

RÉSUMÉ

DR.-ING. BERNHARD VOWINCKEL

Research interest

I currently hold a position as a group leader (equivalent to assistant professor or junior professor) at the Leichtweiß-Institute for Hydraulic Engineering, TU Braunschweig, Germany, which is funded by the Emmy-Noether starting grant from the German Research Foundation. My research interests cover sediment transport in environmental and geophysical flows and their analysis by means of numerical simulations of hydraulic-mechanically coupled systems and innovative experimental techniques. A particular focus is put on High Performance Computing of Computational Fluid Dynamics and multiphase flows in hydraulic engineering and fluvial processes.

Work Experience

SINCE	Junior research group leader
MAR 2020	<i>Technische Universität Braunschweig</i> (Germany) Leichtweiß-Institute for Hydraulic Engineering. Emmy-Noether Programme funded by the German Research Foundation: <i>Particle-resolving Simulations of Cohesive Sediment Dynamics</i> (PRO-MUD).
FEB 2020	Research associate on geotechnical analyses
DEC 2018	<i>Federal Institute for Geosciences and Natural Resources</i> (BGR, Germany) Coupled thermo-hydro-mechanical modeling in fractured porous claystone.
NOV 2018	Postdoctoral scholar on hydraulic engineering
JUN 2018	<i>Technische Universität Braunschweig</i> (Germany) Leichtweiß-Institute for Hydraulic Engineering. Analysis of microgravity experiments and numerical work on cohesive sediment dynamics funded by a <i>Returnee Scholarship</i> from the <i>Alexander von Humboldt Foundation</i> (Germany).
MAY 2018	Postdoctoral scholar on geophysical flows
MAY 2015	<i>University of California Santa Barbara</i> (UCSB, USA) Department of Mechanical Engineering. Computational fluid dynamics of multiphase flows. Design, preparation and analysis of sediment flocculation experiments under microgravity for the International Space Station funded by the <i>National Science Foundation</i> (USA) and the <i>Alexander von Humboldt Foundation</i> .
MAR 2015	Doctoral studies on fluid mechanics
JAN 2010	<i>Technische Universität Dresden</i> (Germany) Institute of Fluid Mechanics (Department of Mechanical Engineering). <i>Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow</i>
NOV 2009	Diploma thesis on hydrology
APR 2009	<i>Technische Universität Dresden</i> (Germany) Institute of Hydrology, Chair of Meteorology. <i>Development of a parametrization of turbulence for the boundary-layer-model HIRVAC-2D on the basis of a TKE-ϵ-closure</i>

Education

- FEB 2015 | Dr.-Ing. MECHANICAL ENGINEERING
Technische Universität Dresden (Germany)
- NOV 2009 | Diplom / Master HYDROLOGY
Technische Universität Dresden (Germany)
- NOV 2006 | Undergraduate HYDROLOGY
Albert-Ludwigs-Universität Freiburg (Germany)

Selected Grants, Fellowships and Awards

- SEP 2020 | INVITED SPEAKER
Sediment Transport in the Ocean and Droplet Transport in Clouds, Discussion Meeting at *International Centre for Theoretical Sciences*, Bangalore, India (cancelled due to the COVID-19 pandemic)
- JUL 2020 | APPOINTED MEMBER
Junge BWG (Braunschweigische Wissenschaftliche Gesellschaft), Germany
- JUN 2020 | AGNES-POCKELS FELLOWSHIP
Offered to highly-qualified external researchers by *TU Braunschweig*, Germany
- OCT 2019 | Accepted to the EMMY-NOETHER PROGRAMME
Funded by the *German Research Foundation*
- SEP 2019 | INVITED SPEAKER / YOUNG INVESTIGATOR SPOTLIGHT
Two-pHase modEling for Sediment dynamIcs Symposium (THESIS), Delaware, USA
- JUN 2018 | Outstanding contribution in REVIEWING
European Journal of Mechanics / B Fluids
- JUN 2018 | 12 month RETURNEE SCHOLARSHIP
Alexander von Humboldt Foundation, Germany
- AUG 2017 | Most outstanding paper HAROLD JAN SCHOEMAKER AWARD
Journal of Hydraulic Research during the period 2014-2016
- JUN 2015 | 24 month FEODOR-LYNEN SCHOLARSHIP
Alexander von Humboldt Foundation, Germany

