

# Charles Collot

---

*Born September 13, 1990. French nationality.*

## Current Position and research field

2022 - **Professeur Junior**, *CY Cergy Paris Université*, France.

I am interested in qualitative properties of solutions of nonlinear evolution partial differential equations. My topics of research include:

- Dynamics near solitons, self-similar solutions and steady states.
- Singularity formation and long time behavior for quasilinear transport and nonlinear parabolic or dispersive equations.
- Certain statistical physics problems: weak wave turbulence, dynamics of infinitely many particles.

## Past positions

2020-2022 **Chargé de Recherches**, *Centre National de la Recherche Scientifique (CNRS)*, *CY Cergy Paris Université*, France.

2018-2020 **Courant Instructor (supervisors P. Germain and N. Masmoudi)**, *Courant Institute*, *New York University*, New York, U.S.A..

2017-2018 **Postdoctoral associate (supervisor N. Masmoudi)**, *New York University in Abu Dhabi*, Abu Dhabi, U.A.E..

## Education

2014-2017 **Ph.D. with P. Raphaël "On critical and supercritical blow-up for the semi-linear heat and wave equations"**, *Université Nice Côte d'Azur*, Nice, France.

Defended on November 8, 2016,

Rapporteurs: T. Cazenave, N. Masmoudi, Jury: T. Cazenave, G. Lebeau, F. Merle, P. Raphaël, L. Vega.

2011-2013 **Master's Degree "Partial Differential Equations and Numerical Calculation" with first class honors**, *École Normale Supérieure and Orsay University*, Paris.

2010-2011 **Bachelor's Degree**, *École Normale Supérieure*, Paris, France.

2008-2010 **Classe préparatoires MPSI-MP\***, *Lycée Malherbe*, Caen, France.

## Preprints and publications (22)

**On classification of non-radiative solutions for various energy-critical wave equations**, *arXiv:2211.16085*, submitted, with C. Kenig, T. Duyckaerts and F. Merle.

*UFR Sciences et Techniques AGM - Département mathématiques*

*2 av. Adolphe Chauvin – 95302 Cergy-Pontoise CEDEX*

☎ +33 6 08 74 53 72, • ✉ [charles.collot@cyu.fr](mailto:charles.collot@cyu.fr)

1/5

**On channels of energy for the radial linearised energy critical wave equation in the degenerate case**, *International Mathematics Research Notices*, 2022, with C. Kenig, T. Duyckaerts and F. Merle.

**Stability and cascades for the Kolmogorov-Zakharov spectrum of wave turbulence**, *arXiv:2208.00947*, submitted, with H. Dietert and P. Germain.

**Soliton resolution for the radial quadratic wave equation in six space dimensions**, *arXiv:2201.01848*, submitted, with C. Kenig, T. Duyckaerts and F. Merle.

**Collapsing-ring blowup solutions for the Keller-Segel system in three dimensions and higher**, *arXiv:2112.15518*, submitted, with T.-E. Ghoul, N. Masmoudi and V. T. Nguyen.

**Stable Singularity Formation for the Inviscid Primitive Equations**, *arXiv:2112.09759*, submitted, with S. Ibrahim and Q. Lin.

**Derivation of the kinetic wave equation for quadratic dispersive problems in the inhomogeneous setting**, *arXiv:2107.11819*, submitted, with I. Ampatzoglou and P. Germain.

**Derivation of the homogeneous kinetic wave equation: longer time scales**, *arXiv:2007.03508*, submitted, with P. Germain.

**Stability of Steady States for Hartree and Schrodinger Equations for Infinitely Many Particles**, *To appear in Annales Henri Lebesgue*, with A.-S. de Suzonni.

**On the derivation of the homogeneous kinetic wave equation**, *To appear in Communications on pure and applied mathematics*, with P. Germain.

**Spectral analysis for singularity formation of the two dimensional Keller-Segel system**, *To appear in Annals of PDEs*, with T.-E. Ghoul, N. Masmoudi and V.-T. Nguyen.

**Refined description and stability for singular solutions of the 2D Keller-Segel system**, *To appear in Communications on pure and applied mathematics*, with T.-E. Ghoul, N. Masmoudi and V.-T. Nguyen.

**Singularities and unsteady separation for the inviscid two-dimensional Prandtl system**, *Archive for Rational Mechanics and Analysis*, 240(3), 1349-1430 (2021), with T.-E. Ghoul and N. Masmoudi.

**Stability of equilibria for a Hartree equation for random fields**, *Journal de Mathématiques Pures et Appliquées*, 137, 70-100 (2020), with A.-S. de Suzonni.

