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Anna Guseva

## EDUCATION

- 26/02/2018 **Ph.D. in Engineering**, University of Bremen, Germany  
*Thesis: "Dynamics and transport of instabilities in magnetized quasi-Keplerian Taylor-Couette flows", supervised by Prof. Marc Avila and funded by German Research Foundation*
- 19/06/2014 **M. Sc. Thermophysics & molecular physics**, National Research University "Moscow Power Engineering Institute", Russia  
*Thesis: "Nonlinear analysis of the azimuthal magnetorotational instability"*
- 19/06/2012 **B. Sc. Thermophysics**, National Research University "Moscow Power Engineering Institute", Russia, *Thesis: "Electrovortex flow in hemispherical geometry"*

## EMPLOYMENT

- since 01/07/2023 **Postdoctoral Fellow**, Laboratoire d'Etudes du Rayonnement et de la Matière en Astrophysique et Atmosphères, the Paris Observatory, France  
○ Numerical and mathematical modelling of stellar magnetohydrodynamics as a part of ANR project PROMETHEE on star formation
- 01/09/2020 – 30/06/2023 **Marie Curie Research Fellow**, University of Leeds, UK  
School of Mathematics  
○ Data-driven analysis and reduced-order modelling of astrophysical dynamos, in collaboration with Prof. S. Tobias
- 01/02/2018– 31/07/2020 **Postdoctoral researcher**, Polytechnic University of Madrid, Spain  
School of Aeronautics and Space Engineering  
○ A comprehensive study of interaction between large- and small-scale structures in turbulent flows, in collaboration with Prof. J. Jiménez
- 01/03/2016 – 31/12/2017 **Research Assistant**, Center of Applied Space Technology and Microgravity, University of Bremen, Germany  
○ I found the possibility of a fully nonlinear self-sustained dynamo action in quasi-Keplerian accretion disc shear flows
- 01/08/2014 – 29/02/2016 **Research Assistant**, Institute of Fluid Mechanics, Friedrich-Alexander-University Erlangen-Nürnberg, Germany  
○ A study of transition to turbulence and momentum transport in magnetized quasi-Keplerian accretion disc flows

## AWARDS

- 2023 Postdoctoral Fellowship of the Paris Observatory  
*Peer-reviewed independent 2-years project on data-driven modelling of stellar magnetic activity for PLATO mission, with the aim of facilitating detection of exoplanets.*
- 2022 The Observatoire de Paris – PSL Visiting Fellowship  
*I was awarded this fellowship to continue my research in the field of data-driven modelling of stellar and planetary dynamos, and participated in activities of the Graduate Program in Astrophysics at the Paris Observatory and PSL University.*

- 2020 Marie Sklodowska Curie Individual Fellowship  
*I was awarded funding for implementation of the research project DynMode under Horizon 2020 Framework Programme. The project was devoted to modelling of interscale nonlinear interactions in the dynamo flows using the novel data-driven approach.*
- 2017 Kavli Institute for Theoretical Physics (US) Affiliate Visitor Grant  
*I was invited as an Affiliate Visitor to a program entitled "Recurrent Flows: The Clockwork Behind Turbulence", gathering experimentalists, theorists and computationalists to work on understanding the transition to turbulence.*
- 2013 Professor Klaus Riedle-Foundation annual prize and scholarship  
*Professor Riedle Scholarship aimed to enhance knowledge exchange between Friedrich-Alexander-University Erlangen-Nürnberg and Moscow Power Engineering Institute, and allowed me to perform a 6-months academic stay in Erlangen (Germany).*

