

Xiaohui Lei

EDUCATION

University of Tsukuba , Tokyo, Japan Water Environment Restoration	Ph.D. Mar 2007
China Institute of Water Resources and Hydropower Research (IWHR) , Beijing, China Hydrology and Water Resources	M.S. Apr 2001
Tsinghua University , Beijing, China Hydraulic Engineering	B.S. July 1998

EMPLOYMENT

April 2007-Present: **Professorate Senior Engineer (2012-present) and Senior Engineer (2007-2012)**, Department of Water Resources, China Institute of Water Resources and Hydropower Research (IWHR), Beijing, China

June 2001-September 2003: **Software Engineer**, Go2Map Software Company, Beijing, China

RESEARCH INTERESTS

Research interests focus on the integrated regulation of multiple water projects. A number of hard problems have been conquered including uncertainty of hydrological forecasting, curse of dimensionality and multi-objectives of water resource scheduling, nonlinearity and strong coupling of engineering control. My notable successes have been achieved are on the following four aspects:

1) Meteorological and hydrological forecasting

For an accurate forecast purpose, the long-term and short-term predictions of rainfall and runoff are respectively studied, especially under the condition of strong human activity. The ensemble forecasting methods based on WRF as well as the distributed hydrological model entitled EasyDHM are developed for the study of land use change and water projects regulation, and is developed as well. These models have been applied in Hanjiang river, Nenjiang river, Zhangweihe river, Xijiang river and etc.

2) Reservoir group optimal operation

We developed a series of structural and non-structural optimal algorithms for the optimization of reservoir operation. Those algorithms could solved the "curse of dimensionality". And besides, we also

developed a reservoir operation mode towards Eco-friendly purpose. By the use of this mode, the problem of the algal bloom is controlled, and the fish reproduction is promoted. Those algorithms and mode have been adopted by a number of reservoirs in China, such as reservoirs in Hanjiang river, in the upper Yangtze river (103 reservoirs are considered), in Xijiang river (25 reservoirs and 59 hydropower stations are considered) etc.

3) Water quantity and quality simulation and regulation of Channel

The coupled simulation problem of water quantity and quality has been systematically studied. Our contribution to this problem is that their inverse method of direct simulation is developed for tracing the sources of various sudden pollution events either in channel or reservoirs. Furthermore, we developed the regulation methods of multiple sluices and pumps for the pollution control purpose. Those methods can be applied for the regulation of normal operation conditions as well. Those channels operated with those methods can be cost saving while satisfy the precondition of the safety, and decreasing the effect of the pollution events for emergency conditions. These models have been adopted for the regulation of the middle route project of South to North Water Diversion (MRP), which is 1400km length, controlled by 63 sluices, 97 dividing gates and Huinanzhuang pump station with design flow of 350 cubic meter per second.

4) Decision support system

I proposed a universal modeling and software framework for the integrated regulation of multiple water projects for a river, a city or a water diversion project.

The decision support systems developed for river water resources regulation will be accomplished in 2017. The feature of this system includes but not limited to long and short-term runoff prediction, water allocation, and water pollution prevention. Furthermore this system will be completely applied in Heihe, Hanjiang, Yisuhe and Shayinghe till the end of 2017, and will be further popularized to each river basin and province to provide better decision and management service in China.

The decision support system for water resources management of Beijing City is under development and will be accomplished by 2019, with three main subsystems of building water Big data platform for water affairs, building water quantity and quality real time forecasting platform and building water operation for all waterworks and all 80 environmental assessment sections of city rivers of whole Beijing City.

The decision support system for MRP has been developed and deployed in the administration of MRP and the continuous upgrading service is being supplied until 2020. The application of the developed system has been supporting the regulation of the multiple sluices and pumps groups under normal and emergency conditions.

