

**Curriculum Vitae
John S. Irwin**

TITLE AND AFFILIATION

Air Quality Modeling Consultant
John S. Irwin and Associates

EDUCATION

B.S. Physics, University of Maryland, 1968
M.S. Marine Sciences (Meteorology), North Carolina State University, 1974

PROFESSIONAL EXPERIENCE

Meteorologist/NOAA/Environmental Protection Agency/Research Triangle Park, North Carolina - 1974 to 1989.

Supervisory Meteorologist/NOAA/Environmental Protection Agency/Research Triangle Park, North Carolina - 1989 to 1998.

Meteorologist/NOAA/Environmental Protection Agency/Research Triangle Park, North Carolina - 1998 to 2004.

Consultant – 2004 to present

PROFESSIONAL ACTIVITIES AND MEMBERSHIPS

American Meteorological Society (Certified Consulting Meteorologist since 2000)
ASTM International
Air Waste & Management Association

PUBLICATIONS AND PRESENTATIONS

International Technical Standards	-	1
Book Chapters	-	4
Journal Articles	-	45
Presentations	-	40
Reports	-	19

Publication List

International Technical Standards

I.1 American Society for Testing and Materials, (2010): Standard Guide for Statistical Evaluation of Atmospheric Dispersion Model Performance (D 6589), (Available at <http://www.astm.org>), 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428, 17 pages.

Book Chapters

- B4. Hogrefe, C., J. Ku, G. Sistla, A. Gilliland, J. Irwin, P. S. Porter, E. Gego, P. Kasibhatla, and S. Rao. Has the performance of regional-scale photochemical modelling systems changed over the past decade? Chapter 4, Air Pollution Modeling and Its Application XIX. Springer, New York, NY, 394-403 (2008).
- B.3 Irwin, J.S. (2005): Chapter 18: A Historical Look at the Development of Regulatory Air Quality Models for the United States Environmental Protection Agency. Air Quality Modeling—Theories, Methodologies, Computational Techniques, and Available Data Bases and Software, Vo. II – Advanced Topics. (Editor P. Zannetti). The EnvironComp Institute and Air & Waste Management Association. 557-622.
- B.2 Canepa, E.C., and J.S. Irwin (2005): Chapter 17: Evaluation Of Air Pollution Models by Elisa Canepa and John S. Irwin. Air Quality Modeling—Theories, Methodologies, Computational Techniques, and Available Data Bases and Software, Vo. II – Advanced Topics. (Editor P. Zannetti). The EnvironComp Institute and Air & Waste Management Association. 503-556.
- B.1 Venkatram, A., I. Burns, C. Chen, J. Irwin, and M. Johnson. (1998): Chapter 6. Model testing and evaluation. Ecological Risk Assessment Decision-Support: A Conceptual Design, Edited by K.H. Reinert, S.M. Bartell, and G.R. Biddinger. Society of Environmental Toxicology and Chemistry (SETAC) Special Publication Series, SETAC Press, Pensacola, FL, 39-44.

Journal Papers

- J.45 Irwin, J.S. (2014): A suggested method for dispersion model evaluation. Journal of the Air & Waste Management Association. (64:3):255-264, DOI: 10.1080/10962247.2013.833147
- J.44 Dennis, R., T. Fox, M. Fuentes, A. Gilliland, S. Hanna, C. Hogrefe, J.S. Irwin, S.T. Rao, R. Scheffe, K. Schere, D. Steyn, and A. Venkatram (2010): A framework for evaluating regional-scale numerical photochemical modeling systems. Environmental Fluid Mechanics. (10):471-489.

