Amélie GRESSIER

28/01/1994

amg.gressier@gmail.com

+33664998442

Baltimore, Maryland, USA

French driving licence B

Computer skills

- Python
- Fortran
- HST data reduction: Iraclis
- Retrieval analysis: Bayesian method, MCMC, Tau-Rex 3.0,
- Proposal : HST, JWST,APT,ETC
- Transit simulations: BATMAN, Pylightcurve, ExoTETHys
- Modeling codes: (1D)Exo-REM, RADCONV, (3D) LMDZ GCM

Languages

- French: mother tongue
- English: C2 Advanced
- Spanish: B1
- German: Beginner

Outreach

- Invited talk in Airbus Defense and Space (ADS): HST legacy for ARIEL (2020)
- Invited talk and interview in Astronomy Night at IAP (2021)

Hobbies

- Running and Fitness
- Rugby
- Yoga
- Cooking
- Learning other languages

Post-doctoral Fellow Position in the Science Mission Office at the Space Telescope Science Institute (STScI)

3700 San Martin Drive 21218, Maryland, Baltimore
2023-2025

JAMES WEBB SPACE TELESCOPE DATA ANALYSIS AND INTERPRETATION

Education

PhD in Astrophysics and Astronomy at the University Versailles Saint-Quentin-en-Yvelines, France
2019-2022
Supervisors: Emmanuel Marcq (LATMOS), Jean-Philippe Beaulieu (IAP) and Benjamin Charnay (LESIA)

- Hubble Space Telescope WFC3 and STIS transmission spectroscopy data analysis
- CHEOPS photometric measurement analysis
- Re-analysis of 26 HST transmission spectra from Super-Earth to Sub-Neptune
- ARIEL and JWST planetary transit simulations
- Radiative and convective atmospheric modelling
- Impact of radiative clouds and photochemical hazes in warm Sub-Neptune transmission spectra

Master degree in Astrophysics-Planetology in Observatoire de Paris
2018-2019 Paris, France

- Master thesis in **IAP** (Paris, France 2019) under the supervision of Alain Lecavelier-des-Etangs.
  Probing the upper atmopshere of Hot-Jupiters using Hubble Space telescope STIS NUV data

Engineering degree in the National School of Civil Aviation (ENAC)
2015-2018 Toulouse France

- Spatial and Aeronautical telecommunications engineering
- Intern in **ESRIN ESA** (Frascati, Italy 2017) under the supervision of Betlem Rosich ***Sentinel-1 SAR data analysis for natural disaster monitoring***
- Master thesis in **ONERA** (Palaiseau, France 2018) under the supervision of Karine Caillault ***Aerosols impact on optical satellite transmission using CALIPSO-CALIOP lidar***

Teaching position

Teaching assistant in University of Versailles Saint-Quentin en Yvelines, France 2020- 2021

- Practical work in physics geometric **optics** undergraduate
- Practical tutorials physics **fluid mechanics** undergraduate

Conferences

- **Exo-systeme II** (Toulouse, France December 2021) *HST WFC3 G141 data analysis: exploring the transition from Super-Earth to Sub-Neptune*
- **ARIEL France** (Paris, France January 2022) *Near-Infrared transmission spectrum of TRAPPIST-1 h using HST/WFC3 G141 data*
- **Bay Aera Exoplanet Meeting** virtual (March 2022): *Small planets atmospheric characterization with HST: application to two Sub-Neptune and TRAPPIST-1 h*
- **Chianti International Topics** (Firenze, Italy, April 2022) *Exploring the transition from Super-Earth to Sub-Neptune with a Hubble transmission survey*
- **Exoplanets IV Meeting** (Las Vegas, USA, May 2022)**:** Talk not given
- **SF2A** (Besançon, France, Juin 2022) Investigating the unexpected methane depletion in close-in Sub-Neptunes: from HST to JWST

List of publications and distinction

First author:

Refereed

1. **Aerosols impact on optical satellite transmission** (Gressier and Kaillault Aerotecnica Missili & Spazio, Associazione italiana di aeronautica e astronautica, 2019, 98 (3), pp.207-219.)

2. **Near-Infrared transmission spectrum of TRAPPIST-1 h using Hubble WFC3 G141** (Gressier et al 2022 Astronomy & Astrophysics Volume 658, id.A133, 25 pp).
This paper presents the first Hubble WFC3 G141 transmission spectrum of a cold, rocky planet, TRAPPIST-1 h. I extracted and corrected the three raw transit observations using the pipeline iraclis. I give the first atmospheric constraint using a Bayesian atmospheric retrieval code. This planet is unlikely to bear a H/He clear dominated atmosphere, but a cloudy/hazy light atmosphere can not be ruled out. The planet might have lost its atmosphere or possesses a secondary N2 or CO2-rich atmosphere.

