

Ivar Tombach, Ph.D.

Environmental Consulting

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RÉSUMÉ

TECHNICAL SPECIALTIES

- Analysis and Interpretation of Environmental Data
- Technical Analysis of Environmental Policy, Regulations, and Guidance
- Design and Management of Air Pollution Research Programs
- Assessment of Source Contributions to Particulate Matter and Visibility
- Evaluation of Control Strategies for Particulate Matter and Visibility

EXAMPLES OF RECENT CLIENTS

- American Petroleum Institute
- Electric power companies – Arizona Public Service, Dynegy Midwest Generation. Salt River Project, Southern California Edison, Southern Company, Tennessee Valley Authority
- Electric Power Research Institute (EPRI)
- Hong Kong Environmental Protection Department
- Midwest Ozone Group
- Southeastern States Air Resource Managers (SESARM), for the VISTAS Regional Planning Organization (RPO)
- Southern Appalachian Mountains Initiative (SAMI)
- U.S. Government – U.S. Environmental Protection Agency, U.S. Minerals Management Service, U.S. National Park Service
- Utility Air Regulatory Group (UARG)
- Western Energy Supply and Transmission (WEST) Associates
- Western Governors' Association, for the WRAP Regional Planning Organization

PROFESSIONAL ACTIVITIES

- Southeastern Aerosol Research and Characterization (SEARCH) – Ongoing analysis of results of measurements of speciated composition of particulate matter by continuous analyzers and from analysis of filter samples, as well as continuous measurements of light extinction, made from 1998 to the present at 8 locations in the Southeastern US.
- Characterization of ammonia gas and ammonium ion concentrations on the Colorado Plateau – Principal investigator of a recent field research program that measured the atmospheric concentrations of ammonia and other gases and of chemical components of particulate matter, to

evaluate the contribution of ammonia to atmospheric particles in a desert region in Arizona and Utah.

- Aerosol measurement and characterization – Principal investigator of many studies, ranging in size from small to \$15 million, of air pollution and the chemical and physical composition of atmospheric particles, their interactions with air pollutant gases, their sources, and their impacts on visibility and on deposition damage to man-made surfaces.
- Principal author of the final report of the Big Bend Regional Aerosol and Visibility Observational Study (BRAVO), a joint government-industry study in west Texas, and of the final report of Project MOHAVE, a Congressionally-mandated study of the impacts of the emissions of the MOHAVE Power Project in Nevada on air pollution and visibility at the Grand Canyon.
- Western Regional Air Partnership (WRAP) -- Member of Technical Analysis Forum, which provided overview of regional visibility-related monitoring, data analysis, and modeling in support of State Implementation Plan (SIP) development for regional haze mitigation. Previously member of the Air Quality Modeling Forum, which guided visibility-related regional (CMAQ and CAMx) and CALPUFF modeling performed by WRAP's Regional Modeling Center.
- Grand Canyon Visibility Transport Commission (GCVTC) -- Member of Technical Committee. The GCVTC was created by Congress to recommend air pollution management strategies for protecting visibility in Class I areas on the Colorado Plateau.
- Peer reviewer of air quality models, and particulate matter and acid deposition measurement research and reports for the U.S. EPA, National Park Service, and others. Chair of international peer-review panel for the National Acid Precipitation Assessment Program's (NAPAP's) research program for evaluating the RADM acid deposition model. Regular reviewer of proposals and grant applications submitted to U.S. EPA and other organizations.
- Regular peer reviewer of manuscripts for *Journal of the Air & Waste Management Assoc.*, *Journal of Geophysical Research*, *Atmospheric Environment*, and other journals.
- Participant in National Academy of Sciences forum and contributor to the National Research Council's report on pollution effects on historic stone buildings and monuments.
- Author of more than 200 articles, papers, and reports on air pollution and its effects.

