

Curriculum Vitae – Dr. Maurits H. Silvis

Chair of Fluid Dynamics
Technical University of Darmstadt
Otto-Berndt-Straße 2
64287 Darmstadt
Germany

Email: silvis@fdy.tu-darmstadt.de
Website: www.mauritssilvis.nl
LinkedIn: www.linkedin.com/in/mauritssilvis

Summary

My name is Maurits Silvis and I am a software developer and tester at the Frankfurt office of beQualified GmbH, as well as a postdoctoral guest researcher at the Chair of Fluid Dynamics of the Technical University of Darmstadt, Germany.

Previously, I was a PhD student in Computational Fluid Dynamics at the University of Groningen, The Netherlands. During my PhD, I focused on improving turbulence models for large-eddy simulations of incompressible flows. In particular, I devised a framework of constraints for the construction of physics-based turbulence models. I also worked on a new turbulence model for rotating turbulent flows.

Experience

- Software and Test Automation Engineer 2020/02 – present
beQualified GmbH, Frankfurt, Germany
- Guest Researcher in Computational Fluid Dynamics 2019/02 – present
Technical University of Darmstadt, Germany
Department: Mechanical Engineering
Research group: Chair of Fluid Dynamics
Advisor: Prof. Martin Oberlack

Education

- PhD Computational Fluid Dynamics 2013/09 – 2020/10
University of Groningen, The Netherlands
Department: Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence
Research group: Computational Mechanics & Numerical Mathematics
Thesis: Physics-based turbulence models for large-eddy simulation: Theory and application to rotating turbulent flows
Advisors: Prof. Arthur Veldman, Prof. Roel Verstappen
- MSc Theoretical Physics 2010/09 – 2012/08
University of Groningen, The Netherlands
Department: Zernike Institute for Advanced Materials
Research group: Theory of Condensed Matter
Thesis: Signatures of exciton-phonon coupling in linear absorption spectra of molecular aggregates: A polaron transformation approach
Advisors: Erik Bloemsa, Prof. Jasper Knoester
Distinction: *Cum laude* (with honor)
- BSc Physics 2007/09 – 2010/08
University of Groningen, The Netherlands
Department: Center for Theoretical Physics
Research group: Theoretical High-Energy Physics
Thesis: A quaternion formulation of the Dirac equation
Advisor: Prof. Mees de Roo
Distinction: *Cum laude* (with honor)

Study and research abroad

- *CTR Summer Program 2016* 2016/06 – 2016/07
Stanford University, Stanford, California
Department: Center for Turbulence Research (CTR)
Project: Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation
Advisor: Prof. Roel Verstappen
Collaborators: Xavier Trias, Jane Bae, Mahdi Abkar, Adrián Lozano-Durán
- *Mathematics of Turbulence* 2014/09, 2014/11
University of California, Los Angeles (UCLA)
Department: Institute for Pure and Applied Mathematics (IPAM)
Project: The higher-order gradient model for large-eddy simulation of turbulent flows
Advisors: Prof. Arthur Veldman, Prof. Roel Verstappen

Awards

- Awarded participation in the 2018 conference on *Symmetry and Computation*
- Received the Young Scientist Award for the best oral presentation at the 2017 *International Workshop on Complex Turbulent Flows*
- Awarded participation in the 2016 *CTR Summer Program* of the Center for Turbulence Research (CTR) at Stanford University for the research proposal entitled “Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation”
- Awarded participation in the 2014 *Mathematics of Turbulence* long program of the Institute for Pure and Applied Mathematics (IPAM) at the University of California, Los Angeles (UCLA)
- Obtained MSc degree in Theoretical Physics with the distinction *cum laude* (with honor)
- Obtained BSc degree in Physics with the distinction *cum laude* (with honor)
- Received the 2008 Holland Society Young Talent Incentive Award for the best first-year study results in Physics in the Netherlands

