

# Publications

## Thesis

- [1] M. Klein. *Towards LES as an Engineering Tool*, Habilitation, Technische Universität Darmstadt. 2009.
- [2] M. Klein. *Direkte Numerische Simulation des primären Strahlzerfalls in Einstoffzerstäuberdüsen*. PhD thesis, Technische Universität Darmstadt, 2002.

## Journal Articles

- [3] A. Alqallaf, M. Klein, and N. Chakraborty. Effects of lewis number on the evolution of curvature in spherically expanding turbulent premixed flames. *Fluids*, 2019, accepted.
- [4] M. Klein and M. Germano. On the decomposition of the Reynolds stress from filtered data. *Physical Review Fluids*, 2018, accepted.
- [5] N. Chakraborty, V. Papapostolou, D. H. Wacks, M. Klein, and H. G. Im. Generalised flame surface density transport conditional on flow topologies for turbulent h<sub>2</sub>-air premixed flames in different regimes of combustion. *Numerical heat transfer*, 2018, accepted.
- [6] J. Hasslberger, S. Ketterl, M. Klein, and Nilanjan Chakraborty. Flow topologies in primary atomization of liquid jets: A direct numerical simulation analysis. *Journal of Fluid Mechanics*, 2018, accepted.
- [7] V. Papapostolou, N. Chakraborty, M. Klein, and H. G. Im. Statistics of scalar flux transport of major species in different premixed turbulent combustion regimes for H<sub>2</sub>-air flames. *Flow Turbulence and Combustion*, 2018, accepted.
- [8] K. Amend and M. Klein. Development and validation of a CFD wash-off model for fission products on containment walls. *International Journal for Nuclear Power*, 63:469–473, 2018.
- [9] U. Ahmed, N. Doan, J. Lai, M. Klein, N. Chakraborty, and N. Swaminathan. Multiscale analysis of head-on quenching premixed turbulent flames. *Physics of Fluids*, 2018, accepted.
- [10] Vassilios Papapostolou, Nilanjan Chakraborty, Markus Klein, and Hong G. Im. Effects of reaction progress variable definition on the flame surface density transport statistics and closure for different combustion regimes. *Combustion Science and Technology*, 2018, accepted.
- [11] J. Hasslberger, M. Klein, and Nilanjan Chakraborty. Flow topologies in bubble-induced turbulence: A direct numerical simulation analysis. *Journal of Fluid Mechanics*, 2018, accepted.
- [12] G. Ozel Erol, J. Hasslberger, M. Klein, and Nilanjan Chakraborty. A direct numerical simulation analysis of spherically expanding turbulent flames in fuel droplet-mists for an overall equivalence ratio of unity. *Physics of Fluids*, 2018, accepted.
- [13] M. Schoepplein, J. Weatheritt, R. Sandberg, M. Talei, and M. Klein. Application of an evolutionary algorithm to LES modeling of turbulent transport in premixed flames. *Journal of Computational Physics*, 2018, accepted.

