding and Challenges*”, Fall 2018 meeting, D.C. (primary convener and chair).
- **Convener and Chair** of special sessions in the AOGS (Asia and Oceanic Geosciences Society) annual meeting
 - “*Convective influences on the upper troposphere and lower stratosphere: challenges, opportunities, and pathways forward*”, 2014, Sapporo, Japan (co-convener and co-chair)
 - “*Frontiers and Challenges in the Applications of Radiative Transfer*”, 2018, Honolulu, US (primary convener and chair)

Awards and Honors

- NASA Langley's 2015 Henry J.E. Reid Award
- AOSS Departmental Outstanding Merit Faculty Award, the University of Michigan, 2015
- AOS postdoctoral fellowship, Princeton University, 12/2003
- Top of graduating class, 1997 USTC (One per department)

Current and Previous Grants (* for current grants)

Sole PI grants

21. *Refining the representations of high-latitude surface-atmosphere radiative coupling in the E3SM, DoE, 8/2021-8/2024, **\$787,680**.
20. *Understand the effect of solar spectral irradiance partition between the visible and near-IR on high-latitude surface climate through a bottom-up mechanism, NASA ROSES-2020, 7/2021-6/2025, **\$849,730**.
19. *On the use of AIRS and CrIS spectral observations and derived products in CERES EBAF data productions, NASA/LaRC, 09/2019-08/2023, **\$360,798**.
18. Evaluate the impact of TISIS observations on the simulated extra-tropical climate, NASA/GSFC, 11/2020-12/2021, **\$35,000**.
17. Incorporate More Realistic Surface-atmosphere Radiative Coupling in E3SM, DoE, 9/2018-9/2021, **\$1,041,098** (including \$285,000 directly to Brookhaven National Lab).
16. Spectral flux from multiple years of Aqua and SUOMI-NPP measurements: derivation, validation, and application in climate studies, NASA ROSES-2017, 6/2018-12/2021, **\$551,193**.
15. The inclusion of UM Spectral Flux data set into the AIRS Official Products, JPL/Caltech, 6/2019-6/2020, **\$64,985**.
14. Response of simulated climate to time-dependent spectral solar irradiance as observed at the TOA, NASA/GSFC, 08/2019-07/2020, **\$39,858**.
13. A weather-process and machine learning combined approach to improve solar forecast for PV power generation, University of Michigan, 09/2017-08/2019, **\$100,000**.
12. On the use of spectral observations and derived products in CERES EBAF data productions, NASA, 01/2016-12/2018 (extended to 08/2019), **\$363,142**.
11. Major improvements on the longwave radiative interactions between surface and clouds in the Polar Regions in atmospheric global circulation model (GCM), DoE BER, 01/2015-01/2018 (extended to 01/2019), **\$546,712**.
10. Understanding the longwave spectral variability: an integrated approach utilizing 11 years of AIRS observations and state-of-the-art GCM simulations and reanalyses data sets, NASA ROSES-2014, 11/2014-11/2017 (extended to 11/2018), **\$481,818**.
9. The synergy between longwave band-by-band radiation budget from AIRS and CERES and other A-Train cloud products in evaluating reanalysis data and GCMs: connecting biases in longwave radiation fields and in cloud fields, NASA ROSES-2013, 05/2014-05/2017 (extended to 05/2018), **\$428,624**.
8. Simulating the spectrally resolved climate monitoring mission using Amazon Cloud Computing, Amazon Climate Research Grant, 11/2014-10/2017, **5 millions of core hours of EC2 instances and \$15,000 Amazon Credit for computing**
7. Developing an off-line simulator based on PCRTM and spectral radiative kernel techniques for reliable and fast computing of both spectral radiance and spectral flux: towards testing climate models in the spectral domain, NASA ROSES-2013, 03/2014-03/2016 (extended to 03/217), **\$247,385**.
6. Understanding the far-IR variability and feedback: the last unexplored territory in radiation budget, NASA JPL, 10/2015-09/2016, **\$60,000**.
5. Understanding of the band-by-band longwave radiation budgets and cloud radiative forcings (CRFs): A synergistic approach with CERES, AIRS, and GCM simulations, **NASA ROSES-2010**, 04/2011-04/2014 (extended to 04/2015), **\$464,575**.
4. Proposal for participation in the science definition team for the CLARREO mission, **NASA ROSES-2010** (Research Opportunities in Space and Earth Sciences -2010), 02/2011-02/2014 (extended to 09/2015), **\$442,323 + \$29,110 (supplement)**.
3. Optimal Blending of EOS observations, Goddard Cumulus Ensemble model, and MERRA reanalysis: towards a better database for testing cloud parameterizations, **NASA Earth Science**

MAP, 05/2009-05/2013 (extended to 05/2014), **\$991,330 (\$773,168** awarded to Univ. of Michigan, the rest awarded to Co-I at NASA Goddard Space Flight Center by inter-federal-agency transfer).

2. Collaborative Research: Testing climate models by feedback analysis using AIRS and GPS occultation data, **NSF Climate and Large-Scale Dynamics program**, 07/2008-06/2011 (no cost extension to 06/2012), **\$243,796**.
1. Co-PI, The Large-scale dehydration process near the tropical tropopause: confront model with MLS, (JPL-PI: Hui Su) **JPL SURP, NASA**, 04/2007-09/2008, **\$30,000¹**.

Co-I (Institute PI) grants with PIs outside University of Michigan

7. *Libera, PI: Peter Pilewskie (Univ. Colorado at Boulder), **NASA EVC**, 3/2021-5/2032, **\$150M in total**, my share: **\$1,214,256**.
6. * Utilizing geostationary satellite observations to develop a next generation ice cloud optical property model in support of JCSDA Community Radiative Transfer Model (CRTM) and JPSS CAL/VAL, PI: Ping Yang (Texas A&M), **NASA ROSES20**, 08/2020-07/2023, my share: **\$93,753**.
5. *Polar Radiant Energy in the Far InfraRed Experiment (PREFIRE), PI: Tristan L'Ecuyer (Univ. Wisconsin at Madison), **NASA EVI-4**, 08/2018-12/2023, **\$35M** in total, my share: **\$860,000**.
4. A Comprehensive Analysis on Cloud Radiative Feedbacks by Cloud Type From A-Train Using Observation-based Cloud Radiative Kernel Method, PI: Qing Yue (NASA/JPL), **NASA ROSES15**, 08/2016-08/2019, my share: **\$120,000**.
3. Hyperspectral infrared earth radiance time series, PI: Lawrence L. Strow (UMBC), **NASA ROSES11**, 03/2013-03/2016, my share: **\$32,934**.
2. Radiative impact of cirrus clouds on tropical troposphere to stratosphere transport, PI: Hui Su (JPL), **NASA ROSES07**, 01/2009-12/2011, my share: **\$75,494** (\$30,000 for FY09, \$20,494 for FY10, \$25,000 for FY11).
1. Defining CLARREO in a Pre-Phase a Study: A Climate Observing System Simulation Experiment and Impact Study on the CLARREO Mission Architecture, PI: James Anderson (Harvard), **NASA Earth Science**, 04/2009-03/2010, my share: **\$70,954**.

Co-I grants with PIs at University of Michigan

2. Coupled Aerosol and Climate Models: An Intercomparison of the GFDL Model and the NCAR Model, PI: Joyce Penner (AOSS), **NSF Climate and Large-Scale Dynamics program**, 08/2010—07/2013, \$600,000, my share: **\$64,733**.
1. Process-based and object-based investigation of bias in the simulations of physical climate, PI: Richard Rood (AOSS), **NASA ROSES06**, 01/2008-01/2011, \$1,125,000, my share: **\$29,000**.

