Hannah Theresa **Rüdisser**

PhD Student in Heliophysics · Graz, AUSTRIA

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SUMMARY

After completing my MSc in Theoretical and Computational Physics with a focus on AI for time series event detection, I began a PhD in Heliophysics at the Austrian Space Weather Office. My research focuses on understanding the global magnetic field structure of coronal mass ejections (CMEs) and integrating artificial intelligence with physical models to advance space weather forecasting.

EDUCATION

University of Graz | PhD in Physics
"Combining AI and physical models to advance forecasting of solar coronal mass ejections"
Supervisors: Helmut Lammer, Christian Möstl | ERC, HELIO4CAST, 101042188, PI: Christian Möstl
Present | Graz, Austria

University of Graz | Master in Theoretical and Computational Physics - *Graduated with Distinction*
"'Deep Learning for the Automatic Detection of Interplanetary Coronal Mass Ejections"
Supervisors: Ute V. Amerstorfer, Andreas Windisch
2020-2022 | Graz, Austria

University of Kentucky | Exchange Semester (ISEP)
2019| Lexington, KY USA

University of Graz | Bachelor in Physics
"Online Gaussian Process Regression"
Supervisors: Wolfgang von der Linden, Sascha Ranftl
2015-2020 | Graz, Austria

EXPERIENCE

Austrian Space Weather Office, GeoSphere Austria | PhD Student
Oct 2022 – present | Graz, Austria

ONERA – The French Aerospace Lab | Visiting Researcher
Sep 2025 – Dec 2025 | Toulouse, France

Frontier Development Lab | Researcher
Sep 2025 – Oct 2025 | Remote/Frascati, Italy

Know-Center GmbH | Junior Researcher
Jun 2020 – Dec 2022 | Graz, Austria

Space Research Institute, Austrian Academy of Sciences |Student Intern
Jul 2018 | Graz, Austria

Space Research Institute, Austrian Academy of Sciences |Student Intern
Jul 2017 | Graz, Austria

AWARDS, GRANTS AND SCHOLARSHIPS

- **ML-Helio Early Career Award** (2025)
- **Travel Grant for attending a Conference** (2025, 1000$)
  Machine Learning in Heliophysics 2025, Madrid, Spain

- **Scholarship for Travel Expenses** (2024, 3600€)
  Awarded by the Faculty of Natural Sciences at the University of Graz
- **Grant for Self-Organized Stays** (2024, 1889€)
  Awarded by the International Office at the University of Graz
- **Grant for attending a Summer School** (2024, 1000€)
  Awarded by the Doctoral School of Physics at the University of Graz
- **3.5 years fully funded PhD Studentship**
  within an ERC Consolidator Grant, HELIO4CAST, 101042188PI: Christian Möstl

First-Authored Publications

submitted / in revision / revised

- Kay, C., Davies, E.E., Dumbović, M., Martinić, K., Palmerio, E., **Rüdisser, H.T.,** Weiler, E., Möstl, C., **Collection, Collation, and Comparison of Near-Earth In Situ CME Boundaries.** Space Weather, Submitted, 2025.

- Zahraoui*, E.-M., **Rüdisser*, H.T.,** Shaifullah*, G.M., Tiburzi, C. (*equal contribution), Grießmeier, J.-M., Möstl, C., Amerstorfer, U.V., Dumbovic, M., Zucca, P., Verbiest, J.P.W., Weiss, A.J., Cecconi, B., Ciardi, B., Vocks, C., Theureau, G., Kravtsov, I.P., Girard, J., Bondonneau, L., Ulyanov, O., Konovalenko, O., Tokarsky, P., Dettmar, R.-J., Corbel, S., and Zakharenko, V., **Probing the magnetic field of a coronal mass ejection with PSR J1022+1001.** Submitted, 2025.