## PUBLICATIONS

- submitted to A. Guseva, L. Petitdemange and S. M. Tobias.  
 JGR **Run-away transition to turbulent strong-field dynamo**  
<https://arxiv.org/abs/2405.10981>
- 2024 **A. Guseva.**  
**Data-driven scale identification in oscillatory dynamos**  
 Monthly Notices of the Royal Astronomical Society, vol. 528, no. 2 (2024).  
<https://doi.org/10.1093/mnras/stae079>
- C. Pinçon, L. Petitdemange, R. Raynaud, L. J. Garcia, **A. Guseva**, M. Rieutord, and E. Alecian.  
**Coriolis darkening in late-type stars. II. Effect of self-sustained magnetic fields in stratified convective envelopes**  
 Astronomy and Astrophysics-A&A, 685, A129 (2024)  
<https://doi.org/10.1051/0004-6361/202349051>
- A. Guseva**, B. Snow, and Z. Wang.  
**Data-driven modelling of coherent structures in mixing layers**  
 Proceedings of the NFFDy Summer Programme on 'Data in Fluids' (2024).  
<https://doi.org/10.17863/CAM.107271>
- 2023 **A. Guseva** and S. M. Tobias.  
**Transition to chaos and modal structure of magnetized Taylor–Couette flow**  
 Philosophical Transactions of the Royal Society A, 381 (2023).  
<https://doi.org/10.1098/rsta.2022.0120>
- 2022 **A. Guseva** and J. Jiménez.  
**Linear instability and resonance effects in large-scale opposition flow control**  
 Journal of Fluid Mechanics, 935, A35 (2022).  
<https://doi.org/10.1017/jfm.2022.34>
- 2020 J. I. Ibrahim, **A. Guseva**, and R. Garcia-Mayoral.  
**Selective opposition-like control of large-scale structures in wall-bounded turbulence**  
 Journal of Physics: Conference Series. Vol. 1522. No. 1. (2020)  
<https://doi.org/10.1088/1742-6596/1522/1/012015>
- F. Nauman and **A. Guseva.**  
**Energy transfers in magnetohydrodynamic shear turbulence**  
 Journal of Physics: Conference Series. Vol. 1522. No. 1. (2020)  
<http://doi.org/10.1088/1742-6596/1522/1/012005>

- 2018 G. Mamatsashvili, F. Stefani, **A. Guseva**, M. Avila  
**Nonlinear evolution of helical magnetorotational instability in a magnetized Taylor-Couette flow**  
 New Journal of Physics 20, 013012 (2018)  
<https://doi.org/10.1088/1367-2630/aa9d65>
- 2017 **A. Guseva**, A.P. Willis, R. Hollerbach, M. Avila  
**Dynamo action in a quasi-Keplerian Taylor-Couette flow**  
 Physical Review Letters, 119, 164501  
<https://doi.org/10.1103/PhysRevLett.119.164501>
- A. Guseva**, A.P. Willis, R. Hollerbach, M. Avila  
**Transport properties of the azimuthal magnetorotational instability**  
 The Astrophysical Journal, 849:92 (2017)  
<https://doi.org/10.3847/1538-4357/aa917d>
- A. Guseva**, A.P. Willis, R. Hollerbach, M. Avila  
**Azimuthal magnetorotational instability at low and high magnetic Prandtl numbers**  
 Magnetohydrodynamics, 53, 1:25-34 (2017).  
<https://arxiv.org/abs/1611.07296>
- 2016 M. Gellert, G. Rüdiger, M. Schultz, **A. Guseva**, R. Hollerbach  
**Nonaxisymmetric MHD instabilities of Chandrasekhar states in Taylor-Couette geometry**  
 Astrophysical Journal, 823, 99:1-9 (2016).  
<https://doi.org/10.3847/0004-637X/823/2/99>
- 2015 **A. Guseva**, A.P. Willis, R. Hollerbach, M. Avila  
**Transition to magnetorotational turbulence in Taylor-Couette flow with imposed azimuthal magnetic field**  
 New Journal of Physics, 17, 093018:1-14 (2015).  
<https://doi.org/10.1088/1367-2630/17/9/093018>
- A. Kharicha, I. Teplyakov, Yu. Ivochkin, M. Wu, A. Ludwig, **A. Guseva**  
**Experimental and numerical analysis of free surface deformation in an electrically driven flow**  
 Experimental Thermal and Fluid Science, 62, 192-201 (2015).  
<http://www.sciencedirect.com/science/article/pii/S0894177714002933>
- Y. Ivochkin, I. Teplyakov, **A. Guseva**, D. Vinogradov  
**Influence of the swirled electrovortex flow on the melting of eutectic alloy In-Ga-Sn**  
 Magnetohydrodynamics, 51, 2:337-344 (2015).  
<http://mhd.sai.lv/contents/2015/2/MG.51.2.18.R.html>