News Media Coverage of research findings

- “New NASA Data Sheds (Sun) Light on Climate Models”
<https://www.nasa.gov/feature/goddard/2021/new-nasa-data-sheds-sun-light-on-climate-models>
<https://scitechdaily.com/new-nasa-multi-wavelength-data-sheds-sun-light-on-climate-models/>

Publications (graduate advisees are highlighted with underlines; postdocs with italics;

¹ As specified in the JPL SURP research announcement, the nominal PI of the project must be the JPL employee even the majority of the grant goes to the partner university. \$30,000 was the amount awarded to University of Michigan. JPL portion was additional \$15,000 for this project.

undergraduate advises double underlined)

Peer-reviewed Book Chapter

R. Goody and **X. Huang**, 2015, Absorption and Thermal Emission. In: Gerald R. North (editor-in-chief), John Pyle and Fuqing Zhang (editors). *Encyclopedia of Atmospheric Sciences*, 2nd edition, Vol 5, pp. 5–12. ISBN: 9780123822253

N. Renno and **X. Huang**, 2015, Radiative–Convective Equilibrium Climate Models. In: Gerald R. North (editor-in-chief), John Pyle and Fuqing Zhang (editors). *Encyclopedia of Atmospheric Sciences*, 2nd edition, Vol 2, pp. 102-104. ISBN: 9780123822253

Peer-reviewed Journal Publications (35 first-authored articles, including 13 papers first-authored by graduate students directly supervised by me. In addition, seven articles first-authored by postdocs advised by me)

89. Xie, Y., **X. L. Huang**, X. H. Chen, T. L'Ecuyer, B. Drouin, Joint Use of Far-Infrared and Mid-Infrared Observation for Sounding Retrievals: Learning from the Past for Upcoming Far-Infrared Missions, *Earth and Space Science*, in press.
88. Bertossa, C., T. L'Ecuyer, A. Merrelli, **X. L. Huang**, X. H. Chen, A Neural Network Based Cloud Mask for PREFIRE and Evaluation with Simulated Observations, *Journal of Atmospheric and Oceanic Technology*, <https://doi.org/10.1175/JTECH-D-22-0023.1>, 2023.
87. Aumann, H., R. Wilson, A. Geer, **X. L. Huang**, X. H. Chen, S. DeSouza-Machado, X. Liu, Global Evaluation of the Fidelity of Clouds in the ECMWF Integrated Forecast System, *Earth and Space Science*, <https://doi.org/10.1029/2022EA002652>, 2023.
86. **Huang, X. L.**, X. H. Chen, C. X. Fan, S. Kato, N. Loeb, M. Bosilovich, S.-H. Ham, F. G. Rose, L. L. Strow, A synopsis of AIRS global-mean clear-sky radiance trends from 2003 to 2020, *JGR-Atmospheres*, 127 (24), e2022JD037598, <https://doi.org/10.1029/2022JD037598>, 2022.
85. Golaz, J.-C. and the entire DoE E3SM modeling team (including **X.L. Huang**), The DOE E3SM Model Version 2: Overview of the physical model and initial model evaluation, *Journal of Advances in Modeling Earth Systems*, 14 (12), e2022MS003156, <https://doi.org/10.1029/2022MS003156>, 2022.
84. Peterson, C., **X. L. Huang**, X. H. Chen, P. Yang, Synergistic use of Far- and Mid-Infrared Spectral Radiances for Satellite-based Detection of Polar Ice Clouds over Ocean, *JGR-Atmospheres*, 127 (9), e2021JD035733, <https://doi.org/10.1029/2021JD035733>, 2022.
83. Xie, Y., **X. L. Huang**, X. H. Chen, T. L'Ecuyer, B. Drouin, J. Wang, Retrieval of Surface Spectral Emissivity in Polar Regions based on the Optimal Estimation Method, *JGR-Atmospheres*, 127, e2021JD035677, <https://doi.org/10.1029/2021JD035677>, 2022.
82. Ren, T., P. Yang, J. Wei, **X. L. Huang**, H. Y. Sang, Performance of cloud 3D solvers in ice cloud shortwave radiation closure over the equatorial western Pacific Ocean, *Journal of Advances in Modeling Earth Systems*, 14(2), e2021MS002754, <https://doi.org/10.1029/2021MS002754>, 2022.
81. Fan, C. X. and **X. L. Huang**, Direct impact of solar farm deployment on surface longwave radiation, *Environmental Research Communications*, <https://doi.org/10.1088/2515-7620/ac40f1>, 3(12), 2021.
80. Flanner, M. G., J. B. Arnheim, J. M. Cook, C. Dang, C. He, **X. L. Huang**, D. Singh, S. M. Skiles, C. A.

- Whicker, C. S. Zender, SNICAR-ADv3: a community tool for modeling spectral snow albedo, *Geoscientific Model Development*, 14, 7673-7704, <https://doi.org/10.5194/gmd-14-7673-2021>, 2021.
79. Stephens G. L., P. Pilewskie, O. V. Kalashnikova, J. J. Gristey, D. R. Thompson, **X. L. Huang**, M. Lebsock, S. Schmidt, The spectral nature of Earth's reflected radiation: measurement and science applications, *Frontiers in Remote Sensing*, 2:664291, <https://doi.org/10.3389/frsen.2021.664291>, 2021.
78. L'Ecuyer, T. and the entire PREFIRE science team (including **X. L. Huang**), The Polar Radiant Energy in the Far InfraRed Experiment: A New Perspective on Polar Longwave Energy Exchanges, *Bulletin of American Meteorological Society*, 102(7), E1431-E1449, <https://doi.org/10.1175/BAMS-D-20-0155.1>, 2021.
77. Jing, X. W., **X. L. Huang**, X. H. Chen, D. L. Wu, P. Pilewskie, O. Coddington, E. Richard, Direct influence of solar spectral irradiance on the high-latitude surface climate, *Journal of Climate*, 34(10), 4145-4158, <https://doi.org/10.1175/JCLI-D-20-0743.1>, 2021.
76. Chen, Y.-H., **X. L. Huang**, P. Yang, C.-P. Kuo, X. H. Chen, Seasonal Dependent Impact of Ice-Cloud Longwave Scattering on the Polar Climate, *Geophysical Research Letters*, 47(23), e2020GL090534, <https://doi.org/10.1029/2020GL090534>, 2020.
75. Fan, C. X. and **X. L. Huang**, Satellite-observed changes of surface spectral reflectances due to solar farming and the implication for radiation budget, *Environmental Research Letters*, 15(11), 114047, <https://doi.org/10.1088/1748-9326/abbdea>, 2020.
74. Murray, J., H. Brindley, S. Fox, C. Bellisario, J. Pickering, C. Fox, R. C. Harlow, M. Smith, D. Anderson, **X. L. Huang**, X. H. Chen, A. Last, R. Bantges, Retrievals of high latitude surface emissivity across the infrared from high altitude aircraft flights, *JGR-Atmospheres*, 125(22), e2020JD033672, <https://doi.org/10.1029/2020JD033672>, 2020.
73. Chen, X. H., **X. L. Huang**, and L. L. Strow, Near-global CFC-11 Trends as Observed by Atmospheric Infrared Sounder from 2003 to 2018, *JGR-Atmospheres*, 125(22), e2020JD033051, <https://doi.org/10.1029/2020JD033051>, 2020.
72. Saito, M., P. Yang, **X. L. Huang**, H. E. Brindley, M. G. Mlynczak, B. H. Kahn, Spaceborne Mid- and Far-infrared Observations Improving Nighttime Ice Cloud Property Retrievals, *Geophysical Research Letters*, 47, e2020GL087491, <https://doi.org/10.1029/2020GL087491>, 2020.
71. Palchetti, L. and the entire FORUM science team, FORUM: unique far-infrared satellite observations to better understand how Earth radiates energy to space, *Bulletin of American Meteorological Society*, 101 (12), E2030–E2046, <https://doi.org/10.1175/BAMS-D-19-0322.1>, 2020
70. Peterson, C. A., Q. Yue, B. Kahn, E. Fetzer, **X. L. Huang**, Evaluation of AIRS Arctic Cloud Phase Classification against Combined CloudSat-CALIPSO Observations, *Journal of Applied Meteorology and Climatology*, 59(8): 1277–1294, doi.org/10.1175/JAMC-D-20-0016.1, 2020.
69. Kato, S., D. Rutan, F. Rose, T. Caldwell, S.-H. Ham, A. Radkevich, T. Thorsen, A. Viudez-Mora, D. Fillmore, **X. H. Huang**, Uncertainty in satellite-derived surface irradiances and challenges in producing surface radiation budget climate data record, *Remote Sensing*, 12(12), 1950, <https://doi.org/10.3390/rs12121950>, 2020.
68. Ren, T., P. Yang, C. Schumacher, **X. H. Huang**, W. Y. Lin, Impact of cloud longwave scattering on