- **Rüdisser, H.T.,** Nguyen, G., LeLouëdec, J., Davies, E.E., and Möstl, C., **ARCANE - Early Detection of Interplanetary Coronal Mass Ejections.** Space Weather, under revision, 2025.

published / in press

- **Rüdisser, H.T.,** Weiss, A.J., Le Louëdec, J., Amerstorfer, U.V., Möstl, C., Davies, E.E., and Lammer, H., **Understanding the effects of spacecraft trajectories through solar coronal mass ejection flux ropes using 3DCOREweb.** The Astrophysical Journal, 973, 150, 2024. DOI: 10.3847/1538-4357/ad660a

- **Rüdisser, H.T.,** Windisch, A., Amerstorfer, U. V., Möstl, C., Amerstorfer, T., Bailey, R. L., and Reiss, M. A., **Automatic Detection of Interplanetary Coronal Mass Ejections in Solar Wind In Situ Data.** Space Weather, 20, 10, 2022. DOI: 10.1029/2022SW003149

Co-Authored Publications

published / in press

- Weiler, E., Möstl, C., Davies, E.E., Veronig, A., Amerstorfer, U.V., Amerstorfer, T., Le Louëdec, J., Bauer, M., Lugaz, N., Haberle, V., **Rüdisser, H.T.,** Majumdar, S., and Reiss, M.A., **First observations of a geomagnetic superstorm with a sub-L1 monitor.** Space Weather, 23, 3, 2025. DOI: 10.1029/2024SW004260

- Zhuang, B., Lugaz, N., Al-Haddad, N., Farrugia, C.J., Amerstorfer, U.V., Davies, E.E., Temmer, M., **Rüdisser, H.T.,** Yu, W., Gou, T., and Winslow, R.M., **Influence of the Deformation of Coronal Mass Ejections on Their In-Situ Fitting with Circular-Cross-Section Flux Rope Models.** Solar Physics, 300, 4, 38, 2025. DOI: 10.1007/s11207-025-02444-w

- Davies, E.E., **Rüdisser, H.T.,** Amerstorfer, U.V., Möstl, C., Bauer, M., Weiler, E., Amerstorfer, T., Majumdar, S., Hess, P., Weiss, A.J., Reiss, M.A., Green, L.M., Long, D.M., Nieves-Chinchilla, T., Trotta, D., Horbury, T.S., O'Brien, H., Fauchon-Jones, E., Morris, J., Owen, C.J., Bale, S.D., and Kasper, J.C., **Flux rope modeling of the 2022 Sep 5 CME observed by Parker Solar Probe and Solar Orbiter from 0.07 to 0.69 au.** The Astrophysical Journal, 973, 51, 2024. DOI: 10.3847/1538-4357/ad64cb

- Long, D., Green, L., Pecora, F., Brooks, D.H., Strecker, H., Orozco-Suarez, D., Hayes, L., Davies, E.E., Amerstorfer, U. V., Mierla, M., Lario, D., Berghmans, D., Zhukov, A., and **H. T. Rüdisser, The eruption of a magnetic flux rope observed by Solar Orbiter and Parker Solar Probe.** The Astrophysical Journal, 955, 152, 2023. DOI: 10.3847/1538-4357/acefd5

- Reiss, M. A., Möstl, C., Bailey, R. L., **Rüdisser, H. T.,** Amerstorfer, U. V., Amerstorfer T., Weiss, A. J., Hinterreiter, J., and Windisch A., **Machine learning for predicting the Bz magnetic field component from upstream in situ observations of solar coronal mass ejections.** Space Weather, 19, 12, 2021. DOI: 10.1029/2021SW002859

- Sreejith, A.G., Fossati, L., Fleming, B. T., France, K. C., Koskinen, T. T., Egan, A., **Rüdisser, H. T.,** and Steller, M., **Colorado Ultraviolet Transit Experiment Data Simulator.** Journal of Astronomical Telescopes, Instruments, and Systems, 5, 1, 2019. DOI: 10.1117/1.JATIS.5.1.018004

