

Talbergerstraße 8f  
12359 Berlin

+49 314 29378

+49 177 4619681

✉ oberleithner@tu-berlin.de

profile: [researchgate.net](#) [google scholar](#)

Born 19th June 1981 in Innsbruck, Austria

# Kilian Oberleithner

## Research Interest

Numerical and Experimental Fluid Mechanics, Data Science, Coherent Structures, Linear Stability Theory, Reduced Order Modelling, Optimal Flow Control, Machine Learning, Aerodynamics, Aeroacoustics, Combustion Instability, Hydro Turbine Instability

## Education

- 7/2021 **Positive Interim Evaluation of Juniorprofessorship**, TU Berlin, [Habilitation equivalent](#)
- 7/2012 **Dr.-Ing. (PhD)**, TU Berlin/University of Arizona, [Summa cum laude](#)  
Thesis: *On Turbulent Swirling Jets: Vortex Breakdown, Coherent Structures, and their Control*  
Advisors: Prof. C. O. Paschereit and Prof. I. Wygnanski
- 7/2007 **Dipl.-Ing. (M.S.) in Engineering Science**, TU Berlin/University of Arizona, [graduated with distinction](#)  
Thesis: *Vortex Breakdown in a Swirling Jet with Axial Forcing*

## Work Experience

- 2018–present **Juniorprofessor**, *Head of Laboratory for Flow Instabilities and Dynamics, Institute of Fluid Dynamics and Engineering Acoustics*, TU Berlin
- 2014–2018 **Head of Flow-instability Research Group**, *Institute of Fluid Dynamics and Engineering Acoustics*, TU Berlin, Chair of Fluid Dynamics
- 2012–2014 **Postdoctoral Fellow**, *Department of Mechanical Engineering*, Monash University, Melbourne, PostDoc in Prof. Julio Soria's research laboratory
- 2009–2012 **Research Associate**, *Institute of Fluid Dynamics and Engineering Acoustics*, TU Berlin, DFG project on flow modelling and control
- 2009 **Visiting Scientist**, *Department of Aerospace and Mechanical Engineering*, University of Arizona, PhD thesis project in Prof. I. Wygnanski's research laboratory
- 2007–2008 **Research Associate**, *Institute of Fluid Dynamics and Engineering Acoustics*, TU Berlin, preparation of research grant proposals
- 2006 – 2008 **Visiting Scholar**, *Department of Aerospace and Mechanical Engineering*, University of Arizona, Master thesis project in Prof. I. Wygnanski's research laboratory
- 2004–2005 **Research Assistant**, *TU Berlin (Berlin, Germany), Institute of Bionics and Evolutiontechnique*, research project: *Separation Control of Swept Wings*

## Publication Record

- 75 peer-reviewed journal articles
- 56 peer-reviewed conference proceedings
- more than 16 invited talks (three key-notes)
- h-index: 23 (google scholar)
- citations: 3050 (google scholar)

## Recognitions and Awards

- 2020 **ASME Best Paper Award**, *Combustion, Fuels, & Emissions Committee*, Paper no.GT2019-90438 presented at the ASME Turbo Expo 2019
- 2020 **ASME Best Paper Award**, *Combustion, Fuels, & Emissions Committee*, Paper no.GT2019-90447 presented at the ASME Turbo Expo 2019
- 2019 **Shortlisted for application for W3 Professorship**, *TU Darmstadt*
- 2018 **ASME Best Paper Award**, *Combustion, Fuels, & Emissions Committee*, Paper no.GT2017-65003 presented at the ASME Turbo Expo 2017
- 2016 **Silver Medal of The Combustion Institute**, *for an outstanding paper presented at the 35th Intern. Comb. Symp.*
- 2016 **Focus on Fluids**, *Extended review article by Prof. Bernd Noack about our recent publication on Spectral POD in the Journal of Fluid Mechanics*
- 2015 **Gallery of Fluid Motion Award**, *American Physical Society*
- 2014 **Distinguished Paper**, *35th Combustion Symposium*
- 2013 **Young Engineer Travel Award**, *ASME International Gas Turbine Institute*
- 2010 **First price at the Science Slam Berlin**, *SO36, Berlin*
- 2010 **Gallery of Fluid Motion Award**, *American Physical Society*

