Andreas Flörs

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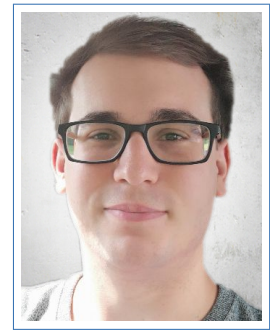⌂ afloers.github.io
in linkedin.com/in/afloers
⊙ github.com/afloers
Date of birth: December 08, 1990
Nationality: German

Employment

03/2021 - present
Post-doctoral Research Scientist *GSI Helmholzzentrum für Schwerionenforschung, Darmstadt, Germany.*
- Kilonova Radiative Transfer Modelling
- Statistical Analysis and Modelling
- Theoretical Atomic Structure Calculations for Lanthanides and Actinides
- Atomic Data Aggregation of Post-Iron-Peak Elements
- Identification of R-Process Material in Neutron-Star-Mergers

09/2020 - 02/2021
Post-doctoral Research Scientist *Max-Planck-Institut für Astrophysik, Garching, Germany.*
- Supernova Spectroscopy
- NLTE Radiative Transfer Simulations
- Supernova Explosion Kinematics
- Atomic Data Aggregation
- Astronomical Data Reduction Pipelines

05/2015 - 08/2015
Student trainee, *Chair E62, TU München, Germany*, Developments and improvements of a GEM-TPC detector simulation

Education

The German system recognizes grades from 1.0 (best) to 4.0 (lowest passing grade)

03/2017 - 08/2020
PhD in Astrophysics *Max-Planck-Institut für Astrophysik, Garching, Germany.*
Thesis: *The Neutron-Rich Ejecta of Type Ia Supernovae and Constraints on the Exploding Mass of their Progenitors*
Supervisor: Prof. Dr. Wolfgang Hillebrandt
Co-supervisor: Dr. Jason Spyromilio

04/2015 - 02/2017
M. Sc. degree in Nuclear, Particle and Astrophysics, *Physics Department, Technische Universität München*, München, Germany.
Thesis: *The Diversity of Nebular Spectra of Type Ia Supernovae*
Supervisor: Prof. Dr. Wolfgang Hillebrandt
Final mark: 1.3

10/2011 - 03/2015
B. Sc. degree in Physics, *Physics Department, Technische Universität München*, München, Germany.
Thesis: *Is the Higgs boson THE Higgs boson?*
Supervisor: Prof. Dr. Martin Beneke
Final mark: 1.5

Languages

German	Native	
English	Fluent	*Academic English C1, Hilderstone College, Broadstairs, UK, Mar 2015*
French	Basic	

Scholarships, Awards, Honors and Grants

09/2020 **Kippenhahn prize**, *Best scientific paper written by a student at the Max-Planck Institute for Astrophysics in 2019*, Garching, Germany.

04/2019 **STScI Spring Symposium 2019 travel grant**, *$ 700*

01/2018 **Best poster prize**, *Supernovae - From Simulations to Observations and Nucleosynthetic Fingerprints*, Bad Honnef, Germany.

03/2017 - **ESO studentship programme**: PhD support for two years at the European Organisation for Astronomical Research in the Southern Hemisphere (ESO).
02/2019

10/2011 - **Max Weber-Programm Alumnus**: Implementation of the German National Merit Foundation according to the Bavarian Elite Support Act for highly-gifted students at universities in Bavaria.
present

2011 **Best Abitur Certificate in Bavaria**

Scientific Collaborations

10/2023 - **HEAVYMETAL** *How Neutron Star Mergers make Heavy Elements*; member of the atomic structure calculations group
present

10/2019 - **adH0cc** *Accurate determination of H0 with core-collapse supernovae*; responsible for data reduction, including the development of data reduction pipelines.
present

03/2019 - **TARDIS-SN**; *TARDIS-SN is an open-source Monte Carlo radiative-transfer spectral synthesis code for 1D models of supernova ejecta*; member of the core development team.
present

02/2019 - **Collaboration with Dr. Stuart Sim**; *Determination of the ionization state of iron in thermonuclear supernovae*; Queen's University Belfast, Belfast, UK
05/2019

02/2018 - **ENGRAVE** *Electromagnetic counterparts of gravitational wave sources at the Very Large Telescope*; *'Theory Group'* kilonova spectroscopy coordinator and member of the *'Spectroscopic Observations'* and *'Public Outreach'* groups.
present

03/2017 - **ePESSTO+**, *Public ESO Spectroscopic Survey for Transient Objects*; member of the *'Faint & Fast Transients'* and *'Nearby Thermonculear Supernovae'* research groups.
present

Qualifications, Schools and Workshops

08/2019 **Second Radiative Transfer Code Comparison Workshop**, *Max-Planck-Institut für Astrophysik, Germany*
Analysis and comparison of synthetic supernova spectra computed by 9 different codes.

