Ralf Deiterding

Curriculum Vitae - December 2016

Contact Information

Title:	Asscoiate Professor in Fluid Dynamics
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Address:	Aerdynamics and Flight Mechanics Research Group Faculty of Engineering and the Environment Highfield Campus University of Southampton Southampton, SO17 1BJ, UK

Areas of research

Computational fluid dynamics and computational engineering, computational aerodynamics, fluid-structure interaction, shock and explosion dynamics, reactive and multiphase flows, convective heat transfer, nonlinear photonics

Scientific computing and numerical analysis, high performance parallel computing, multiscale modeling and simulation

Finite volume and finite difference schemes, lattice Boltzmann methods, level set and Cartesian embedded boundary methods, block-structured adaptive mesh refinement and geometric multigrid methods, split-step Fourier methods, discontinuous Galerkin methods

Object-oriented simulation frameworks, automatic mesh generation and adaption

Verification & validation, uncertainty quantification for complex simulations, data assimilation

Education

Ph.D. in Computational Mathematics
Institute of Mathematics, Technical University Cottbus (Germany), Jan. 2004.
Dissertation: *Parallel adaptive simulation of multi-dimensional detonation structures*, 280 pages
Advisor: G. Bader. Reporters: D. Kröner and U. Maas. Defense Sep. 2003. Grade: "Summa cum laude"

Diploma in Technomathematics (Computational Engineering)
Institute of Mathematics, Technical University Clausthal (Germany), Jan. 1998
Grade: "Excellent"
Diploma thesis: *Numerical coupling of the 3D flow-code FIRE to the 1D hydraulic-code AMESIM for the design of Diesel-injection systems (in German).* Advisor: H. J. Pesch

Professional experience

Associate Professor in Fluid Dynamics
Aerodynamics and Flight Mechanics Research Group, Engineering and the Environment, University of Southampton, Aug. 15 - Present
Research in aerodynamics, computational fluid dynamics, adaptive lattice Boltzmann and finite volume methods. Teaching in fluid dynamics, undergraduate and postgraduate student project supervision, Study Abroad Officer.

Adjunct Associate Professor in Mathematics
Department of Mathematics, University of Tennessee Knoxville, Jun. 10 - Present

Joint Faculty Associate Professor
Center for Interdisciplinary Research and Graduate Education, University of Tennessee Knoxville / Oak Ridge National Laboratory, Sep. 11 - Aug. 16
Ph.D. graduate student supervision in Energy Science and Engineering

Group Leader "Computational Fluid Dynamics"
Department Fluid Systems, Institute of Aerodynamics and Flow Technology, German Aerospace Center, Göttingen, Jul. 13 - Jun. 15. Department Head: C. Wagner
Scientific leadership for a group of 8 staff members plus 7 graduate students. Research in computational fluid dynamics. Development and management of federally funded research projects and contract work. Management of parallel cluster with 5280 cores.

Research & Development Staff and Associate (Computational Scientist)
Computer Science and Mathematics Division, Oak Ridge National Laboratory, Sep. 06 - Jun. 2013. Supervisor: E. F. d'Azevedo
Research in CFD, fluid-structure coupling, combustion simulation, acoustic simulation, computational photonics, uncertainty quantification, asynchronous iterative schemes.
Development of funded research projects for U.S. Departments of Energy and Defense.

Senior Postdoctoral Scholar in Applied and Comp. Mathematics
California Institute of Technology, Jul. 03 - Jul. 06. Sponsor: D. I. Meiron
Chief software architect of the "Virtual Test Facility" software for simulating shock-driven fluid-structure interaction, ASC Alliance Center for Simulation of Dynamic Response of Materials.
Research in computational fluid dynamics, fluid-structure coupling, detonation simulation.

Research Assistant to G. Bader
Institute of Mathematics, Technical University Cottbus, Feb. 98 - Jun. 03
Project: *Analysis and simulation of flows for multi-component gas-mixtures*, supported by German DFG high-priority research program *Analysis and Numerics of Conservation Laws*

Teaching Assistant to G. Bader
Course *Efficient implementation of numerical algorithms in C*
Institute of Mathematics, Technical University Cottbus, Apr. 00 - Sep. 00

Honors and awards

Best paper award: Parallel CFD 2015, May 2015, Montreal, Canada.

Computer Science & Math. Division, Most Distinguished Contribution Special Award, 2012

Computing and Computational Science Directorate Distinguished Contributor, 2011

Department of Energy Office of Science Outstanding Mentor Award for 2009

Alston S. Householder Postdoctoral Fellowship in Scientific Computing for 2006

Best Ph.D. dissertation of Technical University Cottbus in 2003

Research funding

EPSRC, Sub-task within programme grant Transpiration Cooling Systems for Jet Engine Turbines and Hypersonic Flight (PI: P. Ireland), (£6,136,937): **R. Deiterding** (Co-PI), N. Sandham (Co-PI) *Direct numerical simulation of transpirational cooling under hypersonic flight conditions*, £512,549, Oct. 16 - Sep. 19

FAPESP - São Paulo Researchers in International Collaboration and University of Southampton, **R. Deiterding** (Co-PI) and M. O. Domingues, *Advanced criteria for dynamic mesh adaption in computational space weather forecasting*, £20,000, Aug. 16 - Jul. 18

FAPESP and the Newton Fund, M. O. Domingues and **R. Deiterding**, *Adaptive multiresolution criteria in the AMROC framework applied to a two dimensional ideal magnetohydrodynamic model for space weather*, £5,000, Jun. 16

Simulation Science Center Clausthal / Göttingen, Ministry of Research and Culture of Lower Saxony: Gunther Brenner (PI), **R. Deiterding** (Co-PI during application, collaborator since moving to Southampton) *Numerically intensive simulations on an integrated compute infrastructure*, €392,850, Oct. 15 - Sep. 18

Department of Energy Office of Advanced Scientific Computing Research, Applied Mathematics Research Program: R. Archibald (PI), **R. Deiterding (Co-PI)**, C. Hauck (Co-PI), D. Xiu (Co-PI) *Advanced Dynamically Adaptive Algorithms for Stochastic Simulations on Extreme Scales*, $1,310,598, Sep. 10 - Aug. 13

Oak Ridge Nat. Lab. Seed Money Program: **R. Deiterding (PI)**, J. Barhen (Co-PI), *Asynchronous Algorithms for Exascale Computations*, $190,000, Oct. 10 - Sep. 12

Department of Defense, National Security Agency, Sub-task within Durmstrang Special Projects Program (PI: S. Poole): **R. Deiterding (Co-PI)**, Y. Braiman (Co-PI) *Simulation of pulses in optical fiber networks for achieving Tb/s communication rates*, $900,000, Apr. 10 - Sep. 13

U.S. Department of Energy, Office of Science, Postdoctoral Fellowship, Sep. 06 - Aug. 08

External consultant for Caltech ASC Alliance Center: Jan. 07 - Dec. 07

German Science Foundation grant Ba 840/3-3 (full position), Apr. 01 - Jun. 03

German Science Foundation grants Ba 840/3-1, Ba 840/3-2 (half position), Feb. 98 - Mar. 01

Publications

Journal papers

1. X. Cai, J. Liang, **R. Deiterding**. Propagating Modes of Hydrogen Detonations in Supersonic Combustible Mixtures. *Combustion and Flame*, submitted.

2. Q. Wan, **R. Deiterding**, H. Jeon, V. Eliasson. Numerical investigation of oblique shock wave reflection off a water wedge. *J. Fluid Mech.*, submitted.

3. Q. Zhan, X. Chen, L.-M. He, K. Rong, **R. Deiterding**. Investigation of shock focusing in a cavity with incident shock diffracted by an obstacle, *Shock Waves*, in press, doi: 10.1007/s00193-016-0653-0.

4. X. Cai, **R. Deiterding**, J. Liang, Y. Mahmoudi. Adaptive simulations of viscous detonations initiated by a hot jet using a high-order hybrid WENOCD scheme. *Proc. of the Combustion Institute*, in press, doi: 10.1016/j.proci.2016.06.161.

5. M. M. Fragner, **R. Deiterding**. Investigating cross-wind stability of high speed trains with large-scale parallel CFD. *Int. J. Comput. Fluid Dynamics*, 30(6): 402–407, 2016.

6. **R. Deiterding**, S. L. Wood. Predictive wind turbine simulation with an adaptive lattice Boltzmann method for moving boundaries. Proc. of The Science of Making Torque from Wind (TORQUE 2016). *J. Phys. Conference Series*, 753: 082005, 2016.

7. K. Feldhusen, **R. Deiterding**, C. Wagner. A dynamically adaptive lattice Boltzmann method for thermal convection problems. *J. Applied Math. and Computer Science*, 26(4): 735–747, 2016.

