Processes in the Yangtze River System – Experiences and Perspectives –

S. Küppers, G. Subklew, R.-D. Wilken (Editors)

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Pre Conference activity

The external guests of Workshop will be invited to a guided tour through the old city of Aachen including the traditional Christmas Market and a welcome reception with a light meal. Start of the tour is Nov. 27th at 17:30 in the lobby of the IBIS Hotel.

Conference office

The conference office is located in front of the lecture hall and will be available for all kind of questions. For questions before and after conference hours, please feel free to call:

++49-163-8990528

or

++49-175-1823175

Proceedings-CD

All presentations that are provided to the conference administration as a PDF-file will be collected on a proceedings-CD that will be sent to the participants after the meeting.

Legal-Notice

Acknowledgement

The organization of this scientific workshop of Chinese and German research partners would have not been possible without financial support from the International Bureau of the German Federal Ministry of Education and Research (BMBF) in the frame the Cooperation in Science and Technology between China and Germany (CHN 08 / 015).

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- RWTH Aachen University (BMBF-DLR Projekt der RWTH CHN 11 / 001) and
- the Research Centre Jülich.

The partners acknowledge the support of the research projects by the German Federal Ministry of Education and Research (BMBF).

Last not least we acknowledge the administrative and logistic support of Forschungszentrum Jülich and RWTH Aachen in the organisation of the workshop.

About the intention of this Workshop

细节决定成败 - Details determine success or failure

and

众志成城 - Unity is strength

Scientific Committee

Chairmen:

- YIN Daqiang
- Andreas SCHÄFFER
- Günter SUBKLEW

Local organizing committee:

- Ruth DEHMEL
- Tilman FLOEHR
- Henner HOLLERT
- Stephan KÜPPERS
- Yan LIANG
- Martina ROSS-NICKOLL
- Björn SCHOLZ-STARKE
- Rolf-Dieter WILKEN
- Xinyi XIANG
- Ye YUAN

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- ADM Elektronik
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- bbe Moldaenke
  www.bbe-moldaenke.de

- IWW Mülheim
  www.iww-online.de

- microLan
  www.toxcontrol.com

Processes in the Yangtze River System
- Experiences and Perspectives -

Scientific program

28. November 2011

08:00 – 09:30	**Registration**
09:30	**Opening:** ***R. ROSSAINT**, Vice-Rector, RWTH Aachen University,* ***U. SCHURR**, Head of Institute Plant Sciences, Forschungszentrum Jülich GmbH*
Topic:	***Introduction***
Chair:	***R.-D. WILKEN***
09:40 – 10:00	**The German Yangtze-Project from the beginning to today,** *G. SUBKLEW, Forschungszentrum Jülich GmbH*
10:00 – 10:20	**Occurrence of antibiotics and antibiotic resistant genes in drinking water from Yangtze River Delta,** *D. YIN, Tongji University, Shanghai*
10:20 – 10:40	**Ecosystem changes due to river impoundment by the Three Gorges Dam in Central China,** *T. SCHOLTEN, Tübingen University*
10:40 – 11:00	***Coffee and Tea break***
Topic:	***Monitoring and Management I***
Chair:	***S. KÜPPERS***
11:00 – 11:20	**Cyclic process and warning monitor of typical pollutions in Three Gorges Reservoir,** *J. CHANG, Institute of Hydroecology, Wuhan*
11:20 – 11:40	**Monitoring of chlorinated pollutants biodegradation by PCR detection,** *A. TIEHM, Water Technology Center, Karlsruhe*
11:40 – 12:00	**Eutrophication and its control methods of Lake Taihu,** *L. YANG, Nanjing University*
12:00 – 12:20	**Urban impacts on the Yangtze and its tributaries Daninghe, Xiao Jiang and Jialing - gained from water chemistry analyses at selected sites,** *L. REID, Karlsruhe Institute of Technology*
12:20 – 13:30	***Lunch***

Topic:	***Water body dynamics I***
Chair:	***D. YIN***
13:30 – 13:50	**Numerical simulation of dissolved and particulate pollutant transport dynamics in the near dam Yangtze section,** *B. WESTRICH, University of Stuttgart*
13:50 – 14:10	**Effects of phenolic humus monomers on removal of nonylphenol from water by a laccase,** *R. JI, Nanjing University*
14:10 – 14:30	**Exposomics of Virtual Organisms in Three Gorges Area,** *K.-W. SCHRAMM, Technische Universität München*
14:30 – 14:50	**Bioaccumulation and biotransformation of Polybromodiphenyl Ethers in Crucian Carp,** *S. GAO, Nanjing University*
14:50 – 16:10	***"World Cafe" with Coffee and Tea followed by Poster session***
Topic:	***Processes I***
Chair:	***G. SUBKLEW***
16:10 – 16:30	**Method on ecological security assessment and early-warning in reservoir watershed based on IROW framework,** *L. WANG, CRAES, Bejing*
16:30 – 16:50	**Sorption of organic pollutants to Yangtze River sediments and their model components,** *E. KLUMPP, Forschungszentrum Jülich GmbH*
16:50 – 17:10	**Effect of transition metal ions on formation and distribution of disinfection by-products during chlorination of drinking water,** *Z. ZHU, Tongji University, Shanghai*
17:10 – 17:30	**Degradation of xenobiotics in water under various conditions,** *S. KÜPPERS, Forschungszentrum Jülich GmbH*
17:30 – 17:50	**Study on the water safety classification system in the Three Gorges Reservoir area,** *H. JIA, YWRPI, Wuhan*
19:30 – 22:30	**Conference Dinner**

Processes in the Yangtze River System
- Experiences and Perspectives -

Scientific program

29. November 2011

Topic:	***Monitoring and Management II***
Chair:	***A. SCHÄFFER***
09:00 – 09:30	**Management of Water Reservoirs,** *H. POLCZYK, Wasserverband Eifel-Rur*
09:30 – 09:50	**Integrated management for agriculture nonpoint source pollution control at river basin scale,** *Y. CHEN, Zhejiang University, Hangzhou*
09:50 – 10:10	**Application of ^{15}N-^{18}O Double Stable Isotope Tracer Technique in Catchment Non-point Pollution Analytical Study,** *X. LIANG, Zhejiang University, Hangzhou*
10:10 – 10:30	**Assessment of water balance and sediment transport in the Xiangxi Catchment under different land use scenarios,** *K. BIEGER, Universität Kiel*
10:30 – 11:00	***Coffee and Tea break***
Topic:	***Monitoring and Management III***
Chair:	***R. JI***
11:00 – 11:20	**Strategic plan of water pollution control for Three Gorges Reservoir and its upstream basin,** *Y. SU, CRAES, Bejing*
11:20 – 11:40	**WATERUSE - First assessment of water quality concerning micropollutants in the TGR and its tributaries,** *A. WOLF, IWW, Mülheim*
11:40 – 12:00	**Case study on the polluted urban water body rehabilitation in Yangtze River Basin,** *S. CHENG, Tongji University, Shanghai*
12:00 – 12:20	**Distribution patterns and short term dynamics of water quality parameters in the Daninghe and in its confluence zone with the Yangtze- First results of in-situ analyses with the MINIBAT,** *A. HOLBACH, Karlsruhe Institute of Technology*
12:20 – 14:00	***Lunch***

Topic:	***Water body dynamics II***
Chair:	***A. TIEHM***
14:00 – 14:20	**The bioavailability and toxicity of metal oxide nanoparticles to plant in the aquatic environment,** *J. SHI, Zhejiang University, Hangzhou*
14:20 – 14:40	**Conceptual approach and first results of the MICROTOX project: Fate, effects and bioaccumulation of model pollutants in the Yangtze river,** *B. SCHOLZ-STARKE, RWTH Aachen*
14:40 – 15:00	**The adsorption and degradation of pesticide atrazine in the soil of the WFZ in Three-Gorges Reservoir,** *L. MA, Tongji University, Shanghai*
15:00 – 16:30	***"World Café" with Coffee and Tea followed by Poster session***
Topic:	***Water body dynamics III***
Chair:	***J. CHANG***
16:30 – 16:50	**Microhabitat preference and population structure of Chinese kissing loach, Leptobotia tchangi,** *J. LI, TONGJI University, Shanghai*
16:50 – 17:10	**Dynamics of Performance Reference Compounds (PRC) in Virtual Organisms (VO) exposed in TGA,** *C. TEMOKA, Technische Universität München*
17:10 – 17:30	**Data base and evaluation for numerical modelling of pollutant transport in the Yangtze,** *H. WEI, Universität Stuttgart*
17:30 – 17:50	***Residues of Organohalogen Contaminants in Sediment and Water from Dianshan Lake in Yangtze River Delta*,** *Y. QIU, Tongji Universitiy*
17:50 – 18:00	***Outlook and Perspectives***
19:30 – 21:00	**Farewell Reception**

Processes in the Yangtze River System

- *Experiences and Perspectives* -

List of Posters

Poster No.	Autors	Titel
01	*Sarah SCHÖNBRODT, Karsten SCHMIDT, Thorsten BEHRENS, and Thomas SCHOLTEN*	**The Impact of the Three Gorges Dam project on Man-made Terraces (China)**
02	*Adrian GUETLEIN, Axel BERGMANN, Frieder ENZMANN, Michael KERSTEN, Anja WOLF*	**Source apportioning of industrial organic chemicals and organochlorine pesticides in three tributaries of the Three Gorges Reservoir**
03	*Anja WOLF, Axel BERGMANN, Rolf-Dieter WILKEN*	**WATERUSE - First assessment of water quality concerning micropollutants in the TGR and its tributaries**
04	*Lingling WU, Ling CHEN, Junli HOU, Yalei ZHANG, Jianfu ZHAO, Hongwen GAO*	**Assessment of sediment quality of Yangtze River estuary using zebrafish (Danio rerio) embryos**
05	*Irene KRANZIOCH, Andreas HOLBACH, Hao Chen, Lijing Wang, Binghui Zheng, Stefan NORRA, Yonghong B, Karl-Werner SCHRAMM, Andreas TIEHM*	**PCR detection of reductively dechlorinating bacteria in Yangtze samples**
06	*Yonghong Bi, Lei Chen, Kongxian Zhu, Zhengyu Hu, Wei Zhao, Silke BERNHÖF[3], Cedrique TEMOKA, Bernhard HENKELMANN, Karl-Werner SCHRAMM*	**Dioxins in sediment cores in front of the TGD**
07	*Jingxian Wang, Yonghong Bi, Silke Bernhöft, Kongxian Zhu, Gerd Pfister, Bernhard Henkelmann, Karl-Werner Schramm*	**Bioavailable AhR-agonists in Virtual Organisms (VO) deployed in Three Gorges Area**
08	*QIU Yangling, CAO Yuan, ZHOU Yihui, ZHU Zhiliang, ZHAO Jianfu, YIN Daqiang*	**Residues of Organohalogen Contaminants in Sediment and Water from Dianshan Lake in Yangtze River Delta**
09	*Stefan HEISTER, Andreas SCHÄFFER, Burkhard SCHMIDT, Ye Yuan*	**Fate of model pollutants in the Yangtze River**
10	*Björn SCHOLZ-STARKE, Richard OTTERMANNS, Katrin STRAUCH, Tilman FLOEHR, Li Bo, Ling Ling WU, Junli Hou, Xinzhong Yuan, Daqiang YIN, Martina ROSS-NICKOLL*	**Bioaccumulation of model pollutants in the Yangtze River**

11	*Tilman FLOEHR, Björn SCHOLZ-STARKE, Li Bo, Ling Ling Wu, Junli Hou, Xinzhong Yuan, Daqiang Yin, Henner HOLLERT*	**Effects of model pollutants in the Yangtze River**
12	*Lei CHEN, XinYi XIANG, Diana HOFMANN, Stephan KÜPPERS*	**Investigation of environmental transformation and potential bond residues of PACs by Electrochemical Simulation**
13	*XinYi XIANG, Lei CHEN, Diana HOFMANN, Stephan KÜPPERS*	**Photo-degradation of Chlortetracycline under Different Conditions and the Proposed Pathway**
14	*Xingzhong YUAN, Hong LIU, Bo LI, Qiang WANG*	**The littoral zone in the Three Gorges Reservoir, China. Challenges and opportunities**

List of Exhibitors

Booth	Exhibitor	Topic
01	*Helmholtz-Zentrum Geesthacht*	**FerryBox**
02	*Technische Universität München/ Helmholtz-Zentrum München*	**BIOVIRTUOS**
03	*mircoLan*	**On-line Toxicity testing**
04	*bbe Moldaenke*	**Chlorophyll Fluorometry and Toxicity Monitoring**
05	*ADM Elektronik*	**Minibat**
06	*IWW Mülheim*	**IWW Water Centre**
07	*IWW Mülheim*	**IWW Water Technology**

General/Locations

Motivation:
Since 2003 Chinese and German scientists have had continuous consultations on collaborations and scientific exchange on water topics. The last workshop in this series was held in Shanghai in March 2011. In the meantime a number of initiatives, started in Shanghai, have become operational. The current workshop will keep all participants updated and will support the collaboration process.

