

Konstantin Malanchev

RESEARCHER · PHD

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Work Experience

Sternberg Astronomical Institute MSU

Moscow, Russia

RESEARCHER (SINCE DECEMBER 2017)

2008 – present

- Scientific work: modelling of non-stationary disc accretion, mixed length theory of convection implementation for outer parts of accretion discs in X-ray binaries, 3D modelling of accretion in cataclysmic variables, statistics and machine learning methods for cluster search problems in astrophysics catalogs.
- Partial development and administration of institute web-site <http://sai.msu.ru> and Relativistic Astrophysics Department web-site <http://xray.sai.msu.ru>, administration and on-line video streaming for institute YouTube channel.
- Administration of Linux and Windows machines of Relativistic Astrophysics Department.
- Lectures for scholar students and public outreach, excursions to observatory of Sternberg Astronomical Institute.

Faculty of Physics, Lomonosov Moscow State University

Moscow, Russia

LECTURER

September–December 2017

- Course “Scientific Python” for the first year master students.

Faculty of Physics, Higher School of Economics

Moscow, Russia

ASSOCIATE PROFESSOR (SINCE SEPTEMBER 2017)

September 2016 – present

- Seminars for master’s course “Astrophysics and Cosmology” (lecturers are academician A. Starobinsky and Prof. K. Postnov) (2017/2018).
- Seminars for bachelor’s interfaculty minor “Astrophysics” (lecturer is Prof. K. Postnov) (2016/2017, 2017/2018).
- Python seminars for bachelor’s course “Programming and computer methods of linguistics” (2017/2018)

Caucasian observatory of Sternberg Astronomical Institute MSU

Mt. Shatdzhatzmaz,

Karachay-Cherkessia, Russia

OBSERVER

April–May 2015, April–May 2016

- Scientific observations with 2.5-meter telescope: CCD photometry with wide optical filters, IR-photometry with ASTRONIRCAM.
- 2.5-meter telescope commissioning: calibration of optics with Shack-Hartmann sensor, software and hardware testing.

Moscow Planetarium

Moscow, Russia

TOUR GUIDE

Mid 2011 – early 2013

- Excursions to museums of Moscow planetarium.

Formal Education

Sternberg Astronomical Institute, Lomonosov Moscow State University

Moscow, Russia

PH.D. IN ASTROPHYSICS

June 22, 2017

- **Thesis:** Non-stationary processes in astrophysical accretion discs
- **Supervisor:** prof. Nikolai Shakura

Faculty of Physics, Lomonosov Moscow State University

Moscow, Russia

SPECIALIST DEGREE IN ASTRONOMY

January 31, 2013

- **Thesis:** Non-stationary disc accretion in X-ray Novae
- **Supervisor:** prof. Nikolai Shakura

Sparrow Hills Lyceum

Moscow, Russia

HIGH SCHOOL

June 25, 2007

Additional Education

Yandex School of Data Analysis & Higher School of Economics

INTRODUCTION TO MACHINE LEARNING

Coursera, Internet

January–March 2016

Stanford University

ALGORITHMS: DESIGN AND ANALYSIS (PARTS 1&2)

Coursera, Internet

October 2014 – May 2015

Kislovodsk Mountain Astronomical Station of the Pulkovo observatory

STUDENT PRACTICE

- Practical courses on solar astrophysics, participation in solar observations.

Mt. Shatdzhataz,

Karachay-Cherkessia, Russia

July 2010

Special Astrophysics Observatory (SAO RAS)

STUDENT PRACTICE

- Theoretical and practical courses on astrophysics, spectral analysis, instrumentation and observational methods.

Nizhny Arkhyz,

Karachay-Cherkessia, Russia

July 2008

Scientific Interests

- Non-stationary accretion of thin accretion discs: numerical solution of non-linear diffusion equation of disc evolution, disk instability model implementation. X-ray outbursts in LMXB: inside-in vs outside-out scenarios, optical–X-ray delay.
- Vertical structure of accretion discs: effects of irradiation and vertical convection, stability of laminar and turbulent accretion discs.
- Multidimensional hydrodynamical simulations for explanation of observable features of accretion: physical set-up of modelling.
- Software development in astrophysics: numerical calculations, symbolic computations inside programs as a method of solution of problems. GPU computing for user interface of astrophysics software and numerical calculations.
- Machine learning and statistics methods in astrophysics.