11/2018 **Neutron Star Merger Training Workshop**, *Bertinoro, Italy*
Data reduction and interpretation for electromagnetic counterparts of gravitational wave events.

10/2018 **Leadership and mentoring training**, *ESO Garching, Germany*
Introduction into delegating tasks, communicating expectations, leading students.

06/2018	**First Radiative Transfer Code Comparison Workshop**, *Weizmann Institute for Science, Israel*
	Analysis and comparison of synthetic supernova spectra computed by 9 different codes.
03/2018	**Communication skills training**, *ESO Garching, Germany*
	How to give a science talk aimed at different audiences.
05/2017	**First Italian Summer School on Astrostatistics**, *Milan, Italy*
	Hands-on workshop on Bayesian statistics, inference and statistical sampling.
01/2017 - 06/2017	**MPA/ESO Radiative Transfer Course**, *Max-Planck-Institut für Astrophysik, Germany*
	Basics of radiative transfer theory and numerical methods for solving LTE and non-LTE radiative transfer problems.

IT

Programming	Python, including the scientific stack (7 years of experience)
	C/C++ (1.5 years of experience)
VCS	git, github
OS	Mac, Linux, Windows
Codes	Core-developer of *TARDIS-SN*: https://github.com/tardis-sn/tardis
	Contributor to the PypeIt project: https://github.com/pypeit/PypeIt
	Developed my own non-LTE Monte-Carlo radiative transfer code
HPC	Access to CPU clusters at MPA (72 cores) and Michigan State University (192 cores)
	Experience running radiative transfer simulations on JEWELS (Jülich) using the DASK framework

Scientific Community Work

04/2020	**TARDIS Core Member**, Michigan State University, USA.
11/2019	**Organization Lead, TARDIS code comparison**, Michigan State University, USA.
08/2019	**LOC Member of the *Second Radiative Transfer Workshop***, Max-Planck-Institut für Astrophysik, Germany.
10/2018	**ESO Observing Programmes Committee Scientific Assistant Period 103**, ESO Garching, Germany.
08/2018	**Co-Organizer of the *Neural Network Hands-on Workshop***, ESO Garching, Germany.
06/2018 - 02/2019	**Co-Organizer of the *Supernova Meeting***, ESO Garching, Germany.
10/2017	**ESO Observing Programmes Committee Scientific Assistant Period 101**, ESO Garching, Germany.
03/2017 - 02/2019	**Organizer ESO Wine & Cheese Seminar**, ESO Garching, Germany.

Mentoring/Teaching:

| 05/2023 - 07/2023 | **Google Summer of Code 2023 Mentor for the *TARDIS* collaboration**, Michigan State University, USA |

09/2022 - Present	**Graduate Student Advisor**, GSI Helmhotzzentrum für Schwerionenforschung, Germany, Gerrit Leck
05/2022 - 07/2022	**Google Summer of Code 2022 Mentor for the *TARDIS* collaboration**, Michigan State University, USA
05/2022 - 09/2022	**Undergraduate Student Advisor**, GSI Helmhotzzentrum für Schwerionenforschung, Germany, Carsten J. Becker
08/2020 - 02/2021	**Undergraduate Student Mentor**, Michigan State University, USA, Isaac Smith
05/2020 - 07/2020	**Google Summer of Code 2020 Mentor for the *TARDIS* collaboration**, Michigan State University, USA
07/2019 - 02/2021	**Undergraduate Student Mentor**, Michigan State University, USA, Ezequiel Pássaro
05/2019 - 07/2019	**Google Summer of Code 2019 Mentor for the *Python Foundation***, Michigan State University, USA
06/2017	**Lecturer at the *MPA/ESO Radiative Transfer Course***, Max-Planck-Institut für Astrophysik, Germany
10/2015 - 10/2018	**Teaching Assistant for undergraduate physics classes**, Technische Universität München, Germany: *Theoretical Electrodynamics; Relativity, Particles and Fields; Advanced Nuclear, Particle and Astrophysics; Extragalactic Astrophysics*

