

Nomination Form of Candidate for the International Qian Ning Prize

Name	Prof. Dr.-Ing. Silke Wieprecht	Sex	F	
Nationality	German	Date of birth	23.08.1965	
Affiliation	University of Stuttgart, Institute for Hydraulic and Environmental Systems			
Professional Position	Professor, Head of Institute			
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Address				
1. RESUME				
(1) Education:				
1991	Graduation (Dipl.-Ing.) in Civil Engineering			
1991-1996	Scientific assistant at the Institute of Hydromechanics and Hydrology, University of Federal Armed Forces Munich			
1998	PhD in Civil Engineering (Topic: Sediment transport and bed forms in gravel bed rivers)			
(2) Professional Positions:				
1998-2000	Freelance work as consulting engineer in the field of constructional water researches, hydraulics and hydrology specialized in river morphology, sediment transport and physical modelling			
2000-2003	German Federal Institute of Hydrology (Bundesanstalt für Gewässerkunde) in Koblenz in the field of river morphology, responsible for all navigable rivers in Germany			
2002	Research at Beijing University, Institute of Environmental Engineering			
Since 2003	Full Professor “Hydraulic Engineering and Water Resources Management”, Institute for Modeling Hydraulic and Environmental Systems, University of Stuttgart			
Since 2008	Dean and Course Director of international Master’s Program WAREM (Water Resources Management and Engineering Management)			
2010	Research at Norwegian University of Science and Technology, NTNU Trondheim, Department of Hydraulic and Environmental Engineering			
2011-2016	Director of the Institute for Modeling Hydraulic and Environmental Systems, University of Stuttgart			
2016	Research at UiTM, Kuala Lumpur and Penang, Malaysia			
2018-2020	Visiting Professor at UiTM, Kuala Lumpur and Penang, Malaysia			

(3) Involvement in International and National Scientific Activities:

2002-2017	Vice head of the German Water Association (DWA) board WW2 “Sediment Transport”
Since 2017	Head of the German Water Association (DWA) board WW2 “Sediment Transport”
Since 2006	Head of the DWA board WW 1”River Engineering”
2006-2010	Vice dean (Prodekanin) of the Faculty of Civil and Environmental Engineering, University of Stuttgart
2007	Successful foundation of Stuttgart Water Research Centre (WFZ). Since 2007 deputy director of WFZ
Since 2008	Advisor of the Baden-Württemberg Young Professional Network (before: student chapter) of the International Association for Hydro-Environment Engineering and Research (IAHR)
Since 2008	Course Coordinator of International Master’s Program WAREM (Water Resources Management and Engineering Management)
2009-2013	Lead Investigator of the BMBF Joint Research Project EvaSim
2012-2017	Principle Investigator of the BMBF Joint Research Project SURUMER (Sustainable Rubber Cultivation in the Mekong Region)
2016-2021	Lead Investigator of the Joint Research Project CHARM (Challenges of Reservoir Management)
2019-2021	Principle Investigator of the EU Joint Research Project DIRTIX (Evaluating sediment Delivery Impacts on Reservoirs in changing climate and society across scales and sectors)
Since 2013	Member of the World Council of IAHR - International Association for Hydro-Environment Engineering and Research
Since 2013	Patron for the Student Exchange Programme between the Universities of Stuttgart and Cardiff, Great Britain
Since 2011	Associate Editor of International Journal of Sediment Research
Since 2015	Associate Editor of Journal of Applied Water Engineering and Research (JAWER)
2013-2019	Council Member of WASER
2016	Organization of ISRS in Stuttgart, Head of Local Organizing Committee
Since 8/2017	Vice president of IAHR - International Association for Hydro-Environment Engineering and Research

(4) Research interests:

Sediment transport processes:

- Reservoir management, reservoir flushing (field tests together with German, French, Austrian Hydro Power Companies)
- colmation, erosion processes in field and laboratory tests

