FENG XU

E-mail: Feng.Xu@jpl.nasa.gov; Phone: 818-393-8632, 818-224-8858; Address: Mail-Stop: 233-200, Jet Propulsion Laboratory, Pasadena, CA 91109

Education

- **Ph.D. in Physics**, University of Rouen, France (2007)
- **Ph.D. in Thermal Engineering**, Univ. of Shanghai for Sci. and Tech., China (2007)

  Dissertation: Shaped beam scattering by a spheroidal particle and online wet steam measurement by spectral light extinction method
- **M.Eng. in Mechanical Engineering** (graduation in 1.5 years with honors), Univ. of Shanghai for Sci. and Tech. (2004)

  Thesis: Studies on some problems in laser particle sizing
- **B.Eng. in Thermal Engineering**, Univ. of Shanghai for Sci. and Tech. (2002)

Professional Experiences

Scientist III (2013-present): Jet Propulsion Laboratory, California Institute of Technology, USA

Leadership roles:

- Leading algorithm development for JPL's Airborne Multi-angle SpectroPolarimeter Imager (AirMSPI)
- Leading algorithm development for NASA EVI-Instrument Multi-Angle Imager for Aerosols (MAIA)

Major achievements:

- Developed optimization algorithms for joint aerosol and land surface reflection retrieval, and joint aerosol and ocean water-leaving radiance retrieval (in support of JPL's participation in ACE/PACE mission and Earth Venture, under test by use of AirMSPI observations)
- Generalized the polarized radiative transfer equation (RTE) for medium with spatial and spectral variations (with A. B. Davis) and developed Markov chain solution for classical and generalized RTE (in support of AirMSPI/MISR data analysis)
- Developed retrieval algorithm for droplet size distribution from polarized cloudbow observation from top of stratocumulus cloud (under test for AirMPSI Level-2 product)
- Developed the light extinction model (with C. Sotin) in support of Cassini VIMS Titan solar occultation data analysis

- Funded Research Projects: (* Indicates proposals ranked "Excellent" by the Review Panels)
  - NASA RST: Principal Investigator (2015-present)*
  - NASA ESSP-EVI instrument MAIA: Co-Investigator (2016-present)
  - Caltech-JPL PDF: Co-Investigator (2015-present)
  - NASA ACCDAM: Co-Investigator (2014-present)
  - NASA PACEST13: Co-Investigator (2014-present)
  - NASA JPL-ESAP instrument AirMSPI: Co-Investigator (2013-present)
  - NASA CDAP: Co-Investigator (2013-present)
  - NASA NPP: Principal Investigator (2010-2012)
  - German Research Foundation (DFG) Project TR 194/49-1: Principal Investigator (2006-2007)*

- Graduates and undergraduates, summer students mentored/co-mentored:
  - Haitao Yu (2010-2015): Technical University of Darmstadt, Germany
  - Christine Bradley (2014, 2015): University of Arizona, USA
  - Lernik Asserian (2014, 2015): Glendale Community College, USA

Assistant Researcher (2012-2013): Joint Institute for Regional Earth System Science and Engineering, UCLA

Major achievements:

- Extended the Markov chain polarized radiative transfer model to spherical-shell atmosphere of Titan (in support of analyzing Titan images from Cassini Imaging Science Subsystem)
- Linearized Mie scattering theory for light scattering by a non-spherical particle in support of optimization based retrieval algorithm development for AirMSPI and MISR

NASA Post-doc Scholar (2010-2012): Jet Propulsion Laboratory, California Institute of Technology, USA

Advisor: Robert A. West

Major achievements:

- Extended the Markov chain polarized radiative transfer model for plane-parallel and spherical-shell atmospheres. The plane-parallel model is used to simulate MISR radiance (currently used to study MISR veiling light correction). The spherical-shell model is used to simulate and analyze polarization images of Titan returned from Cassini Imaging Science Subsystem

Humboldt Research Fellow (2007-2010): Technical University of Darmstadt, Germany

Advisor: Cameron Tropea

Major achievements:

- Generalized the theory of Debye series for analyzing light scattering by nonspherical particles (in support of developing Laser Doppler and Phase Doppler Measurement techniques for fluid diagnosis).
- Derived analytical solution of optical force and torque exerted on spheroidal particles by laser beams in support developing optical manipulation techniques.