Grants

Study of the new types of viscous instabilities in laminar accretion disks

PRINCIPAL INVESTIGATOR

*Russian Foundation for Basic
Research (RFBR) grant #18-32-00553*

2018 – 2020

The physics of accretion in X-ray binary pulsars – relativistic effects, pulse profiles, and emission properties

CO-INVESTIGATOR

- **Principal investigator:** Nikolai Shakura

RFBR grant #18-502-12025

2018 – 2020

Astrophysics of black holes, neutron stars and white dwarfs

CO-INVESTIGATOR

- **Principal investigator:** Nikolai Shakura

*Russian Science Foundation grant
#14-12-00146*

2014 – 2018

The physics of accretion in X-ray binary pulsars – the emitting region and magnetospheric boundary

CO-INVESTIGATOR

- **Principal investigator:** Nikolai Shakura

RFBR grant #14-02-91345

2014 – 2015

Accretion disks: subcritical and supercritical regimes

CO-INVESTIGATOR

- **Principal investigator:** Nikolai Shakura

RFBR grant #14-02-91172

2014 – 2015

Study of observational appearances of the final stages of stellar evolution

CO-INVESTIGATOR

- **Principal investigator:** Nikolai Shakura

RFBR grant #12-02-00186

2012 – 2014

Awards and memberships

Since 2018 **Young member**, International Astronomical Union.

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| 2015 | Member of Finalist Team , Yandex.Root contest for Unix engineers, system administrators, and all fans of open source and Linux. | Internet |
| 2013 | Winner , D. Ya. Martynov Award for the best master thesis on astronomy, Faculty of Physics MSU. | Moscow, Russia |
| 2007 | Second degree award , XIV Russian Olympiad on Astronomy for the last year school students. | Saransk, Russia |

Languages

English: fluent, including professional vocabulary.

Russian: native.

Computer and Programming Skills

Python: numpy, scipy, astropy, matplotlib, sympy, requests, scikit-learn, Django, Flask/Bottle, Jupyter, etc.

C/C++: C++11, Boost, GSL, OpenMP, Qt, OpenGL.

Another languages: Bash scripting, Perl, Julia, basic web development with HTML/CSS/JS, Make, CMake.

Technologies: Docker (including Swarm), git, Linux administration, MacOS, \LaTeX , AWS (EC2, S3, Route 53, CloudFront).

Organization of conferences and seminars

International Conference in Memory of L. P. Grishchuk

MEMBER OF LOCAL ORGANIZING COMMITTEE

Moscow, Russia

November 2016

Colloquium “Earth in early solar planetary system”

MEMBER OF LOCAL ORGANIZING COMMITTEE

Moscow, Russia

2016

Scientific seminar of Relativistic astrophysics department SAI MSU

SECRETARY

Moscow, Russia

2011 – present

Papers

REFEREED PAPERS

1. Lipunova, G. V., & Malanchev, K. L., “*Determination of the turbulent parameter in accretion discs: effects of self-irradiation in 4U 1543–47 during the 2002 outburst*”, Monthly Notices of the Royal Astronomical Society, vol.468, p.4735, 2017.
2. Lukin, V. V., Malanchev, K. L. et al., “*3D modelling of accretion disc in eclipsing binary system V1239 Her*”, Monthly Notices of the Royal Astronomical Society, vol.467, p.2934, 2017.
3. Oknyansky, V. L. et al. (incl. Malanchev, K. L.), “*The curtain remains open: NGC 2617 continues in a high state*”, Monthly Notices of the Royal Astronomical Society, vol.467, p.1496, 2017.
4. Malanchev, K. L., Postnov, K. A., & Shakura, N. I., “*Convection in axially symmetric accretion discs with microscopic transport coefficients*”, Monthly Notices of the Royal Astronomical Society, vol.464, p.410, 2017.
5. Malanchev, K. L., & Shakura, N. I., “*Vertical convection in turbulent accretion disks and light curves of the X-ray nova A0620-00 1975 outburst*”, Astronomy Letters, vol.41, p.797, 2015.

BOOK

Two chapters in the book “*Accretion processes in astrophysics*”, editor Nikolai Shakura, 2016 (in Russian):

- Lipunova, G. V., & Malanchev, K. L., chapter “*Standard model of disc accretion*”.
- Malanchev, K. L., Postnov, K. A., & Shakura, N. I., chapter “*A viscous-convective instability in laminar Keplerian thin discs*”

PROCEEDINGS

1. Oknyansky, V. L. et al. (incl. Malanchev, K. L.), “*Multi-wavelength monitoring of the changing-look AGN NGC 2617 during state changes*”, Odessa Astronomical Publications, v.30, p.117, 2017.
2. Lamzin S. et al. (incl. Malanchev, K. L.), “*Anomalous eclipses of the young star RW Aur A*”, “Stars: From Collapse to Collapse”, ASP Conf. Ser. v.510, p.356, 2017.