## Fellowships

- 2012 **Post-doctoral fellowship**, *German Academic Exchange Service (DAAD)*, funding [high-level early-career scientists](#) willing to spend up to two years abroad, Monash University Melbourne
- 2012 **Post-doctoral fellowship**, *German Reserach Foundation (DFG)*, funding [high-level early-career scientists](#) willing to spend up to two years abroad, Monash University Melbourne
- 2009 **Doctoral exchange fellowship**, *Gottlieb Daimler and Carl Benz Foundation*, funding [outstanding PhD projects](#) conducted abroad for up to 18 months
- 2008 **Doctoral fellowship**, *NaFöG, Berlin federal state*, granted for [outstanding PhD candidates](#) to conduct doctoral work for up to three years
- 2007 **Start-up research fellowship**, *TU Berlin*, funding for [innovative research ideas](#) to work on a research proposal for six months

## Funding History

Total: **Grants (4 150 000 euros), Fellowships (170 000 euros)**

- Sources:
- German Research Foundation (2 800 000 euros)
  - Federal Ministry for Economic Affairs and Energy (635 000 euros)
  - MAN SE (gas turbine manufacturer) (635 000 euros)
  - German Academic Exchange Service (80 000 euros)

- 2023–2026 **Research Grant**, *DFG SPP 2419*, approx. 320 €K  
*ENERGIZE: Adjoint-based optimisation of Hydrogen Combustors Enabled by Additive Manufacturing*
- 2023–2026 **Research Grant**, *DFG*, approx. 320 €K  
*Boosting Linearized Mean-Field Methods using Physics Informed Neural Networks*
- 2023–2026 **Research Grant**, *DFG*, approx. 310 €K  
*Dynamics of turbulent separation bubbles*, Co-PI with Prof. Julien Weiss, TU Berlin
- 2022–2025 **Research Grant**, *DFG*, approx. 400 €K  
*Linear Stability and Resolvent Analysis for Prediction and Mitigation of Wind Turbine Trailing-edge Noise*, Co-PI with Prof. Ennes Sarradj
- 2020–2024 **Research Grant**, *DFG/FVV*, approx. 300 €K  
*Flame Transfer Function Estimation based on Linearized Reacting Mean Field Modelling*, Co-PI with Prof. Wolfgang Polifke, TU Munich
- 2020–2024 **Research Grant**, *DFG-RFBR*, approx. 350 €K  
*Flow Control of Hydrodynamic Instabilities in Francis Turbines based on Linear Stability Theory.*, Co-PI with Prof. Sergey Alekseenko, ITP Novosibirak
- 2019–2023 **Research Grant**, *BMW*, approx. 770 €K  
*Thermoacoustic analysis of engine-scale swirl combustors.*
- 2019–2023 **Supercomputer Grant**, *Leibniz-Rechenzentrum SuperMuc*, 11.5 M CPU hours  
*LES and global linear stability analysis of turbulent swirl and jet flames.*
- 2019–21 **ARC Discovery Project**, *Australian Research Council*, 342 kUSD  
*The Art of Controlling Multijet Resonance in Jet Noise and Power Generation*, Co-PI with Dr. Daniel Edgington-Mitchell, Monash University, Melbourne
- 2016–2021 **Research Grant**, *DFG-SFB 1029*, subproject C01, approx. 500 €K  
*Experimental and numerical simulation of combustor-plenum-interactions for pulsating combustion*, Co-PI with Prof. Rupert Klein, FU Berlin
- 2018-2020 **Research Grant**, *BMW*, approx. 500 €K  
Experimental and numerical investigation of engine-scale swirl combustors.
- 2016–2019 **Research Grant**, *DFG*, approx. 300 €K  
*Feed-back control of the precessing vortex core in swirl-stabilized flames.*
- 2018 **Start-up research funding (Anschubfinanzierung)**, *TU Berlin*, granted for 6 months
- 2018 **Start-up research funding (Anschubfinanzierung)**, *TU Berlin*, granted for 6 months
- 2017–2018 **Research Grant**, *DAAD*, approx. 30 €K  
*Modelling coherent structures in free and wall-bounded shear flows*, Co-PI with Prof. Julio Soria, Monash University, Melbourne

## Editorial Responsibilities

- 2023–present **Special Issue Editor**, *TCFD*, Journal of Theoretical and Computational Fluid Dynamics, Springer Nature  
Special Issue Title: Data-driven and Physics-based Modelling of Coherent Structures in Turbulent Shear Flow
- 2022–present **Associate Editor**, *TCFD*, Journal of Theoretical and Computational Fluid Dynamics, Springer Nature