Public Outreach

09/2020	**TARDIS Highschool Program Instructor**, Michigan State University, USA. *Teaching scientific programming and supernova physics to highschool pupils.*
2018, 2019	**Presenter for the *European Researcher's Night***, ESO Supernova, Garching, Germany. *Supernovae for laypeople.*
07/2018	**Lunar Eclipse Event**, ESO Supernova, Garching, Germany. *Telesope assistence and public talks.*
2018 - present	**Presenter at the ESO Supernova**, ESO Supernova, Garching, Germany. *Planetarium shows, exhibition and premises tours, public talks.*
2016 - 2018	**ESO Open House Day**, ESO Garching, Germany. *Comet building for children.*

Publications

10/2020	refereed: 23 — first author 4 — citations 4148 — h-index 13

Refereed first author papers:

2023	**Flörs, A.**, Silva, R. F., Deprince, J., et al. *Opacities of singly and doubly ionized neodymium and uranium for kilonova emission modeling*, MNRAS, 524, 3083, 2023 (arXiv:2302.01780)
2020	**Flörs, A.**, *The Neutron-Rich Ejecta of Type Ia Supernovae and Constraints on the Exploding Mass of Their Progenitors*, PhD Thesis, Technical University Munich, Physics Department, NASA ADS:2020PhDT.........6F
2020	**Flörs, A.**, Spyromilio, J., Taubenberger, S., et al. *Sub-Chandrasekhar progenitors favoured for type Ia supernovae: Evidence from late-time spectroscopy*, MNRAS, 491, 2902, 2020 (arXiv:1909.11055)

2018   **Flörs, A.**, Spyromilio, J., Maguire, K., et al. *Limits on stable iron in Type Ia supernovae from near-infrared spectroscopy*, A&A, 620, A200, 2018 (arXiv:1810.10781)

Refereed collaboration papers:

2023   Agudo, I., (+25 additional authors), **Flörs, A.**, et al. *Panning for gold, but finding helium: Discovery of the ultra-stripped supernova SN 2019wxt from gravitational-wave follow-up observations*, A&A, 675, A201, (arXiv:2208.09000)

2023   Csörnyei, G., (+2 additional authors), **Flörs, A.**, et al. *Consistency of Type IIP supernova sibling distances* , A&A, 672, A129, (arXiv:2302.03112)

2019   Pastorello, A., (+17 additional authors), **Flörs, A.**, et al. *The evolution of luminous red nova AT 2017jfs in NGC 4470*, A&A, 625, L8, (arXiv:1906.00811)

2017   Abbot et al., *Multi-messenger Observations of a Binary Neutron Star Merger*, ApJL, 848, L12, 2017 (arXiv:1710.05833)

2017   Smartt, S. J., Chen, T.-W., Jerkstrand, A., et al. *A kilonova as the electromagnetic counterpart to a gravitational-wave source*, Nature, 551, 75, 2017 (arXiv:1710.05841)

Refereed papers with major contribution:

2023   Shingles, L. J., (+2 additional authors), **Flörs, A.**, et al. *Self-consistent 3D Radiative Transfer for Kilonovae: Directional Spectra from Merger Simulations*, ApJL, 954, L41, 2023 (arXiv:2306.17612)

2023   Kwok, L. A., (+13 additional authors), **Flörs, A.**, et al. *A JWST Near- and Mid-infrared Nebular Spectrum of the Type Ia Supernova 2021aefx*, ApJL, 944, L3, (arXiv:2211.00038)

2023   Blondin, S., (+5 additional authors), **Flörs, A.**, et al. *StaNdaRT: a repository of standardised test models and outputs for supernova radiative transfer*, A&A, 668, A163, (arXiv:2209.11671)

2022   Dong, Y., (+3 additional authors), **Flörs, A.**, et al. *SN 2016dsg: A Thermonuclear Explosion Involving a Thick Helium Shell*, ApJ, 934, 102, (arXiv:2206.07065)

2022   Shingles, L. J., **Flörs, A.**, et al. *Modelling the ionization state of Type Ia supernovae in the nebular phase*, MNRAS, 512, 4, (arXiv:2203.16561)

2022   Silva, R. F., (+2 additional authors), **Flörs, A.**, et al. *Structure Calculations in Nd III and U III Relevant for Kilonovae Modelling*, Atoms, 10, 1

