Stanislav Kondratyev

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Personal

Date of birth	18 September 1983
Place of birth	Voronezh, Russia
Citizenship	Russia

Research interests

Specific research areas

- optimal transport methods in PDE, Otto calculus, gradient flows;
- spatial population dynamics;
- the Fokker–Planck equation and the unidirectional transport in Brownian ratchets;
- mathematical non-Newtonian fluid mechanics: weak solvability and trajectory attractors using topological methods.
- discrete geometry: lattice polygons

Skills

- general PDE theory
- applications of optimal transport theory to PDE
- linear operators in function spaces, spectral theory, embedding theorems
- nonlinear operators and calculus in Banach spaces
- fixed point theorems and applications thereof
- the degree of mappings of ininite-dimensional spaces
- mathematical methods in fluid mechanics
- trajectory attractors
- teaching (PDE, algebra, topology, differential geometry)

Major areas of interest

- linear and nonlinear PDE
- optimal transport theory
- nonlinear analysis
- attractors; infinite dimensional dynamic systems and generalisations

Education

2011	**Ph. D.**, *Voronezh State University*, Voronezh, Russia.
2006–2009	**Postgraduate student**, *Voronezh State University*, Voronezh, Russia.
2004–2006	**Master of Science**, *Voronezh State University*, Voronezh, Russia, with honours.
2000–2004	**Bachelor of Science**, *Voronezh State University*, Voronezh, Russia, with honours.

Ph. D. thesis

Title	*Investigation of attractors for certain equations of non-Newtonian fluid mechanics*
Speciality	Differential equations, dynamical systems, and optimal control
Advisor	Prof. Victor G. Zvyagin, Voronezh State University
Description	The aim of the thesis is to apply the theory of trajectory attractors to equations of fluid mechanics with possible non-unique solvability of the initial boundary problem. The existence of trajectory and global attractors is proved for weak solutions of the models of motion of two kinds of fluid: weak aqueous polymer solutions and a fluid with memory. An approach to visualization of attractors is considered. The research uses nonlinear functional analysis and topological methods.

Master thesis

Title	*Extremal properties of integer polygons.*
Supervisor	Nikolai M. Bliznyakov, Voronezh State University
Description	A study of relationship between 2D integer polygons and sublattices of the integer lattice results in an analogue of Minkowski Convex Body Theorem.

Publications

Preprints

S. Kondratyev, D. Vorotnikov. *Spherical Hellinger-Kantorovich gradient flows* (submitted). `https://arxiv.org/abs/1809.03430`, 2018.

S. Kondratyev, D. Vorotnikov. *Nonlinear Fokker-Planck equations with reaction as gradient flows of the free energy* (submitted). `https://arxiv.org/abs/1706.08957`; Pré-Publicações do Departamento de Matemática, Universidade de Coimbra, Preprint Number 17–33.

N. Bliznyakov, **S. Kondratyev**. *Bounds on the number of vertices of sublattice-free lattice polygons*. `http://arxiv.org/abs/1606.00855`; Pré-Publicações do Departamento de Matemática, Universidade de Coimbra, Preprint Number 16–28.

N. Bliznyakov, **S. Kondratyev**. *Existence of sublattice points in lattice polygons*. `http://arxiv.org/abs/1606.00853`; Pré-Publicações do Departamento de Matemática, Universidade de Coimbra, Preprint Number 16–27.

Articles

S. Kondratyev, L. Monsaingeon, D. Vorotnikov. *A new multicomponent Poincaré–Beckner inequality*. Journal of Functional Analysis 272.8 (2017): 3281-3310.
arXiv: `https://arxiv.org/abs/1603.06493`
Journal: `http://www.sciencedirect.com/science/article/pii/S0022123616304050`

S. Kondratyev, L. Monsaingeon, D. Vorotnikov. *A new optimal transport distance on the space of finite Radon measures*. Adv. Differential Equations, 21:11/12 (2016), 1117–1164.
arXiv: `https://arxiv.org/abs/1505.07746`
Journal: `https://projecteuclid.org/euclid.ade/1476369298`

S. Kondratyev, L. Monsaingeon, D. Vorotnikov. *A fitness-driven cross-diffusion system from population dynamics as a gradient flow*. J. Differential Equations, 261 (2016), no. 5, 2784–2808.

arXiv: https://arxiv.org/abs/1603.06431
Journal: https://www.sciencedirect.com/science/article/pii/S0022039616300912

S. Kondratyev, J.M. Urbano, D. Vorotnikov. *On the bulk velocity of Brownian ratchets.* SIAM J. Math. Anal. 48 (2016), no. 2, 950–980.
arXiv: https://arxiv.org/abs/1408.1548
Journal: https://epubs.siam.org/doi/abs/10.1137/15M1016205

V. Zvyagin, **S. Kondratyev**. *Pullback attractors of the Jeffreys-Oldroyd equations.* J. Differential Equations 260 (2016), no. 6, 5026–5042.
Journal: https://www.sciencedirect.com/science/article/pii/S0022039615006622

