

CURRICULUM VITAE

FILIPPOS D. SOFOS



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Date of birth: 04/04/1976

Marital status: Married, 2 children

Current position

Assistant Professor, Physics Department, School of Science, University of Thessaly (from 3rd/2021)

Member of “Computational Physics of Condensed Matter Lab”

Education

- PhD in Engineering, University of Thessaly (GR) – Civil Engineering Department (2009)
- MSc in Digital systems, Democritus University of Thrace (GR)– Electrical and Computer Engineering
- BSc and MSc in Electrical and Computer Engineering, Democritus University of Thrace – Electrical and Computer Engineering (1999)

Research interests

- Machine learning methods in Physics and Material Science
- Fluid transport properties
- Multiscale simulations (Molecular Dynamics, Smoothed-Particle Hydrodynamics, Dissipative Particle Dynamics, CFD)
- Electric/magnetic field flows
- CFD methodologies and Computational Hydraulics
- Environmental and biological flows
- Novel materials

Research experience

- (12/2021-12/2023) Principal Investigator in project “A computational framework for microscopic calculations and macroscopic predictions with novel machine learning methods” (CAMINOS), Center of Research Innovation and Excellence (C.R.I.E.) – U.Th.
- (3/2022 – 3/2025) co-Principal Investigator in project “Multiscale modelling of environmental and free surface flows with particle-based methods (MOVEFREE)”, no. 4584, U.Th. - Brown University, USA, Hellenic Foundation for Research and Innovation

- (08/2021-08/2022) Principal Investigator for project “Multiscale water desalination assisted by machine learning techniques” (ULTRAS_ML), GRNET – National Infrastructures for Research and Technology.
- (7/2014-7/2015), post-doc researcher, University of Thessaly, “Fatigue of Materials Used in Vascular Surgery – 3448, action ARISTEIA II.
- (02-09/2012), Marie Curie post-doctoral research fellow, University of Limerick (IE) – Stokes Institute, for EU GASMEMS project, Temperature measurements in 2-D microflows
- (03-04/2010), Researcher, U.Th. Development of educational MatLab code for Civil Engineering Department.
- (11/2005-10/2008), PhD student, Greek Secretariat of Research and Technology and University of Thessaly, project “Numerical simulation and experimental investigation of flows at the nano- and micro-scale.
- (07/2005-05/2006), Researcher, TEI of Lamia, Development of educational material for distance learning in IT classes.
- (09/2000-03/2001), Researcher, INTPAKOM S.A. – Xanthi research center, Management and development of Hardware - Software of a telecom multiplexer 4XE1.

Teaching experience

- (2021-now) Assistant professor (post- and under-graduate program) Physics Department, U.Th.
- (2010-2020) U.Th. – Civil Eng. Dept. – Adjunct Lecturer
- (2014-2015) University of Western Macedonia – IT & Telecom Eng. Dept. – Adjunct Lecturer
- (2013-2014) Technological Educational Institute (T.E.I.) of Central Greece – Adjunct Lecturer
- (2004-2013) Technological Educational Institute (T.E.I.) of Larisa – Adjunct Lecturer
- (2005-2008) U.Th. – Civil Engineering Department – Doctoral researcher – Teaching assistant
- (2000-2001) Democritus University of Thrace – Electrical and Computer Engineering Dept., MSc student - Teaching assistant

Thesis supervision

- Supervisor of phd student Christos Stavrogiannis, Department of Physics, U.Th.
- Member of the advisory board of phd student Kostantinos Papastamatiou, Department of Physics, U.Th.
- Member of the advisory board of phd student Vasileios Mantzavinos, Department of Physics, U.Th.
- Member of the advisory board of phd student Dimitrios Vasileiou, Department of Physics, U.Th.
- Supervisor of master’s student Dimitrios Aggelis, Department of Physics, U.Th.
- Supervisor of master’s student Kalliopi Exarhou-Kouveli, Department of Physics, U.Th.