Selected Awards

NASA Group Achievement Award (2014) *for outstanding efforts resulting in the successful deployment of the Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) in NASA's PODEX, pre-HyspIRI, and SEAC4RS campaigns*

NASA Postdoc Program Fellowship (2010)

Nomination Award for 100 Excellent Doctoral Dissertations of China (2008) *for outstanding development of light scattering theory and online turbine wet steam measurement technique*

Alexander von Humboldt Research Fellowship (2007)

Shanghai Excellent Master Thesis Award (2005) *for outstanding work on applying light scattering theory in laser particle sizing*

French Government Fellowship (2004)

Shanghai Creation and Invention Award (2004) *for outstanding software development for online turbine wet-steam measurement*

Scientific Publications (complete list on following pages)

- 35 peer-reviewed scientific publications to date
- 348 total citations

- H-Index: 11

Membership and Volunteered Activities:

- **Professional Memberships:** American Geophysical Union; Optical Society of America
- **Journal Reviewer** for ■ Atmos. Meas. Tech. ■ J. Atmos. Sci. ■ Opt. Lett. ■ IEEE Trans. Ant. Prop. ■ Opt. Express ■ Appl. Opt. ■ Experiments in Fluids ■ J. Opt. Soc. Am. A & B ■ J Electromagn Waves Appl. ■ J. Opt. ■ Int. J. Infrared and Millimeter Waves ■ J. Quant. Spectro. & Radiative Trans. ■ Particuology ■
- **Proposal Reviewer** for NASA and French National Research Agency
- **Science Committee Member**: The 7th International Symposium on Measurement Techniques for Multiphase Flows, Tianjin, China (2011); The 9th International Conference on Laser Interaction with Particles, Rouen, France (2012); The 10th International Conference on Laser Interaction with Particles, Rouen, France (2014)