- J.43 Irwin, J.S., K. Civerolo, C. Hogrefe, W. Appel, K. Foley and J. Swall (2008): A procedure for inter-comparing the skill of regional-scale air quality model simulations of daily maximum 8-hour ozone concentrations. Atmospheric Environment. (42):5403-5412
- J.42 Irwin, J.S., W.B. Petersen, and S.C. Howard (2007): Probabilistic characterization of atmospheric transport and diffusion. J. of Applied Meteorology and Climatology. (46):980-993.
- J.41. Isakov, V., J. Irwin, and J. Ching. Using CMAQ for exposure modeling and characterizing the sub-gird variability for exposure estimates. Journal of Applied Meteorology and Climatology (special issue) 46(9):1354-1371 (2007).
- J.40 Gego, E.L., P.S. Porter, C. Hogrefe and J.S. Irwin (2005): An objective comparison of CMAQ and REMSAD performance. Atmospheric Environment. (40):4920-4934.
- J.39 Gego, E.L., P.S. Porter, J.S. Irwin, C. Hogrefe and S.T. Rao (2005): Assessing the comparability of ammonium, nitrate and sulfate concentrations measured by three air quality monitoring networks. Pure and applied geophys. (162):1919-1939.
- J.38 Gego, E., C. Hogrefe, G. Kallos, A. Voudouri, J.S. Irwin and S.T. Rao (2005): Examination of model predictions at different horizontal grid resolutions. Environmental Fluid Mechanics. (5):63-85.
- J.37 Irwin JS and Hanna SR. Characterizing uncertainty in plume dispersion models(2005): Int J Environ and Poll, 25 (1/2/3/4): 16-24
- J.36 Hicks, B, and J.S. Irwin. Atmospheric transport and diffusion modeling systems for effective emergency response. Environmental Monitoring 2:41-42 (2004).
- J.35 Walter F. Dabberdt, W.F, M.A. Carrol, D. Baumgardner, G. Carmichael, R. Cohen, T. Dye, J. Ellis, G. Grell, S. Grimmond, S. Hanna, J. Irwin, B. Lamb, S. Madronich, J. McQueen, J. Meagher, T. Odman, J. Pleim, H.P. Schmid, and Doug Westphal (2004): Meteorological research needs for improved air quality forecasting: report of the 11th prospectus development team of the U.S. weather research program. Bulletin of American Meteorological Society. Vol 85(4): 563-586
- Vette, A., S. Gavett, S.G. Perry, D.K. Heist, A.H. Huber, M. Lorber, P. Lioy, P. Georgopoulos, S.T. Rao, W.B. Petersen, B. Hicks, J.S. Irwin, and G. Foley. Environmental research in response to 9/11 and homeland security. Environmental Monitoring 2:14-22 (2004).
- J.34 Irwin, J.S., Carruthers, D., Stocker, J. and Paumier, J. (2003): Application of ASTM D6589 to evaluate dispersion model performance. Int. J. Environment and Pollution, Vol. 20, Nos. 1–6, pp.4–10.

- J.33 Irwin, J.S. (2001): Comparison of two sampling procedures for the statistical evaluation of the performance of atmospheric dispersion models in estimating centerline concentration values. Air Pollution Modeling and Its Application XIV, (Edited by S-E Gryning and F.A. Schiermeier). Plenum Press, NY., pp 665-673.
- J.32 Irwin, J.S. (2000): Statistical Evaluation of Centerline Concentration Estimates by Atmospheric Dispersion Models. International Journal of Environment and Pollution, Vol. 14, Nos. 1-6, pages 28-38.
- J.31 Irwin, J.S., (1999): Effects of concentration fluctuations on statistical evaluations of centerline concentration estimates by atmospheric dispersion models. Proceedings of the 6th International Conference on Harmonisation Within Atmospheric Dispersion Modelling for Regulatory Purposes, October 11-14, 1999, Rouen, France, International Journal of Environment and Pollution, Vol. 16, Nos. 1-6.
- J.30 Irwin, J.S. (1998): A Comparison of CALPUFF Modeling Results with 1977 INEL Field Data Results. Air Pollution Modeling and Its Application XII, (Edited by S-E Gryning and N. Chammerhac). Plenum Press, NY., pp 143-153.
- J.29 Lee, R.F., and J.S. Irwin (1997): Improving concentration measures used for evaluating air quality models. J. Appl. Meteorol. 36(8):1107-1112
- J.28 Atkinson, D.B., D.R. Bailey, J.S. Irwin, and J.S. Touma (1997): Improvements to the EPA Industrial Source Complex (ISC) Dispersion Model. J. Appl. Meteorol. 36(8):1088-1095.
- J.27 Irwin, J.S. and R.F. Lee, (1996): Comparative Evaluation Of Two Air Quality Models: Within-Regime Evaluation Statistic. Fourth Workshop on Harmonization Within Atmospheric Dispersion Modelling For Regulatory Purposes, Oostende, Belgium, May, 1996, International Journal of Environment and Pollution, 8 (Nos. 3-6):346-355.
- J.26 Irwin, J.S., J.S. Scire, and D.G. Strimaitis, (1996): A comparison of CALPUFF modeling results with CAPTEX field data results. Air Pollution Modeling and Its Application XI, Edited by S.E. Gryning and F.A. Schiermeier, Plenum Press, New York, pp 603-611.
- J.25 Touma, J.S., J.S. Irwin, J.A. Tikvart, and C.T. Coulter (1995): A review of procedures for updating air quality modeling techniques. J of Appl Meteorol. (34): 731-737.
- J.24 Lee, R.F. and J.S. Irwin (1994): A 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, Belgium, November 1994, International Journal of Environment and Pollution, (5), Nos 4-6, 723-733.

