Aurélien Falco

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Date of birth: 28/03/1992

Education

2019 **Ph.D.**, *Inria Bordeaux Sud-Ouest*, Université de Bordeaux.
HPC Solver for FEM/BEM coupling: Within the framework of a solver owned by Airbus, this thesis focuses on the efficient resolution of a FEM/BEM coupling by the combination of $\mathcal{H}$-matrices with sparse techniques.

2015 **Engineering Degree**, *Enseirb-Matmeca*, Bordeaux INP, Computer Science.
Option: Parallelism & Distributed Computing

2015 **Master's Degree for Research**, *Université de Bordeaux*.
Option: Networking, Systems & Mobility

2010-2012 **Classes Préparatoires**, *Lycée Masséna*, Nice, Mathematics & Physics.
A 2-year intensive course in preparation for the selective entrance to French engineering schools

2010 **High School Diploma**, *equivalent to 'A' levels*, Scientific field, with Distinction.
Options: Mathematics, music

Professional Experience

2021-? **Postdoc**, *Maison de la Simulation*, CEA, IPGP.
Coupling magma oceans with atmospheres for hot rocky super earths & emission spectra

2019-2021 **Research Engineer**, *Laboratoire d'Astrophysique de Bordeaux*, CNRS.
Efficient computation of transmission and emission spectra based on 3D GCM simulations of exoplanet atmospheres

2015-2019 **PhD student**, *Inria Bordeaux Sud-Ouest*, Université de Bordeaux, France.
Hierarchical solver for FEM/BEM coupling

2016-2018, 2023 **Teaching Assistant**, *Université Paris Cité (58.5h)*, Enseirb-Matmeca, Bordeaux INP, Master Level (128h).

- Numerical physics, Imperative programming, Work Environment, Operating Systems, Networks, Algorithmic

Other Experience

2023 **Scientific mediation with Spacebus**.

2019-? **Organization of formations, seminars**.

- Seminars for PhD students and postdocs @ La Maison de la Simulation
- Technical formations (git, ssh, IDE, ...) @ Laboratoire d'Astrophysique de Bordeaux

2015 (6 months) **Final Year Project**, *Inria Bordeaux Sud-Ouest*.
Extension of a fast direct solver using sparse $\mathcal{H}$-Matrices for Boundary and Finite Elements Methods

2014 (3 months) **Internship**, *Auckland University*, New Zealand.
Parallelization of signal processing algorithms using OpenCL in the context of the SKA project

Qualifications

Computer Science

Languages **Programming**, *C/C++/C#, Python, Fortran, Java*.
Parallelism, *MPI, OpenMP, OpenCL*.
Tools, *Bash, LaTeX, CMake, git, SQL, R, jupyter notebooks...*.

OS Linux, MacOS, Windows

Languages

French **Native**

English **Fluent** *(TOEIC : 900/990, IELTS : 7/9 in 2014)*

German **Basic knowledge**

Publications

Aurélien Falco and Jérémy Leconte. Influence of the three-dimensionality of GCM simulations on lightcurves. *in prep*, 2023.

Aurélien Falco, Sébastien Charnoz, Pascal Tremblin, Pierre-Olivier Lagage, and Robert Ridgway. Hydrogenated atmospheres of lava planets: atmospheric structure and emission spectra. *submitted*, 2023.

Sébastien Charnoz, Aurélien Falco, Pascal Tremblin, Paolo Sossi, Razvan Caracas, and Pierre-Olivier Lagage. The effect of a small amount of hydrogen in the atmosphere of ultrahot magma-ocean planets: Atmospheric composition and escape. *Astronomy & Astrophysics*, 674:A224, June 2023.

Aurélien Falco, Tiziano Zingales, William Pluriel, and Jérémy Leconte. Toward a multidimensional analysis of transmission spectroscopy. I. Computation of transmission spectra using a 1D, 2D, or 3D atmosphere structure. *Astronomy & Astrophysics*, 658:A41, February 2022.

Tiziano Zingales, Aurélien Falco, William Pluriel, and Jérémy Leconte. Toward a multidimensional analysis of transmission spectroscopy. Part III: Modelling 2D effects in retrievals with TauREx. *arXiv e-prints*, page arXiv:2207.14247, July 2022.

William Pluriel, Jérémy Leconte, Vivien Parmentier, Tiziano Zingales, Aurélien Falco, Franck Selsis, and Pascal Bordé. Toward a multidimensional analysis of transmission spectroscopy. II. Day-night-induced biases in retrievals from hot to ultrahot Jupiters. *Astronomy & Astrophysics*, 658:A42, February 2022.

B. Charnay, D. Blain, B. Bézard, J. Leconte, M. Turbet, and A. Falco. Formation and dynamics of water clouds on temperate sub-Neptunes: the example of K2-18b. *Astronomy & Astrophysics*, 646:A171, February 2021.

Aurélien Falco. *Combler l'écart entre H-Matrices et méthodes directes creuses pour la résolution de systèmes linéaires de grandes tailles*. Theses, Université de Bordeaux, June 2019.

Emmanuel Agullo, Aurélien Falco, Luc Giraud, and Guillaume Sylvand. Vers une factorisation symbolique hiérarchique de rang faible pour des matrices creuses. In *Conférence d'informatique en Parallélisme, Architecture et Système (ComPAS'17)*, Sophia Antipolis, France, June 2017.

Presentations & others

2023 DPS 55 (online)
2023 Ariel Consortium meeting (Tenerife)
2023 Seminar at MDLS
2023 Seminar at IPGP
2023 EMAC workshop (online)
2023 Exosystèmes III (Marseille)
2022 SF2A (Besançon)
2022 Les Houches school
2021 ARES school (Biarritz)
2018 Sparse Days Conference (Toulouse)
2017 Compas Conference (Sophia Antipolis)
2015 CIMI workshop (Toulouse)

Software contributions

Pytmosph3R `https://forge.oasu.u-bordeaux.fr/jleconte/pytmosph3r-public`
TauREx 2D `https://forge.oasu.u-bordeaux.fr/falco/taurex_2d`
Exo_k `https://forge.oasu.u-bordeaux.fr/jleconte/exo_k-public`
ATMO 1D-2D atmosphere model (radiative transfer/chemistry)

hmat-oss Its parent repository hmat is a proprietary tool that implements $\mathcal{H}$-matrices (not public), but a part of the project is open-source and available here: `https://github.com/aurelienfalco/hmat-oss/tree/af/bcsf` (fork)

Contacts

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Emmanuel Agullo	emmanuel.agullo@inria.fr
Luc Giraud	luc.giraud@inria.fr
Guillaume Sylvand	guillaume.sylvand@airbus.com