

## 1. Annual Report

International Helmholtz Network

**Helmholtz-CAS**

**“Research Centre for Environmental Information Science”**

**RCEIS**

<b>Project Number:</b>	HIRN-0002 (T533D313)
<b>Funding:</b>	Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF)
<b>Project Title:</b>	Helmholtz -CAS Research Centre for Environmental Information Science (RCEIS)
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<b>Report Period:</b>	01.03.2014 – 28.02.2015



# RCEIS

Research Centre for  
Environmental Information  
Science

## International Helmholtz Network

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**Summary**

The Sino-German Research Centre for Environmental Information Science (RCEIS) was established in March 2014. It shall become a Sino-German competence centre and research platform for Earth systems observation and prediction by combining expertise in the fields of environmental and information sciences using modern information technology. In this report, the working results for the first year from March 2014 to February 2015 are presented and the future plans for the second and third year are introduced as well. The first year was regarded to be very successful and a lot have been achieved regarding the scientific contributions, new projects and the network extension. These achievements and activities are listed in the following table.

## RCEIS Activity Time Table (1<sup>st</sup> Year)

No.	When	Activities
1	01.03.2014	Dr. Cui Chen started her work as the RCEIS coordinator
2	17.-18.06.2014	5. Water Research Horizon Conference (WRHC) "Water in Urban Areas", Berlin, RCEIS Kick-off German Partners, Workshop on German-Chinese co-operation in water science (Chen et al. 2015)
3	25.-26.09.2014	Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences, visiting UFZ
4	08.10.2014	The Chinese University of Hong Kong visiting UFZ (Prof. LIN)
5	10.-11.10.2014	The Hamburg Summit: China meets Europe
6	09-12.11.2014	Chinese Research Academy of Environmental Research (CRAES) visiting UFZ
7	17.-23.11.2014	Sino-German Symposium on Sustainable Water Management and Ecosystem Restoration in the Poyang Lake Basin, Nanchang
8	22.11.2014	The Opening Ceremony for the RCEIS
9	23.11.2014	Visiting Key Laboratory of Poyang Lake Wetland and Watershed Research (Jiangxi Normal University), Nanchang, China
10	25.11.2014	Visiting Chinese Institute of Water resources and Hydropower - IWHR, Beijing
11		Sino-German Workshop on "A global analysis of long term evapotranspiration time series from lysimeter systems"
12	09.12.2014	Chinese delegation from Hubei Province visiting UFZ
13	31.12.2014	Submission of the NNSF/DFG Cooperation Group Proposal to the Sino-German Centre for Science Promotion
14	21.02.2015	Publication of the strategy paper on "Challenges and opportunities of German-Chinese cooperation in water science and technology" (Chen et al. 2015)

15	25.02.2015	Visiting Hubei Research Academy of Environmental Sciences in Wuhan, China
16	26.02.2015	Visiting Institute of Rock and Soil Mechanics, Chinese Academy of Sciences , Wuhan
17	08.04.2015	Publication of the Thematic Issue on "Waste water treatment and pollution control in the Liao River Basin" in Environmental Earth Sciences
	<b>Upcoming events</b>	
	07.05.2015	Sino-German cooperation within the Mega-Water-Program of China Kick-off event of the German BMBF CLIENT Water Projects Invitation to the official Inauguration Event in Beijing, China (Minister Prof. WAN Gang, ST Dr. Schütte)
	08.05.2015	Konferenz „Nachhaltige Urbanisierung“, Shanghai, Chinesisch-Deutsche Kooperation im Wissenschaftsjahr 2015 „Zukunftsstadt“ Presentation of the BMBF CLIENT Project "Urban Catchments"
	10-12.05.2015	BMBF CLIENT Project "Urban Catchment" 2 <sup>nd</sup> Workshop in Chaohu City, China
	29-31.05.2015	4th Sino-German Energy Conference, Chengdu, China
	Sep/Oct 2015	Sino-German Workshop for Geothermal Energy (in the preparation)
	24.-27.11.2015	Lysimeter Workshop, Beijing

## RCEIS Activity Map (1<sup>st</sup> Year)

The study areas of the RCEIS projects (work packages) are listed in the following table and highlighted in the following figure:

WP	Study area	Projects	Partners
1	Songhua-Liaohe River Basin	EU EuropeAid Project SUSTAIN H2O (Thematic Issue in EES)	CRAES UFZ CEH
2	Yellow River Delta	BMBF project DELIGHT “Delta Information System for the Geo-Environmental and Human Habitat Transition”	DLR CAS-IGSNRR
3a	Chao Lake	BMBF CLIENT project “Managing Water Resources for Urban Catchments”	UFZ CAS-HYB CAS-NIGLAS
3b	Poyang Lake	NNSF-DGF Cooperation Group Proposal “A modeling platform prototype for environmental system dynamics”	CAS-IGSNRR UFZ KIT DLR
5	Heihe River Basin	Water resource management of Heihe River: Optimising irrigation in oasis desert eco-systems	FZJ CAS-IGSNRR

