

MARZIO PILLER

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ITALY

EDUCATION

PhD	Università degli Studi di Bologna (ITALY) Fluid Dynamics and Heat Transfer	Feb. 2002
BS	Università degli Studi di Trieste (ITALY) Mechanical Engineering Graduated Summa Cum Laude	Feb. 1998

QUALIFICATIONS

Qualification as Associate Professor in thermal sciences, energy technology and building physics, Italian National Recruitment Program.	2014
National Engineering License, with professional practice examination.	1998

MEMBERSHIPS

- Member of the Academic Board of the PhD School in Industrial and Environmental Fluid Mechanics (2005 – 2007)
- Member of the Academic Board of the PhD School in Earth Science and Fluid Mechanics (2016 -)

GRANTS

As Principal investigator

Fondo Incentivante per la Ricerca di Base (MIUR)	2018
Subcontractor of the National Research Council for the research project PITERonboard, work-package 05, <i>Trattamento a bordo dell'acqua di sentina</i>	2017-2018

(Onboard treatment of bilge wastewater).

Finanziamento di Ateneo per la Ricerca Scientifica (internal university grant). <i>CFD investigation of de-oiling hydrocyclones for maritime applications.</i>	2014
Finanziamento di Ateneo per la Ricerca Scientifica (internal university grant). <i>TOMO4OIL – Oil reservoir ricks: improve characterization of fluid transport properties through X-ray tomography and pore-scale numerical simulation.</i>	2012
STEMMA Ltd. <i>Set-up of a LAM-type (Local Area Model) meteorological model based on WRF.</i>	2006
Dipartimento di Ingegneria Navale, del Mare e per l'Ambiente dell'Università degli Studi di Trieste. <i>Modification and improvement of a CFD code for the simulation of free turbulent jets.</i>	1998
<u>As participant</u>	
NAVALPROGETTI Ltd. (P.I.: Prof. R. Taccani, Univ. Trieste) <i>Estimating the availability of a helideck on a off-shore platform by numerical simulation.</i> Responsibility: realization of numerical simulations (geometrical model, mesh, CFD simulations) and data analysis.	2012
GEOENERGY.BZ Ltd. (P.I.: Prof. B. della Vedova, Univ. Trieste) <i>Analysis of the deep geothermal resource in South Tirol: preliminary evaluation down to 5-6 km depth.</i> Responsibility: realization of a set of one-dimensional geothermal models and data analysis.	2009
ENI E&P (Exploration and Production). (P.I.: G. Schena, Univ. Trieste) <i>Calculation of absolute and relative permeability of reservoir rocks by X-ray tomography and micro-scale CFD simulation.</i> Responsibility: realization of numerical simulations (geometrical model, mesh, CFD simulations) and data analysis.	2008-2010
Nat. Interest Project Funding (PRIN). (P.I.: Prof. B. della Vedova, Univ. Trieste) <i>Studio di un segmento di catena Alpina (traforo del Sempione) mediante modellistica termica 3-D.</i> Responsibility: realization of numerical simulations (geometrical model, mesh, heat transfer simulations) and data analysis.	2006
National Interest Project Funding (PRIN). (P.I.: Prof. C. Poloni, Univ. Trieste) <i>Ottimizzazione di superfici per problemi di scambio termico.</i> Responsibility: <i>development of a Spectral Element Method with immersed boundaries.</i>	2004
National Interest Project Funding (PRIN). (P.I.: Prof. E. Nobile, Univ. Trieste) <i>Studio della convezione naturale turbolenta in cavità con riscaldamento laterale</i>	2003

per mezzo di tecniche di simulazione numerica diretta (DNS). Responsibility: realization of direct numerical simulations of turbulent flows with heat transfer and data analysis.

National Interest Project Funding (PRIN). (P.I.: Prof. E. Nobile, Univ. Trieste) 2001
Indagine della convezione mista turbolenta in tubazioni orizzontali per mezzo di tecniche di simulazione numerica diretta. Responsibility: realization of direct numerical simulations of turbulent flows with heat transfer and data analysis.

