

Curriculum Vitae: Professor Kuo-Nan Liou

Appointments and Degrees

- UCLA: Founding Director, Joint Institute for Regional Earth System Science and Engineering (JIFRESSE), 2006-; Distinguished Professor of Atmospheric Sciences, 2004 -; Chair, Department of Atmospheric and Oceanic Sciences, 2000-2004; Director, Institute of Radiation and Remote Sensing (IRRS), 1997-2006; Professor, Atmospheric and Oceanic Sciences, 1997-; Mechanical and Aerospace Engineering, 2003 -; Electrical Engineering, 2011- present
- University of Utah: Chairman, Department of Meteorology, 1996-1997; Director, Center for Atmospheric and Remote Sounding Studies (CARSS), 1987-1997; Professor, 1980-1997; Associate Professor, 1975-1980; Adjunct Professor, Meteorology, 1997-2007; Physics, 1992-2006; Geology and Geophysics, 1992-1997
- Other: Assistant Professor (Res), U. of Washington, 1972-1974; Visiting Professor-Scientist: Caltech/JPL, 2004; U. of Arizona, 1995; Taiwan U., 1995; Peking U., 1991; Harvard U., 1985; UCLA, 1981; NASA/Ames, 1980/81; NCAR, 1975/76; Research Associate, GISS/Columbia U, 1970-1972
- Ph.D., New York University
- B.S., National Taiwan University

Recognitions and Awards

- Received the *Carl-Gustaf Rossby Research Medal* from the American Meteorological Society for "international leadership and seminal contributions to improving the theory and application of atmospheric radiative transfer and its interactions with clouds and aerosols," 2018
- Received the COAA (Chinese American Oceanic & Atmospheric Association) *Lifetime Contribution Award*, 2018
- Elected a *Foreign Member of the Chinese Academy of Sciences*, 2017
- Received the 2013 *Roger Revelle Medal* from the American Geophysical Union "for outstanding contributions in atmospheric sciences, atmosphere-ocean coupling, atmosphere-land coupling, biogeochemical cycles, climate, or related aspects of the Earth system," 2013
- Received a *Distinguished Alumnus Award* from National Taiwan University, 2013
- Received the IRC (International Radiation Commission) *Quadrennial Gold Medal* for "contributions of lasting significance to the field of radiation research," 2012
- Delivered a Distinguished Lecture in Atmospheric Sciences at the Asia Oceania Geosciences Society 8th Annual Meeting, Taipei, Taiwan, 8/2011
- Received the 2010 COSPAR (Committee on Space Research, ICSU) *Biennial William Nordberg Medal* for "outstanding contributions to the application of space science," 2010
- Shared the *Nobel Peace Prize* bestowed upon the Intergovernmental Panel on Climate Change (IPCC) for "substantial contributions to the work of IPCC," 2007
- Elected a *Member of the Academia Sinica (Chinese Academy of Sciences, Taiwan, ROC)*, 2004
- Received a Distinguished Achievement Award from the Chinese American Engineers and Scientists Association of Southern California, 2004
- Received an Honorary Professorship, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China, 2002
- Elected a Fellow of the American Association for the Advancement of Science, 1999
- Elected a *Member of the National Academy of Engineering*, 1999
- Received the *Jule G. Charney Medal* from the American Meteorological Society for "pioneering work in the theory and application of radiative transport and its interaction with clouds," 1998
- Elected an Honorary Member of the Chinese American Oceanic and Atmospheric Association, 1998
- Received a *Creativity Award* from the Atmospheric Sciences Division of the National Science Foundation for "Light Scattering by Ice Crystals: Theory and Experiment," 1996
- Elected a Fellow of the American Geophysical Union, 1996
- Elected a Fellow of the American Meteorological Society, 1987
- Elected a Fellow of the Optical Society of America, 1983