V. Zvyagin, **S. Kondrat'ev**. *Pullback attractors for the model of motion of weakly concentrated aqueous polymer solutions.* Izv. Math. 2015, 79 (4), 645–667. Original Russian text published in Izv. Ross. Akad. Nauk Ser. Mat. 79 (2015), no. 4, 3–26.
Journal: https://iopscience.iop.org/article/10.1070/IM2015v079n04ABEH002756/meta

V. Zvyagin, **S. Kondratyev**. *Pullback attractors for a model of motion of weak aqueous polymer solutions.* Doklady Mathematics, 90:3 (2014), 660-662. Original Russian text published in Doklady Akademii Nauk, 459:1 (2014), 10-13.
Journal: https://link.springer.com/article/10.1134/S1064562414070072

V. G. Zvyagin, **S. K. Kondrat'ev**. *Attractors of equations of non-Newtoninan fluid dynamics*, Russ. Math. Surv., 2014, 69:5, 845-913. Original Russian text published in Uspekhi Mat. Nauk, 69:5(419) (2014), 81-156.
Journal: http://iopscience.iop.org/article/10.1070/RM2014v069n05ABEH004918/meta

V. Zvyagin, **S. Kondratyev**. *Approximating topological approach to the existence of attractors in fluid mechanics*, J. Fixed Point Theory Appl. 13 (2013), 359–395.
Journal: https://link.springer.com/article/10.1007/s11784-013-0122-7

V. Zvyagin, **S. Kondratyev**. *An approach to visualisation of trajectory and phase attractors*, Contemporary Analysis and Applied Mathematics, **1**:2 (2013), 212–236.

V. Zvyagin, **S. Kondratyev**. *Attractors of weak solutions to regularized equations of motion of fluids with memory*, Matematicheskii Sbornik, **203**:11 (2012), 83–104. English translation: Sbornik: Mathematics, 2012, **203**:11, 1611–1630.
Journal: http://iopscience.iop.org/article/10.1070/SM2012v203n11ABEH004278/meta

V. Zvyagin, **S. Kondratyev**. *Attractors of weak solutions to a regularized system of motion equations for fluids with memory*, Izvestiya Vysshikh Uchebnykh Zavedenii. Matematika, **8** (2011), 86–89. English translation: Russian Math. (Iz. VUZ), **55**:8 (2011), 75–77.
Journal: https://link.springer.com/article/10.3103/S1066369X11080111

M. Turbin, **S. Kondratyev**. *Visualization of attractors for a mathematical model of motion of weak aqueous polymer solutions*, Proceedings of Voronezh State University. Physics, Mathematics, **2** (2010), 142–163. (in Russian)

S. Kondratyev. *On attractors of a model describing the motion of weak aqueous polymer solutions*, Proceedings of Voronezh State University. Physics, Mathematics, **1** (2010), 117–138. (in Russian)

S. Kondratyev. *Convergence of trajectory and global attractors of approximations of the autonomous 3D Navier–Stokes equations*, Proceedings of Voronezh State University. Physics, Mathematics, **1** (2009), 126–137. (in Russian)

V. Zvyagin, **S. Kondratyev**. Attractors for equations of models of motion of viscoelastic media. Voronezh, VSU, 2010, 266 p. (Russ.)
This student manual incorporates some of my own results.

Professional qualifications

2017 CNU qualification for Maître de Conferences, sections 25 (mathematics) and 26 (applied mathematics)

Experience

2013–now **Postdoc**, *Centro de Matemática da Universidade de Coimbra*, Coimbra, Portugal.
Mathematical research.

2006–2013 **Research assistant**, *Research Institute of Mathematics, Voronezh State University*, Voronezh, Russia.
Participation in scientific projects and teaching.

2010–2011 **Instructor**, *Department of Algebra and Topological Methods of Analysis, Mathematical Faculty of Voronezh State University*, Voronezh, Russia.
Undergraduate and graduate courses for students of the Mathematical Faculty.

Teaching

2006–2013 **Attractors in fluid mechanics**.
A special course for graduate students focusing on classical and modern approaches to attractors of PDEs (jointly with Prof. Zvyagin).

2009–2013 **Introduction to dynamical systems**.
A special course for graduate students being an introduction to dynamical systems and chaos.

2009–2012 **Introduction to mathematical modelling**.
A special course for graduate students devoted to the basics of mathematical modelling.

2012–2013 **Algebra**.
A lecture course for undergraduate students.

2009–2012 **Algebra**.
Practical classes for undergraduate students.

2006–2007 **Topology and differential geometry**.
Practical classes for undergraduate students.

