

Summary of Professional Experience

In December 2021, Dr. Baumann joined Picarro Inc., a precision instrument manufacturer specialized in the application of Cavity-Ring Down Spectroscopy (CRDS) for accurate real-time measurement of trace gases in indoor and outdoor environments, workplaces, facilities and private homes. One of his initial tasks was to improve accuracy, specificity, and sensitivity of CRDS analyzers measuring highly resolved formaldehyde (HCHO) and ethylene oxide (EtO) in real time. In ongoing collaborations with the US Environmental Protection Agency (EPA), he focuses on minimizing detection limits while maximizing selectivity in the continuous measurement of EtO in different ambient air applications across climate zones, seasons and environments.

From July 2017 to November 2021, Dr. Baumann served the Environmental Sciences and Engineering department of the Gillings School for Global Public Health at the University of North Carolina in Chapel Hill as an Assistant Professor, investigating multi-phase chemical reactions occurring on particles and droplets suspended in air (aerosol). In the first 6 months of this period, he joined the Multiphase Chemistry department at the Max-Planck Institute for Chemistry in Mainz, Germany, where he designed and conducted experiments allowing reproducible loading of a simulated epithelial lining fluid (ELF), containing electrolytes, surfactants and proteins, with quinones alone or in combination with other nitrated and oxygenated PAH (NOPAHs). The loaded ELF is suitable for determining the oxidative potential (OP) of the target NOPAHs employing both extra- and intra-cellular assays. The surface-mediated uptake was shown to yield higher OP compared with that from bulk mixtures. This work is ongoing and will inform kinetic modeling of the ELF interface in a comprehensive PM_{2.5} exposure and health risk assessment.

In July and August 2020, Dr. Baumann received funding to investigate the viability of infectious aerosol in conjunction with the COVID-19 pandemic. As PI and Co-I in two highly interdisciplinary research projects, he developed capacity to measure concentration and viability of aerosol-transmitted SARS-CoV-2 virus in field and laboratory experiments. Earlier in 2019, he joined the NC Collaborative involving Duke, Eastern Carolina and NC State Universities, and Schools from UNC Chapel Hill, Charlotte, and Wilmington, to study the spatial and temporal distribution of per- and poly-fluoroalkyl substances (PFAS) contained in atmospheric aerosol. As part of this effort, he designed and conducted fence line measurements of PFAS to monitor PFAS fugitive emissions from the Chemours manufacturing plant in Fayetteville, one of the largest Teflon manufacturers in the US. At the same time, Dr. Baumann joined the Incentive to Maximize Partnerships and Catalyze Teamwork (IMPACT), where in collaboration with NCA&T Greensboro and RTI International, biomass combustion PM exposures were produced and their toxicity investigated by focusing on selected biomarkers of cytotoxicity, oxidative stress, and toxicogenomic responses. Dr. Baumann was responsible for chemically characterizing the PM emissions generated in the NCA&T combustion test chamber.

In 2007, Dr. Baumann joined Atmospheric Research & Analysis, Inc. (ARA), where he served 10 years as Senior Scientist and Laboratory Director. In his first year with ARA, he built and staffed a laboratory specifically designed for advanced chemical analysis of discrete aerosol samples, employing state-of-the-science instrumentation. The ARA laboratory primarily served the South-Eastern Aerosol Research and Characterization (SEARCH) network in the scientific analyses and evaluation of aerosol samples from the network stations. SEARCH data are basis for over 300 scientific publications since its inception in 1998.

Since July 2015, Dr. Baumann implemented and optimized automated gas chromatographic instrumentation at four SEARCH network sites that uniquely collect hourly data of volatile organic compounds (VOC) in a continuous manner. The availability of highly resolved continuous VOC data allows insights into diurnal and seasonal characteristics of ambient VOC and their changing role in photochemical processes leading to ozone and secondary organic aerosol (SOA) pollution across the Southeast.

In 2013, Dr. Baumann managed the SEARCH-Centreville site to serve as ground site for the Southern Oxidants & Aerosol Study (SOAS), where over 100 scientists from universities, federal and other institutions deployed research instruments in June and July, to study and ultimately better understand climate and air quality in the Southeastern U.S. (<http://SOAS2013.rutgers.edu/>). During SOAS, Dr. Baumann studied boundary layer dynamics effects on air quality in rural and urban settings using two CHM15k Nimbus LIDAR ceilometers from Jenoptik. During this time, he also provided technical and analytical support to UNC Chapel Hill (Surratt group) in operating an Aerosol Chemical Speciation Monitor (ACSM) to investigate the role of isoprene in the formation of SOA.

Between 2008 and 2012, he helped develop an air quality program within the Defense Coastal-Estuarine Research Program (DCERP), a large multi-disciplinary ecosystem research study funded by DoD-SERDP. In this study, Dr. Baumann led the interdisciplinary effort to quantitatively link chemically resolved pollutant emissions from prescribed burning with specific fuel conditions including mechanical thinning, testing its merit as an effective fuel treatment option to accelerate long-leaf pine restoration in the Southeast.

Prior to joining ARA, Dr. Baumann worked in the Center for Aerosol Technology at RTI International (RTI), where he helped develop research programs in air quality management, emissions control, receptor modeling, exposure measurements, sensor development, testing, quality assurance and quality control. While at Georgia Institute of Technology, Dr. Baumann directed the Air Resources Engineering Center (AREC) and managed the field and laboratory activities of the Southern Center for the Integrated Study of Secondary Air Pollutants (SCISSAP).

His research specialties are in methods development, conduct, QAQC, evaluation and interpretation of the measurements of atmospheric aerosol constituents in polluted and rural environments. Dr. Baumann's technical areas of expertise include conducting measurements for source characterizations; evaluating atmospheric dispersion, transport, and transformation of pollutants; conducting size-specific, speciated aerosol (PM and reactive gases) sampling; and performing receptor modeling of gas- and particle-phase pollutants for source apportionment.

