

Curriculum Vitae – F.Xavier Trias

Heat and Mass Transfer Technological Center (Technical University of Catalonia, UPC)
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Current position

- Nov 2018 - present: Associate Professor (*In Catalan: Professor Agregat*) at the Heat and Mass Transfer Technological Center (Technical University of Catalonia, UPC).

Education and previous positions

- Nov 2013-Nov 2018 : *Ramón y Cajal* (tenure-track) Senior Researcher at the Heat and Mass Transfer Technological Center (Technical University of Catalonia, UPC). Granted by a fellowship by the *Ministerio de Ciencia e Innovación*: **Ranked 1st** in Spain (area of Mechanical and Aeronautical Engineering).
- Jul 2009-Oct 2013: Postdoctoral Researcher at the Heat and Mass Transfer Technological Center (Technical University of Catalonia, UPC) granted by a *Juan de la Cierva* fellowship by the *Ministerio de Ciencia e Innovación*.
- Jan 2007-June 2009: Postdoctoral Researcher at the Department of Mathematics and Computing Science at the University of Groningen, The Netherlands. Granted by a *Beatriu de Pinós* fellowship by the *Generalitat de Catalunya*.
- Sep 2001-Dec 2006: PhD Mechanical Engineering in the Technical University of Catalonia (UPC). Final qualification: *Cum Laude*.

Brief summary of research in the last years

By the end of 2009, after my postdoctoral stay at the University of Groningen (The Netherlands), I was awarded with a *Juan de la Cierva* fellowship and I joined the School of Mechanical and Aeronautical Engineering at the UPC where I could consolidate my research lines. Namely, (i) the development of numerical algorithms, (ii) the direct numerical simulation (DNS) of cutting-edge turbulent configurations and (iii) the development and improvement of turbulence modeling techniques. Shortly, the first line of research was initially focused on the adaptation of a Schur complement-based parallel Poisson solver to modern supercomputers. To do so, a hybrid MPI+OpenMP parallelization strategy was used extending the range of potential scalability up to hundreds of thousands of processors. Using this approach, new DNS simulations were carried out at Rayleigh numbers significantly higher than in previous studies [1]. These results shed light into the physics of turbulence and provided reference data to test the performance of new turbulence models based on the regularization of the non-linear convective term. Moreover, on the basis of my research background, I developed a new family of eddy-viscosity models for Large-Eddy Simulation (LES) [4]. Related with this, I also derived a simpler and more accurate approach to discretize this kind of models [2] and, more recently, I proposed a new characteristic length scale for LES [5]. Finally, I would like to remark my contributions on the development of a fully-conservative spatial discretization on unstructured grids [3]. This provides a solid mathematical framework for testing subgrid stress models for LES on such grids. In summary, I have published 46 papers (17 as first author) in top-ranked international journals and I have participated in many national and international projects, two of them funded by the European Commission as a leader researcher. I also have 118 international conference papers (43 as first author). My H-index (Scopus) is 22. I have a wide teaching experience and I have supervised 7 doctoral thesis and I am currently supervising 7 more. For further information you can visit my website www.fxtrias.com.

Top five publications

5. **F.X. Trias**, A. Gorobets, M.H. Silvis, R.W.C.P. Verstappen, A. Oliva. “A new subgrid characteristic length for turbulence simulations on anisotropic grids”, *Physics of Fluids*, 26:115109, 2017.
<https://doi.org/10.1063/1.5012546>