Conference Talks

2025

- **From Detection to Reconstruction: Combining Automatic Flux Rope Fitting and Real-Time ICME Detection for Operational Short-Term Forecasting.** European Space Weather Week (27–31 October 2025), Umeå, Sweden.
- **ARCANE: An Operational Framework for Automatic Realtime ICME Detection in Solar Wind In Situ Data.** Machine Learning in Heliophysics (22–26 September 2025), Madrid, Spain.
- **From Detection to Reconstruction: Combining Automatic Flux Rope Fitting and Real-Time ICME Detection for Operational Short-Term Forecasting.** XVIIIth Hvar Astrophysical Colloquium (15–19 September 2025), Hvar, Croatia.
- **ARCANE: An Operational Framework for Automatic Realtime ICME Detection in Solar Wind In Situ Data (Highlight).** EGU General Assembly (27 April–2 May 2025), Vienna, Austria.
- **Enhancing Space Weather Forecasting with Machine Learning at the Austrian Space Weather Office.** RAS – Advancing Space Weather Forecasting: Bridging Gaps in Machine Learning (11 April 2025), Online.
- **ARCANE: An Operational Framework for Automatic Realtime ICME Detection in Solar Wind In Situ Data.** Machine Learning and Computer Vision in Heliophysics (7–9 April 2025), Sofia, Bulgaria.

2024

- **3DCOREweb: Reconstruct CMEs using the 3D Coronal Rope Ejection Model.** Triennial Earth-Sun Summit (TESS) (7–12 April 2024), Dallas, TX USA.
- **Modeling CMEs as Large Scale Magnetic Flux Ropes.** ÖGAA Austrian Early Career Conference (8–9 March 2024), Salzburg, Austria.

2023

- **3DCOREapp: Reconstruct CMEs using the "3D Coronal Rope Ejection Model".** European Space Weather Week (20–24 November 2023), Toulouse, France.
- **Automatic Detection of Interplanetary Coronal Mass Ejections in Solar Wind In Situ Data.** EGU General Assembly (23–28 April 2023), Vienna, Austria.
- **Automatic Detection of Interplanetary Coronal Mass Ejections.** Machine Learning and Computer Vision in Heliophysics (19–21 April 2023), Sofia, Bulgaria.

2022

- **Automatic Detection of Interplanetary Coronal Mass Ejections in Solar Wind In Situ Data.** European Space Weather Week (24–28 October 2022), Zagreb, Croatia.
- **Automatic Detection of Interplanetary Coronal Mass Ejections.** EGU General Assembly (23–27 May 2022), Vienna, Austria.

Conference Posters

2025

- **ARCANE: An Operational Framework for Automatic Realtime ICME Detection in Solar Wind In Situ Data.** SWATNet Final Conference, (10-14 February 2025), Helsinki, Finland.

2024

- **Automatic Realtime Detection of Large Scale Structures in Solar Wind In Situ Data.** European Space Weather Week (4–8 November 2024), Coimbra, Portugal.
- **Early warning for Solar Eruptions with VIGIL 2.0.** European Space Weather Week (4–8 November 2024), Coimbra, Portugal.
- **Understanding the effects of spacecraft trajectories through solar coronal mass ejection flux ropes using 3DCOREweb.** EGU General Assembly (15–19 April 2024), Vienna, Austria.

2022

- **Machine Learning for solving the Bz Problem in Space Weather Forecasting.** AGU Fall Meeting (12–16 December 2022), Online.
- **Automatic Detection and Classification of Boundary Crossings in Spacecraft in situ Data.** Europlanet Science Congress (18–23 September 2022), Granada, Spain.