- radiative fluxes associated with the Madden-Julian Oscillation in the Indian Ocean and Maritime Continent, *JGR-Atmospheres*, *JGR-Atmospheres*, 125(13), <https://doi.org/10.1029/2020JD032591>, 2020.
67. Chen, X. H., **X. L. Huang**, Y. F. Cai, H. M. Shen, J. Y. Lu, Intra-day Forecast of Ground Horizontal Irradiance Using Long Short-Term Memory Network (LSTM), *Journal of the Meteorological Society of Japan*, 98(5), <https://doi.org/10.2151/jmsj.2020-048>, 2020.
66. Pan, F., S. Kato, F. G. Rose, A. Radkevich, X. Liu, X. L. Huang, An algorithm to derive temperature and humidity profile changes using spatially and temporally averaged spectral radiance differences, *Journal of the Atmospheric and Oceanic Technology*, <https://doi.org/10.1175/JTECH-D-19-0143.1>, 2020.
65. Ren, T., P. Yang, G. L. Tang, **X. L. Huang**, E. Mlawer, Improved delta-Eddington approximation for optically thin clouds, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 240, 106694, [10.1016/j.jqsrt.2019.106694](https://doi.org/10.1016/j.jqsrt.2019.106694), 2020.
64. Kuo, C.-P., P. Yang, **X. L. Huang**, Y.-H. Chen, G.S. Liu, Assessing the accuracy and efficiency of longwave radiative transfer models involving scattering effect with cloud optical property parameterizations, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 240, 106683, [10.1016/j.jqsrt.2019.106683](https://doi.org/10.1016/j.jqsrt.2019.106683), 2020
63. Peterson, C., X.H. Chen, Q. Yue, **X.L. Huang**, The Spectral Dimension of Arctic Outgoing Longwave Radiation and Greenhouse Efficiency Trends from 2003-2016, *JGR-Atmospheres*, 124, doi.org/10.1029/2019JD030428, 2019.
62. Chen, Y.-H., X.L. Huang, X. H. Chen, M. G. Flanner, The Effects of Surface Longwave Spectral Emissivity on Atmospheric Circulation and Convection over the Sahara and Sahel, *Journal of Climate*, 32(15), 4873-4890, doi.org/10.1175/JCLI-D-18-0615.1, 2019.
61. Wu, K., J. N. Li, J. Cole, **X.L. Huang**, K. vo Salzen, F. Zhang, Accounting for Several Infrared Radiation Processes in Climate Models, *Journal of Climate*, 32 (15), 4601-4620, [10.1175/JCLI-D-18-0648.1](https://doi.org/10.1175/JCLI-D-18-0648.1), 2019.
60. **Huang, X.L.**, X. H. Chen, Q. Yue, Band-by-band contributions to the longwave cloud radiative feedbacks, *Geophysical Research Letters*, 46, [10.1029/2019GL083466](https://doi.org/10.1029/2019GL083466), 2019.
59. Yue, Q., B. H. Kahn, E. J. Fetzer, S. Wong, **X. L. Huang**, M. Schreier, Temporal and Spatial Characteristics of Short-term Cloud Feedback on Global and Local Interannual Climate Fluctuations from A-Train Observations, *Journal of Climate*, 32(5), 1875-1893, [10.1175/JCLI-D-18-0335.1](https://doi.org/10.1175/JCLI-D-18-0335.1), 2019.
58. Pan, F., **X. L. Huang**, The spectral dimension of relative humidity feedbacks in the CMIP5 experiments, *Journal of Climate*, 31(24), 10021-10038, [10.1175/JCLI-D-17-0491.1](https://doi.org/10.1175/JCLI-D-17-0491.1), 2018.
57. X.H. Chen, **X. L. Huang**, X. Q. Dong, B. K. Xi, E. Dolinar, N. Loeb, S. Kato, P. Stackhouse, M. Bosilovich, Using AIRS and ARM SGP clear-sky observations to evaluate meteorological reanalyses: a hyperspectral radiance closure approach, *JGR-Atmospheres*, 123 (20), 11720-11734, [10.1029/2018JD028850](https://doi.org/10.1029/2018JD028850), 2018.
56. Aumann, H. H., X. H. Chen, E. Fishbein, A. Geer, S. Havemann, **X. L. Huang**, X. Liu, G. Liuzzi, S. DeSouza-Machado, E. M. Manning, G. Masiello, M. Matricardi, I. Moradi, V. Natrai, C. Serio, L. L. Strow, J. Vidot, R. C. Wilson, W. Wu, Q. G. Yang, Y. L. Yung, Evaluation of Radiative Transfer Models with Clouds, *JGR-Atmospheres*, 123(11), 6142-6157, [doi:10.1029/2017JD28073](https://doi.org/10.1029/2017JD28073), 2018.

55. Tang, G. L., P. Yang, G. W. Kattawar, **X. L. Huang**, E. J. Mlawer, B. A. Baum, M. D. King, Improvement of the simulation of cloud longwave scattering in broadband radiative transfer models, *Journal of the Atmospheric Sciences*, 75(7), 2217-2233, doi:10.1175/JAS-D-18-0014.1, 2018.
54. Kato, S., F. G. Rose, D. A. Rutan, T. J. Thorsen, N. G. Loeb, D. R. Doelling, **X. L. Huang**, W. L. Smith, W. Y. Su, S.-H. Ham, Surface Irradiances of Edition 4.0 Clouds and the Earth's Radiant Energy System (CERES) Energy Balanced and Filled (EBAF) Data Product, *Journal of Climate*, 31(11), 4501-4527, doi:10.175/JCLI-D-17-0523.1, 2018.
53. **Huang, X. L.**, X. H. Chen, M. G. Flanner, P. Yang, D. Feldman, C. Kuo, Improved representation of surface spectral emissivity in a global climate model and its impact on simulated climate, *Journal of Climate*, 31(9), 3711-3727, doi:10.1175/JCLI-D-17-0125, 2018.
52. Flanner, M. G., **X. L. Huang**, X. H. Chen, G. Krinner, Climate response to negative greenhouse gas forcing in polar winter, *Geophysical Research Letters*, 45, 1997–2004. doi.org/10.1002/2017GL076668, 2018.
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47. Liu, X., W. Wu, B. A. Wielicki, Q.G. Yang, S. H. Kizer, **X. L. Huang**, X. H. Chen, S. Kato, Y. L. Shea, M. G. Mlynchzak, Spectrally Dependent CLARREO Infrared Spectrometer Calibration Requirement for Climate Change Detection, *Journal of Climate*, 30, 3979-3998, doi:10.1175/JCLI-D-1600704.1, 2017.
46. *Chen, X. H.*, **X. L. Huang**, C. Y. Jiao, M. G. Flanner, T. Raeker, B. Palen, Running climate model on a commercial cloud computing environment: A case study using Community Earth System Model (CESM) on Amazon AWS, *Computers & Geosciences*, 98, 21-25, doi:10.1016/j.cageo.2016.09.14, 2017.
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44. Kahn, B. H, **X. L. Huang**, G. L. Stephens, W. D. Collins, D. R. Feldman, H. Sui, S. Wong, and Q. Yue, ENSO regulations of far- and mid-infrared contributions to clear-sky OLR, *Geophys. Res. Letts.*, 43, 8751-8759, doi:10.1002/2016GL070263, 2016.

43. **Huang, X.L.**, X.H. Chen, D.K. Zhou, X. Liu, An observationally based global band-by-band surface emissivity dataset for climate and weather simulations, *J. Atmos. Sci.*, 73, 3541-3555, doi:10.1175/JAS-D-15-0355.1, 2016.
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37. **Huang, X. L.**, X. H. Chen, B. J. Soden, X. Liu, The spectral dimension of longwave feedbacks in the CMIP3 and CMIP5 experiments, *Geophysical Research Letters*, 41, doi:10.1002/2014GL061938, 2014.
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35. **Chen, X. H.**, **X. L. Huang**, M. G. Flanner, Sensitivity of modeled far-IR radiation budgets in polar continents to treatments of snow surface and ice cloud radiative properties, *Geophysical Research Letters*, 41, doi:10.1002/2014GL061216, 2014.
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32. **Chen, X.H.** and **X.L. Huang**, Usage of differential absorption method in the thermal IR: a case study of quick estimate of clear-sky column water vapor, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 104, 99-106, 2014.
31. **Wang, C.P.**, and **X.L. Huang**, Parallax Correction in the Analysis of Multiple Satellite Data Sets, *Geoscience and Remote Sensing Letters*, 11, 965-969, doi: 10.1109/LGRS.2013.2283573, 2014.
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- assumptions on the longwave spectral fingerprinting studies, *JGR-Atmospheres*, 118, 7309-7320, doi:10.1002/jgrd.50562, 2013.²
28. Renno, N.O. and Co-authors of the entire CHASER science team, CHASER: Clouds, Hazards, and Aerosols Survey for Earth Researchers, *Bulletin of American Meteorological Society*, 94(5), 685-694, doi:10.1175/BAMS-D-11-00239.1, 2013.
 27. **Huang, X.L.**, H.W. Chuang, A. Dessler, *X.H. Chen*, K. Minschwaner, Y. Ming, V. Ramaswamy, Radiative-convective equilibrium perspective of the weakening of tropical Walker circulation in response to global warming, *Journal of Climate*, 26(5), 1643-1653, doi:10.1175/JCLI-D-12-00288.1, 2013.
 26. **Huang, X.L.**, J. N.S. Cole, F. He, G.L. Potter, L. Oreopoulos, D.M. Lee, M. Suarez, N.G. Loeb, Longwave band-by-band cloud radiative effect and its application in GCM evaluation, *Journal of Climate*, 26(2), 450-467, doi:10.1175/JCLI-D-12-00112.1, 2013.
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 23. **Huang, X.L.**, N. G. Loeb, H.W. Chuang, Assessing stability of CERES-FM3 daytime longwave unfiltered radiance with AIRS radiances, *Journal of Atmospheric and Oceanic Technology*, 29(3), 375-381, doi:10.1175/JTECH-D-11-00066.1, 2012.
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 21. **Huang, X.L.** and Y. L. Yung, Reply to Comments on "A common misunderstanding about the Voigt line profile", *Journal of the Atmospheric Sciences*, 69(1), 414-415, doi:10.1175/JAS-D-11-0186.1, 2012.
 20. Wang, C.P., Z. J. Luo, **X.L. Huang**, Parallax correction in collocating CLOUDSAT and MODIS observations: method and application to convection study, *Journal of Geophysical Research-Atmospheres*, 116, D17201, doi:10.1029/2011JD016097, 2011.
 19. Kahn, B. H., J. Teixeira, E. J. Fetzer, A. Gettelman, S. M. Hristova-Veleva, **X.L. Huang**, A. K. Kochanski, M. Köhler, S. K. Krueger, R. Wood, and M. Zhao, Temperature and water vapor variance scaling in global models: Comparisons to satellite and aircraft data, *Journal of the Atmospheric Sciences*, 68(9), 2156-2168, 2011.
 18. Su, H., J. H. Jiang, J. Teixeira, A. Gettelman, **X.L. Huang**, G. Stephens, D. Vane, and V. S. Perun, Comparison of regime-sorted tropical cloud profiles observed by CloudSat with GEOS5 analyses and two general circulation model simulations, *JGR-Atmospheres*, 116, D09104, doi:10.1029/2010JD014971, 2011.
 17. Chuang, H.W., **X.L. Huang**, and K. Mischwaner, Interannual variations of tropical upper tropospheric humidity and tropical rainy-region SST: comparisons between models, reanalyses, and observations, *JGR-Atmospheres*, 115, D21125, doi:10.1029/2010JD014205, 2010.