- J.23 Irwin, J.S. and Kretzschmar, J.G. (1992): Summary of the 19-th NATO/CCMS international round table discussion on the harmonization of atmospheric dispersion models. Air Pollution Modeling and Its Application IX, Edited by H. Van Dop and G. Kallos, Plenum Press, New York, pp 769-779.
- J.22 Irwin, J.S. and J.O. Paumier (1990): Characterizing the dispersive state of convective boundary layers for applied dispersion modeling. Boundary-Layer Meteorology (53):267-296.
- J.21 Irwin, J.S., S.T. Rao, W.B. Petersen and D.B. Turner (1987): Relating error bounds for maximum concentration estimates to diffusion meteorology uncertainty. Atmos. Environ. (21):1927-1937.
- J.20 Gryning, S.E., A.A.M. Holtslag, J.S. Irwin and B. Sivertsen (1987): Applied dispersion modeling based on meteorological scaling parameters. Atmos. Environ. (21): 79-89.
- J.19 Rao, S.T., G. Sistla, V. Pagnotti, W.B. Petersen, J.S. Irwin, And D.B. Turner (1985): Resampling and extreme value statistics in air quality model performance evaluation. Atmos. Environ. (19):1503-1518.
- J.18 Rao, S.T., G. Sistla, V. Pagnotti, W.B. Petersen, J.S. Irwin, And D.B. Turner (1985): Evaluation of the performance of RAM with the Regional Air Pollution Study data base. Atmos. Environ. (19):229-246.
- J.17 Irwin, J.S. (1985): Modeling the diurnal variation of meteorological variables within the boundary layer - preliminary comparison results. (Edited by C. De Wispelarere), Air Pollution Modeling and Its Application V, Plenum Publishing Corporation, New York. pg. 195-210.
- J.16 Sivertsen, B., S.E. Gryning, A.A.M. Holtslag, and J.S. Irwin (1985): Atmospheric dispersion modeling based upon boundary layer parameterization. (Edited by C. De Wispelarere), Air Pollution Modeling and Its Application V, Plenum Publishing Corporation, New York. pg. 177-194. 175.
- J.15 Holtslag, A.A.M., S.E. Gryning, J.S. Irwin and B. Sivertsen (1985): Parameterization of the atmospheric boundary layer for air pollution dispersion models. (Edited by C. De Wispelarere), Air Pollution Modeling and Its Application V, Plenum Publishing Corporation, New York. pg. 147-175.
- J.14 Turner, D.B. and J.S. Irwin (1985): The relation of urban model performance to stability. Air Pollution Modeling and Its Application II, C. De. Wispelaere (ed.), Plenum Pub. Co. New York. pg. 721-732.
- J.13 Irwin, J.S. and T. Brown (1985): A sensitivity analysis of the treatment of area-sources by the climatological dispersion model. J. Air Pollu. Cont Assoc. (35):359-364.