Networking
The workshop will consist of talks, poster sessions, an exhibition and round table discussions. Among these elements of networking common lunch and dinner times will give a number of opportunities for networking between Chinese and German Scientists.

Locations
The workshop will be held in Aachen Universities new conference building called "Super-C" (see front picture), all other locations like hotels, dinner restaurants are within walking distance. In addition the bus line 3A (starting: Aachen, Misereor, in direction Aachen Ponttor; stop "Audimax"; from there 2 min walking) and 13 B (starting: Aachen, Misereor, in direction Aachen Ponttor and leave the bus at Aachen, Technische Hochschule) will be available for direct transfer between hotel and conference center.

Getting here
Aachen can be easily reached by German trains. For the Chinese partners flying to Düsseldorf or Frankfurt will give direct access to trains to Aachen.

Accommodation
The accommodation is:

IBIS-Hotel, Marschiertor,
Friedlandstraße 6 – 8,
52064 Aachen

Tel. **+49 (0)2 41 / 478 80**

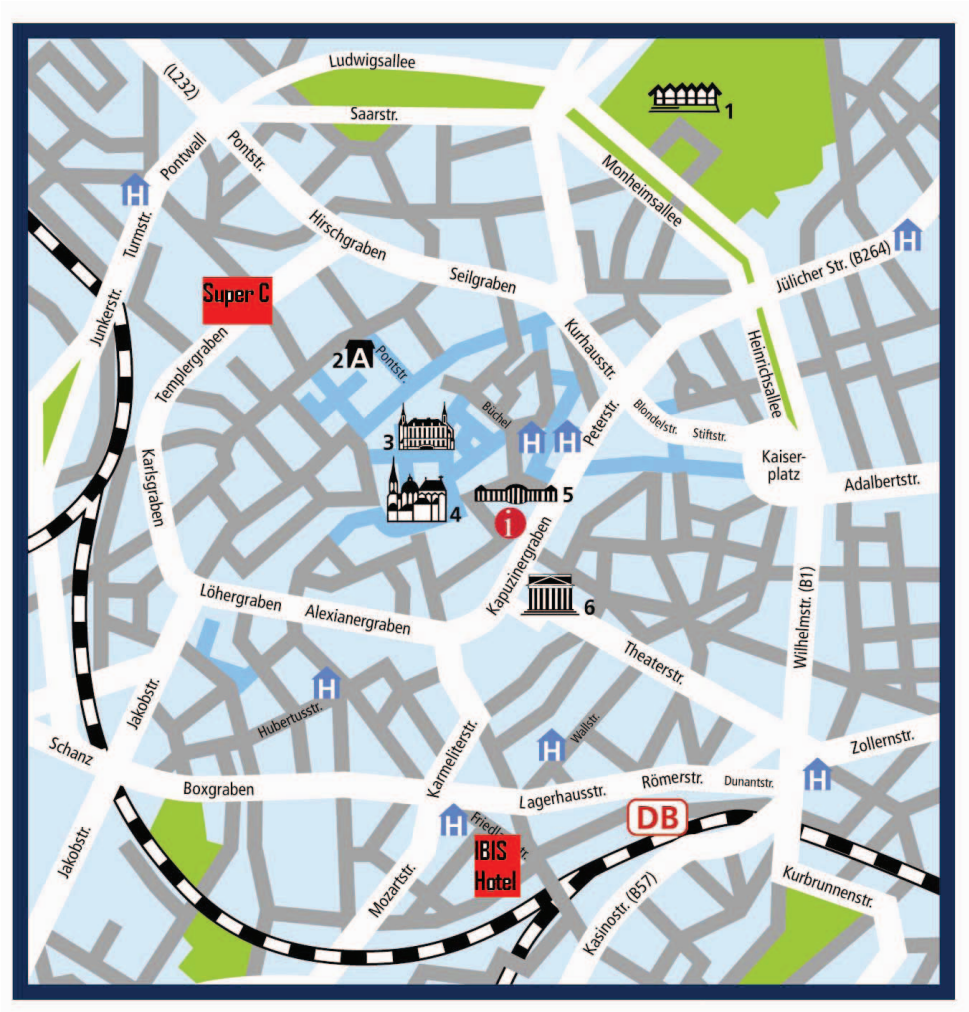
Social program
The social program will include a guided tour to the city of Aachen visiting the Christmas Market and showing the architecture of the old city.

Scientific Post-Program
The partners of the German Yangtze-Hydro-Consortium will organize trips to different universities, Research Centres to exchange current knowledge on water and the technologies related to water treatment.

How to find the Conference Dinner?
The conference Dinner will take place in "Stairs"-Restaurant (www.stairs-aachen.de), Theaterstr. 17, Aachen, a classical building with in the heart of Aachen – you find the restaurant on the map (next side) close to number "**6**" within walking distance of your hotel.

How to find the Farewell Reception?
The Farewell Reception will be performed in the restaurant "Altes Torhaus" (www.altestorhaus.de) in walking distance of your hotel – we will pick you up in the lobby of the hotel at 18:45.

Map of inner City of Aachen with important locations



Super C: Conference Center
IBIS Hotel: Conference Hotel

Important places to visit:

3: ancient city hall
4: historical catherdral
5: "Elisenbrunnen" – Spa – built by famous German architect: ***Karl Friedrich Schinkel***
6: Aachen Theatre

Lecture-abstracts

The Chinese-German Yangtze-Project - from the beginning to today

Günter Subklew, Julia Ulrich, Leander Fürst, Agnes Höltkemeier

Forschungszentrum Jülich GmbH, Institut für Bio- und Geowissenschaften
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No other river governs the lives of so many people as the mighty Yangtze, whose course divides the People's Republic of China into two almost equal halves from North to South. For thousands of years, the river has influenced the economy, the communication, and the agriculture in China, as well as its culture. The Yangtze was indeed always both, a curse and a blessing for the country. Its sediment-rich waters helped increase the fertility of the adjacent agricultural regions by regular flooding. However, in the 20th century the flooding also caused the death of 320,000 individuals.

The famous "Three Gorges" are situated on the middle reaches of the Yangtze and have a total length of 193 km. This part of the river has enormous potential for hydropower due to the large flow rate and height of fall, but this also involves dangers for navigation and in the lower reaches leads to the floods mentioned above. Controlling the water masses of the Yangtze was an aim for at least one century: The first concrete plans to build the dam date back to the begin of the 20th century. The decision to start its construction was made in 1993. Finished in 2009 today the final water level in the reservoir region is reached.

About twenty Chinese and German partners have joined together in the Yangtze Project. The German side is coordinated by Research Centre Jülich and comprises universities, Helmholtz Centres and private companies, according to their special expertise. On the Chinese side, leading universities, CAS institutions and government establishments are participating in the project under the leadership of the government's State Council Three Gorges Project Construction Committee and Tongji University.

The central element of the partnership is the current bilateral cooperation between Germany and China. Due to the very nature of the project, the overarching goals are oriented almost to the objectives formulated in the framework programme of the German Federal Ministry of Education and Research (BMBF) "Research for Sustainability". Research Centre Jülich puts a great emphasis in common research projects with Chinese and German partner institutions investigating the environmental impacts of the Three Gorges Dam. In bilateral workshops and fact-finding missions four research areas were defined actually marking the claims of the bilateral project network. By that time 11 projects are in progress in Germany, financed by BMBF. That Ministry also supports the exchange of scientists and PhD students on short term (International Bureau) and long term contracts (German Exchange Service, DAAD). Similar support is provided by Chinese Ministries (MOE, MOST) and the China Scholarship Council. In addition Research Centre Jülich promotes the scientific education of Chinese PhD students by scholarships from its own basic funding.

Occurrence of Antibiotics and Antibiotic Resistance Genes in Drinking Water from Yangtze River Delta

LEI JIANG, YUAN YUAN, DAQIANG YIN

Key Laboratory of Yangtze River Water Environment, Ministry of Education , College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China
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Antibiotics have been extensively used as human therapy, veterinary medicine, and as husbandry growth promoters. A significant portion of the administered antibiotics in human and animals is excreted and released into the aquatic environment through many pathways. The occurrence and ecological risk of antibiotic resides in the aquatic environment have caused great public concerns in the environment area and health organization. In this study, the occurrence antibiotics and antibiotic resistance genes (ARGs) were investigated.

20 of the 22 antibiotics were detected in drinking water sources at the concentrations of 0.08 - 137.95 ng/L in June and 0.18 - 380.42 ng/L in December, which showed the same seasonal variation as the Huangpu River. There appear to be higher in the concentrations of antibiotics detected in drinking water sources of Shanoghai relative to concentrations reported previously in U.S. and Keran.

The occurrence of 39 antibiotic resistance genes (ARGs) were investigated in surface water of the Huangpu River and the drinking water sources of Shanghai, China., including four sulfonamide ARGs, 23 tetracycline ARGs, four chloramphenicol ARGs, four *β*–lactam ARGs and four penicillin ARGs. Two sulfonamide ARGs (*sul* I and *sul* II), eight tetracycline ARGs (*tet*(A), *tet*(B), *tet*(C), *tet*(G), *tet*(M), *tet*(O), *tet*(W) and *tet*(X)), and one *β*–lactam ARG (TEM) were detected at the frequencies ranging from 42.86% to 100%. Average concentrations of ARGs showed *sul* genes (*sul* I of 1.04×10^5 copy/mL water, *sul* II of 1.62×10^5copy/mL water) > TEM (5.47×10^3 copy/mL water) > *tet* genes (ranging from 3.6×10^1 to 9.76×10^3 copy/mL water). Higher ARG contaminations were observed in suburban sampling sites than in urban sites, indicating that livestock and agricultural activities were major contributors to the prevalence of ARGs in the aquatic environment. Concentrations of ARGs were observed a generally consistent trend with associated antibiotic concentrations in water samples, suggesting that antibiotic residues in the environment were important factors in the spread of ARGs. The comparable or highe ARG contanimations in the drinking watr sources draw an urgent attention to these emerging environmental contaminants for the sake of public health concerns.

This work was supported by the International Science & Technology Cooperation Program of China (2010DFA91800)

Ecosystem changes due to river impoundment by the Three Gorges Dam in Central China

Sarah Schönbrodt*, Thorsten Behrens, Katrin Bieger, Dominik Ehret, Michaela Frei, Georg Hörmann, Christoph Seeber, Markus Schleier, Britta Schmalz, Nicola Fohrer, Hermann Kaufmann, Lorenz King, Joachim Rohn, Günter Subklew, Xiang Wei, and Thomas Scholten

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When damming the world's third-longest river, the Yangtze, for reasons of economic and socio-economic wealth, ecosystem changes are widely expected to increase rapidly, too. However, the dimension and dynamics of the typical aftermaths such as soil erosion, mass movements, diffuse sediment and matter fluxes, and land-use changes are hardly foreseeable.

Five years after starting the river impoundment by the Three Gorges Dam (TGD) in 2003, German-Chinese research collaboration was set up [1]. Together with Chinese scientists, five German universities (Tuebingen, Kiel, Erlangen, Potsdam, Giessen) conduct studies concerning soil erosion, mass movements, matter transport, and land-use changes [2-4]. Within the framework of this YANGTZE-GEO project, overall aim of those partners is the development of an integrated risk assessment for the ecological impacts. Representative for the TGD region, the highly dynamic Xiangxi catchment (3,200 km²) was chosen as study area. Using multi-level approaches by means of GIS, field investigation, data mining and state-of-the-art remote sensing techniques the risk potential of soil erosion, landslide susceptibility, matter transport, and land-use vulnerability was assessed.

High-resolution maps exhibit high risk potential in the immediate, locally densely populated backwater area in the southern Xiangxi catchment. Soil erosion (mean 169.3 t $ha^{-1}a^{-1}$) and mass movements prevail significantly by a multiple compared to the mostly forested headwater zone. According to our results, land use change is strongly driven by uphill-migration, construction of infrastructure, land reclamation and a shift from traditional crops to cash crops. We conclude that the effects of topography and lithology on soil erosion and mass movements are fostered mainly by land use change since the distance to the inundated area is a second prominent indicator of those geo-risks.

Furthermore, YANGTZE-GEO shows the relevance of such research and crucially contributes to the understanding of the dimension and dynamics of the ecological consequences of large dam projects.