2022   Perego, A., (+9 additional authors), **Flörs, A.**, et al. *Production of Very Light Elements and Strontium in the Early Ejecta of Neutron Star Mergers*, ApJ, 925, 1, (arXiv:2009.08988)

2021   Barna, B., (+7 additional authors), **Flörs, A.**, et al. *ASASSN-14lp: two possible solutions for the observed ultraviolet suppression*, MNRAS, 506, 1, (arXiv:2106.09053)

2021   O'Brien, J. T., (+8 additional authors), **Flörs, A.**, et al. *Probabilistic Reconstruction of Type Ia Supernova SN 2002bo*, ApJL, 916, 2, L14, (arXiv:2105.07910)

2020   Prentice, S., (+1 additional author), **Flörs, A.**, et al. *The rise and fall of an extraordinary Ca-rich transient – The discovery of ATLAS19dqr/SN 2019bkc*, A&A, 635, A186, 2020 (arXiv:1909.05567)

2019   McBrien, O., (+12 additional authors), **Flörs, A.**, et al. *SN2018kzr: a rapidly declining transient from the destruction of a white dwarf*, ApJL, 885, L23, 2019 (arXiv:1909.04545)

2019 Taubenberger, S., **Flörs, A.**, et al. *SN 2012dn from early to late times: 09dc-like supernovae reassessed*, MNRAS, 488, 5473, 2019 (arXiv:1907.06753)

2018 De Cia, A., (+8 additional authors), **Flörs, A.**, et al. *Light curves of hydrogen-poor Superluminous Supernovae from the Palomar Transient Factory*, ApJ, 860, 100, 2018 (arXiv:1708.01623)

2018 Dhawan, S., **Flörs, A.**, Leibundgut, B., et al. *Nebular spectroscopy of SN 2014J: Detection of stable nickel in near infrared spectra*, A&A, 619, A102, 2018 (arXiv:1805.02420)

Software:

2020 Kerzendorf, W., Sim, S. A., Vogl, C., et al. *tardis-sn/tardis: TARDIS v3.0.dev3527*, Zenodo, 2020

2020 Prochaska, J. X., Hennawi, J., Cooke, R., et al. *pypeit/PypeIt: Release 1.2.0*, Zenodo, 2020

List of Seminars and Talks

Conference contributions: **4 invited talks**, **12 contributed talks** and 3 poster presentation.
Seminars and colloquia: **2 invited seminars**, 9 contributed talks.
Workshops: 7 contributed talks.

11/2023 KHuK Annual Meeting, Bad Honnef, Germany, **invited talk**: *"The State of Kilonova Modeling in Germany"*

09/2023 Nuclei in the Cosmos XVII, Daejeong, South Korea, poster presentation: *"Calibrated Lanthanide Opacities"*

09/2023 The Radiative Transfer and Atomic Physics of Kilonovae, Stockholm, Sweden, **contributed talk**: *"Towards a complete and calibrated set of lanthanide atomic data"*

07/2023 IReNA workshop on weak interactions in nuclear astrophysics, Michigan State University, USA, **contributed talk**: *"Atomic Structure Calculations of Neodymium and Uranium for Kilonova Emission Modeling"*

02/2023 3rd ENGRAVE meeting, MPA Garching, Germany, **contributed talk**: *"Lanthanide Atomic Structure for Kilonova Modeling during LIGO/Virgo Period O4"*

12/2022 Heidelberg Workshop on Supernovae, Heidelberg, Germany, workshop contribution: *"Atomic Structure Calculations for Kilonova Radiative Transfer"*

11/2022 Kilonova: Multimessenger and Multiphysics, Bad Honnef, Germany, **invited talk**: *"3D Radiative Transfer Kilonova Modeling with Detailed Nuclear and Atomic Inputs"*

11/2022 Kilonova: Multimessenger and Multiphysics, Bad Honnef, Germany, poster presentation: *"Advances towards the atomic structure of lanthanide ions"*

07/2022 Western Michigan University Theory Seminar, Western Michigan University, USA, **invited talk**: *"FAC calculations of lanthanide ions using an optimised local central potential"*

06/2022 NBIA Workshop on Radiation Transfer in Astrophysics, Kopenhagen, Denmark, **contributed talk**: *"Kilonovae: Signatures of Heavy r-Process Nucleosynthesis"*

05/2022 FAIR next generation scientists - 7th Edition Workshop, Paralia, Greece, **contributed talk**: *"Atomic Data for Heavy r-Process Nucleosynthesis"*