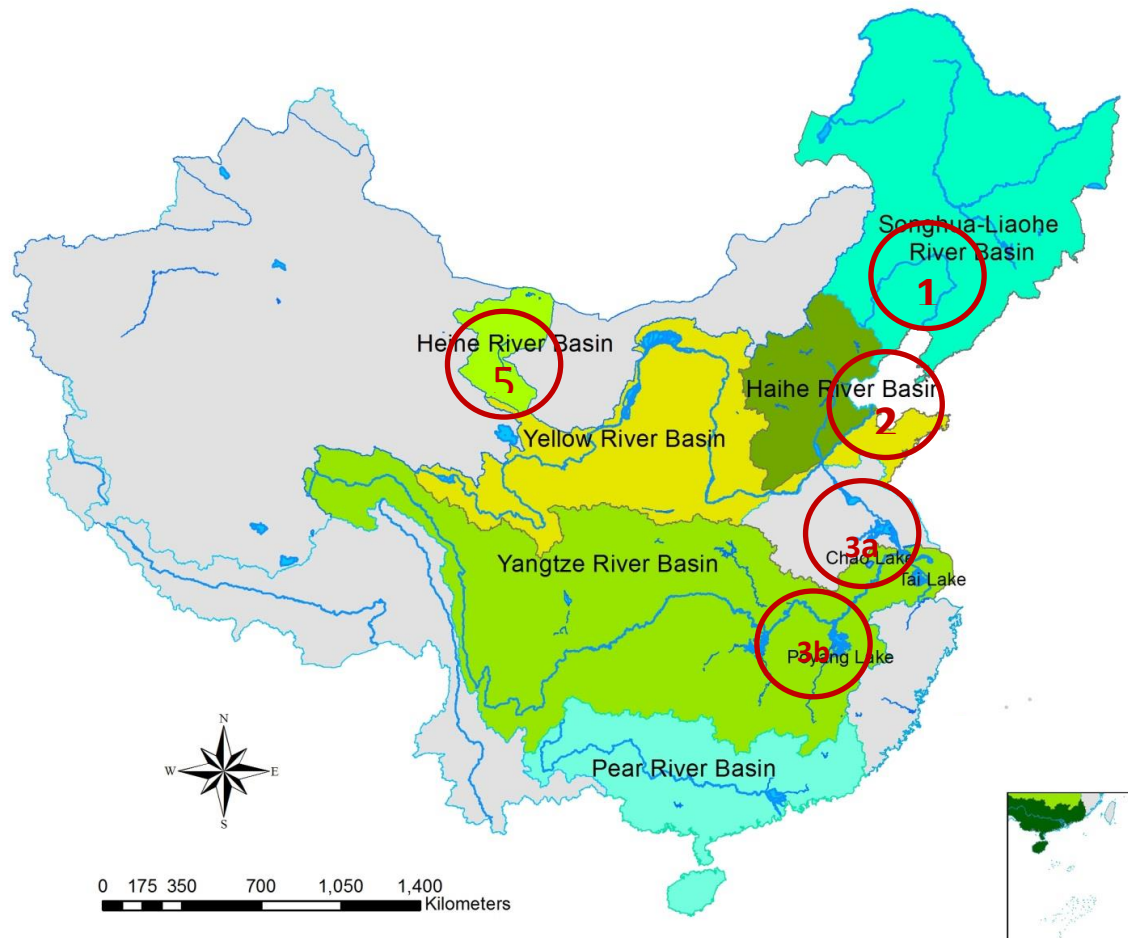


Fig.1 RCEIS study area in China

## Sino-German Activities and Networking

### 1. The Opening Ceremony of RCEIS

On 22.November, 2014, the Opening Ceremony for the RCEIS took place in Beijing at the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences.

RCEIS is the joint Helmholtz-CAS Network for Environmental Information Science which was established from the beginning of 2014. It should become a Sino-German competence centre and research platform for Earth system observation and prediction by combining expertise in the fields of environmental and information sciences using modern information technology.



Fig.2 RCEIS opening ceremony on 22, Nov, 2014

The former Chinese Minister of Science and Technology (MOST), Prof. Guanhua Xu, director of Sino-German Centre for Science Promotion, Helmholtz Beijing office representative, Prof. Quan-Sheng Ge, director of the Institute of Geographical Sciences and Natural Resources (CAS) and Prof. Tianxiang Yue (CAS) have joined the opening. Prof. Guanhua Xu and Prof. Olaf Kolditz have given the opening speech on behalf of the Chinese and German sides.