Vocational experience

- (2015-2021) State employee
- (2004) Electrical engineer in industry section
- (2003-2004) Computer programmer (in parallel with military services).
- (2000-2003) INTPAKOM S.A., Xanthi Research Center, Greece – Software/Hardware Engineer

Grants

- Marie Curie grant as experienced researcher, University of Limerick, Stokes Institute, 2012
- Technical Chambers of Greece, grant for university degrees, Democritus University of Thrace, 1999

Languages

- Mother tongue: Greek
- English: Cambridge Proficiency in English degree (C2)
- Spanish: Inicial de Espanol degree (B1)
- Deutsch: (A2)

Computer skills

- Operating systems: MS Windows, Linux/Unix
- Programming languages: Python, Julia, R, Fortran, C/C++, VHDL, Tcl, Assembly
- Computer tools: MatLab/Octave, LabView, LAMMPS, MPLAB, Xilinx Design Suite, Altera Design Suite, Protel PCB, AutoCAD

Invited Talks

- “Symbolic regression: re-assessing fluid properties through analytical equations derived exclusively from data with physics-based descriptions”, at Nano-AI, NCSR Demokritos, GR, June 2022.

Journal Editor

- Guest Editor for the Special Issue “Nanofluidics: Computational Methods and Applications” Frontiers in Nanotechnology Journal, 2022-23.
- Guest Editor for the Special Issue “Machine Learning and Artificial Intelligence in Fluid Mechanics”, Fluids Journal, MDPI, 2022-23.
- Guest Editor for the Special Issue "Fluid Flows at the Nanoscale", Fluids Journal, MDPI, 2021.

Member of Institutions

- Referee in peer-reviewed journals, such as: Nature Communications, Microfluidics and Nanofluidics (Springer), Heat and Mass Transfer (Springer), Desalination (Elsevier), International Journal of Heat and

Mass Transfer (Elsevier), Journal of Molecular Liquids (Elsevier), Computational Material Science (Elsevier), Molecular Simulation (Taylor & Francis), Symmetry, Entropy, Fluids (MDPI), Membrane and Water Treatment (Techno-Press), MRS Communications (Cambridge Core)

- Member of Technical Chambers of Greece since 2000.
- Member of Psi-K, CECAM

Journal Publications

1. F. Sofos , A. Charakopoulos , K. Papastamatiou ,T.E. Karakasidis, A combined clustering/symbolic regression framework for fluid property prediction, Physics of Fluids 34 (2022) 062004.
2. F. Sofos, C. Stavrogiannis, K. K. Exarhou-Kouveli, D. Akaboua, G. Charilas, T. E. Karakasidis, Current Trends in Fluid Research in the era of Artificial Intelligence: A Review, Fluids 7 (2022) 116. *(feature paper for the Journal: Feature Papers are submitted upon individual invitation or recommendation by the scientific editors)*
3. K. Papastamatiou, F. Sofos, T.E. Karakasidis, Machine learning symbolic equations for diffusion with physics-based descriptions AIP Advances 12 (2022) 025004.
4. F. Sofos, T.E. Karakasidis, I.E. Sarris, Effects of channel height, wall wettability, and electric field strength on ion removal from water in nanochannels, Nature Scientific Reports 12 (2022) 641.
5. F. Sofos, E. Chatzoglou, and A. Liakopoulos, An assessment of SPH simulations of sudden expansion/contraction 3-D channel flows. Computational Particle Mechanics 9 (2022) 101-115.
6. F. Sofos, A Water/Ion Separation Device: Theoretical and Numerical Investigation, Applied Sciences 11(2021) 8548.
7. F. Sofos, T.E. Karakasidis, Nanoscale slip length prediction with machine learning tools, Nature Scientific Reports (2021) 11, 12520.
8. F. Sofos, T.E. Karakasidis, Machine learning techniques for fluid flows at the nanoscale, Fluids 6, (2021) 96. *Editor's Choice article: Recommended by the scientific editors of MDPI journals, that they believe will be particularly interesting to authors, or important in this field. The aim is to provide a snapshot of some of the most exciting work published in the various research areas of the journal.*
9. F. Sofos, T.E. Karakasidis, I.E. Sarris, Molecular Dynamics Simulations of Ion Drift in Nanochannel Water Flow, Nanomaterials 10 (2020) 2373.
10. F. Sofos, T.E. Karakasidis, D. Spetsiotis, Molecular Dynamics simulations of ion separation in nano-channel water flows using an electric field, Molecular Simulation 45 (2019), 1395-1402.
11. F. Sofos, A. Liakopoulos, T.E. Karakasidis, Particle-based modeling and meshless simulation of flows with Smoothed Particle Hydrodynamics, Global Nest 21(2019) 513-518.
12. D. Spetsiotis, F. Sofos, T.E. Karakasidis, D. Kasiteropoulou, A. Liakopoulos, Multi-parameter analysis of water flows in nanochannels, Desalination and Water Treatment 125 (2018), 8-15.

