

## Vasanthi Sivaprakasam

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Applied Physicist with 15+ years of experience in lasers and optics as lead scientist, principal investigator and experimentalist, specializing in spectroscopy, sensing, instrumentation and lidar. I have designed and developed a range of laboratory-grade research instruments to fielded DoD sensors for aerosol threat agent detection and characterization to trace detection in sea water.

### Technical Skills and Expertise

- **Spectroscopy in the UV to SWIR** spectral region: Optical design, layout, sensor development, theory-based model development, data acquisition, data analysis, detection algorithm development.
- **Laser Induced Fluorescence**: Developed sensitive *in situ* fluorescence Instrumentation for characterization of threat agent aerosol particles in air and trace constituents in sea and drinking water. Developed spectral analysis techniques and detection algorithms.
- **Raman and Surface Enhanced Raman Spectroscopy (SERS)**: Developed a novel method to perform SERS on individual aerosol particles and demonstrated  $10^5$  signal enhancement. Demonstrated repeatable spectral response and comparison to bulk SERS measurements.
- **Multi-spectral and hyper-spectral lidar**: Instrumentation, modelling of sensor parameter and analysis of multi-dimensional point clouds. Demonstrated active ranging and spectral content provide higher discrimination in detecting obscured objects.
- **Elastic Light scattering**: Develop instrumentation to study angular and polarized light scattering. Developed theoretical model for experimental validation and data analysis.
- **Orbital Angular Momentum (OAM)**: Designed and implemented experimental setup to study OAM laser beam properties in single and multiple particle scattering regimes. Plans are to apply scattering mitigations techniques learned here, to improve active imaging in adverse environments.
- **Electrodynamic particle trapping**: Developed *real-time algorithm* to stabilize particles in linear quadrupole traps. Technique allows for optical characterization of single particles including elastic scattering, fluorescence and Raman spectroscopy.
- Expert programmer in **Labview, matlab and C** for developing scattering and imaging models and analysis methods including singular value decomposition, cluster analysis, Bayesian statistics, physics based optical system models, system photon budget and instrument interface.

### Professional Community Services

- **Committee member**, OSA Optics and Photonics for Sensing the Environment (ES) Topical meeting (2019-current)
- **Working group member**, American Association of Aerosol Research (AAAR) annual conference, Bioaerosols meeting (2015-2018)
- serve in professional organizations as
  - Conference **session chair** for AAAR (2015) and OSA (2020 – current)
  - **Judge** for best paper for American Geological Union (2019)
- Serve as **Task Area Manager** of electro-optics for the Optical Sciences Division at Naval Research Laboratory - Support portfolio management of NRL's internally funded multi-year research projects

- serve as **reviewer** for
  - OSA – Optics Letters, Optics Express and Applied Optics (2005 – current)
  - ACS – Journal of Physical Chemistry and Environmental Science and Technology (2014 – current)
  - Royal Society of Chemistry journals (2014-current)
  - Analytica Chimica Acta (2021-current)
- **Panel member** of Biological Capability Area Process Action Team (Bio-CAPAT) committee (2018 – current). Provide guidance and aid in establishing criteria for testing and evaluation of bioaerosol detection sensors.
- **Panel member** of Intelligence Advanced Research Projects Activity's (IARPA) Aerosol Identification Workshop (2022). Served as aerosol expert in discussing current status and shortcomings in aerosol identification.
- serve on SPIE autonomous lidar standardizing panel (2019-current) aimed at setting standards and testing parameters for autonomous lidars.

### Work Experience

- Head of Advanced Optical Concepts Section & Research Physicist at Naval Research Laboratory (Aug 2022 – present)  
4555 overlook avenue SW, Washington DC 20375
  - Lead a team of research scientist
  - Manage programs and section budget
  - **PI/Co-PI of 4 current programs.** My role as PI of these programs include executing, supervising and providing guidance to NRL team members and external collaborators.
  - Actively **writing proposals** and soliciting **future programs** in Aerosol detection, laser propagation and Imaging and OAM scattering
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- Research Physicist: Naval Research Laboratory (Sep 20, 2004 – Aug 2022)  
4555 overlook avenue SW, Washington DC 20375
  - Principal investigator and lead scientist of multiple sensor development programs with interdisciplinary team members (Please see detailed programmatic and research experience below)
  - Design and develop sensor hardware, software and algorithms
  - Write/present proposal, progress update to sponsors, conferences and publications
  - Manage contracts & budgets
- Post Doc Research Associate: Naval Research Laboratory (May 1, 2003 – Sep 19, 2004),  
4555 overlook avenue SW, Washington DC 20375
  - Conducted research on Bioaerosol detection.
  - Developed multiple wavelength Laser Induced Fluorescence sensor for *in situ* detection of bioaerosols in ambient atmosphere.
- Post Doc Research Associate: University of South Florida (May 1, 2002 – April 25, 2003),  
4202 E Fowler Avenue, Tampa FL 33620
  - Conducted research and supervised field-testing of Laser Induced Fluorescence sensor for characterizing marine environment.
  - Supervised graduate students at the laser sensing laboratory.
- Graduate Teaching Assistant: University of South Florida (May 1, 1996 – May 1, 1997),  
4555 overlook avenue SW, Washington DC 20375
  - Taught laboratory courses for introductory level physics.

