Alexander A. Vinokurov

Personal Info
Citizenship: Russian Federation
Age: 29
Status: married
Spoken languages: Russian (native), English (fluent)

Contact
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Expertise
Theory of electromagnetic wave scattering by non-spherical particles of size comparable with the wavelength. Numerical modeling, software development, performing large scale computations, data analysis and visualisation.

Education

Ph.D., Physics and Mathematics, November 2007
Saint-Petersburg State University, faculty of Physics
> *Thesis*: The Light Scattering by Non-spherical Particles Computation Methods Using the Spherical Basis
> *Adviser*: Prof. V. G. Farafonov
> *Committee*: Prof. I. V. Komarov, Prof. S. Y. Slavyanov
> *Spec. No.*: 05.13.18

Specialist, Applied Mathematics, June 2004
Saint-Petersburg State University, faculty of Applied Mathematics and Control Processes
> *Thesis*: Solution of the Assignment Problem with Incentive Compatibility Condition
> *Adviser*: Prof. N. A. Zenkevich

Scientific Experience

10/2009–present
Senior Scientist
Pulkovo Astronomical Observatory of the Russian Academy of Sciences
> Participation in the development of the model of cosmic dust.

1/2010–present
Senior Scientist
State University of Aerospace Instrumentation, dept. of Applied Mathematics
> Development and analysis of numerical methods for solving the problem of light scattering by non-spherical particles with homogeneous and inhomogeneous structure. Managing development of the methods' implementations within ScattPy framework.

5/2009–present
Associate Professor
State University of Aerospace Instrumentation, dept. of Applied Mathematics
> Reading lectures on Game Theory, Probability Theory, Mathematical Statistics, Mathematical Logic, Complex Analysis.

10/2007–1/2010
Junior Scientist
State University of Aerospace Instrumentation, dept. of Applied Mathematics
> Development and analysis of the numerical methods of modelling light scattering by non-spherical particles that use expansions of fields in terms of spherical wave functions. Implementing methods with FORTRAN, numerical and analytical analysis of their applicability ranges.

10/2006–5/2009
Assistant Professor
State University of Aerospace Instrumentation, dept. of Applied Mathematics
> Reading lectures on Game Theory, Probability Theory; seminars on Mathematical Logic, Complex Analysis, Numerical Methods, Linear Programming.

Research Projects

2007–2009 **Grant RFBR 07-02-00831, member**

Title: Development of modern model of cosmic dust

Leader: N. V. Voshchinnikov

My contributions:

1. A separation of variables method based on expansions of the electromagnetic fields in terms of spherical wave functions is extended at the case of nonspherical (axisymmetric) particles with a large number of layers. The numerical code for calculations of the optical properties of multilayered nonspherical scatterers was developed and tested.

2. A detailed analysis of the basic optical properties of nonspherical inhomogeneous particles of various shape and structure was completed. The results are collected in the original graphic library free available via Internet.

2010–2012 **Grant RFBR 10-02-00593, member**

Title: Evolution of dust, gas and magnetic fields in the interstellar medium

Leader: N. V. Voshchinnikov

My contributions:

A separation of variables method using special scalar potentials and their expansions in terms of the spherical functions is developed to solve the problem of light scattering for multilayered particles of any axisymmetric shape. For radiation passing through a polydisperse medium containing partly aligned porous nonspherical scatterers, a strong dependence of the linear polarization degree on particle structure is revealed.

2010-present **ScattPy, project leader, developer**

Title: An open source Python package for the light scattering computations.

Site: http://scattpy.github.com

Project description:

ScattPy is a Python package for computing optical properties of non-spherical particles. It gives a user friendly flexible framework that takes advantage of programming with the modern language supported by the abundant library of scientific packages. The framework is designed to include the methods and interfaces to third-party codes required to treat scatterers of different shape and structure.

Publications

Journal Papers

A. A. Vinokurov, V. B. Il'in, and V. G. Farafonov. Scattpy: a new python package for light scattering computations. *J. Quant. Spectr. Rad. Transf.*, In Press (accepted), 2011.

A. A. Vinokurov, V. B. Il'in, and V. G. Farafonov. On optical properties of nonspherical inhomogeneous particles. *Opt. Spectr.*, 109:444–453, 2010.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. Near-and far-field light scattering by nonspherical particles: Applicability of methods that involve a spherical basis. *Opt. Spectr.*, 109:432–443, 2010.

A. A. Vinokurov, V. G. Farafonov, and V. B. Il'in. Separation of variables method for multilayered non-spherical particles. *J. Quant. Spectr. Rad. Transf.*, 110:1356–1368, 2009.

V. G. Farafonov, V. B. Il'in, A. A. Vinokurov, and E. V. Farafonov. Unified approach to the solution of the problem of light scattering by non-spherical particles using spherical wave functions. *Uspehi Sovr. Radioel.*, (6):11–28, 2008.

V. G. Farafonov and A. A. Vinokurov. Light scattering by multilayered axisymmetric particles: Solution of the problem by the separation of variables method. *Opt. Spectr.*, 105(2):292–305, 2008.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. On use of the field expansions in terms of spheroidal functions. *J. Quant. Spectr. Rad. Transf.*, 106:33–43, 2007.

V. G. Farafonov, A. A. Vinokurov, and V. B. Il'in. Comparison of the light scattering methods using the spherical basis. *Opt. Spectrosc.*, 102:927–938, 2007.