Professional Training

Ph.D. (German equivalent), Energy Engineering, University of Stuttgart, Germany	1987-1992.
M.Sc. (German equivalent), Mechanical Engineering, University of Stuttgart, Germany	1982-1986.
Graduate Study Abroad Scholarship, University of Colorado, Boulder, CO	1982-1983.
B.Sc. (German equivalent), Mechanical Engineering, University of Stuttgart, Germany	1978-1981.

Professional Experience

2021 to present. Picarro Inc., Environmental Group, Santa Clara, CA.

Application Scientist. Focus to improve the already impressive performance of Picarro CRDS analyzers measuring formaldehyde (HCHO) and ethylene oxide (EtO) in real-time. These are two of the 188 hazardous air pollutants (HAPs) listed by EPA, with EtO receiving increased public attention due to EPA's recent decrease of its lifetime exposure limit in ambient air to 11 pptv (parts per trillion by volume, long-term 100:1,000,000 risk level). In concerted efforts with EPA, try to understand sources of EtO, its background levels in rural and urban environments, its variability in space and time, its

background levels indoors, and what fraction of the population and workforce is at risk from elevated EtO levels.

2017 to 2021. Environmental Sciences and Engineering, University of North Carolina, Chapel Hill.

Assistant Professor. Assume adjunct position to collaborate with Multiphase Chemistry Department of the Max Planck Institute for Chemistry in Mainz Germany. Investigate health risks of oxygenated and nitrated polycyclic aromatic hydrocarbons (NOPAHs) incl. quinones carried by ultrafine PM into the alveolar region of the human lung, by studying the surface-mediated uptake of specific NOPAHs and generation of reactive oxygen species (ROS) in the simulated ELF. Develop and conduct lab and field experiments to investigate toxicological effects of fine and ultra-fine PM emitted from wood combustion and to determine atmospheric contributions to observed deposition of per- and poly-fluoroalkyl substances (PFAS) over North Carolina. Design and conduct fence line monitoring of PFAS at prevailing up- and down-wind locations of the Chemours manufacturing facility near Fayetteville NC. Advise and co-advise MS and PhD students in the collection, analysis, evaluation and interpretation of aerosol samples indoors and at different source-receptor locations outdoors. Develop and conduct multidisciplinary research to determine measures that effectively inactivate SARS-CoV-2 virus laden aerosol in indoor environments.

2007 to 2017. Atmospheric Research & Analysis, Inc., Cary and Morrisville, NC.

Senior Scientist and Lab Director. After developing significant analytical capacity, he manages investigative and research-driven laboratory operations, as well as several air quality projects sponsored by various private companies, including the Wood Buffalo Environmental Association (WBEA), Southern Company, Electric Power Research Institute (EPRI), and government organizations including EPA and DoD.

2005 to 2007. RTI International and U.S. EPA, Research Triangle Park, NC.

Senior Research Engineer, Center for Aerosol Technology. Developed and supported research projects in air quality management, emissions control, receptor modeling, exposure measurements, sensor development, testing, and QC. Significantly contributed to various projects sponsored by the U.S. EPA, the U.S. Department of Homeland Security (DHS), the Defense Advanced Research Projects Agency (DARPA), and the U.S. DoD.

1998 to 2005. Georgia Institute of Technology (Georgia Tech), Atlanta, GA.

Senior Research Engineer. While directing the Air Resources Engineering Center, developed technical capacity for and successfully conducted several research driven field and laboratory experiments investigating atmospheric aerosol chemistry, physics and air quality in rural and urban environs of the US and China. Teach, advise and co-advise MS and PhD students in quality assured air quality measurements and interpretation. Initiated by and in collaboration with experts from the medical research community (CDC and Emory University), a health tracking system was started that would ultimately link ambient air quality to related health effects.

1993 to 1998. National Oceanic and Atmospheric Administration (NOAA) and the National Center for Atmospheric Research (NCAR), Boulder, CO.

Postdoctoral Fellow. Helped develop and improve NO₂ and NO_y measurement techniques. NO₂ photolysis design optimization for faster response and investigation of possible signal artifacts in newly developed detector modules for high-yield photolytic conversion of NO₂ and surface-catalytic reduction of NO_y species. Modules deployed in pristine arctic regions and on high-flying aircraft provided new insights in nitrogen oxides chemistry in the remote atmosphere.

1987 to 1992. Energy Engineering Faculty, University of Stuttgart, Germany.

Dr.-Ing. Candidate. Performed dissertation research on forest ecosystem parameters, functionalities, and sensitivities, culminating in Ph.D. thesis work on *Ozone Deposition into Forest Stands—Different Experimental Methods*. Estimated deposition rates by different experimental and theoretical (modeled) methods and put in context with ecosystem vitality and environmental defense mechanisms. Advised over 40 graduate students in study and thesis works. Post-thesis, delivered and implemented air quality monitoring station, under European Commission contract AG-090-04-037, at meteorological observatory operated by the Obafemi Awolowo University of Ife in Lagos, Nigeria.

1984 to 1987. Mechanical Engineering Faculty, University of Stuttgart, Germany.

M.Sc. Candidate. Conducted Master Thesis work on *Dispersion of Air Pollutants from a Heavily Used Motorway (Autobahn)*. This work concerned the influence of road-side embankments on the dispersion of air pollutants emitted from a line source and their effect on the local air quality.

1982 to 1984. University of Stuttgart and University of Colorado, Boulder.

MechE Graduate Student and Study Abroad Scholar. Independently studied *The Stretched Membrane Solar Heliostat Design* at the Solar Energy Research Institute (SERI), providing structural analysis of a conceptual design alternative for less economical first generation heliostats used in solar thermal power plants.