Research interests

- Computational fluid dynamics
- Turbulence modeling
- Large-eddy simulation

Publications

Peer-reviewed journal publications

4. Streher, L. B., Silvis, M. H., Cifani, P., and Verstappen, R. W. C. P. (2021). “Mixed modeling for large-eddy simulation: The single-layer and two-layer minimum-dissipation-Bardina models”. *AIP Advances* 11, 015002. DOI: 10.1063/5.0015293.
3. Trias, F. X., Gorobets, A., Silvis, M. H., Verstappen, R. W. C. P., and Oliva, A. (2017). “A new subgrid characteristic length for turbulence simulations on anisotropic grids”. *Physics of Fluids* 29, 115109. DOI: 10.1063/1.5012546.
2. Silvis, M. H., Remmerswaal, R. A., and Verstappen, R. (2017). “Physical consistency of subgrid-scale models for large-eddy simulation of incompressible turbulent flows”. *Physics of Fluids* 29, 015105. DOI: 10.1063/1.4974093.

1. Bloemsmas, E. A., Silvis, M. H., Stradomska, A., and Knoester, J. (2016). “Vibronic effects and destruction of exciton coherence in optical spectra of J-aggregates: A variational polaron transformation approach”. *Chemical Physics* 481, pp. 250–261. DOI: 10.1016/j.chemphys.2016.06.018.

Preprints

2. Silvis, M. H., Bae, H. J., Trias, F. X., Abkar, M., and Verstappen, R. (2019). “A nonlinear subgrid-scale model for large-eddy simulations of rotating turbulent flows”. arXiv: 1904.12748 [physics.flu-dyn].
1. Silvis, M. H. and Verstappen, R. (2015). “Physically-consistent subgrid-scale models for large-eddy simulation of incompressible turbulent flows”. arXiv: 1510.07881 [physics.flu-dyn].

Peer-reviewed conference proceedings

5. Silvis, M. H. and Verstappen, R. (2019). “Nonlinear Subgrid-Scale Models for Large-Eddy Simulation of Rotating Turbulent Flows”. In: *Direct and Large-Eddy Simulation XI*. ed. by Salvetti, M. V., Armenio, V., Fröhlich, J., Geurts, B. J., and Kuerten, H. Springer International Publishing, pp. 129–134. DOI: 10.1007/978-3-030-04915-7_18.
4. Streher, L. B., Silvis, M. H., and Verstappen, R. (2018). “Mixed modeling for large-eddy simulation: The minimum-dissipation-Bardina-model”. In: *Proceedings of the 7th European Conference on Computational Fluid Dynamics*. Ed. by Owen, R., De Borst, R., Reese, J., and Pearce, C. International Center for Numerical Methods in Engineering, Barcelona, Spain, pp. 335–345.
3. Silvis, M. H. and Verstappen, R. (2018). “Constructing Physically Consistent Subgrid-Scale Models for Large-Eddy Simulation of Incompressible Turbulent Flows”. In: *Turbulence and Interactions: Proceedings of the TI 2015 Conference*. Ed. by Deville, M. O., Couaillier, V., Estivalezes, J.-L., Gleize, V., Lê, T.-H., Terracol, M., and Vincent, S. Springer International Publishing, pp. 241–247. DOI: 10.1007/978-3-319-60387-2_26.
2. Silvis, M. H., Remmerswaal, R. A., and Verstappen, R. (2017). “A Framework for the Assessment and Creation of Subgrid-Scale Models for Large-Eddy Simulation”. In: *Progress in Turbulence VII: Proceedings of the iTi Conference in Turbulence 2016*. Ed. by Örlü, R., Talamelli, A., Oberlack, M., and Peinke, J. Springer International Publishing, pp. 133–139. DOI: 10.1007/978-3-319-57934-4_19.
1. Silvis, M. H., Trias, F. X., Abkar, M., Bae, H. J., Lozano-Durán, A., and Verstappen, R. W. C. P. (2016). “Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation”. In: *Studying Turbulence Using Numerical Simulation Databases - XVI: Proceedings of the 2016 Summer Program*. Ed. by Moin, P. and Urzay, J. Center for Turbulence Research, Stanford University, pp. 265–274.