13. A. Liakopoulos, F. Sofos, T.E. Karakasidis, Darcy-Weisbach friction factor at the nanoscale: From atomistic calculations to continuum models, *Physics of Fluids* 29, 052003 (2017).
14. A. Liakopoulos, F. Sofos, T.E. Karakasidis, Friction factor in nanochannel flows, *Microfluidics & Nanofluidics* 20 (2016) 1-7.
15. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Molecular dynamics simulation on flows in nano-ribbed and nano-grooved channels, *Heat and Mass Transfer* 52 (2016)153-162.
16. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Fluid structure and system dynamics in nanodevices for water desalination, *Desalination and Water Treatment* 57 (2015), 11561-11571.
17. A.E. Giannakopoulos, F. Sofos, T.E. Karakasidis, A. Liakopoulos, A quasi-continuum multi-scale theory for self-diffusion and fluid ordering in nanochannel flows, *Microfluidics & Nanofluidics* 17 (2014), 1011-1023.
18. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, How wall properties control diffusion in grooved nanochannels: a molecular dynamics study, *Heat and Mass Transfer* 49 (2013) 1081-1088.
19. P. Berillis, C. Simon, E. Mente, F. Sofos, I.T. Karapanagiotidis, A novel image processing method to determine the nutritional condition of lobster, *Micron* 45 (2013) 140-144.
20. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Fluid flow at the nanoscale: how fluid properties deviate from the bulk, *Nanoscience & Nanotechnology Letters* 5 (2013) 1-4.
21. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Parameters affecting slip length at the nanoscale, *Journal of Computational & Theoretical Nanoscience* 10 (2013) 1-3.
22. A.E. Giannakopoulos, F. Sofos, T.E. Karakasidis, A. Liakopoulos, Unified description of size effects of transport properties of liquids flowing in nanochannels, *International Journal of Heat & Mass Transfer* 55 (2012) 5087-5092.
23. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Surface wettability effects on flow in rough wall nanochannels, *Microfluidics & Nanofluidics* (2012), Volume 12, Numbers 1-4, 25-31.
24. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Effect of wall roughness on diffusion coefficient and shear viscosity in nanochannels, *International Journal of Heat & Mass Transfer* 53 (2010) 3839-3846.
25. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Effects of wall roughness on flow in nanochannels, *Physical Review E* 79 (2009) 026305.
26. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Transport properties of liquid argon in krypton nanochannels: Anisotropy and non-homogeneity introduced by the solid walls, *International Journal of Heat & Mass Transfer* 52 (2009) 735-743.
27. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Non-Equilibrium Molecular Dynamics investigation of parameters affecting planar nanochannel flows, *Contemporary Engineering Sciences* 2 (2009) 283-298.

28. M. Sagri, F. Sofos, D. Mouzaki, “Digital Storytelling, comics and new technologies in education: review, research and perspectives”, *The International Education Journal: Comparative Perspectives* 17 (2018) 98-113.
29. M. Sagri, D. Mouzaki, F. Sofos, “Teaching cinema with machinima”, *International Journal of Arts and Technology* 12, 2 (2020) 155-173.