8. **R. Deiterding**, M. O. Domingues, S. M. Gomes, K. Schneider. Comparison of adaptive multiresolution and adaptive mesh refinement applied to simulations of the compressible Euler equations. *SIAM J. Sci. Comput.*, 38(5): S173–S193, 2016.

9. X. Cai, J. Liang, **R. Deiterding**. Numerical investigation on detonation control using a pulse hot jet in supersonic combustible mixture. *Combustion Science and Technology*, 188(10): 1674–1690, 2016.

10. X. Cai, J. Liang, **R. Deiterding**, Z. Lin. Numerical simulation on detonation initiation and propagation in supersonic combustible mixtures with nonuniform species, *AIAA Journal*, 54(8): 2449–2462, 2016.

11. X. Cai, J. Liang, **R. Deiterding**, Z. Lin. Adaptive simulations of cavity-based detonation in supersonic hydrogen-oxygen mixture. *Int. J. Hydrogen Energy*, 41(16): 6917–6928, 2016.

12. X. Cai, J. Liang, **R. Deiterding**, Y. Che, Z. Lin. Adaptive mesh refinement based simulations of three-dimensional detonation combustion in supersonic combustible mixtures with a detailed reaction model. *Int. J. Hydrogen Energy*, 41(4): 3222–3239, 2016.

13. M. M. Fragner, K. A. Weinman, **R. Deiterding**, U. Fey, C. Wagner. Comparison of industrial and scientific CFD approaches for predicting cross wind stability of the NGT2 model train geometry. *Int. J. Railways Techn.*, 4(1):1–28, 2015.

14. A. K. F. Gomes, M. O. Domingues, K. Schneider, O. Mendes, **R. Deiterding**. An adaptive multiresolution method for ideal magnetohydrodynamics using divergence cleaning with parabolic-hyperbolic correction. *Applied Numerical Mathematics*, 95: 199–213, 2015.

15. X. Cai, J. Liang, Z. Lin, **R. Deiterding**, F. Zhuang. Detonation initiation and propagation in nonuniform supersonic combustible mixtures, *Combustion Science and Technology*, 187(4): 525–536, 2015.

16. X. Cai, J. Liang, Z. Lin, **R. Deiterding**, H. Qin, X. Han. Adaptive mesh refinement based numerical simulation of detonation initiation in supersonic combustible mixtures using a hot jet, *ASCE's Journal of Aerospace Engineering*, 28(1): 04014046, 2015.

17. X. Cai, J. Liang, Z. Lin, **R. Deiterding**, Y. Liu. Parametric study of detonation initiation using a hot jet in supersonic combustible mixtures, *Aerospace Science and Technology*, 39: 442–455, 2014.

18. X. Cai, J. Liang, Z. Lin, **R. Deiterding**. Effects of hot jet on detonation initiation and propagation in supersonic combustible mixtures, *Acta Astronautica*, 105(1): 265–277, 2014.

19. Y. Mahmoudi, N. Karimi, **R. Deiterding**, S. Emami. Hydrodynamic instabilities in gaseous detonations: a comparison of Euler, Navier-Stokes and large eddy simulation, *J. Propulsion and Power*, 30(2): 384–396, 2014.

20. **R. Deiterding**, S. Wood. Parallel adaptive fluid-structure interaction simulation of explosions impacting on building structures, *Computers & Fluids*, 88: 719–729, 2013.

21. **R. Deiterding**, R. Glowinski, H. Oliver, S. Poole. A reliable split-step Fourier method for the propagation equation of ultra-fast pulses in single-mode optical fibers, *J. Lightwave Technology*, 4. IEEE J. Lightwave Technology, 31(12): 2008–2017, 2013.

22. P. T. Barton, **R. Deiterding**, D. I. Meiron, D. I. Pullin. Eulerian continuum model and adaptive finite-difference method for high-velocity impact and penetration problems, *J. Comp. Physics* 240: 76–99, 2013

23. L. E. Perotti, **R. Deiterding**, K. Inaba, J. E. Shepherd, M. Ortiz. Elastic response of water-filled fiber composite tubes under shock wave loading, *Int. J. Solids and Structures* 50(3-4): 473–486, 2013.

24. S. J. Laurence, N. J. Parziale, **R. Deiterding**. Dynamical separation of spherical bodies in supersonic flow, *J. Fluid Mech.* 713: 159–182, 2012.

25. J. L. Ziegler, **R. Deiterding**, J. E. Shepherd, D. I. Pullin. An adaptive high-order hybrid scheme for compressive, viscous flows with detailed chemistry, *J. Comp. Physics* 230(20): 7598–7630, 2011.

26. S. J. Laurence, **R. Deiterding**. Shock-wave surfing, *J. Fluid Mech.* 676: 396–431, 2011.

27. **R. Deiterding**. High-resolution numerical simulation and analysis of Mach reflection structures in detonation waves in low-pressure $H_2 : O_2 : Ar$ mixtures: a summary of results obtained with the adaptive mesh refinement framework AMROC. *J. Combustion* 2011:738969, 2011.

28. E. J. Bochove, A. B. Aceves, Y. Y. Braiman, P. R. Colet, **R. Deiterding**, A. Jacobo, C. Miller, C. Rhodes, S. A. Shakir, Model of the self-Q-switching instability of passively phased fiber laser array, *IEEE Journal of Quantum Electronics* 47(6): 777–785, 2011.

29. M. Lombardini, **R. Deiterding**. Large-eddy simulation of Richtmyer-Meshkov instability in a converging geometry, *Physics of Fluids* (Gallery of Fluid Motion) 22(9): 091112, 2010.

30. **R. Deiterding**. A parallel adaptive method for simulating shock-induced combustion with detailed chemical kinetics in complex domains, *Computers & Structures* 87: 769–783, 2009.

31. S. J. Laurence, **R. Deiterding**, H. G. Hornung. Proximal bodies in hypersonic flows. *J. Fluid Mech.* 590: 209–237, 2007.

32. **R. Deiterding**, F. Cirak, S. P. Mauch, D. I. Meiron. A virtual test facility for simulating detonation- and shock-induced deformation and fracture of thin flexible shells. *Int. J. Multiscale Computational Engineering* 5(1): 47–63, 2007.

33. C. Pantano, **R. Deiterding**, D. J. Hill, D. I. Pullin. A low-numerical dissipation patch-based adaptive mesh refinement method for large-eddy simulation of compressible flows, *J. Comp. Physics* 221 (1): 63–87, 2007.

34. S. Browne, Z. Liang, **R. Deiterding**, J. E. Shepherd. Detonation front structure and the competition for radicals. *Proc. of the Combustion Institute* 31(2): 2445–2453, 2007.

35. F. Cirak, **R. Deiterding**, S. P. Mauch. Large-scale fluid-structure interaction simulation of viscoplastic and fracturing thin shells subjected to shocks and detonations. *Computers & Structures* 85 (11-14): 1049–1065, 2006.

36. **R. Deiterding**, R. Radovitzky, S. P. Mauch, L. Noels, J. C. Cummings, D. I. Meiron. A Virtual Test Facility for the efficient simulation of solid materials under high energy shock-wave loading, *Engineering with Computers* 22 (3-4): 325–347, 2006.

Chapters and proceeding papers in books

37. M. M. Fragner, **R. Deiterding**. Investigating side-wind stability of high speed trains using high resolution large eddy simulations and hybrid models. In T. Tuovinen et al., editors, *Computational Methods and Models for Transport: New Challenges for the Greening of Transport Systems*, pages 265-286, Springer, 2017.

38. **R. Deiterding**, S. W. Poole. Robust split-step Fourier methods for simulating the propagation of ultra-short pulses in single- and two-mode optical communication fibers. In R. Glowinski, S. Osher, W. Yin, editors, *Splitting Methods in Communication and Imaging, Science and Engineering*, pages 603–625, Springer, 2017.

39. N. Kin, **R. Deiterding**, C. Wagner. High-resolution simulation of side flow past a generic model of a high-speed train. In C. Breitsamer et al., editors, *Proc. 19th DGLR-Fachsymposium der STAB, Munich, 2014*, Notes on Numerical Fluid Mechanics and Multidisciplinary Design, Springer, 10 pages, in press.

40. **R. Deiterding**, S. L. Wood. An adaptive lattice Boltzmann method for predicting wake fields behind wind turbines. In C. Breitsamer et al., editors, *Proc. 19th DGLR-Fachsymposium der STAB, Munich, 2014*, Notes on Numerical Fluid Mechanics and Multidisciplinary Design, Springer, 10 pages, in press.