Popular science writing

1. Silvis, M. (2015). “Osborne Reynolds: On the phenomenon of turbulence”. *Periodiek. Magazine of the FMF, student association for Physics and Mathematics, University of Groningen* 3, pp. 14–17. URL: http://perio.fmf.nl/archief/perio_2015-3.pdf#page=14.

Theses

3. Silvis, M. H. (2020). “Physics-based turbulence models for large-eddy simulation. Theory and application to rotating turbulent flows”. PhD thesis. University of Groningen, The Netherlands. DOI: 10.33612/diss.133469979.
2. Silvis, M. H. (2012). “Signatures of exciton-phonon coupling in linear absorption spectra of molecular aggregates. A polaron transformation approach”. Master’s thesis. University of Groningen, The Netherlands.
1. Silvis, M. H. (2010). “A quaternion formulation of the Dirac equation”. Bachelor’s thesis. University of Groningen, The Netherlands.

Metrics

Citations: 93

h-index: 5

Citations excluding self-citations: 66

h-index excluding self-citations: 4

Presentations

International conference presentations

13. Streher, L. B., Silvis, M. H., and Verstappen, R. (2018). “Mixed modeling for large-eddy simulation: The minimum-dissipation-Bardina model”. *7th European Conference on Computational Fluid Dynamics*, Glasgow, United Kingdom, June 11–15, 2018.
12. Silvis, M. H. and Verstappen, R. (2018). “Symmetry constraints for the modeling and numerical simulation of turbulent flows”. *Symmetry and Computation*, Marseille, France, April 3–7, 2018.
11. Silvis, M. H. and Verstappen, R. (2017). “A new turbulence model for large-eddy simulations of rotating flows”. *International Workshop on Complex Turbulent Flows*, Tangier, Morocco, November 27–28, 2017.
10. Trias, F. X., Gorobets, A., Silvis, M. H., Verstappen, R. W. C. P., and Oliva, A. (2017). “A new subgrid characteristic length for large-eddy simulation”. *International Workshop on Complex Turbulent Flows*, Tangier, Morocco, November 27–28, 2017.
9. Silvis, M. H., Bae, H. J., Trias, F. X., Abkar, M., Moin, P., and Verstappen, R. (2017). “Subgrid-scale models for large-eddy simulation of rotating turbulent channel flows”. *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, Colorado, United States of America, November 19–21, 2017.
8. Silvis, M. H., Trias, F. X., and Verstappen, R. (2017). “New subgrid-scale models and characteristic length scales for large-eddy simulation of rotating turbulent flows”. *16th European Turbulence Conference*, Stockholm, Sweden, August 21–24, 2017.
7. Silvis, M. H. and Verstappen, R. (2017). “Nonlinear subgrid-scale models for large-eddy simulation of rotating turbulent flows”. *Direct and Large-Eddy Simulation XI*, Pisa, Italy, May 29–31, 2017.
6. Silvis, M., Trias, X., Abkar, M., Bae, H. J., Lozano-Durán, A., and Verstappen, R. (2016). “Subgrid-scale models for large-eddy simulation of rotating turbulent flows”. *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, Oregon, United States of America, November 20–22, 2016.
5. Silvis, M., Remmerswaal, R., and Verstappen, R. (2016). “A framework for the assessment and creation of subgrid-scale models for large-eddy simulation”. *7th Interdisciplinary Turbulence Initiative Conference on Turbulence*, Bertinoro, Italy, September 7–9, 2016.
4. Verstappen, R. and Silvis, M. (2015). “Scale-truncating relaxation models for large eddy simulations”. *68th Annual Meeting of the APS Division of Fluid Dynamics*, Boston, Massachusetts, United States of America, November 22–24, 2015.
3. Silvis, M. and Verstappen, R. (2015). “Physically-consistent subgrid-scale models for large-eddy simulation of incompressible turbulent flows”. *4th International Conference on Turbulence and Interactions*, Cargèse, France, November 2–6, 2015.
2. Silvis, M. and Verstappen, R. (2015). “Going beyond eddy viscosity: Finding a minimal representation of subgrid-scale stresses in large-eddy simulation”. *15th European Turbulence Conference*, Delft, The Netherlands, August 25–28, 2015.
1. Silvis, M. H., Verstappen, R. W. C. P., and Veldman, A. E. P. (2014). “The higher-order gradient model for large-eddy simulation of turbulent flows”. *6th European Conference on Computational Fluid Dynamics*, Barcelona, Spain, July 20–25, 2014.