Book chapters

- B1 F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos and A. Liakopoulos, “Fluid flows from nanoscale to macroscale: a molecular dynamics based approach”, *Advances in Civil Engineering Research*, ISBN: 978-960-88490-4-4, Volos 2014.
- B2 F. Sofos, T.E. Karakasidis, and A. Liakopoulos, “Fluid transport properties at the nanoscale by molecular dynamics simulations”, *Advances in Civil Engineering Research*, ISBN: 978-960-88490-4-4, Volos 2014.
- B3 F. Sofos, T.E. Karakasidis, and A. Liakopoulos, “*Variation of transport properties along nanochannels: a study by non-equilibrium molecular dynamics*”, *IUTAM Symposium on Advances in Micro- and Nanofluidics*, IUTAM Bookseries 15, Springer Science + Business Media B.V., 2009.
- B4 F. Sofos, I. Andreadis, F. Tsalides, “*A cellular approach on calculating square root according to IEEE 754*”, *Proceedings of the 4^o Int. Conference on Technology and Automation*, Tziolas, Thessaloniki GR, 2000.

Conference publications/presentations

1. K. Papastamatiou, F. Sofos, T.E. Karakasidis, Calculating material properties with purely data-driven methods: From clusters to symbolic expressions. In *ACM Conference Proceedings of the 12th Hellenic Conference on Artificial Intelligence (SETN 2022)*, September 07–09, 2022, Corfu, Greece ACM, New York, NY, USA.
2. F. Sofos, T.E. Karakasidis, M. Valasaki, C.G. Papakonstantinou, Mechanical and structural properties of FRP concrete: data-driven, machine learning approaches, *XXXVI Pan-Hellenic conference on Solid-State Physics and Materials Science*, 26-28 September 2022, Heraklion, Greece.
3. K. Papastamatiou, K.K. Exarhou-Kouveli, C. Stavrogiannis, F. Sofos, T.E. Karakasidis, From Lennard-Jones to real fluids: property extraction with symbolic regression, *Materials Science and Engineering (MSE) 2022*, 27-29 September 2022, Darmstadt, Germany.
4. F. Sofos, T.E. Karakasidis, The slip length as a material property: calculations at the nanoscale with machine learning tools, *XXXV Panhellenic Conference on Solid State Physics and Materials Science*, NCSR “Demokritos”, 26-29 September 2021, Athens, Greece.
5. E. Chatzoglou, F. Sofos, A. Liakopoulos, SPH based study of confined microflows characterized by abrupt changes in cross-sectional area, *ECOMAS: Particles 2021*, Hamburg, Germany, October 2021.

6. D. Spetsiotis, F. Sofos, T.E. Karakasidis, A. Liakopoulos, Nanoscale flows for water purification applications, 3rd Efficient Water Systems Conference, Lefkada, GR, June 2018.
7. A. Liakopoulos, F. Sofos, T.E. Karakasidis, Modelling Environmental Flows with Lagrangian Particle Methods, 14th International Conference on Protection and Restoration of the Environment, Thessaloniki, GR, July 2018.
8. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Wall effects on diffusion coefficients in nanochannel flows, 11th International Conference on Diffusion in Solids and Liquids, Munich, Germany, June 2015.
9. F. Sofos, T.E. Karakasidis, A. Liakopoulos, The impact of slip on nanochannel friction factor, 8th GRACM International Congress on Computational Mechanics, Volos, GR, July 2015.
10. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Molecular dynamics methods for modelling blood flows at the micro/nano scale, 12th International Conference on Nanosciences & Nanotechnologies (NN15), 7-10 July 2015, Thessaloniki, Greece.
11. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos and A. Liakopoulos, Transport properties of fluids in hydrophobic/hydrophilic nanochannels, 4th Micro/Nanoflows Conf., London, UK, September 2014
12. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Understanding the structure of fluid flows in nanodevices through molecular dynamics simulations, 12th International Conference on Protection and Restoration of the Environment, Skiathos, GR, July 2014
13. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Darcy friction factor in nanoscale channel flows: a molecular dynamics study, 10th HSTAM International Congress on Mechanics May 2013, Chania, Crete, Greece.
14. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Fluid/wall interactions in a nanofluidic system: the interface region, 9th International Conference on Nanosciences & Nanotechnologies (NN12), July 2012, Thessaloniki, Greece
15. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Transport properties of fluids in confined nanochannels: bridging nano to macro, 3rd Micro and Nano Flows Conference (MNF2011), August 2011, Thessaloniki, Greece.
16. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Fluid flow at the nanoscale: how fluid properties deviate from the bulk, 8th International Conference on Nanosciences & Nanotechnologies (NN11), July 2011, Thessaloniki, Greece
17. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Fluid properties in rough-wall nanochannels, 2nd European Conference on Microfluidics, Toulouse, 2010
18. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Non-Equilibrium Molecular Dynamics Simulations of Channel Flows, Bulletin of the APS 52 (17), 2007.

19. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Variation of transport properties along nanochannels: a study by non-equilibrium molecular dynamics, IUTAM Symposium on Advances in Micro- and Nanofluidics, Dresden, 2007
20. IT role in agriculture and smart water management, International conference, Thessaly Region – Pinios River, Larissa, November 2018.
21. F. Sofos, T.E. Karakasidis, and A. Liakopoulos, Slip/No slip existence at the nanoscale, XXVI Panhellenic Conference on Solid State Physics and Materials Science, Ioannina, 2010.
22. D. Kasiteropoulou, F. Sofos, T.E. Karakasidis, A. Liakopoulos, Multiscale modeling in rough wall channels, Flow 2008, Kozani, November 2008.
23. T.E. Karakasidis, F. Sofos, D. Kasiteropoulou, A. Liakopoulos, Transport properties calculation with MD methods, Flow 2006, Patras, November 2006.
24. F. Sofos, Temperature measurements in 2D microflows, Marie-Curie ESOF 2012, July 2012, Dublin, IE.
25. P. Berillis, E. Mente, C. Simon, F. Sofos, I.T. Karapanagiotidis, Tubule and digestive cell area measurement of the digestive gland of lobsters. The role of image analysis into the digestive physiology, The Crustacean Society Summer Meeting and the 10th Colloquium Crustacea Decapoda Mediterranea, July 2012, Athens.
26. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Width effects on flows in nanochannels, XXV Panhellenic Conference on Solid State Physics & Materials Science, Thessaloniki, September 2009.
27. A. Liakopoulos, F. Sofos, T.E. Karakasidis, Molecular Dynamics to extract friction factor at the nanoscale 32th Panhellenic Conference on Solid State Physics and Materials Science, Ioannina, 2016.
28. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Molecular Dynamics simulations: a tool for studying micro and nano-bleeding, 2st Workshop on Fatigue of Materials used in Vascular Surgery, Thessaloniki, GR, May 2015.
29. F. Sofos, T.E. Karakasidis, A.E. Giannakopoulos, A. Liakopoulos, Modelling and simulation of size effects on liquid flows at small scales, 1st Workshop on Fatigue of Materials used in Vascular Surgery, Volos, GR, February 2015.
30. F. Sofos, T.E. Karakasidis, A. Liakopoulos, Argon shear viscosity calculation in a rough-wall nanochannel, Nanotech Conference & Expo 2011, June 2011, Boston MA, USA.
31. Presentation: F. Sofos, GASMEMS project presentation, 1st European Conference on Gas Microflows GASMEMS 2012, June 2012, Skiathos, GR.
32. Presentation: F. Sofos, HydroMedon, 2nd Panhellenic Meeting of post-graduate students, Volos, 2008.
33. Presentation: Analysis, Statistical processing and data presentation with open software, Open software for engineers meeting, TEE of C.-W. Thessaly, Larissa, 2018.

Other publications

- 1 Post-doc technical report, Measurement of Temperature in a 2D Microchannel, Limerick, Ireland, 2012.
- 2 PhD Thesis: Fluid flows at the nanoscale: Numerical modelling with MD methods, Volos, GR, 2009.
- 3 MSc Thesis: Advanced pipelining methods, Xanthi, GR, 2002.
- 4 BSc Thesis: Design and implementation of a voltage stabilizer with DSP, Xanthi, 1999.