- J.12 Turner, D.B., J.S. Irwin and A.D. Busse (1985): Comparison of RAM model estimates with the 1976 St. Louis RAPS measurements of sulfur dioxide. Atmos. Environ. (19):247-253.
- J.11 Petersen, W.B. and J.S. Irwin (1984): Climatological variability in maximum concentrations. Atmos. Environ. (5):739-742.
- J.10 Irwin, J.S. and M.E. Smith (1984): Potentially useful additions to the rural model performance evaluation. Bull. Amer. Meteorol. Soc. (65):559-568.
- J.9 Irwin, J.S. (1984): Site-to-site variation in performance of dispersion parameter estimation schemes. Air Pollution Modeling and Its Application III, C. De Wispelaere (ed.), Plenum Pub. Co. NY, pg. 605-617.
- J.8 Ching, J.K.S., J.F. Clarke, J.S. Irwin, and J.M. Godowitch (1983): Review of relevance of mixed layer scaling for daytime dispersion based on RAPS and other programs. Atmos. Environ. (17):859-871.
- J.7 Irwin, J.S. (1983): Estimating plume dispersion - a comparison of several sigma schemes. J. Clim. Appl. Meteorol. (22):92-114.
- J.6 Turner, D.B. and J.S. Irwin (1983): Comparison of sulfur dioxide estimates from the model RAM with the St. Louis Raps measurements. Air Pollution Modeling and Its Application II, C. De Wispelaere (ed.), Plenum Pub. Co. New York. pg. 695-707.
- J.5 Weber, A.H., J.S. Irwin, W.B. Petersen, J.E. Mathis, and J.P. Kahler (1982): Spectral scales in the atmospheric boundary layer. J. of Appl. Meteorol. (21):1622-1632.
- J.4 Turner, D.B. and J.S. Irwin (1982): Extreme value statistics related to performance of a standard air quality simulation model using data at seven power plant sites. Atmos. Environ. (16):1907-1914.
- J.3 Irwin, J.S. and F.S. Binkowski (1981): Estimation of the Monin-Obukhov scaling length using on-site instrumentation. Atmos. Environ. (15):1091-1094. (Erratum, 1982, Atmos. Environ. (16):887)
- J.2 Irwin, J.S. and A.M. Cope (1979): Maximum surface concentration of SO₂ from a moderate-size steam-electric power plant as a function of power plant load. Atmos. Environ., (13):195-197.
- J.1 Irwin, J.S. (1979): A theoretical variation of the wind profile power-law as a function of surface roughness and stability, Atmos. Environ. (13): 191-194.

Presentations

- P.40 Irwin, J.S., (2007): An operational model evaluation procedure for assessing the relative skill between competing air quality models in estimating 8-hour maximum ozone values. Proceedings of the 11th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes held in Cambridge, U.K. July 2007, pages 13-17.
- P.39 Ching, J., V. Isakov, M.A. Majeed, and J.S. Irwin. An approach for incorporating sub-grid variability information into air quality modeling. Proceedings, 14th Joint Conference on the Applications of Air Pollution Meteorology with the Air and Waste Management Association, Atlanta, GA, Jan. 28- Feb. 2, 11 pp. (2006).
- P.38 Irwin, J.S., E. Gego, C. Hogrefe, J. M. Jones and S. T. Rao (2004): Comparison of sulfate concentrations simulated by two regional-scale models with measurements from the improve network. Proceedings of the 9th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes held in Garmisch-Partenkirchen, June 2004, pages 69-73.
- P.37 Irwin JS and Hanna SR. Characterizing uncertainty in plume dispersion models (2004): Proceedings of the 9th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes held in Garmisch-Partenkirchen, June 2004, pages 287-292.
- P.36 Rao, S.T., J. Irwin, K. Schere, T. Pierce, R. Dennis, and J. Ching, (2003): Past, present, and future air quality modeling and its applications in the United States, Invited Keynote address for the 8th International Conference on Atmospheric Sciences and Applications to Air Quality (ASAAQ), 11 - 13 March 2003, Tsukuba Science City, Japan
- P.35 Irwin, J.S., (2003), Models are Cartoons of Reality. California Energy Commission and the California Air Resources Board Short-range Dispersion Modeling, January 24-25, 2002
- P.34 Gego, E., C. Hogrefe, G. Kallos, A. Voudouri, P. S. Porter, J.S. Irwin and S.T. Rao (2002): Spatial Analysis of Meteorological and Air Quality Observations and Model Predictions, 26th NATO/CCMS International Technical Meeting on Air Pollution Modelling and Its Application, 26-30 May 2003, Istanbul, Turkey.
- P.33 Irwin, J.S., Carruthers, D., Paumier, J., and Stocker, J., (2002) Application of ASTM D6589 to evaluate dispersion model performance to simulate average centerline concentration values. Proceedings of the 8th International Conference on Harmonisation Within Atmospheric Dispersion Modelling for Regulatory Purposes, October 14-17, 2002, Sofia, Bulgaria, 5 pages.

