

Russell F. Lee

Meteorologist

April 24, 2004

Expertise

Air pollution meteorology

Air dispersion model applications, including AERMOD, CALPUFF and ISC

Air dispersion model evaluation

AERMOD and ISCST3 applications and training

CALPUFF applications

Model development and customization (Fortran)

Technical and peer review

Education and Training

B.S. Engineering (Meteorology), University of Michigan, 1963

Graduate courses in meteorology and mathematics, North Carolina State University, 1981-1985 (no degree earned)

CALPUFF Training Course by Earth Tech, 2003

Professional Activities and Memberships

American Meteorological Society (AMS) (Full member)

Charlotte-Metro Chapter of the AMS

Air and Waste Management Association (A&WMA)

AMS/EPA Regulatory Model Improvement Committee (AERMIC)

American Society of Testing and Materials, member of Subcommittee 11 (Meteorology) of Committee D22 (Air Quality)

Employment History

1999-Present Private consultant in air pollution meteorology, currently in Charlotte, NC

1997–1999 Senior Product Specialist. Trinity Consultants, Inc., Research Triangle Park, NC

1970–1997 Meteorologist, NOAA, U.S. Department of Commerce, assigned to the U.S. Environmental Protection Agency, Research Triangle Park, NC (Retired October 1997)

1964–1969 Meteorologist, National Weather Records Center (now National Climatic Data Center), U.S. Department of Commerce, Asheville, NC.

Experience Summary

Mr. Lee is a meteorologist with specialization in applications to air quality. Since February 1999, he has been working as an independent contractor in the field. He has recently been active in teaching training courses on the ISCST3 air quality model and the new AERMOD air quality model, which is expected to replace ISCST3 for regulatory applications. Many of these courses were taught jointly with Lakes Environmental Software and Pacific Environmental Services (now MACTEC). He has prepared additional videotaped courses on using AERMOD for the U.S. Environmental Protection Agency. He has also applied ISCST3, AERMOD and CALPUFF models to specific situations under contract. He has 39 years experience as a meteorologist, including 33 years specializing in air pollution applications with emphasis in air quality modeling.

Mr. Lee began his career in 1964 as a meteorologist at what is now the National Climatic Data Center (NCDC), U.S. Department of Commerce. While at NCDC, he was appointed to the Science Advisory Staff, where he worked on special meteorological studies for the Department of Commerce, NASA, and other government agencies.

In 1970, Mr. Lee accepted a position at what is now the Office of Air Quality Planning and Standards of the U.S. Environmental Protection Agency (EPA), formally as an employee of the Air Resources Laboratory, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. While at the EPA, from the mid-1980s through 1992, he was responsible for providing technical assistance on the appropriate use of the Industrial Source Complex air quality models (ISCST and ISCLT) to personnel at EPA headquarters, EPA Regional Offices, state and local air pollution agencies and model users in the private sector. Mr. Lee was instrumental in bringing about a major revision of the Industrial Source Complex Model (ISC), known as ISC2 (including both ISCST2 and ISCLT2). The design of this completely re-programmed model virtually eliminated errors that had plagued the earlier version. He has presented a number of training lectures on the applications of the ISCST and other EPA air quality models in the classroom, by satellite, and by video conferencing. The audience has included EPA Regional Office personnel, air pollution professionals from throughout the United States, and the U.S.-Russian Working Group on Air Pollution Modeling in St. Petersburg, Russia.

Mr. Lee has been active in developing and applying model evaluation procedures and sensitivity analyses throughout much of his career. He has recently been actively involved in efforts to improve techniques used in the evaluation of air quality models that have been reported at conferences, and in professional journals in the U.S. and Internationally. He also developed a procedure that allows the EPA to verify when a modification of a regulatory model may be considered equivalent to the regulatory model. In 1990 he developed and applied an analysis designed to inform modelers of the impact that using a new or revised model will have on modeled design concentrations for a variety of source types. The EPA now requires this analysis, called a "consequence analysis," for most new and revised models that are proposed for regulatory use. In addition, he was the lead meteorologist on numerous special model evaluation projects during his tenure at the EPA. These projects included a comparative evaluation of the

EPA's ISCST2 air quality model with its European counterparts and a comparison of the relative effects on model predictions of using several alternative dispersion parameters.

Mr. Lee has served as an active member of the ad hoc "Technology Transfer Workgroup" during two periods of time. From 1986 through 1991, this workgroup helped define how the complex terrain dispersion model, CTDM-PLUS, would be implemented in a regulatory setting. More recently, the TTW was reactivated for a period of time to address the implementation of the newly developed AERMOD air quality model in a regulatory setting.

