Clément Bonnerot

Curriculum vitae

Niels Bohr International Academy
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Profile

My research focuses on the theoretical aspect of tidal disruption events as well as other transient and high-energy phenomena. In particular, I study the magneto-hydrodynamics of these systems including the impact of general relativity and radiative processes with a combination of analytical and numerical techniques.

Research experience

2020–2022 **Marie Curie fellow**, *Niels Bohr Institute*, Copenhagen, Denmark.

2017–2020 **Postdoctoral scholar**, *California Institute of Technology*, Pasadena, USA.
Member of the TAPIR group and of the network of theoretical astrophysicists dedicated to the study of transients detected by the *Zwicky Transient Facility*

2013–2017 **PhD student**, *Leiden Observatory*, Leiden, The Netherlands.
Title: "Dynamics and Radiation from Tidal Disruption Events"
Advisors : Prof. E. M. Rossi and Prof. G. Lodato

2013 **Master project**, *University of Leicester*, Leicester, UK.
Title : "New Models for the Origin of the G2 Cloud" (duration: 4 months)
Advisor : Prof. S. Nayakshin

2011 **Bachelor project**, *Lund Observatory*, Lund, Sweden.
Title: "The Dynamical Evolution of Young Stellar Clusters" (duration : 3 months)
Advisor : Prof. M. B. Davies

Education

2013–2017 **PhD in Astrophysics**, *Leiden Observatory*, Leiden, The Netherlands.
Defended on October 5, 2017

2011–2013 **Master in Physics**, *École Polytechnique Fédérale de Lausanne*, Lausanne, Switzerland.
Double degree program (final grade: 5.61/6)

2009–2011 **Engineering degree**, *École Centrale de Lille*, Lille, France.
Highest level French engineering school

2006–2009 **Preparatory class**, *Lycée Janson de Sailly*, Paris, France.
Intensive preparation to the national competitive examination for admission to the French engineering schools

Numerical expertise

Methods Lagrangian hydrodynamics codes, possibly including magnetic fields and radiative processes under the influence of general relativity (PHANTOM, GIZMO, SPHNG, GASOLINE), N-body codes (NBODY6, REBOUND) and stellar evolution code (MESA).

Languages Fortran, C, Python, Mathematica and LaTeX.

Responsibilities

Organization — Organization of a workshop on radiative transfer with applications to tidal disruptions at the Niels Bohr Institute, June 2022.

Organization of the weekly TAPIR seminar at Caltech, 2017–2020.

Organization of the "PhD talks" every other week at Leiden Observatory, 2014–2017.

Refereeing — Referee for the *Monthly Notices of the Royal Astronomical Society* and the *Astrophysical Journal*, since 2016.

External evaluation of observational proposals for *OPTICON*, 2018.

Supervision and teaching

Supervision — Supervision of PhD student Taj Jankovic from University of Nova Gorica, 2021.

Co-supervision of PhD student Anna Balaudo from Leiden Observatory, 2021.

Co-supervision of undergraduate student Gauri Batra at Caltech, 2020.

Co-supervision of PhD student Zujia Lu at Leiden Observatory, 2016–2017.

Co-supervision of undergraduate student Wanqiang Liu at Leiden Observatory, 2017.

Supervision of bachelor student Paul Couzy at Leiden Observatory, 2016.

Teaching — Invited lecture on tidal disruptions and selected parts of the course "Theoretical Astrophysics" at the Niels Bohr Institute, 2022.

Course on the smoothed-particle-hydrodynamics numerical method for Master students at Leiden Observatory, April 2016.

Teaching assistant for Master courses "Computational Astrophysics" and "Stellar Structure and Evolution" during two semesters at Leiden Observatory, 2015–2016.

Teaching assistant for Physics courses at the bachelor level at EPFL, 2011–2012.

Outreach

Press — Three-page article "L'ogre et les étoiles" in the national French scientific magazine *La Recherche*, March 2018.

Presentation — Presentation for the general public at Caltech on tidal disruption events, June 2018.