- P.32 Irwin, J.S., Carruthers, D., Paumier, J., and Stocker, J., (2002) Assessing dispersion model performance to simulate average centerline concentration values. Proceedings of the 12th Joint A&WMA/AMS Conference, May 20-24, 2002, Norfolk, VA, pages 43-44.
- P.31 Irwin, J.S., (2001): Evaluate Earth Science Models for What They are Cartoons of Reality, OFCM Workshop on Effective Emergency Response-Selecting a Suitable Dispersion Model for a Given Application, December 5, 2001, Washington, D.C.
- P.30 Irwin, J.S., (2001): First Define the Information Needed, Then Select a Course of Action, OFCM Workshop on Effective Emergency Response-Selecting a Suitable Dispersion Model for a Given Application, December 5, 2001, Washington, D.C.
- P.29 Irwin, J.S., (2001): Model Evaluation - Models are Not Reality. U.S. Weather Research Program Prospectus Development Team 11 on Air Quality Modeling Forecasting, November 6-8, 2001, Palm Springs, California.
- P.28 Irwin, J.S., K. Steinberg, C. Hakkarinen, and H. Feldman (2001): Characterizing uncertainty in risk calculations. Proceedings of Guideline on Air Quality Modeling: A New Beginning AW&MA Specialty Conference. April 4-6, 2001, Newport, RI.
- P.27 Irwin, J.S. and J.P. Notar (2001): Long-range-transport screening technique using CALPUFF. Proceedings of Guideline on Air Quality Modeling: A New Beginning AW&MA Specialty Conference. April 4-6, 2001, Newport, RI.
- P.26 Irwin, J.S., Niedzialek, J., and Burzynski, J.,(2001): A comparison of CALPUFF air quality simulation results with monitoring data for Krakow Poland. Proceedings of the 7th International Conference on Harmonisation Within Atmospheric Dispersion Modelling for Regulatory Purposes, March 28-31, 2001, Beligrate, Italy, 5 pages.
- P.25 Irwin, J.S. (2000): Comparison of two sampling procedures for the statistical evaluation of the performance of atmospheric dispersion models in estimating centerline concentration values. Proceedings of Millennium NATO/CCMS International Technical Meeting on Air Pollution Modelling and Its Application, Boulder, Colorado, May 14-19, 2000.
- P.24 Irwin, J.S. and M-R. Rosu, (1998): Comments on a Draft Practice for Statistical Evaluation of Atmospheric Dispersion Models, Proceeding of the 10th Joint Conference on the Application of Air Pollution Meteorology with the A&WMA, Phoenix, AZ., pp. 6-10.
- P.23 Atkinson, D.G., J.S. Touma, D.R. Bailey, and J.S. Irwin, (1996): Improvements to the EPA industrial source complex (ISC) dispersion model. Proceedings of Ninth Joint Conference on Applications of Air Pollution Meteorology with A&WMA, January 28-February 2, 1996, Atlanta, Georgia, American Meteorological Society, Boston, MA, pp 592-595.