Literature:

1) G. Subklew, J. Ulrich, L. Fürst, A. Höltkemeier, Environmental Impacts of the Yangtze Three Gorges Project: An Overview of the Chinese-German Research Cooperation. J. of Earth Sci., 21 (2010) 817-823
2) S. Schönbrodt, P. Saumer, T. Behrens, C. Seeber, T. Scholten, Assessing the USLE Crop and Management Factor C for Soil Erosion Modeling in a Large Mountainous Watershed in Central China. J. of Earth Sci., 21 (2010) 835-845

3) D. Ehret, J. Rohn, C. Dumperth, S. Eckstein, S. Ernstberger, K. Otte, R. Rudolph, J. Wiedenmann, W. Xiang, R. Bi, Frequency ratio analysis of mass movements in the Xiangxi catchment, Three Gorges Reservoir area, China. J. of Earth Sci., 21 (2010) 824-834
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Monitoring of chlorinated pollutants biodegradation by PCR

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Department Environmental Biotechnology, DVGW-Technologiezentrum Wasser (TZW), Karlsruher Straße 84, 76139 Karlsruhe, Germany; **Email: andreas.tiehm@tzw.de*

Sites contaminated with man-made chemicals are a world-wide problem. Halogenated compounds such as chloroethenes, chlorobenzenes, and chlorophenols are among the most prevalent pollutants. Several groups of bacteria such as *Desulfomonile*, *Dehalobacter*, *Desulfitobacterium*, and *Desulfuromonas* are known to be able to degrade chlorinated pollutants under anaerobic conditions. During reductive dechlorination, tetrachloroethene (PCE) is transformed via trichloroethene (TCE) to the endproduct dichloroethene (DCE). Only bacteria of the *Dehalococcoides* group are able to completely dechlorinate PCE to ethene. Complete dehalogenation of chloroethenes can be achieved by reductive dechlorination to ethene or by sequential anaerobic/aerobic mineralization, depending on the site conditions and the microbial community present at the site.

The microbial community composition can be efficiently analysed by polymerase chain reaction (PCR). PCR methods are available for the analysis of reductively dechlorinating bacteria and for the detection of physiological groups using different electron acceptors such as nitrate, Fe(III), or sulphate. The PCR reaction is conducted with specific oligonucleotide primerpairs which are specific for the target organisms. PCR results in a million fold copy of specific DNA-sequences which can be made visible with an agarosegel electrophoresis.

The PCR method was applied to prove the presence of dechlorinating bacteria in a study demonstrating the feasibility of bio-electro-processes for chloroethene degradation [2,3]. Recently, a correlation between the dechlorinating activity and the number of *Dehalococcoides* specific gene copies was demonstrated [1]. As part of the Sino-German Yangtze project, sediment samples were taken from different sites of the Yangtze River area. PCR demonstrated the presence of dechlorinating bacteria known for their ability to degrade chloroethenes. Advanced PCR methods will be developed to detect specific reductive dehalogenase genes and mRNA in order to get more insight into the degradation process.

Acknowledgement

Financial support by the German Ministry of Education and Research (BMBF grant no. 02WT1130) is gratefully acknowledged.

References

1) Ö. Aktas, K.R. Schmidt, S. Mungenast, C. Stoll, A. Tiehm. (2011). Effect of chloroethene concentrations and granular activated carbon on reductive dechlorination rates and growth of *Dehalococcoides* spp. *Bioresource Technology*: in press (DOI: 10.1016/j.biortech.2011.09.119)

2) S. Lohner, D. Becker, K.M. Mangold, A. Tiehm. (2011). Sequential reductive and oxidative biodegradation of chloroethenes stimulated in a coupled bioelectro-process. *Environmental Science & Technology* 45: 6491-6497

3) S. Lohner, A. Tiehm. (2009).
Application of electrolysis to stimulate microbial reductive PCE dechlorination and oxidative VC biodegradation. *Environmental Science & Technology* 43: 7098-7104

Eutrophication and its control methods in Lake Taihu

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Lake eutrophication is of the great concern to the Chinese government and limnologists. In 1960's, Lake Taihu was from oligotrophication to mesotrophication, and then, was from mesotrophication to eutrophication in 1980's, however, eutrophication was sharply serious in Lake Taihu and toxic algal bloom had expanded from the partial area to the most parts of Lake Taihu since 1990's. In 1980's, cyanobacteria, diatoms and green algae were dominant specieswhich ratios were 20%, 28% and 40% respectively. But since 1990's, cyanobacteria became dominant in all the species of algae in Lake Taihu with the peak of 94%, the mainly population of cyanobacteria was *Microcystis* spp. Lake eutrophication was due to more and more nutrients (nitrogen and phosphorus) input from atmosphere, surface flow (river) and shallow underground water. The microcystins and other pollutants produced from cyanobacterial bloom were dangerous not only to lake ecosystems but also to human health.

In order to reduce eutrophication, the principle of the combination of blockage and scatter must be introduced in Lake Taihu. The nutrients and other pollutants' input must decrease while their output must increase. After the control of the ex-pollutant sources, the main methods are used to increase the output of the nutrients and other pollutants from the lake, such as sediment dredging, dilution or water diversion and so on. Algae filtration and salvage is useful method of alleviation water bloom in Lake Taihu. The nutrients removal also comes from the food chain and harvest of macrophyte. To rebuild the health ecosystems, the ecological restoration becomes more and more necessary in Lake Taihu now. Improvement of the water quality in Lake Taihu will be fulfilled through region management and useful technologies.

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Urban impacts in the Yangtze and its tributaries Daninghe, Xiao Jiang and Jialing – Gained from water chemistry analyses at selected sites

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The Three Gorges Area has experienced a strong economic rise during the last 30 years and even more in the recent years as the centre of investments and reconstruction associated with the building of the Three Gorges Dam. Accompanied with it is a rising pressure on the environment through the increase of urbanisation and industrialisation. Together with the hydrodynamic changes from the construction of the dam, new problems for the water quality of the rivers in this area emerged.[1]

To grasp the impact of the rising pressure by anthropogenic sources, a one week field study at three distinct locations along the Three Gorges Reservoir was conducted in April, 2011. 55 water samples, 57 samples of suspended matter and 16 soil and sediment samples were taken around the cities of Wushan, Kaixian and Chongqing and analysed for concentrations of inorganic contents. Hierarchical Cluster analysis was conducted on the datasets to get a statistical overview of connections and differences between the samples.

The Cluster analysis shows a clear distinction between the chemical compositions of the different examined rivers. Water in the Wushan Lake is more comparable to the Yangtze water flowing by, mixed together with effluent water from the city, than to the composition of the Daninghe which flows into the lake. This composition is also measurable upstream in the Daninghe itself and might be due to the backwater effect. In the Xiaojiang near Kaixian effects of the regional geology and local coal mining activities are more evident than influences of the city. High metal concentrations in Chongqing indicate a strong impact of this megacity on the water quality of the Three Gorges Reservoir.

Further studies are required to get a clearer picture of the urban impacts and to calculate annual loads of elements. Application of continuous monitoring in rivers together with specific measurements at discharge locations in and around the cities would be necessary.

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Numerical simulation of dissolved and particulate pollutant transport dynamics in the lower near dam Yangtze section

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After raising the reservoir water level in 2003 some hundred million tons of suspended sediments were deposited upstream of the dam, about one third of sediment inflow was flushed to downstream. The operation scheme is predicted to maintain 85.8% of the flood control capacity in the coming 100 years [1]. However, pollutants from agriculture, industry and municipalities are of concern due to their impact on the aquatic environment and hence, transport behavior of sediment associated pollutants must be modeled and analyzed to establish a sustainable water reservoir management.

Basic studies of pollutant transport dynamics in the lower near dam section of the Yangtze are carried out by the 2-dimensional hydrodynamic model. Morphological data are taken from cross-section profiles in the literature [2] and the digital elevation model (DEM) of Shuttle Radar Topography Mission (SRTM) from CGIAR. Water discharge, suspended sediment concentration and pollutant loads are extracted from pertaining literature [2] and special publications. The model describes the spatial-temporal flow field, transport and dispersion of sediment associated pollutants with emphasis on the dynamic interaction and mutual influence of the river Yangtze, its major tributaries and adjacent lagoon-like dead water bodies.

Further investigations will include sorption, degradation and transformation processes between sediment, dissolved and particulate pollutants. Different hydrological and operational scenarios will be modeled. Up-dated water quality data collected within the Yangtze-Project such as the data from the mobile measuring device (MINIBAT) in the Daning River close to Wushan will be used for calibration and validation.

Effects of phenolic humus monomers on removal of nonylphenol from water by a laccase

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Nonylphenol (NP) is a typical endocrine disrupting compound in the environment. Laccase is an enzyme excreted by fungi and plants for oxidizing phenolic compounds. It has been reported that laccase can oxidize many xenobiotics including molecules without phenolic structure and may be applied to treat polluted water and soils. However, the transformation of NP by laccase has not been well studied yet. Using ^{14}C and ^{13}C tracer techniques we studied the removal of a NP isomer (4-(3',5'-dimethyl-3'-heptyl)phenol, 4-NP111) from water by the fungi *Trametes versicolor* laccase in the presence and absence of one soil humic acids (HA), one riverine dissolved organic matter (DOM), 16 humus phenolic compounds, and a commercial mediator ABTS. The presence of the HA and the DOM reduced the transformation efficiency of NP by the laccase. Effects of the various phenolic compounds on the NP transformation were dependent on the structure of the phenols. While the phenols containing two hydroxyl groups on the ring (such as catechol, caffeic acid) inhibited the NP transformation by the laccase, the phenols containing only one hydroxyl group, one or two methoxyl groups on the ring enhanced the NP transformation. In particular, syringaldehyde had the highest stimulation effect on the NP transformation (99% within 4 hours) among the tested phenolic mediators, even higher than the commercial mediator ABTS (85% within 4 hours). Using ^{14}C-tracer technique, we studied the fate of NP during laccase transformation, and found that NP was reacted to polymers but not oxidized to small molecules by laccase. Our results provided useful information for potential development of laccase-based techniques for treatment of NP contaminated water using naturally occurring phenolic compounds as mediators.

Keywords: nonylphenol, laccase, water treatment, humus monomers

Exposomics of Virtual Organisms in Three Gorges Area

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The exposome is defined as the measure of all the exposures of an individual in a lifetime and how those exposures relate to disease (CDC 2010). Exposomics is the study of the exposome and is related to genomics, metabonomics, lipidomics, transcriptomics and proteomics. Biomarkers are targeted to determine exposure and effect. Exposomics includes the study of exposures in the environment. Virtual Organisms (VO) are artificially designed to simulate a specific biological compartment such as for example the fat as a part of the lipidome of an organism. BIOVIRTOUS-project employs VO reflecting this fatty compartment because especially POP are accumulating to a large extend in fatty tissues. VO are normally representing a time period of 1-4 weeks 'living' at the sampling site. Thus VO provide a more averaged information about the POP in TGR. The VO are exposed in TGR from Chongqing 600 km downstream to the dam attempting to characterize the impact of POP content in the main inflowing rivers. First results of POP concentrations back-calculated to water concentrations showed obvious regional variations of PAH, PCB and OCP levels in the reservoir. Total PAH exhibit higher concentrations occurring in the region of upstream and near the dam. Phenanthrene, fluoranthene, pyrene and chrysene were the predominant PAH compounds in TGR water. Total PCB concentrations are low with the highest one occurred in the region near the dam. Total Organochloropesticides (OCP) levels showed homogenous distribution in the whole reservoir. HCH, DDT and HCB, PeCB were the major compounds of OCP fingerprints. Based on water quality criteria, the TGR water could be designated as being heavily polluted by HCB and PAH. However the freights are to be estimated and might be substantial. The biomagnification into biota can also result in remarkable concentrations in edible biota. Data on PAH, PCB and OCP concentrations found in this survey can be used as reference levels for future POP monitoring programs in TGR. The comparison of chemical and effect-oriented analysis revealed large differences between known and unknown compounds which caused EROD activity of sample extracts. Unknown compounds in TGR are suspected to be responsible for the high anti-estrogenic activity in extracts of suspended particles.

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Bioaccumulation and Biotransformation of Polybromodiphenyl Ethers in Crucian Carp (Carassius auratus)

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Polybrominated diphenyl ethers (PBDEs) are extensively used as flame retardants and have become ubiquitous environmental pollutants. Significant biotransformation of some PBDEs via reductive debromination has been observed. However, little is known about the fate of lower brominated BDEs in fish, specifically about their oxidation metabolism. In this study, the tissue distribution, excretion, depuration and biotransformation of 4,4'-dibromodiphenyl ether (BDE 15) and 2,2',4,4'-dibromodiphenyl ether (BDE 47) were investigated in crucian carp (*Carassius auratus*) which were exposed to spiked water solution and dietary at different concentrations for 50 d, followed by a 14-d depuration period.

