Michal **Steiner**

3rd year PhD candidate @University of Geneva

About me

I am a 3rd year PhD candidate at the University of Geneva studying exoplanetary atmospheres at high resolution.

Specialization

- Exoplanets
- Exoplanetary atmospheres
- High-resolution spectroscopy
- Transmission spectroscopy

Programming skills

Python : 5+ years
MATLAB : 1 year
IDL : 1/2 year
Pascal : 1/2 year

Languages

- Czech: Native language
- English: 10+ yrs
- German: 8+ yrs (unused for long time)
- Japanese: 5+ yrs (below JLPT N3 level)

@ Webpage
Twitter
GitHub

Education

2021–ongoing | **PhD candidate (3rd year); Supervisors: David Ehrenreich & Vincent Bourrier**
University of Geneva · Geneva, Switzerland
PhD on the topic of high-resolution spectroscopy of exoplanetary atmospheres. Expected end August 2025.

2019–2021 | **Master degree; Thesis supervisors: David Ehrenreich & Vincent Bourrier & Christophe Lovis & Julia Seidel**
University of Geneva · Geneva, Switzerland
Master degree in the Exoplanetology specialization. Master thesis on the topic of high-resolution transmission spectroscopy.

2015–2019 | **Bachelor degree; Thesis supervisor: Petr Harmanec**
Charles University · Prague, Czech republic
Bachelor degree in General physics. Bachelor thesis on the topic of radial velocity measurements of Be stars.

Publications

First-authored papers
(1 total; NASA/ADS Library link)
Co-authored papers
(1 total; NASA/ADS Library link)
Latest publication:
Steiner et al. 2023: (Link to abstract) *HEARTS VIII. - Transmission spectroscopy of KELT-10b* published in A&A

Detailed description below (link)

Public outreach

4 visits	Guide at the observatory of Geneva
1 day	Public outreach at PlanetS booth at Fantasy Basel 2023 (72 000 visitors)
1 day	Open days at observatory of Geneva 2023
1 day	Public outreach at PlanetS booth at Fantasy Basel 2022 (60 000 visitors)
1 day	Open days at observatory of Geneva 2022

Detailed description below (link)

Observations

2 Nights	VM observations at Paranal with ESPRESSO@VLT
24 Nights	Remote observations with Euler 1.2m telescope
5 Nights	dVM observations with ESPRESSO@VLT

Detailed description below (link)

Conferences

2022-2023 | **International conferences**
3 Talks · 1 Poster

2022-2023 | **Domestic conferences**
3 talks ·

Detailed description below (link)

Teaching

Supervision of students:
Astrophysics lab project (1 semester): Characterization of planetary atmosphere of WASP-107b
Astrophysics lab project (1 semester): Search for correlations between exoplanetary atmospheric signatures
Detailed description below (link)

Open-source code

RATS - Revealing Atmospheres with Transmission Spectroscopy (Github Link)
PTO - Planning of Transit Observations (Github Link)

Detailed description below (link)

Michal Steiner
Michal.Steiner@unige.ch
Michal.Steiner.github.io

This is a one-page CV summary, with detailed CV starting on next page.

Detailed CV

Publications - First author papers

First-authored papers (1 total; NASA/ADS Library link)

Steiner et al. (2023)

Hot Exoplanet Atmospheres Resolved with Transit Spectroscopy (HEARTS). VIII.
Nondetection of sodium in the atmosphere of the aligned planet KELT-10b

Using single transit of HARPS data of hot Jupiter KELT-10b, we show that this planet is aligned, through the usage of Rossiter-McLaughlin Revolutions technique. We also do not detect atmospheric signature within the detections limits, ruling out strong atmospheric escape for this planet. Finally, we simulate the contamination effect of Rossiter-McLaughlin and Center-to-Limb Variation effect on to the transmission spectrum, and we show how non-correction of this effect mutes the detected signal.

Publications - co-authorships

Co-authored papers (1 total; NASA/ADS Library link)

Psaridi et al. (2023)

Three Saturn-mass planets transiting F-type stars revealed with TESS and HARPS. TOI-615b, TOI-622b, and TOI-2641b