- Large-scale/long-term morphodynamic processes (from catchment scale to transport processes in the rivers)
- Influence of anthropogenic measures (dams) on transport processes
- Influence of biofilm on sediment transport
- In-situ measurements (development of new methods for erosion, colmation, porosity)
- Laboratory analyses SETEG (Flow channel for determining the depth-dependent erosion stability of water sediments), erosion measurements: image analyses, statistical evaluations; air measurements in currents
- Numerical modeling (1d, 2d, 3d)

Dams:

- Statistical evaluation of measured control data with trend analysis
- Air intrusion processes of immersed free jets (turbines)

(5) Selected Publications:

Noack, M., Beckers, F., Haun, S., **Wieprecht, S.**

Investigation the stability of reservoir sediments in the lab and field
(2018) MATEC Web of Conferences, 246, art. no. 01002, .

Beckers, F., Noack, M., **Wieprecht, S.**

Uncertainty analysis of a 2D sediment transport model: an example of the Lower River Salzach
(2018) Journal of Soils and Sediments, 18 (10), pp. 3133-3144.

Schäfer Rodrigues Silva, A., Noack, M., Schlabing, D., **Wieprecht, S.**

A data-driven fuzzy approach to simulate the critical shear stress of mixed cohesive/non-cohesive sediments
(2018) Journal of Soils and Sediments, 18 (10), pp. 3070-3081.

Yi, Y., Cheng, X., Yang, Z., **Wieprecht, S.**, Zhang, S., Wu, Y.

Evaluating the ecological influence of hydraulic projects: A review of aquatic habitat suitability models
(2017) Renewable and Sustainable Energy Reviews, 68, pp. 748-762.

Noack, M., Ortlepp, J., **Wieprecht, S.**

An Approach to Simulate Interstitial Habitat Conditions During the Incubation Phase of Gravel-Spawning Fish
(2017) River Research and Applications, 33 (2), pp. 192-201.

Schmidt, H., Thom, M., King, L., **Wieprecht, S.**, Gerbersdorf, S.U.

The effect of seasonality upon the development of lotic biofilms and microbial biostabilisation
(2016) Freshwater Biology, 61 (6), pp. 963-978.

Gerbersdorf, S.U., **Wieprecht, S.**

Biostabilization of cohesive sediments: Revisiting the role of abiotic conditions, physiology and diversity of microbes, polymeric secretion, and biofilm architecture
(2015) Geobiology, 13 (1), pp. 68-97.

Gerbersdorf, S.U., Cimatoribus, C., Class, H., Engesser, K.-H., Helbich, S., Hollert, H., Lange, C., Kranert, M., Metzger, J., Nowak, W., Seiler, T.-B., Steger, K., Steinmetz, H., **Wieprecht, S.**

Anthropogenic Trace Compounds (ATCs) in aquatic habitats - Research needs on sources, fate, detection and toxicity to ensure timely elimination strategies and risk management
(2015) *Environment International*, 79, pp. 85-105.

Noack, M., Gerbersdorf, S.U., Hillebrand, G., **Wieprecht, S.**

Combining field and laboratory measurements to determine the erosion risk of cohesive sediments best
(2015) *Water (Switzerland)*, 7 (9), pp. 5061-5077.

Hauser, I., Martin, K., Germer, J., He, P., Blagodatskiy, S., Liu, H., Krauß, M., Rajaona, A., Shi, M., Pelz, S., Langenberger, G., Zhu, C.-D., Cotter, M., Stürz, S., Waibel, H., Steinmetz, H., **Wieprecht, S.**, Fror, O., Ahlheim, M., Aenis, T., Cadisch, G.

Environmental and socio-economic impacts of rubber cultivation in the Mekong region: Challenges for sustainable land use
(2015) *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*, 10, art. no. 027.

Thom, M., Schmidt, H., Gerbersdorf, S.U., **Wieprecht, S.**

Seasonal biostabilization and erosion behavior of fluvial biofilms under different hydrodynamic and light conditions
(2015) *International Journal of Sediment Research*, 30 (4), pp. 273-284.

Schmidt, H., Thom, M., Matthies, K., Behrens, S., Obst, U., **Wieprecht, S.**, Gerbersdorf, S.U.