Feng Xu's Peer-Reviewed Publications

Total number of publications: 35

Total citations: 348

H-Index: 11

Last updated: May 05, 2016

1. **F. Xu**, O. Dubovik, P.-W. Zhai, D. J. Diner, O. V. Kalashnikova, F. C. Seidel, P. Litvinov, A. Bovchaliuk, M. J. Garay, G. van Harten, and A. B. Davis. Joint retrieval of aerosol and water-leaving radiance from multi-spectral, multi-angular and polarimetric measurements over ocean, Atmos. Meas. Tech. Discuss. doi:10.5194/amt-2015-394, in review, 2016. http://www.atmos-meas-tech-discuss.net/amt-2015-394/
2. **F. Xu**, A. B. Davis, and D. J. Diner, "Markov chain formalism for generalized radiative transfer in a plane-parallel medium, accounting for Polarization", J. Quant. Spectrosc. Radiat. Transfer. In review, 2016.
3. A. A. Kokhanovsky, A. B. Davis, B. Cairns, O. Dubovik, O. P. Hasekamp, I. Sano, S. Mukai, V. V. Rozanov, P. Litvinov, T. Lapyonok, I. S. Kolomiets, Y. A. Oberemok, S. Savenkov, W. Martin, A. Wasilewski, A. Di Noia, F. A. Stap, J. Rietjens, **F. Xu**, V. Natraj, M. Duan, T. Cheng, R. Munro, Space-based remote sensing of atmospheric aerosols: The multi-angle spectro-polarimetric frontier, Earth-Sci. Rev. 145, 2015.
4. A. B. Davis and **F. Xu**, A generalized linear transport model for spatially correlated stochastic media, J. Comput. & Theoretical Transport, 43, 474-514, 2014.
5. H. Yu, **F. Xu**, C. Tropea, Optical caustics associated with the primary rainbow of oblate droplets: simulation and application in non-sphericity measurement, Opt. Express, 21, 25761-25771, 2013.
6. H. Yu, **F. Xu**, C. Tropea, Simulation of optical caustics associated with the secondary rainbow of oblate droplets, Opt. Lett. 38, 4469-4472, 2013.
7. **F. Xu**, R. A. West and A. B. Davis, A hybrid method for modeling polarized radiative transfer in a spherical-shell planetary atmosphere, J. Quant. Spectrosc. Radiat. Transfer. 117, 59-70, 2013.
8. H. Yu, **F. Xu**, and C. Tropea, Spheroidal droplet measurements based on generalized rainbow patterns, J. Quant. Spectrosc. Radiat. Transfer. 126, 105-112, 2013.
9. D. J. Diner, **F. Xu**, M. J. Garay, J. V. Martonchik, B. E. Rheingans, S. Geier, A. Davis, B. R. Hancock, V. M. Jovanovic, M. A. Bull, K. Capraro, R. A. Chipman, and S. C. McClain, The Airborne Multiangle SpectroPolarimetric Imager (AirMSPI): a new tool for aerosol and cloud remote sensing, Atmos. Meas. Tech. 6, 2007-2025 (2013).
10. D. J. Diner, **F. Xu**, J. V Martonchik, B. E. Rheingans, S. Geier, V. M. Jovanovic, A. Davis, R. A. Chipman, and S. C. McClain, Exploration of a polarized surface bidirectional reflectance model using the Ground-based Multiangle SpectroPolarimetric Imager, Atmosphere 3, 591-619, 2012.
11. **F. Xu**, A. B. Davis, S. V. Sanghavi, J. V. Martonchik, and D. J. Diner, Linearization of Markov chain formalism for vector radiative transfer in a plane-parallel atmosphere/surface system, Appl. Opt. 51, 3491-3507, 2012.
12. G. Gouesbet, **F. Xu**, and Y. P. Han, Expanded description of electromagnetic arbitrary shaped beams in spheroidal coordinates, for use in light scattering theories: A review, J. Quant. Spectrosc. Radiat. Transfer. 112, 2249-2267, 2011.