In aqueous exposure, bioaccumulation parameters of BDE 15 were calculated and the results showed a rapid uptake. BDE 15 was most concentrated in the gill and liver, with bioconcentration factor values (BCFs) of 1.69×10^5 and 1.28×10^5, respectively, which were higher than that of muscle. Five biotransformation products of BDE 15 in carp were identified using GC-MS/MS among which two were debrominated metabolites, and the other three were mono-OH-BDE 15, diOH-BDE 15 and bromophenol, respectively.

Unlike the aqueous exposure, BDE 15 and BDE 47 were most concentrated in the liver in dietary exposure, with their biomagnification factors (BMFs) of 1.083 and 1.145, respectively, which were also higher than that of muscle. Similarly, several metabolites of BDE 47 were detected. Three metabolic pathways: hydroxylation, debromination/hydroxylation and cleavage of the diphenyl ether bond were found in fish, forming OH-tetraBDEs, OH-triBDEs and dibromophenol. These results unequivocally indicated that oxidation metabolism of PBDEs did occur via the formation of hydroxylated (OH-) metabolites in freshwater fish exposed *in vivo*.

Method on Ecological Security Assessment and Early-warning in Reservoir Watershed Based on IROW Framework

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Ecological Security (ES) is a brand-new management target, while the assessment of ES is the base for implementing ES management in reservoir. However, for the lack of particularity understanding and systematic analysis of reservoir, specific assessment method for reservoir is still underdeveloped.

In view of characteristics and problems of reservoir ecosystem as well as the requirements of ES, the IROW-based technical framework for assessing reservoir ecological security is formed using abroad advanced management idea for reference. Focusing on the security of inflow (I), reservoir itself(R), outflow(O) and the least impacts of human activities in reservoir watershed (W), the IROW concept framework is firstly identified. A preliminary index system for the assessment is established covering 67 recommended factors. Aiming at the speciality of reservoir ecosystem evolution, means of identifying spatio-temporal reference condition is introduced for developing corresponding evaluation criterion. Besides, mathematic calculation model and security level division are studied and provided. Some special concern on preparation and results interpretation related to the assessment is also presented.

Guided by the IROW framework, integrated early-warning model system (SLLW) is studied and put forward considering coupling effects from socio-economics, land use, load control and water quality and hydrodynamics. Demonstration studies for these methods are carried out in Three Gorges Reservoir and its typical tributary.

Sorption of organic pollutants to Yangtze River sediments and their model components

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The sorption processes of polycyclic aromatic hydrocarbons (phenanthrene, pyrene) [1,2], surfactant degradation products (nonylphenol, perfluorooctanoic acid (PFOA)) [3,4], and a widely used antibiotic veterinary pharmaceutical (sulfadiazine) [5] on Yangtze River sediments and their organic and inorganic components are discussed.

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Effect of Coexistent Transition Metal and Bromide Ions on Formation and Distribution of Disinfection By-Products during Chlorination

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The more frequent salt intrusion of drinking water sources in Yangtze River has happened in recent years, the possible negative results may affect the drinking water safety because of higher halogen content and the coexistent transition metal ions. Using humic acid as the source of precursor in natural water, the effects of Fe^{3+} Cu^{2+} Mn^{2+} Ni^{2+} Pb^{2+} Zn^{2+} Ca^{2+} on the formation and distribution of THMs under various pH conditions and Br^- concentration were studied. Two typical practical drinking water sources of Shanghai were collected, and the effects of coexistent ferric and bromide ions on the formation and species distribution of DBPs during the chlorination of different raw water samples have been investigated. For the practical water samples, specific attentions were paid on the total organic halogen (TOX) and its halogen species fractions.

The results of this study showed that the coexistent ferric and bromide ions significantly increased the formation of THMs in alkaline conditions, but the promotion for the formation of HAAs appeared in weak acid conditions. The SUVA value of water samples had a close relationship with the formation of DBPs. It was found that, with the increment of bromide ion concentrations, coexistent ferric ions obviously increased the formation of TOX and TOBr. It suggested that, for the coastal areas, more attention should be paid to the drinking water safety because the more frequent saltwater intrusion brings more risk of bromine contained DBPs for drinking water disinfection by chlorination, especially in the situation with the coexistence of ferric ions.

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Degradation of xenobiotics in water under various conditions

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Water is one of the most important natural resources but the use of water often results in long-term water pollution. Especial attention is needed for chemicals brought into the environment by human use, the so-called Xenobiotics.

In general, clean-up technologies are available, but due to economic and ecological pressure there is a need to develop more efficient and cost effective technologies and management concepts (including energy efficiency aspects). To do so:

- the mechanisms of degradation need to be understood,
- factors influencing the degradation need to be known,
- potential reaction products including chemical binding needs to be understood and
- the potential persistence needs to be known.

Electrochemistry coupled to mass spectrometry (EC-MS) has been demonstrated to be an interesting tool for the evaluation of degradation mechanisms previously [1]. Meanwhile it has been shown that also reductive processes can be performed by EC-MS and the reaction with soil model compounds has been demonstrated [2]. Furthermore the method is under investigation as a model system for predicting the persistence of chemicals in the environment.

Another important degradation mechanism is the photochemical degradation of chemicals in the environment. Here an offline coupling to mass spectrometry is used to determine degradation rates and to evaluate the degradation products.

Results of model reactions with model substances will be presented and next steps from model systems to real world samples will be discussed.

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Study on the water safety classification system in the Three Gorges Reservoir area

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The water protection in the Three Gorges Reservoir (the TGR) becomes more and more important as a strategy water source. However, with the Three Gorges project was built up and running, the hydro-condition has undergone profound changes. The water function classification system as the basic of the water resource protection management cannot fully meet the current reservoir water use and protection requirements. In order to solve this problem, the new water function classification, the water safety classification, was developed.

The division of water safety zoning could be broken into four aspects: driving force, pressure, condition and influence [1]. And the index system should take into consideration six factors, that is, hydrology, water quality, biology characteristics, water resources utility, Public Participation and socioeconomic status[2][3]. Among the six evaluation factors, hydrology, water quality, biology characteristics belong to natural property, while Public Participation, water resource utility and socioeconomic status belong to social property. According to the above, the index system of the water safety zoning consists of six factors, eleven indices. The natural property evaluation and social property evaluation are considered as two principles to restrain the level of the water safety assurance. And the full value of natural property and the full value of social property are same, that is 100. The water safety assurance levels are classified as priority, coordination and general level.

Considering monitoring network of hydrology and water quality as well as administrative boundaries, the Yangtze River mainstreams are divided into 32 reaches of the mainstream of the Yangtze River in the Three Gorges Reservoir. By applying the evaluation index system of water safety assurance, among the 32 reaches in the Yangtze mainstreams, there are 14 coordination protection zones, 12 general protection zones and 6 priority protection zones.

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Integrated Management for Agriculture Nonpoint Source Pollution Control at River Basin Scale

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The integrated strategy for comprehensive controls of agricultural non-point source pollution (AGNPSP) is elucidated in this paper, based on essential characteristics, main types, and primary causes of AGNPSP along with the current pollution status and research progresses of AGNPSP across the whole world. The mechanisms and pollutants sources of AGNPSP, and spatial-temporal loadings of regional agricultural pollution investigation combined with estimation by mathematical model were illustrated with highlights on the key control technologies featured with site-specific nutrients management. The pivotal control strategy of AGNPSP should be integrated with the individual technology emphasizing on: (1) preferential development of ecological fertilization, controlled availability fertilizer technology, non-flooded rice tillage technology, novel water-saving irrigation-drainage techniques and on-site nutrient interception technology, for pollution control from agricultural land; (2) comprehensive disposals covering ecological treatment, technology of non-traditional resource derived from animal wastes and agricultural recycling economy operation, for pollution control from animal farm operation; (3) seeking non-power requested bioreactor with cost-effect and care-easy operation, and artificial wetland technology, for pollution control from rural daily activity. The deteriorating trend of AGNPSP is believed to cease accompanying with improving of water quality, by individual technology innovations, systematic integration, sound demonstration and field outreach.

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Application of ^{15}N-^{18}O Double Stable Isotope Tracer Technique in Catchment Non-point Pollution Analytical Study

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In recent years, the catchment non-point pollution is getting more and more serious, and the traceability of pollution source is carried on extensively. Among them, the ^{15}N-^{18}O double stable isotope tracer technique is a relatively burgeoning pollution source method recently [1-3]. It was applied in Environmental Studies from the 1970s and has the advantages of high sensitivity, convenient operation and accurate measurement test results, ect. We introduces the theoretical basis of the ^{15}N-^{18}O double stable isotope trace technology applied in catchment non-point pollution analytical study, elaborates the progress of it on catchment traceability of pollution source study and makes the prospect of the application in future catchment non-point pollution analytical study of it. This technology has been applied in the research of assessing agricultural nonpoint pollutant sources their contribution indexes from cropland, animal production, and rural wastewater in the Tiaoxi river, which is the most important river in the Taihu basin due to its largest water flow flux and associated nonpoint source pollutants. Results showed that nitrate in river of more than 60% water samples were derived from NH_4^+ or urea fertilizer and soil organic nitrogen, indicating cropland is the most important source of nonpoint pollutants. Our research also highlighted that nitrate leaching from croplands to nearby waters could be mitigated by three steps: 1) to create slow release fertilizer manufacture techniques based crop nutrient adaptation; 2) to develope eco-coupled field water and fertilizer controlling, non-point source pollutants reduction technology; 3) to establish interception and remediation techniques with enhanced N/P reduction function.

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Assessment of water balance and sediment transport in the Xiangxi Catchment under different land use scenarios

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The Three Gorges Region in China is currently subject to a large-scale land use change, which was induced by the construction of the Three Gorges Dam. The relocation of towns, villages and agricultural areas is expected to impact the water balance and increase erosion rates as well as sediment yields in the affected catchments.

As field experiments are often too labor- and time-intensive and also do not provide the possibility to analyze the effect of management decisions prior to their implementation, hydrologic and water quality models are frequently used to assess the impact of land use changes on water resources. In this study, the eco-hydrological model SWAT is applied to the Xiangxi Catchment in the Three Gorges Region in order to simulate daily stream flow and monthly sediment loads at Xingshan gauging station under changing land use conditions.

The calibration of stream flow resulted in a satisfactory fit of simulated and observed data, which is indicated by NSE values of 0.70 and 0.69 for the calibration and validation periods, respectively. In contrast, the model was not able to simulate the monthly average sediment loads correctly as indicated by very low NSE values of 0.42 (calibration) and 0.07 (validation). This might be due to a number of reasons including an inadequate representation of spatial rainfall variability by the available climate stations, insufficient input data, uncertainties inherent in the model structure or uncertainties in the observed sediment loads. The high number of possible reasons for the incorrect prediction of sediment loads by SWAT reveals the need for further research in the field of hydrological and water quality modeling in China. Nevertheless, the results prove the general applicability of SWAT to the Xiangxi Catchment and provide a sound basis for the simulation of land use scenarios. The scenarios will be developed based on trends identified from land use maps of the years 1987, 1999 and 2007.

The water pollution prevention and control programming of the Three Gorges Reservoir and its upstream watershed

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Based on a comprehensive analysis of the present status and future trends of the water pollution in Three Gorges reservoir (TGR) and its upstream watershed, starting from the twelfth five-year plan of water pollution prevention in this region, water pollution prevention and control strategy is analyzed and described in this report, with its corresponding targets are also presented.

During the next five year, the economic growth mode of China will turn into a new transition period. The water environment protection of TGR watershed will under enormous pressure since the implementation of western China development strategy□central China growing strategy and major development strategies of surrounding provinces and regions. It is expected that the urbanization rate of this region in 2015 will increase about 10 percentage points from 2010, and the newly increased wastewater of this region will be about 750 million tons.

Under the guidance of sustainable development and the strategy of 'let the rivers and lakes rehabilitate', management concepts including 'balance the basin and the region'□'coordinate rivers and reservoir', 'sustainable-protective-corrective classified action' are carried out in the watershed. Also, except for giving attention to the whole watershed, priority is established among control units and prior unit is focused to ensure ecological safety of TGR. As for the details, firstly, whole watershed is divided into three control subareas, namely reservoir area, influence area and upstream area. Secondly, 319 control units are identified considering water system, district boundary, admitted water function zoning and water resource division. 20 prior control units are finally selected with comprehensive analysis and experts and governors consulting. Based on these, sustainable or protective or corrective oriented policies and measures are planned for each control unit in view of its characteristics and problems.