External Responsibilities

SINCE 2012	Reviewer for the German Research Foundation and a total of 25 journals among them <i>Physical Review Letters</i> , <i>Water Resources Research</i> , <i>Journal of Geophysical Research</i> , <i>Journal of Fluid Mechanics</i> , <i>Journal of Hydraulic Research</i> , <i>Physical Review Fluids</i>
SINCE APR 2019	Session convener <i>Measurements, monitoring and modelling of hydro-morphological processes in open-water environments</i> at the general assembly of the <i>European Geophysical Union</i> (EGU)
SINCE 2015	Member <i>International Association of Hydro-Environment Engineering and Research</i> (IAHR), <i>European Geophysical Union</i> (EGU), <i>American Physical Society</i> (APS), and <i>European Mechanics Society</i> (EUROMECH)
AUG 2016	Session chair Session on particle-laden flows at the <i>VIIIth International Symposium on Stratified Fluids</i> , San Diego (USA)

Status: July 2020

Bernhard Vowinckel

LIST OF PUBLICATIONS
DR.-ING. BERNHARD VOWINCKEL

Peer-reviewed journal articles

- K. Zhao, **B. Vowinckel**, T.-J. Hsu, T. Köllner, B. Bai, E. Meiburg. An efficient cellular flow model for cohesive particle flocculation in turbulence. *Journal of Fluid Mechanics*, 889, R3, 2020.
- K. Papadopoulos, V. Nikora, **B. Vowinckel**, R. Jain, S. Cameron, M. Stewart, C. Gibbins, J. Fröhlich. Double-averaged kinetic energy budgets in flows over mobile granular beds: insights from DNS data analysis. *Journal of Hydraulic Research*, in press, 2019.
- B. Vowinckel**, E. Biegert, P. Luzzatto-Fegiz, E. Meiburg. Consolidation of freshly deposited cohesive and non-cohesive sediment: particle-resolved simulations, *Physical Review Fluids*, 4(7), 074305, 2019.
- B. Vowinckel**, J. Withers, P. Luzzatto-Fegiz, E. Meiburg. Settling of cohesive sediment: particle-resolved simulations, *Journal of Fluid Mechanics*, 858, 5-44, 2019.
- L. Zhao, R. Ouillon, **B. Vowinckel**, E. Meiburg, B. Kneller, Z. He. Transition of a hyperpycnal flow into a saline turbidity current due to differential diffusivities. *Geophysical Research Letters*, 45(21), 11-875, 2018.
- E. Biegert, **B. Vowinckel**, R. Ouillon, E. Meiburg. High-resolution simulations of turbidity currents. *Progress in Earth and Planetary Science*, 4(1), 33, 2017.
- R. Jain, **B. Vowinckel**, J. Fröhlich. DNS of particle cluster motion influenced by hydraulic roughness: implications for sediment transport. *Flow, Turbulence and Combustion*, 99(3-4), 973-990, 2017.
- E. Biegert, **B. Vowinckel**, E. Meiburg. A collision model for grain-resolving simulations of flows over dense, mobile, multidisperse granular sediment. *Journal of Computational Physics*, 340, 105-127, 2017.
- B. Vowinckel**, V. Nikora, T. Kempe, J. Fröhlich. Momentum balance in flows over mobile granular beds: Application of Double-Averaging Methodology to DNS data. *Journal of Hydraulic Research*, 55(2), 190-207, 2017.
- B. Vowinckel**, V. Nikora, T. Kempe, J. Fröhlich. Spatially-averaged momentum fluxes and stresses in flows over mobile granular beds: A DNS-based study. *Journal of Hydraulic Research*, 55(2), 208-223, 2017.
- B. Vowinckel**, R. Jain, T. Kempe, J. Fröhlich. Entrainment of single particles in a turbulent open-channel flow: a numerical study. *Journal of Hydraulic Research*, 54(2), 158-171, 2016.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Fluid-particle interaction in turbulent open channel flow with fully-resolved mobile beds. *Advances in Water Resources*, 72, 32-44, 2014.