Publications

3 review papers — **C. Bonnerot**, N. C. Stone, 2021, Space Science Reviews, 217, 1.
"Formation of an Accretion Flow"

G. Lodato, R. M. Cheng, **C. Bonnerot**, J. L. Dai, 2020, Space Science Reviews, 216, 4.
"Simulations of Tidal Disruption Events"

G. Lodato, A. Franchini, **C. Bonnerot**, E. M. Rossi, 2015, JHEAp, 7, 158.
"Recent developments in the theory of tidal disruption events"

12 research papers — **C. Bonnerot**, W. Lu, 2021, submitted to MNRAS.
"The nozzle shock in tidal disruption events"

C. Bonnerot, W. Lu, P. F. Hopkins, 2021, MNRAS, 504, 4885.
"First light from tidal disruption events"

W. Lu, P. Beniamini, **C. Bonnerot**, 2021, MNRAS, 500, 1817.
"On the formation of GW190814"

C. Bonnerot, W. Lu, 2020, MNRAS, 495, 1374.
"Simulating disc formation in tidal disruption events"

W. Lu, **C. Bonnerot**, 2020, MNRAS, 482, 686.
"Self-intersection of the Fallback Stream in Tidal Disruption Events"

C. Bonnerot, E. M. Rossi, 2019, MNRAS, 484, 1301.
"Streams collision as possible precursor of double tidal disruption events"

D. J. Price, J. Wurster, C. Nixon, T. S. Tricco, S. Toupin, A. Pettitt, C. Chan, G. Laibe, S. Glover, C. Dobbs, R. Nealon, D. Liptai, H. Worpel, **C. Bonnerot**, G. Dipierro, E. Ragusa, C. Federrath, R. Iaconi, T. Reichardt, D. Forgan, M. Hutchison, T. Constantino, B. Ayliffe, D. Mentiplay, K. Hirsh, G. Lodato, 2018, PASA, 35, e031.
"Phantom: A smoothed particle hydrodynamics and magnetohydrodynamics code for astrophysics"

R. Nealon, D. J. Price, **C. Bonnerot**, G. Lodato, 2018, MNRAS, 474, 1737.
"On the Papaloizou-Pringle instability in tidal disruption events"

C. Bonnerot, D. J. Price, G. Lodato, E. M. Rossi, 2017, MNRAS, 469, 4879.
"Magnetic field evolution in tidal disruption events"

C. Bonnerot, E. M. Rossi, G. Lodato, 2017, MNRAS, 464, 2816.
"Long-term stream evolution in tidal disruption events"

C. Bonnerot, E. M. Rossi, G. Lodato, 2016, MNRAS, 458, 3324.
"Bad prospects for the detection of giant stars' tidal disruption: effect of the ambient medium on bound debris"

C. Bonnerot, E. M. Rossi, G. Lodato, D. J. Price, 2016, MNRAS, 455, 2253.
"Disc formation from tidal disruptions of stars on eccentric orbits by Schwarzschild black holes"

1 conference proceeding

G. Lodato, **C. Bonnerot**, E. M. Rossi, A. Franchini, 2016, Active Galactic Nuclei 12: A Multi-Messenger Perspective (AGN12).
"Modeling The Optical Emission Of Tidal Disruption Events"

Scientific presentations

3 invited talks

"Formation of an Accretion Flow in Tidal Disruption Events", *Review talk at the conference "Tidal Disruption Events: General Relativistic Transients"*, January 2020, Kyoto, Japan.

"Simulating Realistic Disc Formation in Tidal Disruption Events", *Conference EWASS 2019*, June 2019, Lyon, France.

"Formation of an Accretion Flow in Tidal Disruption Events", *Review talk at the workshop "Using Tidal Disruption Events to Study Super-Massive Black Holes"*, October 2018, Bern, Switzerland.

12 contributed talks

"Simulating Realistic Disc Formation in Tidal Disruption Events", *Workshop "Tidal Disruption Events: General Relativistic Transients"*, January 2020, Kyoto, Japan.

"Simulating Realistic Disc Formation in Tidal Disruption Events", *Workshop "ZTF theory meeting"*, September 2019, San Luis Obispo, USA.

"Streams Collision from Double Tidal Disruption Events", *Workshop "ZTF theory meeting"*, July 2018, Santa Barbara, USA.

"Streams Collision from Double Tidal Disruption Events", *Conference "Aspen Winter Conference: Using Tidal Disruption Events to Study Super-Massive Black Holes"*, January 2018, Aspen, USA.

"Magnetic Field Evolution in Tidal Disruption Events", *Conference "TDE17: Piercing the sphere of influence"*, September 2017, Cambridge, UK.

"Magnetic Field Evolution in Tidal Disruption Events", *Workshop "ZTF theory meeting"*, June 2017, San Luis Obispo, USA.