A multi-disciplinarily designed mesocosm to address the complex flow-sediment-ecology tripartite relationship on the microscale
(2015) *Environmental Sciences Europe*, 27 (1), 11 p.

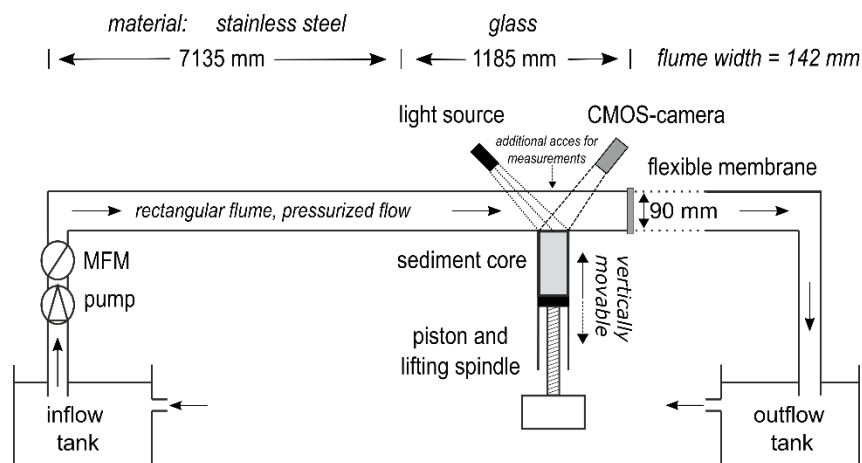
(6) Academic Achievements and Awards:

1998	Dissertation with distinction
2003	Call for Full Professorship (C4) in Stuttgart
SS 2008	University of Stuttgart Environmental Engineering student award for best lecture
SS 2009	University of Stuttgart Environmental Engineering student award for best lecture
SS 2012	University of Stuttgart Environmental Engineering student award for best lecture
SS 2014	University of Stuttgart Environmental Engineering student award for best lecture

2. Three most outstanding achievements with supporting materials

Outstanding scientific or technological contributions in the fields of erosion and sedimentation research:

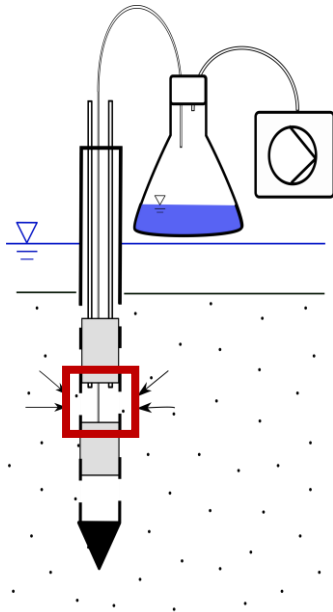
- Silke Wieprecht invented and developed together with her team a specific device to investigate sediment samples on their erosion behavior. Undisturbed samples (sediment cores) are taken from the field and then taken to the laboratory, where erosion measurements are conducted in the SETEG flume (Flow channel for determining the **depth-dependent erosion stability** of fluvial sediments). The sediment is exposed to increasing flow rates. During time of exposure, high spatio-temporal resolution measurements are conducted with a specific high resolution photogrammetric detection installation (PHOTOSED) to quantify the erosion variability and to analyze the erosion behavior. Thus, the spatio-temporal erosion variability can be shown within only a few consecutive time steps. The spatial distribution of the erosion progress can illustrate the emerging erosion pattern and points and the large variability of deepening.



The SETEG flume is very precise and reveals details of erosion processes which was yet not possible. The installation is worldwide unique. Due to its high scientific and practical relevance several institutions decided to cooperate with the team of Silke Wieprecht and already copied or intend to copy the system and apply for their own purposes. E.g., for several years Silke Wieprecht and her team tested the sealing clay material for German waterways on behalf of BAW (Federal Waterways Engineering and Research Institute) on their erosion resistance. Just recently BAW decided to build a similar flume to do the testing from now on – with the same system – by their own.