2021

- **Automatic Detection and Classification of Boundary Crossings in Spacecraft in situ Data.** AGU Fall Meeting (13–17 December 2021), Online.
- **Automatic Detection of Interplanetary Coronal Mass Ejections.** AGU Fall Meeting (13–17 December 2021), Online.
- **Automatic Detection and Classification of Boundary Crossings in Spacecraft in situ Data.** Europlanet Science Congress (13–24 September 2021), Online.
- **Automatic Detection and Classification of ICMEs in Solar Wind Data.** EGU General Assembly (19–30 April 2021), Online.

SEMINAR TALKS, GUEST LECTURES, OUTREACH AND TOPICAL DISCUSSION MEETINGS

- **Exner Lectures 2025**
  "Artificial Intelligence in Space Weather Forecasting"
  Nov 2025 | Vienna, Austria
- **Podcast "Mehr als Wind und Wetter"**
  "Die stürmische Seite der Sonne"
  Nov 2025 | Online
- **TDM13 – European Space Weather Week 2025**
  "Scientific outlooks for analysis of space weather data in the age of AI"
  Oct 2025 | Umeå, Sweden
- **Pint of Science Festival**
  "Künstliche Intelligenz im Weltraumwetter: Automatische Erkennung von Sonnenstürmen"
  May 2025 | Graz, Austria
- **Three Minute Thesis Competition**
  "Solar Storms – Predicting the Unpredictable"
  Mar 2025 | Graz, Austria
- **IRAP PEPS Seminar**
  "Combining AI and Physical Models to Advance Forecasting of Solar Coronal Mass Ejections"
  Dec 2024 | Toulouse, France
- **ST-ECS Networking Campfire**
  "How to convene a scientific session"
  Nov 2024 | Online
- **ONERA DPHY-ERS Science Seminar**
  "Space Weather Forecast at the Austrian Space Weather Office"
  Oct 2024 | Toulouse, France
- **Neural Networks 2, FH Joanneum**
  "Time Series Event Detection"
  Jan 2023 | Graz, Austria
- **Machine Learning in Heliophysics – Trailblazers in Graz**
  "Automatic Detection of ICMEs in Solar Wind Data"
  Apr 2022 | Graz, Austria
- **Solar Orbiter Science Working Group**
  "Automatic Detection of ICMEs in Wind, STEREO-A and STEREO-B Data using Deep Neural Networks and Computer Vision Techniques"
  Jun 2021 | Online

SESSION CONVENING

- **Machine Learning in Planetary Sciences and Heliophysics.** ESSI1.11/PS7/ST4, EGU General Assembly (27 April–2 May 2025), Vienna, Austria.
- **Machine Learning in Planetary Sciences and Heliophysics.** ESSI1.5, EGU General Assembly (15–19 April 2024), Vienna, Austria.
- **Machine Learning in Planetary Sciences and Heliophysics.** ESSI1.3, EGU General Assembly (23–28 April 2023), Vienna, Austria.
- **Machine Learning in Planetary Sciences.** MITM5, Europlanet Science Congress (18–23 September 2022), Granada, Spain.
- **Machine Learning in Planetary Sciences and Heliophysics.** ITS2.1/PS1.2, EGU General Assembly (23–27 May 2022), Vienna, Austria.
- **Machine Learning in Planetary Sciences.** MITM8, Europlanet Science Congress (13–24 September 2021), Online.

PROFESSIONAL SERVICE

- **Co-Lead of ISWAT H2-06.** Automatic detection and forecasting of ICME in situ properties.
- **Peer review** (JGR Machine Learning, 2025)
- **Professional Memberships** (ISWAT H2-02, EGU)

SUMMER SCHOOLS

- **Comparative Heliophysics**
  NASA's Living with a Star Heliophysics
  2024 | Boulder, CO USA
- **Operational Space Weather Fundamentals**
  2024 | L'Aquila, Italy
- **Space Weather Data, Models and Services**
  E-SWAN School
  2023 | Toulouse, France
- **Comparative Heliophysics**
  NASA's Living with a Star Heliophysics
  2023 | Online