² This article has been chosen as AGU Research Spotlight and reported on AGU newsletter, EOS.

16. **Huang, X.L.**, N.G. Loeb, and W.Z. Yang, Spectrally resolved fluxes derived from collocated AIRS and CERES measurements and their application in model evaluation, Part II: cloudy sky and band-by-band cloud radiative forcing over the tropical oceans, *JGR-Atmospheres*, 115, D21101, doi:10.1029/2010JD013932, 2010.
15. Keihm, S., S. Brown, S. Desai, W. Lu, C. Ruf, **X. Huang**, J. Teixeira, E. Fetzer, and Y. Yung, Ocean Water Vapor and Cloud Liquid Water Trends from 1992-2005 TMR Data, *JGR-Atmospheres*, 114, D18101, doi:10.1029/2009JD012145, 2009.
- 14³. **Huang, X.L.**, and H. Su, Cloud radiative effect on tropical troposphere to stratosphere transport represented in a large-scale model, *Geophysical Research Letters*, 35, L21806, doi:10.1029/2008GL035673, 2008.
13. LinHo, **X.L. Huang**, N.-C. Lau, Winter-to-Spring Transition in East Asia: A Planetary-Scale Perspective of the South China Spring Rain Onset, *Journal of Climate*, 21(13), 3081-3096, DOI:10.1175/2007JCLI1611.1, 2008.
12. **Huang, X.L.**, W.Z. Yang, N.G. Loeb, and V. Ramaswamy, Spectrally resolved fluxes derived from collocated AIRS and CERES measurements and their application in model evaluation, Part I: clear sky over the tropical oceans, *Journal of Geophysical Research-Atmospheres*, 113, D09110, doi:10.1029/2007JD009219, 2008.
11. Huang, Y., V. Ramaswamy, **X.L. Huang**, Q. Fu, and C. Bardeen, A strict test in climate modeling with spectrally resolved radiances: GCM simulation versus AIRS observations, *Geophysical Research Letters*, 34, L24707, doi:10.1029/2007GL031409.
10. **Huang, X.L.**, V. Ramaswamy, and M. Daniel Schwarzkopf, Quantification of the source of errors in AM2 simulated tropical clear-sky outgoing longwave radiation, *Journal of Geophysical Research – Atmospheres*, 111, D14107, doi:10.1029/2005JD006576, 2006.
9. Li, L., A.P. Ingersoll, **X.L. Huang**, Interaction of Moist Convection with Zonal Jets on Jupiter and Saturn, *Icarus*, 180(1), 113-123, doi:10.1016/j.icarus.2005.08.016, 2006.
8. **Huang, X.L.**, B.J. Soden, and D.L. Jackson, Interannual co-variability of tropical temperature and humidity: a comparison of model, reanalysis data and satellite observation, *Geophysical Research Letters*, 32, L17808, doi:10.1029/2005GL023375, 2005
7. Soden, B.J., D.L. Jackson, V. Ramaswamy, M.D. Schwarzkopf and **X.L. Huang**, The radiative signature of upper tropospheric moistening, *Science*, 310(5749), 841-844, 10.1126/science.1115602, 2005.
6. Natraj, V., X. Jiang, R.-L. Shia, **X.L. Huang**, J.S. Margolis, and Y.L. Yung, The Application of Principal Component Analysis in Fast, Highly Accurate and High Spectral Resolution Radiative Transfer Modeling: A Case Study of the O₂ A-band, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 95(4), 539-556, 2005.
5. **Huang, X.L.**, and Y. L. Yung, Spatial and spectral variability of the outgoing thermal IR spectra from AIRS: A case study of July 2003, *Journal of Geophysical Research – Atmospheres*, 110 (6), D12102, doi:10.1029/2004JD005530, 2005.
4. **Huang, X.L.**, and Y. L. Yung, A common misunderstanding about the Voigt line profile, *Journal of the Atmospheric Sciences*, 61(13), pp. 1630-1632, July 2004.
3. **Huang, X.L.**, J.J. Liu, and Y.L. Yung, Analysis of thermal emission spectrometer data using spectral EOF and tri-spectral methods, *Icarus*, 165(2), pp.301-314, October 2003.

³ This article has been selected as Editor's highlight article on *Geophysical Research Letters*

2. **Huang, X.L.**, Y.L. Yung, J.S. Margolis, Use of High-Resolution Measurements for the Retrieval of Temperature and Gas-Concentration Profiles from Outgoing Infrared Spectra in the Presence of Cirrus Clouds, *Applied Optics*, 42(12), pp. 2155-2165, April 2003.
1. **Huang, X.L.**, J. Farrara, S. S. Leroy, Y. L. Yung, and R. M. Goody, Cloud Variability as Revealed in Outgoing Infrared Spectra: Comparing Model to Observation with Spectral EOF Analysis, *Geophys. Res. Lett.*, 29(8), doi:10.1029/2001GL014176, 2002.

Submitted (graduate advisees are highlighted with underline, undergraduate advisees highlighted with underline and asterisk)

Invited Presentations at International Conferences and Workshops

1. **Huang, X.L.**, DoE Solar Forecasting Prize Panel, 2022 Meteorology & Market Design for Grid Services Workshop, Denver, Colorado, June 6-9, 2022.
2. **Huang, X.L.**, On the Direct Use of Spectrally Resolved Observations in Climate Studies, HM5B.3, Optical Society of America 2021 Optical Sensors and Sensing Congress. Hyperspectral Imaging and Sounding of the Environment, online virtual, July 19-23, 2021.
3. **Huang, X.L.**, Cloud Longwave Scattering: A Missing Link in Current Models for Realistic Atmosphere and Surface Radiative, AS43-A001, the 16th Asia Oceania Geosciences Society Annual Meeting, Singapore, July 28 – August 2, 2019.
4. **Huang, X.L.**, Challenges and opportunities in the far-IR remote sensing, HTu4C.1, 2019 Optical Society of America Hyperspectral Imaging and Sounding of the Environment Conference, San Jose, California, June 25-27, 2019.
5. **Huang, X.L.**, Spectrum: an underutilized dimension in climate modeling and diagnostics, 2018 Fall AGU, A24A-01, December 10-14, 2018.
6. **Huang, X.L.**, The benefit of far-IR measurements for a better understanding and model representation of the surface-atmospheric radiative coupling, the 1st workshop on the Far-IR Outgoing Radiation Understanding and Monitoring (FORUM) mission, Florence, Italy, October 23-25, 2018.
7. **Huang, X.L.**, Far-IR Remote Sensing of Our Planet: Challenges and Opportunities, Session of Light Scattering and Radiative Transfer: Basic Research and Application, 2018 Progress in Electromagnetics Research Symposium, Toyama, Japan, August 1-4, 2018.
8. **Huang, X.L.**, On the Use of Hyperspectral Observations in Climate Studies: Unveiling a Hidden Dimension, HW2F.2, 2016 Optical Society of America Hyperspectral Imaging and Sounding of the Environment, Leipzig, Germany, Nov 14-17, 2016.