Mr. Lee has been serving as an active member of AERMIC, the AMS/EPA Regulatory Model Improvement Committee, from its inception in 1991 until the present time. The primary function of AERMIC has been to develop the AERMOD air quality model, a state-of-the-art air quality model based on modern planetary boundary layer theory. In addition to contributing to the technical aspects of the model, he was largely responsible for the developmental evaluation during the early phase of the project. A developmental evaluation consists of a series of diagnostic tests against measured data that are performed each time a change was made to the model. This approach allows problems to be detected and corrected early in the development of the model.

Mr. Lee retired from Federal service in 1997 after 27 years assigned to the U.S. EPA. Since 1999 he has been a private consultant in the field of air pollution meteorology and air dispersion modeling. He continued as an active member of AERMIC, and co-teaches six to eight training courses per year on both ISCST3 and AERMOD.

Recent projects have included:

- AERMOD and ISCST3 training, both within and outside the U.S.
- AERMOD, CALPUFF and ISCST3 modeling projects
- Technical review of modeling projects and documents
- Model-related software modification and development
- Meteorological data accession and conversion to modeling formats
- Consulting in air dispersion modeling (AERMOD, CALPUFF, ISCST3)
- Provided technical advice on, and wrote portions of, a draft modeling guidance for a jurisdiction outside the U.S.
- Expert consultation for legal cases

Selected Publications and Presentations

Books

Thé, J.L., and R.F. Lee, 2004: "Available Software," Chapter 22 of *Air Quality Modeling: Volume I—Fundamentals*, Paolo Zannetti, ed. Air and Waste Management Association, Pittsburgh, PA.

Journal Articles

- Venkatram, A., R. Brode, **R. Lee**, R. Paine, S. Perry, W. Peters, J. Weil, R. Wilson, 2001: A complex terrain dispersion model for regulatory applications. *Atmos. Environ.* Vol. 35, No. 24, pp. 4211–4221.
- Lee, R.F.**, and J.S. Irwin, 1997: Improving concentration measures used for evaluating air quality models. *Jour. Appl. Meteorol.*, Vol. 36, No. 8, pp. 1107-1112.
- Irwin, J.S., and **R.F. Lee**, 1996: Comparative evaluation of two air quality models: within-regime evaluation statistic. *Proceedings, Fourth Workshop on Harmonisation with Atmospheric Dispersion Modelling for Regulatory Purposes*, May 6-9, 1996, Oostende, Belgium. pp 535-542. *Published in International Journal of Environment and Pollution.*
- Lee, R.F.**, and J.S. Irwin, 1995: Methodology for a comparative evaluation of two air quality models, *Workshop on Operational Short-range Atmospheric Dispersion Models for Environmental Impact Assessment in Europe*, Mol, Nov. 1994, published in *Int. J. Environment and Pollution*, Vol. 5, Nos. 4-6, pp. 723-733. (Note: The proceedings of the Workshop were published “as is” without further review in the *Int. J. Environment and Pollution*.)

Technical Conference Papers

- Lee, R.F.** and J.L. Thé, 2003: The Effect of CALMET Surface Layer Weighting Parameter R1 on the Accuracy of CALMET at Other Nearby Sites: a Case Study. Paper number 03-A-32 presented at *Guideline on Air Quality Models: The Path Forward*, October 22-24, 2003, Mystic, CT. Air and Waste Management Association, Pittsburgh, PA.
- Paine, R., R. Brode, R. Wilson, A. Cimorelli, S. Perry, J. Weil, W. Peters, R. Lee and A. Venkatram, 2003: AERMOD: Latest Features and Evaluation Results. Paper number 69878 presented at *A&WMA 96th Annual Conference and Exhibition*, June 22-26, 2003
- Nand, K., **R.F. Lee** and K. Lu, 2003: AERMOD-ACE2588 Model for Performing Air Toxics Health Risk Assessment. Paper number 69951 presented at *A&WMA 96th Annual Conference and Exhibition*, June 22-26, 2003. Air and Waste Management Association, Pittsburgh, PA.
- J. L. Thé, R.W. Brode and **R.F. Lee**, 2001: Worldwide data quality effects on PBL short-range regulatory air dispersion models. *Proceedings, Seventh International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes*, May 28-31, 2001, Belgirate, Italy. Paper presented by J.L. Thé.
- Lee, R.F.**, R.J. Paine, 2001: Effect of ASOS Cloud Data on AERMOD Results. *Air and Waste Management Association Conference on Guideline on Air Quality Models: A New Beginning*, April 4–6, 2001, Newport, RI. Air and Waste Management Association, Pittsburgh, PA. Paper presented by R. F. Lee.
- Lee, R.F.**, A. Goodman, A. Heinerikson, 1999: Comparison between AERMOD and ISCST3 using data from three industrial plants. Paper No. 99-536. *Air and Waste*