With full implementation of twelfth five-year plan, it is expected that percentage of tributaries worse than meso-eutrophication will be less than 50%. The achievement ratio of water functional zones will be more than 90%. The COD and NH3-N emissions (industrial and domestic) of the Three Gorges Reservoir and its upstream watershed will be controlled, with 5.32 percent and 8.36 percent decrease compared to 2010.

Assessment of the Suitability of Water from the Three-Gorges-Reservoir in China for Drinking Water Production and Agricultural Irrigation (-WATERUSE-)

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To provide the public with high quality drinking water is a technological challenge, particularly in emerging countries. In the catchment area of the Three Gorges Reservoir (TGR, China) productive and protected groundwater resources are very rare. Surface water is often used as a raw water source, but bank filtration as a first purification step is not feasible at TGR area. Thus, water works along Yangtze River and its tributaries usually produce purified tab water directly from surface water, using standard filtration and disinfection techniques. For drinking purposes, bottled water is used. The presented study focuses on the suitability of surface water from the TGR as drinking and irrigation water. In addition, the use of innovative water purification technologies is assessed.

Hydrogeology and water chemistry of the 630 km long TGR area are strongly influenced by the geology (red sandstones and clay stones, limestones, gypsum) and a subtropical climate (mean temperature 19°C, precipitation ca. 1.138 mm/a). Soil erosion is leading to a high particulate matter load in the relevant rivers. Anthropogenic input of pollutants originates mainly from sewage, industrial discharge, garbage dumping and from agricultural activities.

Using active and passive sampling methods (ceramic and silicone dosimeters) surface water and suspended solids from TGR area are analysed for in-organic (anions, cations, heavy metals, contrast agents) using IC and ICP-MS and organic emerging pollutants (industrial chemicals, pesticides, pharmaceuticals). In addition, lab experiments will be performed to investigate convenient drinking water treatment methods for the elimination of the pollutants.

First results of the inorganic river water analyses reflect the geogenic background. Heavy metal concentrations were usually well below international river water regulations. The contrast agent gadolinium was detected in all samples, probably as geogenic background, while an increased concentration at Puli river indicates an anthropogenic influence. Concentrations of organic pollutants (e.g. PAH, etc.) at TGR are usually lower compared to concentrations found in German rivers. Particularly, pharmaceutical substances which showed increased water concentrations in Germany in recent years are almost absent in TGR water samples. High concentrations of pesticides (range 2 - 4 µg/l) were identified in samples from Jialing river (biggest tributary of Yangtze river in TGR), indicating agricultural impact on water resources. Summer monsoons are controlling the highly varying river discharge. Thus, pollutant loads show a high seasonal variability with unknown eco-toxicological impact.

Further sampling campaigns will focus on varying hydrological, geographical, and anthropogenic settings and the impact on the TGR chemistry (e.g. high/low river water level during the seasons) and the quantification of the anthropogenic input along the Yangtze and its tributaries.

Case study on the polluted urban water body rehabilitation in Yangtze River Basin

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Due to its importance of geography and natural resources, Yangtze Rive Basin has been playing indispensable roles in regional development of China. In the past three decades, the fast development of economy and urbanization in Yangtze River Basin has caused increasingly sever pollutions of urban water bodies in China. Resulted from high mineral nutrient loadings of sewage, industry and agricultural discharges, eutrophication of urban water bodies inevitably became a widespread problem across the country. Consequently, the deterioration of aquatic ecosystem occurs, and which is especially significant for aquatic vegetation. In order to rehabilitate the polluted urban water bodies, combined technologies are needed to apply. As a case study, a representative polluted urban river named Nanfei River (Hefei City, Anhui Province) was chosen to be rehabilitation project target. Water quality improving and ecological rehabilitating measures, including sediment dredging, water allocation, constructed wetland, in-situ aeration, aquatic vegetation replant and ecosystem restoration, were integrated and employed. After one and half years' implement, water quality and biodiversity of the water body were improved. The concentrations of COD_{Cr}, ammonia (NH_4^+-N) and total phosphorus (TP) declined by 29.5%, 31.5% and 36.7%, respectively. The species of macrophytes increased from 14 to 60, and the diversities of benthos rose significantly in the river.

Distribution patterns and short term dynamics of water quality parameters in the Daninghe and in its confluence zone with the Yangtze -First results of in-situ analyses with the MINIBAT

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The water quality in the Yangtze Three Gorges Reservoir has been a major concern since the closure of the dam in 2003. Increasing eutrophication and algal bloom events [1] and questions of transport, accumulation and remobilization of organic and inorganic pollutants [2] in and from the Reservoir sediments are widely discussed. Thus, it is most important to understand the characteristic hydrodynamics in the reservoir on different temporal and spatial scales to be able to estimate processes of transport, water exchange and interaction of water bodies. In this respect, the large scale water level fluctuations in the reservoir and processes at confluence zones of tributaries with the Yangtze main stream are of major interest.

In a first attempt, water quality data were collected with a towed underwater sampling device (MINIBAT) in the Daninghe and its confluence zone with the Yangtze close to Wushan in Chongqing province during one week in August, 2011. The MINIBAT is equipped with sensors for the in-situ and on-line monitoring of six important water quality parameters (temperature, conductivity, turbidity, dissolved oxygen, pH, chlorophyll *a*). Additionally, a combined GPS-Echosounder system and an integrated pressure sensor are used for georeferencing the data. Two- and three-dimensional evaluation and geostatistical interpolation of the water quality data reveals vertical and horizontal gradients within the Daninghe water bodies, remarkable short-term variations in the Wushan Lake and pointers to processes of interaction in the confluence zone of the Daninghe and the Yangtze.

Further investigations will aim for the modeling of long- and short-term variability of water quality in the Wushan area with special respect to different water levels in the reservoir as well as to extend the investigations to other areas of interest.

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The bioavailability and toxicity of metal oxide nanoparticles to plant in the aquatic environment

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Metal oxide nanoparticles are receiving increasing attention in a large variety of applications; efforts are underway to understand the potential for eco-toxicity (Nowack and Bucheli, 2007). In particular, copper oxide nanoparticles (CuO-NP) are being used in antifouling paints for boats (Saison et al., 2008) and marketed for many applications including ceramics, electronics, and propellants (Pan et al., 2010). In aqueous media, the bioavailability and toxicity of metal oxide nanoparticles can be due to the effects of the dissolved ionic metal, or there may be special hazards from nanoparticles themselves due to enhanced bioactivity (Karlsson et al., 2008). As an essential part of ecological system, plants may play an important role on the transportation and bioaccumulation processes of nanoparticle in food chain. In our study, the bioavailabity and toxicity of CuO-NP to plant was investigated in the aquatic environment. 1000 mg L^{-1} CuO-NP and the comparable dose of soluble Cu (0.5 mg L^{-1}) released by CuO-NP in Rorison nutrient solution were applied to *Elsholtzia splendens*. The Cu content in the root , stem and leaf of plant exposed to 1000 mg L^{-1} CuO-NP were much higher than that exposed to the 0.5 mg L^{-1} soluble Cu. The significant decrease of chlorophyll and biomass were observed stressed by CuO-NP, but not in the comparable soluble Cu treatment, indicating the phytotoxicity of CuO-NP was not directly from their limited dissolution in the Rorison nutrient solution. The presence of nanoparticles in the endodermal and vacuole cells of *Elsholtzia splendens* under the CuO-NP treatment was revealed by TEM-EDX. The micro X-ray Absorption Near Edge Structure (μ-XANES) fitting confirmed that CuO-NP-like substance existed in the root, stem, and leaf of *Elsholtzia splendens*. These results indicated that CuO-NP were able to concentrate in the rhizosphere, enter into the root cells, and transport to stem and leaf cells.

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Conceptual approach and first results of the MICROTOX project: Fate, bioaccumulation and effects of model pollutants in the Yangtze River

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The creation of the Three Gorges Reservoir caused the flooding of former urban, industrial and agricultural areas. Consequently, substantial amounts of organic and inorganic pollutants were released into the reservoir. Beyond contaminants and nutrients (e.g. nitrate, phosphate) enter the reservoir by runoff from adjacent agricultural areas as well as from sewage of industry, aquacultures and households. Periodical changes in water level cause flooding events and thereby a relocation of contaminated water, particulate matter and sediment onto agriculturally used areas along the reservoirs shore.

The main aims of the presented project are to develop tools and to contribute to the identification of the major processes that determine the fate and degradation, the potential bioaccumulation and the ecotoxicological effects of sediments on aquatic organisms. We focus on the specific alterations of the behavior and the effects of organic pollutants that are caused by the formation of the unique conditions within the new reservoir body.

We present our conceptual approach including the definition of contamination scenarios. Thorough literature research put us into the position to find suitable model compounds and to build hypotheses on the most likely determining factors. First behavior and fate studies of 14-C radiolabelled model pesticides in water-sediment systems point to potential bioaccumulative metabolites. The complex model AQUATOX was modified and used for preliminary modeling exercises. We show the particular importance of the nutrient regime on the composition of the aquatic food webs and its implications for the bioaccumulation. Sediment samples of the Kaixian region have been tested in the Fish Embryo Toxicity Test and the Sediment contact Assay.

Beyond may these findings serve as a starting point for a subsequent project on management strategies to reduce the pollution in temporary Yangtze flooding areas.

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The adsorption and degradation of pesticide atrazine in the soil of the WFZ in Three-Gorges Reservoir

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Three Gorges Reservoir (TGR) water fluctuation zone (WFZ) is a transition zone that the aquatic ecosystems and terrestrial ecosystems alternately control, it is also a particular wetland ecosystem with characteristics of different hydrological transmission and material cycle. Batch experiments were used to study the adsorption and degradation of atrazine on five different soils in the WFZ of the TGR. The detection methods of atrazine was as following: Ultrasonic extraction, Solid Phase Extraction (SPE) and High Pressure Liquid Chromatography(HPLC) with diode-array detector(DAD), and the recovery of atrazine and linuron was respectively 89.3% and 90.4%. The Result showed that the factors such as PH and soil layers affected atrazine adsorption on soils. The adsorption isotherms could fit Freundlich equation well and the physical adsorption prevailed in sorption of atrazine compare with chemical adsorption. The organic content of soil also was a most important factor affecting the atrazine capacity, and the higher capacity was found in soil at a lower PH. The degradation dynamics of atrazine in the soils showed that the degradation half-life of atrazine in Fuling yellow soil and Zhongxian purple soil was respectively 28.881 days and 24.321 days. According to domestic classification criteria for pesticide residue in the soil, atrazine was belonged to easily degradable pesticides. In this experiment, the degradation half-life of the atrazine in both soil had little change before and after sterilization.

Key words: atrazine; Three Gorges Reservoir, water fluctuation zone; adsorption , and degradation , soils

Conservation perspective on aquatic biodiversity in the Taihu Lake Basin, China

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The East Tiaoxi River, one of the largest inflowing rivers into Taihu Lake, is mainly composed of three main tributaries, namely the South Tiaoxi River, the Middle Tiaoxi River and the North Tiaoxi River. With the rapid development of economy, degradation of aquatic environment has been one of the most pressing issues in the watershed. Under such circumstances, Kyushu University in Japan and Tongji University in China have conducted a joint research project since 2009 to solve the aquatic environmental problems and conserve biodiversity in the Taihu Lake basin. The objectives of our research were: (1) to clarify the present condition of aquatic living things, especially freshwater fishes and aquatic plants; (2) to review the main threats to aquatic biodiversity; and (3) to propose some recommendation for conservation of aquatic biodiversity in the watershed.

In this study, 85 freshwater fish species were recorded in the East Tiaoxi River, in which were 35 species endemic to China. Eleven native species and three exotic species were newly recorded. About 41 aquatic vegetations were recorded including emerged plant (23), submerged plant (10) and floating plant (8). In the middle-lower reaches, the turbidity was significantly correlated with the ship traffic by a multiple regression model with the stepwise method, and the fish assemblage was negatively correlated with water turbidity. Mining along the river could increase the navigation frequency, which increase the turbidity of the river. The riverbank restoration with concrete and stones exerted negative effect on fish biodiversity, while submerged plants were significantly and positively correlated to fish biodiversity.

In the upper streams, a stepwise multiple linear regression analysis revealed that the density of *Leptobotia tchangi* was significantly and positively correlated with water velocity, while the body size was significantly and positively correlated with river bed pebble size. Non-metric Multidimensional Scaling ordination (NMDS) revealed fish assemblages differed along the stream continuum, but there was little apparent change associated with the seasons. Canonical Correspondence Analysis ordinations (CCA) revealed fish assemblages were significantly related to both water quality and habitat structure variables such as distance to source, stream width, altitude, pH, water depth, and water velocity. Furthermore, river engineering could be the main threat to fish diversity in the upper stream, which is ongoing practice in the upper streams resulting decrease of fish richness and abundance dramatically.