4. **F.X. Trias**, D. Folch, A. Gorobets, A. Oliva. "Building proper invariants for eddy-viscosity subgrid-scale models", *Physics of Fluids*, 27: 065103, 2015. [dx.doi.org/10.1063/1.4921817](https://doi.org/10.1063/1.4921817)
3. **F.X. Trias**, O. Lehmkuhl, A. Oliva, C.D. Pérez-Segarra, R.W.C.P. Verstappen. "Symmetry-preserving discretization of Navier-Stokes equations on collocated unstructured grids", *Journal of Computational Physics*, 258 (1): 246-267, 2014. [dx.doi.org/10.1016/j.jcp.2013.10.031](https://doi.org/10.1016/j.jcp.2013.10.031)
2. **F.X. Trias**, A. Gorobets, A. Oliva. "A simple approach to discretize the viscous term with spatially varying (eddy-)viscosity", *Journal of Computational Physics*, 253 (1): 405-417, 2013. [dx.doi.org/10.1016/j.jcp.2013.07.021](https://doi.org/10.1016/j.jcp.2013.07.021)
1. **F.X. Trias**, M. Soria, A. Oliva, C.D. Pérez-Segarra, "Direct numerical simulations of two- and three-dimensional turbulent natural convection flows in a differentially heated cavity of aspect ratio 4", *Journal of Fluid Mechanics*, vol. 586, pp. 259-293, 2007. [dx.doi.org/10.1017/S0022112007006908](https://doi.org/10.1017/S0022112007006908)

Stays in foreign institutions

In the last decade, I have visited several international institutions accumulating more than 4.5 years. Namely,

- June-July 2016: Participation in the CTR Summer Program 2016 at the Center for Turbulence Research (CTR) at the Stanford University, USA. Research project: "Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation". Ref#5 is one of the main outcomes.
- July-October 2012 and February-June 2015: Stays at the Keldysh Institute for Applied Mathematics of the Russian Academy of Sciences, Russia.
- December 2011-March 2012, July-October 2012, March-June 2017 and December 2018: Stays at the Johann Bernoulli Institute for Mathematics and Computing Science at the University of Groningen, The Netherlands.
- January 2007-June 2009: Postdoctoral Researcher at the Department of Mathematics and Computing Science at the University of Groningen, The Netherlands, with Prof. Roel Verstappen.
- June 2005-July 2005: Stay at the Mechanical and Aerospace Engineering Department at the University of California, Los Angeles (UCLA), USA, with Prof. John Kim.
- May 2004-June 2004 and July 2006: Stay at the Department of Mathematics and Computing Science at the University of Groningen, The Netherlands, with Prof. Roel Verstappen.

Scholarships, grants and prizes

- 2013-2018: 5-year senior researcher scholarship *Ramón y Cajal* by the *Ministerio de Ciencia e Innovación*. **Ranked 1st** in Spain (in the area of Mechanical and Aeronautical Engineering) with 96/100 points.
- 2009-2012: 3-year postdoctoral scholarship *Juan de la Cierva* by the *Ministerio de Ciencia e Innovación*. Heat and Mass Transfer Technological Center in the Technical University of Catalonia.
- 2007-2009: 2-year postdoctoral scholarship *Beatriu de Pinós* by the *Generalitat de Catalunya*. Department of Mathematics and Computing Science at the University of Groningen, The Netherlands.
- 2001-2005: 4-year pre-doctoral scholarship FPU by the *Ministerio de Educación y Cultura*. PhD Student at the CTTC in the Technical University of Catalonia.

Other relevant academic/scientific activities

- Co-organizer of the ECCOMAS 2020 mini-symposiums "*Discrete conservation properties in CFD*" and "*Advanced techniques for large-eddy simulation of turbulence in near-wall regions*", July 19-24, 2020, Paris (postponed to January 2021 due to COVID19 pandemic).
- Co-organizer of the mini-symposium "*Advanced models for large-eddy simulation of wall-bounded turbulent flows*" in the ECCOMAS CFD 2018 conference, June 14-17, 2018, Glasgow.
- Leader researcher of many Tier-1 and Tier-0 supercomputing projects including the PRACE project "*Exploring new frontiers in Rayleigh-Bénard convection*" awarded with 33.1Mh.
- Co-organizer of the mini-symposium "*Advanced models for large-eddy simulation and regularization of turbulent flows*" in the ECCOMAS CFD 2014 conference, July 20-25, 2014, Barcelona.
- Member of the Scientific Committee of the ANEP (*Agencia Nacional de Evaluación y Prospectiva*) in the area of Mechanical, Naval and Aeronautical Engineering.