3. Oknyansky, V. L. et al. (incl. Malanchev, K. L.), “Monitoring of the Changing-Look AGN NGC 2617”, “Actual problems of extragalactic astronomy”, p.8, 2017.
4. Malanchev, K., Postnov, K., & Shakura, N., “A viscous-convective instability in laminar Keplerian thin discs”, “Radiation mechanisms of astrophysical objects: classics today”, p.331, 2016.
5. Malanchev, K. L. & Lipunova, G. V., “Model of viscous evolution of accretion disc in wide X-ray binary 4U 1543–47 during its 2002 outburst”, “Fundamental and applied cosmic studies”, p.44, 2016.
6. Malanchev, K., “Vertical convection in turbulent accretion disk and light curves of X-ray Nova A0620-00”, “International Conference on Particle Physics and Astrophysics”, Journal of Physics Conference Series, vol.675, p.032020, 2016.
7. Malanchev, K. L., Meshcheryakov, A. V. & Shakura, N. I., “Modeling of Light Curves of X-ray Novae”, “Fifty years of Cosmic Era: Real and Virtual Studies of the Sky. Conference of Young Scientists of CIS Countries”, p.114, 2012.

ASTRONOMER’S TELEGRAMS

1. Oknyansky V. L. et al. (incl. Malanchev K. L.), “New outburst of NGC 2617”, #9050, May 14, 2016.
2. Oknyansky V. L. et al. (incl. Malanchev K. L.), “NGC 2617 brightens again after long very low state”, #11703, June 9, 2018.

Participation in Conferences and Schools

1. Oral talk “3D hydrodynamical modelling of accretion in close binary systems with white dwarf”, Lomonosov conference, 2017, Lomonosov Moscow State University, Moscow, Russia.
2. Oral talk “On convective stability of accretion discs with microscopic transport coefficients”, Fundamental and applied cosmic studies, Space Research Institute RAS, 2017, Moscow, Russia.
3. Poster “Freddi — new tool for X-ray nova modelling”, High Energy Astrophysics, Space Research Institute RAS, 2016, Moscow, Russia.
4. Oral talk “Model of viscous evolution of accretion disc in wide X-ray binary 4U 1543–47 during its 2002 outburst”, Fundamental and applied cosmic studies, Space Research Institute RAS, 2016, Moscow, Russia.
5. Poster “Viscous evolution of accretion disc around black hole in 4U 1543–47 in 2002”, High Energy Astrophysics, Space Research Institute RAS, 2015, Moscow, Russia.
6. Oral talk “Vertical convection in turbulent accretion disk and light curves of X-ray Nova A0620-00”, The International Conference on Particle Physics and Astrophysics, MEPhI, 2015, Moscow, Russia.
7. Oral talk “Numerical Simulation of X-Ray Nova Light Curves”, IUTAM Symposium on Growing solids, 2015, Moscow Russia.
8. Poster “Non-stationary disk accretion in X-ray Novae”, Black Hole Accretion and AGN Feedback, 2015, Shanghai observatory, Shanghai, China.
9. Oral talk “Numerical modelling of non-stationary accretion in X-ray novae”, Conference of Russian Astronomical Society, 2015, Sternberg Astronomical Institute MSU, Moscow, Russia.
10. Oral talk “Study of the secondary peak of light curves of X-ray novae”, Fundamental and applied cosmic studies, Space Research Institute RAS, 2015, Moscow, Russia.
11. Participation and poster “Non-stationary disk accretion in X-ray Novae” in International Cargèse school on cosmic accelerators, 2013, Cargèse, France.
12. Participation in School of Modern Astrophysics, 2013, Pushino, Russia.
13. Participation in High Energy Astrophysics, 2013, Heidelberg, Germany.
14. Participation and oral talk “Non-stationary disk accretion in X-ray Novae” in Kaurovka Winter School, 2012, Sverdlovskaya oblast, Russia.
15. Oral talk “Non-stationary disk accretion in Soft X-ray transients”, Accretion flow instabilities: 30 years of the thermal-viscous disc instability model, Nicolaus Copernicus Astronomical Center, Warsaw, Poland.
16. Oral talk “Non-stationary disk accretion in X-ray Novae”, 2012 Observation evidences of stellar evolution, Special astrophysics observatory, Karachay-Cherkessia, Russia.
17. Poster “Modelling of light curves of X-ray novae”, High Energy Astrophysics, Space Research Institute RAS, 2011, Moscow, Russia.
18. Oral talk “Modelling of light curves of X-ray novae”, Fifty years of Cosmic Era: Real and Virtual Studies of the Sky, 2011, Armenian Academy of Sciences, Yerevan, Armenia.