### Education

Ph.D in Applied Physics, University of South Florida, Tampa, FL (2002)

Dissertation: "UV Laser Induced Fluorescence spectroscopic studies and trace detection of dissolved plastics (Bisphenol-A) and organic compounds in water."  
Advisor: Dr. Dennis K. Killinger

Masters in Physics, University of South Florida, Tampa, FL (1999)  
Thesis: "Geometrical and polarization effects on Laser Induced Raman scatter and fluorescence emission of quinine sulfate and trace species in water."  
Advisor: Dr. Dennis K. Killinger

Bachelors of Science in Physics, University of South Florida, Tampa, FL (1996)  
Senior research Project: "Polishing and transmission measurement of fibers."

### **Patents & Awards**

Berman Award 2017 – Outstanding publication in Optical Sciences Division—"Surface Enhanced Raman Spectroscopy of individual suspended aerosol particles," J. of Phys. Chem. C, 121, 22326-22334 (2017).

Edison Patent Award 2012 – "A Polarized Elastic Scatter Detection method to measure the velocity and track individual aerosol particles," Patent # 20120105849.

V. Sivaprakasam, "A Polarized Elastic Scatter Detection method to measure the velocity and track individual aerosol particles," Patent # 20120105849, May 3, 2012.

Featured in 2010 NRL Review, "Our People Make a Big Difference."

D. K. Killinger, A. Sharikova and V. Sivaprakasam, "Deep-UV led and laser fluorescence apparatus for monitoring water quality", Patent # 7812946, Oct 12, 2010.

Research selected as one of Top 20 NRL Research Accomplishments in 2009, "Observation and Measurement of 2-Photon Excitation Emission from Single Micron-Sized Bio-Aerosols."

### **Detailed Programmatic and Research Experience**

***Naval Research Laboratory, Washington DC (current programs)*** – My portfolio at NRL primarily focuses on characterization and identification of aerosols by studying the micro-physics of individual micron-sized particles for Chemical and Biological threat agent detection. The techniques I have developed extend to optical characterization and compositional analysis of atmospheric aerosols for environmental impacts. Below are highlights of major projects, including SPERS, the first demonstration of Surface Enhancement of Raman effects from individual aerosol particles, BAPS a simultaneous multiwavelength polarimetric scattering approach and RAAD, a Laser Induced Fluorescence threat agent detection sensor now transitioning to a Program of Record. A multi-spectral SWIR lidar shows promise in improving target recognition for ISRT applications and environmental monitoring capabilities. Two OAM laser based programs to exploit scattering properties for chem/bio detection and improving active imaging capabilities in adverse environments. The projects are funded through varying sponsors including DTRA, ONR, DHS and NRL in-house efforts.

- OAM beams for scattering and Imaging: PI of two related programs, the scattering properties of OAM beam is exploited in improving individual particle characterization, such as particle sizing and possibly measure index of refraction of individual particles, not possible to date. A related program explores the advantages of OAM beams compared to Gaussian beams for imaging in adverse environments such as fog or highly scattering environment as in ocean surfaces. This is an international collaborative program with Martin Lavery at University of Glasgow, who is a one of the world's leading experts on OAM beams and David Mckee at University of Strathclyde. Programs aims to deliver an improved active imaging capability that can transition to higher TRL.
- Capturing the chemistry of multi-phase detonation waves for hypersonic applications: This is a multi-divisional in-house effort to understand the physics and chemistry of fuels during detonation in hypersonic engine applications. As a Co-PI I am leveraging on past program on Enhanced Raman spectroscopy of single particles this program aims to understand the evolution of jet engine fuel drops in controlled environmental conditions towards improving efficiency of the detonation process in actual engines, an important DoD thrust.