RESEARCH EXPERIENCE

Università degli Studi di Trieste, Trieste (ITALY) Nov 1999 to present

- Numerical simulation of turbulent heat transfer
- Innovative methods for CFD (compact finite-volume schemes on staggered and boundary-fitted grids; continuous and discontinuous mixed finite-volume/finite-element methods with spectral accuracy).
- Micro-scale numerical simulation of single- and multi-phase flow through porous media.
- Application of X-ray tomography and radiography to the *quantitative* visualization of multi-phase flow through porous media.
- Models for estimating the ground thermal resistance for vertical borehole heat exchangers.
- Analytical solution of laminar free convection in inclined channels.
- Numerical simulation of laminar free convection in channels partially filled with metal foam.
- Numerical simulation of multiphase flow through hydro-cyclones.
- CFD/experimental models of professional appliances for food-processing.
- Currently exploiting numerical simulation to assess the feasibility of a strategy for mitigating bacteria contamination in surgical operating rooms.

University of Illinois, Urbana Champaign 2000 (12 months) and 2001 (three months)
Visiting researcher

- Direct numerical simulation of turbulent heat transfer at low Prandtl numbers.
Supervisor: Prof. T.J. Hanratty.

TEACHING EXPERIENCE

Undergraduate courses, Università degli Studi di Trieste, Trieste (ITALY)

- *Thermodynamics and heat transfer* 2003 - 2010
An undergraduate course within the Engineering Faculty, (90 hrs frontal lesson) averaging 20 students, covering the following topics: classical thermodynamics for mechanical engineers (with applications mainly focusing on open thermodynamic

- systems), heat transfer (conduction, convection, surface-to-surface radiation). I was the only responsible of the class. Thus, my duties consisted in providing both theoretical lessons and practice exercises, preparing the written tests for the exams, carry out oral examinations and correct homeworks.
- *Thermotechnical plants* 2011
An undergraduate course within the Engineering Faculty (60 hrs frontal lesson) followed by 2 students, covering the following topics: interactions between humans and the built environment (with particular regard to thermal-hygrometric conditions and ventilation), calculation of building's energetic needs, HVAC. I was the leading instructor for this class but I thought only the first of two modules (30 hrs frontal lesson). My duties consisted in providing both theoretical lessons and practice exercises, preparing the written tests for the exams, carry out oral examinations.
 - *Thermotechnical plants for naval applications* 2012 – present
An undergraduate course within the Engineering Faculty (50 hrs frontal lesson) averaging 15 students, covering the following topics: measurement techniques for thermotechnical plants, brief recall of relevant issues of fluid mechanics, piping, wellness conditions (with particular regard to thermal-hygrometric conditions and ventilation), calculation of energetic needs for conditioned spaces, HVAC. I am the only responsible of the class. Thus, my duties consist in providing both theoretical lessons and practice exercises, preparing the written tests for the exams, carry out oral examinations and correct homeworks.
 - *Computational mechanics* 2017-present
An undergraduate course within the Mathematics Faculty (48 hrs frontal lesson), covering the following topics: fundamental fluid mechanics (also one-dimensional, isentropic gas dynamics), finite-difference methods in CFD (Cartesian and boundary-fitted grids), pressure-velocity coupling, finite-volume methods (mainly on unstructured, polyhedral meshes). I am the only responsible of the class. Thus, my duties consist in providing both theoretical lessons and practice exercises, code several algorithms (mainly using MATLAB) that students are asked to improve/modify, preparing the written tests for the exams, carry out oral examinations and correct homeworks.
 - *Controllo Ambientale degli Edifici* 2018-present
An undergraduate course for the Architecture Bachelor degree (48 hrs frontal lesson) starting soon, mostly regarding heating and conditioning of the built environment. I am the only responsible of the class. Thus, my duties consist in providing both theoretical lessons and practice exercises, preparing the written tests for the exams, carry out oral examinations and correct homeworks.

Graduate courses, Università degli Studi di Trieste, Trieste (ITALY)

- *Thermo-pneumatics* 2016
A graduate course held for NIDEC ASI Inc., a private company active in the design, building and deployment of electric motors. Two experienced electrical engineers attend the classes (30 hrs frontal lesson), focusing on heat conduction, heat radiations,

analytical and numerical solution of hydraulic and thermal-hydraulic networks. My duties consist in preparing lecture notes (in English), also incorporating technical notes provided by NIDEC ASI Inc., providing theoretical lessons, code several algorithms (mainly using MATLAB) that students are asked to improve/modify.