Seminars, Colloquium, Invited Talks and Lectures (* for invited)

52. *Distinguished Climate Lecture, NASA/JPL, January 19, 2023
51. *Environmental Sciences and Engineering Seminar, Caltech, February 16, 2022
50. *Missoula Fire Sciences Laboratory, USDA, October 28, 2021
49. *Climate and Radiation Branch, NASA/Goddard Space Flight Center, May 1, 2019
48. *Department of Atmospheric Science, Colorado State University, September 21, 2018
47. *Atmosphere and Ocean Research Institute, the University of Tokyo, Japan, August 7, 2018
46. *Department of Earth System Sciences, Tsinghua University, China, June 22, 2018
45. *School of Earth and Atmospheric Sciences, Gatech, April 12, 2018
44. *Department of Chemical Engineering, University of Iowa, April 27, 2017
43. Department of Meteorology, University of Reading, Reading, UK, October 17, 2016.
42. China University of Geosciences, Wuhan, China, August 10, 2016.
41. Institute of Geodesy and Geophysics, Chinese Academy of Sciences, Wuhan, China, August 08, 2016

40. * DoE ACME (Accelerated Climate Model for Energy) PI meeting, Rockville, MD, June 08, 2016.
40. School of Environmental Sciences and Engineering, South Univ. of Science and Technology of China, Shenzhen, China, March 30, 2016.
39. Atmospheric, Chemistry, Dynamics and Radiation Seminar Series, JPL/Caltech, Oct 26, 2015.
38. Yuk Lunch Special Seminar, Division of Geological and Planetary Science, Caltech, Oct 23, 2015
37. Seminar series, Geophysical Fluid Dynamics Lab, NOAA, July 22, 2015
36. * Weekly seminar, Research Center for Environmental Changes, Academia Sinica, Taiwan, Republic of China, June 17, 2015
35. Weekly seminar, PCMDI (Program for Climate Model Diagnostics and Intercomparisons), Lawrence Livermore National Laboratory, May 12, 2015
34. Seminar series, Geophysical Fluid Dynamics Lab, NOAA, July 02, 2014
33. * Weekly seminar, Research Center for Environmental Changes, Academia Sinica, Taiwan, Republic of China, May 21, 2014
32. * Departmental seminar, Department of Atmospheric Sciences, National Central University, Taiwan, Republic of China, May 13, 2014
31. * Departmental seminar, Department of Atmospheric Sciences, National Taiwan University, Taiwan, Republic of China, May 08, 2014
30. * Departmental seminar, Department of Meteorology, Pennsylvania State University, State College, PA, October 31, 2013
29. Atmospheric and Oceanic Research Institute, Tokyo University, Japan, August 2013
28. Laboratory for Middle Atmosphere and Global Environment Observation, Institute of Atmospheric Physics, China Academy of Sciences, August 2012
27. The Center of Earth System Sciences, Tsinghua University, China, August 2012
26. Department of Atmospheric and Oceanic Sciences, Peking University, China, August 2012
25. Departmental seminar, Dept. of Atmos. Sci., Texas A&M University, March 2012
24. Seminar series, Geophysical Fluid Dynamics Lab, NOAA, July 20, 2011
23. Department of Oceanic Meteorology, Ocean University of China, June 2011
22. Department of Atmospheric and Oceanic Sciences, Peking University, June 2011
21. * Departmental seminar, Dept. of Atmos. Sci., Texas A&M University, September 28, 2010
20. Shanghai Typhoon Institute, China Meteorological Administration, August 2, 2010
19. Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, July 29, 2010
18. Institute of Atmospheric Physics, Chinese Academy of Sciences, July 27, 2010
17. NOAA CREST center at City College of New York Seminar Series, Jun 10, 2010
16. NASA JPL Atmospheric Chemistry, Dynamics, and Radiation Seminar Series, May 28, 2010
15. * (2-hour lecture) Observed and modeled radiative impact of tropical tropopause cirrus on troposphere-to-stratosphere transport. *The Beijing International Summer School (BISS) on Climate Environment (2009): Climate Dynamics and Physics*, Beijing, China, August 10-19, 2009
14. * (2-hour lecture) Matchmaking of climate observations and climate models: where shall they meet? *The Beijing International Summer School (BISS) on Climate Environment (2009): Climate Dynamics and Physics*, Beijing, China, August 10-19, 2009
13. * 52nd Annual Conference on Great Lakes Research, session 22 *Climate Variability and Its Impacts on Environment and Ecosystems in the Great Lakes Region*, Ohio, 05/2009
12. Applied Physics Program, University of Michigan, 12/2008
11. Institute of Atmospheric Physics, China Academy of Science, China, 10/2008
10. School of Earth and Space Sciences, University of Science & Technology of China, China, 10/2008
9. Anderson's Group, Earth and Planetary Sciences, Harvard University, 07/2007
8. Department of Atmospheric, Oceanic, and Space Sciences, University of Michigan, 03/2007
7. * Department of Physics Seminar, University of Maryland at Baltimore County, 05/2006

6. *Department of Environmental Sciences Seminar, Rutgers, the State University of New Jersey, 02/2006
5. *Department of Atmospheric, Oceanic, and Space Sciences Seminar, University of Michigan, 02/2006
4. *Atmospheric Science Seminar, the University of Arizona, 04/2005
3. *Formal Seminar, Geophysical Fluid Dynamics Laboratory, NOAA, 10/2003
2. *AIRS (Atmospheric Infrared Sounder) team seminar, JPL, 09/2003
1. AIRS (Atmospheric Infrared Sounder) team seminar, JPL, 08/2002

Services to University of Michigan

- 2022-2023 Convener, the LAUNCH committee for M. Radaideh by the ADVANCE program
- 2022-2023 Member, College of Engineering nomination committee
- 2022-2023 Member, CLASP climate science faculty search committee
- 2021-2022 Member, CLASP space science faculty search committee
- 2021-present Chair, CLASP award nomination committee
- 2020 Member, the Promotion Review Committee for Dr. Christiane Jablonowski
- 2019-2020 Member, CLASP planetary science faculty search committee
- 2018-2021 Member, CLASP executive committee
- 2018-present Member, CLASP alumni and friends committee
- 2018-2021 Member, CLASP award nomination committee
- 2018-2019 Member, ADVANCE program LAUNCH committee for Dr. Ángel Adames
- 2018 Member, the Promotion/Tenure Review Committee for Dr. Eric Kort
- 2017-2018 Member, CLASP Chair search committee
- 2016-2017 Chair, CLASP faculty search committee
- 2014-2018 Chair, AOSS/CLASP Graduate Program
- 2014 Chair, the Promotion Review Committee for Dr. Darren McKague
- 2012-2013 Chair, AOSS faculty search committee
- 2012-2013 AOSS Ph.D. Qualify exam committee member
- 2011-2014 CoE (College of Engineering) International Program Committee member
- 2010-2011 Co-chair of AOSS departmental seminar
- 2009-2011 CoE (College of Engineering) Scholastic Standing Committee member
- 2009-2011 AOSS Executive committee member
- 2008-2009 AOSS departmental seminar committee member
- 2008 Fall AOSS undergraduate recruiting committee member
- 2008 AOSS Ph.D. Qualify exam committee member
- 2007 Faculty Marshal for the University spring commencement ceremony
- Qualify oral exam committee member for various graduate students
- Ph.D. thesis committee member for
Shih-Yu Lee (Geology, 2008); Minghuai Wang (AOSS, 2009); Cheng Zhou (AOSS, 2009); Anthony Visco (Applied Physics, 2012); Yuxing Yun (AOSS, 2012); Andrew J. Crow (AERO, 2013); Justin Perket (AOSS, 2015); Xiaojing Du (Earth Environ Sci., 2020); Sophia Macarewich (Earth Environ Sci., 2021); Jiyue Zhu (EECS, 2021); Weihui Gu (EECS, 2022); Tanner Douglas (EECS, 2022); Sydney Gable (Earth Environ Sci., Present); Chloe Whicker (CLASP, Present).

Teaching Experience

• University of Michigan

Instructor for

Climate350/Space350/Earth351 (Atmospheric Thermodynamics)

An Upper-division core course for all undergraduates majored in climate science and climate impact engineering

AOSS380/Climate380/Space380 (An Introduction to Radiative Transfer)

An Upper-division core course for all undergraduates majored in Climate and Space sciences and engineering

AOSS532/Climate532/Space532 (Radiative Transfer)

Core course for graduate students in both climate and space sciences and engineering

AOSS586/Climate586/Space586 (AOSS605-002 in Fall 2010) (Advanced Data Analysis, previous name: Climate Data Analysis)

Elective course for Ph.D. students and core course for Master of Engineering in Applied Climate

• **Princeton University**

July 2004-June 2006

Guest lecturer for a graduate-level course, *Atmospheric Radiation*

Supervised Postdoctoral Scholars and Students

• Postdocs:

Past: Wenze Yang (Sr. Software Engineer, Oculli),

Baohua Chen (Teaching assistant professor, TAMU-Corpus Christi)

Lei Song (Associate Director of HAAS, Institute of Atmospheric Physics, China Academy of Sciences)

Xiuhong Chen (Application Programmer/Senior Analyst, Univ. of Michigan)

Xianwen Jing (Associate Professor, Hubei Normal University)

• Ph.D. students:

Current: Sole-chaired: Chongxing Fan, Yan Xie

Past: Co-chaired: Li Xu, 2012 (with Joyce Penner; research scientist, UC Irvine)