- [14] N. Chakraborty, D. Alwazzan, M. Klein, and R.S. Cant. On the validity of Damköhler's first hypothesis in turbulent Bunsen burner flames: A computational analysis. *Proc. Comb. Inst.*, 37, 2019.
- [15] M. Klein, H. Nachtigal, M. Hansinger, M. Pfitzner, and N. Chakraborty. Flame curvature distribution in high pressure turbulent Bunsen premixed flames. *Flow Turbulence and Combustion*, 2018.
- [16] N. Chakraborty, D.H. Wacks, S. Ketterl, M. Klein, and H.G. Im. Scalar dissipation rate transport conditional on flow topologies in different regimes of premixed turbulent combustion. *Proc. Comb. Inst.*, 37, 2019.
- [17] N. Chakraborty, M. Klein, D. Alwazzan, and H.G. Im. Surface density function statistics in hydrogen-air flames for different turbulent premixed combustion regimes. *Combustion Science and Technology*, 2018.
- [18] M. Klein, C. Kasten, N. Chakraborty, N. Mukhadiyev, and H.G. Im. Turbulent scalar fluxes in  $H_2$ -air premixed flames at low and high Karlovitz numbers. *Combustion Theory and Modelling*, 2018, accepted.
- [19] J. Lai, M. Klein, and N. Chakraborty. Direct numerical simulation of head-on quenching of statistically planar turbulent premixed methane-air flames using a detailed chemical mechanism. *Flow Turbulence and Combustion*, 2018, accepted.
- [20] M. Klein and N. Chakraborty. A-priori analysis of an alternative wrinkling factor definition for flame surface density based large eddy simulation modelling of turbulent premixed combustion. *Combustion Science and Technology*, 2018, accepted.
- [21] M. Klein, D. Alwazzan, and N. Chakraborty. A direct numerical simulation analysis of pressure variation in turbulent premixed bunsen burner flames-part 1: Scalar gradient and strain rate statistics. *Computers and Fluids*, 2018, accepted.
- [22] M. Klein, D. Alwazzan, and N. Chakraborty. A direct numerical simulation analysis of pressure variation in turbulent premixed bunsen burner flames-part 2: Surface density function transport statistics. *Computers and Fluids*, 2018, accepted.
- [23] S. Ketterl and M. Klein. A band-width filtered forcing based generation of turbulent inflow data for direct numerical or large eddy simulations and its application to primary breakup of liquid jets. *Flow Turbulence and Combustion*, 2018, accepted.
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- [70] K. Amend and M. Klein. Development and validation of a CFD wash-off model for fission products on containment walls. In *49th Annual Meeting on Nuclear Technology*, Berlin, May 2018.
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- [156] M. Klein and J. Janicka. Large-eddy-simulation of the primary breakup of a spatially developing liquid film. In *ICLASS 2003, International Conference on Atomization and Sprays*, Sorrento, July 2003.
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- [159] M. Klein, A. Sadiki, and J. Janicka. Direct numerical simulation of the primary breakup of a spatially developing liquid jet. In *TSFP3, 3rd International Symposium on Turbulence and Shear Flow Phenomena*, Sendai, Japan, June 2003.
- [160] M. Klein, A. Sadiki, and J. Janicka. Untersuchung des Primärzerfalls eines Flüssigkeitsfilms: Vergleich Direkte Numerische Simulation, Experiment und lineare Theorie. In *Spray 2002, 7. Workshop über Techniken der Fluidzerstäubung und Untersuchungen von Sprühvorgängen*, pages 63–72, Freiberg, 2002.
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## Invited Talks

- [168] M. Klein. Mathematische und physikalische Modellierung von turbulenten Zweiphasenströmungen. ITLR, University Stuttgart, March 2018.
- [169] M. Klein. Towards LES for two phase flows. Helmholtz-Zentrum Dresden-Rossendorf, July 2017.
- [170] M. Klein. Recent experiences with modelling of turbulence chemistry interaction in the context of LES using DNS of turbulent premixed generic planar flame configurations. Annual meeting of the UK Consortium on Turbulent Reacting Flows, September 2016.
- [171] M. Klein. Analysis of the combined modelling of subgrid transport and filtered flame propagation for premixed turbulent combustion. University of Duisburg, January 2015.
- [172] M. Klein. An attempt to assess the quality of les in the context of implicit filtering. University of Newcastle, November 2013.
- [173] M. Klein. Industrial cfd: Applications and challenges. Technical University of Munich, February 2013.
- [174] M. Klein. 3D CFD base engine development. University of Applied Science, Darmstadt, December 2010.
- [175] M. Klein. 3D CFD base engine development. University of Applied Science, Darmstadt, December 2009.
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- [177] M. Klein. LES quality assessment. In *8th Workshop on Turbulent Nonpremixed Flames*, Heidelberg, August 2006.
- [178] M. Klein. Quality assessment of LES in the context of implicit filtering. In *Quality Assessment of Unsteady Methods for Turbulent Combustion Prediction and Validation*, Darmstadt, June 2005.
- [179] M. Klein. Numerical and experimental characterization of the turbulence structure in swirled flows. Cambridge University, November 2004.
- [180] M. Klein. How LES can be made an engineering tool. Cambridge University, July 2004.
- [181] M. Klein. Direkte numerische Simulation von ebenen ein- und zweiphasigen Freistrahlen. University of Zurich, Mai 2003.
- [182] M. Klein. On the artificial generation of inlet and initial data for unsteady turbulent flow simulation. In *17. TECFLAM-Seminar*, Stuttgart, Dezember 2003.