41. M. Lombardini, **R. Deiterding**. Three-dimensional parallel adaptive mesh refinement simulations of shock-driven turbulent mixing in plane and converging geometries. In R. Biswas et al., editors, *Parallel Computational Fluid Dynamics: Recent Advances and Future Directions*, Proc. Parallel CFD 2009 Conf., Moffet Field, May 2009, pages 462–472, DEStech Publications, Lancaster, 2010.

42. **R. Deiterding**. Parallel adaptive simulation of weak and strong detonation transverse-wave detonation structures in $H_2 - O_2$ detonations. In R. Biswas et al., editors, *Parallel Computational Fluid Dynamics: Recent Advances and Future Directions*, Proc. Parallel CFD 2009 Conf., Moffet Field, May 2009, pages 519–534, DEStech Publications, Lancaster, 2010.

43. S. Laurence, **R. Deiterding**, H. G. Hornung. Tandem spheres in hypersonic flow. In K. Hannemann and F. Seiler, editors, *Proc. 26th Int. Symposium on Shock Waves, Göttingen*, pages 713–718, Springer, Berlin, 2009.

44. **R. Deiterding**, F. Cirak, S. P. Mauch. Efficient fluid-structure interaction simulation of viscoplastic and fracturing thin-shells subjected to underwater shock loading. In S. Hartmann et al., editors, Proc. *Int. Workshop Fluid-Structure Interaction. Theory, Numerics and Applications*, Herrsching am Ammersee, pages 65–80, kassel university press GmbH, Kassel, 2009.

45. M. Lombardini, **R. Deiterding**, D. I. Pullin. Large-eddy simulation of the Richtmyer-Meshkov instability in a converging geometry. In J. Meyers et al., editors, *Quality and Reliability of Large-Eddy Simulations*, Proc. of QLES 2007 Int. Symposium, Leuven, pages 283–294, Ercoftac Series, Vol. 12, Springer, Netherlands, 2008.

46. C. Pantano, **R. Deiterding**, D. J. Hill, D. I. Pullin. A low-numerical dissipation patch-based, adaptive mesh refinement method for large-eddy simulation of compressible flows. In S. Kassinos, P. Moin, editors, *Complex Effects in Large Eddy Simulation*, Proc. of LES 2005 Int. Symposium, Cyprus, pages 251–262, Lecture Notes in Computational Science and Engineering, Vol. 56, Springer, New York, 2007.

47. **R. Deiterding**, F. Cirak, S. P. Mauch, D. I. Meiron. A virtual test facility for simulating detonation-induced fracture of thin flexible shells. In V. N. Alexandrov et al., editors, Proc. *Int. Conf. Computational Science 2006*, University of Reading, pages 122–130, Lecture Notes in Computer Science 3992, Springer, Berlin, 2006.

48. **R. Deiterding**. A high-resolution method for realistic detonation structure simulation. In W. Takahashi, T. Tanaka, editors, Proc. Tenth International Conference on *Hyperbolic Problems: Theory, Numerics, Applications*, Sep. 2004, Vol. 1, pages 343–350, Yokohama Publishers, 2006.

49. **R. Deiterding**. An adaptive Cartesian detonation solver for fluid-structure interaction simulation on distributed memory computers. In A. Deane et al., editors, *Parallel Computational Fluid Dynamics - Theory and Application*, Proc. Parallel CFD 2005 Conf., pages 333–340, Elsevier, 2006.

50. **R. Deiterding** and G. Bader. High-resolution simulation of detonations with detailed chemistry. In G. Warnecke, editor, *Analysis and Numerics of Conservation Laws*, pages 69–91, Springer, Berlin, 2005

51. **R. Deiterding**. Detonation structure simulation with AMROC. In L. T. Yang et al., editors, Proc. *High Performance Computing and Communications 2005*, pages 916–927, Lecture Notes in Computer Science 3726, Springer, Berlin, 2005.

52. **R. Deiterding**. Construction and application of an AMR algorithm for distributed memory computers. In T. Plewa et al., editors, *Adaptive Mesh Refinement - Theory and Applications*, Proc. of the Chicago Workshop on Adaptive Mesh Refinement Methods, Sep. 2003, pages

361–372, Lecture Notes in Computational Science and Engineering, Vol. 41, Springer, New York, 2005.

53. **R. Deiterding**. Detonation Simulation with the AMROC Framework. In K. Kremer and V. Macho, editors, *Forschung und wissenschaftliches Rechnen: Beiträge zum Heinz-Billing-Preis 2003*, pages 63–77, Ges. für Wiss. Datenverarbeitung, Göttingen, 2004.

Further published proceeding papers

54. S. L. Wood, **R. Deiterding**. A parallel adaptive lattice Boltzmann method for FSI simulation of flexible structures. *Proc. Parallel CFD 2015*, May 2015, Montreal, Canada, 8 pages, submitted.

55. J. Feaster, F. Battaglia, **R. Deiterding**, J. Bayandor. Validation of an adaptive meshing implementation of the lattice Boltzmann method for insect flight. *Proc. of the ASME 2016 Fluids Engineering Division Summer Meeting*, FEDSM2016-7782, V01AT12A007.

56. K. Feldhusen, **R. Deiterding**, C. Wagner. Validation of a dynamically adaptive lattice Boltzmann method for 2D thermal convection simulations, *2nd Int. Conf. on Mathematics and Computers in Sciences and Industry*, Aug. 2015, Sliema, Malta, 8 pages.

57. X. Cai, J. Liang, **R. Deiterding**, Z. Lin. Numerical simulation on detonation initiation and propagation in supersonic combustible mixtures with nonuniform species. In *20th AIAA International Space Planes and Hypersonic Systems and Technologies Conference*, Glasgow, GB, Jul. 2015, 19 pages.

58. S. L. Wood, **R. Deiterding**. A lattice Boltzmann method for horizontal axis wind turbine simulation, *14th Int. Conf. on Wind Engineering*, Jun. 2015, Porto Alegre, Brazil, 18 pages.

59. S. L. Wood, **R. Deiterding**. A dynamically adaptive lattice Boltzmann method for flapping wing aerodynamics, *Proc. ASME-JSME-KSME Joint Fluids Engineering Conference 2015*, Jul. 2015, Seoul, Korea, V01AT13A008.

60. **R. Deiterding**, S. L. Wood. A dynamically adaptive lattice Boltzmann method for predicting wake phenomena in fully coupled wind engineering problems. In B. Schrefler, E. Onate and M. Papadrakakis, editors, *IV Int. Conf. on Coupled Problems in Science and Engineering*, pages 489–500, 2015.

61. X. Cai, J. Liang, Y. Che, **R. Deiterding**, Z. Lin, F. Zhuang. Three-dimensional simulation of detonation initiation and propagation in supersonic combustible mixtures. *Proc. 8th Int. Conf. Computational Fluid Dynamics*, Chengdu, China, Jul. 2014, paper ICCFD8-2014-116, 15 pages.

62. M. M. Fragner, K. A. Weinman, **R. Deiterding**, U. Fey, C. Wagner. Numerical and experimental studies of train geometries subject to cross winds. In J. Pombo, editor, *Proc. of the 2nd Int. Conf. on Railway Technology*, Civil-Comp Press, Stirlingshire, UK, paper 24, 2014, 19 pages.

63. M. Ihme, Y. Sun, **R. Deiterding**. Detailed simulation of shock-bifurcation and ignition of an argon-diluted hydrogen/oxygen mixture in a shock tube. *51st AIAA Aerospace Sciences Meeting*, paper AIAA 2013-0538, Grapevine (TX), Jan. 2013, 14 pages.

64. R. K. Archibald, **R. Deiterding**, C. Hauck, J. Jakeman, D. Xiu. Approximation and error estimation in high dimensional space for stochastic collocation methods on arbitrary sparse samples, *Proc. of Exascale Research Conference*, Portland, Apr. 2012, 7 pages.

65. **R. Deiterding**. Block-structured adaptive mesh refinement - theory, implementation and application. In M. Massot et al., editors *Multiresolution and adaptive mesh refinement methods*, European Series in Applied and Industrial Mathematics: Proceedings, Vol. 34, pages 97-150, 2011.

66. R. K. Archibald, **R. Deiterding**, J. Jakeman. Extending adaptive sparse grids for stochastic collocation to hybrid parallel architectures, *Proc. of SciDAC 2011*, 5 pages.

67. J. L. Ziegler, **R. Deiterding**, J. E. Shepherd, D. I. Pullin, G. Blanquart. Verification and direct numerical simulation of irregular hydrocarbon detonations, In *23st Int. Colloquium on the Dynamics of Explosions and Reactive Systems*, 5 pages, extended abstract 293, 2011.