- T. Kempe, **B. Vowinckel**, J. Fröhlich. On the relevance of collision modelling for interface-resolving simulations of sediment transport in open-channel flow. *International Journal of Multiphase flow*, 58:214-235, 2014.
- B. Vowinckel**, T. Kempe, J. Fröhlich, V. Nikora. Numerical simulation of sediment transport in open channel flow. In Murillo, R., editor, *River Flow*, pages 507-514, ISBN 978-0-415-62129-8, 2012.
- R. Kindler, J. Siemens, K. Kaiser, D.C. Walmsley, C. Bernhofer, N. Buchmann, P. Cellier, W. Eugster, G. Gleixner, T. Grunwald, A. Heim, A. Ibrom, S.K. Jones, M. Jones, K. Klumpp, W. Kutsch, K.S. Larsen, S. Lehuger, B. Loubet, R. McKenzie, E. Moors, B. Osborne, K. Pilegaard, C. Rebmann, M. Saunders, M.W. Schmidt, M. Schrumpf, J. Seyfferth, U. Skiba, J.-F. Soussana, M.A. Sutton, C. Tefs, **B. Vowinckel**, M. Zeeman, M. Kaupenjohann. Dissolved carbon leaching from soil is a crucial component of the net ecosystem carbon balance, *Global Change Biology*, 17(2):1167-1185, 2011.

Monographs

- B. Vowinckel**: Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow. Dissertation, TU Dresden, 2015.

Conferences with proceedings

- N. Rommelfanger, **B. Vowinckel**, Z. Wang, R. Dohrmann, E. Meiburg, P. Luzzatto-Fegiz. A simple theory and experiments for onset of flocculation in kaolin clay suspensions. *River Flow 2020*, Delft, 2020.
- B. Vowinckel**, G. Zieffle, H. Kunz, J. Maßmann. Coupled hydraulic-mechanical effects in the Mont Terri Rock Laboratory: Numerical modelling of the CD-A experiment. *8th International Clay Conference 2020*, Nancy, France, 2020.
- K. Zhao, **B. Vowinckel**, T.-J. Hsu, T. Köllner, B. Bai, E. Meiburg. An efficient cellular flow model for cohesive particle flocculation in turbulence. *EGU General Assembly 2020*, Vienna, Austria, 2020.
- J. Maßmann, G. Zieffle, S. Costabel, M. Furche, B. Graupner, J. Hesser, D. Jaeggi, F. Königer, K. Rink, R. Schuhmann, **B. Vowinckel**, K. Wieczorek. In-situ Experiment on the Influence of Humidity on the Cyclic and Long-Term Deformation Behavior (CD-A) of the Opalinus Clay at the Mont Terri Rock Laboratory, Switzerland: Excavation of the Twin Niches, First Measurements, Simulations and Analysis. *EGU General Assembly 2020*, Vienna, Austria, 2020.
- E. Meiburg, **B. Vowinckel**, J. Withers, K. Zhao, F. Pomes, R. Ouillon, T. Köllner, P. Luzzatto-Fegiz. Grain-resolving simulations of cohesive sediment transport. *Ocean Sciences Meeting*, San Diego, USA, 2020.
- B. Vowinckel**. Cohesive sediment dynamics: Linking particle-resolved simulations with Earth- and Space-based experiments. **Invited lecture** at *THESIS-Symposium*, Delaware, USA, 2019.