- Multi-spectral SWIR Lidar: PI of project to develop a supercontinuum laser based multiple band SWIR lidar system for improved imaging and spectral discrimination capability through partial obscurity. The potential advantages of this system over conventional fusion of lidar and hyperspectral imaging is being evaluated for Intelligence, Surveillance, Reconnaissance and Targeting, ISRT applications and environmental pollution monitoring. Various deconvolution and detection algorithms were explored for processing point cloud images. The modelling efforts developed under this program demonstrates the clear advantage of multi-spectral lidar over passive hyperspectral lidar in obscured environments.
- Single Particle Enhanced Raman Spectroscopy, SPERS: PI of project to develop novel methods to create Surface Enhanced Raman Spectroscopy (SERS)-active aerosols by the incorporation of metallic nanoparticles that enables compositional identification of aerosols. SERS is a popular technique that amplifies weak signal by orders of magnitude, rendering the signal strong enough for detection by traditional sensors. Developed a Raman system to measure spontaneous and enhanced Raman spectra from micron-sized particles held in an electrodynamic quadrupole trap. This work led to first demonstration of SERS from individual aerosol particles with Raman enhancement of  $10^5$ , a key capability for measuring Raman signal from ambient aerosols in real-time.

### Referred Publications

1. **V. Sivaprakasam**, M. B. Hart, "Surface-Enhanced Raman Spectroscopy for Environmental Monitoring of Aerosols," ACS Omega 15, 10150–10159. (2021).
2. J. Alex Huffman, Anne E. Perring, Nicole J. Savage, Bernard Clot, Benoît Crouzy, Fiona Tummon, Ofir Shoshanim, Brian Damit, Johannes Schneider, **Vasanthi Sivaprakasam**, Maria A. Zawadowicz, Ian Crawford, Martin Gallagher, David Topping, David Doughty, Steven C. Hill, Yongle Pan, "Real-time sensing of bioaerosols: Critical review and current perspectives," *Invited paper*, Aerosol Science and Technology, 1521-7388 (2019).
3. **V. Sivaprakasam**, M. B. Hart, and J. D. Eversole, "Surface Enhanced Raman Spectroscopy of individual suspended aerosol particles," J. of Phys. Chem. C, 121, 22326-22334 (2017).
4. M. B. Hart, **V. Sivaprakasam**, J. D. Eversole, L. J. Johnson and J. Czege, "Optical measurements from single levitated particles using a linear electrodynamic quadrupole trap," Applied Optics 54, 31, F174-181 (2015).
5. **V. Sivaprakasam**, M. B. Hart, V. Jain and J. D. Eversole, "Metallic-nanoparticles-enhanced fluorescence from individual micron-sized aerosol particles on-the-fly," Optics Express 22, 16, 18966-18978 (2014).
6. G. E. Collins, B. C. Giordano, **V. Sivaprakasam**, R. Ananth, M. Hammond, C. D. Merritt, J. E. Tucker, M. Malito, J. D. Eversole and S. Rose-Pehrsson, "Continuous flow, explosives vapor generator and sensor chamber," Review of Scientific Instruments 85, 5, 054101-8 (2014).
7. **V. Sivaprakasam**, J. E. Tucker and J. D. Eversole, "Generation and optical characterization of aerosol particles with controlled mixed composition," Optics Express 22, 7 (2014).
8. **V. Sivaprakasam**, A. L. Huston, A. Schultz and J. D. Eversole, "A novel polarized elastic scatter detection method of aerosol particle velocimetry with reduced errors due to coincidence and phantom particles," Aerosol Science and Technology 47, 3, 249-257 (2013).
9. **V. Sivaprakasam**, J. Lou, M. Currie, and J. D. Eversole, "Two-photon excited fluorescence from biological aerosol particles," JQSRT 112, 1511-1517 (2011).
10. **V. Sivaprakasam**, H.B. Lin, A.L. Huston and J.D. Eversole, "Spectral characterization of biological aerosol particles using two-wavelength excited laser-induced fluorescence and elastic scattering measurements," Optics Express 19, 7 (2011).
11. J. Lou, M. Currie, **V. Sivaprakasam** and J. D. Eversole, "Green and Ultraviolet Pulse Generation with a Compact, Fiber Laser, Chirped-Pulse Amplification System for Aerosol Fluorescence Measurements," Review of Scientific Instruments 81, 10, 103107:1-6 (2010).
12. **V. Sivaprakasam**, T. Pletcher, J. Tucker, A. Huston, J. McGinn, D. Keller and J. Eversole, "Classification and Selective Collection of Individual Aerosol Particles Using Laser-Induced Fluorescence", Applied Optics 48, 4 (2009).
13. Y. Pan, J. Eversole, P. Kaye, V. Foot, R. Pinnick, S. Hill, M. Mayo, J. Bottiger, A. Huston, **V. Sivaprakasam**, R. Chang, *Optics of Biological Particles*, Bio-aerosol Fluorescence (Springer 2007).
14. D. Killinger and **V. Sivaprakasam**, "Water Monitoring with Laser Fluorescence," Optics and Photonics News 17, 1 (2006).
15. **V. Sivaprakasam**, A. Huston, C. Scotto and J. Eversole, "Multiple UV wavelength excitation of bioaerosols", Optics Express 12, 19 (2004).