Selected Project Experience

Dr. Baumann has extensive experience in methods development, conduct, quality control (QC), statistical analysis, evaluation and interpretation of the measurements of atmospheric aerosol constituents in polluted and rural environments. His selected project experience at ARA (since 2007) includes the following:

Implementation and Optimization of Continuous VOC Measurements in the SEARCH Network (2015-2016). Dr. Baumann led the effort of implementing automated GC instrumentation for the continuous measurement of volatile organic compounds (VOC), an important precursor for atmospheric ozone and fine particulate matter, into four SEARCH network sites. He optimized the systems (Markes Unity-2 Thermal Desorption Air Sampler with Agilent 7890B dual column Gas Chromatograph) to achieve highest sensitivity and compound resolution, while maintaining highest degree of data quality and integrity. The characterization of diurnal and seasonal VOC patterns across the Southeast provides new insights into the mechanisms relevant for the atmospheric formation of ozone and fine particulate matter.

Measurement of Organosulfur (OS) Compounds in Fine PM (2014-2016). Employing isotope dilution Inductively Coupled Plasma Mass Spectrometry (ICPMS) in conjunction with ion chromatography on discrete aerosol samples collected on quartz fiber filters, Dr. Baumann's laboratory developed a method to measure the amount of sulfur organically bound in PM_{2.5}. These OS compounds are being formed from oxidation of isoprene and monoterpenes, and are important in the evaluation of SO₂ emission control measures mandated by EPA and employed by industry over the last two decades. ICPMS' poor S-sensitivity is improved by spiking internal standards with isotopic ³³S, reacting with O₂ to form SO, and analyzing both 48 and 49 amu isotopes via oxygen Dynamic Reaction Cell ICPMS.

Field Testing and Evaluation of an Aerosol Chemical Speciation Monitor (2011-2016). The ACSM measures chemical composition of particles smaller 1 micron (PM₁), combining an aerodynamic particle focusing lens with high vacuum thermal particle vaporization, electron impact ionization, and mass spectrometry, similar to the widely used Aerodyne Aerosol Mass Spectrometer (AMS), except that it is smaller, lower cost, and simpler to operate. In a five year collaboration with the Surratt group from UNC Chapel Hill, Dr. Baumann helped to field test and evaluate the ACSM performance at three different

urban and rural locations of the Southeastern US. This project shed new light on the role of isoprene oxidation in the atmospheric formation of secondary organic aerosol (SOA) and organosulfates in PM_{2.5}.

Comparison of Boundary Layer Dynamics at Rural and Urban Sites via LIDAR Ceilometer

Technology (2012-2015). A cloud height meter based on the LIDAR (Light Detection And Ranging) technology, the CHM15k Nimbus commercially available from Jenoptik, Germany, was deployed at various SEARCH sites for different seasons to study and compare boundary layer dynamics and its effects on local air quality. Valuable information was gained on the difficulties of continuously operating a commercial ceilometer in the humid atmosphere of the Southeast. Although comparison during the below SOAS campaign with a research-grade ceilometer showed good performance in estimating atmospheric mixing heights on an hourly basis, the lower level resolution needed to detect shallow inversion layers at night, remained highly uncertain despite immense post-analytical efforts.

Logistical and Analytical Support of the Southern Oxidants and Aerosol Study (2013-2014).

The abundance of volatile organic compounds (VOC) emitted from anthropogenic and biogenic sources combined with high concentrations of atmospheric oxidants, makes the atmosphere over the southeastern US conducive for photochemical aerosol formation. As a result, the atmospheric abundances of many climate forcing agents and air pollutants are high in the Southeast. However, the mechanisms controlling these abundances are very poorly understood. The SEARCH-Centreville site served as ground site for a large SOAS team of over 100 scientists to investigate these mechanisms in the summer of 2013. Dr. Baumann managed the site and provided logistical support during the campaign and analytical support during the subsequent data analysis, evaluation and interpretation phase.

Evaluation of Passive/Active Measurement Systems for Ambient NH₃ and HNO₃ (2011-2012).

The Wood Buffalo Environmental Association (WBEA) has been measuring ambient NH₃ and HNO₃ concentrations employing passive sampling techniques at remote sites in the Athabasca Oil Sands, since 2005. Dr. Baumann rigorously examined the quality of WBEA's passive measurements, in particular the difference in effective stoichiometric, specific chemical absorption of HNO₃ onto sodium chloride versus the non-specific physical adsorption onto nylon. He recommended not use nylon for the passive sampling of HNO₃ intended to quantify its atmospheric deposition at remote and pristine locations relevant to ecological effects assessments.

Develop and Manage the Assessment of XRF Measurement Uncertainty (2008-2012).

Employing modern instrumentation comprised of an Inductively Coupled Plasma Mass Spectrometer (ICPMS), an Ion Chromatograph (IC) and a Vibrating Orifice Aerosol Generator (VOAG) in conjunction with an ISO-6 clean room (< 10⁶ particles/m³), he conducted specific experiments targeting true measurement uncertainty in the detection of XRF elements in fine PM using an Energy Dispersive X-Ray Fluorescence (ED-XRF) spectrometer. Involvement of EPA's scanning electron microscope confirmed the validity of the VOAG application in this approach.

Air Quality Program Development within Large Ecosystem Research Study (2006-2012).

As part of the DoD-SERDP-funded Defense Coastal-Estuarine Research Program (DCERP), involving a diverse team of discipline experts from 9 different research institutions, Dr. Baumann led the team of the overarching Atmospheric Module and played a pivotal role of effectively integrating the four other Terrestrial and Aquatic Modules. He also designed and conducted comprehensive field measurements for the successful determination of *in situ* emission factors for an unprecedented suite of chemical aerosol constituents

As Senior Research Engineer with RTI International:

Develop Nanoparticle Delivery Methods for Toxicology Studies (2005 to 2006).

The objective of this RTI Internal Research and Development (IRD) study was to develop methods for the delivery of nanoparticles to cellular systems *in vitro* and via intra-tracheal administration without significant alteration of the nanoparticle structural characteristics as a result of the delivery device. Designed and implemented a test

setup that allowed the characterization of the available delivery devices in terms of size distribution of the administered nanoparticles. Developed novel safety protocol for handling of nanomaterials.

Develop Test Bed and Procedures to Verify Bioaerosol Instrument Performance (2006). The main objective was to develop a controlled environment that can reproduce the bioaerosol “background” mix, concentration levels and variability encountered under normal conditions inside high value, high-risk buildings, and that allows simulation of realistic threats for testing the detection specificity of novel sensors.