- Management Association 90th Annual Meeting and Exhibition in Saint Louis, Missouri, June, 1999.*
- Paine, R., **R. Lee**, R. Brode, R. Wilson, A. Cimorelli, S. Perry, J. Weil, A. Venkatram, W. Peters, 1999: AERMOD: Model formulation and evaluation results. Paper No. 99-476. *Air and Waste Management Association 92nd Annual Meeting and Exhibition, St. Louis, Missouri, June 20–24, 1999.* Air and Waste Management Association, Pittsburgh, PA. Paper presented by R. Paine.
- Grosch, T. and **R. F. Lee**, 1999: Sensitivity of the AERMOD Air Quality Model to the Selection of Land Use Parameters. Presented at the *Seventh International Conference on Air Pollution: AIR POLLUTION 99*, 27-29 July 1999, Palo Alto, CA. Paper presented by T. Grosch.
- Lee, R.F.**, R.J. Paine, S.G. Perry, A.J. Cimorelli, J.C. Weil, A. Venkatram, R.B. Wilson, 1998: Developmental Evaluation of the AERMOD Dispersion Model. *Preprints, Tenth Joint Conference on Application of Air Pollution Meteorology with the A&WMA, January 11-16, Phoenix, Arizona.* American Meteorological Society, Boston, MA pp. 21-25. Paper presented by R. F. Lee.
- Venkatram, A., J. Weil, A. Cimorelli, **R. Lee**, S. Perry, R. Wilson, R. Paine, 1998: AERMOD's simplified algorithm for dispersion in complex terrain. *Preprints, Tenth Joint Conference on Application of Air Pollution Meteorology with the A&WMA, January 11-16, Phoenix, Arizona.* American Meteorological Society, Boston, MA pp. 21-25. Paper presented by A. Venkatram.
- Cimorelli, A.J., S.G. Perry, **R.F. Lee**, R.J. Paine, A. Venkatram, J.C. Weil, R.B. Wilson, 1996: Current progress in the AERMIC model development program. *Air and Waste Management Association 89th Annual Meeting and Exhibition in Nashville, Tennessee, June, 1996.*
- Irwin, J.S., and **R.F. Lee**, 1996: Comparative evaluation of two air quality models: within-regime evaluation statistic. *Proceedings, Fourth Workshop on Harmonisation with Atmospheric Dispersion Modelling for Regulatory Purposes, May 6-9, 1996, Oostende, Belgium*, pp 535-542. (published in proceedings, also published in *International Journal of Environment and Pollution*). Paper presented by J.S. Irwin.
- Lee, R.F.**, and J.S. Irwin, 1996: Improving concentration measures used for evaluating air quality models. *Preprints, Ninth Joint Conference on Applications of Air Pollution Meteorology with the A&WMA, January 28-February 2, 1996, Atlanta, Georgia.* American Meteorological Society, Boston, MA, pp. 520-523. Paper presented by R.F. Lee.
- Lee, R.F.**, S.G. Perry, A.J. Cimorelli, R.J. Paine, A. Venkatram, J.C. Weil, R.B. Wilson, 1995: AERMOD—The developmental evaluation. *Proceedings of the Twenty-First NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Application.* Paper presented by William Peterson.
- Perry, S.G., A.J. Cimorelli, **R.F. Lee**, R.J. Paine, A. Venkatram, J.C. Weil, and R.B. Wilson, 1994: AERMOD: A Dispersion Model for Industrial Source

Applications. *Air And Waste Management Association 87th Annual Meeting and Exhibition in Cincinnati, Ohio, June 19-24, 1994.*

Lee, R.F., 1993: Pilot Study: Evaluation of the ISCST2 Model. *Proceedings of the Workshop: Intercomparison of Advanced Practical Short-Range Atmospheric Dispersion Models, August 30-September 3, 1993, Manno, Switzerland.* Paper presented by R.F. Lee.

Other Publications

Cimorelli, A., S. Perry, A. Venkatram, J. Weil, R. Paine, R. Wilson, **R. Lee**, W. Peters, 2000: AERMOD Description of model formulation. EPA web site (<http://www.epa.gov/scram001>).

Cimorelli, A., R. Wilson, S. Perry, A. Venkatram, J. Weil, R. Paine, **R. Lee**, 1999: Minimum meteorological data requirements for AERMOD—study and recommendations. EPA web site (<http://www.epa.gov/scram001>).

Cimorelli, A.J., S.G. Perry, A. Venkatram, J.C. Weil, R.J. Paine, R.B. Wilson, **R.F. Lee**, and W.D. Peters, 1998: AERMOD: Description of Model, EPA web site (<http://www.epa.gov/scram001>).

Paine, R.J., **R.F. Lee**, R. Brode, R.B. Wilson, A.J. Cimorelli, S.G. Perry, J.C. Weil, A. Venkatram, and W.D. Peters, 1998: Model Evaluation Results for AERMOD, EPA web site (<http://www.epa.gov/scram001>).