International workshop presentations

2. Silvis, M., Trias, F. X., Abkar, M., Bae, H. J., Lozano-Durán, A., and Verstappen, R. (2016). “Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation”. *CTR Summer Program 2016*, Center for Turbulence Research, Stanford University, Stanford, California, United States of America, June 26 – July 22, 2016.
1. Silvis, M., Verstappen, R., and Veldman, A. (2014). “The higher-order gradient model for large-eddy simulation of turbulent flows”. *Mathematics of Turbulence*, Institute for Pure and Applied Mathematics, University of California, Los Angeles, United States of America, September 8 – December 12, 2014.

Presentations during national meetings

3. Silvis, M. and Verstappen, R. (2017). “Subgrid-scale modeling for large-eddy simulation of rotating channel flows”. *Turbulence Contact Day*, J. M. Burgerscentrum, Delft, The Netherlands, October 27, 2017.
2. Silvis, M. and Verstappen, R. (2016). “Physically consistent turbulence models for large-eddy simulation”. *Burgers Symposium 2016*, Lunteren, The Netherlands, June 16–17, 2016.
1. Silvis, M., Verstappen, R., and Veldman, A. (2015). “Going beyond eddy viscosity: Finding a general representation of subgrid-scale stresses in large-eddy simulation”. *Turbulence Contact Day*, J. M. Burgerscentrum, Delft, The Netherlands, June 12, 2015.

Presentations during scientific visits

2. Silvis, M., Remmerswaal, R., and Verstappen, R. (2017). “Physical consistency of subgrid-scale models for large-eddy simulation”. Chair of Fluid Dynamics, Technical University of Darmstadt, Darmstadt, Germany, February 14, 2017.
1. Silvis, M. and Verstappen, R. (2016). “Physical consistency of subfilter-scale models for large-eddy simulation of incompressible turbulent flows”. Heat and Mass Transfer Technological Center, Technical University of Catalonia, Terrassa, Spain, January 25–29, 2016.

Poster presentations during international conferences

2. Silvis, M. H. and Verstappen, R. (2018). “Symmetries and conservation laws as constraints for the modeling and numerical simulation of turbulent flows”. *Symmetry and Computation*, Marseille, France, April 3–7, 2018.
1. Silvis, M. H., Bloemsma, E. A., Stradomska, A. U., and Knoester, J. (2012). “Spectral signatures of exciton-phonon coupling in molecular aggregates: A polaron transformation approach”. *10th International Conference on Excitonic Processes in Condensed Matter, Nanostructured and Molecular Materials*, Groningen, The Netherlands, July 2–6, 2012.

Poster presentations during international workshops

1. Silvis, M. H. and Verstappen, R. W. C. P. (2014). “How to model subgrid-scale effects on large-scale energy distribution in large-eddy simulation of turbulent flows?”. *Mathematics of Turbulence*, Institute for Pure and Applied Mathematics, University of California, Los Angeles, United States of America, September 8 – December 12, 2014.

Poster presentations during national meetings

3. Silvis, M. H. and Verstappen, R. W. C. P. (2015). “Symmetry-preserving subgrid-scale models for large-eddy simulation of turbulent flows”. *40th Woudschoten Conference*, Zeist, The Netherlands, October 7–9, 2015.
2. Silvis, M. H. and Verstappen, R. W. C. P. (2015). “Going beyond eddy viscosity: Finding a minimal representation of subgrid-scale stresses in large-eddy simulation”. *Burgers Day*, J. M. Burgerscentrum, Delft, The Netherlands, January 15, 2015.