Peer Review of Steubenville Mercury Source Apportionment Results for EPA’s Office of Research and Development (ORD) (2005). Organized, conducted, and synthesized a thorough scientific peer review of ORD’s findings from mercury wet deposition measurements in Steubenville, OH, into a final report for inclusion into the U.S. Government’s electronic docket system. These research results improved models used to predict mercury deposition on local, regional and global scales, and were ultimately used to develop scientifically sound policies for mercury risk management, such as the Clean Air Mercury Rule (CAMR).

Receptor Model Comparison Quality Assurance Procedures Report (2005). Substantially contributed to the eventual development of a receptor modeling guidance package for end users that allowed uniform selection, application, and comparison of receptor models and their output by those who fall into a fairly broad range of skill levels. The report served as the foundation for Category 4 Quality Assurance Project Plans (QAPPs) for future applications involving comparisons of results from receptor models.

As Senior Research Engineer with Georgia Tech:

Development of a Smoke Management Plan (SMP) for GA (2004 to 2005). As a member of a committee consisting of experts and representatives from the state’s regulatory agency, the U.S. military, forest service, research community and NGO, he developed procedures that helped identify sensitivities of certain measures to ambient ozone and fine PM concentrations. He developed potential strategies for identifying source contributions from wild land and prescribed fires relative to mobile sources and atmospheric sources that govern the regional background.

Air Quality Impacts Resulting from Prescribed Burning in the SE-US (2003 to 2005). He served as Principal Investigator of this project sponsored by the U.S. Army Infantry Center and the Installation Management Agency South-East Regional Office (IMA-SERO). Emission factors for gas- and particle-phase pollutants were determined *in situ*, utilizing the well-established U.S. Army land management procedures as a platform to investigate the complex character of emissions from prescribed burning in the Southeast, and their relationship to other sources’ impact on sub-regional air quality.

Pensacola Partnership for Environmental Research and Community Health—Air Quality Study (PERCH-AQS, 2003 to 2005). In this EPA-sponsored project, partners from the Universities of West and South Florida assessed the effect of environmental hazard exposure on the health status of geographically defined populations in Escambia and Santa Rosa counties. Based on this assessment, he led a 1-month intensive field study that characterized the ambient air quality at an elementary school in Pensacola, FL, identifying multiple sources for both ozone and PM_{2.5} with secondary organic aerosol formation being the bulk contributor to the latter.

Fall-line Air Quality Study (FAQS, 2000 to 2005). Continuous PM_{2.5} and trace gas network measurements in urban and rural environs along Georgia’s fall-line, the line dividing the Piedmont region from the Coastal Plain, were made during a 3-year period and used to develop an effective and efficient plan for improving air quality. Dr. Baumann assessed urban and regional air pollution, identified sources of pollutants and pollutant precursors, conceptualized potential solutions, and evaluated potential poor air quality in the Augusta, Macon, and Columbus metropolitan areas.

Texas Air Quality Study 2000 (TexAQS2k). Dr. Baumann conducted discrete PM_{2.5} speciation, continuous PM_{2.5} mass and trace gas measurements during a 5-week intensive field campaign in Houston, TX. In this large multi-institutional research project, studied pollutants emissions and atmospheric transformations under photo-chemically active and highly polluted conditions. A commercial high-rise building was utilized to measure atmospheric tracers 254 m agl, and to identify and compare chemical processes of aerosol transformation and new particle formation.

Air Quality Impacts from Chinese Mega-Agro-Plexes (China-MAP). Dr. Baumann established network measurements in the greater Yangtse Delta region during 1999 as part of a combined World Bank/National Aeronautics and Space Administration (NASA)-sponsored project. Conducted discrete PM_{2.5}/PM₁₀ mass and composition, as well as continuous trace gas, including ozone, carbon monoxide, sulfur dioxide, nitric oxide, nitrogen oxide measurements during intensive field campaigns in November 1999 and March–April 2000.

EPA PM Supersite Campaign in Atlanta, GA (1999). In this first of several succeeding PM Supersite campaigns funded by EPA, Dr. Baumann developed and tested new instrumentation for comprehensively measuring PM_{2.5} gaseous precursors, mass, and composition. He established and verified benchmark procedures for quality assurance (QA) and QC. In the capacity of leading the field and laboratory activities, he performed this campaign under the umbrella of the Southern Oxidants Study (SOS) and within the research objectives of the Southern Center for the Integrated Study of Secondary Air Pollutants (SCISSAP).

As Postdoctoral Fellow with NOAA and NCAR:

Flatland Flux Experiment. As a Co-Investigator in a NOAA-led project, he performed 1 Hz gradient and 10 Hz eddy covariance measurements of biological, physical, and chemical parameters at an agricultural experiment site near Bondville, IL. The results allowed an estimate of NO_x emissions from the soil and its transport through the corn canopy and into the free troposphere.

Stratosphere-Troposphere Experiments: Radiation, Aerosols, and Ozone (STRAO). As Co-Investigator in a NCAR-led project, Dr. Baumann helped develop research-grade CO, NO, and NO_y instrumentation for high-altitude aircraft deployment. In the active field mission, he conducted CO measurements aboard the University of North Dakota Citation II aircraft, which played a key role in identifying polluted boundary layer air being effectively transported into the upper troposphere in deeply convective thunderstorms.

Southern Oxidants Study in Nashville, Tennessee (SOS). Dr. Baumann conducted *in situ* measurements and provided QA/QC to collaborating participants. He validated, evaluated, and interpreted meteorological parameters, CO, NO, NO₂, NO_y, O₃, and SO₂ at the comprehensive ground research site in a suburban area. As a result, he estimated photochemical ozone production rates in urban outflow from real-time observations for the first time, pointing to significant entrainment rates during high-pressure stagnation periods in summer.