68. E. J. Bochove, S. A. Shakir, Y. Starcher, A. Jacobo, P. R. Colet, A. B. Aceves, Y. Y. Braiman, **R. Deiterding**, C. Miller, C. Rhodes. Simple model to explain instability in passively-phased high-power fiber laser arrays. In J. Hein, L. O. Silva, G. Korn, L. A. Gizzi, C. Edwards, editors, Diode-Pumped High Energy and High Power Lasers, *Proc. of SPIE*, Vol. 8080, page 808009, 2011.

69. L. E. Perotti, T. El Sayed, **R. Deiterding**, M. Ortiz. Response of fiber reinforced sandwich structures subjected to explosive loading. In G. Ravichandran, editor, *9th Int. Conf. on Sandwich Structures*, Pasadena, Jun. 2010, 10 pages.

70. **R. Deiterding**. Computational and theoretical analysis of weak and strong transverse-wave structures in gaseous detonations, *Proc. of the 2010 Scientific through Advanced Computing (SciDAC) Conference*, Chattanooga, Jul. 2010, pages 36–41.

71. **R. Deiterding**. Parallel adaptive Cartesian upwind methods for shock-driven multiphysics simulation, *Anais do CNMAC*, Vol. 3, Proc. CNMAC 2010 - 33rd Brazilian National Congress for Applied and Computational Mathematics, pages 1048-1057, 2010.

72. E. J. Bochove, A. B. Aceves, **R. Deiterding**, L. I. Crabtree, Y. Y. Braiman, A. Jacobo, P. R. Colet. Space-time-dynamic model of passively-phased ring-geometry fiber laser array. In K. Tankala, J. W. Dawson, editors, Proc. of Photonics West, San Francisco, Feb. 2010, *Proc. of SPIE*, Vol. 7580, page 758026-1, 2010.

73. **R. Deiterding**, M. O. Domingues, S. M. Gomes, O. Roussel, K. Schneider. Adaptive multiresolution or adaptive mesh refinement? A case study for 2D Euler equations. In F. Coquel et al., editors, *Multiresolution and Adaptive Methods for Convection-Dominated Problems*, pages 28–42, European Series in Applied and Industrial Mathematics: Proceedings, Vol. 29, EDP Sciences, 2009.

74. **R. Deiterding**. Adaptive high-resolution simulation of realistic gaseous detonation waves. *Proc. Appl. Math. Mech.* 7(1): 2100057–2100058, 2007. Special Issue: 6th Int. Congress on Industrial and Applied Mathematics (ICIAM07), Zürich 2007.

75. **R. Deiterding**. An adaptive level set method for shock-driven fluid-structure interaction. *Proc. Appl. Math. Mech.* 7(1): 2100037–2100038, 2007. Special Issue: 6th Int. Congress on Industrial and Applied Mathematics (ICIAM07), Zürich 2007.

76. **R. Deiterding**. Numerical simulation of transient detonation structures in H_2-O_2 mixtures in smooth pipe bends. In P. Bauer et al., editors, *21st Int. Colloquium on the Dynamics of Explosions and Reactive Systems*, Poitiers, Jul. 2007, CD-ROM, 4 pages.

77. C. Pantano, **R. Deiterding**, D. J. Hill, D. I. Pullin. A low-numerical dissipation patch-based, adaptive mesh refinement method for large-eddy simulation of compressible flows. *Journal of Physics: Conference Series* 46 (2006) 48–52. Proc. of SciDAC 2006.

78. **R. Deiterding**, F. Cirak, S. P. Mauch, D. I. Meiron. A virtual test facility for simulating detonation-induced deformation and fracture of thin flexible shells. In P. Wesseling et al., editors, *European Conference on Computational Fluid Dynamics 2006*, Egmond aan Zee, Sep. 2006, CD-ROM, 18 pages.

79. **R. Deiterding**. Numerical structure analysis of regular hydrogen-oxygen detonations. In *Proc. of Fall Meeting of Western States Section of the Combustion Institute*, Los Angeles, Oct. 2003, CD-ROM, 24 pages.

80. **R. Deiterding**. Efficient simulation of multi-dimensional detonation phenomena. In A. Handlikova et al, editors, *Proc. of ALGORITMY 2002, 16th Conf. on Scientific Computing*, pages 94–101. Dep. of Math. and Descriptive Geometry, Slovak Univ. of Techn., Bratislava, Slovakia.

81. **R. Deiterding**. Accurate simulation of Rayleigh-Taylor instabilities. In P. Jonas and V. Uruba, editors, *Proc. of Colloquium on Fluid Dynamics*, Prague, Oct. 1999, pages 37–44.

82. G. Bader, **R. Deiterding**. A distributed memory adaptive mesh refinement package for inviscid flow simulations. In P. Jonas and V. Uruba, editors, *Proc. of Colloquium on Fluid Dynamics*, Prague, Oct. 1999, pages 9–14.

Technical reports

83. C. Marggraf-Micheel, J. Winzen, M. Konstantinov, A. Heider, **R. Deiterding**, C. Wagner. Final report for project INKA (Innovative cabin systems) TP1 Passenger-optimized Cabin Systems (in German), Aug. 2014, 22 pages.

84. B. Cuff, **R. Deiterding**. Hybrid parallelization of iterative methods. ORNL/TM-2012/493. Oak Ridge National Laboratory, Oct. 2012, 16 pages.

85. S. Wood, **R. Deiterding**. Shock-driven fluid-structure interaction for civil design. ORNL/TM-2011/274. Oak Ridge National Laboratory, Nov. 2011, 26 pages.

86. M. Lombardini, **R. Deiterding**. Large-eddy simulations of Richtmyer-Meshkov instability in a converging geometry. *American Physical Society Division of Fluid Dynamics, Fluid Dynamics Videos*, Oct. 2009, http://hdl.handle.net/1813/14106 and arXiv:0910.3257v1.

87. S. Pannala, E. Popov, **R. Deiterding**, B. Neykov. Test problem 4: 2009 Three-dimensional assembly test problem definition and initial simulations report. ORNL/TM-2009/246/R0. Oak Ridge National Laboratory, Oct. 2009, 51 pages.

88. J. Steensland, J. Ray, H. Johansson, **R. Deiterding**. An improved bi-level algorithm for partitioning dynamic grid hierarchies. SAND2006-2487. Sandia National Laboratories, May 2006, 36 pages.

89. C. Pantano, **R. Deiterding**, D. J. Hill, D. I. Pullin. A low-numerical dissipation patch-based adaptive mesh refinement method for large-eddy simulation of compressible flows. CIT-ASCI-TR319. California Institute of Technology, Sep. 2005, 49 pages.

90. **R. Deiterding**. Simulation of thermal ignition of an ozone-oxygen mixture in a cylindrical vessel. NMWR-00-4, Technical University Cottbus, Nov. 2000, 11 pages.

91. **R. Deiterding**. Simulation of a shock tube experiment with non-equilibirum chemistry. NMWR-00-3, Technical University Cottbus, Oct. 2000, 12 pages.

Meetings and symposia

Plenary talks

1. *International Symposium of Combustion Instabilities*, Tsinghua University (China), Jan. 5-7, 2017.

2. A massively parallel, dynamically adaptive lattice Boltzmann method for fluid-structure coupling (in German), *HPCN-Workshop 2014*, T-Systems Solutions for Research, Göttingen (Germany), May 13, 2014.

3. Parallel adaptive Cartesian upwind methods for shock-driven multiphysics simulation, *33rd Brazilian National Congress for Applied and Computational Mathematics*, Águas de Lindóia (Brazil), Sep. 22, 2010.

4. Deciphering the structure of gaseous detonations by numerical simulation. *6th Annual Burgers Symposium for Fluid Dynamics*, College Park, Nov. 18, 2009.

Invited minisymposia talks

5. A dynamically adaptive lattice Boltzmann method for aerodynamics and wake prediction of fully coupled problems (in German), *Workshop Simulation Science Center Clausthal / Göttingen*, Clausthal (Germany), Nov. 16, 2015.

6. A dynamically adaptive lattice Boltzmann method for flapping wing aerodynamics, Aerospace Minisymposium, *ASME-JSME-KSME Joint Fluids Engineering Conference 2015*, Seoul, Jul. 30, 2015.

7. An adaptive parallel lattice Boltzmann method for simulating complex wake transport behind moving geometries (in German), 9th North-German Simulation Forum, Hamburg (Germany), Sep. 18, 2014.

8. A block-structured parallel adaptive Lattice-Boltzmann method for rotating geometries, Minisymposium on Challenges in Parallel Adaptive Mesh Refinement, *SIAM Conf. on Parallel Processing for Scientific Computing*, Portland, Feb. 19, 2014.