## Review Activities

- Journals AIAA Journal, Journal of Fluid Mechanics, Physics of Fluids, Proceedings of the Combustion Institute, Combustion and Flame, European Journal of Mechanics B/Fluids, Experiments in Fluids, Flow Turbulence and Combustion, Journal of Engineering for Gas Turbine and Power, International Journal of Mass and Heat Transfer, Journal of Turbulence, Physical Review Fluids, and more
- PhD thesis TU Berlin, TU Munich, University of Poitiers, University of Toulouse, KU Leuven, EPFL,...
- Agencies: German Research Foundation (DFG), Czech Science Foundation
- Conferences: ASME Turbo EXPO, International Symposium on Combustion, GAMM - International Association of Applied Mathematics and Mechanics.

## Organization of Scientific Meetings

- 2021–2022 **Primary organizer of Flow Control Section**, *GAMM, International Association of Applied Mathematics and Mechanics*
- 2020–2021 **Primary organizer of Experimental Combustion Session**, *ASME Turbo Expo 2021*
- 2019–2020 **Primary organizer of Adjoint Stability Analysis Session**, *ASME Turbo Expo 2020*
- 2019–2021 **Scientific committee member**, *Euromech Colloquium Jet Noise Modelling and Control*
- 2018 **Organizing committee member**, *Active Flow and Combustion Control Conference 2018*

## Teaching Activities

- 2022–present **Teaching Certificate**, *Berliner Zentrum für Hochschullehre*, Blended E-Learning (Fokusgutelehredigital)
- 2018–present **Colloquium Flow Instability and Dynamics**, *weekly online colloquium with students and researchers*,  
topics covered: stability theory, turbulent flows, data mining, industrial applications,...
- 2018–present **Thermo-fluid Dynamics Student Projects**, *semester projects and mini lectures with students at MS level*,  
topics covered: model reduction, data mining, machine learning
- 2018–present **Data Analysis Techniques in Thermo-Fluid Dynamics**, *lecture with app. 50 students at BA and MS level*,  
topics covered: discrete fourier analysis, structure identification, POD, DMD, tomographic reconstruction

- 2016–present **Control of Turbulent Flows**, *lecture with app. 40 students at BA and MS level*, topics covered: linear stability theory, coherent structures, reduced order modelling, flow separation control, laminar turbulent transition control, combustion control
- 2016–present **Introduction to Turbulent Flows**, *lecture with app. 60 students at BA and MS level*, topics covered: statistical description of turbulent flows, Reynolds equations, free shear flows, scales of turbulent motion, turbulence modelling, DNS/RANS/LES
- 2015 **Teaching Certificate**, *Berliner Zentrum für Hochschullehre, FOKUS Modul I*
- 2020 **Seminar on Online Teaching**, *Berliner Zentrum für Hochschullehre*

## Supervision

- 2018–present **Post-Docs**, *currently two*, Research topics: data mining, linearized modelling of turbulent flows, wind turbine aeroacoustic, gas turbine thermoacoustics
- 2012–present **PhD Students**, *currently eight, graduated nine (eight with distinction)*, recipients of ASME Best Paper Award (3), Gallery of Fluid Motion Award (2), Silver Medal of The Combustion Institute (1)
- 2016–present **Co-supervised PhD students**, *currently four*, in collaboration with DLR, PTB, University of California
- 2007–present **Master's Students**, *currently seven, graduated 33*
- 2007–present **Bachelor's Students**, *currently three, graduated 15*

## Advanced Vocational Training

- 2021 **Leadership Workshop**, *Solving conflicts productively*
- 2021 **Leadership Workshop**, *Joining forces - communicating feedback and praise authentically*
- 2020 **Team Building Workshop**, *The virtual team - keep everybody on board*
- 2018 **Leadership Workshop**, *Introduction to modern leadership*

## Institutional Responsibilities

- 2019–present **Member of Gender Equality Commission**, *TU Berlin*
- 2022–2024 **Member of the Equal Opportunity Fund Award Committee**, *Mitglied der Vergabekommission des Gleichstellungsfonds, TU Berlin*
- 2022–2024 **Member of Board of the Faculty**, *Fakultätsratsmitglied, TU Berlin*
- 2021–2023 **Member of Board of the Institute**, *Institutsratsmitglied und stellvertretender geschäftsführender Direktor, TU Berlin*
- 2019–present **Member of Berlin International Graduate School in Model and Simulation based Research**, *TU Berlin*
- 2018–present **Member of Appointments Committee for Professorships**, *TU Berlin*



Berlin, Germany, May 23, 2023

## Selected List of Invited Talks

Instabilities and coherent structures in swirling flows and their relevance for thermoacoustics, 2021. [Australasian Fluid Mechanics Society Seminar Series](#).