AWARDS

- The first-grade Dayu award for scientific and technological advancement in water resources derived from the project “Key Technology of Meteorological and Hydrological Forecasting in Changing Environment”, 2016
- The first-grade prize for scientific and technological advancement by Hubei Province derived from the project “Key Technology of Ecology-oriented Multi-objective Integrated Operation of Cascaded Reservoir Group and Its Application in Han River Basin”, 2016
- The first-grade prize by the Ministry of Education derived from the project “Multi-source and Multi-objective Water Resource Elaborate Allocation and Regulation under the Water Deficit Condition”, 2016
- The national first-grade prize for scientific and technological advancement derived from the project “Evolutionary Mechanism of Basin-level Water Cycle and Highly Efficient Utilization of Water Resources”, 2014
- The first-grade Dayu award for scientific and technological advancement in water resources derived from the project “Comprehensive Simulation and Prediction of Water Cycle and its Associated Process in Haihe River Basin”, 2012
- The first-grade Dayu award for scientific and technological advancement in water resources derived from the project “Dual Water Circulation Rules and Evolution Mechanism of Water Resources in Haihe River Basin”, 2011
- The second-grade Dayu award for scientific and technological advancement in water resources derived from the project “Key Technology and Application of Multi-model Multi-mode Flood Combined Forecasting Based on Coupled Land-Atmosphere”, 2011
- Excellent doctoral dissertation in the research field of life and environment science of University of Tsukuba, 2007

PROFESSIONAL AFFILIATIONS AND SERVICE

Member, Specialized Committee of Water Diversion, Chinese Hydraulic Engineering Society, 2017

Member, Specialized Committee of Pump Station, Chinese Hydraulic Engineering Society, 2017

MAJOR UNIVERSITY SERVICE

Adjunct Professor, Nanchang Hangkong University, 2017-

Adjunct Professor, Chang’an University, 2017-

Adjunct Professor, Taiyuan University of Technology, 2017-

Adjunct Professor, China Three Gorges University, 2016-

Adjunct Professor, Capital Normal University, 2013-

Adjunct Professor, Donghua University, 2016-

PUBLICATIONS

- Qingchun Yang*, Jianing Zhang, Zeyu Hou, **Xiaohui Lei***, Wei Tai, Weiwei Chen, Tao Chen, Jordi Delgado: Shallow groundwater quality assessment: use of the improved Nemerow pollution index, wavelet transform and neural networks [J]. *Journal of Hydroinformatics* (Accepted, In press).
- Ji Liang, Baowei Yan, **Xiaohui Lei***, Wenbo Fu, Xianfeng Ni: Parameter Optimization of Double-excess Runoff Generation Model [J]. *Polish Journal of Environmental Studies* (Accepted, In press).
- Jing Zhang, **Xiaohui Lei**, Qiannan Li: Two model performance comparisons with multi-sites observations based on Uncertainty method for modeling hydrologic dynamics. *Journal of Irrigation and Drainage Engineering* (Accepted, In press)
- Xiaohui Yuan, Qingxiong Tan, **Xiaohui Lei***, Yanbin Yuan, Xiaotao Wu: Wind Power Prediction Using Hybrid Autoregressive Fractionally Integrated Moving Average and Least Square Support Vector Machine [J]. *Energy*, 2017, 129:122-137.
- Jingwen Zhang, Xu Wang, Pan Liu, **Xiaohui Lei***, Zejun Li, Wei Gong, Qingyun Duan, Hao Wang: Assessing the Weighted Multi-Objective Adaptive Surrogate Model Optimization to Derive Large-Scale Reservoir Operating Rules with Sensitivity Analysis, *Journal of Hydrology* [J]. 2017, 544:613-627.
- Tongtiegang Zhao, Jianshi Zhao, **Xiaohui Lei***, Xu Wang, Bisheng Wu: Improved Dynamic Programming for Reservoir Flood Control Operation [J]. *Water Resources Management*, 2017, 31(7):2047-2063.
- Yizi Shang, Yizi, Shibao Lu*; Xiaofei Li; Gaohu Sun; Ling Shang; Hongwang Shi; **Xiaohui Lei**; Ye, Yuntao; Sang, Xuefeng; Wang, Hao: Drivers of industrial water use during 2003-2012 in Tianjin, China: A structural decomposition analysis [J]. *Journal of Cleaner Production*, 2017, 140:1136-1147.
- Qiaofeng Tan, Xu Wang*, Pan Liu, **Xiaohui Lei**, Siyu Cai, Hao Wang, Yi Ji: The Dynamic Control Bound of Flood Limited Water Level Considering Capacity Compensation Regulation and Flood Spatial Pattern Uncertainty [J]. *Water Resources Management*, 2017, 31:1-16.
- Yizi Shang, Shibao Lu*, Xiaofei Li, Pengfei Hei, **Xiaohui Lei**, Jiaguo Gong, Jiahong Liu, Jiaqi Zhai, Hao Wang: Balancing development of major coal bases with available water resources in China 8 through 2020 [J]. *Applied Energy*, 2017, 194:735-750.
- Yizi Shang, Pengfei Hei*, Shibao Lu*, Ling Shang, Xiaofei Li, Yongping Wei, Dongdong Jia, Dong Jiang, Yuntao Ye, Jiaguo Gong, **Xiaohui Lei**, Mengmeng Hao, Yaqin Qiu, Jiahong Liu, Hao Wang: China's energy-water nexus: Assessing water conservation synergies of the total coal consumption cap strategy until 2050 [J]. *Applied Energy*, 2016, <https://doi.org/10.1016/j.apenergy.2016.11.008>.