In this paper, three new planets are detected using the transit method and radial velocity follow-up. My contribution to this paper was observational - I observed one of the ECAM/Euler light curves used in the paper.
Author list:
Psaridi, A., Bouchy, F., Lendl, M., Akinsanmi, B., Stassun, K. G., Smalley, B., Armstrong, D. J., Howard, S., Ulmer-Moll, S., Grieves, N., Barkaoui, K., Rodriguez, J. E., Bryant, E. M., Suárez, O., Guillot, T., Evans, P., Attia, O., Wittenmyer, R. A., Yee, S. W., Collins, K. A., Zhou, G., Galland, F., Parc, L., Udry, S., Figueira, P., Ziegler, C., Mordasini, C., Winn, J. N., Seager, S., Jenkins, J. M., Twicken, J. D., Brahm, R., Jones, M. I., Abe, L., Addison, B., Briceño, C., Briegal, J. T., Collins, K. I., Daylan, T., Eigmüller, P., Furesz, G., Guerrero, N. M., Hagelberg, J., Heitzmann, A., Hounsell, R., Huang, C. X., Krenn, A., Law, N. M., Mann, A. W., McCormac, J., Mékarnia, D., Mounzer, D., Nielsen, L. D., Osborn, A., Reinarz, Y., Sefako, R. R., **Steiner, M.**, Strøm, P. A., Triaud, A. H. M. J., Vanderspek, R., Vanzi, L., Vines, J. I., Watson, C. A., Wright, D. J., & Zapata, A.

Conferences - International

July 2023

TOE III
Talk (10min) · Porto, Portugal
High-resolution spectroscopy of TOI-132 b
In this talk I showed my ongoing analysis of ESPRESSO dataset of TOI-132b ((WIP))

January 2023

Face-to-Face meeting of ESPRESSO Science Team
Talk (7min) · Granada, Spain
Analysis of ESPRESSO dataset of TOI-132b
In this talk I reported on my ongoing analysis of ESPRESSO dataset of TOI-132b (WIP)

September 2022

EPSC 2022
Talk (7min) · Granada, Spain
KELT-10b through high-resolution spectroscopy
In this talks I showed my ongoing work on the HARPS KELT-10b dataset, later published in Steiner et al. 2023

June 2022

EAS 2022
Poster · Valencia, Spain
KELT-10b through high-resolution spectroscopy
In this poster I showed my ongoing work on the HARPS KELT-10b dataset, later published in Steiner et al. 2023

Conferences - Domestic

May 2023 | **JURA conference 2023**
Talk (15min) · Grindelwald, Switzerland
KELT-10b with high-resolution spectroscopy
In this talk I discussed my work on the transmission spectroscopy of KELT-10b, which was published in Steiner et al. 2023, and TOI-132b (WIP)

April 2023 | **General Assembly of PlanetS 2023**
Interactive session (10min); together with Dany Mounzer · Grindelwald, Switzerland
High-resolution transmission spectroscopy
In this collaborative session we introduce the transmission spectroscopy method, it's (dis-)advantages and the broad scope of how it is used to characterize atmospheres of exoplanets.

April 2022 | **General Assembly of PlanetS 2022**
Talk (15min) · Grindelwald, Switzerland
KELT-10b with high-resolution spectroscopy
In this talk I discussed my work on the transmission spectroscopy of KELT-10b, which was later published in Steiner et al. 2023

April 2022 | **Jura 2022 conference**
Talk (15 min) · Grindelwald, Switzerland
Eyes on KELT-10b with high-resolution spectroscopy
In this talk I discussed my work on the transmission spectroscopy of KELT-10b, which was later published in Steiner et al. 2023

Education:

2021-ongoing | **PhD candidate; Supervisors: David Ehrenreich & Vincent Bourrier**
University of Geneva · Geneva, Switzerland
I am currently a 3rd year PhD candidate at University of Geneva. The thesis topic is high-resolution transmission spectroscopy. Expected end: August 2025 at the latest. As part of my thesis I am analyzing several ESPRESSO datasets, for which I am using mix of custom developed tools like the RATS pipeline and open-source packages like astropy and specutils. I have also written multiple proposals for observation time at ESPRESSO/VLT during the P110, P111, P112, and P113 ESO proposal call periods.

2020-2021 | **Master thesis; Supervisors: David Ehrenreich & Vincent Bourrier & Christophe Lovis & Julia Seidel**
University of Geneva · Geneva, Switzerland
My master thesis on the topic: "High-resolution spectroscopy of planetary atmospheres". In this thesis, I analyzed HARPS data taken as part of the HEARTS survey for planet KELT-10b. This work led to my first first-author paper and was published in Steiner et al. (2023). The analysis was done by predecessor to the RATS pipeline.

Spring 2020 | **APL II (Astrophysics Lab project); Supervisor: Thibaut Dumont**
University of Geneva · Geneva, Switzerland
My second APL project as part of the master curriculum titled: "Introduction to the physics of low-mass stars and study of the impact of the helium enrichment". I analyzed a grid of helium-enriched stellar models and looked at how different levels of helium enrichment affect stellar evolution. I have used a Python tool on an externally provided stellar model grid to do so.

Fall 2019-2020 | **APL I (Astrophysics Lab project); Supervisors: Julia Seidel & Jens Hoeijmakers**
University of Geneva · Geneva, Switzerland
As part of my master curriculum, I worked on APL I project titled: "Study of WASP-166b, hunting for metals in the atmosphere via transmission spectroscopy and CCF". In this work, using a mix of provided code and my own code, extract the transmission spectrum of WASP-166b, a bloated Neptune sized planet. I utilized both the resolved line technique and CCF technique.