Habitat alteration, overfishing, pollution and inland navigation are the most significant threats to fish diversity in this watershed. To conserve fish biodiversity in this watershed, the North Tiaoxi River and Middle Tiaoxi River should be set as priority for conservation immediately due to amount of river engineering in the upper streams currently. Meanwhile, constructed /conserving shallow zones or backwater should be applied in the middle-lower reaches, which was successfully applied in Netherland. Furthermore, the river restoration, which involves habitat creation, should be employed which can positively affect the structure and diversity of fish assemblages, halt the progressive deterioration of aquatic ecosystems and sustain a valuable ecological resource for human beings.

Dynamics of Performance Reference Compounds in virtual organisms exposed in Yangtze River

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Virtual organisms (VO) such as SPMD are useful tools for monitoring trace levels of non polar organic chemicals in aquatic environments. The Performance Reference Compounds (PRC) spiked into VO prior deployment are used to assess an analyte's in situ SPMD-water exchange kinetics. For the estimation of water concentration (C_w) of the targeted compound, we assume that the rate of chemical loss from VO relates to both the unit capacity (K_{SPMD}) of the device and the magnitude of the uptake rate constant (k_u) (Huckins *et al*, **2006**). PRC are not abundant at significant levels in the aquatic environment, have physicochemical properties similar to their native analogue and can be separated from them by high resolution mass spectrometry (Huckins *et al*, **2002**). Based on our experience, we choose in this present work 16 labeled 13C PAH compounds: Naphthalin-13C6, Acenaphthylen-13C6, Acenaphthen-13C6, Fluoren-13C6, Phenanthren-13C6, Anthracen-13C6, Fluoranthen-13C6, Pyren-13C3, Benzo(a)anthracen- 13C6, Chrysen-13C6, Benzo(b)fluoranthen-13C6, Benzo(k)fluoranthen-13C6, Benzo(a)pyren-13C4, Indeno(1,2,3-cd)pyren-13C6, Benzo(g,h,i)perylen-13C12, Dibenz(a,h)anthracen-$13C_6$ and native compounds namely PCB congener 60, 127, 159 and 37 with moderate to relatively high VO fugacity to enable an estimation of ambient chemical levels at different times (7d, 21d, 24d).For the calculation of the PRC-based sampling rates ,we compared both approaches, integrative sampling and attainment approach of equilibrium regardless environmental conditions (biofouling, turbulence, temperature…) and sampling sites. Compounds with $K_{ow}<10^5$ like Naphthalin-13C6, Fluoren-13C6, Phenanthren-13C6, Anthracen-13C6 were generally useful. The other PRC compounds exhibit too low dissipation rates of PRC (<20%) even after 24d. Analytes accumulated by VO may be in the linear (integrative), curvilinear and equilibrium partitioning phases of sampling. However attention needs to be paid to the choice of these sampling approaches for a better estimation of analyte concentration in VO.

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Data base and evaluation for numerical modelling of pollutant transport in the Yangtze River

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Dissolved and particulate pollutants play a key role in the ecological functioning of rivers and reservoirs like the Three Gorges Reservoir [1]. Numerical models which are powerful tools to study dynamic processes of different scale require a sound data base to describe and predict morphological and ecological processes [2].

A large amount of data have already been collected and evaluated for the numerical modeling of pollutant transport processes. Water level and discharge data are obtained at ten key hydrological stations along the Yangtze River, among others. Sediment properties are mainly extracted from literature. Morphological data are obtained from literature, public available digital elevation model ASTER from NASA and SRTM from CGIAR produced by NASA originally, and the Yangtze River navigation map. Pollutant data were found in the literature and recent water quality data from our mobile measuring device (MINIBAT) used in the Yangtze Project. Additional data are collected as following: ArcGIS shape files for China, Yangtze River and Three Gorges Area; Geological map of China, Chongqing and Hubei; land cover and soil maps in ArcGIS files. Socio-economic data are found in yearbooks of China, Chongqing and Hubei, etc.

To improve and complete the data base, more data will be collected. The results of environmental and ecological studies from other sub-projects will be taken into consideration. Literature study is to be continued. The ever-increasing real time water level, discharge, precipitation data and water quality report are saved on hourly, daily or weekly basis.

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Residues of Organohalogen Contaminants in Sediment and Water from Dianshan Lake in Yangtze River Delta

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Organochlorine pesticides (OCPs) and Polychlorinated biphenyls (PCBs) are two kinds of important persistent organic pollutants (POPs) and have been of great concern worldwide owing to their chronic toxicity, persistence and bioaccumulation. Due to their lipophilic characteristics, POPs tend to accumulate in sediment and may enter into the water column under certain circumstances. It's easy for POPs to find their way into the biota in water and may pose threat to human being through food consumption.

Dianshan Lake, which is located in south-west of Shanghai, China, is one of the major water supply sources of the city. Its water quality is vital to the health of the residents and the city's economic growth. Few studies about POPs in the lake have been done so far. The present work investigated the pollution level and distribution of OCPs and PCBs in the water column and sediment from Dianshan Lake.

Water, suspended particulate and sediment samples were collected from Dianshan Lake in June and September 2011. The concentration of OCPs in water, suspend particulate and sediment were 0.95-7.95 ng/L, 0.70-16.09 ng/L and 2.38-13.01 ng/g, respectively. HCHs, HCB and Heptachlor were the dominant pollutants. The concentration of PCBs from water, suspend particulate and surface sediment ranged widely from N.D.-6.84 ng/L, 0.26-15.13 ng/L and N.D.-33.44 ng/g, respectively. The dominant PCB congeners were CB52 and CB18. The detected rates of α-HCH were 100% in the water samples. Both the concentration and the detected rates of PCBs in the water samples were lower than that in suspended particulates. Except the correlation of HCB between water and suspended particulate was high (the R^2 was 0.609), the other kinds of pollutants had low correlation coefficients between different phases. This may due to Dianshan Lake is a shallow lake, and the water body and sediment can be disturbed by winds easily which destroys the phase balance.

Poster-abstracts

Poster 01

The Impact of the Three Gorges Dam project on Man-made Terraces (China)

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The effect of man-made terraces on the reduction of soil erosion is globally without controversy. Man-made terraces form equilibrium between geomorphic settings and anthropogenic use [1] and are an important tool for erosion control in mountainous regions [2]. Though, an inadequate construction and mismanagement of terraces can strongly affect its efficacy on soil erosion control. Rapid intensification and valorization respectively re-activation of terraces as observed in the Three Georges Dam (TGD) region in Central China [3] can lead to a degradation of terraces. This degradation of terraces is assumed to enforce the process of soil erosion on terraces.

Within the YANGTZE-GEO project, this study aims at the assessment of the varying conditions of terraces and their impact on soil erosion in the TGD ecosystem, one of the world's currently most dynamic regions. It presents a method how to differentiate terrace conditions. Their spatial distribution and their cause factors are focus of this study. Using field investigation, GIS-based data analysis, and remote sensing more than 1000 terraces in the Xiangxi catchment (3,200 km²) were analyzed.

The condition of terraces is a key factor of soil erosion. Four different classes were identified: well (14 %) and badly maintained (39 %), partially (22 %) and completely collapsed (11 %). Mainly anthropogenic effects define their spatial distribution. The closer the terraces to the new Xiangxi shoreline and main roads, the worse their condition and soil erosion. A fast access to the main transportation routes in the highly dynamic backwater area of the Xiangxi River is concluded as main reason for the degradation of terraces.

In a further step, the conceptual *TerraCE* model was developed in order to transfer the findings onto a larger scale in the Xiangxi catchment. This enables the consideration of the local-specific, varying terrace conditions in soil erosion modeling.

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Poster 02

Source apportioning of industrial organic chemicals and organochlorine pesticides in three tributaries of the Three Gorges Reservoir

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The Yangtze River is the third largest river in the world and its watershed accounts for 40% of China's freshwater resources. Its catchment area is one of the most important economic areas and constitutes for 50% of the country's grain, as well as 40% of the Gross Domestic Product. Simultaneously, because of a large-scale industrial and domestic development as well as agricultural runoff, it is one of the most polluted areas in China [1]. Müller et al. [2] measured a discharge of industrial organic chemicals (IOC) from 500 to 3500 kg/day to the East China Sea.
This study focuses the Three Gorges Reservoir (TGR), the largest reservoir in the world. Despite the enormous quantities of industrial waste water and pesticides, which contaminates surface water [1, 2] and can cause toxic effects on life forms [3], as well as its importance for the country, almost no study for IOC and organochlorine pesticides (OCP) has been yet published for the TGR. In view of these facts, water samples for three tributaries (Daninghe, Xiaojiang and Jialing) and the main stream have been collected. Considering the dimension for the catchment of the TGR, it is important to estimate the correlations between land use and organic chemicals in the river water.
Calculations with landcover data [4] were executed for the watersheds of the sampled tributaries in order to present the percentage distribution of land use and to estimate potential sources for IOC and OCP. Furthermore, trends in concentration distribution of IOC and OCP downstream the different rivers are shown. To the best of our knowledge, this represents the first study of potential input sources of IOC and OCP for three tributaries of the TGR.

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Poster 03

Assessment of the Suitability of Water from the Three-Gorges-Reservoir in China for Drinking Water Production and Agricultural Irrigation (-WATERUSE-)

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To provide the public with high quality drinking water is a technological challenge, particularly in emerging countries. In the catchment area of the Three Gorges Reservoir (TGR, China) productive and protected groundwater resources are very rare. Surface water is often used as a raw water source, but bank filtration as a first purification step is not feasible at TGR area. Thus, water works along Yangtze River and its tributaries usually produce purified tab water directly from surface water, using standard filtration and disinfection techniques. For drinking purposes, bottled water is used. The presented study focuses on the suitability of surface water from the TGR as drinking and irrigation water. In addition, the use of innovative water purification technologies is assessed.

Hydrogeology and water chemistry of the 630 km long TGR area are strongly influenced by the geology (red sandstones and clay stones, limestones, gypsum) and a subtropical climate (mean temperature 19°C, precipitation ca. 1.138 mm/a). Soil erosion is leading to a high particulate matter load in the relevant rivers. Anthropogenic input of pollutants originates mainly from sewage, industrial discharge, garbage dumping and from agricultural activities.

Using active and passive sampling methods (ceramic and silicone dosimeters) surface water and suspended solids from TGR area are analysed for in-organic (anions, cations, heavy metals, contrast agents) using IC and ICP-MS and organic emerging pollutants (industrial chemicals, pesticides, pharmaceuticals). In addition, lab experiments will be performed to investigate convenient drinking water treatment methods for the elimination of the pollutants.

First results of the inorganic river water analyses reflect the geogenic background. Heavy metal concentrations were usually well below international river water regulations. The contrast agent gadolinium was detected in all samples, probably as geogenic background, while an increased concentration at Puli river indicates an anthropogenic influence. Concentrations of organic pollutants (e.g. PAH, etc.) at TGR are usually lower compared to concentrations found in German rivers. Particularly, pharmaceutical substances which showed increased water concentrations in Germany in recent years are almost absent in TGR water samples. High concentrations of pesticides (range 2 - 4 µg/l) were identified in samples from Jialing river (biggest tributary of Yangtze river in TGR), indicating agricultural impact on water resources. Summer monsoons are controlling the highly varying river discharge. Thus, pollutant loads show a high seasonal variability with unknown eco-toxicological impact.

Further sampling campaigns will focus on varying hydrological, geographical, and anthropogenic settings and the impact on the TGR chemistry (e.g. high/low river water level during the seasons) and the quantification of the anthropogenic input along the Yangtze and its tributaries.

Poster 04

Assessment of sediment quality of Yangtze River estuary using zebrafish (Danio rerio) embryos

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Yangtze River estuary is one of the largest estuaries worldwide. In this study, the sediment quality of Yangtze River estuary was evaluated using zebrafish (*Danio rerio*) embryos. Freshly fertilized zebrafish eggs (2 hours after fertilization) were exposed to the whole sediment and its organic phase of extract, respectively. The parameters, including survival rate, abnormality, hatching rate, and heart rate of the zebrafish embryos, were recorded during the 96 h-exposure. The results demonstrated that the concentrations of heavy metals (Zn, Cu, Cd, Ni, Cr, and As) and LMW (Low Molecular weight) PAHs (Fluorene) in the sediment of Yangtze River estuary exceeded their corresponding effects range low values (ERL). The maximum concentrations of Zn and Fluorene in the sediment samples were 239.6 μg/g and 45.9 ng/g, respectively. In both whole sediment test and organic extract test, the survival rate and heart rate of zebrafish embryos were reduced, as well as abnormalities and delayed hatching were induced. For example, the highest mortality of the embryos was 39% in the whole sediment exposure. Overall, the occurrence of toxic compounds in the sediment of Yangtze River estuary may have potentially teratogenic effect on biota. The sediment from the upstream of Yangtze River estuary have more observed toxic effects on zebrafish embryos than that form the downstream. Therefore, more attention should be paid to control these pollutants, especially heavy metals in the Yangtze River estuary.