Analysis and control of coherent flow structures in turbulent swirl flames, 2018. [Keynote lecture](#), Fifth GDR Symposium on Flow Separation Control, IMFT, Toulouse.

Analysis and control of coherent flow structures in turbulent swirl flames, 2017. [Keynote lecture](#), Sixth International Conference on Heat and mass transfer and hydrodynamics in swirling flows, Novosibirsk, November 21-23, 2017.

Hydrodynamic instabilities and coherent structures in swirl flames: experiments and linear stability analysis, 2017. Monash University, Melbourne.

Hydrodynamic instabilities and coherent structures in swirl flames: experiments and linear stability analysis, 2017. LadHyx, Paris.

Exploration and Control of Coherent Structures in Swirl Flames, September 2016. IUTAM Symposium on Jet Noise Modelling and Control, Ecole Polytechnique, Palaiseau.

Instabilities and coherent structures in swirl-stabilized combustion: experiments and linear stability analysis, January 2016. Institut de Mécanique des Fluides de Toulouse.

Instabilities and coherent structures in swirl-stabilized combustion: experiments and linear stability analysis, June 2015. NASA Langley.

## Selected Journal Articles

1. Casel\*, M., **Oberleithner, K.**, Zhang F.C., Zirwes T., Bockhorn, H. Trimis, D., Kaiser\*, T. "Resolvent-based modeling of coherent structures in a turbulent jet flame using a passive flame approach" *Combust. Flame*, 236, 22, **2022**
2. Kuhn\*, P., Soria, J. and **Oberleithner, K.**, "Linear modeling of self-similar jet turbulence" *J. Fluid Mech.*, 919, A7, **2021**
3. Kaiser\*, T., and **Oberleithner, K.**, "A Global Linearized Framework for Modelling Shear Dispersion and Turbulent Diffusion of Passive Scalar Fluctuations" *J. Fluid Mech.*, 915, A111, **2021**
4. Schmidt\*, S., **Oberleithner, K.**, "Instability of forced planar liquid jets: mean field analysis and nonlinear simulation" *J. Fluid Mech.*, 883 (A7), **2020**
5. Müller\*, J., Lückoff\*, F., Paredes, P., Theofilis, V., **Oberleithner, K.**, "Receptivity of the turbulent precessing vortex core: synchronization experiments and global adjoint linear stability analysis" *J. Fluid Mech.*, 888, A3, **2020**
6. Kaiser\*, T., Lesshaft, L., **Oberleithner, K.**, "Prediction of the flow response of a turbulent flame to acoustic perturbations based on mean flow resolvent analysis" *J. Eng. Gas Turbines Power*, 141 (11), **2019 Best paper Award**
7. Sieber\*, M., Paschereit, C. O., **Oberleithner, K.** "Spectral Proper Orthogonal Decomposition" *J. Fluid Mech.*, 792, 798–828, **2016**; featured in *Focus of Fluids*
8. **Oberleithner, K.**, Stöhr, M., Im, S. H., Arndt C. M., Steiberg, A. M. "Formation and flame-induced suppression of the precessing vortex core in a swirl combustor: experiments and linear stability analysis" *Combust. Flame*, 162, 8, 3100–3114, **2015**
9. Terhaar\*, S., **Oberleithner, K.**, Paschereit, C. O. "Key Parameters Governing the Precessing Vortex Core in Reacting Flows: An Experimental and Analytical Study" *Proc. Combust. Inst.*, 35, 3, 3347 - 3354 **2014**, *Awarded with the Silver Medal of The Combustion Insitute*
10. **Oberleithner, K.**, Sieber\*, M., Nayeri, C. N., Paschereit, C. O., Petz, C., Hege, H., Noack, B. R., Wygnanski, I. "Three-dimensional coherent structures in a swirling jet undergoing vortex breakdown: stability analysis and empirical mode construction" *J. Fluid Mech.*, 679, 383-414, **2011**

---

\* advisee