13. **F. Xu** and A. B. Davis, Derivatives of light scattering properties of a nonspherical particle computed with the T-matrix method, Opt. Lett. 36, 4464-4466, 2011.
14. **F. Xu**, A. B. Davis, and R. A. West, Markov chain formalism for vector radiative transfer in plane-parallel atmosphere overlying a surface of bidirectional reflectivity, Opt. Lett. 36, 2083-2085, 2011.
15. **F. Xu**, A. B. Davis, R. A. West, and L. W. Esposito, Markov chain formalism for polarized light transfer in plane-parallel atmospheres, with numerical comparison to the Monte Carlo method, Opt. Express 19, 946-967, 2011.
16. **F. Xu** and J. A. Lock, Debye series for light scattering by a coated nonspherical particle, Phy. Rev. A. 81, 063812, 2010.
17. **F. Xu**, J. A. Lock, and G. Gouesbet, Debye series for light scattering by a nonspherical particle, Phy. Rev. A. 81, 043824, 2010.
18. **F. Xu** and J. A. Lock, Optical caustics observed in light scattering by an oblate spheroid, Appl. Opt. 49, 1288-1304, 2010.
19. **F. Xu**, J. A. Lock, and C. Tropea, Debye series for light scattering by a spheroid, J. Opt. Soc. Am. A 27, 671-686, 2010.
20. K. F. Ren, **F. Xu**, J. Dorey, and X. Cai, Development of a Precise and in Situ Turbidity Measurement System, Chem. Eng. Comm. 197, 250-259, 2010.
21. **F. Xu**, J. A. Lock, G. Gouesbet, and C. Tropea, Optical stress on the surface of a particle: Homogeneous sphere, Phys. Rev. A. 79, 053808, 2009.
22. S. Bakic, **F. Xu**, N. Damaschke, and C. Tropea, Feasibility of extending rainbow refractometry to small particles using femtosecond laser pulses, Part. Part. Syst. Charact. 26, 34-40, 2009.
23. **F. Xu**, X. Cai, M. Su, K. F. Ren, and J. M. Dorey, Study on the measurement of high pressure wet steam by spectral light extinction method, Chinese J. Power Eng. 29, 254-261, 2009.
24. **F. Xu**, J. A. Lock, G. Gouesbet, and C. Tropea, Radiation torque exerted on a spheroid: analytical solution, Phys. Rev. A. 77, 154806, 2008.
25. X. Cai, **F. Xu**, T. Ning, et al. Online measuring of steam condensation process with heterogeneous/homogeneous nucleation in the last stage of air-cooled steam turbine, Chinese J. Power Eng. 28, 55-60, 2008.
26. **F. Xu**, K. F. Ren, G. Gouesbet, G. Gréhan, and X. Cai, Generalized Lorenz-Mie theory for arbitrarily oriented, located and shaped beam scattering by a homogeneous spheroid, J. Opt. Soc. Am. A 24, 119-131, 2007.
27. **F. Xu**, K. F. Ren, G. Gouesbet, X. Cai, and G. Gréhan, Theoretical prediction of radiation pressure force exerted on a spheroid by an arbitrarily shaped beam, Phys. Rev. E 75, 026613, 2007.
28. **F. Xu**, K. F. Ren, and X. Cai, Expansion of arbitrarily oriented, located and shaped beam in spheroidal coordinates, J. Opt. Soc. Am. A 24, 109-118, 2007.
29. M. Su, **F. Xu**, X. Cai X., K. F. Ren, and J. Shen, Optimization of regularization parameters of inversion in particle sizing using light extinction method, Particuology 5, 295-299, 2007.
30. **F. Xu**, K. F. Ren, and X. Cai, Extension of geometrical-optics approximation to on-axis Gaussian beam scattering. I. By a spherical particle, Appl. Opt. 45, 4990-4999, 2006.
31. **F. Xu**, K.F. Ren, X. Cai, and J. Shen, Extension of geometrical-optics approximation to on-axis Gaussian beam scattering. II. By a spheroidal particle with end-on incidence, Appl. Opt. 45, 5000-5009, 2006.
32. J. Shen, B. Yu, Y. Xu, **F. Xu**, and J. Shen, Particle sizing by spectral analysis on transmission fluctuations, Powder Techn. 166, 91-99, 2006.

33. M. Su, L. Dong, X. Cai, **F. Xu**, and K. F. Ren, The optimization of regularization parameter of inversion in particle sizing using light extinction method, Chinese J. Process Eng., 6(z2), 364-367, 2006.

34. **F. Xu**, X. Cai, M. Su, and K. F. Ren, Inversion of refractive index in particle sizing by multi-spectral light extinction method, China Powder Sci. and Tech. 12(3), 1-5, 2005.

35. **F. Xu**, X. Cai, and K. F. Ren, Geometrical optics approximation of forward scattering by coated particles, Appl. Opt. 43, 1870-1879, 2004.

36. **F. Xu**, X. Cai, K. F. Ren, and G. Gréhan, Application of genetic algorithm in particle size analysis by multispectral extinction measurements, Particuology 2, 235-240, 2004.

Software

- **F. Xu**. and K. F. Ren, TURACE 1.0 - 5.0, developed since 2004 within the framework of the contracts between Electricity of France and University of Rouen (2005-2006). This software is used for the spectrum acquisition and data processing to obtain the droplet size distribution and wetness of the wet steam by using spectral light extinction method. The newest version of the software up to now, TURACE 5.0, permits to realize online measurement of the particle size distribution and concentration, off-line data analysis, as well as the numerical simulation of the spectral light extinction.