Armand LECLERC

Curriculum Vitae

CRAL - AstroENS
ENS de Lyon, France
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My Webpage
Github *ResearchGate*

Education

2022–present **PhD, Astrophysics**, *CRAL, ENS de Lyon*, Lyon, France.
Topological physics phenomena of waves in stellar interiors.

2019–2021: **Master of Theoretical Physics**, *Ecole Normale Supérieure (ENS) de Lyon*, Lyon, France.
Advanced courses on various topics of modern theoretical physics. GPA: 8.4/10, Mention "Très Bien".

Publications

Published or Accepted for publication

2025 **A core-sensitive mixed f/g mode of the Sun predicted by wave topology and hydrodynamical simulation**, A.Le Saux, A.Leclerc, G.Laibe, P.Delplace, A.Venaille.
Accepted for publication in The Astrophysical Journal Letters

2025 **The importance of Berry phase in solar acoustic modes**, A.Leclerc, G.Laibe.
Published in The Astrophysical Journal Letters

2025 **Topology of shallow-water waves on the rotating sphere**, N.Perez, A.Leclerc, G.Laibe, P.Delplace.
Published in the Journal of Fluid Mechanics

2024 **Wave topology of stellar inertial waves**, A.Leclerc, G.Laibe, N.Perez.
Published in Physical Review Research

2024 **PT and anti-PT symmetry for astrophysical waves**, A.Leclerc, G.Laibe, N.Perez.
Published in Astronomy & Astrophysics

2024 **Exceptional ring of the buoyancy instability in stars**, A.Leclerc, L.Jezequel, N.Perez, A.Bhandare, G.Laibe, P.Delplace.
Published in Physical Review Research

2023 **From ray tracing to waves of topological origin in continuous media**, A.Venaille, Y.Onuki, N.Perez, A.Leclerc.
Published in SciPost Physics

2022 **Topological Modes in Stellar Oscillations***, A.Leclerc, G.Laibe, P.Delplace, A.Venaille, N.Perez.
Published in The Astrophysical Journal

Online list accessible here (NASA ADS).

Research Experience

PhD

2022 – present
Topological physics in astrophysical waves and instabilities.
Developing a new approach of linear waves and instabilities in astrophysical and geophysical contexts, relying on topology. This technique from condensed matter physics allows for a new analytical tackling of waves with long wavelengths, i.e fundamental modes of celestial bodies. When applied to the spectrum of the Sun, it predicts a wave of a new kind which is found in nonlinear simulations, whose properties are such that it will give astronomers access to the solar core.

Advisor : **Prof. Guillaume Laibe**, *CRAL*, ENS de Lyon.

Internships

Feb,2022 – Jul,2022
Gravity waves excitation by turbulent plumes in the Sun.
Analysis of gravity waves in compressible hydrodynamical simulations of the solar interior. Convective plumes generated in the convective zone hit the radiative region and excite trains of gravity waves, whose power spectrum is exhibited and correlated to the plume.

Advisor : Prof. Isabelle Baraffe, *Department of Physics and Astronomy*, University of Exeter.

Sept,2021 – Feb,2022
Topological asteroseismology.
Topological analysis of the waves propagating in stellar media. Re-formulation of the equations of linear waves, computation of Chern numbers and prediction of a wave of a new kind in stellar spectra.

Advisor : Prof. Guillaume Laibe, *CRAL*, ENS de Lyon.

Mar,2021 – Aug,2021
Instability detections in anisotropic spheroidal galaxies.
Analysis of instabilities caused by anisotropy in galaxies. Analytical equilibria with tunable anisotropy parameters are implemented in a spectral code to detect their influence on linear modes.

Advisor : Dr. Simon Rozier, *Post-doc, Observatory of Strasbourg, France*

Grants

2022 **Doctoral funding** Contrat Doctoral Spécifique Normalien (CDSN), ENS de Lyon.

2018: **ENS de Lyon Entrance Exam**, Admission among the 2.6% candidates selected.

Teaching

2022-2025 : **Nonlinear physics - Lectures Master 2**, Prépa agrégation de Physique, ENS de Lyon.

2023-2025 : **Introduction to Astrophysics - Tutorials Master 1**, Physics Department, ENS de Lyon.

2022-2025 : **Quantum Mechanics - Tutorials Bachelor**, Physics Department, ENS de Lyon.

Extra

June 2023 : **Local Organization Committee Member**, Star@Lyon conference (website).

References

Dr. Guillaume LAIBE
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