Poster 05

PCR detection of reductively dechlorinating bacteria in Yangtze samples

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Chlorinated compounds such as chloroethenes, chlorobenzenes, and chlorophenols are toxic and widely distributed contaminants. Different bacteria groups such as *Dehalobacter*, *Desulfuromonas*, or *Desulfitobacterium* are able to degrade the chlorinated pollutants under anaerobic conditions. The presence of anaerobic reductively dechlorinating bacteria in sediments of the Yangtze River area was assessed by PCR (Polymerase Chain Reaction) analysis detecting specific rRNA genes. After nucleic acids amplification, the DNA copies were made visible by agarosegel electrophoresis.

Eighteen sediment samples were taken from the Yangtze River area, including the three tributaries Jialing River, Xiangxi River and Daninghe River. Based on the PCR analysis, four different dechlorinating bacteria were detected: *Dehalobacter* in 1 sample, *Desulfomonile* in 10 samples, *Desulfuromonas* in 14 samples, and *Desulfitobacterium* in 3 samples. All of these bacteria are known for their ability to degrade tetrachloroethene (PCE) via trichloroethene (TCE) to dichloroethene (DCE). Detection of these bacteria corresponded with the detection of other anaerobic groups, e.g. Fe(III)- and sulphate-reducing bacteria. Notably, in the sediment core samples also the monooxygenase gene (TMOA) was detected, indicating a potential for aerobic degradation processes.

Nine sediment samples were selected to test the chloroethene degrading activity in batch experiments. Anaerobic reductive dechlorination of PCE was tested in the presence of hydrogen and acetate as electron donors. Within eight weeks incubation time, three cultures from the Yangtze area degraded PCE via TCE to *cis*-DCE or *trans*-DCE, respectively. In another three cultures, a complete dechlorination to ethene was observed, indicating the growth of bacteria belonging to the *Dehalococcoides* group that were below the detection limit in PCR analysis. Next studies will focus on quantitative detection of the dechlorinating bacteria by qPCR and the analysis of specific reductive dehalogenase genes.

Acknowledgement
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Poster 06

Dioxins in sediment cores in front of the TGD

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In order to screen the pollution of dioxins in Three Gorges Reservoir besides of other chemicals (Wang et al 2009), two sediment cores were obtained from different sites in front of Three Gorges Dam (TGD), each core was divided into different samples with every 10 cm length. Dioxins were tested by GC-MS and 17 different dioxins at different concentration were detected from these samples. The total amount of toxic congeners in each sample ranged from 35.3 to 371 pg g^{-1}, and the mean was 72.6 pg g^{-1}. TEQ (WHO 1998, Humans) among samples ranged from 0.30 to 1.86 ng/kg. There was neither a significant difference between samples of the same core nor between the two locations (ANOVA, $p>0.05$). It could be concluded that dioxins concentration in sediment core was low with very low environmental risk potential, and dioxin pattern in the two sites might have the same source. It is the first report on the dioxins concentrations in the sediment core in front of TGD.

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Poster 07

Bioavailable AhR-agonsits in Virtual Organisms (VO) deployed in Three Gorges Area

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Virtual Organisms (VO) are artificially designed to simulate a specific biological compartment such as fat as a part of the lipid of an organism. Persistent organic pollutants (POP) prefer to accumulate in the fat part of an organism. Therefore, VO can mimic 'living' at the sampling site to reflect a time period deposition of POP in fatty compartment of local organism. Aryl hydrocarbon receptor (AhR) agonists are known to be able to cause a multitude of effects such as hepatotoxicity, teratogenesis, immunotoxicity, and tumorigenesis (DeVito and Birnbaum, 1994). The AhR agonist activity (EROD) is generally regarded as an early warning signal for the AhR related toxic effects of PCB, PAH and related compounds (Safe, 1990). In this study, the VO (SPMD) was exposed in TGR from Chongqing 600 km downstream to the dam attempting to characterize the level and distribution of AhR agonists in the big reservoir. Chemical analysis (HRGC/HRMS) was used to determine the amounts of PAH and PCB in SPMD and EROD bioassay was applied to assess the potential toxicity of AhR agonists. First results of EROD activities showed obvious regional variations in the reservoir. The EROD activity in upstream was obvious higher than in downstream area of the reservoir. Total PAH exhibit higher concentrations in the region of upstream and total PCB concentrations are low in the whole reservoir. In comparison the bioassay results with the chemical analysis, EROD EQ-24h should be mainly caused by PAH in SPMD and PCB accounted a very small part for inducing EROD activity in SPMD. Most of the TEQ-PAH were higher than EROD EQ-72h indicating some of PAH were non-persistent compounds. Perhaps some of PAH or substituted PAH were persistent and were main contributor to the EROD EQ-72h in SPMD. Until now not much attention has been paid to the contribution of particulate matter to the total dioxin-like activity of surface water or wastewater. In our study, the suspended particle samples collected from upstream of the river showed high EROD activity and such activities were found not correlated with PAH and PCB concentrations. Unknown compounds in TGR are suspected to be responsible for the high EROD activity in extracts of suspended particles in TGR. Our study indicates that the combination of biomimetic sampling with the bioassays and chemical analyses provided an effective tool for the identification of environmentally relevant waterborne pollutants in TGR.

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Poster 08

Residues of Organohalogen Contaminants in Sediment and Water from Dianshan Lake in Yangtze River Delta

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Organochlorine pesticides (OCPs) and Polychlorinated biphenyls (PCBs) are two kinds of important persistent organic pollutants (POPs) and have been of great concern worldwide owing to their chronic toxicity, persistence and bioaccumulation. Due to their lipophilic characteristics, POPs tend to accumulate in sediment and may enter into the water column under certain circumstances. It's easy for POPs to find their way into the biota in water and may pose threat to human being through food consumption.

Dianshan Lake, which is located in south-west of Shanghai, China, is one of the major water supply sources of the city. Its water quality is vital to the health of the residents and the city's economic growth. Few studies about POPs in the lake have been done so far. The present work investigated the pollution level and distribution of OCPs and PCBs in the water column and sediment from Dianshan Lake.

Water, suspended particulate and sediment samples were collected from Dianshan Lake in June and September 2011. The concentration of OCPs in water, suspend particulate and sediment were 0.95-7.95 ng/L, 0.70-16.09 ng/L and 2.38-13.01 ng/g, respectively. HCHs, HCB and Heptachlor were the dominant pollutants. The concentration of PCBs from water, suspend particulate and surface sediment ranged widely from N.D.-6.84 ng/L, 0.26-15.13 ng/L and N.D.-33.44 ng/g, respectively. The dominant PCB congeners were CB52 and CB18. The detected rates of α-HCH were 100% in the water samples. Both the concentration and the detected rates of PCBs in the water samples were lower than that in suspended particulates. Except the correlation of HCB between water and suspended particulate was high (the R^2 was 0.609), the other kinds of pollutants had low correlation coefficients between different phases. This may due to Dianshan Lake is a shallow lake, and the water body and sediment can be disturbed by winds easily which destroys the phase balance.

Poster 09

Fate of model pollutants in the Yangtze River

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The aim of this subproject is to determine the fate and behavior of a model pollutant in Yangtze water sediment systems.

We will investigate the fate of pesticides in Yangtze water and sediment in agriculturally influenced areas of the Three Gorges Reservoir while non-agriculturally influenced areas will be used for obtaining control samples. We select propanil as model substance, which is known to release the priority pollutant 3,4-dichloroaniline (DCA). DCA is also formed by many other pesticides and therefore an important model pollutant for our studies. DCA has been reported to form a toxic metabolite in soil and sediment, i.e., tetrachloro-diazobenzene. We try to synthesize this azo-compound by chemical means in order to study its fate. We will apply flooding conditions with sediment, with sediment collected in the dry season of the reservoir as well as in the temporarily flooded season, and soil at the river bank as well. We will incubate propanil, DCA and the azo compound in water sediment collected from the Yangtze river, applying radioactively labeled compounds in order to establish mass balances. As preliminary studies we investigated the herbicide clodinafop-propargyl in water sediment from the river Rhine. Adsorption to the sediment was moderate, mineralization was low, and formation of non-extractable residues was also moderate.

By investigating the fate of a model substance known to from toxic metabolites we will address one major part of the environmental risk assessment which will be complemented by two further projects of our group on the ecotoxicity (see poster by Floehr et al.) and the bioaccumulation (see poster of Scholz-Starke et al.) of the pollutants.

Poster 10

Bioaccumulation of model pollutants in the Yangtze River

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The creation of the Three Gorges Reservoir caused the flooding of former urban, industrial and agricultural areas. Consequently, substantial amounts of organic and inorganic pollutants were released into the reservoir. Beyond contaminants and nutrients (e.g. nitrate, phosphate) enter the reservoir by runoff from adjacent agricultural areas as well as from sewage of industry, aquacultures and households. Periodical changes in water level cause flooding events and thereby a relocation of contaminated water, particulate matter and sediment onto agriculturally used areas along the reservoirs shore.
The main aim of the presented research project is a deeper understanding of the processes that determine the bioaccumulation of organic pollutants, i.e. mainly pesticides, along aquatic food chains under the newly developing conditions of a huge reservoir. Since the analysis of organic traces is very labor and cost intensive, we use deterministic modeling approaches for the description of the potential accumulation and biomagnification. The poster shows the variety of criteria, which were used to identify the most suitable model for the specific research questions. The model should be variable and customizable; it should include complex food webs components as well as the possibility of coupling other models, e.g. hydrodynamic models. It should allow for detailed analysis of the bioaccumulation as internal concentrations within different taxa of aquatic organisms. We then describe the properties of the candidate model AQUATOX (US EPA) and the consecutive steps of model parameterization. The first modeling exercises are presented. Our research is firstly focused on the influence of the nutrient regime on food web structures and thus shows the profound influence of nutrients on biomagnification processes.
The poster leads over to the ongoing work on the regionalization of different pollution scenarios.

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Poster 11

Effects of model pollutants in the Yangtze River

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The creation of the Three Gorges Reservoir caused the flooding of former urban, industrial and agricultural areas. Consequently, substantial amounts of organic and inorganic pollutants were released into the reservoir. Beyond contaminants and nutrients enter the reservoir by runoff from adjacent agricultural areas as well as from sewage of industry, aquacultures and households. Periodical changes in water level cause flooding events and thereby a relocation of contaminated water, particulate matter and sediment onto agriculturally used areas along the reservoirs shore.
In order to assess (i) possible links between molecular/biochemical responses and ecologically relevant effects, and (ii) if ecotoxicological effects might be related to adverse effects in fish from the field, sediment samples and fish were collected at different locations and analyzed using a weight-of-evidence (WOE) approach with several lines of evidence. The objective of the poster presentation is to introduce the conceptual framework and to present first results of the ongoing study.
As previously addressed by Chapman & Hollert (2006) a variety of lines of evidence can be used in WOE studies. Briefly, (i) a comprehensive battery of acute (neutral red assay, *Arthrobacter*, fish embryo toxicity test and sediment contact assay with *Danio rerio*) and mechanism-specific bioassays (micronucleus assay and Ames test, EROD and YES assays) is applied to characterize the ecotoxicological hazard potential. (ii) Biochemical investigations and the micronucleus assay with erythrocytes will be applied, representing *in situ* parameters as well as (iii) persistent organic pollutants (PCB, PAH and PCDD/Fs), endocrine disrupting substances, limnochemical parameters and the concentration of heavy metals will be analyzed. To identify organic contaminants causing effects in sediment toxicity assays, (iv) effect directed analysis (EDA) will be applied. Sediment samples have been taken in Kaixian county from Hanfeng Lake, Baijiaxi River as well as the Pengxi River. The latter connecting these water bodies to the Three Gorges Reservoir.

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Poster 12

Investigation of environmental transformation and potential bond residues of PACs by Electrochemical Simulation

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Polycyclic aromatic compounds (PAC´s) are widespread in the environment; from both natural and anthropogenic sources. Depending on the substitution scheme these compounds can undergo oxidative or reductive degradation – whereas the oxidative degradation mechanism is much more typical than the reductive. The degradation products can undergo further chemical reactions, for example with soil organic matter to form bound residues [1].