- Yizi Shang*, Jianhua Wang, Yuntao Ye, **Xiaohui Lei**, Jiaguo Gong, Hongwang Shi: An analysis of the factors that influence industrial water use in Tianjin, China [J]. *International Journal of Water Resources Development*, 2016, 1-12.
- Fang Liu, Miao Li*, Hao Wang, **Xiaohui Lei**, Lele Wang, and Xiang Liu: Fabrication and Characterization of a Cu-Zn-TiO₂ Nanotube Array Polymetallic Nanoelectrode for Electrochemically Removing Nitrate from Groundwater [J]. *Journal of The Electrochemical Society*, 2016, 163: 421-427.
- Wanzhen Song*, Yuan Yuan, Yunzhong Jiang, **Xiaohui Lei**, Dongcai Shu: Rule-based water resource allocation in the Central Guizhou Province, China [J]. *Ecological Engineering*, 2016, 87:194-202.
- Fang Liu, Miao Li*, Hao Wang, **Xiaohui Lei**, Xiang Liu*, Lele Wang: Fabrication and Characterization of Cu/Ti Bilayer Nanoelectrode for Electrochemical Denitrification [J]. *International Journal of Electrochemical Science*, 2016, 11(10):8308-8322.
- Wenhua Wan, Jianshi Zhao*, Jay, Lund, Tongtiegang Zhao, **Xiaohui Lei**; Hao Wang: Optimal Hedging Rule for Reservoir Refill [J]. *Journal Of Water Resources Planning And Management*, 2016, 142(11): 04016051.
- Yizi Shang, Shibao Lu*; Ling Shang; Xiaofei Li; Yongping Wei; **Xiaohui Lei**; Chao Wang; Hao Wang: Decomposition methods for analyzing changes of industrial water use [J]. *Journal of Hydrology*, 2016, 543:808-817.
- Yi Ji, **Xiaohui Lei***, Siyu Cai, Xu Wang: Application of a Classifier Based on Data Mining Techniques in Water Supply Operation [J]. *Water*, 2016, 8(12), 599.
- Yi Ji, **Xiaohui Lei***, Siyu Cai, Xu Wang: Hedging Rules for Water Supply Reservoir Based on the Model of Simulation and Optimization [J]. *Water*, 2016, 8(6):249.
- Yuhui, Wang; Weihong, Liao; Yi, Ding; Xu, Wang; Yunzhong, Jiang; Xinshan, Song; **Xiaohui, Lei***: Water resource spatiotemporal pattern evaluation of the upstream Yangtze River corresponding to climate changes [J]. *Quaternary International*, 2015, 380, 187-196.
- Jingwen Zhang, Pan Liu*, Hao Wang, **Xiaohui Lei**, Yanlai Zhou: A Bayesian model averaging method for the derivation of reservoir operating rules [J]. *Journal Of Hydrology*, 2015, 528: 276-285.
- Tongtiegang Zhao, Jianshi Zhao*, Pan Liu, **Xiaohui Lei**: Evaluating the marginal utility principle for long-term hydropower scheduling [J]. *Energy Conversion and Management*, 2015, 106:213-223.
- Wanzhen Song*, Yunzhong Jiang, **Xiaohui Lei**, Hao Wang; Dongcai Shu: Annual runoff and flood regime trend analysis and the relation with reservoirs in the Sanchahe River Basin, China [J]. *Quaternary International*, 2015, 380:197-206.
- Yuhui Wang, Yunzhong Jiang, Weihong Liao, Pin Gao, Xiaomin Huang, Hao Wang, Xinshan Song*, **Xiaohui Lei**: 3-D hydro-environmental simulation