- Together with her team Silke Wieprecht invented a totally new approach for in-situ detection of **colmation/clogging effects in rivers**. Clogging of river bed through fine material depositions alters sediment dynamics strongly. Fine sediment glues the top layer and/or the interstitial. As open pores are filled, exchange processes between the free flowing water phase and the hyporheic zone are not possible anymore. Due to colmation also especially spawning habitats get lost. Either the eggs were covered and die due to oxygen deficiency or can even not be put in the spawning area as fish cannot dig spawning pits due to conglutination of the sediment particles. Colmation is one of the main negative parameters which are responsible for only satisfactory or even

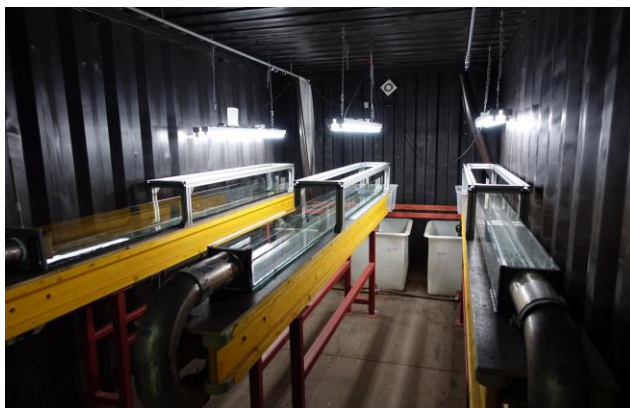
bad ecological status of many rivers. According to the European Water Frame Work Directive a good ecological status has to be reached. Thus, actions have to be taken to improve the colmated sections of rivers. However, up to now only subjective observation methods were available to assess the degree of colmation/clogging. Additionally, only the first top layer is accessible for a visual inspection. The inner colmation cannot be observed at all. Although, management measures had to rely on these mainly sentimental values. With the new approach in-situ measurements of the clogging degree are possible, even with a relative high resolution over the depth.



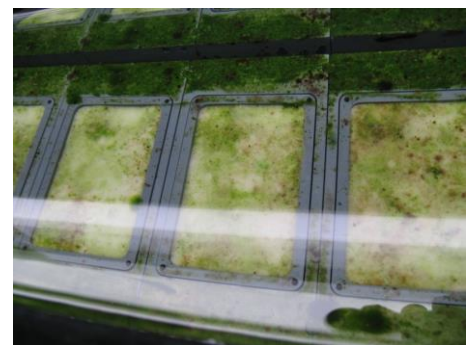
Brief description of the system:

- Double packer seals standpipe and forms a measuring chamber
- Ambient pressure in the chamber through ventilation pipes
- Water seeps into the chamber and is slurped off with a vacuum pump.
- Determination of the slurping rate
- Creation of a vertical profile
- Conversion of slurping rates to actual hydraulic conductivities, which are directly related to degree of clogging/colmation
- Additionally: Combined with an optode to determine a vertical profile of dissolved oxygen in the interstitial

- Silke Wieprecht has established a highly interdisciplinary working environment at her institute. Engineers are researching together with biologist especially to investigate the interaction of biology and sediments. Together with her team she invented flumes, where biofilm is grown to investigate its influence on critical shear stress.



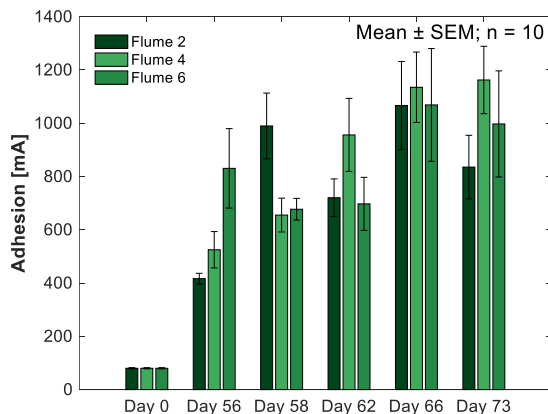
Flumes to grow biofilm under defined conditions



Biofilm growth on sediments

The experiments clearly reveal that the biofilm highly contributes to consolidation of sediments. It can be observed that the critical shear stress for the initiation of motion is increased up to a factor of 10. The adhesiveness of the biofilm can be measured with a specifically developed device. Iron particles are spread on the biofilm/sediment surface. With an electromagnet the magnetic intensity can be defined and measured, which is required to detach the particles from the biofilm matrix. This serves as

an indicator for the adhesiveness of the biofilm and the degree of conglutination which is responsible for the increase of the critical shear stress.