9. Examples of industrially relevant turbulent flow simulation with OpenFOAM, *Northern germany OpenFoam User meetiNg 2013*, Braunschweig, Oct. 9, 2013.

10. Adaptive high-resolution simulation of shock-induced unsteady hydrogen-air combustion, Minisymposium on Detonation Dynamics and Structure, *14th Int. Conf. on Numerical Combustion*, San Antonio, Apr. 9, 2013.

11. Massively parallel fluid-structure interaction simulation of blast and explosions impacting on realistic building structures with a block-structured AMR method, *8th SIAM Conference on Parallel Data Processing*, Feb. 16, 2012.

12. Advancing dynamically adaptive algorithms for stochastic simulations on extreme scales, Minisymposium on Mathematical and Numerical Aspects of Uncertainty Quantification, *7th Int. Congress on Industrial and Applied Mathematics*, Vancouver, Jul. 20, 2011.

13. High-resolution computational and theoretical analysis of Mach reflection structures in detonations, Minisymposium on High-order Methods for the Simulation of Detonation Evolution and Structure, *13th Int. Conf. on Numerical Combustion*, Corfu (Greece), Apr. 27, 2011.

14. Hybrid and dynamically adaptive higher-order shock-capturing methods for compressible gas dynamics, Minisymposium on High-Order and Adaptive Methods for PDE Simulation, *SIAM Conference on Computational Science and Engineering*, Reno, Feb. 28, 2011.

15. Simulating shock-driven compressible turbulence with a hybrid adaptive scheme, Minisymposium on Advanced Method for the Simulation of Partial Differential Equations, *33rd Brazilian National Congress for Applied and Computational Mathematics*, Águas de Lindóia (Brazil), Sep. 21, 2010.

16. Improving the parallel scaling of the block-structured mesh adaptation framework AMROC. Minisymposium on Challenges in Parallel Adaptive Mesh Refinement, *7th SIAM on Parallel Data Processing*, Seattle, Feb. 24, 2010.

17. A level-set-based adaptive mesh refinement method for fully coupled shock-driven fluid-structure interaction simulation. Minisymposium on Adaptive Mesh Refinement Strategies for Simulating Large Multiphysics Multiscale Problems, *IMACS World Congress*, Athens, GA, Aug. 4, 2009.

18. The VTF - an approach to large-scale simulation of detonation-driven fluid-structure interaction, Minisymposium on Hydrogen Flames, Fires and Explosions, *SIAM Conference on Computational Science and Engineering*, Miami, Mar. 6, 2009.

19. Coupled simulation of thin solid structures subjected to shock waves in liquids, Minisymposium on Techniques for Multi-Domain and Multi-Physics Problems, *SIAM Conference on Computational Science and Engineering*, Miami, Mar. 5, 2009.

20. Numerical simulation of multidimensional gaseous detonation waves with a parallel adaptive finite volume method, Minisymposium on Computational Challenges on Modeling Transient Detonation, *61st Annual American Physical Society Division of Fluid Dynamics Meeting*, San Antonio, Nov. 23, 2008.

21. Fluid-structure interaction simulation of shock wave impact on solid structures, keynote lecture in Minisymposium on Recent Advances in Numerical Methods for Hyperbolic Problems, *8th World Congress on Computational Mechanics*, Venice (Italy), Jul. 2, 2008.

22. Accurate simulation of transient cellular structures in gaseous detonations with an adaptive high-resolution method, Minisymposium on Adaptive Numerical Methods for Combustion Simulation, *12th Int. SIAM Conference on Numerical Combustion*, Monterey, Mar. 31, 2008.

23. A parallel SAMR framework for strongly driven fluid-structure interaction problems, Minisymposium on Structured Adaptive Mesh Refinement (SAMR) on Supercomputers, *6th SIAM Conf. on Parallel Data Processing*, Atlanta, Mar. 13, 2008.

24. Numerical simulation of realistic detonation structures, Minisymposium on Numerical Methods for Chemically Reacting Flows, *6th Int. Congress on Industrial and Applied Mathematics*, Zürich (Switzerland), Jul. 19, 2007.

25. AMROC - A Cartesian SAMR framework for compressible gas dynamics, Minisymposium on Integrated Software Frameworks for Advanced Scientific and Engineering Applications, *SIAM Conference on Computational Science and Engineering*, Costa Mesa, Feb. 22, 2007.

26. Simulation of supersonic combustion phenomena in evolving geometries with Cartesian upwind methods, Minisymposium on Wave Propagation Algorithms for Complex Applications, *SIAM Conference on Computational Science and Engineering*, Costa Mesa, Feb. 21, 2007.

27. A dynamically adaptive high - resolution method for detonation simulation, Minisymposium on Recent Advances in Fixed-grid Numerical Methods for Hyperbolic Problems, *7th World Congress on Computational Mechanics*, Los Angeles, Jul. 21, 2006.

28. Coupled simulation of detonation-induced fracture of thin flexible shells, Minisymposium on Methods and Applications in Coupled Engineering Simulation, *7th World Congress on Computational Mechanics*, Los Angeles, Jul. 16, 2006.

29. Adaptive simulation of cellular detonation structures in low-pressure hydrogen-oxygen mixtures under transient conditions, Minisymposium on Flow Simulations and Algorithms on Block-structured Adaptively Refined Meshes, *11th Int. SIAM Conference on Numerical Combustion*, Granada (Spain), Apr. 24, 2006.

30. The Virtual Test Facility – A multiphysics framework for simulating the dynamic response of materials. Minisymposium on Infrastructures for Developing Large Scale and Dynamic Computational Mechanics Applications, *8th U.S. National Congress on Computational Mechanics*, Austin, Jul. 25, 2005.

31. Dynamic mesh adaptation in detonation-driven fluid-structure problems, Minisymposium on Error Control and Mesh Adaptation in FEA, *3rd MIT Conference on Computational Fluid and Solid Mechanics*, Boston, Jun. 14, 2005.

Contributed talks

32. Predictive wind turbine simulation with an adaptive lattice Boltzmann method for moving boundaries, *The Science of Making Torque from Wind (TORQUE 2016)*, Munich, Oct. 5, 2016.

33. Application and validation of an adaptive lattice Boltzmann method for high-resolution wind turbine wake simulation, *EUROMECH Colloquium 576 Wind Farms in Complex Terrains*, Stockholm, Jun. 10, 2016.

34. Simulation of wind turbine wake interaction with an adaptive lattice Boltzmann method for moving boundaries, *68th Annual Meeting of the APS Division of Fluid Dynamics*, Boston, Nov. 22, 2015.

35. A dynamically adaptive lattice Boltzmann method for predicting wake phenomena in fully coupled wind engineering problems, *Coupled Problems 2015*, Venice, Italy, May 18, 2015.

36. An adaptive lattice Boltzmann method for predicting turbulent wake fields in wind parks, *67th Annual Meeting of the APS Division of Fluid Dynamics*, San Francisco, Nov. 24, 2014.

37. A massively parallel, dynamically adaptive lattice Boltzmann method for predicting wakes between wind turbines (in German), *19th DGLR-Fachsymposium der STAB*, Munich, Nov. 4, 2014.

38. A parallel fluid-structure interaction simulation system for blast and explosion analysis. *7th M.I.T. Conference on Computational Fluid and Solid Mechanics*, Boston, Jun. 12, 2013.

39. A reliable split-step Fourier method for simulating the propagation of ultra-fast pulses in optical communication fibers, *8th IMACS Int. Conf. on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory*, Athens (GA), Mar. 26, 2013.

40. Parallel FSI simulation of explosions impacting on building structures, *Int. Conf. Parallel Computational Fluid Dynamics*, Atlanta, May 22, 2012.

41. A reliable split-step method for the simulation of ultra-fast pulses in optical fibers, *7th Int. Congress on Industrial and Applied Mathematics*, Vancouver, Jul. 19, 2011.

42. Hybrid and dynamically adaptive higher-order shock-capturing methods for compressible gas dynamics, *7th Int. Congress on Industrial and Applied Mathematics*, Vancouver, Jul. 20, 2011.

43. Performance assessment and optimization of a block-structured adaptive mesh refinement method, *ORNL-UTK Numerical Day*, Oak Ridge, Apr. 28, 2010

44. A parallel adaptive method for simulating shock-induced combustion with detailed chemical kinetics in complex domains, *5th M.I.T. Conference on Computational Fluid and Solid Mechanics*, Boston, Jun. 18, 2009.

45. Parallel adaptive simulation of weak and strong detonation transverse-wave detonation structures in $H_2 - O_2$ detonations, *21st Int. Conf. on Parallel Computational Fluid Dynamics*, Moffet Field, May 20, 2009.