Sole-chaired: Hui-wen Chuang, 2012 (Private sector, Taiwan)

Chunpeng Wang, 2014 (Applied Scientist II, Amazon, USA)

Fang Pan, 2017 (Software engineer, JD Digits)

Yi-Hsuan Chen, 2019 (AOS Postdoc, Princeton University)

Colten Peterson, 2022 (NASA NPP Postdoc, Goddard Space Flight Center)

• M.S. students:

Past: Lu Ren (Central Meteorological Administration, China), Hongze Cheng (TD Engine, China),

Zach Fair (Univ. Michigan), Haoming Shen (EECS, Univ. Michigan)

• Undergraduate Students:

Past: Qian Li (Mathematics), Christopher Thomas (Nuclear Engineering), Lekeisha Suggs

(Aerospace), David Reed (AOSS), Ghassan Alaka, Jr. (AOSS), Andrew Chen (Northwestern

University), Han Wang (USTC, China), Trent Key (AOSS), Edric Guo (EECS), Jiayue Lu (EECS); YiFan

Cai (SJTU, China), Yunfei Ma (MIT)

• Highschool interns:

Current: Eric Zhao and Akshar Cowlagi (Huron Highschool, Ann Arbor), Derrick Zhao (Union county magnet school, New Jersey)

Professional Affiliation

• **Members of:**

American Geophysical Union

American Meteorological Society

Selected Regular Conference Abstracts and Proceedings (graduate advisees are highlighted with underline, undergraduate advisees are highlighted with underline and asterisk)

1. Fan, C., Chen, Y., Jing, X., Chen, X., Lin, W., **Huang, X. L.**, & Yang, P. An Overall Assessment of the Ice-Cloud Longwave Scattering Effects on the Simulated Global Climate. 36th Conference on Climate Variability and Change, 103rd AMS Annual Meeting. Denver, CO, USA. January 8-12, 2023.
2. Fan, C., & **Huang, X. L.**, Satellite-observed changes of surface reflectance, emissivity, and temperature due to solar farming and the implication for radiation budget. 14th Conference on Weather, Climate, and the New Energy Economy, 103rd AMS Annual Meeting. Denver, CO, USA. January 8-12, 2023.
3. Raghuraman S. P., D. Paynter, V. Ramaswamy, R. Menzel, and **X. L. Huang**, Direct Infrared Spectral Observations of Global Greenhouse Gas Forcing and Feedback, A14G-01, 2022 Fall AGU meeting, Chicago, Dec 12-16, 2022.
4. Xie, Y., **X. L. Huang**, X. H. Chen, T. L'Ecuyer, and B. Drouin, On the use of far-IR radiances in satellite retrievals: how can the observations collected half century ago help us preparing for the upcoming missions, A32B-03, 2022 Fall AGU meeting, Chicago, Dec 12-16, 2022.
5. X. H. Chen, **X. L. Huang**, D. Wu, P. Pilewskie, O. Coddington, Response of Surface Climate to the Variation of Solar Spectral Irradiance: a Sensitivity Study, GC31F-03, 2022 Fall AGU meeting, Chicago, Dec 12-16, 2022.
6. **X. L. Huang**, X. H. Chen, N. G. Loeb, S. Kato, Longwave spectral radiative feedbacks as revealed from models, two decades of satellite observations, and reanalysis, A45L-2008, 2022 Fall AGU meeting, Chicago, Dec 12-16, 2022.
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8. **X. L. Huang**, A climate data record of spectral OLR from hyperspectral observations: Unveiling a hidden dimension in the earth radiation budget, the WMO 2nd Climate Observation Conference, Darmstadt, Germany, Oct 17-19, 2022.
9. Y. Xie, **X. L. Huang**, X. H. Chen, T. L'Ecuyer, B. Drouin, How can far-IR radiances observed half a century ago help us prepare for the upcoming missions, Princeton Center for Theoretical Science Workshop: From Spectroscopy to Climate, Princeton, New Jersey, August 22-24, 2022
10. **X. L. Huang**, *Studying climate through a spectral lens*, Princeton Center for Theoretical Science Workshop: From Spectroscopy to Climate, Princeton, New Jersey, August 22-24, 2022.
11. **X. L. Huang**, Y.-H. Chen, and Co-authors, Two missing physical processes in the climate models for the radiative coupling between cloud and surface in the polar regions, 3rd PAN-GASS meeting, Monterey, California, July 25-29, 2022.
12. C. X. Fan and **X. L. Huang**, Satellite-Observed Changes of Surface Radiative Properties due to Solar Farming and the Implication for Radiation Budget, 2022 International Radiation Symposium, Thessaloniki, Greece, July 4-8, 2022.
13. **X. L. Huang**, P. Yang, and Co-authors, High-latitude surface-atmosphere radiative coupling in the far-IR: missing physics in climate models and opportunities in future observations, 2022 International Radiation Symposium, Thessaloniki, Greece, July 4-8, 2022.
14. C. A. Peterson, **X. L. Huang**, X. H. Chen, P. Yang, Synergistic use of Far- and Mid-Infrared Spectral Radiances for Polar Cloud Phase Determination from Space, Part I: Ice Thermodynamic Phase, A34A-01, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
15. C. X. Fan and **X. L. Huang**, Solar Farm as an Ideal Test Bed for Satellite Surface Emissivity and Temperature Retrieval Algorithms, A15D-1667, 2021 Fall AGU Meeting, New Orleans, Dec 13-17,

- 2021.
16. J. Wei, P. Yang, S. F. DiMarco, and **X. L. Huang**, The impact of improving ocean surface albedo on hydrological responses in the community earth system model, A55P-1627, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
 17. P. Yang, J. J. Coy, M. Saito, L. D. Chen and **X. L. Huang**, Ice cloud property retrievals with the GOES-16 satellite observations based on an improved ice cloud optical property model, A22B-06, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
 18. X. H. Chen, **X. L. Huang**, Q. Liang and P. A. Newman, CFC-11 Column Concentration Retrieved from AIRS and CrIS with Near-global Coverage, A23D-05, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
 19. **X. L. Huang**, X. H. Chen, C. X. Fan, W. Y. Lin, P. Yang, The impact of high-latitude longwave radiative couplings on the Arctic sea-ice simulation by the E3SM, GC55A-0399, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
 20. Y. Xie, **X. L. Huang**, X. H. Chen, T. L'Ecuyer, B. Drouin and J. Wang, Retrieval of surface spectral emissivity in the polar regions using different a priori constraints, A15D-1658, 2021 Fall AGU Meeting, New Orleans, Dec 13-17, 2021.
 21. C.X. Fan, & **X L Huang**, Use different machine-learning algorithms for clear-sky detections in infrared hyperspectral observations: assessment and physical interpretability. Session 1B: AI for Weather and Climate, 3rd NOAA Workshop on Leveraging AI in Environmental Sciences, September 13-17, 2021.
 22. **X. L. Huang**, On the Direct Use of Spectrally Resolved Observations in Climate Studies, HM5B.3, Optical Society of America 2021 Optical Sensors and Sensing Congress/ Hyperspectral Imaging and Sounding of the Environment, online virtual, July 19-23, 2021.
 23. C. A. Peterson and **X. L. Huang**, Cloud Phase Classification in the Arctic using Far-Infrared Radiances, A210-0018, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 24. C. X. Fan and **X. L. Huang**, Satellite-Observed Changes of Surface Spectral Reflectances due to Solar Farming and the Implication for Radiation Budget, GC135-10, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 25. H. E. Brindley, J. Murray, S. Fox, C. Bellisario, C. Fox, C. Harlow, **X. L. Huang**, R. J. Bantges, A. Last, X. H. Chen and J. C. Pickering, Retrieval of high latitude surface emissivity across the far and mid-infrared from a high-altitude aircraft flight, A230-0010, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 26. M. Saito, P. Yang, and **X. L. Huang**, Exploiting ABI/GOES multiband observations for ice cloud property retrievals, A008-0010, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 27. T. S. L'Ecuyer, B. Drouin, A. J. Merrelli, **X. L. Huang**, B. H. Kahn, J. E. Kay, N. Schlegel, N. Miller, C. A. Peterson, S. Padmanabhan and B. Lim, The Polar Radiant Energy in the Far InfraRed Experiment (PREFIRE): Characterizing Far InfraRed Emission from Earth's Polar Regions, A239-03, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 28. X. H. Chen and **X. L. Huang**, Evaluation of Arctic Meteorological Fields in Reanalyses Using Satellite Observed Clear-sky Hyperspectral Radiances, A144-0011, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 29. **X. L. Huang**, X. W. Jing, Y.-H. Chen and P. Yang, High-latitude surface-atmosphere radiative coupling in the far-IR: missing physics in climate models and opportunities in future observations, GC123-07, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 30. X. W. Jing, **X. L. Huang**, X. H. Chen, D. L. Wu, O. Coddington, E. C. Richard, P. Pilewskie, Direct influence of solar spectral irradiance on the high-latitude surface climate: a surface radiation budget perspective, A237-03, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
 31. Y. Xie and **X. L. Huang**, Retrieval of surface spectral emissivity in the polar regions: an optimal-

