Alberto Cuadra Lara

Post-doctoral Researcher at Universidad Carlos III de Madrid

+34 657 500 219 | Github://AlbertoCuadra

acuadra@ing.uc3m.es | ResearchGate://Alberto-Cuadra-Lara

acuadralara.com | ORCiD://0000-0001-8280-2426

Research Experience

Jul 2023 - current	**Post-doctoral researcher in Fluid Mechanics**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain.
Jul 2019 - Jul 2023	**Pre-doctoral researcher in Fluid Mechanics**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain. Advisors: Prof. Marcos Vera & Prof. César Huete
Nov 2022 - Feb 2023	**Research-stay**: Department of Engineering for Innovation, University of Salento, Italy. Advisor: Prof. Mario Di Renzo
Mar 2019 - Jun 2019	**Research Technician in Fluid Mechanics**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain. Advisor: Prof. Marcos Vera
Oct 2018 - Jan 2019	**M.Sc. research assistant**, Fluid Mechanics Group, Universidad Carlos III de Madrid, Spain. Advisor: Prof. Marcos Vera

Education

Jul 2019 - Jul 2023	**Ph.D. in Fluid Mechanics, Universidad Carlos III de Madrid** Thesis title: Development of a wide-spectrum thermochemical code with application to planar reacting and non-reacting shocks. Advisors: Prof. Marcos Vera and Prof. César Huete. Cum Laude, International Ph.D.
Sept 2017 - Feb 2019	**M.Sc. Applied Mathematics, Universidad Carlos III de Madrid** Thesis title: Development of a thermochemical code with teaching and research applications. GPA: 3.68/4.0
Oct 2011 - Jul 2017	**B.Sc. Industrial Technologies Engineering, Universidad de Málaga** Thesis title: Numerical study of a diffusion flame with axial co-flow using ANSYS Fluent. GPA: 3.08/4.0

Awards & Fellowships

2024	**2024 Center for Turbulence Research Summer Program**, Stanford University, USA
Oct 2018 - Jan 2019	**M.Sc. Research Assistant Fellowship**, Universidad Carlos III de Madrid, Spain
Sep 2016 - Dec 2016	**Study-stay under Convocatoria Iberoamérica**, Ministerio de Educación, Spain. Destination: Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico.
Oct 2014 - Jul 2015	**Study-stay under ERASMUS +**, Ministerio de Educación, Spain. Destination: Universitatea Politehnica din București, Romania.

Publications

Journal Articles

1. **Cuadra, A.**, C. T. Williams, M. Di Renzo, Vera, M., & Huete, C. (2024). Direct numerical simulations and linear analysis for hypersonic shock-turbulence interaction in air (**work in progress**).
2. **Cuadra, A.**, Huete, C., & Vera, M. (2024). Combustion Toolbox: An open-source thermochemical code for gas- and condensed-phase problems involving chemical equilibrium (**under review**).
3. Patiño-Jaramillo, G., **Cuadra, A.**, Vera, M., & Iglesias, I. (2024). Implementation of Hydraulic Network Models for networks representing transformer winding cooling systems (**work in progress**).
4. Sánchez, J., **Cuadra, A.**, Huete, C., & Vera, M. (2022). SimEx: A tool for rapid evaluation of the effects of explosions. Applied Sciences, 12(18), 9101. DOI: 10.3390/app12189101.
5. Huete, C., **Cuadra, A.**, Vera, M., & Urzay, J. (2021). Thermochemical effects on hypersonic shock waves interacting with weak turbulence. Physics of Fluids 33, 086111 (**featured article**). DOI: 10.1063/5.0059948.

6. **Cuadra, A.**, Huete, C., & Vera, M. (2020). Effect of equivalence ratio fluctuations on planar detonation discontinuities. Journal of Fluid Mechanics, 903, A30. DOI: 10.1017/jfm.2020.651

Relevant Code contribution

1. **Cuadra, A.**, Huete, C., & Vera, M. (2024). Combustion Toolbox: A MATLAB-GUI based open-source tool for solving gaseous combustion problems. (v1.0.5). Zenodo. DOI: 10.5281/zenodo.5554911.
   Website: https://combustion-toolbox-website.readthedocs.io
2. Sánchez, J., **Cuadra, A.**, Huete, C., & Vera, M. (2022). SimEx: A tool for rapid evaluation of the effects of explosions. Applied Sciences 2022, 12(18), 9101. DOI: 10.3390/app12189101.
3. **Cuadra, A.** (2022). ATWS: Algorithmic Trading Weighted Strategy developed in Pine Script for TradingView. Available in: https://github.com/AlbertoCuadra/algo_trading_weighted_strategy.