16. **V. Sivaprakasam** and D. K. Killinger, "Tunable ultraviolet laser-induced fluorescence detection of trace plastics and dissolved organic compounds in water", *Appl. Optics* **42**, 33 (2003).
17. **V. Sivaprakasam** R.F. Shannon, Jr., C. Luo, P. Coble, J.R. Boehme and D. K. Killinger, "Development and initial calibration of a portable laser-induced fluorescence system used for in situ measurements of trace plastics and dissolved organic compounds in seawater and the Gulf of Mexico", *Appl. Optics* **42**, 33 (2003).
18. **V. Sivaprakasam** and D.K. Killinger, "Effect of polarization and geometric factors on quantitative laser-induced fluorescence-to-Raman intensity ratios of water samples and a new calibration technique", *J. Opt. Soc. Am. B*, **20**, 1980, (2003).

### Other Publications

1. Heath Gemar, **Vasanthi Sivaprakasam**, Michael Yetzbacher, Abbie T. Watnik, "Unveiling an Obscured Target Spectra through Multi-Spectral Lidar using DIRSIG," MSS Active EO Systems/EO &IRCM conference proceedings, Atlanta GA, May 2022.
2. M. K. Yetzbacher, S. D. Park, **V. Sivaprakasam**, M. J. DePrenger, "Active Hyperspectral Imaging and Ranging," MSS Active EO Systems/EO &IRCM conference proceedings, Atlanta GA, May 2022.
3. **Vasanthi Sivaprakasam**, Michael K. Yetzbacher, Heath E. Gemar, Abbie T. Watnik, "Multispectral SWIR lidar for imaging and spectral discrimination through partial obscurations," *Proc. SPIE* 11392, Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imagery XXVI, 113920D (2020).
4. **V. Sivaprakasam**, J. Czege and J. D. Eversole, "Wavelength resolved polarized elastic scatter measurements from micron sized single particles," *Proc. of SPIE* **8710**, 18-24 (2013).
5. Jay D. Eversole, **V. Sivaprakasam**, T. Pletcher, D. Keller, "Single aerosol particle selection and capture using laser scattering and fluorescence", *SPIE conference proceedings* **7116**, 71160F-1-11 (2008).
6. **V. Sivaprakasam**, A. Huston, H.B. Lin, J.D. Eversole, P. Falkenstein and A. Schultz, "Field test results and ambient aerosol measurements using dual wavelength fluorescence excitation and elastic scatter for bioaerosols", *SPIE conference proceedings* **6554**, R5540 (2007).
7. T. Pletcher, J. McGinn, D. Keller, A. Huston, J. Eversole, **V. Sivaprakasam**, "Recent advances in the development of a novel aerosol sorting and deposition system for bio-threat sensing applications", *SPIE conference proceedings* **6739**, 73910 (2007).
8. Timothy Pletcher, Joseph McGinn, David Keller, Alan Huston, Jay Eversole and **Vasanthi Sivaprakasam**, "Experimental Performance of a Novel Aerosol Sorting and Deposition System for Bio-threat Sensing Applications", *SPIE conference proceedings* **6398**, 63980A-1-13 (2006).
9. **V. Sivaprakasam**, A. Huston, C. Scotto and J. Eversole, "Multiple UV wavelength excitation and fluorescence of bioaerosols", *SPIE conference proceedings* **5585**, p. 71-78 (2004).
10. A. Huston, **V. Sivaprakasam**, C. Scotto, H.B. Lin, J. Eversole, A. Schultz, J. Willey, "Optical classification of bioaerosols using UV fluorescence and IR absorption spectroscopy", *SPIE conference proceeding* **5617**, p. 300-311 (2004).