Projects

As the project leader

2015–2016 *Investigation of problems of mathematical fluid mechanics and biology on the basis of topological methods in analysis* Russian Foundation for Basic Research grant 15-31-20241

As a researcher

2017–now *Dynamic models in mechanics of solids and image processing allowing for type 1-Laplacian discontinuities* FCT project TUBITAK/0005/2014 directed by Prof. Dmitry Vorotnikov

2015–2016	Centre for Mathematics of the University of Coimbra, project UID/MAT/00324/2013
2014–2015	*Degenerate elliptic and parabolic equations and its applications to front propagation* FCT project UTA-CMU/MAT/0007/2009 directed by Prof. José Miguel Urbano
2013–2014	*Degenerate elliptic and parabolic equations and its applications to front propagation* FCT project UTA-CMU/MAT/0007/2009 directed by Prof. José Miguel Urbano
2012–2013	*Investigation of solvability of initial boundary problems, of existence of attractors, and of feedback optimal control problems for mathematical models of non-Newtonian fluid mechanics* Russian Foundation for Basic Research grant directed by Dr. M. Turbin
2012–2013	*Application of topological methods in nonlinear problems of fluid mechanics, optimal control theory, and stochastical analysis* Russian Foundation for Basic Research grant directed by Prof. V. Zvyagin
2010–2012	*Topological and geometrical methods in hydrodynamics, optimal control, and stochastic analysis* Russian Foundation for Basic Research grant directed by Prof. V. Zvyagin
2009–2013	*Scientific and pedagogical personnel of the innovative Russia* federal target programme directed by Prof. V. Zvyagin.
2007–2009	*Development and application of topological and geometrical methods for problems of mechanics, control theory, and stochastic analysis* Russian Foundation for Basic Research grant directed by Prof. V. Zvyagin
2004–2006	*Topological and geometrical methods for problems of mechanics, control theory, and stochastic analysis* Russian Foundation for Basic Research grant directed by Prof. V. Zvyagin

Conferences

17–19 December 2015	**International Workshop on Calculus of Variations and its Applications**, Universidade Nova de Lisboa, Lisbon, Portugal. On the bulk velocity of Brownian ratchets (poster and a very very short talk)
July 6–10, 2015	**Equadiff 2015**, Université Claude Bernard Lyon 1, Lyon, France. On the bulk velocity of Brownian ratchets (poster)
June 22–23, 2015	**Gradient Flows in Paris**, Laboratoire Jacques-Louis Lions, Paris, France. Without talk
June 1–5, 2015	**Collective dynamics in gradient flows and entropy driven structures**, GSSI, L'Aquila, Italy. Without talk
May 5–15, 2014	**Kinetics, non standard diffusions and stochastics: emerging challenges in the sciences**, Austin, Texas, US. Without talk
2013	**Voronezh Spring Mathematical School**, *S. Kondratyev*, *Pullback attractors of a model of motion of weak aqueous polymer solutions.*, Voronezh, Russia.

2012 **Crimean Autumn Mathematical School**, *V. Zvyagin*, **S. Kondratyev**, *Visualization of attractors for the Jeffreys model in the vicinity of the Poiseuille flow*, Sudak, Ucraine.

2011 **Modern problems of mathematics and its applications**, **S. Kondratyev**, *Convergence of attractors of approximations for the model of motion of weak aqueous polymer solutions*, Dushanbe, Tajikistan.

2011 **Voronezh Winter Mathematical School**, **S. Kondratyev**, *Visualizatiion of attractors of small perturbations of the Poiseuille flow for the Jeffreys system with the substantial derivative*, Voronezh, Russia.

2004 **Voronezh Winter Mathematical School**, *N. Bliznyakov*, **S. Kondratyev**, *A property of convex integer polygons*, Voronezh, Russia.

Talks

8 June 2017 **A model in population dynamics as a gradiet flow**, *Stanislav Kondratyev*, Prof. Stefanelli's seminar, University of Vienna , Vienna, Austria.

31 October 2016 **On the bulk velocity of Brownian ratchets**, *Stanislav Kondratyev*, Analysis seminar, University of Texas at Austin, Austin, US.

27 April 2016 **A discrete nonsymmetric variant of the Minkowski Convex Body Theorem**, *Stanislav Kondratyev*, Seminar in Algebra and Combinatorics, CMUC, University of Coimbra, Coimbra, Portugal.

23 October 2015 **A distance on the space of Radon measures with application to spatial population dynamics**, *Stanislav Kondratyev*, Seminar in Analysis, CMUC, University of Coimbra, Coimbra, Portugal.

10 January 2014 **Attractors of trajectory spaces in fluid mechanics**, *Stanislav Kondratyev*, Seminar in Analysis, CMUC, University of Coimbra, Coimbra, Portugal.

25 October 2011 **Investigation of attractors for certain equations of non-Newtonian fluid mechanics**, *S. Kondratyev*, Prof. Skubachevski's Seminar, People's Friendship University of Russia, Moscow, Russia.

Invited stays

Oct/Nov 2016 **University of Texas at Austin**, *Austin, US*, (4 weeks).

September 2017 **University of Lisbon**, *Lisbon, Portugal*, (1 week).

Languages

Russian (native), English, Portuguese, French, a little bit of this, a little bit of that. . .