University
of Basel

Department of
Mathematics and Computer Science

PhD and PostDoc Positions in Mathematical Fluid Dynamics
(Research Group of Prof. Gianluca Crippa at the University of Basel)

Several PhD and PostDoc positions will be available in the next years in the group of Prof. Gianluca Crippa at the Department of Mathematics and Computer Science of the University of Basel (Switzerland). The positions are funded by the Swiss National Science Foundation (through the research project "FLUTURA: Fluids, Turbulence, Advection") and by the University of Basel.

The ideal start for all positions is Spring or Fall 2023. However, expressions of interest for a possible start at a later time (in 2024 or 2025) are also welcome at this stage.

The mission of our research group is to investigate problems in mathematical fluid dynamics with tools from mathematical analysis. The common feature of these problems is the appearance of irregular behaviors and the creation of small scales. A non-exhaustive list of the topics we aim to address includes:
- Mixing, regularity, and irregularity for fluid flows.
- Anomalous dissipation and enhanced diffusion.
- Turbulence theory, both in the incompressible and in the compressible cases.
- Conservation and dissipation of the kinetic energy and of the enstrophy, both in the incompressible and in the compressible cases.
- Flows and advection under irregular velocity fields.
- Selection or lack of selection of solutions for problems without uniqueness of solutions.
- Existence, uniqueness, and structure of solutions for nonlinear problems from fluid dynamics.
- Generalized notions of solutions (for instance, measure-valued and statistical solutions).

Our ambition is to provide rigorous mathematical results in physically relevant regimes. We apply techniques from mathematical analysis, theory of PDEs, geometric measure theory, harmonic analysis, and stochastic differential equations. Familiarity with the physical background is advantageous especially in the context of turbulence. Perspective candidates are encouraged to read the summary of the FLUTURA research project, visit the webpage of our previous ERC Starting Grant "FLIRT: Fluid Flows and Irregular Transport", and browse through the publications of Prof. Crippa on arXiv.

Applications are welcome and must be submitted via email to gianluca.crippa@unibas.ch following the instructions below. Informal inquiries on any aspects of the positions can be sent to the same email address. The review of the applications will start in January 2023 and will continue until the positions are filled. Receipt of the applications will be acknowledged. Shortlisted candidates will be invited for a presentation and an interview (in person or online).

- Duration of the positions:
    - PhD positions: initially one year, extended by three more years after a positive evaluation.
    - PostDoc positions: in principle two years, extensions are possible upon mutual agreement. Shorter employment durations can also be considered if requested by the candidate.
- We offer a competitive salary and access to research funds for participation to conferences or for invitation of research collaborators.
- Teaching: one exercise group each semester (weekly correction of assignments and two-hour tutorial) and assistance for written and oral exams. PostDoc may instead teach a class as main lecturer upon mutual agreement.

Basel, November 2022
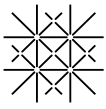
Application Procedure for PhD Positions

Please submit via email to gianluca.crippa@unibas.ch using the subject
[FLUTURA: PhD] your name and affiliation
the following documents as a single PDF file:
- A cover letter of 2-3 pages in which you address the following points:
  - Describe briefly your last couple of years at university and the main courses you attended.
  - Describe briefly the topic of your master thesis and the results obtained.
  - Why would you like to do a PhD in mathematics?
  - What do you expect from a PhD in mathematics?
  - Why would you like to do a PhD in mathematical fluid dynamics? And why in Basel?
  - Explain why you are the right candidate for the position.
  - Browse the internet and find some popularization articles about recent discoveries in fluid dynamics. Explain briefly why you find such topics fascinating.
  - There will be for sure some hard times during your PhD. Maybe, after thinking for six months about a problem, you suddenly realize that your approach cannot work. How would you deal with such a situation?
  - The graduate school in mathematics in Basel is quite small. How would you try to establish some interactions with your fellow PhD students in other fields of mathematics?
  - You will have to do some teaching during your PhD. How do you imagine yourself explaining some basic mathematics to students from other disciplines?
- Your curriculum vitae. It can contain links to further information about you, for instance to your webpage or to some publications of yours. But please be assured that you do not need any publications or previous research experience in order to start a PhD!
- Your transcript of records.
- A list of 2-3 professors or senior mathematicians (with contact information) that can provide reference about you (no recommendation letters need to be sent at this stage!). You can explain your connection to them.

Application Procedure for PostDoc Positions

Please submit via email to gianluca.crippa@unibas.ch using the subject
[FLUTURA: PostDoc] your name and affiliation
the following documents as a single PDF file:
- A cover letter of 2-3 pages in which you address the following points:
  - Describe briefly the topic of your PhD thesis and the results obtained.
  - Describe briefly your previous PostDoc positions and the results obtained (if applicable).
  - Describe how your expertise and your previous results relate to the research topics in this call.
  - Describe how you plan to contribute to the research topics in this call.
  - Explain why you are the right candidate for the position.
  - What do you expect from a PostDoc in our research group?
  - What are your long-term career plans?
- Your curriculum vitae and list of publications. Please include links to your publications (for instance to arXiv), but do not send full publications together with your application.
- A research statement of ca. 4-5 pages in which you describe in more detail your past research results as well as your future research plans, also in relation to the topics in this call.
- A list of 2-3 professors (with contact information) that can provide reference about you (no recommendation letters need to be sent at this stage!). You can explain your connection to them.