- *Heat transfer* 2006 – 2007
A graduate course within the PhD School of Industrial and Environmental Fluid Mechanics (30 hrs frontal lesson) averaging 10 students, covering the following topics: conduction, convection, surface-to-surface radiation. I was the only responsible of the class. Thus, my duties consisted in providing both theoretical lessons and practice exercises, preparing the written tests for the exams, carry out oral examinations and correct homeworks.
- *Introduzione alla simulazione numerica diretta della turbolenza* (Introduction to direct numerical simulation of turbulent flows) 2005
A seminar (8 hrs frontal lesson) on direct numerical simulation of turbulence, held for PhD students at the Milan Polytechnic University.
- *Introduction to atmospheric thermodynamics and dynamics* 2007
A graduate, introductory course (15 hrs frontal lesson) on the thermodynamics and dynamics of the atmosphere, averaging 10 students. Held within the graduate training program *Energia e Ambiente (Energy and Environment)* of the ALFORM project, supported by the Friuli Venezia Giulia district (Italy).
- *Numerical methods in hydrogeology* 2009-2012
A graduate, introductory course (15 hrs frontal lesson) about numerical simulation of groundwater flow, heat- and mass-transfer. Held within the graduate training course *Caratterizzazione e Uso Sostenibile delle Risorse del Territorio (Characterization and sustainable exploitation of natural resources)*, supported by the Friuli Venezia Giulia district (Italy).

Masters Students advised

2017 M. Brocca. *Proposal and assessment of a mitigation strategy for bacteria contamination in surgical operating rooms*. Tesi di Laurea in Ingegneria Ambientale e del Territorio, Università degli Studi di Trieste. Currently underway.

2013 M. Vincis. *Numerical simulation of a ship's cabin fire*. Tesi di Laurea Magistrale in Ing. Navale, Università degli Studi di Trieste.

2012. Y. Segatto. *Calcolo della permeabilità relativa e della pressione capillare tramite digital core analysis*. Tesi di Laurea Magistrale in Ingegneria Civile Curriculum Ambientale, Università degli Studi di Trieste.

2011 D. Casagrande. *Simulazione alla scala dei pori di imbibizione e drenaggio in campioni di rocce serbatoio*. Tesi di Laurea in Ingegneria

Ambientale e del Territorio, Università degli Studi di Trieste.

Masters Students co-tutored

2010 C. Brocca. *Simulazione Numerica del fenomeno di Capillary Trapping di scCO₂ in mezzi porosi*. Tesi di Laurea in Ingegneria Ambientale e del Territorio, Università degli Studi di Trieste.

2009 F. Tonini. Simulazioni Lattice-Boltzmann di flussi bifase in rocce serbatoio. Tesi di Laurea Specialistica in Ingegneria Ambientale e del Territorio, Università degli Studi di Trieste.

2007 G. Spinelli. *Sulla possibilità di visualizzazione di flussi multifase in sistemi porosi con microtomografia*. Tesi di Laurea in Recupero delle Materie Prime Secondarie, Università degli Studi di Trieste.

2001 L. Pizzignacco. *Decomposizione del dominio nella simulazione numerica diretta di flussi convettivi turbolenti: metodologia ed applicazioni*. Tesi di Laurea in Fisica Tecnica, Università degli Studi di Trieste.

Doctoral Students advised

2016-2018 E. Tiberi. Studi fluidodinamici di apparecchiature professionali per la ristorazione. (Investigation of the fluid-dynamic features of professional food-processing appliances.) Scuola di Dottorato in Ingegneria industriale e dell'informazione, University of Trieste.

2013-2016 D. Casagrande. Characterization of dynamic processes of immiscible displacement in porous media. Scuola di Dottorato in Tecnologie per l'Energia e l'Ambiente, University of Bergamo.

2013-2015 N. del Puppo. *Metodi teorici e sperimentali per l'analisi e la progettazione di mezzi navali e strutture marine* (Theoretical and experimental methodologies for the design and assessment of floating vessels and marine structures). Scuola di Dottorato in Scienze dell'Ingegneria, Indirizzo in Ingegneria Meccanica, Navale dell'Energia e della Produzione, University of Trieste. I supervised Dr. del Puppo during the last two years of Ph.D. program.

2012-2014 G. Stipcich. *High-order methods for computational fluid dynamics*. Scuola di Dottorato in Environmental and Industrial Fluid Mechanics, University of Trieste. I supervised Dr. Stipcich during the last two years of Ph.D. program.

PATENTS

Schena, G., Piller, M., Zanin, M. *Method for tomographic reconstruction of a sample.*
University of South Australia; University of Trieste (Re-filing of Australian Provisional
Patent No 2015902664)

LANGUAGES

Italian: Native Language

English: Advanced Listener, Advanced Speaker, Superior Reading and Writing

COMPUTER SKILLS

Programming: FORTRAN90, MPI

Applications: ANSYS-FLUENT, ANSYS-ICEM, OPENFOAM, MATLAB, LATEX

Operating systems: Windows, Linux