Global Atmospheric Watch (GAW) in Argentina. Dr. Baumann provided support to the World Meteorological Organization (WMO) in establishing a GAW station in Ushuaia, Tierra del Fuego, Argentina. He developed and tested highly sensitive sensors for *in situ* measurements of CO and O₃ at one of the most remote GAW stations of the WMO.

Tropospheric OH Photochemistry Experiment (TOHPE). Dr. Baumann conducted *in situ* measurements of meteorological parameters, CO, NO, NO₂, NO_y, and O₃ near the top of Colorado's Front Range. He helped detect, trace and characterize the "upslope circulation" carrying polluted air masses from the Denver–Boulder urban corridor to the upper troposphere.

Citation Statistics

Google Scholar per August 2024

Citations: 7098 h-index: 49 i10-index: 70
<https://scholar.google.ca/citations?hl=en&user=rWy1Y3cAAAAJ>

Research Gate per August 2024

Citations: 6731 h-index: 47 RI score: 2794, above 97% of RG members' scores.
https://www.researchgate.net/profile/Karsten_Baumann/reputation

Peer-Reviewed Journal Articles

- Chang, N.Y., C.M.A. Eichler, D.E. Amparo, J. Zhou, **K. Baumann**, E.A. Cohen Hubal, J.D. Surratt, G.C. Morrison, B.J. Turpin, Indoor air concentrations of PM_{2.5} quartz fiber filter-collected ionic PFAS and emissions to outdoor air: Findings from the IPA campaign, *Environ. Sci. Proc. Impacts*, Royal Society of Chemistry, submitted 2024.
- Webb, M., G. Morrison, **K. Baumann**, J. Li, J. Ditto, H. Huynh, J. Yu, K. Mayer, L. Mael, D. Kim, M. Link, M. Vance, D. Farmer, J. Abbatt, V. Grassian, D. Poppendieck, B. Turpin, Dynamics of residential indoor gas- and particle-phase water-soluble organic carbon: Measurements during the CASA experiment, *Environ. Sci. Proc. Impacts*, Royal Society of Chemistry, submitted 2024
- Vizuete, W., J. Kim, R. Chartier, P. Doraiswamy, M. Fiddler, R. Newman, S. Bililign, V. Rao, H. Hartwell, J. Zavala, **K. Baumann**, Human bronchial epithelial lung cell *in vitro* exposures to ultrafine (nano sized) aerosols from biomass combustion, *ACS Environ. Sci. Technol.*, es-2023-013539 under revision 2023.
- Webb, M., L. Cui, G. Morrison, **K. Baumann**, J.D. Surratt, Z. Zhang, J. Atkin, B.J. Turpin, The fate of organic peroxides indoors: Quantifying humidity-dependent uptake on naturally soiled indoor window glass, *Environ. Sci. Proc. Impacts*, Royal Society of Chemistry, doi.org/10.1039/d3em00041a, 2023.
- Baumann, K.**, M. Wietzoreck, P. Shahpoury, A. Filippi, S. Hildmann, S. Lelieveld, T. Berkemeier, H. Tong, U. Pöschl, G. Lammel, Is the oxidative potential of components of fine particulate matter surface-mediated? *Environ. Sci. Pollut. Res.*, doi.org/10.1007/s11356-022-24897-3, 2022.
- Zhou, J., **K. Baumann**, J.D. Surratt, B.J. Turpin, Legacy and Emerging Per- and Polyfluoroalkyl Substances (PFAS) collected on PM_{2.5} filters in close proximity to a fluoropolymer manufacturing facility, *Environ. Sci. Proc. Impacts*, Royal Society of Chemistry, doi.org/10.1039/d2em00358a, 2022.
- Plaas, H.E., R.W. Paerl, **K. Baumann**, C. Karl, K.J. Pependorf, M.A. Barnard, N.Y. Chang, N.P. Curtis, H. Huang, O.L. Mathieson, J. Sanchez, D.J. Maizel, A.N. Bartenfelder, J.S. Braddy, N.S. Hall, K.L. Rossignol, R. Sloup, and H.W. Paerl, Harmful cyanobacterial aerosolization dynamics in the airshed of a eutrophic estuary, *Sci Tot Env* 852, doi.org/10.1016/j.scitotenv.2022.158383, 2022.
- Cooke, M.E., N.C. Armstrong, Z. Lei, Y. Chen, C.M. Waters, Y. Zhang, N.A. Buchenau, M.Q. Dibley, I.R. Ledsy, T. Szalkowski, J.Y. Lee, **K. Baumann**, Z. Zhang, W. Vizuete, A. Gold, J.D. Surratt, A.P. Ault, Organosulfate formation in proxies for aged sea spray aerosol: Reactive uptake of isoprene epoxydiols to acidic sodium sulfate, *ACS Earth Space Chem.*, doi.org/10.1021/acsearthspacechem.2c00156, 2022.

- Zhou, J., **K. Baumann**, N. Chang, G. Morrison, W. Bodnar, Z. Zhang, J.M. Atkin, J.D. Surratt, B.J. Turpin, Per- and polyfluoroalkyl substances (PFASs) in airborne particulate matter (PM_{2.0}) emitted during floor waxing, *Atmos. Environ.* 268, <https://doi.org/10.1016/j.atmosenv.2021.118845>, 2022.
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- Olson, J.A., **K. Baumann**, C.J. Volpe, J.W. Harder, E.J. Williams, and G.H. Mount: Meteorological overview of the 1993 OH Photochemistry Experiment, *J. Geophys. Res.* 102 (D5), 6187–6197, 1997.
- Stevens, P.S., J.H. Mather, W.H. Brune, F. Eisele, D. Tanner, A. Jefferson, C. Cantrell, R. Shetter, S. Sewall, A. Fried, B. Henry, E. Williams, **K. Baumann**, P. Goldan, and W. Kuster: HO₂/OH and RO₂/HO₂ ratios during TOHPE: Measurement and theory, *J. Geophys. Res.* 102 (D5), 6379–6391, 1997.
- Williams, E.J., J.M. Roberts, **K. Baumann**, S.B. Bertman, S. Buhr, R.B. Norton, and F.C. Fehsenfeld: Variations in NO_y composition at Idaho Hill, CO, *J. Geophys. Res.* 102 (D5), 6297–6314, 1997.
- Baumbach, G., **K. Baumann**, A. Grauer, R. Semmler, B. Steisslinger, H. Wanner, T. Künzel, and U. Neu: A tethered measuring system for detection of O₃, NO₂, HC concentrations, and meteorological parameters in the lower PBL, *Meteorol. Zeitschrift N.F.* 2, 178–188, 1993.
- Baumann, K.**, G. Baumbach, and F. Dröscher: Schadstoffaufkommen im Vorderen Bayerischen Wald (Pollutant incidence in the outer Bavarian Forest), *Forstw. Cbl.* 109, 327–340, 1990.