- of Miyun reservoir, Beijing [J]. *Journal of Hydro-environment Research*, 2014, 8(4):383-395.
- Xiaohui Lei***, Weihong Liao, Yuhui Wang, Yunzhong Jiang, Hao Wang, and Yu Tian: Development and Application of a Distributed Hydrological Model: EasyDHM [J]. *Journal of Hydrologic Engineering*, 2014, 19(1):44–59.
- Xiaomin Huang, Weihong Liao, **Xiaohui Lei***, Yangwen Jia, Xu Wang, Yunzhong Jiang, Hao Wang: Parameter Optimization of the Easy Distributed Hydrological Model with a Modified Dynamically Dimensioned Search Algorithm [J]. *Environmental Modelling & Software*, 2014, 52:98-110.
- Jialan Sun, **Xiaohui Lei***, Yu Tian, Weihong Liao, Yuhui Wang: Hydrological Impacts of Climate Change in the Upper Reaches of the Yangtze River Basin [J]. *Quaternary International*, 2013, 304:62-74.
- Xiangyi Ding, Huaidong Zhou, **Xiaohui Lei**, Weihong Liao, Yuhui Wang, Hydrological and associated pollution load simulation and estimation for the Three Gorges Reservoir of China [J]. *Stochastic Environmental Research and Risk Assessment*, 2013, 27(3):617-628.
- Wenli, Huang*, Miao Li, Baogang Zhang, Chuanping Feng, **Xiaohui Lei**, Bin Xu: Influence of Operating Conditions on Electrochemical Reduction of Nitrate in Groundwater [J]. *Water Environment Research*, 2013, 85(3):224-231.
- Yuhui Wang, **Xiaohui Lei**, Weihong Liao, Yunzhong Jiang, Jianshe Liu, Xinshan Song, Hao Wang: Monthly spatial distributed water resources assessment: a case study [J]. *Computers & Geosciences*, 2012, 45:319-330.
- Yuhui Wang, Hao Wang, **Xiaohui Lei**, Yunzhong Jiang, Xinshan Song: Flood Simulation using Parallel Genetic Algorithm Integrated Wavelet Neural Networks [J]. *Neurocomputing*. 2011, 74(17):2734-2744.
- Tongtiegang Zhao, Ximing Cai, **Xiaohui Lei**, Hao Wang: Improved Dynamic Programming for Reservoir Operation Optimization with a Concave Objective Function [J]. *Journal of Water Resources Planning and Management-ASCE*, 2012, 138(6):590-596.
- Xiaohui Lei**, Yu Tian, Weihong Liao, Wei Bai, Yangwen Jia, Yunzhong Jiang, Hao Wang: Development of AutoWEP Distributed Hydrological Model and Application to the Upstream Catchment of Miyun Reservoir [J]. *Computers & Geosciences*, 2012, 44:203-213.
- Xiaohui Lei**, Yuhui Wang, Weihong Liao, Yunzhong Jiang, Yu Tian, Hao Wang: Development of efficient and cost-effective distributed hydrological modeling tool MWEasyDHM based on open-source MapWindow GIS [J]. *Computers & Geosciences*, 2011, 37:1476-1489.
- Miao Li, Chuanping Feng, Zhenya Zhang, **Xiaohui Lei**, Norio Sugiura: Simultaneously regeneration of zeolites and removal of ammonia using electrochemical method [J]. *Journal of Electroanalytical Chemistry*, 2010, 127(3):161-166.