- estimation approach, A239-07, 2020 Fall AGU Meeting, online, Dec 1-17, 2020.
32. C. A. Peterson, Q. Yue, B. H Kahn, E. J. Fetzer and **X. L. Huang**, Evaluation of AIRS Arctic Cloud Phase Classification against Combined CloudSat-CALIPSO Observations, A53K-3026, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 33. M. Flanner, **X. L. Huang**, X. H. Chen and G. Krinner, The Polar Winter Anti-Greenhouse Effect: Surface Temperature Impacts, Dependence on Inversion Strength, and Geoengineering Potential, A52A-04, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 34. P. Yang, M. Saito, **X. L. Huang**, and B. H. Kahn, Sensitivity study of ice cloud radiative property for future spaceborne far-infrared remote sensing applications, A21Q-2620, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 35. T. Ren, P. Yang, and **X. L. Huang**, Radiative cooling uncertainties introduced by neglecting cloud longwave scattering from the Indian Ocean to the Maritime Continent, A21Q-2629, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 36. W. Y. Lin, S. C. Xie, Q. Tang, Y. Y. Zhang and **X. L. Huang**, Evaluation of E3SM Atmospheric Simulations over Antarctica and the Southern Ocean, A13P-3050, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 37. X. H. Chen, and **X. L. Huang**, Near-global CFC-11 Trends as Observed by Atmospheric Infrared Sounder from 2002 to 2018, A33T-2891, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 38. **X. L. Huang**, Y.-H. Chen, X. H. Chen, P. Yang, C.-P. Kuo and W. Y. Lin, Seasonally dependent impact of cloud longwave scattering on the polar climate: why it is a missing physics in current climate models? A53K-3024, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 39. X. W. Jing, Y.-H. Chen, **X. L. Huang**, P. Yang, W. Y. Lin, Impact of including the longwave scattering effect of clouds on the Arctic energy budget and climate, A53K-3025, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 40. Y.-H. Chen, **X. L. Huang**, C.-P. Kuo, X. H. Chen, and P. Yang, A missing physics in climate models for the simulation of Southern Ocean: longwave radiative coupling between surface and atmosphere, A11J-2885, 2019 Fall AGU Meeting, San Francisco C.A., Dec 9-13, 2019.
 41. **Huang, X.L.**, Cloud Longwave Scattering: A Missing Link in Current Models for Realistic Atmosphere and Surface Radiative Couplings, Photonics & Electromagnetics Research Symposium 2019, Xiamen, China, Dec 17-20, 2019.
 42. **Huang, X.L.**, X.H. Chen, Q. Yue, G. Elsasser, K. Suzuki, X.W. Jing, Model-dependent cloud radiative kernels: derivations and applications, 2019 CFMIP Meeting on Clouds, Precipitation, Circulation, and Climate Sensitivity, Mykonos, Greece, Sep 30-Oct 4, 2019.
 43. Huang, X.L., F. Pan, S. Leroy, P. Lin, Y. Ming, V. Ramaswamy, The Stratospheric Changes Inferred from 10 Years of AIRS and AMSU-A Radiances, AS22-A002, the 16th Asia Oceania Geosciences Society Annual Meeting, Singapore, July 28 - August 2, 2019.
 44. (invited) **Huang, X.L.**, Cloud Longwave Scattering: A Missing Link in Current Models for Realistic Atmosphere and Surface Radiative, AS43-A001, the 16th Asia Oceania Geosciences Society Annual Meeting, Singapore, July 28 - August 2, 2019.
 45. **Huang, X.L.**, F. Pan, S. Leroy, P. Lin, Y. Ming, V. Ramaswamy, The Stratospheric Changes Inferred from 10 Years of AIRS and AMSU-A Radiances, AS22-A002, the 16th Asia Oceania Geosciences Society Annual Meeting, Singapore, July 28 - August 2, 2019.
 46. (invited) **Huang, X.L.**, Challenges and opportunities in the far-IR remote sensing, HTu4C.1, 2019 Optical Society of America Hyperspectral Imaging and Sounding of the Environment Conference, San Jose, California, June 25-27, 2019.
 47. C. Peterson, X. H. Chen, Q. Yue, **X. L. Huang**, The Spectral Dimension of Arctic Greenhouse Efficiency Changes from 2003 to 2016: Insights from Far-IR and Mid-IR Trends, EGU2019-3004,

- 2019 EGU Meeting, Vienna, Austria, Apr 7-12, 2019.
48. **X. L. Huang** and X. H. Chen, Some considerations for constructing global spectral OLR climatology from the FORUM mission: radiance-to-flux conversion and spatial gap filling, EGU2019-7959, 2019 EGU Meeting, Vienna, Austria, Apr 7-12, 2019.
 49. C. Bellisario, S. Tett, D. Feldman, C. Kuo, J. Manners, **X. L. Huang**, R. Essery, Impact of a spectrally resolved emissivity and its far-infrared variability in GCM, EGU2019-14707, 2019 EGU Meeting, Vienna, Austria, Apr 7-12, 2019.
 50. **X. L. Huang**, X. H. Chen, Q. Yue, Band-by-Band Contributions to the Longwave Cloud Radiative Feedbacks, 3A.8, 2019 AMS Annual Meeting, Phoenix, Arizona, Jan 6-10, 2019.
 51. X. H. Chen, H. M. Shen, J. Y. Lu*, **X. L. Huang**, Intraday Ground Horizontal Irradiance Forecasting Using LSTM, 5A.2, 2019 AMS Annual Meeting, Phoenix, Arizona, Jan 6-10, 2019.
 52. Y.-H. Chen, X. H. Chen, **X. L. Huang**, M. Flanner, The Effects of Surface Longwave Spectral Emissivity on Atmospheric Circulation and Convection over the Sahara and Sahel Regions, 896, 2019 AMS Annual Meeting, Phoenix, Arizona, Jan 6-10, 2019.
 53. C. Peterson, X. H. Chen, Q. Yue, **X. L. Huang**, The Spectral Dimension of Arctic Greenhouse Efficiency Changes during the Aqua Observation Period, A52B-03, 2018 Fall AGU Meeting, Washington D.C., Dec 10-14, 2018.
 54. Y.-H. Chen, X. H. Chen, C.-P. Kuo, X. L. Huang, P. Yang, The Role of Surface Emissivity and Ice Cloud Longwave Scattering on Simulated Climate in the Arctic, A53I-2600, 2018 Fall AGU Meeting, Washington D.C., Dec 10-14, 2018.
 55. C. Bellisario, S. FB Tett, H. E. Brindley, D. Feldman, J. Manners, R. Essery, **X.L. Huang**, Estimation of a spectrally resolved emissivity and its far-infrared variability in GCM, A52B-02, 2018 Fall AGU Meeting, Washington D.C., Dec 10-14, 2018.
 56. X. H. Chen, **X. L. Huang**, Q. Yue, Band-by-band contributions to the longwave cloud radiative feedbacks in the Arctic, A24A-06, 2018 Fall AGU Meeting, Washington D.C., Dec 10-14, 2018.
 57. **X. L. Huang**, X. H. Chen, J. F. Wang, Y. Deng, Surface energy budget in the Arctic: a maximum-entropy-production perspective, A13F-2521, 2018 Fall AGU Meeting, Washington D.C., Dec 10-14, 2018.
 58. C. Peterson, X. H. Chen, **X. L. Huang**, An Analytical Interpretation of the Simulated Greenhouse Efficiency in Response to the Change of CO₂, AS37-A011, 2018 AOGS meeting, Honolulu, Hawaii, Jun 4-8, 2018.
 59. X. H. Chen, **X. L. Huang**, N. G. Loeb, X. Q. Dong, B. K. Xi, E. Dolinar, M. G. Bosilovich, S. Kato, W. L. Smith, P. W. Stackhouse, A clear-sky hyperspectral closure study for MERRA-2 and ERA-interim reanalyses, AS51-A005, 2018 AOGS meeting, Honolulu, Hawaii, Jun 4-8, 2018.
 60. **X. L. Huang**, X. H. Chen, Q. Yue, Spectral Decomposition of Cloud Radiative Effect and Cloud Radiative Feedbacks, AS51-A006, 2018 AOGS meeting, Honolulu, Hawaii, Jun 4-8, 2018.
 61. **X. L. Huang**, X. H. Chen, M. Flanner, P. Yang, D. Feldman, C. Kuo, Impact of Inclusion of Realistic Surface Spectral Emissivity in the Global Climate Model on the Simulated Arctic Climate Mean States and Climate Changes, 9B.3, 2018 AMS Annual Meeting, Austin, Jan 7-11, 2018.
 62. **X. L. Huang**, X. H. Chen, M. Flanner, P. Yang, D. Feldman, C. Kuo, Reducing the biases in simulated polar climate by incorporating realistic surface spectral emissivity into the global climate model, Abstract C12B-06, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
 63. C. Kuo, D. Feldman, **X. L. Huang**, M. Flanner, P. Yang, X. H. Chen, Temporal Arctic longwave surface emissivity feedbacks in the Community Earth System Model, Abstract GC53E-0935, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
 64. Y.-H. Chen, C.-P. Kuo, **X. L. Huang**, P. Yang, X. H. Chen, The influence of Cloud Longwave Scattering together with a state-of-the-art Ice Longwave Optical Parameterization in Climate Model Simulations, Abstract A31E-2238, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.