Books and Book Chapters

- Pöhlker, C., K. Baumann, and G. Lammel. 2020. Methods of Sampling Trace Substances in Air. Pp. 565–608 in *Handbook of Atmospheric Measurements*, edited by Thomas Foken. Part B: In-situ Measurement Techniques, Springer, Germany.
- Edgerton, E.S., J.M. Fort, K. Baumann, J.R. Graney, M.S. Landis, S. Berryman, and S. Krupa. 2012. Method for Extraction and Multielement Analysis of Hypogymnia physodes samples from the Athabasca Oil Sands Region. Pp. 315–342 in *Alberta Oil Sands*, edited by Kevin E. Percy. Developments in Environmental Science Vol. 11, Elsevier, The Netherlands.
- Baumann, K., S.R. Mitchell, N.L. Christensen, J.J. Schauer, D.R. Blake, J.M. Fort, and E.S. Edgerton. 2013. Effects of mechanical thinning on fuel consumption and emissions from prescribed burning in coastal North Carolina. Pp. 84–121 in *Proceedings of 4th Fire Behavior and Fuels Conference, February 18–22, Raleigh, NC*. Published by Internatl. Assoc. of Wildland Fire, Missoula, MT.
- Baumbach, G. (with assistance from K. Baumann, F. Dröscher, A. Grauer, H. Gross, B. Steisslinger, and U. Vogt). 1996. *Air Quality Control* (textbook). Springer Verlag: Berlin, Germany.
- Baumbach, G., and K. Baumann. 1991a. Air quality measurements at Schöllkopf near Freudenstadt. Pp. 39–47 in 7th ERC Report: *Air Quality Control*, KfK-PEF 80(1): Karlsruhe.
- Baumann, K., and G. Baumbach. 1990. Interaction of gaseous air pollutants inside forest stands. Pp. 80–92 in CEC Air Pollution Report 26: *Environmental Research with Plants in Closed Chambers*.
- Baumann, K., and G. Baumbach. 1989. Determination of the gaseous air pollutant uptake of a spruce branch by means of the enclosure technique. Pp. 169–176 in *Mechanisms and Effects of Pollutant-Transfer into Forests*. Edited by H.-W. Georgii. Kluwer Academic Publishers: Dordrecht.
- Baumbach, G., and K. Baumann. 1989. Ozone in forest stands—Examinations to its occurrence and degradation. Pp. 37–44 in *Mechanisms and Effects of Pollutant-Transfer into Forests*. Edited by H.-W. Georgii. Kluwer Academic Publishers: Dordrecht.

- Baumbach, G., K. Baumann, and F. Dröscher. 1988. O₃- and NO_x-measurements in forest and urban areas. Pp. 502–507 in *Ozone in the Atmosphere*. Edited by R.D. Bojkov, and P. Fabian. Proceedings of the International Ozone Symposium in Göttingen. Deepak Publishers.
- Baumbach, G., K. Baumann, and F. Dröscher. 1988. Behavior of air pollutants under inversion weather conditions. Pp. 115–124 in *Environmental Meteorology*. Edited by K. Grefen, and J. Löbel. Kluwer Academic Publishers: Dordrecht.
- Baumann, K. 1987. Dispersion of exhaust gases perpendicular to a heavily used motorway. Pp. 131–150 in *IMEchE Conference 1987–1988: Proceedings of the Institution of Mech. Engineers, Vehicle Emissions and Their Impact on European Air Quality*.

Technical Reports

- Baumann K., E.S. Edgerton, and S. Krupa. 2012. *HNO₃ Passive Sampler Evaluation Study*. Wood Buffalo Environmental Association (WBEA), Fort McMurray, Alberta, Canada, Final Report. Atmospheric Research & Analysis, Inc., Cary, NC, and Univ. of Minnesota, St. Paul, MN.
- Baumann K. 2012. *Optimization of Prescribed Burning by Considering Mechanical Thinning as a Viable Land Management Option*. Defense Coastal/Estuarine Research Program (DCERP), SERDP RC-1413, Final Report Chapter 15. RTI International, Research Triangle Park, NC.
- Baumann K., and W.P. Robarge. 2009. *Atmospheric Module*. Defense Coastal/Estuarine Research Program (DCERP), SERDP SI-1413, Annual Technical Report 2. RTI International, Research Triangle Park, NC.
- Baumann K., and W.P. Robarge. 2008. *Atmospheric Module*. DCERP, SERDP SI-1413, Annual Technical Report 1. RTI International, Research Triangle Park, NC.
- Cole, J., and K. Baumann. 2005. *Final Report on the Peer Review of Steubenville Mercury Source Apportionment Results*. Memorandum to M. Landis. EPA/ORD/NERL/HEASD/ECAB. RTI.
- Baumann K. 2005. *Air Quality Pilot Field Study Phase III—Comprehensive PM Analysis*. Assessment of Environmental Pollution and Community Health in Northwest Florida, Partnership for Environmental Research and Community Health (PERCH). GTRC-3506B35 Report. RTI, Research Triangle Park, NC.
- Baumann K. 2005. *Study of Air Quality Impacts Resulting from Prescribed Burning—Focus on Sub-Regional PM_{2.5} and Source Apportionment*. GTRC-3506C05/C22 Final Report. RTI, Research Triangle Park, NC.
- Baumann K., C.E. Rodes, R.D. Willis, and W.D. Ellenson. 2005. *Receptor Model Comparison Quality Assurance Procedures Report*. WA 141 Final Report. RTI, Research Triangle Park, NC.
- Baumann K. 2004. *Ozone and Fine PM Mass and Composition Measurements During the Fall-line Air Quality Study (FAQS)*. GTRC-G35633 Final Report. Georgia Tech, Atlanta, GA.
- Baumann K. 2004. *Pilot Study of Air Quality Impacts Resulting from Prescribed Burning (PB) on Military Facilities*. GTRC-3506B24 Final Report. Georgia Tech, Atlanta, GA.
- Baumann K. 2004. *Demonstration of a Continuous, Real-Time PM_{2.5} Chemical Speciation Monitor Based on an Aerosol Mass Spectrometer*. GTRC-G35C08/ARI-10284. EPA SBIR Contract EP-04-008, Final Report. Georgia Tech, Atlanta, GA.
- Baumann K. 2003. *Measurements of Trace Gases and PM_{2.5} Mass and Composition Near the Ground and at 254 m agl during TexAQ52000*. GTRC-G35632 Final Report. Georgia Tech, Atlanta, GA.