1. Bloemsma, E. A., Silvis, M. H., Malyshev, V. A., and Knoester, J. (2012). “Exciton Dynamics in Coupled Molecular Aggregates”. *Physics @ FOM*, Veldhoven, The Netherlands, January 17–18, 2012.

Teaching

Supervision

- Bachelor research project in Applied Mathematics 2016/03 – 2016/07
University of Groningen, The Netherlands
Student: Daniel Ward
Project: Assessing turbulence models for large-eddy simulation using exact solutions to the Navier-Stokes equations
Co-supervised with: Prof. Roel Verstappen
Reference: Ward, D. (2016). “Assessing turbulence models for large-eddy simulation using exact solutions to the Navier–Stokes equations”. Bachelor’s thesis. University of Groningen, The Netherlands
- Master research project in Applied Mathematics 2014/07 – 2016/05
University of Groningen, The Netherlands
Student: Ronald A. Remmerswaal
Project: A Family of Orthogonalised Nonlinear LES Models Based on the Velocity Gradient: Discretisation and Analysis
Co-supervised with: Prof. Roel Verstappen
Reference: Remmerswaal, R. A. (2016). “A Family of Orthogonalised Nonlinear LES Models Based on the Velocity Gradient: Discretisation and Analysis”. Master’s thesis. University of Groningen, The Netherlands

Teaching experience

Teaching assistant at University of Groningen, The Netherlands

- Numerical Mathematics 1 2016/02 – 2016/06
- Partial Differential Equations 2016/01 – 2016/06
- Numerical Mathematics 1 2015/03 – 2015/07
- Partial Differential Equations 2015/01 – 2015/05
- Linear Algebra for Industrial Engineering and Management students 2011/04 – 2011/07
- Calculus 1 2010/09 – 2010/11
- Linear Algebra for Industrial Engineering and Management students 2010/04 – 2010/07
- Calculus for Industrial Engineering and Management students 2009/11 – 2010/02
- Mathematics Refresher Course 2009/09 – 2009/10
- Calculus for Industrial Engineering and Management students 2008/11 – 2009/02
- Mathematics Refresher Course 2008/09 – 2008/10

Teaching certificates

- Teaching for PhD students (2 ECTS) 2015/03 – 2015/06
Educational Support and Innovation, and Graduate School of Science
University of Groningen, The Netherlands
- Introduction to Teaching (1 ECTS) 2014/06
Educational Support and Innovation, and Graduate School of Science
University of Groningen, The Netherlands

Other academic activities

- Reviewer for *Physics of Fluids* 2017/11 – 2018/04
- Organization of research group meetings 2013/09 – 2017/03
Organize the bi-weekly colloquium of the research group I worked in, during which PhD students and, occasionally, (international) guests presented their latest results
- Outreach: Presentation during student career orientation day 2017/03
Tell students in Mathematics and Physics about my career path as an academic researcher
- Research evaluation Mathematics 2015/11
Participate in the five-yearly research evaluation of the Bernoulli Institute
- Outreach: Popular science article 2015/02 – 2015/06
Reference: Silvis, M. (2015). “Osborne Reynolds: On the phenomenon of turbulence”. *Periodiek. Magazine of the FMF, student association for Physics and Mathematics, University of Groningen* 3, pp. 14–17. URL: http://perio.fmf.nl/archief/perio_2015-3.pdf#page=14
- Outreach: Presentation during *Student for a day* 2013/11, 2014/03
Present my research during open days for secondary school pupils, to inform them about the daily (working) life of an academic researcher

Programming

Programming languages

- Java
- Gherkin
- Python
- HTML
- CSS
- JavaScript
- PHP
- SQL
- MATLAB
- Mathematica
- C++
- Fortran
- LaTeX

Tools

- Bash
- Git
- GitLab
- GitHub

- Bitbucket
- Jira
- Jenkins
- ReportPortal

Software

- *lesTools*: A toolbox for the construction and assessment of subgrid-scale models for large-eddy simulations

Programming certificates

- Programming in C/C++ (12 ECTS) 2016/09 – 2017/04
Center for Information Technology
University of Groningen, The Netherlands

Languages

- Dutch
- English
- German