Books

A. A. Vinokurov. *Game Theory: normal form games*, volume 1. SUAI, St. Petersburg, 2010.

Submitted Papers

V. G. Farafonov, V. B. Il'in, A. A. Vinokurov, and S. V. Barkanov. Light scattering by small axisymmetric particles: generalization of the separation of variables method with the spherical basis. *J. Opt. Technol.*, Submitted, 2011.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. Light scattering by axisymmetric particles: the separation of variables method with spherical basis. In V. P. Veiko and T. A. Vartanyan, editors, *Fundamentals of Laser Assisted Micro- and Nanotechnologies*. SPIE Proceedings, 2011. Submitted.

Presented Conference Reports

A. A. Vinokurov, V. B. Il'in, and V. G. Farafonov. A python library for computing light scattering by multilayered non-spherical particles. In *Peer-reviewed abstracts of the conference on Electromagnetic and Light Scattering XII*, Helsinki, Finland, 2010. Oral presentation.

V. B. Il'in, V. G. Farafonov, and A. A. Vinokurov. Theoretical and computational aspects of the svm, ebcm, and pmm methods in light scattering by small particles. In *Peer-reviewed abstracts of the conference on Electromagnetic and Light Scattering XII*, Helsinki, Finland, 2010. Invited talk.

M. S. Prokopjeva, V. B. Il'in, V. G. Farafonov, and A. A. Vinokurov. Polarizing efficiency of nonspherical scatterers of different structure. In *Peer-reviewed abstracts of the conference on Electromagnetic and Light Scattering XII*, Helsinki, Finland, 2010. Poster.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. Light scattering by nonspherical particles. In *Abstracts of the Int. Conf. Fundamentals of Laser Assisted Micro- & Nanotechnologies*, St. Petersburg, Russia, 2010. Invited talk.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. Generalized solution to the light scattering problem for axisymmetric particles. In *Abstracts of the Int. Conf. Days on Diffraction*, St. Petersburg, Russia, 2010. Poster.

V. B. Il'in, N Zavyalov, V. G. Farafonov, A. A. Vinokurov, and M. S. Proopjeva. New approach to light scattering problem solution using field expansions in terms of wave functions. In *Abstracts of the Int. Conf. Fundamentals of Laser Assisted Micro- & Nanotechnologies*, St. Petersburg, Russia, 2009. Poster.

A. A. Vinokurov and E. V. Farafonov. Solution of light scattering problem for layered nonspherical particles. In *Abstracts of the Days on Diffraction Conference (DD'2008)*, pages 93–94, St.Petersburg, Russia, 2008. Oral presentation.

A. A. Vinokurov, V. G. Farafonov, and V. B. Il'in. Separation of variables method for multilayered particles. In *Peer-Reviewed Abstracts of the 11th Conference on Electromagnetic & Light Scattering (ELS-XI)*, pages 105–109, London, UK, 2008. Oral resentation.

V. G. Farafonov, E. V. Farafonov, V. B. Il'in, and A. A. Vinokurov. Unified approach to the methods using single field expansions. In *Peer-Reviewed Abstracts of the 11th Conference on Electromagnetic & Light Scattering (ELS-XI)*, pages 13–17, London, UK, 2008. Poster.

V. G. Farafonov, V. B. Il'in, and A. A. Vinokurov. New life of mie's approach with other bases, potentials, methods, etc. In *Abstracts of the Mie Theory 1908–2008 Conference*, pages 105–106, Halle, Germany, 2008. Poster.

A. A. Vinokurov, V. G. Farafonov, and V. B. Il'in. Comparison of LS methods using single expansions of fields. In *Peer-Reviewed Abstracts of the 10th Conference on Electromagnetic & Light Scattering (ELS-X)*, pages 229–233, Bodrum, Turkey, 2007. Oral presentation.

A. A. Vinokurov. Comparison of the applicability ranges of the ebcm, pmm and svm methods using spherical basis. In *Abstracts of the Ecology and Space conference*, pages 14–15, St. Petersburg, Russia, 2007. Oral presentation.

A. A. Vinokurov. Analysis of applicability ranges of exact light scattering methods using spherical basis. In *Abstracts of the Days on Diffraction Conference (DD'2007)*, pages 93–94, St.Petersburg, Russia, 2007. Oral presentation.

Technical Skills

Programming languages
FORTRAN77/90, Python, Perl, LaTeX
Also familiar with C, C++, C#.

Scientific tools
Python with SciPy (alternative to Matlab), Matplotlib (Python visualization package)

Developement environments
Linux, version control systems (CVS, SVN, Git)

Developement methodologies
Waterfall developement process, Test driven developement process

Commercial Experience

6/2008–8/2010   **Senior QA Engineer**
BridgeQuest Inc.
Development and maintenance of an automated GUI testing framework for a database replication software project.

10/2003–6/2008   **QA Manager/QA Engineer**
DataArt Inc.
Managing Quality Assurance (QA) efforts in outsource software development projects, coordination with customers. Coordination of work in distributed QA teams. Development of the QA documentation (Test Plan, Test Suites, Use Cases). Development of automated tests and testing frameworks. Running functional, performance, regression tests in automated and manual modes, presenting testing reports.

1/1999–10/2003   **Freelance web developer**
Development of commercial web sites for several companies.

January 19, 2011