04/2022 First annual conference of ELEMENTS, Frankfurt, Germany, **contributed talk**: *"Lanthanide Atomic Data and Their Application in Kilonova Radiative Transfer"*

03/2022 DPG-Spring Meeting, Mainz, Germany, **invited talk**: *"Kilonova Radiative Transfer and Atomic Structure of the Heaviest Elements"*

11/2021 XXth Workshop on Nuclear Astrophysics, Ringberg, Germany, **contributed talk**: *"Atomic Data Requirements for Kilonova Radiative Transfer"*

10/2020	Informal Discussion, ESO Garching, Germany, seminar talk: *"How to model a supernova"*
02/2020	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Solar abundance of manganese: a case for near-Chandrasekhar-mass Type Ia supernova progenitors"*
01/2020	Institute Seminar, Max-Planck Institute für Astrophysik, Garching, Germany, seminar talk: *"Constraining SN Ia explosion models from nebular phase spectroscopy"*
12/2019	Heidelberg Workshop on Supernovae, Heidelberg, Germany, workshop contribution: *"Peculiar Distributions of Iron in SNe Ia"*
10/2019	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Observational evidence for high neutronization in supernova remnants: implications for type Ia supernova progenitors"*
09/2019	The Extragalactic Explosive Universe, ESO Garching, Germany, **contributed talk:** *"Sub-Chandrasekhar mass progenitors favoured for SNe Ia: Evidence from late-time spectroscopy"*
08/2019	Second Radiative Transfer Workshop, Max-Planck Institute für Astrophysik, Garching, Germany, workshop contribution: *"Baysian inference of the progenitor systems of SNe Ia"*
04/2019	STScI Spring Symposium, Space Telescope Science Institute, Baltimore, USA, **contributed talk:** *"Constraints on the progenitors of normal SNe Ia from nebular phase spectroscopy"*
04/2019	Stars & Exoplanets Meeting, Flatiron Center for Computational Astrophysics, USA, **invited seminar talk:** *"Developing a likelihood function for supernova modelling"*
04/2019	Transient Meeting, Center for Cosmology and Particle Physics NYU, USA, seminar talk: *"SNe Ia - a one-parameter family of explosions"*
04/2019	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Hα emission in the nebular spectrum of the Type Ia supernova ASASSN-18tb"*
03/2019	XIXth Workshop on Nuclear Astrophysics, Ringberg, Germany, **contributed talk:** *"The evolution of temperature and density in the iron-rich ejecta of SNe Ia in the nebular phase"*
02/2019	Queen's University Belfast Astronomy Colloquium, Belfast, UK, **invited seminar talk:** *"Constraining SN Ia explosion models from nebular phase spectroscopy"*
12/2018	Heidelberg Workshop on Supernovae, Heidelberg, Germany, workshop contribution: *"The origin of iron in SNe Ia: stable nickel"*
09/2018	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Surface Radioactivity or Interactions? Multiple Origins of Early-excess Type Ia Supernovae and Associated Subclasses"*
06/2018	First Radiative Transfer Workshop, Weizmann Institute of Science, Israel, workshop contribution: *"The one-zone model and its application to nebular modelling of type Ia SNe"*
05/2018	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Using late-time optical and near-infrared spectra to constrain Type Ia supernova explosion properties"*
01/2018	From Simulations to Observations and Nucleosynthetic Fingerprints, Bad Honnef, Germany, poster contribution: *"Limits on stable iron in type Ia SNe from late-time IR spectroscopy"*
12/2017	Heidelberg Workshop on Supernovae, Heidelberg, Germany, workshop contribution: *"Bayesian modelling of nebular phase observations of SNe Ia"*
10/2017	Queen's University Belfast Astronomy Colloquium, Belfast, UK, **contributed talk:** *"Nebular Infrared Spectroscopy of Type Ia SNe"*
06/2017	Supernova Meeting, ESO Garching, Germany, seminar talk: *"Supersymmetric model for triggering supernova Ia in isolated white dwarfs"*
12/2016	Würzburg Workshop on Supernovae, Würzburg, Germany, workshop contribution: *"Evolution of line shifts and widths in SN Ia nebular spectra"*
03/2016	XIIXth Workshop on Nuclear Astrophysics, Ringberg, Germany, **contributed talk:** *"Modelling of optical nebular phase spectra of SNe Ia"*