Recently we have shown that electrochemistry coupled to mass-spectrometry (EC-MS) might be a tool to perform a chemical reaction of an antibiotic (sulfadiazine) with catechol, a model substance for soil organic matter (SOM). Changing the reaction conditions in the EC-cell, we found that either a product of sulfadiazine itself or a product of a metabolite generated under oxidative conditions can be received [2].

Oxidative reactions of three PAC´s (1,2-Benzoanthracene, 2,3-Benzoanthracene Chrysene) at different pH (3, 7, 10) were simulated by electrochemistry and the products were analyzed by the coupled mass-spectrometry. Then we took a look at a model for soil organic matter [3] and choose a number of model substances for the organic part of SOM to find out where typical reaction-sites for bond residues might be. With these chemicals we generated oxidative degradation products and performed reactions with the SOM model substances. The structures of reaction products have been elucidated by FT-ICR-MS.

The results of the approach will be presented. It opens a new way for the study of environmental processes of PACs and mechanisms for the formation of bound residues.

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Poster 13

Photo-degradation of Chlortetracycline under Different Conditions and the Proposed Pathway

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Pharmaceuticals and personal care products (PPCPs) are increasingly used in daily life, environmental problems related with which are attracting more and more attentions from researchers. Tetracycline is a large family of antibiotics, which Chlortetracycline (CTC) belongs to. After several decades of accumulated great consumption, tetracycline and their metabolites have already been disclosed into natural environment in large amount. Understanding of fate of tetracycline in natural eco-system is both important to reliable ecological risk assessment and to the development of effective removal technology.

Ultraviolet light is electromagnetic radiation with a wavelength shorter than that of visible light, but longer than X-rays, in the range 10nm to 400nm, which is an important part of sunlight. Shorter wavelengths indicate higher energy and a higher potential to destroy organic chemicals. In this study, degradation of CTC under UV irradiation was investigated. Different factors were tested to investigate the reaction systems, namely: pH values, addition of Zero-valent iron, TiO2 and ZnO. By collecting MS spectrums every 30 minutes the degradation rates of CTC in the different systems were obtained. In addition, intermediate products were identified, which was used to give hints on the pathway of CTC photo-degradation. First results and the further planning will be presented.

Exhibition

FerryBox: Using Automated Water Measurement Systems to Monitor Water Quality: Perspectives for the Yangtze River and Three Gorges Dam

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The building of the Three Gorges Dam (Hubei Province, China) has transformed a region with an economy based on sustainable agriculture for millennia into an entirely different environment within an exceptionally short time. This disrupts the natural biogeochemical cycles of carbon, nutrients, and metals and possibly will affect the whole catchment including downstream ecosystems, such as wetlands, estuaries, deltas, and adjacent sea areas.

While there are already research programmes running to monitor the water quality of the river and the backwater area, these programs are limited to ship campaigns with sampling and laboratory analysis. The spatial and temporal resolution of such measurements is not sufficient for an overall assessment of the water quality and for prognoses in the context of anthropogenic and climate change.

Starting from changes that have already been documented, a concept of applying regular automated observations by a so called FerryBox is presented. The FerryBox is an automated water quality measurement system aboard a ship or on shore, to monitor the short and long term development of the water quality. FerryBoxes have become a valuable tool in marine research that helps to fill gaps in coastal and open ocean operational observation networks [1]. Such systems are very well suited to give feedback of the river water in the backwater area and downstream of the dam for assessment of measures to improve the water quality [2].

Keywords:
FerryBox, Three Gorges Dam, Yangtze River, eutrophication

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Product: **On-line Toxicity testing for Drinkingwater, river- and wastewater**
Company: **microLAN BV**
Website: **www.toxcontrol.com**

Company profile

The TOXcontrol from microloan BV was developed as a fully automated version of the Microtox™
using the same luminescent bacteria. It is already in use for more than 10 years for applications like river monitoring (the river Rhine, Danube, Muse and the Marne) and intake
protection for drinking water companies like in Amsterdam, Paris, Rome, London and Washington. microLAN headquarters is in Waalwijk, the Netherlands, in 2010 it opened an office in Zhengzhou (Henan Province, China).

The TOXcontrol uses luminescent bacteria as an indication of toxicity. Because of the sensitivity to different substance groups and the short time needed to perform the test, the toxicity test is internationally standardized and accredited (ISO 11348).

The TOXcontrol is currently being deployed on many locations in Europe, USA and the Far East, especially in China where the system is used for drinking water monitoring in cities like Beijing, Guangzhou, and Shanghai. It is the only system currently on the market for continuous monitoring of toxicity in drinking water and surface water. It has the capability of protecting drinking water companies for the introduction of toxic chemicals into their water and ending up into their drinking water product.

microLAN has set up an established network of selected and trained distributors for the support of their products. The goal is to develop several applications onto the platform of the TOXcontrol. One first example is the elaboration of the toxicity analysis with an UV-VIS spectrolyser from s::can and low level detection of specific heavy metals using different buffers. New sensors are also being developed right now which will enhance the toxicity monitoring with on-line analysis of the water quality for detection of Chlorophyll, pH, DO and temperature.

More information can be found at: www.toxcontrol.com

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Guard your water - Chlorophyll Fluorometry and Toxicity Monitoring

Dr. Detlev Lohse and Sönke Kobarg

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For more than 15 years now bbe Moldaenke GmbH has been one of the leading manufacturers of top-quality products in environmental technology. We develop and produce measuring instruments and software to assess and manage water quality. Our instruments are made for use in oceanography, limnology, drinking water monitoring, river dam monitoring, bathing water analysis, supervision of aqua culture systems and environmental assessment.

The two core areas of our expertise are firstly spectrofluorometers for chlorophyll analysis and, what is essential, the recording of algae classes and secondly real-time early warning systems, so-called toximeters. In this area, bbe Moldaenke is the international market leader.

We are a well-trained and highly motivated team of experts coming from all different professions such as environmental engineering, physics, biology or biochemistry. All members of the team work closely together to profit from each other's experience and expertise and to design the best possible products.

Additionally, the development of new techniques is often supported by co-operation with scientific institutions. Over the years, several research projects have successfully resulted in the development of new products. To keep up-to-date with the scientific community, the results are usually published in the relevant journals or presented at seminars and conferences.

Due to all the different experts who work with bbe, we have excellent troubleshooting capabilities. In addition to technical assistance, we offer profound biological advice and provide a very skilled customer service such as an online remote control and telephone service, but if necessary, we are also able to provide quick assistance on site.

The bbe team is able to focus on the important tasks of development, quality control and service since a lot of the basic work of the manufacturing process has been outsourced.

The whole team is extremely flexible, enabling us to react quickly and reliably to the growing requirements of our customers. We always have an ear for our customers' needs and are grateful for all innovative ideas and proposals that support our work.

Water quality control has become a major interest and our top-quality products enjoy high global demand. With a network of distributors we are able to provide direct services in more than 30 countries all over the world.

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IWW is one of the leading water research institutes in Germany and a prominent member of the international research community. In its research branch, IWW is a private, not-for-profit company affiliated with the University of Duisburg-Essen. Founded in 1986, IWW presently employs more than 100 full-time employees at the location Mulheim an der Ruhr/Germany. The 20 shareholders of IWW are mainly from the water-supply and wastewater industry.

Main fields of activity are water resources management, water technology, water networks, water quality analysis, applied microbiology and management consulting. Currently, research focuses on water quality modelling, on membrane applications (UF/MF, NF, RO) for treatment of different water qualities, on asset management, on biofilm monitoring and its prevention in water networks, household installations and industrial cooling systems.

Water Resources Prof. Dr. C Schüth	Water Technology Prof. Dr.-Ing. R Gimbel	Water Chemistry Prof. Dr. T Schmidt	Microbiology Prof. Dr. HC Flemming	Management Consulting Prof. Dr. A Hoffjan
Water Resources Management Dr. A Bergmann	Water Technology Dr. S Panglisch	Water Networks Dr. W Merkel	Water Quality Dr. U Borchers	Applied Microbiology Dr. G Schaule	Management Consulting Dipl.-Volksw. A Hein

The consulting and services branch provides consulting experience to water suppliers, industry and public authorities in technical and analytical issues. IWW offers a broad spectre of service analysis for inorganic, organic and microbiological parameters. A special focus is on quality control for service laboratories with IWW as a major organiser of interlaboratory trials in Germany and involved in EU-wide quality assessment projects. Management consulting includes performance indicators, benchmarking and technical risk assessment for public and industrial water supply.

IWW is engaged in several international water-related projects, e.g. in China, Iran, Syria, Ireland and in a number of EU-funded research projects. IWW is a renowned organizer of national and international conferences, recently on water contamination emergency issues (WCEC'5) and asset management (LESAM 2011).

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WATER TECHNOLOGY

A very imprtant main field of activity is water technology. Currently research focuses are laid on membrane applications (UF/MF, NF, RO), ozonation, central softening and particle removal. A special focus is laid on corrosion aspects

The water technology branch provides consulting experience to water suppliers, industry and public authorities in technical issues. IWW offers a broad spectre of service and consultancy:

Technical Services
Water treatment: planning, design, optimisation of treatment processes and entire treatment chains; feasibility studies; lab and pilot plant investigations; membrane applications, functional check of technical treatment systems

Corrosion and material testing: testing of products, devices, pipes etc. on chemical and microbial corrosion; lab scale and pilot investigations; support of product design

Special analysis: Sieve analysis, flocculation/filtration test, grain size distribution (mobile and lab), membrane permeability, adsorption tests,

Large Scale Equipment:
Filtration columns (sand, gravel, activated carbon, ion exchange)
Pilot containers for membrane applications (MF, UF, NF, RO), oxidation processes
Pumping and measuring devices up to 10 m^3/h

Education
Training for professional (in house and on site)
Generating of manuals for treatment plants

Co-operation
Applied joint research projects with industrial and public partners

Current research and consultancy topics (assortment)
- Pilot investigations for combined membrane and oxidation processes (> 100.000 m^3/d),
- Turbidity removal using flocculation / filtration
- Centralized softening
- Minimizing warming up of river water caused by cooling processes

Post-Conference program

Wednesday, Nov. 30. 2011

08:30 h start at the IBIS Hotel, public transport
09:00 h visit of Biology V-Institute and the Institute for Vehicle Technology

11:30 h: transfer to Research Center Jülich by bus

Lunch in the Casino of the Research Center Jülich

13:00h visit of IBG 2, IBG 3 and ZCH

17:00 h: transfer to Aachen (IBIS Hotel) or to train stations in Düren/Aachen.

Thursday, Dec. 1. 2011

Tour to IWW, Mülheim and Cologne including visit of the water plant, the measuring ship at the river Rhine and the Cologne Dom

07:30 h start at the IBIS Hotel
09:30 h presentation of the IWW including visit of the laboratories

10:30 h: visit of Mülheim water works

12:30 h: Lunch

13:00h start to Cologne
14:00h visit of measuring ship at the Rhine (www.rheinstation.uni.koeln.de)

16:00h visit of the Dom

17:00 h: transfer to Aachen (IBIS Hotel) or to train stations in Cologne/Aachen.

Current and future activities
(as known by Nov. 15., 2011)

Conferences/Meetings

in 2012 there will be a conference in Shanghai: www.icbbe.org/epph2012

A next joint meeting of Chinese and German Partners will be plannend for 2012

Conference-Papers

A series of conference papers following this meeting is planned. A project-presentation paper is already in press:

The Yangtze-Hydro Project: a Chinese–German environmental program

A. Bergmann & Y. Bi & L. Chen & T. Floehr & B. Henkelmann & A. Holbach & H. Hollert & W. Hu & I. Kranzioch & E. Klumpp & S. Küppers & S. Norra & R. Ottermanns & G. Pfister & M. Roß-Nickoll & A. Schäffer & N. Schleicher & B. Schmidt & B. Scholz-Starke & K.-W. Schramm & G. Subklew & A. Tiehm & C. Temoka & J. Wang & B. Westrich & R.-D. Wilken & A. Wolf & X. Xiang & Y. Yuan

Abstract:
Water of good quality is one of the basic needs of human life. Worldwide, great efforts are being undertaken for an assured water supply. In this respect, one of the largest water technology projects worldwide is the Yangtze Three Gorges Dam in China. There is a need for extensive scientific and technical understanding of the challenges arising from this large hydrological engineering project. German and Chinese groups from various scientific fields are collaborating to provide knowledge for the sustainable management of the reservoir. In this project description, the Yangtze Three Gorges Dam Project, its goals and challenges, are described in brief, and the contributions of the German research projects are presented.

find the full paper at:

http://www.springerlink.com/content/7136240187146876/

Central-Web-Page of the German project-partners:

http://www.yangtze-project.de/wasser/

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Last Minute ….

…. changes and/or additions will be found on a separate page in the conference bag.

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