**On singularity formation for the two dimensional unsteady Prandtl system around the axis**, *To appear in Journal of the European Mathematical Society*, with T.-E. Ghoul, S. Ibrahim and N. Masmoudi.

**Singularity formation for Burgers equation with transversal viscosity**, *To appear in Annales Scientifiques de l'École Normale Supérieure*, with T.-E. Ghoul and N. Masmoudi.

**Strongly anisotropic type II blow up at an isolated point**, *Journal of the American Mathematical Society*, 33(2), 527-607 (2020), with F. Merle and P. Raphaël.

**On the stability of type I blow up for the energy super critical heat equation**, *Memoirs of the American Mathematical Society*, 260(1255) (2019), with P. Raphaël and J. Szeftel.

**Dynamics near the ground state for the energy critical nonlinear heat equation in large dimensions**, *Communications in Mathematical Physics*, 352(1), 215-285 (2017), with F. Merle and P. Raphaël.

**Stability of ODE blow-up for the energy critical semilinear heat equation**, *Comptes Rendus Mathématique*, 355(1), 65-79 (2017), with F. Merle and P. Raphaël.

**Non radial type II blow up for the energy supercritical semilinear heat equation**, *Analysis & PDE*, 10(1), 127-252 (2017).

**Type II blow up manifolds for a supercritical semi-linear wave equation**, *Memoirs of the American Mathematical Society*, 252(1205) (2018).

### Proceedings and reviews (3)

**Self-similarity in the singularity formation for the Prandtl's equations and related problems**, *Seminaire Laurent Schwartz - EDP et applications*, 1-16 (2019).

**Un resultat de diffusion pour l'equation de Hartree autour de solutions non localisees**, *Seminaire Laurent Schwartz - EDP et applications*, 1-12 (2018), with A.-S. De Suzonni.

**On blow-up and dynamics near ground states for some semi-linear equations**, *Seminaire Laurent Schwartz - EDP et applications*, 1-12 (2016).

### Supervision

**Ph.D. of Cyril Maleze**, co-supervision with A.-S. de Suzonni as principal supervisor, École Polytechnique and CY Cergy Paris University.

### Organization

- 2022- **P.I. of the ANR-22-CPJ2-0018-01 project *Chaire professeur junior "Analyse harmonique et mécanique des fluides"***.
- 2022- **Co-P.I. of the Emergence project *CYngular Fluids and Interfaces***, CY Cergy Paris Université, Cergy-Pontoise, other co-P.I. Christophe Prange.
- 2021- **Member of the team involved in the CYNA Project (postdoc recruitment + conference organisation)**, CY Cergy Paris Université, Cergy-Pontoise, P.I. Philippe Gravejat.
- 2020- **Co-organizer of Geometry, Partial Differential Equations and Mathematical Physics seminar**, CY Cergy Paris Université, Cergy-Pontoise.
- 2020- **Member of AGM laboratory's council**, CY Cergy Paris Université, Cergy-Pontoise.
- 2021 **Boundary layer day workshop**, CY Cergy Paris Université, Cergy-Pontoise, with C. Prange.

UFR Sciences et Techniques AGM - Département mathématiques

2 av. Adolphe Chauvin – 95302 Cergy-Pontoise CEDEX

☎ +33 6 08 74 53 72, • ✉ charles.collot@cyu.fr

2014-2016 **Co-organizer of a J.A. Dieudonné Laboratory's PDE seminar, Co-organizer of the Ph.D. students' workshop, co-organizer of the Ph.D. students' seminar on PDEs and numerical analysis, member of the PhD school council, member of L.J.A.D laboratory's council, Université Nice Côte d'Azur, Nice.**

## Talks given at conferences and seminars

2022: SITE online conference: Long Time Behavior and Singularity Formation in PDEs-Part IV (Jan., Abu Dhabi, online), KIT workshop on wave phenomena (Feb., Karlsruhe, online), Calderon-Zygmund seminar (The Univ. of Chicago), Analysis Seminar (Brown Univ.), Syngflow ANR project meeting (Apr., Univ. Bordeaux), L.J.A.D. Analysis seminar (June, Nice), Nonlinear Waves and Dispersive Equations (June, Oberwolfach), Bath analysis seminar (Oct., Bath), Cambridge analysis seminar (Oct., Cambridge), Journée d'analyse des Hauts-de-France (Nov., Lille), National Taiwan University analysis seminar (Dec., Taipei, online).