- Miao Li, Qiang Xue, Zhenya Zhang, Chuanping Feng, Nan Chen, **Xiaohui Lei**, Zhaoli Shen, Norio Sugiura: Removal of geosmin (trans-1,10-dimethyl-trans-9-decalol) from aqueous solution using an indirect electrochemical method[J]. *Electrochimica Acta*, 2010, 55(23):6979-6982.
- Miao Li, Chuanping Feng, Zhenya Zhang, Rui Zhao, **Xiaohui Lei**, Rongzhi Chen, Norio Sugiura: Application of an electrochemical-ion exchange reactor for ammonia removal [J]. *Electrochimica Acta*, 2009, 55(1):159-164.
- Miao Li, Chuanping Feng, Zhenya Zhang, **Xiaohui Lei**, Yinan Yang, Norio Sugiura: Simultaneous reduction of nitrate and oxidation of by-products using electrochemical method [J]. *Journal of Hazardous Materials*, 2009, 171(1-3):724-730.
- Xiaohui Lei**, Miao Li, Zhenya Zhang, Chuanping Feng, Wei Bai, Norio Sugiura: Electrochemical regeneration of zeolites and the removal of ammonia [J]. *Journal of Hazardous Materials*, 2009, 169(1-3): 746-750.
- Xiaohui Lei**, Haruyuki Fujimaki, Yifeng Lu, Zhenya Zhang, Takaaki Maekawa: Ammonia removal from pretreated methane fermentation effluent through a soil trench system: a column experiment [J]. *Chemosphere*, 2007, 66(11) : 2077-2086.
- Xiaohui Lei**, Takaaki Maekawa: Electrochemical treatment of anaerobic digestion effluent with Ti/Pt-IrO₂ electrode [J]. *Bioresource Technology*, 2007, 98(18): 3521-3525.
- Xiaohui Lei**, N. Sugiura, C. Feng, Takaaki Maekawa: Pretreatment of anaerobic digestion effluent with ammonia stripping and biogas purification, *Journal of Hazardous Materials* [J]. 2007, 145(3): 391-397.

BOOKS

- Xiaohui Lei, Yu Tian, Huiming Wu and Hao Wang. Key Technical Research and Demonstration of Miyun Reservoir Water Scheduling Project Safety and Operation [M]. China Water & Power Press, 2017.
- Xiaohui Lei, Hao Wang, Weihong Liao, Mingxiang Yang and Yunzhong Jiang. Key Technical research of Hydrological Simulation and Forecasting under Non-uniform Condition [M]. China Water & Power Press, 2017.
- Xiaohui Lei, Jing Quan, Hao Wang and Yunzhong Jiang. Key Technology and Application of Sudden Water Pollution Emergent Regulation of Cross-basin Water Diversion Project [M]. China Water & Power Press, 2017.
- Xiaohui Lei, Kewang Tang and Weihong Liao. Study of Water Cycle Simulation and Regulation in the Pearl River Basin [M]. China Water & Power Press, 2014.
- Xiaohui Lei, Hao Wang, Yunzhong Jiang and Xu Wang. Complex Water Resource System Simulation and Optimization [M]. China Water & Power Press, 2012.
- Xiaohui Lei, Yunzhong Jiang and Hao Wang. Distributed Hydrological Model EasyDHM [M]. China Water & Power Press, 2010.