"Hydrodynamics and Radiation from Tidal Disruption Events", *Workshop "Using Tidal Disruption Events to Study Super-Massive Black Holes"*, November 2016, Bern, Switzerland.

"Disc Formation from Tidal Disruptions of Stars on Eccentric Orbits", *Conference "Jerusalem TDE Workshop"*, November 2015, Jerusalem, Israel.

"Disc Formation from Tidal Disruptions of Stars on Eccentric Orbits", *Workshop "Galactic nuclei at high resolution in many dimensions"*, October 2015, Alájar, Spain.

"Disc Formation from Tidal Disruptions of Stars on Eccentric Orbits", *Conference "Symposium on Astroparticle Physics"*, March 2015, Nijmegen, The Netherlands.

"Disc Formation from Tidal Disruptions of Stars on Eccentric Orbits", *Conference "NOVA Network-3 Meeting"*, November 2014, Leiden, The Netherlands.

"Disc Formation from Tidal Disruptions of Stars on Eccentric Orbits", *Conference "Accretion & Jets Theory Meeting"*, October 2014, Leiden, The Netherlands.

19 seminars and presentations

"Hydrodynamics and Radiation from Tidal Disruption Events", *Talk at the "Pizza lunch" of Caltech*, January 2021, Pasadena, USA.

"Hydrodynamics and Radiation from Tidal Disruption Events", *Talk at the "Theory Thursday" meeting of the Carnegie Observatories*, September 2020, Pasadena, USA.

"Simulating Realistic Disc Formation in Tidal Disruption Events", *Talk in the group "Black holes and AGNs" at IAP*, December 2019, Paris, France.

"Hydrodynamics and Radiation from Tidal Disruption Events", *Seminar at CRAL*, June 2019, Lyon, France.

"Simulating Realistic Disc Formation in Tidal Disruption Events", *Talk at the "Theory Thursday" meeting of Carnegie Observatories*, May 2019, Pasadena, USA.

"Hydrodynamics and Radiation from Tidal Disruption Events", *Talk in the group TAC of UC Berkeley*, April 2018, Berkeley, USA.

"Streams Collision from Double Tidal Disruption Events", *TAPIR seminar at Caltech*, March 2018, Pasadena, USA.

"Hydrodynamics and Radiation from Tidal Disruption Events", *Seminar at Leiden Observatory*, June 2017, Leiden, The Netherlands.

"Stream evolution in tidal disruption events", *Talk at the "Astrophysics journal club" of the Benoziyo Center for Astrophysics*, February 2017, Rehovot, Israel.

"Stream evolution in tidal disruption events", *Talk at the "High energy meeting" of the Hebrew University of Jerusalem*, February 2017, Jerusalem, Israel.

"Stream evolution in tidal disruption events", *Seminar at the Max Planck Institute for Astrophysics*, January 2017, Garching, Germany.

"Stream evolution in tidal disruption events", *Seminar "Flash talk" at UC Santa Cruz*, October 2016, Santa Cruz, USA.

"Stream evolution in tidal disruption events", *Talk at the "CTC theory lunch talk" at the University of Maryland*, October 2016, College park, USA.

"Stream evolution in tidal disruption events", *Talk at the "High-energy group meeting" of Columbia University*, September 2016, New York, USA.

"Stream evolution in tidal disruption events", *Seminar "CAS wine and cheese" at Johns Hopkins University*, September 2016, Baltimore, USA.

"Stream evolution in tidal disruption events", *Seminar "Galaxy and Cosmology" at Harvard University*, September 2016, Cambridge, USA.

"Stream evolution in tidal disruption events", *Presentation at the "Lunch Talk" of Leiden Observatory*, September 2016, Leiden, The Netherlands.

"Stream evolution in tidal disruption events", *Seminar "Astro-coffee" at Monash University*, May 2016, Monash, Australia.

"Bad prospects for the detection of giant stars' tidal disruption", *Presentation at the "PhD Talk" of Leiden Observatory*, April 2016, Leiden, The Netherlands.

2 posters **"Disc Formation from Tidal Disruption Events"**, *Conference "First Stars, Galaxies and Black Holes: Now and Then"*, June 2015, Groningen, The Netherlands.

"Disc Formation from Tidal Disruption Events", *Conference "Netherlands Astronomy Conference"*, May 2015, Nunspeet, The Netherlands.