46. Efficient fluid-structure interaction simulation of plates subjected to underwater shock loading, *Int. Workshop on Fluid-Structure Interaction: Theory, Numerics and Applications*, Herrsching (Germany), Sep. 30, 2008.

47. Numerical simulation of transient detonation structures in $H_2 - O_2$ mixtures in smooth pipe bends, *21st Int. Colloquium on the Dynamics of Explosions and Reactive Systems*, Poitiers (France), Jul. 23, 2007.

48. Large-scale simulation of shock- and detonation-driven fluid-structure interaction phenomena. *6th Int. Congress on Industrial and Applied Mathematics*, Zürich (Switzerland), Jul. 19, 2007.
49. Large-scale fluid-structure interaction simulation of viscoplastic and fracturing thin shells subjected to shocks and detonations. *4th M.I.T. Conference on Computational Fluid and Solid Mechanics*, Boston, Jun. 14, 2007.
50. A Cartesian structured AMR framework for parallel fluid-structure interaction simulation. *Int. Conf. Parallel Computational Fluid Dynamics*, Busan (South Korea), May 16, 2006.
51. A Cartesian structured AMR framework for parallel fluid-structure interaction simulation. *5th SIAM Conf. on Parallel Data Processing*, San Francisco, Feb. 22, 2006.
52. AMROC - A Cartesian structured AMR framework for distributed memory computers. *Int. Conf. Parallel Computational Fluid Dynamics*, Maryland, May 25, 2005.
53. Detonation structure simulation with AMROC. *High Performance Computing and Communications 2005*, Sorrento (Italy), Sep. 23, 2005.
54. Towards simulation of detonation-induced thin-shell dynamics with the Virtual Test Facility. *3rd Workshop on Comp. Methods for Multidimensional Reactive Flows*, Heidelberg (Germany), Jan. 27, 2005.
55. High-resolution simulation of realistic detonation structures. *Tenth International Conference on Hyperbolic Problems: Theory, Numerics, Applications*, Osaka (Japan), Sep. 14, 2004.
56. Numerical structure analysis of regular hydrogen-oxygen detonations. *Fall Meeting of Western States Section of the Combustion Institute*, Los Angeles, Oct. 2003.
57. Construction and application of an AMR algorithm for distributed memory computers. *Chicago Workshop on Adaptive Mesh Refinement Methods*, Sep. 4, 2003,
58. Numerical simulation of cellular detonation structure. *2nd Workshop on Comp. Methods for Multidimensional Reactive Flows*, Heidelberg (Germany), Dec. 2002.
59. Numerical simulation of cellular detonation structures in detonations, *6th Workshop on Conservation Laws*, Hirschegg (Austria), Sep. 2002.
60. Efficient simulation of multi-dimensional detonation phenomena. *ALGORITMY 2002, 16th Conf. on Scientific Computing*, Podbanske (Slovakia), Sep. 2002.
61. Accurate simulation of detonation phenomena. *ANumE-Colloquium*, Freiburg, Feb. 2002.
62. An AMR-algorithm for distributed memory computers. *11th GAMM-Workshop on Numerical Methods in Fluid Mechanics*, Kirchzarten (Germany), Nov. 26, 2001.
63. Adaptive high resolution methods for inviscid flow problems with chemical reaction. Workshop on *Computational Methods for Multidimensional Reactive Flows*, Heidelberg (Germany), Sep. 2000.
64. Accurate simulation of Rayleigh-Taylor instabilities. *Proc. of Colloquium on Fluid Dynamics*, Prague (Czech Republic), Oct. 1999.
65. Adaptive simulation of inviscid gas-flows on super-computers (in German), *South-east German Colloquium on Numerical Mathematics*, Freiberg, Apr. 23, 1999.

Selected posters

66. Large-eddy simulation of a high speed train geometry under cross-wind with an adaptive lattice Boltzmann method, *68th Annual Meeting of the APS Division of Fluid Dynamics*, Boston, Nov 23, 2015.

67. Computational sub-structure analysis of multidimensional detonation waves. *DOE Office of Advanced Scientific Computing Research Applied Mathematics PI Meeting*, Argonne National Laboratory, Oct 16, 2008.

68. A Cartesian AMR framework for detonation- and shock-driven fluid-structure interaction simulation. *DOE Office of Advanced Scientific Computing Research Applied Mathematics PI Meeting*, Lawrence Livermore National Laboratory, May 24, 2007.

69. Accurate simulation of detonation phenomena. *Int. Conf. Dynamic Days 2002*, Heidelberg (Germany), Jul. 15-17, 2002.

70. Object-oriented design of an AMR-algorithm for distributed memory computers. *8th Int. Conf. on Hyperbolic Problems*, Magdeburg (Germany), Feb. 2000.

Organized

71. 4th OpenFOAM United Meeting, Institute of Aerodynamik and Flow Technology, DLR Göttingen, May 26 - 27, 2014 (with H. Rusche).

72. Minisymposium on Recent Advances in Numerical Methods for Hyperbolic Problems, *8th World Congress on Computational Mechanics*, Venice (Italy), Jul. 2 - 3, 2008 (with S. Karabasov, V. Goloviznin, T. Kozubskaya, Yoko Takakura, and M. Lukakova).

73. Minisymposium on Adaptive Numerical Methods for Combustion Simulation, *12th Int. SIAM Conference on Numerical Combustion*, Monterey, Mar. 31 - Apr. 1, 2008 (with J. Banks).

74. Minisymposium on Structured Adaptive Mesh Refinement (SAMR) on Supercomputers, *6th SIAM Conf. on Parallel Data Processing*, Atlanta, Mar. 13, 2008.

Seminars and colloquia

75. Adaptive Cartesian CFD methods for fluid-structure interaction simulation, *Faculty of Mechanical Engineering, Brandenburg Technical University Cottbus*, Nov. 8, 2016.

76. Application of parallel adaptive mesh refinement in the multi-physics simulation of detonations and shock-induced combustion waves, *School of Engineering, University of Central Lancashire*, Nov. 2, 2016.

77. Application and validation of an adaptive lattice Boltzmann method for wind turbine wake simulation, *Institute for Physics und Forwind for Wind Energy Research, University Oldenburg*, May 31, 2016.

78. A dynamically adaptive lattice Boltzmann method for aerodynamics and wake prediction of fully coupled problems, *Engineering and the Environment, University of Southampton*, Nov. 11, 2015.

79. Scalable Cartesian CFD algorithms for multi-resolution and fluid-structure interaction simulation, *Department of Mechanical Engineering, Michigan State University*, Lansing, Mar. 31, 2015.

80. Adaptive Cartesian CFD methods for fluid-structure interaction simulation, *Engineering and the Environment, University of Southampton*, Mar. 25, 2015.

81. A fluid-structure interaction system for dynamically adaptive Cartesian CFD methods, *Department of Mechanical Engineering, Virginia Tech*, Blacksburg, Dec. 1, 2014.

82. A dynamically adaptive lattice Boltzmann method for predicting turbulent wake fields in wind parks, *Institute for Physics und Forwind for Wind Energy Research, University Oldenburg*, Jul. 14, 2014.

83. Adaptive high-resolution methods for simulating shock-induced hydrogen-air combustion, *Institute for Fluid Dynamics and Technical Acoustics, Technical University Berlin*, Jan. 7, 2014.

84. Efficient simulation methods for compressible flows with combustion and fluid-structure interaction (in German), *Institute for Technical Mechanics, Technical University Clausthal*, Sep. 2, 2013.

85. Simulation of coupled fluid-structure problems with adaptive Cartesian finite-volume methods (in German). *Institute for Mathematics, Technical University Clausthal*, Jul. 25, 2013.

86. Adaptive Cartesian methods for fluid-structure interaction simulation. *School of Engineering and Computing Sciences, Durham University (United Kingdom)*, Sep. 4, 2012.

87. Adaptive Cartesian methods for multi-physics simulation of compressible flows. *Department for Aerospace Engineering, University of Michigan, Ann Arbor*, Apr. 2, 2012.

88. Parallel adaptive Cartesian methods for shock-driven fluid-structure interaction simulation. *Institute for Numerical Mathematics and Optimization, Technical University Freiberg (Germany)*, Mar. 19, 2012.

89. Simulation of complex multiphysics problems with adaptive Cartesian finite volume methods (in German). *Centre for Simulation Technology, University of Stuttgart (Germany)*, Jan. 13, 2012.

90. Dynamically Adaptive Cartesian methods for shock-driven fluid-structure interaction simulation. *Southern Methodist University, Dallas*, Nov. 16, 2011.

91. Dynamically Adaptive Cartesian methods for shock-driven fluid-structure interaction simulation. *Department of Mathematical Sciences, University of Delaware*, Oct. 20, 2011.