2018-19 | **Bachelor's thesis; Supervisor: Petr Harmanec**
CHARLES UNIVERSITY · Prague, Czech Republic
I worked on a bachelor thesis titled: "A new study of the long-term and orbital variations of the Be star V923 Aql". In this work, I analyzed spectra taken from the Ondřejov observatory (Czech Republic), measured radial velocity using the H-alpha emission line, and discussed long-term variations. The last thorough analysis of this system was done in 1989. To do that I have been using externally provided program.

2018 | **Studentship; Supervisor: Petr Harmanec**
CHARLES UNIVERSITY · Prague, Czech Republic
Studentship titled: "A contribution to finishing the study of a massive quadruple system V649 Cas". In this project, I analyzed spectra taken from the Ondřejov observatory (Czech Republic) and measured radial velocity using several spectral lines on quadruple system V649 Cas. To do that I have been using externally provided program.

TEACHING

Fall 2023-24 | **APL I (Astrophysics Lab project)**
UNIVERSITY OF GENEVA · Geneva, Switzerland
I supervised Loukas Asatiani on a project titled: "Search for correlations between exo-planetary atmospheric signatures". APL projects are part of Master program curriculum at University of Geneva.

Fall 2022-23 | **APL I (Astrophysics Lab project)**
UNIVERSITY OF GENEVA · Geneva, Switzerland
I supervised Yue Yu on a project titled: "Probing atmospheres of hot Jupiters with transmission spectroscopy". APL projects are part of Master program curriculum at University of Geneva.

PUBLIC OUTREACH

June 2023 | **Open days at Observatory of Geneva**
2 500 VISITORS · Geneva, Switzerland
Open days organized at observatory of Geneva as part of 250 years celebration.

May 2023 | **Fantasy Basel**
72 000 VISITORS · Basel, Switzerland
Public outreach event organized by PlanetS at Fantasy Basel 2023 (ComicCon).

June 2022 | **Open days at Observatory of Geneva**
2 500 VISITORS · Geneva, Switzerland
Open days organized at observatory of Geneva as part of 250 years celebration.

May 2022 | **Fantasy Basel**
60 000 VISITORS · Basel, Switzerland
Public outreach event organized by PlanetS at Fantasy Basel 2022 (ComicCon).

2021-2024 | **Guide for multiple public visits at Observatory of Geneva**
20-40 VISITORS PER VISIT · Geneva, Switzerland
Regular public visits are organized at Observatory of Geneva. I was in charge of 4 visits (mostly high schools), with around 120 visitors total

OBSERVATIONS

2024 | **Remote dVM observations with ESPRESSO/VLT**
1 NIGHT · Remotely
As part of the ATREIDES team (PI: Vincent Bourrier, Large program with ESPRESSO/VLT), I observed single transit through the dVM (designated Visitor Mode).

2023 | **VM observations with ESPRESSO/VLT**
2 NIGHTS · Paranal, Chile
I have been observing with ESPRESSO/VLT in VM (Visitor Mode) as part of emission spectroscopy (P.I. Costa-Silva)

2021-2023 | **Remote dVM observations with ESPRESSO/VLT**
4 NIGHTS · Remotely
As part of my association with the ESPRESSO GTO Science Team, I observed several nights through the dVM (designated Visitor Mode) with ESPRESSO/VLT.

2021-2024 | **Remote observations with 1.2m Euler telescope at LaSilla, Chile**
24 NIGHTS · Geneva, Switzerland
Using the remote system implemented at Geneva I observed with 1.2m Euler telescope at LaSilla, Chile.

Open-source code

RATS | **Revealing Atmospheres with Transmission Spectroscopy**
https://github.com/MichalSteiner/rats · GNU GPL license
This is my pipeline for extracting transmission spectra from high-resolution spectrographs like HARPS and ESPRESSO. It is around 90% documented and build general enough to be used on multiple datasets without much necessary adaptation. Currently, it allows most necessary corrections for transmission spectroscopy. Performing Rossiter-McLaughlin analysis is currently being developed for this pipeline, and should be available by end of 2024.

PTO | **Planning of Transit Observations**
https://github.com/MichalSteiner/PTO · GNU GPL license
A complete rehaul of transit planner developed by V. Bourrier, R. Allart, O. Attia. This version allows calculation of transit windows for multiple planets, and different set of ephemeris, which can then be compared. Optimal observation time is also automatically provided. Additionally, a simple ESO p2 API module is provided, allowing to quickly create a large set of transit windows OBs. Finally, a transmission spectroscopy simulation module is also implemented, which can be used to estimate expected SNR.