

Curriculum Vitae

Dr. Bidzina Shergelashvili

Surname: Shergelashvili
Name: Bidzina
Nationalities: Belgium and Georgia
Country of origin: Georgia
Gender: Male
Title: Dr.

Head of Centre for Computational Helio
Studies
Associated professor at
Ilia State University, Georgia

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Division of Sun and Solar System
Studies, Senior Researcher
E. Kharadze Georgian National
Abastumani Astrophysical Observatory



EDUCATION

- 2003-2006 "Doctor in the Science of Mathematics", **PhD**, 10th April 2006,
Centre for Plasma Astrophysics, Department of Mathematics, K.U.Leuven, Belgium
PhD Thesis "*On wave properties in the inhomogeneous solar plasma: new approaches*"
- 1996-2000 Post graduate studies, Aspirant
Department of Theoretical Astrophysics, Abastumani Astrophysical Observatory, Tbilisi, Georgia
- 1989-1994 Physics, Specialization: Theoretical Physics, Major subject: Astrophysics (obtained degree equivalent to **MSc**),
1994 Faculty of Physics, I. Javakhishvili Tbilisi State University, Tbilisi, Georgia
MSc Thesis: "*Propagation of Alfvén waves in the inhomogeneous magnetic tubes*"
- 1986-1989 Prof. A. Razmadze Special secondary school for Physics and Mathematics, Tbilisi Georgia

PROFESSIONAL APPOINTMENTS

- March 2020 – present Head of Centre for Computational Helio Studies, Faculty of Natural Sciences and Medicine, Ilia State University, Georgia
- March 2020 – present Senior Researcher E. Kharadze Georgian National Abastumani Astrophysical Observatory, Georgia
- June 2010 - present Associated Professor at Ilia State University, Tbilisi, Georgia
- August 2014 - December 2017 Research Scientist at Space Research institute, Austrian Academy of Science, Graz, Austria
- January 2010 - April 2018 Post doctoral researcher at Combinatorial Optimization and Decision Support (CODeS),
Computer Science at K.U. Leuven campus Kortrijk.
Scientific Manager of Marie Curie FP7-PEOPLE-2010-IRSES grant # 269299 - "Solar and Space Weather Network of Excellence" - SOLSPANET (Coordinator Prof. Stefaan Poedts).
- June 2010 - December 2011 Research fellow at the Institute of Theoretical Physics, Ruhr University of Bochum, Germany (Between 1st June 2010- 31st May 2011 the fellowship had been realized within the FP6 research Training Network-SOLAIRE)
- November 2009 - June 2010 Assistant Professor at I. Chavchavazde State University, 0162 Tbilisi, Georgia
- December 2000 - present Researcher at Georgian National Astrophysical Observatory (former Abastumani AO).
- April 2006 - September 2008 Postdoctoral Researcher at the Institute of Theoretical Physics, K.U.Leuven, Belgium (project Implementation has been officially evaluated by the Scientific Committee of K.U.Leuven as "Excellent" /highest on scale/).

Curriculum Vitae

RESEARCH GRANT AWARDS DURING 2006-2019

- February 2023 -present, Visiting researcher at Ruhr Universität Bochum (Germany), Institut für Theoretische Physik IV, Lehrstuhl für Weltraum- und Astrophysik. (Host PD Dr. Horst Fichtner), DAAD grant for EU fellowships for Georgian researchers, 2023.
- April 2022 – December 2022 – Visiting International Professorship (VIP), Ruhr Universität Bochum (Germany), Institut für Theoretische Physik IV, Lehrstuhl für Weltraum- und Astrophysik.
- April 2019 – December 2020: Visiting professor at Ruhr Universität Bochum (Germany), Institut für Theoretische Physik IV, Lehrstuhl für Weltraum- und Astrophysik - Deutsche Forschungsgemeinschaft (DFG) grant FI 706/25-1 (Host PD Dr. Horst Fichtner) - Initiation of International Collaboration project – „Connecting the Sun and the Heliosphere: Physical Conditions at the Heliobase and Their Signatures in Space Weather“.
- April 2018 – December 2019: Visiting professor at Universität Siegen (Germany), Naturwissenschaftlich-Technische Fakultät, Department Maschinenbau, Institut für Fluid- und Thermodynamik, Lehrstuhl für Strömungsmechanik - Deutsche Forschungsgemeinschaft (DFG) grant FO 674/12-1 (Host Prof. Holger Foyssi) - Initiation of International Collaboration project – „Invariant Numerical Discretization of Shallow-water Equations using Method of Moving Frames“.
- November 2017 – present: Shota Rustaveli National Science Foundation of Georgia grant FR17_609- “Phenomenological statistical model of the flow patterns in the solar surroundings”. (PI- B. Shergelashvili, coordinator E. Philishvili).
- November 2016 – December 2019: Shota Rustaveli National Science Foundation of Georgia grant DI-2016-52 - “Theoretical statistical modeling of the flow patterns in the solar atmosphere”. (PI- A. Taktakishvili, coordinator G. Ramishvili, assistant of PI B. Shergelashvili). The project is being implemented by Ilia State University, Georgia in collaboration with NASA's Goddard Space Flight Center.
- August 2014 – July 2017 - Österreichisch Fonds zur Förderung der wissenschaftlichen Forschung (FWF) project P25640-N27 (PI M.L. Khodachenko), “Energy transport and release in the solar atmosphere: effects of background flow”.
- December 2012 - December 2015: Shota Rustaveli National Science Foundation of Georgia grant DI/14/6-310/12 - “Nonequilibrium phenomena in the solar corona and wind - methods for solar and space weather studies”. (PI- A. Taktakishvili, co-PI B. Shergelashvili). The project has been implemented by Ilia State University, Georgia in collaboration with NASA's Goddard Space Flight Center.
- September 2011 - August 2016: Marie Curie FP7-PEOPLE-2010-IRSES grant # 269299 - “Solar and Space Weather Network of Excellence” - SOLSPANET. Coordinator K.U. Leuven groups: Centre for Plasma Astrophysics (CPA) and Combinatorial Optimization and Decision Support (CODeS).
- 2010-2012: Grant of Georgian National Science Foundation, “Magnetoseismology of the solar atmosphere” - grant no. GNSF/ST09/4-310.
- 2006-2009: Grant of Georgian National Science Foundation, “Waves in the solar atmosphere: excitation, propagation and role in the chromosphere/coronal heating” - grant no. GNSF/ST06/4-098
- November 2006 - October 2007: K.U.Leuven post-doctoral scholarship - PDM/06/116, “Doctoral Assistant” in the Institute of Theoretical Physics, K. U. Leuven (Belgium).