Committee & Conference Affiliations

- Member (elected), Council of the Academia Sinica (CAS in Taiwan), 2017-2020
- Chair, Roger Revelle Medal Committee, American Geophysical Union, 2017-2020; Member, 2015-2016
- Co-Chair, Review Committee, Institute of Earth Sciences and Research Center for Environmental Changes, Academia Sinica, 2015
- Chair, Atmospheric Sciences Section Fellows Committee, American Geophysical Union, 2013-2014
- Chair, Section 12, Special Fields and Interdisciplinary Engineering, National Academy of Engineering, 2008-2010 (Vice Chair, 2006-2008); Member, Section 12 Peer Committee, 2003-2006; Member, NAE Committee on Membership, 2008-2011; NAE Nominating Committee, 2011-2013
- Chair, Selection Committee, Mathematics and Physical Sciences, Presidential Science Prize of Taiwan, 2011
- Chair, Search Committee for Director, Res. Center for Environmental Changes, Academia Sinica, 2011-2012
- Member, Visiting Review Committee, Departments of Atmospheric Sciences: University of Washington, 11/2010; Texas A&M University, 3/2009; National Taiwan University, 3/2009 (Chair)
- Report Review Monitor and Coordinator, Division of Earth and Life Studies, NRC/NAS, 2002-2008
- Chair, Fellows Committee, Meteorological Society of the Republic of China, 2007-2009
- Member, Union Fellows Committee, American Geophysical Union, 2002-2006
- Chair, Advisory Panel, Research Center for Environmental Changes, Academia Sinica, Taiwan, 2004-2010
- Member, Advisory Panel, China Meteorological Administration, Beijing, China, 2005
- Member, Atmospheric Sciences Section Executive Committee, American Geophysical Union, 1996-2005
- Chair, Visiting Review Cmte, School of Earth and Atmospheric Sciences, Georgia Institute of Tech., 10/2003
- External Reviewer, Chinese Academy of Sciences, Beijing, China, 2004
- Member, Atmospheric Sciences Program Reconfiguration Panel, Department of Energy, 11/2003
- Member, Advisory Committee, Center for Clouds-Chemistry-Climate, Scripps, UCSD, 1997-2003
- Member, Scientific Committee, Chapman Conf. on Atmospheric Absorption of Solar Radiation, AGU, 2001
- Convener, Radiative Transfer Theory, International Radiation Symposium, Saint Petersburg, Russia, 7/2000
- Member, Visiting Review Committee, CIRES, University of Colorado, 10/1999
- Chair, First International Asia-Pacific Symposium on Remote Sensing, Beijing, China, 9/1998
- Convener, Radiative Properties of Clouds, International Radiation Symposium, Fairbanks, Alaska, 8/1996
- Member, International Radiation Commission/IAMAS, 1992-2000
- Chair, Scientific Committee, Inner Mongolia Grassland Surface-Atmosphere Exp. (IMGRASS), 1992-1997
- Chair, U.S. Steering Committee, Heihe Basin Field Experiment (HEIFE), Western China, 1986-1989
- Chair, Beijing International Radiation Symposium, Beijing, China, 8/1986
- Member, ISCCP Panel, Climate Research Committee, National Research Council/NAS, 1984-1987
- Member, Committee on Clouds and Radiation, IAMAP/IAPSO Joint Assembly, 1985
- Chair, Fifth Conf. on Atmospheric Radiation (Clouds, Radiation/Climate), AMS, Baltimore, 11/1983
- Chair, Committee on Atmospheric Radiation, AMS, 1982-1984; Member, 1977-1982, 1992-1995

Editorial Affiliations

- Reviewer, IPCC Fifth Assessment Report; Chapter 7: Clouds and Aerosols, 2012
- Chief Editor (with M.D. Chou), *Recent Progress in Atmospheric Sciences: Applications to the Asia-Pacific Region*. World Scientific Publishing Co., 486 pp, 2008
- Editor, *Journal of the Atmospheric Sciences*, American Meteorological Society, 1999-2005
- Review Editor, the Intergovernmental Panel on Climate Change (IPCC) Report, 1998-1999
- Advisory Editor, *Journal of Terrestrial, Atmospheric and Oceanic Sciences*, 1998-2009
- Associate Editor, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 1997-2008; 2011-present
- Associate Editor, *Journal of Geophysical Research-Atmospheres*, 1997-2001
- Editor, *Theoretical and Applied Climatology*, and *Meteorology and Atmospheric Physics*, 1985-2008
- Member, Editorial Board, *Advances in Atmos. Sci.*, 1984-2004; *Acta Meteorological Sinica*, 2004-2013
- Guest Editor, Special Volume on Clouds and Radiation, *Journal of Geophysical Research*, 1987
- Editor, *Atmospheric Radiation Progress and Prospects*, Science Press, Beijing and AMS, 699 pp, 1987

Authorial and Other Activities

- **PhD student supervision:**

Supervised 33 PhDs in Atmospheric Sciences and Meteorology. A number of them have become outstanding scientists in Atmospheric Sciences.