- P.22 Lee, R.F. and J.S. Irwin, (1996): Improving concentration measures used for evaluating air quality models. Proceedings of Ninth Joint Conference on Applications of Air Pollution Meteorology with A&WMA, January 28-February 2, 1996, Atlanta, Georgia, American Meteorological Society, Boston, MA, pp 520-523.
- P.21 Sivertsen, B. and J.S. Irwin, (1996): Tracer Gas experiment to verify the dispersion from a tall stack. Proceedings of Ninth Joint Conference on Applications of Air Pollution Meteorology with A&WMA, January 28-February 2, 1996, Atlanta, Georgia, American Meteorological Society, Boston, MA, pp 41-45.
- P.20 Cowherd, C., Muleski, G.E., Kinsey, J.S., Touma, J.S., and J.S. Irwin (1994): An Intensive Field Study of Air Quality, Meteorology and Source Activity at a Western Surface Coal Mine. Paper 94-FA145.03. Air & Waste Management Association 87th Annual Meeting and Exhibition, Cincinnati, OH, June 19-24, 1994.16 pp.
- P.19 Touma, J.S., Irwin, J.S., and Tikvart, J.A., (1993): An update of new air quality modeling techniques for regulatory programs. In The Role of Meteorology in Managing the Environment in the 1990's. Proceedings of an International Specialty Conference, Scottsdale, Arizona, January 1993. VIP-29. A&WMA, Pittsburgh, pp 87-98.
- P.18 Ching, J.K.S., and Irwin, J.S., (1993): Modeled mesoscale meteorological fields with four-dimensional data assimilation in regional scale air quality models..In The Role of Meteorology in Managing the Environment in the 1990's. Proceedings of an International Specialty Conference, Scottsdale, Arizona, January 1993. VIP-29. A&WMA, Pittsburgh, pp 219-230.
- P.17 Irwin, J.S. (1992): Boundary layer parameterizations and long-range transport. Proceeding of the workshop "Objectives for Next Generation of Practical Short-Range Atmospheric Dispersion Models." Dansk Center for Atmospheric Research. Riso, Denmark, pp 99-107.
- P.16 Irwin, J.S. (1992): Summary of the NATO/CCMS round table discussion on the harmonization of atmospheric dispersion models. Proceeding of the workshop "Objectives for Next Generation of Practical Short-Range Atmospheric Dispersion Models." Dansk Center for Atmospheric Research. Riso, Denmark, pp 49-61.
- P.15 Petersen, W.B., and Irwin, J.S., (1992): A sensitivity analysis on the effects of serial correlation on exposure estimates. Proceedings of the 1991 U.S. EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants, Durham, NC, pp 645-650.
- P.14 Lansari, A., Strelitz, R.A., and Irwin, J.S., (1992): A theoretical study of the effects of variable meteorological conditions on indoor ozone concentration distribution. Proceedings of the 1991 U.S. EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants, Durham, NC, pp 914-919.