EMPLOYMENT HISTORY

Independent Environmental Consultant (1999-Present)

ENSR Corp. (1992-1999) - Vice President and National Program Manager

AeroVironment Inc. (1971-1991) – Co-founder, Vice President and Director

Meteorology Research, Inc. (1969-1971) - Research Scientist

EDUCATION

Ph.D. (Aeronautics), California Institute of Technology, 1969

M.Ae.E. (Aerospace Engineering), Cornell University, 1966

B.S. (Engineering, with honors), California Institute of Technology, 1963

PROFESSIONAL CERTIFICATIONS, AFFILIATIONS AND AWARDS

Institute for Professional Environmental Practice,
Qualified Environmental Professional (QEP) #11960220

Air and Waste Management Association,
Recipient of the 2011 Frank A. Chambers Excellence in Air Pollution Award;
Emeritus Fellow Member;
Founding member and former Chairman (twice) of Visibility Technical Committee

American Association for Aerosol Research

American Geophysical Union

American Meteorological Society

American Society of Mechanical Engineers

Sigma Xi, the Scientific Research Society

EXAMPLES OF PEER-REVIEWED PUBLICATIONS

Tombach, I., and P. Brewer 2005. Natural background visibility and regional haze goals in the southeastern United States. *Journal of the A&WMA* 55:1600-1620.

Schichtel, B., M. Pitchford, K. Gebhart, W. Malm, M. Barna, E. Knipping, and I. Tombach 2005. Reconciliation and interpretation of Big Bend National Park's particulate sulfur source apportionment – Results from the BRAVO study Part I. *Journal of the A&WMA* 55:1709-1725.

Pitchford, M., B. Schichtel, K. Gebhart, M. Barna, W. Malm, I. Tombach and E. Knipping 2005. Reconciliation and interpretation of the Big Bend National Park's light extinction source apportionment – Results from the BRAVO study Part II. *Journal of the A&WMA* 55:1726-1732.

Tombach, I., and K. McDonald 2003. Visibility and Radiative Balance Effects. Chapter 9 in *Particulate Matter Science for Policy Makers: A NARSTO Assessment*, P. McMurry, M. Shepherd, and J. Vickery, Editors. Cambridge University Press, New York.

Green, M.C., and I. Tombach 2000. Use of Project MOHAVE perfluorocarbon tracer data for source attribution analysis. *Journal of the A&WMA* 50:717-723.

McDade, C., I. Tombach, C. Seigneur, P. Mueller and P. Saxena 2000. The relationship of distant SO₂ emissions to Dallas-Fort Worth Winter Haze. *Journal of the A&WMA* 50:826-834.

McDade, C., I. Tombach, S. Hering, and N. Kreisberg 2000. Analysis and simulation of wintertime light scattering by the urban aerosol in Dallas-Fort Worth. *Journal of the A&WMA* 50:849-857.

Seigneur, C., P. Pai, I. Tombach, C. McDade, P. Saxena and P. Mueller 2000. Modeling of potential power plant plume impacts on Dallas-Fort Worth visibility. *Journal of the A&WMA* 50:835-848.

Pai, P., R. Farber, P. Karamchandani and I. Tombach 2000. Assessment of the Nested Grid Model estimates for driving regional visibility models in the southwestern United States. *Journal of the A&WMA* 50:818-825.

Seigneur, C., B. Pun, P. Pai, J-F. Louis, P. Solomon, C. Emery, R. Morris, M. Zahniser, D. Worsnop, P. Koutrakis, W. White, and I. Tombach 2000. Guidance for the performance evaluation of three-dimensional air quality modeling systems for particulate matter and visibility. *Journal of the A&WMA* 50:588-599.

Zannetti, P., I. Tombach and S. Cvencek 1993. Calculation of visual range improvements from SO₂ emission controls - II. An application to the eastern United States. *Atmospheric Environment* 27A:1479-1490.

Zannetti, P., I. Tombach, and W. Balson 1990. Calculation of visual range improvements from SO₂ emission controls - I. Semi-empirical methodology. *Atmospheric Environment* 24A:2361-2368.

Mathai, C.V., J.G. Watson, Jr., C.F. Rogers, J.C. Chow, I. Tombach, et al. 1990. Intercomparison of ambient aerosol samplers used in western visibility and air quality studies. *Environmental Science and Technology* 24:1090-1099.