- (1) Qiang Fu: Professor of Atmospheric Sciences, University of Washington
- (2) Ping Yang: Professor and Head, Department of Atmospheric Sciences, Texas A&M
- (3) Yongkang Xue: Professor of Geography, UCLA
- (4) Patrick Minnis: Senior Scientist, Langley Research Center, NASA
- (5) Cenlin He: Postdoctoral Researcher, Advanced Study Program, NCAR

** A reflection of John Roskovensky (2004) as a graduate student under my supervision ([PDF](#))

- **Presented more than 130 scientific papers, seminars, and lectures** (two examples)

- (1) 2013 AGU Revelle Medal (citation and response [PDF](#)).
- (2) 2018 AMS Rossby Medal ([PDF](#); Invited paper; A Perspective on Radiative Transfer and Cloud Microphysics in Climate Models [PDF](#))

- **Scholarly Publications**

- (1) **Books:**

- (a) *An Introduction to Atmospheric Radiation*, 1980, Academic Press, 392 pp, translated into Russian, Chinese, and Arabic.
- (b) *An Introduction to Atmospheric Radiation*, 2nd Edition, 2002, 583 pp, translated into Chinese, 2005, 614 pp; second printing, 2006; digital printing, 2010; translated into Japanese, 2014, 646 pp (*2954 citations*, Google, 4/2018).
- (c) *Radiation and Cloud Processes in the Atmosphere: Theory, Observation, and Modeling*, 1992, Oxford University Press, 487 pp (744 citations, Google).
- (d) *Light Scattering by Ice Crystals: Fundamentals and Applications (Liou and Yang)*, 2016, Cambridge University Press, 443 pp. ([PDF](#))

- (2) **Selected Peer-Reviewed Journal Articles:** (<http://www.atmos.ucla.edu/~liougst/>)

Liou has authored and co-authored more than 265 peer-reviewed papers, invited book chapters, and review articles on the subjects of light scattering by ice crystals and aerosols, radiative transfer theory and application, satellite remote sensing, and the impacts of clouds and aerosols on climate. Google Scholar Citations (LIOU KN, 4/2018): total, 18571; h-index, 73; i10-index, 281. The following are his representative papers:

- Liou, K.N., and et al., 2014: Stochastic parameterization for light absorption by internally mixed BC/dust in snow grains for application to climate models. *J. Geophys. Res.*, 119, 7616-7632, doi: 10.1002/2014JD021665. (*Introduce a stochastic parameterization for light absorption by internally mixed BC/dust in snow grains for climate forcing analysis.*)
- Liou, K.N., Y. Takano, Q. Yue, and P. Yang, 2013: On the radiative forcing of contrail cirrus contaminated by black carbon. *Geophys. Res. Lett.* 40, 778-784, doi:10.1002/GRL.50110.
- Liou, K.N., Y. Takano, and P. Yang, 2011: Light absorption and scattering by aggregates: Applications to black carbon and snow grains. *J. Quant. Spectrosc. Radiat. Transfer*, 112, 1581–1594.
- Lee, W.L., K.N. Liou, and A. Hall, 2011: Parameterization of solar fluxes over mountain surfaces for application to climate models. *J. Geophys. Res.*, 116, D01101, doi:10.1029/2010JD014722.
- Liou, K.N., Y. Takano, and P. Yang, 2010: On geometric optics and surface waves for light scattering by spheres. *J. Quant. Spectrosc. Radiat. Transfer*, 111, 1980–1989.
- Liou, K.N., Y. Gu, Q. Yue, and G. McFarguhar, 2008: On the correlation between ice water content and ice crystal size and its application to radiative transfer and general circulation models. *Geophys. Res. Lett.*, 35, L13805, doi:10.1029/2008GL033918. (*A new approach to determine ice crystal size based on the predicted ice water content for use in climate models.*)
- Feldman, D., K.N. Liou, and et al., 2006: Direct retrieval of stratospheric CO₂ infrared cooling rate profiles from AIRS data. *Geophys. Res. Lett.*, 33, L11803, doi:10.1029/2005GL024680.
- Chen, Y., and K.N. Liou, 2006: A Monte Carlo method for 3D thermal infrared radiative transfer. *J. Quant. Spectrosc. Radiat. Transfer*, 101, 166-178.