Submitted

3. **The Hubble PanCET Program: The near-UV transmission spectrum of WASP-79 b** (Gressier et al. 2023 final stage of submission in A&A).
This paper presents a method to decorrelate the systematics noise from the transit signal and fit light curves of near-UV Hubble STIS E230M observations. I apply the technique to WASP-121 b's observations and confirm the photo-evaporation of its atmosphere previously detected by Sing et al. 2019. Besides, I analysed two unprecedented transit observations of WASP-79 b and observed an increase in the planet-to-star radius ratio at short wavelengths. The difference between the radius ratios at 2400Å and 3000Å reaches 0.0191±0.0042 (4.5 sigma). Although the NUV transmission spectrum does not show evidence of hydrodynamical escape, the strong atmospheric features are likely due to species at very high altitudes. The comparison of WASP-79 b's transmission spectrum with three other warmer Hot-Jupiters shows a similar absorption level to WASP-178 b and WASP-121 b.

4. **Population study: Exploring the transition from Super-Earth to Sub-Neptune with a Hubble transmission survey** (Gressier et al. 2023 submitted to A&A).
In this work I present the first large-scale consistent Hubble WFC3 G141 transmission survey of Super-Earth and Sub-Neptunes. I collected 26 transmission spectra of planets smaller than $6R_{Earth}$ *. All transmission spectra are obtained using the same pipeline, iraclis and consistently analysed using a Bayesian atmospheric retrieval code, Tau-REx. I present a model comparison method to quantify atmospheric and molecular detections. I confirmed, the detection of an atmosphere for 13 planets with a radius larger than* $1.7R_{Earth}$ *and detected water vapour with high confidence for nine planets. The most striking result is the absence of methane detection in Sub-Neptune atmospheres. I evaluate the impact of KCl and* Na_2S *clouds on the water feature amplitude around 1.4microns using self-consistent simulations with Exo-REM. I built a grid of model spanning the metallicity, temperature and cloud coverage. We confirmed the retrieval results and refined the nature of clouds in Sub-Neptune atmospheres. We concluded that we could not fit flat spectra with radiative clouds only and that photochemical hazes are probably responsible for low water amplitudes in the atmosphere of Sub-Neptunes between 500 and 800 K. For smaller planets, although the HST data cannot be used to distinguish a light atmosphere with clouds from a high mean molecular weight atmosphere, I have shown by performing telescope simulations for the James Webb Space Telescope and the future ESA-Ariel space mission that the extended wavelength range and increasing spectral resolution will allow to distinguish those scenarios.*

Second author

Refereed

5. **ARES IV: Probing the atmospheres of two warm Neptune planets HD 106315 c and HD 3167 c with HST/WFC3 camera** (Guilluy et al 2021, The Astronomical Journal, Volume 161, Issue 1, id.19, 22pp.)
   I prepared this paper in collaboration with Gloria Guilluy. We present the transmission spectrum of two warm Neptune-like planets. I extracted, corrected and fitted the raw light curves of HD 106315 c and led the atmospheric retrieval analysis on both planets. We found a robust hydrogen-dominated atmospheric signal (over 5 sigma) linked to a strong water feature around 1.4 microns in both spectra. Carbon dioxide is also detected in HD 3167 c's atmosphere. The atmospheric detection of these two planets is promising for intermediate-sized planets atmospheric characterisation.

Collaboration

Refereed

These papers are part of the work done during the ARIEL Retrieval of Exoplanets School (ARES Summer School)

6. **ARES I: WASP-76 b a tale of two HST spectra** (Edwards et al 2020, The Astronomical Journal, Volume 160, Issue 1, id.8, 14pp.)
7. **ARES II: Characterising the Hot Jupiters WASP-127 b, WASP-79 b and WASP-62 b with HST** (Skaf et al 2020, The Astronomical Journal, Volume 160, Issue 3, id.109)
8. **ARES III: Unveiling the two faces of KELT-7 b with HST/WFC3** (Pluriel et al 2020, The Astronomical Journal, Volume 160, Issue 3, id.112)
9. **ARES V: No evidence for molecular absorption in the HST/WFC3 spectrum of GJ 1132 b** (Mugnai et al 2021, The Astronomical Journal, Volume 161, Issue 6, id.284, 13pp)

Proposals

CHEOPS	March 2022	PI Accepted Proposal AO3 **Cloudiness of three warm Sub-Neptunes**
HST	November 2020	Accepted proposal as coI (PI: Edwards GO16457) **Atmospheric characterisation of a Disintegrating Planet in the Hot Neptune Desert**

Distinction

- *1st Prize at the PEGASUS Conference for Aeronautical schools in 2019 for the paper:* **Aerosols impact on optical satellite transmission** (Gressier and Kaillault 2019)