

# Alberto Cuadra Lara



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## Research Experience

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

## Education

Jul 2019 - Jun 2023	<b>Ph.D. in Fluid Mechanics, Universidad Carlos III de Madrid</b> 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
Sept 2017 - Feb 2019	<b>M.Sc. Applied Mathematics, Universidad Carlos III de Madrid</b> Thesis title: Development of a thermochemical code with teaching and research applications. GPA: 3.68/4.0
Oct 2011 - Jul 2017	<b>B.Sc. Industrial Technologies Engineering, Universidad de Málaga</b> Thesis title: Numerical study of a diffusion flame with axial co-flow using ANSYS Fluent. GPA: 3.08/4.0

## Fellowships

Oct 2018 - Jan 2019	<b>M.Sc. Research Assistant Fellowship</b> , Universidad Carlos III de Madrid
Sept 2016 - Dec 2016	<b>Study-stay under Convocatoria Iberoamérica</b> , Ministerio de Educación, Spain. Destination: Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico.
Oct 2014 - Jul 2015	<b>Study-stay under ERASMUS +</b> , Ministerio de Educación, Spain. Destination: Universitatea Politehnica din București, Romania.

## Publications

### Journal Articles

- Cuadra, A.**, C. T. Williams, M. Di Renzo, Vera, M., & Huete, C. (2023). Hypersonic Shocks Interacting with Turbulence in Air: comparison of linear theory with non-equilibrium effects on DNS (**work in progress**).
- Cuadra, A.**, Huete, C., & Vera, M. (2023). Combustion Toolbox: An open-source thermochemical code for gas- and condensed-phase problems involving chemical equilibrium (**work in progress**).
- Patiño-Jaramillo, G., **Cuadra, A.**, Vera, M., & Iglesias, I. (2023). Implementation of Hydraulic Network Models for networks representing transformer winding cooling systems (**work in progress**).
- 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.
- 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
- 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. (2022). Combustion Toolbox: A MATLAB-GUI based open-source tool for solving gaseous combustion problems. (v0.9.99c). 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](https://github.com/AlbertoCuadra/algo_trading_weighted_strategy).

## Conference contribution





1. **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.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. 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.
9. **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.
10. **Cuadra, A.**, & Vera, M. (2019). Development of a GUI-based thermochemical code with teaching and research. In 1st Colloquium of the Spanish Theoretical and Applied Mechanics Society (STAMS), Madrid, Spain.
11. 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.**, 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.
2. **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.
3. **Cuadra, A.**, Huete, C. & Vera, M. (2019). Turbulence generation by planar detonations in heterogeneous mixtures. In Spanish Workshop on Fluid Mechanics, Granada, Spain.

## Teaching



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2020 - 2023		<b>Combustion</b> (Lab session)	Universidad Carlos III de Madrid
2019 - 2023		<b>Aero-thermochemistry</b> (Lab sessions)	Universidad Carlos III de Madrid
2019 - 2023		<b>Fluid Mechanics</b> (Lab sessions)	Universidad Carlos III de Madrid
2019 - 2023		<b>Explosion Dynamics</b> (Lab sessions)	Centro Universitario de la Guardia Civil

## Student Advising

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### B.Sc level

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