RESEARCH EXPERIENCES

- Intelligent water conservancy Platform Construction of Beijing City*, Chief Scientist, 60 million RMB, National Major Science and Technology Program for Water Pollution Control and Treatment, 01/2017-12/2020
- Water Quality Early Warning and Management Platform Construction of the Middle Route of the South-to-North Water Diversion Project*, Chief Scientist, 40 million RMB, National Major Science and Technology Program for Water Pollution Control and Treatment, 01/2017-12/2020
- Risk Decision Theory and Assessment Method of Reservoir Group Operation*, Chief Scientist, 4.6 million RMB, National Thirteenth Five-Year-Plan Key Research and Development Planning Project, 2016YFC0402208, 07/2016-12/2020
- Technical Research and Demonstration of Emergency Operation and Distributed Control of the Middle Route of the South-to-North Water Diversion Project*, Technical Director, 2.8 million RMB, National Twelfth Five-Year-Plan Scientific and Technological Support Planning Project, 2015BAB07B03, 04/2015-12/2017
- Construction of Digital Platforms in Ya-Long River Basin, Chief Scientist, 3 million RMB, Yalong River Hydropower Development Company, LTD, YHDC A-201505, 01/2015-12/2017
- Algorithm Development and Application of Real-Time Dispatching Model of Cascaded Pump Stations of Miyun Reservoir Store Project*, Technical Director, 8 million RMB, Beijing Science and Technology Commission,
- Study of Key Technology of Groundwater Development and Oasis Safe Water usage*, Chief Scientist, Key Projects Financed by the Ministry of Water Resources, 201301102, 01/2013-12/2015
- Study of Key Technology of Environmental Impacts Assessment of Basin Comprehensive Planning*, Chief Scientist, Key Projects Financed by the Ministry of Environment, 2013467042-4, 01/2013-06/2015
- Study of Dual Water Cycle Model and Water Resources Allocation of Water Diversion Project in Central Guizhou*, Chief Scientist, Guizhou Province Science and Technology Project, 20126013-6-1, 01/2013-06/2015
- Key Technology and Demonstration of Water Quantity and Quality Joint Regulation and Emergency Treatment of the Middle Route of the South-to-North Water Diversion Project*, Technical Director, 20 million RMB, National Major Science and Technology Program for Water Pollution Control and Treatment, 2012ZX07205-005, 01/2012-12/2014
- System Development and Integration of Taihu Basin Water Quantity and Water Quality Integrated Regulation*, Chief Scientist, 2.9 million RMB, Key Projects Financed by the Ministry of Environment, 201101026, 01/2011-12/2013
- Joint Regulation Technologies of Three Gorges and Super Large-scale*

Cascade Hub Group, Principal finishing person, 8 million RMB, National Eleventh Five-Year-Plan Scientific and Technological Support Planning Project, 02/2009-06/2012

Simulation and Regulation of Basin Water Cycle, Principal finishing person, 5 million RMB, NSFC Innovative Research Group Fund Project, 01/2008-12/2013

Evolutionary Mechanism of Water Cycle in Haihe River Basin and High-efficient Utilization of Water Resources, Principal finishing person, National High-tech Program Adopted in March 1997, 04/2007-12/2010

Research on Key Technologies for the Regulation of the Middle Route of South-to-North Water Transfer Project, Principal finishing person, 6.7 million RMB, National Eleventh Five-Year-Plan Scientific and Technological Support Planning Project, 04/2007-01/2011