Baumann K. 2002. Southern Center for the Integrated Study of Secondary Air Pollutants (SCISSAP), EPA/NCER/ORD STAR Grant R826372, Final Report. Georgia Tech, Atlanta, GA.

Honors and Awards

Career Author Award for sustained success in publishing, RTI International, Durham NC 2006.
Advanced Study Program (ASP) Postdoctoral Fellowship, NCAR, Boulder CO 1995.
CIRES Postdoctoral Fellowship, University of Colorado, Boulder CO 1993.
Study Abroad Scholarship, German Academic Exchange Program (DAAD) 1982.

Professional Associations

American Solar Energy Society (ASES), 2007 to date.
Sierra Club (NC Chapter), 2006 to date.
Air & Waste Management Association (AWMA), 2006 to date.
Union of Concerned Scientists (UCS), 2005 to date.
American Association for the Advancement of Science (AAAS), 2004 to date.
Environmental Defense Fund (EDF), 2003 to date.
American Chemical Society (ACS), 2002 to date.
American Association for Aerosol Research (AAAR), 1999 to date.
National Resources Defense Council (NRDC), 1999 to date.
American Geophysical Union (AGU), 1993 to date.
Verein Deutscher Ingenieure (VDI), 1982 to date.

Professional Service

Peer Reviewer, *Aerosol Science and Technology*, *Atmos. Environ.*, *Environmental Monitoring and Assessment*, *Environ. Sci. & Technol.*, *Geophysical Research Letters*, *J. Geophys. Res.*, *Journal of the Air & Waste Management Association*, *Science of the Total Environment*, and miscellaneous research proposals considered by NASA, NOAA, DOE, JFSP, and other research organization, 1993 to date.

Subject Editor for Europe-based journal *Environmental Science and Pollution Research (ESPR)* in Subject Area 3 *Atmospheric Chemistry and Physics*, *Health Issues*, Springer Berlin/Heidelberg, 2006 to 2009.

Conference Session Chair, Air Quality and Climate in the Southeast US: Insights from Recent Measurement Campaigns, Session 6AQ, 33rd Annual Conference of the American Association for Aerosol Research, Rosen Shingle Creek Resort, Orlando, FL. October 20-24, 2014.

Conference Session Chair, Local and Regional Aerosols and Their Influence on Rural and Urban PM Levels, Session 8B, *Particulate Matter Supersites Program & Related Studies*, American Association for Aerosol Research, Atlanta, GA. February 7–11, 2005.

Book Reviewer, *Chemistry of the Natural Atmosphere*, 2nd edition. Edited by Peter Warneck. IGS, Academic Press, San Diego, CA. 71:927, 2000. ISBN 0-12-735632-0.

Voluntary Services

Morrisville Smart City Steering Committee, joined 2021. MSCSC is being created in order to advise the Town Council and work with the guidance, direction, and support of the Town's IT Department to

develop the smart city initiatives and support technology innovation that benefits Morrisville towards sustainable development. <https://www.townofmorrisville.org/Home/ShowDocument?id=5251>.

Morrisville Environmental & Recycling Committee, Co-Chair, 2009-2020. MERC is committed to community education about recycling and solid waste. MERC members also make sure the Town Council has all of the information they need to make sound decisions on solid waste and recycling collection for the Town. <http://www.townofmorrisville.org/index.aspx?NID=292>.

Morrisville Community Garden, Co-Founder and VP, 2010-2018. The MCG is a non-profit community-centered service organization. Besides various member benefits, the partnership with the NC State Cooperative Extension offers a wide variety of educational programs ranging from basic gardening, composting, organic weed and pest control, nutrition and beekeeping. www.mcgarden.us.

Capital Area Soccer League, Coach, 2006-2013. With over 5000 members, CASL is one of the largest public soccer organizations in the Southeast. Mr. Baumann volunteered eight years as a coach, teaching recreational teen soccer players how to play as a *Mannschaft*.

Seminars and Courses Taught

Air Quality Impacts of Prescribed Burning. Invited Seminar for the Source Apportionment Work Group, U.S. EPA/ORD, Research Triangle Park, NC. September 14, 2005.

Air Quality Impacts from Prescribed Burning in Georgia. Invited talk at Max-Planck Institute for Chemistry, Mainz, Germany. September 16, 2004.

Partnership for Environmental Research and Community Health (PERCH)—Air Quality Study. PERCH Science Workshop, University of Western Florida (UWF), Pensacola, FL. November 3, 2003.

Research Opportunities for the Study of Emissions, Air Quality, and Human Health during the XXVIII Olympic Games in Athens, Greece. International Meeting at the EC Joint Research Center, Brussels. January 17, 2003.

Study of Air Quality Impacts Resulting from Prescribed Burning on Military Facilities. Coordinating Meeting for the collaboration of all participating parties and groups, Fort Benning, Columbus, GA. August 22, 2002.