Degree of adhesion after 56, 58, 62, 66 and 73 days of biofilm growth.

It can be seen that there is a constant increase which in turn results in seriously higher critical shear stresses for the initiation of motion of sediments.

Outstanding contribution to promoting scientific and technological training of personnel in the field of erosion and sedimentation:

- Silke Wieprecht supervises actually a group of app. 11 PhD students and 3 Post Docs dealing with the topic of sediment transport and thus she highly contributes to the promotion of scientific personnel in the field of erosion and sedimentation (<http://www.iws.uni-stuttgart.de/index.en.html>). In the last 10 years she supervised 17 dissertations as first advisor and 12 as second supervisor internationally (Norway, Italy, Austria, Switzerland, Germany) in the field of sediment transport. Additionally, she is very active as study dean of the international Master's program WAREM, where her main focus is on sediment transport (<https://www.warem.uni-stuttgart.de/>). Students from all over the world learn about water and especially about sediment transport issues. Silke Wieprecht is highly committed by organizing lab tours, field trips, excursion and case studies all related to the topic of sediment transport in order to sensitize students for this topic and secondly to educate them in solving the problems occurring due to erosion and sedimentation or even better to prevent their formation. Potential professionals and the future academic elite has to be provided with high quality education to be able to embrace existing and upcoming challenges in sediment transport.
- Silke Wieprecht was one of the founding member of GESINUS (German-Sino-Unsteady-Sediment transport). In the 1990ies a German-Sino workshop in Beijing at IRTCES took place under the title of "Unsteady Sediment Transport". This was the nucleus of a close cooperation between German and Chinese young researchers dealing with the topic of unsteady sediment transport. As a consequence, 1994 the GESINUS group was formed with the aim of an open discussion about any research dealing with sediment transport. The overall concept covered the idea that especially PhD students and PostDocs shall closely interact and exchange about their findings and ideas in a casual atmosphere. The meetings aim at providing a platform where young researcher can even present only intermediate stage results and also discuss about shortcomings and challenges in their actual research. Special emphasis is placed on open and uncomplicated interaction (professional and personal). It is also possible to take unconventional paths.

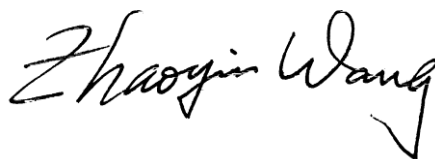
The GESINUS group is still very active and meets once a year. At the turn of the year, these meetings are organized by an organization group consisting of two to three members from different institutions (<https://gesinus1.wordpress.com/>)

3. Recommendation reasons

Silke Wieprecht is dedicated to sediment transport. In her whole scientific life sediment transport was always the center of her research. If required, she also goes unconventional paths

Her research is driven by discovering new things. In particular, she recognized very early that a mono-disciplinary approach would only lead to limited results. Interdisciplinary research was and is therefore particularly close to her heart. Her research focuses, for example, on the interaction of morphology and habitat conditions for fish and macrozoobenthos. She has taken physical habitat modelling a big step forward by implementing dynamic approaches for the development of morphodynamics. Also her latest research on the interaction of biofilms on fine sediments has been developed in a team of engineers and biologists with a strong interdisciplinary focus.

Dr. Wieprecht is very active in WASER activities. She organized the 13 ISRS in Stuttgart. The symposium was regarded the most successful symposium on river sedimentation mainly due to her organization work.



Signature:

Date: March 25, 2019

4. Preliminary screening (to be filled by the Office)