- P.13 Lansari, A., Lindstrom, A.B., Templeman, B.D., and Irwin, J.S., (1992): Multizonal mass balance modeling of benzene dispersion in a private residence. Proceedings of the 1991 U.S. EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants, Durham, NC, pp 669-674.
- P.12 Irwin, J.S., and Petersen, W.B., (1992): Modeling carbon monoxide (CO) exposures within micorenvironments given personal exposure monitoring data. Proceedings of the 1991 U.S. EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants, Durham, NC, pp 651-658.
- P.11 Paumier, J.O., and Irwin, J.S., (1991): Comparison of modified Carson and EPA mixing height estimates using data from five field experiments. Preprints, Seventh Joint Conference on Applications of Air Pollution Meteorology, January 14-18, New Orleans, Louisiana. American Meteorological Society, Boston, MA, pp 282-285.
- P.10 Irwin, J.S., and Paumier, J.O. (1990): Sonic anemometer measurement within a room. Proceedings of the Fifth International Conference on Indoor Air Quality and Climate, Toronto, Canada, July 29-August 3, Volume 4, pp 391-394.
- P.9 Irwin, J.S. (1990): Estimating exposures downwind of isolated buildings. Proceedings of the 1990 EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants. EPA/600/9-90/026. U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711, pp 905-910.
- P.8 Dennis, R. and J.S. Irwin (1984): Current views of model performance evaluation. Proceedings of the Savannah River Laboratory DOE/AMS Model Evaluation Workshop. (Edited by A.H. Weber and A.J. Garrett), Kiawah, South Carolina, October 23-26, 1984. 53 pp.
- P.7 Rao, S.T., G. Sistla, V. Pagnotti, W.B. Petersen, J.S. Irwin, And D.B. Turner (1984): Resampling and Extreme Value Statistics in Air Quality Model Performance Evaluation. Proceedings of 4th Joint Conference on Applications of Air Pollution Meteorology, October 16-19, 1984, Portland, OR. American Meteorological Society, Boston, MA., pg 103-106.
- P.6 Petersen. W.B. and J.S. Irwin (1984): Climatological Variability in Maximum Concentrations. Proceedings of 4th Joint Conference on Applications of Air Pollution Meteorology, October 16-19, 1984, Portland, OR. American Meteorological Society, Boston, MA., pg 99-102.
- P.5 Rao, S.T., G. Sistla, V. Pagnotti, W.B. Petersen, J.S. Irwin, And D.B. Turner (1984): Evaluation of RAM with the RAPS Level 7 Data Base. Preprints of the 77th Annual Meeting of the APCA, June 24-29, 1984.
- P.4 Ching, J.K.S., J.F. Clarke, J.S. Irwin, and J.M. Godowitch (1981): Review of EPA mixed layer diffusion program and assessment of future needs. Proceedings of the workshop on the parameterization of mixed layer diffusion, Oct. 20-23, 1981, Las Cruces, N M., U.S. Army Research Office, RTP, NC.

P.3 Ruff, R.E., H.S. Javitz, and J.S. Irwin (1980): Development and application of a statistical methodology to evaluate the real-time air-quality model (RAM). Proceedings of the Second Joint Conference on Applications of Air Pollution Meteorology. New Orleans, LA, March 24-27, 1980, American Meteorological Society, 7 pp.

P.2 Lockhart T.J. and J.S. Irwin (1980): Methods for calculating the "Representativeness" of Data. Proceedings of Symposium on Intermediate Range Atmospheric Transport Processes and Technology Assessment. Gatlinburg, TN, October 1-3, 1980. CONF-801064, NTIS, Springfield, VA. pg. 169-176.

P.1 Irwin, J.S. (1979): Estimating plume dispersion - A recommended generalized scheme. Proceedings of the 4th Symposium on Turbulence, Diffusion, and Air Pollution, Jan. 15-18, 1979, Reno, NV., American Meteorological Society, Boston, Mass. pg. 62-69.

Reports

R.19 Irwin, J.S., (2002): A Historical Look at the Development of Regulatory Air Quality Models for the United States Environmental Protection Agency. NOAA Technical Memorandum OAR ARL-244. Air Resources Laboratory, Silver Spring, MD. 67 pages.

R.18 Hicks, B., R. Addis, W. Bach, T. Bauer, B. Beitler, P. Davidson, J. Ellis, D. Garvey, J. Irwin, J. Mitchell, D. Payton, D. Randerson, and J. Sarkisian. (2002): Atmospheric Modeling for Releases from Weapons of Mass Destruction: Response by Federal Agencies in Support of Homeland Security. *FCM-R17-2002*. August, 2002, U.S. Department of Commerce, Office of the Federal Coordinator for Meteorological Services and Supporting Research, Silver Spring, MD, 160 pages

R.17 Irwin, J.S., (1998): Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts. EPA-454/R-98-019, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 151 pp. (NTIS Accession Number PB 99-121089).

R.16 Irwin, J.S. Scruggs, M., and Vimont, J. (1992): Interagency Workgroup on Air Quality Modeling (IWAQM) Work Plan Rationale. EPA-454/R-92-001, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 23 pp.