### Invited Talks

1. **V. Sivaprakasam**, "Surface Enhanced Raman Spectroscopy, SERS for Aerosol Point Detection," CLEO, OSA, San Jose CA, May 2020.
2. **V. Sivaprakasam**, "Multi-Spectral Optical Techniques for in situ Aerosol Characterization," Solar System Exploration Division Seminar Series at NASA Goddard Space Flight Center, October 2019.
3. **V. Sivaprakasam**, "Spectral Characterization of Aerosols," Symposium at Army Research Laboratory, Adelphi MD, August 2019.
4. **V. Sivaprakasam**, "Optical Characterization of Individual Aerosol Particles," Optics and Photonics for Sensing the Environment, OSA, San Jose CA, June 2019.
5. J. Eversole, **V. Sivaprakasam**, M. Hart, C. Scotto, and J. Czege, "Aerosol Research Update: Bio-Aerosol Confinement, Single-Particle Enhanced Raman, and Fluorescent Bar-Coded Tracking", seminar, DTRA Headquarters, Ft. Belvoir, VA. May 2019.
6. **V. Sivaprakasam**, "Optical Characterization of Individual Aerosol Particles for Defense and Environmental Monitoring," Eastern Analytical Symposium, Princeton, NJ, November 2017.
7. **V. Sivaprakasam**, "Spectroscopy of Individual Aerosol Particles for Defense Applications," NRL Academy, Washington DC, August 2017.
8. **V. Sivaprakasam**, "Optical Characterization of Individual Bioaerosol Particles," Bioaerosols: Characterization & Environmental Impact Workshop – Austin TX, March 2014.