RESEARCH INTERESTS / EXPERIENCE / EXPERTISE

Solar and Space Weather

- Modeling of the solar wind wave turbulent heating and acceleration. Impact of the distribution of wave sources on the heating process.
- Conceptual and statistical modeling of the contribution shear flow and other nonequilibrium process induced wave phenomena in the heating and acceleration of the solar wind and dynamics of the magnetic structures in the solar corona and beyond.
- Solar wind and CME observations and analytic/numerical modeling.
- Development of the Solar and Space weather monitoring and forecasting tools within the framework of the internationally driven space weather services and in line with the general ESA awareness program and consistent with ESA Virtual Space Weather Modelling Centre (VSWMC).
- Using of the Radio observations to detect intrinsic properties of the CMEs and other space weather events (the work is developed within SOLSPANET network in collaboration with Kharkov Institute of Radio Astronomy, Ukraine).
- Statistical analysis of the very low frequency radio signal to detect the impact of the solar flares produced particle beams on the Earth ionosphere (the work is developed within SOLSPANET network in collaboration with Shamakhi Astrophysical Observatory of the Azerbaijan National Academy of Science).

Non-equilibrium statistical mechanics and thermodynamics

- Waves and oscillations in non-equilibrium plasmas (applications to variable stars, solar flares and CME's).
- Events of self-organized criticality in the solar atmosphere (numerical modelling of solar flare statistics).

Curriculum Vitae

- Nonequilibrium fluctuation theory (large deviation approach).
- Fundamental statistical properties of the systems close/far from their equilibrium; applications to astrophysical situations.

Wave dynamics and interactions

- Wave dynamics in shear flows. Non-modal changes and mutual conversion of the MHD wave modes and their dissipation in shear flows.
- Waves in the thermally nonequilibrium and inhomogeneous astrophysical plasmas.
- Pulsations and oscillations of the inhomogeneous magnetic structures (slabs and cylinders, coronal seismology).

TECHNICAL SKILLS

Numerical modelling of physical processes in geophysical and astrophysical systems using FORTRAN and C, AMRVAC (Versatile Advection Code for solving the fully nonlinear dissipative equations of MHD in 3D), C, IDL, Maple, Matlab, Python, Web design using HTML, Corel Draw, Microsoft Office, Latex, etc., Web programming, Database management via Ms-SQL (or My-SQL), knowledge of both windows and Linux based platforms.

STUDENT SUPERVISION AND MENTORING

I have significant experience in cooperation with students and young researchers.:

- **Six master students** defended their thesis during last years with excellence at Ilia State University under my supervision.
- One student defended the disertaions. Currently, I supervise **three PhD students** at Ilia State University and one in Ruhr University of Bochum, Germany.

INTERNATIONAL NETWORK

Centre for mathematical Plasma Astrophysics (CmPA), KULeuven, Belgium, School of Mathematics and Statistics, The University of St. Andrews, Shamakhy Astrophysical Observatory of National Academy of Sciences of Azerbaijan, Institute of Radio Astronomy of National Academy of Sciences of Ukraine, Institute of Theoretical Physics, Ruhr University of Bochum, Germany, Departament de Física, Universitat de les Illes Balears, Spain, Astronomy and Astrophysics Group at University of Warwick, UK

May 2023 – IAU member.