92. Block-structured AMR algorithms for complex hyperbolic applications. *Laboratory for Scientific Computing, University of Cambridge (United Kingdom)*, Nov. 29, 2010.

93. Shock-driven multiphysics simulation with a parallel adaptive embedded boundary method. *Department of Mechanical, Aerospace, and Biomedical Engineering, University of Tennessee Knoxville*, Jan. 21, 2010.

94. Parallel adaptive Cartesian upwind methods for shock-driven multiphysics simulation. *Center for Applied Scientific Computing, Lawrence Livermore National Laboratory*, Jul. 27, 2009.

95. Efficient algorithms and data structures for adaptive flow simulation on parallel computer systems (in German), *Institute for Distributed Systems, University Hannover (Germany)*, May 11, 2009.

96. Embedded boundary finite volume methods for simulating shock-driven fluid-structure interaction, *Seminar for Applied Mathematics, University of Kiel (Germany)*, Jul. 9, 2008.

97. A framework for parallel adaptive Cartesian finite volume methods in evolving geometry, *Oak Ridge National Laboratory*, Apr. 17, 2006.

98. Application of adaptive Cartesian finite volume upwind schemes for hyperbolic computational fluid dynamics and fluid-structure coupling, *Center for Computational Engineering Science, RWTH Aachen (Germany)*, Apr. 3, 2006.

99. A parallel adaptive ghost-fluid method for hyperbolic computational fluid dynamics and fluid-structure coupling, *Institute for Applied Mathematics, University Freiburg (Germany)*, Mar. 28, 2006.

100. Application of Cartesian SAMR for real-world CFD, *Center for Computation and Technology, Louisiana State University Baton Rouge*, Mar. 20, 2006.

101. Structured adaptive mesh refinement in the Virtual Test Facility, *Center for Risk Studies and Safety, University of California Santa Barbara*, Mar. 6, 2006.

102. Application of Cartesian finite volume upwind schemes for real-world CFD, *Centre for Analysis, Scientific computing and Applications, Technical University Eindhoven (Netherlands)*, Nov. 25, 2005.

103. Adaptive multilevel discretizations for computational fluid dynamics, Graduate Aeronautical Laboratories, *California Institute of Technology*, Pasadena, Apr. 02, 2004.

104. Simulation of real detonation and turbulence phenomena in compressible gaseous flows with self-adaptive finite volume methods (in German), *Technical University Cottbus*, Jan. 2004.

105. Adaptive simulation of multi-dimensional structures (in German), *Institute for Applied Mathematics, University Freiburg*, Jun. 03, 2003.

106. Adaptive finite volume methods for detonation simulation, Center of Advanced Computational Research, *Californian Institute of Technology*, Pasadena, May 20, 2003.

107. Application of parallel adaptive mesh refinement for detonation structure simulation, *Rutgers University*, Piscataway, Feb. 19, 2003.

108. Adaptive simulation of unstable detonation phenomena, *Seminar of Applied Mathematics, ETH Zürich (Switzerland)*, May 5, 2002.

Teaching

Courses

SESA3029 - Aerothermodynamics

University of Southampton, Fall 2016/17

SESA6074 - Hypersonic & High Temperature Gas Dynamics

University of Southampton, Spring 2015/16

Block-structured adaptive finite volume methods in C++ - The AMROC framework for parallel AMR and shock-induced combustion simulation

Compact course at Department of Aerospace Engineering, Xiamen University, Xiamen (China), Jul. 18-22, 2016.

Compact course at College of Aerospace Science and Engineering, National University of Defense Technology, Changsha (China), Jul. 26-29, 2016.

Block-structured adaptive mesh refinement in C++ - The AMROC framework for parallel AMR

Compact course at Brazilian Institute of Space Research (INPE), São José dos Campos (Brazil), Jun. 30 - Jul. 1, 2016.

Block-structured adaptive mesh refinement methods for shock-induced combustion simulation

Compact course at College of Aerospace Science and Engineering, National University of Defense Technology, Changsha (China), Mar. 17-26, 2014.

Block-structured adaptive mesh refinement methods for conservation laws - theory, implementation and application

Compact course at Joint Institute for Computational Sciences, University of Tennessee Knoxville, Jul. 25-29, 2011.

Compact course at Laboratory for Scientific Computing, Department of Physics, University of Cambridge (United Kingdom), May 4-6, 2011.

Compact course at Institute of Mathematics, Statistics and Scientific Computing, University of Campinas (Brazil), Sep. 29, 2010.

Compact course at Joint Institute for Computational Sciences, University of Tennessee Knoxville, Jul. 26-30, 2010.

Course within Summer School on Multi-Resolution Methods, Fréjus (France), Jun. 14-18, 2010.

Devised, implemented and supervised lab exercises for course *Efficient implementation of numerical algorithms in C*, Technical University Cottbus, Apr.-Sep. 2000

Postdoc supervision

A. Cerminara (University of Southampton), *Numerical methods develoment and direct numerical simulation of transpirational cooling under hypersonic flight conditions*, since Jan. 2017

Graduate student supervision

Ph.D. research of C. Gkoudesnes (University of Southampton), *Development and application of lattice Boltzmann models for predictive large eddy simulation of turbomachinery aerodynamics*, 1st supervisor, since Jan. 2017

Ph.D. research of C. Atkins (University of Southampton), *Simulation of hypersonic non-equilibrium flows under vehicle motion and wall ablation*, 1st supervisor, since Oct. 2016

Ph.D. research of S. Wood (University Tennessee Knoxville and ORNL), *Development of fluid-structure interaction software for predictive wind plant simulation*, 1st supervisor through UTK/ORNL Center for Interdisciplinary Research and Graduate Education, Sep. 2011 - Aug. 2016

Graduate internship of X. Cai (CRC stipend, National University of Defense Technology, Changsha). *High-resolution finite volume methods for simulating the exterior flow during the passage of high-speed trains*, Nov. 2014 to Sep. 2015

Ph.D. research of A. Kerr (DAAD stipend, DLR and Technical University Ilmenau). *Very large-eddy simulation of road vehicle aerodynamics using the lattice Boltzmann method*, Oct. 2014 - Jun. 2015

Graduate internship of B. Hanschke (Technical University Cottbus), *Simulation of prototypical vehicle passage problems*, autumn 2014

Ph.D. research of K. Feldhusen (DLR and Technical University Ilmenau), *Large eddy simulation of multi-physics interior flows in airplane cabins with the lattice Boltzmann method*, Feb. 2014 - Jun. 2015

Ph.D. research of N. Kin (DLR and Technical University Ilmenau), *Large eddy simulation of exterior flows around high-speed trains*, Feb. 2014 - Jun. 2015

Summer graduate internship of P. Jolivet (Université Pierre et Marie Curie, Paris), *Multi-level domain decomposition methods*, 2013

Summer graduate internship of Y. Sun (University of Michigan, Ann Arbor) *Adaptive numerical simulation of boundary layer flows in shock tubes*, 2012

Research Alliance in Math and Science summer graduate internship of S. Wood (Florida International University Miami), *Shock-driven fluid-structure interaction simulation with AMROC and DYNA3D*, 2011

DOE Computational Science Graduate Fellow internship of J. Ziegler (California Institute of Technology), *Direct numerical simulation of the Mach reflection phenomenon in gaseous detonation waves*, 2008

Graduate student summer internship of V. Srikrishnan, *Computational methods for implicit geometry representation*, 2007

Diploma thesis of M. Hausdorf (Technical University Cottbus), *Realization of adaptive multigrid methods for finite difference and finite volume discretization (in German)*, Jul. 2002 - Jan. 2003

Undergraduate student supervision

Individual project of Aden Cox (University of Southampton), *Aerodynamics of a high-speed train entering into a tunnel*, fall and spring 2016/17

Individual project of Jared Blackford (University of Southampton), *Actuator line models for wind turbine simulation*, fall and spring 2016/17

Individual project of Rowland Zachary (University of Southampton), *Actuator disc models for wind turbine simulation*, fall 2016/17

Leonardo and Erasmus+ internship of M. A. Solilo (Bronislaw Markiewicz State School of Technology and Economics Jaroslaw), *Development of a AMROC-HDF4 reader for Paraview*, autumn 2014

Summer undergraduate internship of B. Cuff (Middle Tennessee State University Murfreesboro), Summer Undergraduate Laboratory Internships, *GPU parallelization of grid-based iterative methods with CUDA*, 2012

Summer undergraduate internship of H. Oliver (North Carolina State University Raleigh), Higher Education Research Experiences, *Implementation of numerical methods for pulse propagation in dispersion-managed optical fibers*, 2011