- Gu, Y., and K.N. Liou, 2000: Interactions of radiation, microphysics, and turbulence in the evolution of cirrus clouds. *J. Atmos. Sci.*, 57, 2463-2479.
- Yang, P., and K.N. Liou, 1996: A geometric-optics/integral-equation method for light scattering by nonspherical ice crystals. *Appl. Opt.*, 35, 6568-6584. (*Develop an innovative approach on geometric optics for light scattering by ice crystals based on fundamental electromagnetic theories; 423 citations.*)
- Fu, Q., S. Krueger, and K.N. Liou, 1995: Interactions of radiation and convection in simulated tropical cloud clusters. *J. Atmos. Sci.*, 52, 1310-1328.
- Liou, K.N., and Y. Takano, 1994: Light scattering by nonspherical particles: Remote sensing and climatic implications. *Atmos. Res.*, 31, 271-298.
- Fu, Q., and K.N. Liou, 1993: Parameterization of the radiative properties of cirrus clouds. *J. Atmos. Sci.*, 50, 2008-2025. (*A new approach to parameterize ice cloud radiative properties for use in climate models and remote sensing; 830 citations.*)
- Fu, Q., and K.N. Liou, 1992: On the correlated k-distribution method for radiative transfer in nonhomogeneous atmospheres. *J. Atmos. Sci.*, 49, 2139-2156. (*A simple approach based on the first principle to sort spectral absorption lines for use in multiple scattering atmospheres; 776 citations.*)
- Liou, K.N., S. Ou, and G. Koenig, 1990: An investigation on the climatic effect of contrail cirrus. In "Air Traffic and the Environment Background, Tendencies and Potential Global Atmospheric Effects." U. Schumann (Ed.), Springer-Verlag, pp. 154-169. (*Discover an increase in cirrus cloud cover over Salt Lake City and a number of Midwest Cities corresponding to the period of rapid growth of high-flying air traffic beginning around 1965.*)
- Takano, Y., and K.N. Liou, 1989: Radiative transfer in cirrus clouds. I. Single-scattering and optical properties of hexagonal ice crystals. II. Theory of multiple scattering in an anisotropic medium. *J. Atmos. Sci.*, 46, 3-36. (*Develop a new frontier in light scattering and absorption by ice crystals and aerosols by means of geometric optics; 781 citations.*)
- Liou, K.N., and S. Ou, 1989: The role of cloud microphysical processes in climate: An assessment from a one-dimensional perspective. *J. Geophys. Res.*, 94, 8599-8607. (*First report on the second indirect effect of aerosol-cloud interaction on precipitation. See IPCC 2001, section 5.3.5; see also Albrecht 1989, Science, 9/15, References and Notes #30.*)
- Liou, K.N., Q. Fu, and T. Ackerman, 1988: A simple formulation of the delta-four-stream approximation for radiative transfer parameterizations. *J. Atmos. Sci.*, 45, 1940-1947.
- Liou, K.N., and Y. Xue, 1988: Exploration of the remote sounding of infrared cooling rates due to water vapor. *Meteor. Atmos. Phys.*, 38, 131-139. (*A novel attempt to determine heating rates and surface fluxes from space remote sensing. See also Feldman, D., K.N. Liou, and et al., 2006.*)
- Liou, K.N., 1986: Influence of cirrus clouds on weather and climate processes: A global perspective. *Mon. Wea. Rev.*, 114, 1167-1198. (*Define the role of cirrus in climate; 1023 citations.*)
- Liou, K.N., and Q. Zheng, 1984: A numerical experiment on the interactions of radiation, clouds and dynamic processes in a general circulation model. *J. Atmos. Sci.*, 41, 1513-1535.
- Cai, Q., and K.N. Liou, 1982: Polarized light scattering by hexagonal ice crystals: theory. *Appl. Opt.*, 21, 3569-3580.
- Liou, K.N., and S. Ou, 1979: Infrared radiative transfer in finite cloud layers. *J. Atmos. Sci.*, 36, 1985-1996.
- Liou, K.N., and H. Lahore, 1974: Laser sensing of cloud composition: A backscattered depolarization principle. *J. Appl. Meteor.*, 13, 257-263. (*Discover the backscattering depolarization principle to differentiate ice crystal and water droplet. See a review in Sassen 1991, Bull. Amer. Meteor. Soc.; CALIPSO, a lidar satellite.*)
- Liou, K.N., 1974: Analytic two-stream and four-stream solutions for radiative transfer. *J. Atmos. Sci.*, 31, 1473-1475. (*Derive the analytic 4-stream solution for radiative transfer for use in radiation and climate parameterization. See Goody and Yung 1989, p. 386. See also Liou et al. 1988.*)
- Liou, K.N., 1973: A numerical experiment on Chandrasekhar's discrete-ordinates method for radiative transfer: Applications to cloudy and hazy atmospheres. *J. Atmos. Sci.*, 30, 1303-1326.
- Liou, K.N., 1972: Light scattering by ice clouds in the visible and infrared: A theoretical study. *J. Atmos. Sci.*, 29, 524-536. (*The first attempt to model light scattering by ice particles.*)