- E. Biegert, **B. Vowinckel**, L. Hua, E. Meiburg. Stress balance for a viscous flow with a single rolling particle. In Paquier, A., editor, *River Flow*, 2018.
- B. Vowinckel**, J. Withers, E. Meiburg, P. Luzzatto-Fegiz. Grain-resolving simulations of cohesive sediment. *8th International Symposium on Environmental Hydraulics*, Notre Dame, USA, 2018.
- B. Vowinckel**, R. Jain, T. Kempe, J. Fröhlich. Conditional averaging for the onset of erosion of single particles in a turbulent open-channel flow. In *Direct and large-eddy simulation X* (pp. 463-468). Springer, 2018.
- B. Vowinckel**, J. Withers, E. Meiburg, P. Luzzatto-Fegiz. Grain-resolving simulations of settling cohesive sediment. *Bulletin of the American Physical Society*, 62, 2017.
- P. Luzzatto-Fegiz, **B. Vowinckel**, E. Meiburg. Quantifying Cohesive Sediment Dynamics for Advanced Environmental Modeling, *2017 Meeting of the American Society for Gravitational and Space Research*, Seattle, USA, 2017.
- E. Biegert, **B. Vowinckel**, E. Meiburg. Towards establishing the rheology of a sediment bed. *Bulletin of the American Physical Society*, 62, 2017.
- B. Vowinckel**, J. Withers, E. Meiburg, P. Luzzatto-Fegiz. Grain-resolving simulations of cohesive sediment. *EUROMECH Colloquium 588 Coupling Mechanisms and Multi-Scaling in Granular-Fluid Flows*, Toulouse, France, 2017.
- B. Vowinckel**, J. Withers, E. Meiburg, P. Luzzatto-Fegiz. Grain-resolving simulations of cohesive sediment. *IUTAM/AMERIMECH symposium: Dynamics of Gravity Currents*, Santa Barbara, USA, 2017.
- E. Biegert, **B. Vowinckel**, E. Meiburg. Towards Establishing the Rheology of a Sediment Bed. *IUTAM/AMERIMECH symposium: Dynamics of Gravity Currents*, Santa Barbara, USA, 2017.
- E. Meiburg, M. Nasr-Azadani, E. Biegert, **B. Vowinckel**. High-resolution simulations of Turbidity Currents. **Invited paper** at *JpGU-AGU Meeting 2017*, Tokyo, Japan, 2017.
- B. Vowinckel**, M. Carmi, E. Biegert, E. Meiburg. Shear flows of dense suspensions: flow modification by particle clustering and mixing. *Bulletin of the American Physical Society*, 61, 2016.
- E. Biegert, **B. Vowinckel**, E. Meiburg. A collision model for simulating dense suspensions. *Bulletin of the American Physical Society*, 61, 2016.
- B. Vowinckel**, E. Biegert, E. Meiburg. Phase-resolved simulations of sediment erosion due to unsteady pressure drag. *VIIIth International Symposium on Stratified Flows*, San Diego, USA, 2016.
- E. Meiburg, M.M. Nasr-Azadani, E. Biegert, **B. Vowinckel**. High-resolution simulations of turbidity currents interacting with complex topography. *Second Conference on Forward Modelling of Sedimentary Systems*, Trondheim, Norway, 2016.