## TEACHING EXPERIENCE

- 2022-ongoing Magnetohydrodynamic instabilities and dynamo action, the Paris Observatory  
*A series of lectures developed and delivered to master students in astrophysics as a part of the Gas Dynamics course*
- 2023 Numerical Analysis course at the School of Mathematics, U. Leeds.  
*Weekly workshops for undergraduate students*
- 2014-2015 Numerical methods for fluid mechanics, U. Erlangen-Nuremberg  
*Preparing new course structure and materials; giving seminars for graduate students in Mechanical, Chemical and Computational Engineering.*

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## SUPERVISION OF STUDENTS

- 2024 Elsa Louaas  
Master-level research project “Modelling of convective-radiative interfaces using transpiring boundary conditions” at LERMA, the Paris Observatory
- 2023- Virgin Durepaire  
ongoing PhD project “Magnetic instabilities in radiative stellar interiors” at LERMA, the Paris Observatory  
*co-supervision with L. Petitdemange and K. Belkacem*

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## SELECTED TALKS AND PRESENTATIONS

- 09/2024 Invited talk  
**Large scales in turbulent shear flows**  
EEBE Seminars on Computational Mechanics, Barcelona, Spain
- 04/2024 Invited talk  
**Data-driven approach to interaction between magnetic fields and rotating convection**  
FAST-LISN Seminar of mechanics, Paris, France
- 09/2023 A. Guseva, Ludovic Petitdemange, S. Tobias  
**Weak and strong dynamos: a data-driven analysis**  
Geophysical & Astrophysical Fluid Dynamics: Experiments and Models  
Nice, France
- 07/2023 A. Guseva, S. Tobias  
**Data-driven analysis of magnetorotational turbulence**  
National Astronomy Meeting, Cardiff, UK
- 11/2022 Invited talk  
**A data-driven approach to nonlinear dynamos**  
Seminars of the Institute of Space Sciences, Barcelona, Spain
- 10/2022 A. Guseva, S. Tobias  
**Data-driven reduced-order modelling of dynamo waves**  
Programme “Frontiers in dynamo theory: from the Earth to the stars”,  
Isaac Newton Institute, Cambridge, UK
- 03/2022 Invited talk  
**Large-scale opposition flow control**  
Non-linear Physics Seminars, École normale supérieure, Paris, France
- 05/2021 A. Guseva, S. Tobias  
**Nonlinear dynamos: a data-driven approach**  
UKMHD 2021 conference (online)
- 09/2019 A. Guseva, M.P. Encinar, J. Jiménez  
**Active flow control of the logarithmic layer**  
17th European Turbulence Conference, Turin, Italy
- 09/2016 A. Guseva, A.P. Willis, R. Hollerbach, M. Avila  
**Angular momentum transport in quasi-Keplerian flows with imposed azimuthal magnetic field**  
11th European Fluid Mechanics Conference, Sevilla, Spain
- 06/2016 A. Guseva, A.P. Willis, R. Hollerbach, M. Avila  
**Transport properties of the azimuthal magnetorotational instability**  
10th PAMIR International Conference on Fundamental and Applied MHD,  
Cagliari, Italy

## CONTRIBUTIONS TO RESEARCH COMMUNITY

I served as a reviewer for the German Research Foundation (DFG), Dutch Research Council (NWO) and for several high-quality peer-reviewed journals:

- Monthly Notices of the Royal Astronomical Society
- Journal of Plasma Physics
- Journal of Fluid Mechanics
- Physical Review E
- Physical Review Fluids
- European Journal of Fluid Mechanics
- International Journal of Heat and Fluid Flow

Conference and seminar organization:

- Member of the scientific committee of Spanish Fluid Mechanics Conference 2025 (SFMC25)
- Interdisciplinary session “Magnetised stars and planets: combining theory and observations”, National Astronomy Meeting, Cardiff, UK (2023)
- Seminars of Astrophysical and Geophysical Fluid Dynamics group, School of Mathematics, University of Leeds (2021-2023)
- The 4th Summer School on Turbulence, Madrid, Spain (2019)