Conference contribution

1. Di Renzo, M., **Cuadra, A.**, C. T. Williams, & Huete, C. (2024). Impact of density fluctuations on hypersonic shock-wave/turbulence interactions. In 1st European Fluid Dynamics Conference (EFDC1), Aachen, Germany.
2. **Cuadra, A.**, C. T. Williams, Di Renzo, M., Vera, M., & Huete, C. (2023). Direct numerical simulations of hypersonic shock-turbulence interactions. In 76th Annual Meeting of the Division of Fluid Dynamics (APS DFD), Washington DC, USA.
3. **Cuadra, A.**, Vera, M., Di Renzo, M., & Huete, C. (2023). Linear Theory of Hypersonic Shocks Interacting with Turbulence in Air. In 2023 AIAA SciTech Forum, National Harbor, USA. DOI: 10.2514/6.2023-0075.
4. **Cuadra, A.**, Huete, C., & Vera, M. (2022). Desarrollo de un código termoquímico para la evaluación de las propiedades teóricas de explosivos (CT-EXPLO) y la estimación del rendimiento de motores cohete (CT-ROCKET). In 9th Congreso Nacional de I+D en Defensa y Seguridad, Pontevedra, Spain.
5. **Cuadra, A.**, Huete, C., & Vera, M. (2022). Amplificación de la turbulencia a través de una onda de choque en régimen hipersónico. In 9th Congreso Nacional de I+D en Defensa y Seguridad, Pontevedra, Spain.
6. **Cuadra, A.**, Huete, C., & Vera, M. (2022). Combustion Toolbox: a MATLAB-GUI based open-source tool for solving combustion problems. In 12th National and 3rd International Conference on Engineering Thermodynamics (CNIT), Madrid, Spain.
7. **Cuadra, A.**, Huete, C., & Vera, M. (2022). Theory of turbulence augmentation across hypersonic shock waves in air. In 1st Spanish Fluid Mechanics Conference (SFMC), Cádiz, Spain.
8. **Cuadra, A.**, Huete, C., Vera, M., & Urzay, J. (2021). Theory of turbulence augmentation across hypersonic shock waves. In 74th Annual Meeting of the Division of Fluid Dynamics (APS DFD), Phoenix, USA.
9. **Cuadra, A.**, Huete, C., & Vera, M. (2021). Effect of fuel mass fraction heterogeneity on the detonation propagation speed. In 25th International Congress of Theoretical and Applied Mechanics (ICTAM), Milano, Italy.
10. Huete, C., **Cuadra, A.**, & Vera, M. (2019). Stability of non-adiabatic shock waves. Proceedings of the 27th International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS), Paper 077, Beijing, China.
11. **Cuadra, A.**, & Vera, M. (2019). Development and validation of a new MATLAB®/GUI based thermochemical code. In 11th International Mediterranean Combustion Symposium (MSC), Tenerife, Spain.
12. **Cuadra, A.**, & Vera, M. (2019). Development of a GUI-based thermochemical code with teaching and research applications. In 1st Colloquium of the Spanish Theoretical and Applied Mechanics Society (STAMS), Madrid, Spain.
13. Huete, C., Melendez, A., **Cuadra, A.**, Sánchez, J., & Vera, M. (2018). Simulación del efecto de ondas expansivas sobre estructuras porticadas. In 6th Congreso Nacional de I+D en Defensa y Seguridad, Valladolid, Spain.

Seminars & Workshops

1. **Cuadra, A.**, C. T. Williams, Di Renzo, M., Vera, M., & Huete, C. (2023). Direct numerical simulations and linear analysis for hypersonic shock-turbulence interaction in air. In 4th Spanish HPC Combustion Workshop, Barcelona, Spain.
2. **Cuadra, A.**, Huete, C. & Vera, M. (2023). Linear analysis on shock-turbulence interaction implemented with the Combustion Toolbox. Seminar presented during the research-stay with Prof. M. Di Renzo, Lecce, Italy.

3. **Cuadra, A.**, Huete, C. & Vera, M. (2021). Development of an open-source thermochemical code: Fundamentals and application to shock turbulence interaction problems in the hypersonic regime. Seminar presented as part of the PhD Programme in Mechatronics Engineering, Málaga, Spain.
4. **Cuadra, A.**, Huete, C. & Vera, M. (2019). Turbulence generation by planar detonations in heterogeneous mixtures. In Spanish Workshop on Fluid Mechanics, Granada, Spain.

Teaching

M.Sc. level

2023 - 2024	**Combustion** (12466)	Universidad Carlos III de Madrid
2020 - 2023	**Combustion** (Lab session) (12466)	Universidad Carlos III de Madrid

B.Sc. level

2019 - 2024	**Aero-thermochemical Systems** (Lab sessions) (15061)	Universidad Carlos III de Madrid
2023 - 2024	**Fluid Mechanics I - Directed studies** (17909)	Universidad Carlos III de Madrid
2023 - 2024	**Fluid Mechanics** (14023)	Universidad Carlos III de Madrid
2023 - 2024	**Fluid Mechanics** (Lab sessions) (15499)	Universidad Carlos III de Madrid
2019 - 2022	**Fluid Mechanics** (Lab sessions) (15499)	Universidad Carlos III de Madrid
2023 - 2024	**Explosion Dynamics** (Lab sessions) (16350)	Centro Universitario de la Guardia Civil
2019 - 2022	**Explosion Dynamics** (Lab sessions) (16350)	Centro Universitario de la Guardia Civil

Student Advising

M.Sc. level

2023 - 2024	2-end-of-degree project	Universidad Carlos III de Madrid

B.Sc. level

2023 - 2024	1-end-of-degree project	Universidad Carlos III de Madrid
2021 - 2022	1-end-of-degree project	Universidad Carlos III de Madrid
2019 - 2020	1-internship project	Universidad Carlos III de Madrid Sending: ENSTA Bretagne, France

Updated on April 2, 2024