### Contributed Presentations (recent)

1. **Vasanthi Sivaprakasam**, Matthew B. Hart, Ryan Lindle, Paul S. Winkler and Abbie Watnik, "Elastic Light Scattering Measurements from Orbital Angular Momentum Laser Beams," Single Particle Light Scattering from Light Beams with Orbital Angular Momentum," Laser Applications to Chemical, Security and Environmental Analysis, Vancouver CA, July 2022.
2. Heath Gemar, **Vasanthi Sivaprakasam**, Michael Yetzbacher, Abbie T. Watnik, "Unveiling an Obscured Target Spectra through Multi-Spectral Lidar using DIRSIG," MSS Active EO Systems/EO &IRCM conference, Atlanta GA, May 2022.
3. M. K. Yetzbacher, S. D. Park, **V. Sivaprakasam**, M. J. DePrenger, "Active Hyperspectral Imaging and Ranging," MSS Active EO Systems/EO &IRCM conference, Atlanta GA, May 2022.
4. Matthew B. Hart, **Vasanthi Sivaprakasam**, Ryan Lindle, Wenbo Sun and Abbie Watnik, "Single Particle Light Scattering from Light Beams with Orbital Angular Momentum," 39<sup>th</sup> Annual Conference of the American Association for Aerosol Research, Virtual Conference, October 2021.
5. M. K. Yetzbacher, S. D. Park, **V. Sivaprakasam**, M. J. DePrenger, "Feasibility of Active Hyperspectral Imaging Using Commercial-Off-The-Shelf Cameras as Detectors," OSA Optical Sensors and Sensing Congress; Fourier Transform Spectroscopy, Virtual Conference, July 2021.
6. **V. Sivaprakasam**, Michael K. Yetzbacher, H. E. Gemar and A. T. Watnik, "Multi-Spectral SWIR Lidar for Imaging and Spectral Discrimination through Partial Obscurations," OSA Laser Applications for Chemical, Security and Environmental Analysis, Virtual Conference, June 2020.
7. **V. Sivaprakasam**, Michael K. Yetzbacher, H. E. Gemar and A. T. Watnik, "Multi-Spectral SWIR Lidar for Imaging and Spectral Discrimination through Partial Obscurations," SPIE Defense and Commercial Sensing, Virtual Conference, April 2020.
8. **V. Sivaprakasam**, Michael K. Yetzbacher, H. E. Gemar, A. T. Watnik and J. P. Czarnaski, "Multi-Spectral SWIR Lidar for Imaging and Spectral Discrimination through Partial Obscurations," AGU Fall meeting, San Francisco Ca, Dec 2019.
9. J. Eversole, **V. Sivaprakasam**, M. Hart, C. Scotto, and J. Czege, "NRL Aerosol Research: Overview and Recent Accomplishments", DTRA Reachback, Informational seminar, DTRA Headquarters, Ft. Belvoir, VA, Jan 2019.
10. **V. Sivaprakasam**, J. E. Tucker and J. D. Eversole, "Ambient Background Aerosol: Fluorescence Measurements," Biological Capability Area Process Action Team (Bio-CAPAT) at the Joint Test & Evaluation Capabilities and Methodologies Integrated Product Team (TECMIPT) Quarterly Meeting; Office of the Deputy Under Secretary of the Army, Test and Evaluation (DUSA-TE): Falls Church VA, September 2018.
11. **V. Sivaprakasam**, M. B. Hart and J. D. Eversole, "Enhanced Raman Spectroscopy of Individual Aerosol Particles, IAC, St. Louis, MO, September 2018.
12. **V. Sivaprakasam**, M. B. Hart, P. Lane, G. Kushto and J. D. Eversole, "Surface Enhanced Raman Spectroscopy of Aerosol Particles," FACSS, Reno, NV, October 2017.
13. **V. Sivaprakasam**, M. B. Hart, P. Lane, G. Kushto and J. D. Eversole, "Surface Enhanced Raman Spectroscopy of Aerosol Particles," AAAR 36<sup>th</sup>, Rayleigh, NC, October 2017.
14. M. B. Hart, **V. Sivaprakasam** and J. D. Eversole, "Vapor Pressure Measurements Using Aerosols of Low-Volatile Materials," AAAR 36<sup>th</sup>, Rayleigh, NC, October 2017.
15. **V. Sivaprakasam**, M. B. Hart and J. Eversole, "Enhanced Raman spectroscopy of aerosol particles," Electromagnetic and Light Scattering XVI, College Park, MD, March 2017.
16. M. B. Hart, **V. Sivaprakasam**, J. Czege and J. Eversole, "Using a linear electrodynamic trap and elastic scattering for single particle environmental studies," Electromagnetic and Light Scattering XVI, College Park, MD, March 2017.
17. **V. Sivaprakasam**, M. B. Hart and J. Eversole, "Investigation of Enhanced Raman spectroscopy of Aerosol Particles," AAAR 35<sup>rd</sup> Annual conference, Portland, OR, October 2016.
18. **V. Sivaprakasam**, J. Eversole, D. Silcott, M. Owen, J. Tucker, J. Linnell, F. MacDonald and A. Woods, "Aerosol Concentration Calibration and Controlled Delivery for 1 to 8 Micron Particle Sizes," AAAR 35<sup>rd</sup> Annual conference, Portland, OR, October 2016.
19. M. B. Hart, **V. Sivaprakasam**, P. Lane, J. Czege and J. Eversole, "Aerosol studies using a linear electrodynamic quadrupole," AAAR 35<sup>rd</sup> Annual conference, Portland, OR, October 2016.
20. J. D. Eversole, **V. Sivaprakasam**, M. B. Hart, P. A. Lane, J. Richardson, B. Saar and W. Herzog, "Single Aerosol Particle Composition Using Vibrational Spectroscopy," European Aerosol Conference, Tours, France, September 2016.

21. J. Eversole, **V. Sivaprakasam**, D. Silcott, J. Tucker, J. Linnell, F. MacDonald and M. Owen, "Aerosol Concentration Calibration Method for Particle Sizes from 1 to 8 Microns," European Aerosol Conference, Tours, France, September 2016.
22. **V. Sivaprakasam**, M. B. Hart and J. D. Eversole, "Spontaneous and Enhanced Raman Spectra of Aerosol Particles," LACSEA, Heidelberg, Germany, July 2016.
23. J. Czege, **V. Sivaprakasam**, and J. D. Eversole, "Wavelength resolved polarized elastic scatter measurements from single particles," AAAR 33<sup>rd</sup> Annual conference, Orlando, FL, October 2014.
24. **V. Sivaprakasam**, J. E. Tucker and J. D. Eversole, "Fluorescence Characterization of Individual Bio-Aerosols and Ambient Air Measurements," AAAR 32<sup>nd</sup> Annual conference, Portland, OR, October 2013.
25. **V. Sivaprakasam**, J. Czege and J. D. Eversole, "Single particle, angle and wavelength resolved polarized elastic scatter measurement," Electromagnetic and Light Scattering XIV, Lille, France, June 2013.
26. **V. Sivaprakasam**, J. Czege and J. D. Eversole, "Wavelength resolved polarized elastic scatter measurements from micron sized single particles," SPIE Defense, Security and Sensing, Baltimore, MD, April 2013.