- B. Vowinckel**, E. Biegert, E. Meiburg. Highly resolved simulations of sediment erosion due to unsteady pressure drag. *SoCalFluids X*, Irvine, USA, 2016.
- R. Jain, **B. Vowinckel**, J. Fröhlich. Direct Numerical Simulation of sediment transport over irregular sediment bed in an open channel flow. 11th *ERCRAFTAC Symposium* (ETMM), Sicily, Italy, 2016.
- R. Jain, **B. Vowinckel**, J. Fröhlich. Impact of the regularity of the sediment bed on bed-load transport. *Proceedings of Applied Mathematics and Mechanics*, volume 16, issue 1, 583-584, 2016.
- K. Papadopoulos, V. Nikora, **B. Vowinckel**, S. Cameron, J. Fröhlich, M. Stewart, H. Biggs, C. Gibbins. Energy balance in mobile-boundary flows: implications for sediment transport and flow-biota interactions. 11th *International Symposium on Ecohydraulics*, Melbourne, Australia, 2016.
- B. Vowinckel**, T. Kempe, V. Nikora, J. Fröhlich. Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow. *Bulletin of the American Physical Society*, 60, 2015.
- E. Biegert, **B. Vowinckel**, E. Meiburg. Simulating immersed particle collisions: the Devil's in the details. *Bulletin of the American Physical Society*, 60, 2015.
- B. Vowinckel**, T. Kempe, V. Nikora, J. Fröhlich. Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow. *EGU General Assembly 2015*, Vienna, Austria, 2015.
- B. Vowinckel**, T. Kempe, J. Fröhlich, V. Nikora. Direct Numerical Simulation of Bed-Load Transport of Finite-Size Spherical Particles in a Turbulent Channel Flow. In *Direct and Large-Eddy Simulation IX*, Springer International Publishing, 663-669, 2015.
- B. Vowinckel**, R. Jain, T. Kempe, J. Fröhlich. Incipient motion of inertial particles in a turbulent open channel flow. 10th *ERCRAFTAC Symposium* (ETMM), Marbella, Spain, 2014.
- V. Nikora, S. Cameron, M. Stewart, M. Witz, **B. Vowinckel**, J. Fröhlich. River turbulence: current state, challenges, and prospects. **Invited lecture** at *River Flow 2014*, Lausanne, Switzerland, 2014.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow. *NIC-Symposium*, Jülich, Germany, 2014.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Particle-resolving simulations of bed-load sediment transport. 8th *International Conference on Multiphase Flow*, Jeju, Korea, paper no. 792, 2013.
- T. Kempe, S. Schwarz, C. Santarelli, **B. Vowinckel**, J. Fröhlich. Application of the Immersed Boundary Method to particle-laden and bubbly flows. **Invited lecture** at the . Amsterdam, the Netherlands, 2013.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Phase-resolved simulations of bed-load transport. *THESIS-Symposium*, Chatou, France, 2013.

- V. Nikora, F. Ballio, S. Coleman, D. Pokrajac, S. Cameron, **B. Vowinckel**, J. Fröhlich. Spatially-averaged flows over mobile rough beds: A theoretical framework. **Invited lecture** at 8th *Symposium on River, Coastal and Estuarine Morphodynamics*, Santander, Spain, 2013.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Numerical investigation of near-bed transport in horizontal turbulent open channel flow. 13th *Workshop on two-phase flow predictions*, Halle-Wittenberg, Germany, 2012.
- B. Vowinckel**, J. Fröhlich. Simulation of bed load transport in turbulent open channel flow, *Proceedings in Applied Mathematics and Mechanics*, volume 12, issue 1, 505-506, 2012.
- B. Vowinckel**, T. Kempe, J. Fröhlich. Impact of collision models on particle transport in open channel flow. In Proc. 7th *Int. Symp. Turb. Shear Flow Phen.*, Ottawa, Canada, 2011.
- B. Vowinckel**, I. Schnauder, A. Sukhodolov. Spectral dynamics of turbulence in shallow mixing layers at a confluence of two parallel streams, *Hydraulics Measurement & Experimental Methods*, ASCE, Lake Placid, USA, 2007.

Further publications

- B. Vowinckel**, T. Kempe, J. Fröhlich (2013): Highly-resolved numerical simulations of bed-load transport in a turbulent open-channel flow. *inSiDE - innovatives Supercomputing in Deutschland*, 11/2, Autumn 2013.

Invited seminars

- October 2019: Seminar at Center for Interdisciplinary Research in Fluids, *University of California, Santa Barbara*, USA
- November 2018: Department of Computer Science, *Friedrich-Alexander-Universität*, Erlangen-Nürnberg, Germany.
- March 2018: International workshop: the Physics of Dense Suspensions, *Kavli Institute for Theoretical Physics*, UCSB, USA
- March 2017: Group for Environmental Fluid Mechanics and Hydrology, *Stanford University*, USA
- February 2017: Unit for Mathematical Soft Matter, *Okinawa Institute for Science and Technology*, Japan
- March 2016: International workshop: Two-Phase Continuum Models for Geophysical Particle-Fluid Flows, *Max Planck Institute for the Physics of Complex Systems*, Dresden, Germany
- June 2015: Seminar at Center for Interdisciplinary Research in Fluids, *University of California, Santa Barbara*, USA
- June 2014: Seminar at Center for Interdisciplinary Research in Fluids, *University of California, Santa Barbara*, USA