Trace gas and PM_{2.5} Mass and Composition Measurements in the Yangtse Delta at SheShan, LinAn, and ChangShu. Joint China-US Workshop on the China-MAP Project, Hong Kong, China, September 25, 2001.

Measurements of Trace Gases and PM_{2.5} Species and Mass at LaPorte (LP) and Williams Tower (WT). TexAQs 2000 Science Meeting, Austin, TX. August 7, 2001.

Current Status and Results from PM_{2.5} and Trace Gas Network Measurements in the Southeastern United States. Science Planning Meeting for the Pearl River Delta Air Quality Research Study, Beijing, China. May 24, 2001.

Atmospheric Tracers for Forest Fire Plumes with Examples and Recommendations from the Southern Oxidants Study. U.S. EPA Region 4 Air Monitoring Workshop, Atlanta, GA. May 3, 2001.

Results from the Georgia Tech Particle Composition Monitor (PCM). The 1999 Atlanta Supersite Science Workshop, Raleigh–Durham, NC. March 2000.

Characterization of Events Identified by Meteorological and Gas Phase Measurements. The 1999 Atlanta Supersite Science Workshop, Raleigh–Durham, NC. March 2000.

Discrete Measurements of Aerosol Composition in the Southern Center for the Integrated Study of Secondary Air Pollutants (SCISSAP). CEE Seminar Series, Georgia Tech. April 2000.

PM_{2.5} and NO_y Network Measurements in the Yangtse delta. Science Planning Meeting for the China-MAP field intensive, Wuxi, PRC. September 1998.

CO Measurements Onboard the UND Citation Aircraft during the Stratospheric-Tropospheric Experiment: Radiation, Aerosols, and Ozone (STERAO). NCAR science workshop, Boulder, CO. June 1998.

Estimates for Ozone Entrainment Rates Using a Mass Balance Approach. ASP Research Seminar, NCAR, Boulder, CO. March 1998.

Ozone Photochemistry and Transport in the Lower Troposphere with Some Plant Physiological Implications: From the Black Forest to the Rocky Mountains. Invited talk at the University of Michigan, Ann Arbor, MI. February 1998.

Quantification of Lightning Produced NO over Colorado. Invited seminar at the School for Earth and Atmospheric Sciences at Georgia Tech, Atlanta, GA. January 1998.

Sources of Reactive Nitrogen Oxides: Lightning Versus Soil. ASP Research Seminar, NCAR, Boulder, CO. October 1997.

CO Measurements Onboard the UND Citation Aircraft during STERAO—First Results and Comparison with NOAA–WP3 Aircraft Data. NCAR Science Workshop, Boulder, CO. March 1997.

CO and NO Produced by Lightning? NCAR, ASP Research Seminar, Boulder, January 1997.

Comparison of trace gas measurements over complex terrain, long-path absorption versus *in situ*. Invited talk at the Fraunhofer-Institut für Atmosphärische Umweltforschung, Garmisch-Partenkirchen, Germany. October 1995.

Long-Term Measurements of Air Pollutants in Forests: Ozone Deposition and Stomatal Uptake. NOAA, Aeronomy Laboratory Seminar, Boulder, CO. February 1994.

Meteorological and Chemical Measurements at the Colorado Front Range: First Results and Instrument Intercomparisons. NOAA, Aeronomy Laboratory Seminar, Boulder, Co. February 1994.

Various lectures for an *Air Quality Control* graduate course. University of Stuttgart, Germany. 1990 to 1992.

Presentations

Over 100 presentations at technical meetings, workshops, national and international conferences and symposia in the United States and Europe. List of titles is available upon request.

Special Courses

Shipley training course on Writing Winning Proposals, which provided a better understanding of the proposal development structure and hierarchy at RTI, November 2005.

Introductory course of SAS Programming I: Essentials, which allowed further applications of PCA tools in statistical evaluations of numerous data matrices, November 2005.

SAS Programming II: Manipulating Data with the DATA Step, improved proficiency in SAS program applications, September 2006.

SAS Statistics I: Introduction to ANOVA, Regression, and Logistic Regression, necessary to reach SAS multivariate statistical methods for practical research applications involving PCA and related tools, December 2006.

Microsoft Excel 2013 Pivot Tables webinar, Fred Pryor Seminars and Career Track, May 2014.

Computer Skills

Microsoft Windows 10 Pro: Word, Excel, Power Point, Visio, Apple Mac-OS, Fortran-V, NI-LabVIEW, Wavemetrics IGOR, EPA-CMB8.2, EPA-PMF5.0

Languages

German, fluent (native), English (fluent), Spanish (conversational), French (basic)

Country Experience

Canada: Collection and analysis of fine and coarse PM filter samples from the Athabasca oil sands region for the Wood Buffalo Environmental Association (WBEA), Fort McMurray, 2011 to 2014.

Mexico: Participation in the Megacity Initiative: Local and Global Research Observations (MILAGRO) for studying aerosol chemistry in Mexico City's regional pollution plume, 2006.

United States: Participation in various airborne- and ground-based atmospheric measurement campaigns in the central mountain, southern coastal, and southeastern regions of the country, 1993 to 2016.

People's Republic of China: Planning and conducting networked measurements of gas- and particle-phase air pollutants within the Yangtze River Delta and the greater Shanghai region, 1999 to 2000.

Argentina: Set up and conduct of *in situ* measurements of meteorological parameters, CO and O₃ at the Global Atmospheric Watch Station of the WMO in Ushuaia, Tierra del Fuego, 1994.

Germany: Conduct of research projects during Ph.D. work, incl. air quality measurements on towers in different forests, in several cities and along roadways of different jurisdictions, 1985 to 1992.

Switzerland: Participation in tethered balloon measurements of ozone and ozone precursors for vertical profiling of the PBL in the Middle-Land of the canton Berne in 1992.

Nigeria: Set up and implementation of an ambient air quality monitoring station in Lagos, Nigeria, for continuous measurement of important meteorological and air pollutant species in 1992.