2021: Joint meeting of the A.M.S (Jan., Washington, online), Lisbon WADE (Jan., online), Long Time Behavior and Singularity Formation in PDEs - Part II (Jan., Abu Dhabi, online), Spectral problems in Mathematical Physics seminar (Apr., Paris, online), Open PDE seminar (Apr., worldwide online), I.H.E.S Large-scale limits of interacting particle systems workshop (Oct., Paris), BIRS workshop Singularity Formation in Nonlinear PDEs (Oct., Banff online), I.C.E.R.M. Generic Behavior of Dispersive Solutions and Wave Turbulence workshop (Oct., Brown), London PDE seminar (Oct., online), Cambridge kinetic reading group (Nov., online), NYUAD seminar (Nov., Abu Dhabi),

2020: CAMS Colloquium at University of Southern California (Jan., Los Angeles), Paris 13 Analysis Seminar (Mar., Villetaneuse), Institut Mathématiques de Bordeaux analysis seminar (Apr., Bordeaux), Shanghai Tech PDE Seminar (Apr., Shanghai), Long Time Behavior and Singularity Formation in PDEs conference (May, Abu Dhabi), NCTS PDE and Analysis Seminar (Jun., Taipei), Princeton Analysis Seminar (Sep., Princeton), Lyon Analysis Seminar (Nov., Lyon)

2019: New York University in Abu Dhabi (Jan., U.A.E.), University of Sharjah (Jan., U.A.E), Fluid dynamics seminar (Feb. Princeton), Columbia (Apr., New York), Waves Cote d'Azur conference (Jun., Nice), Advances in Dispersive Equations workshop (Jul., Banff, Canada), minicourse given at USTC (Aug., Hefei, China), University of Maryland (Oct., Washington), Effective Equations in Quantum Physics session of AMS joint meeting (Gainesville, Florida), Brown University (Nov., Providence), University of British Columbia (Dec., Canada)

2018: Conference in honor of Lin and Shatah (Jan., Abu Dhabi), University of Victoria (Jan., Victoria), Courant Institute (Feb., New York), Journées Jeunes EDPistes (Mar., Nancy), Université libre de Bruxelles (Jun., Bruxelles), Conférence Jeunes Chercheurs en EDP dispersives (Jun., Paris), Nonlinear Waves Conference (Jul., Karlsruhe), Courant Instructors day (Oct., New York), Cergy-Pontoise university seminar (Nov., Paris), Courant Institute (Dec., Paris).

2017: Journées jeunes EDPistes (Mar., Autrans), Lille university (May), Paris Dauphine university (May), Strasbourg university (Jun.), Nonlinear Waves and Dispersive Equations (Jun., Oberwolfach), Analyse asymptotique des équations d'évolution (Jul., C.I.R.M, Marseille), Nonlinear equations and singularity formation (Oct., Pauli Institute, Vienne), analysis seminar (Nov., American University of Sharjah).

2016: Ph.D. students seminar (Jan., Nice), Imperial college (Fev., London), Ph.D. students in sciences day (May, Nice), Laurent Schwartz seminar at IHES (May, Paris), Orsay University (Oct., Paris), Ph.D. students seminar (Oct., Rennes), Second Workshop on Evolution Equations (Dec., Valdivia, Chile).

2015: Ph.D. students seminar (May, Nice), Ph.D. students workshop (June, Nice),  
Ph.D. students seminar (Oct., Berkeley).  
2014: workshop of the analysis team of Nice (Sep., Lecco), analysis team seminar  
(Nov., Nice).

## Long term stays

Winter 2022: one month at Courant Institute and The University of Chicago, New York and Chicago.

Summer 2019: Mini-course at University of Science and Technology of China, Hefei.

Spring 2019: Invited researcher for two months at IHÉS, Bures-sur-Yvettes.

Winter 2019: Invited researcher for one month at NYUAD, Abu Dhabi.

Spring 2018: Invited researcher for three months at IHÉS, Bures-sur-Yvettes.

Winter 2018: One month at Courant Institute, New York.

Fall 2015: Program associate for "New Challenges in PDE" at MSRI, Berkeley.

## Spoken languages

**French and English (fluent), Spanish (intermediate).**

## Teaching

2022-2023 **Dynamics of parabolic equations**, *CY Cergy Paris Université.*

2022-2023 **Python programming**, *CY Cergy Paris Université.*

2022-2023 **Fourier Analysis**, *CY Cergy Paris Université.*

2021-2022 **Introduction to mathematical modelling**, *CY Cergy Paris Université.*

2019-2020 **Linear Algebra Instructor**, *New York University.*

2018-2019 **Analysis Instructor**, *New York University.*

2018-2019 **Calculus I Instructor**, *New York University.*

2016-2017 **Tutorial in mathematics for economy (first year BA), tutorial in statistics for economy (first year BA)**, *Université Nice Côte d'Azur.*

2014-2016 **Course in mathematics for biology (first year BA), tutorial in discrete mathematics (first year BA)**, *Université Nice Côte d'Azur.*