65. C. Bellisario, H. E. Brindley, J. E. Murray, A. Last, J. Pickering, C. Harlow, S. Fox, C. Fox, M. Smith, D. Anderson, **X. L. Huang**, X. H. Chen, Retrievals of the Far Infrared emissivity of snow over the Greenland Plateau using the Tropospheric Airborne Fourier Transform Spectrometer (TAFTS), Abstract C21D-1143, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
66. X. H. Chen, **X. L. Huang**, N. G. Loeb, X. Q. Dong, B. K. Xi, E. Dolinar, M. G. Bosilovich, S. Kato, W. L. Smith, P. W. Stackhouse, A clear-sky hyperspectral closure study for MERRA-2 and ERA-interim reanalyses, Abstract A31F-2249, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
67. S.-H. Ham, N. G. Loeb, S. Kato, F. G. Rose, M. G. Bosilovich, D. A. Rutan, **X. L. Huang**, A. Collow, Clear-sky irradiance simulation using GMAO products and its comparison to ground and CERES satellite observation, Abstract A31F-2250, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
68. C.-P. Kuo, P. Yang, **X. L. Huang**, D. Feldman, M. Flanner, C. Kuo, E. J. Mlawer, The potential influence of multiple scattering on longwave flux and heating rate simulations with clouds, Abstract A31D-2201, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
69. Z. Fair, **X. L. Huang**, J.F. Wang, Y. Deng, The Applicability of Maximum Entropy Production Theory for Turbulent Heat Flux Modeling Over the Arctic, Abstract A53G-2354, 2017 Fall AGU meeting, New Orleans, Dec 11-15, 2017.
70. **Huang, X.L.**, X. H. Chen, M. Flanner, P. Yang, D. Feldman, C. Kuo, Improved Representation of Surface Spectral Emissivity in the GCM and its Impact on the Simulated Climate, AS18-A007, 2017 AOGS meeting, Singapore, Singapore, August 7-11, 2017.
71. F. Pan, **X. L. Huang**, S. S. Leroy, P. Lin, Y. Ming, V. Ramaswamy, D. Feldman, M. Flanner, The stratospheric changes inferred from 10 years of AIRS and AMSU-A radiances, Abstract A43J-05, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
72. Schneider, A.M., M. Flanner, P. Yang, B.q. Yi, **X. L. Huang**, D. Feldman, How Can Polarization States of Reflected Light from Snow Surfaces Inform Us on Surface Normals and Ultimately Snow Grain Size Measurements, Abstract C33B-0790, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
73. C.-P. Kuo, P. Yang, **X. L. Huang**, D. Feldman, M. Flanner, The impacts of light scattering by clouds on longwave radiative transfer, Abstract A33F-0309, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
74. X. H. Chen, **X. L. Huang**, M. Flanner, P. Yang, D. Feldman, C. Kuo, Incorporating realistic surface longwave spectral emissivity in the CESM and the impact on simulated current climate and climate changes, Abstract A33D-0241, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
75. C. Kuo, D. Feldman, **X. L. Huang**, M. Flanner, X. H. Chen, P. Yang, C. P. Kuo, Radiative Forcing from Emissivity Response in Polar Regions, Abstract A33B-0219, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
76. Q. Yue, B. H. Kahn, E. J. Fetzer, S. Wong, **X. L. Huang**, M. M. Schreier, Short-term Cloud Radiative Feedback from A-Train Using the Observation-based Cloud Radiative Kernel Method, Abstract A33B-0218, 2016 Fall AGU meeting, San Francisco, CA, Dec 12-16, 2016.
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79. **Huang, X.L.**, Spectrum: An Underutilized Dimension in Weather and Climate Model Evaluations, Abstract AS24-019, 2016 AOGS Meeting, Beijing, China, July 31-August 05, 2016.

80. Chen, X.H., **X.L. Huang**, Assessing the Impact of Surface Emissivity Treatments in the CESM on Simulated Climate Change in Response to a Doubling of CO₂, Abstract AS24-A005, 2016 AOGS Meeting, Beijing, China, July 31-August 05, 2016.
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82. Pan, F., **X.L. Huang**, X.H. Chen, The spectral details of observed and simulated short-term feedbacks of El Niño-Southern Oscillation, Abstract A51C-57, 2015 Fall Meeting, AGU, San Francisco, California, December 14-18, 2015.
83. Cheng, H.Z., X. H. Chen, **X.L. Huang**, Quantification of the errors associated with the representation of surface emissivity in atmospheric models, Abstract A53B-0376, 2015 Fall Meeting, AGU, San Francisco, California, December 14-18, 2015.
84. Chen, X. H., **X.L. Huang**, et al., Running climate model in the commercial cloud computing environment: A case study using Community Earth System Model (CESM), Abstract A33A-123, 2015 Fall Meeting, AGU, San Francisco, California, December 14-18, 2015.
85. Kuo, C., D. Feldman, P. Yang, M. Flanner, **X.L. Huang**, Benchmarking longwave multiple scattering in cirrus environments, A53B-381, 2015 Fall Meeting, AGU, San Francisco, California, December 14-18, 2015.
86. Kuo, C.-P., P. Yang, **X.L. Huang**, D. Feldman, M. Flanner, Impact of Multiple Scattering on Infrared Radiative Transfer involving Ice Clouds, A51T-08, 2015 Fall Meeting, AGU, San Francisco, California, December 14-18, 2015.
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89. Pan, F., **X.L. Huang**, The spectral details of observed and simulated short-term feedbacks of El Niño-Southern Oscillation, Abstract AS16-A006, the AOGS 12th Annual Meeting, Singapore, August 02-07, 2015.
90. Chen, X.H. and **X.L. Huang**, Derivation of clear-sky longwave spectral flux solely from hyperspectral observations: a case study with AIRS observations, 2015 HISE (Hyperspectral Imaging and Sounding of Environments) meeting, Optical Society of America, March 1-4, 2015.
91. **Huang, X.L.**, X.H. Chen, B. J. Soden, and X. Liu, Spectral Radiative Kernel and the Spectrally Resolved Longwave Feedbacks in the CMIP3 and CMIP5 Experiments, Abstract A21H-3122, 2014 Fall Meeting, AGU, San Francisco, California, December 15-19, 2014.
92. Chen, X.H., **X.L. Huang**, M. G. Flanner, Sensitivity of Modeled Far-IR Radiation Budgets in Polar Continents to Treatments of Snow Surface and Ice Cloud Radiative Properties, Abstract C43B-0388, 2014 Fall Meeting, AGU, San Francisco, California, December 15-19, 2014.
93. Pan, F., **X.L. Huang**, X.H. Chen, H. Guo, Stratospheric Temperature Trends in the 11 Years of AIRS Spectral Radiance Observations, Abstract A23K-3409, 2014 Fall Meeting, AGU, San Francisco, California, December 15-19, 2014.
94. Feldman, D., W. D. Collins, **X.L. Huang**, X. H. Chen, V. Walden, Far-Infrared Surface Emissivity Impacts on Climate and the Potential for a Positive Feedback, Abstract A42E-08, 2014 Fall Meeting, AGU, San Francisco, California, December 15-19, 2014.
95. Yue, Q., E. Fetzer, M. Schreier, B. Kahn, **X.L. Huang**, Cloud Radiative Effect by Cloud Types Based on Radiative Transfer Model Calculations and Collocated A-Train Data, Abstract A41L-08, 2014 Fall Meeting, AGU, San Francisco, California, December 15-19, 2014.

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97. **Huang, X.L.**, F. Pan, Trend and variability of lower stratosphere in the 11 years of AIRS spectral radiance observations, Abstract AS14-A008, AOGS 2014, Sapporo, Japan, July 28-August 01, 2014.
98. **Huang, X.L.**, Spectral radiative kernel technique and the spectral dimension of radiative feedback, the 14th Conference on Atmospheric Radiation by AMS, Boston, MA, July 7-11, 2014.
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102. **Huang, X.L.**, Derivation of spectrally resolved flux from hyperspectral sounding measurements: algorithms, validation, and application, The 3rd International Symposium on Atmospheric Light Scattering and Remote Sensing, Nagoya, Japan, July 29-August 2, 2013.
103. **Huang, X.L.**, Some thoughts on constraining the ice cloud feedback over the tropical Pacific in future climate change, the 19th CERES-II Science Team Meeting, Hampton, Virginia, May 7-9, 2013.
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