Summer undergraduate internship of S. Wood (Florida International University Miami), through the DOE/Florida International University Science & Technology Workforce Development Initiative, *Development of verification test cases for shock-driven fluid-structure interaction simulation*, 2009

Summer undergraduate research fellowship of R. Rotta (Technical University Cottbus), *Efficient parallelization strategies for hierarchical AMR algorithms*, 2005

Summer undergraduate research fellowship of R. Rotta (Technical University Cottbus), *Load-balancing strategies for parallel AMR algorithms*, 2004

Undergraduate research project of M. Enculescu (Technical University Cottbus), *Numerical simulation of one-dimensional ZND detonations (in German)*, 2001

Several ancillary student projects in computational fluid dynamics, numerical methods for hyperbolic conservation laws, scientific visualization, 1999 - Jun. 2003

Graduate student advising

R. Schuster, graduate student of C. Wagner (Technical University Ilmenau and DLR) and A. Henning, Acoustic noise prediction in urban environments, since Apr. 2014

T. Köthe, graduate student of C. Wagner (Technical University Ilmenau and DLR), adjoint methods for optimization of cabin ventilation systems, Jul. 2013 - Jun. 2015

D. Jakubek, graduate student of C. Wagner (Technical University Ilmenau and DLR), adjoint methods for minimization of drag coefficients of train geometries, Jul. 2013 - Jun. 2015

C. Kath, graduate student of C. Wagner (Technical University Ilmenau and DLR), large eddy simulation of thermal convection flows in airplane cabins, Jul. 2013 - Dec. 2014

J. Ziegler, graduate student of D. I. Pullin (Graduate Aeronautical Laboratory Caltech), numerical simulation of compressible, diffusive, reactive flows with detailed chemistry with adaptive high order schemes, Jan. 2008 - Dec. 2011

J. Krimmel, graduate student of T. Colonius (Mechanical Engineering Caltech), numerical simulation of shock wave lithotripsy, Jun. 2005 - Jun. 2010

M. Lombardini, graduate student of D. I. Pullin, adaptive large-eddy simulation of shock-driven compressible turbulence, Dec. 2004 - May 2008

S. Laurence, graduate student of H. G. Hornung (Graduate Aeronautical Laboratory Caltech), numerical simulation of bodies in hypersonic flow, Jun. 2004 - Aug. 2006

C. Mouton, graduate student of H. G. Hornung, numerical simulation of three-dimensional Mach reflection phenomena, 2005

G. K. O'Reilly, graduate student of D. I. Pullin, numerical simulation of shock-vortex interaction, 2004

A. Rohde, graduate student of M. Mutz (Environmental Sciences Techn. Univ. Cottbus), simulation of porous media flow in sediment layers, 1999

Graduate student committees

F. Hammer, J. J. Otero Perez, J. Leggett, B. S. Soriano, B. Font Garcia (Aerodynamics and Flight Mechanics Research Group, University of Southamton)
H. Kim (Institute for Sound and Vibration Research, University of Southamton)
J. Feaster (Department for Mechanical Engineering, Virginia Polytechnic Institute and State University, Blackburg)

Professional activities

Grant referee

Israel Ministry of Science, Technology and Space: Jan. 2017
Department of Energy Applied Mathematics Research Program: Mar. 2011, May 2012, Jul. 2012 (2 proposals), Nov. 2013
Austrian Science Fund: Sep. 2013
ORNL Laboratory Director Research & Development Program: Oct. 2011
ORNL Seed Money Program: Dec. 2010, Nov. 2011
NERSC allocation Department of Energy ASCR Leadership Computing Challenge: Apr. 2010
ORAU/ORNL High Performance Computing Grant Program: Dec. 2008

Reviewer

Computers & Structures: Oct. 2006, Dec. 2008, Mar. 2009, Dec. 2009, Jan. 2010, Aug. 2010 (3 papers), Oct. 2010, Dec. 2010, Jan. 2011, Nov. 2011, Jan. 2012, Apr. 2012, Jul. 2012, Aug. 2012 (2 papers), Sep. 2012, Feb. 2013 (2 papers), Mar. 2013, Nov. 2013, Feb. 2014, Apr. 2014, Feb. 2015
J. Fluid Mechanics: Nov. 2010, Dec. 2010, Jul. 2011, Jan. 2012, Aug. 2012, Sep. 2012, Nov. 2012
Computers & Fluids: May 2010, Feb. 2013, May 2013, Oct. 2013, Oct. 2016
Proc. of the Combustion Institute: Feb. 2010 (6 papers), Feb. 2012, Jan. 2014 (4 papers), Jan. 2016 (5 papers)
J. Comput. Physics: May 2016, Jul. 2016
Int. J. Thermal Sciences: Jul. 2016
AIAA Journal: Jul. 2016
Shock Waves: Sep. 2016
Computation: Aug. 2016, Oct. 2016
Aerospace Science and Technology: Jul. 2016, Aug. 2016
Theoretical and Computational Fluid Dynamics: Jun. 2016, Oct. 2016
Part C: Journal of Mechanical Engineering Science: Jul. 2016, Sep. 2016
J. Renewable and Sustainable Energy: Jul. 2016
STAB Symposium 2014: Jan. 2015 (4 papers)
J. Propulsion and Power: May 2014
Fusion Engineering and Design: May 2014, Oct. 2014

J. Aerodynamics: Oct. 2014
Progress in Computational Fluid Dynamics: Jul. 2008, Jun. 2009, Dec. 2009, Mar. 2015
Int. J. Railway Technology: Dec. 2014, Mar. 2015
Int. J. Computational Fluid Dynamics: Sep. 2014
ASME J. Vibration and Acoustics: Aug. 2014, Nov. 2014, Jan. 2015
Physics of Fluids: Oct. 2013
Shock Waves: Oct. 2015
Central European J. Physics: Jun. 2013, Aug. 2013, Apr. 2014
Communications in Computational Physics: Jun. 2015
Open Physics: Sep. 2015
Energy & Fuels: Aug. 2015
Int. J. of Hydrogen Energy: Oct. 2015
Advances in Engineering Software: Oct. 2015
Int. J. of Heat and Fluid Flow: Nov. 2015
Chinese J. of Aeronautics: Jan. 2016
24th Int. Colloquium on the Dynamics of Explosions and Reactive Systems: Dec. 2013
Applicable Analysis: May 2012
SIAM J. Numerical Analysis: Oct. 2012
SIAM J. Multiscale Modeling and Simulation: Aug. 2011, Jul. 2012
Math. Problem in Engineering: Mar. 2011
J. Parallel and Distributed Computing: Jul. 2010
Int. J. for Numerical Methods in Fluids: Apr. 2007, Apr. 2009, Sep. 2009
Supercomputing 2009 (1 technical paper)
ACM Symposium on Applied Computing 2009, Computational Sciences Track (3 papers)
Proc. of the Royal Soc. Series A: Oct. 2007, Nov. 2007
Engineering with Computers: Nov. 2005
19th Int. Parallel and Distributed Processing Symposium: Dec. 2005
Eurographics 2004

University Services

Study Abroad Faculty Officer, ERASMUS exchanges for the Aerospace Engineering Programme, University of Southampton, Since Aug. 2015
Graduate student selection committee, UTK/ORNL Center for Interdisciplinary Research and Graduate Education: Feb. 2012, Feb. 2013

Affiliations

Member of Society for Industrial and Applied Mathematics (SIAM)
Member of the American Physical Society
Deutscher Hochschulverband

Software

Virtual Test Facility for simulating the dynamic response of materials
http://www.cacr.caltech.edu/asc
∼430,000 lines of code C++, C, Fortran 77, Fortran 90, ∼27 % (largest contribution) of program text by **R. Deiterding**

AMROC - Adaptive Mesh Refinement in Object-oriented C++
http://amroc.sourceforge.net
∼140,000 lines of code C++, C, Fortran 77, ∼75 % of overall program text by **R. Deiterding**

Specific skills

Programming languages: C++, C, Fortran 77, Fortran 90, Pascal, Modula, Python, Basic

Project organization: Mercurial, SVN, CVS, cvsview, doxygen, TWiki, HTML

Parallel libraries: MPI, OpenMP, CUDA

Parallel system experience: Various Linux Beowulf clusters, IBM SP2 - SP5, IBM BG/P, Compaq Q, Sun and IBM SMP systems

CFD and FEM Software: OpenFOAM, StarCCM+, DYNA3D

Mesh generation: CATIA, Cubit, Ansa, CADFix, Truegrid

Scientific visualization: IBM DataExplorer, Paraview, VisIt, Visual 3

Mathematical software: Matlab, Mathematica, Maple

Languages

German: native speaker
English: fluent, written and spoken
French: intermediate
Russian: basic