R.15 Stogner, R.E., Irwin, J.S., Petersen, W.B., Aissa, M., and Lansari, A., (1991): Two indoor air exposure modeling studies: CONTAM modeling results, and serial correlation effects. EPA/600-3-91/013, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, NC, 149pp.

R.14 Irwin, J.S., J.O. Paumier and R.W. Brode (1988): Meteorological processor for regulatory models (MPRM-1.1) user's guide. EPA-600/3-88/043. Atmospheric Sciences Research Laboratory, RTP, NC, 225 pp., (NTIS Accession Number PB 89-127526).

- R.13 Paumier, J., D. Stinson, T. Kelly, C. Bollinger and J.S. Irwin (1986): MPDA-1: a meteorological processor for diffusion analysis - user's guide. EPA/600/8-86/011. Atmospheric Sciences Research Laboratory, RTP, NC, 181 pp. (NTIS Accession Number PB 86-171402).
- R.12 Irwin, J.S., T. Chico and J. Catalano (1986): CDM-2.0 - Climatological Dispersion Model User's Guide. EPA/600/8-85/029. Atmospheric Sciences Research Laboratory, RTP, NC, 136 pp. (NTIS Accession Number PB 86-136546).
- R.11 Irwin, J.S., T.M. Asbury and W.B. Petersen (1986): Description of the Savannah River Laboratory meteorological data base for 1975 to 1979. EPA/600/3-86-017. Atmospheric Sciences Research Laboratory, RTP, NC, 121 pp. (NTIS Accession Number PB 86-166287).
- R.10 Irwin, J.S., S.E. Gryning, A.A.M. Holtslag and B. Sivertsen (1985): Atmospheric Diffusion Modeling Based on Boundary Layer Parameterization. EPA/600/3-85-056. Atmospheric Sciences Research Laboratory, RTP, NC, 44 pp. (NTIS Accession Number PB 86-103660).
- R.9 Petersen, W.B., J.S. Irwin, D.B. Turner, J.A. Catalano, and F.V. Hale III (1983): Handbook for preparing user's guides for air quality models. EPA-600/8-83-018. Environmental Sciences Research Laboratory, RTP, NC, 47 pp.
- R.8 Irwin, J.S. and D.B. Turner (1983): An analysis of Complex I and Complex II -candidate screening models. EPA-600/3-83-034. Environmental Sciences Research Laboratory, RTP, NC, 57 pp. (NTIS PB 83-207399).
- R.7 Irwin, J.S., (1983): Preparing meteorological data for use in routine dispersion calculations -- workgroup summary report. NOAA TR-ERL ARL-122. 20 pp.
- R.6 Irwin, J.S. (1979): Scheme for estimating dispersion parameters as a function of release height. EPA-600/4-79-062. U.S. Environmental Protection Agency, NC, 68 pp.
- R.5 Turner, D.B. and J.S. Irwin (1977): Application of the CDM (Climatological Dispersion Model) to the NATO common data base for Frankfurt Part II. Summer and winter. Document for practical demonstration of urban air quality simulation models, NATO/CCMS panel on modeling.
- R.4 Irwin, J.S. (1976): The application of the SCAM (sampled chronological air-quality model) to the NATO common data base for Frankfurt, document for practical demonstration of urban air quality simulation models, NATO/CCMS panel on modeling.
- R.3 Irwin, J.S. (1976): A frequency-distribution algorithm for multiple-source short-term pollution concentrations, Documentation of Urban Air Quality Simulation Models, NATO/CCMS panel on modeling.

R.2 Weber, A.H., J.S. Irwin, J.P. Kahler, and W.B. Petersen (1975): Atmospheric turbulence properties in the lowest 300 meters. EPA-600/4-75-004. U.S. Environmental Protection Agency, RTP, NC, 161 pp.

R.1 Irwin, J.S. (1974): Analysis of turbulence parameters in the lowest 300 meters of the atmosphere, Masters Thesis, NC State University, Raleigh, NC.