For the RCEIS Helmholtz partners, Dr. Claudia Künzer from DLR (German Aerospace Centre), Jianhui Wei from KIT (Karlsruhe Institute for Technology) and several scientists from UFZ (Prof. Gerrit Schüürmann and Dr. Cui Chen – Scientific Coordinator of RCEIS) have attended the opening. Right before that, the first RCEIS Sino-German Symposium on “Sustainable Water Management and Ecosystem Restorations in Poyang Lake Basin” has successfully taken place in Nanchang City, China. RCEIS is dedicated to the joint Sino-German cooperation in the area of environmental sciences in the future.

## **2. Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences, visiting UFZ**

Prof. Qi Zhang and Dr. Jiang Sanyuan of Nanjing Institute of Geography & Limnology (NIGLAS), Chinese Academy of Sciences, Nanjing visited the UFZ in Magdeburg from 25. - 26<sup>th</sup>, September, 2014. The aim of the visit was to exchange research interests and exploring possible future cooperation. In addition, the return visit of Dr. Michael Rode was prepared by NIGLAS in Nanjing for November 2015. On 25, September, the Chinese scientists were introduced about the UFZ in Magdeburg and the Department of Aquatic Ecosystem Analysis (ASAM). This included a conversation with the Head of Department Prof. D. Borchardt (ASAM) and Dr. Karsten Rinke (Head of Department Lake Research).

On 26, September, a full-day excursion was carried out in the Hydrological Observatory TERENO Bode. This research aims and methods were presented. Important point here was the explanation of the monitoring concept for the detection of point and diffuses substances into the water system of the Bode. The small agricultural catchment area Sauerbach was presented, which is equipped with extensive sensor metrology for high temporal resolution detection of water related variables. The set-up of lysimeter especially for the study area was explained. In addition, other water quality monitoring stations at Bode and Selke were presented and explained. Its implications were discussed for the scale-dependent monitoring plan in TERENO area. The NIGLAS intends to establish comparable monitoring approaches for Chinese research area.

From 29, September to 02, October, both scientists took part in the International Conference TERENO ([www.tereno-conference2014.de](http://www.tereno-conference2014.de)) in Bonn. Prof Zhang gave a presentation on "Extreme droughts in the largest freshwater lake (Lake Poyang) in China and effects of the Three Gorges Dam". Dr. Jiang presented his results on "Effects of temporal and spatial resolution of calibration data on integrated hydrologic water quality model identification". The contributions were involved in the session "Improving water quality management using new water quality modeling and observation strategies" organized by Dr. Michael Rode. The TERENO Conference offered good opportunity for networking and for many discussions with scientists.

### **3. The Chinese University of Hong Kong visiting UFZ**

On 8, October, 2014, Prof. Hui Lin from the Institute of Space and Earth Information Science, the Chinese University of Hong Kong visited UFZ. On the meeting, Lars Bilke from department of Environmental Informatics has introduced the three-dimensional Visualization Centre (VISLAB) and its applications in Beijing Nankou area – important groundwater resources for the Beijing city. Ursula Schmitz, the director of the department of Central Strategy at UFZ has given an overview about the research area of UFZ. Both sides have exchanged their ideas in the area of the Virtual Geographical Environment using modern visualization technology. Barbara Kolditz, the assistant of the international journal of Environmental Earth Sciences has introduced the journal and several thematic issues related to China. Prof. Lin was invited as guest editor for a special issue "Developing dynamic VGEs" for an international conference organized by Prof. Lin.





Fig. 3 Chinese guests visiting VISLAB on 08, Oct, 2014

#### 4. The Hamburg Summit: China meets Europe

On October 10 and 11, 2014 over 600 experts from the business, political and academic world came together at the Hamburg Chamber of Commerce to discuss the state of the Sino-European relations. Chinese Premier Li Keqiang, President of the European Parliament Martin Schulz and Minister of Foreign Affairs of the Federal Republic of Germany, Dr. Frank-Walter Steinmeier, spoke as guests of honor.

During Chinese Premier Li Keqiang's visit to Berlin on the 10<sup>th</sup> 2014, China and Germany issued the "Sino-German Cooperation Platform for Action". Both sides are planning long-term cooperation between the two countries in the next 5-10 years. The Sino-German cooperation route map is included in this document. The cooperation platform states that the Sino-German "Clean Water" Innovation Centre in Shanghai should play an important role in strengthening bilateral cooperation in water resources protection, safe drinking water, and sewage treatment and recycling, clean production and industrial water reuse and promote mutual communication between scientific research institutions and industries for exchanging scientific and technological achievements in water science and technology. German participation in large Chinese Water Engineering Projects is a priority.

German Federal Ministry of Education and Research (BMBF) has provided pre-funding in the German "Clean Water" framework for joint research and innovation projects. On the basis of successful cooperation so far, BMBF and the China Ministry of Housing and Urban-Rural Development (MoHURD) agreed to support energy efficiency, high resource utilization of water and wastewater treatment technology and equipment.

China is the partner of the campaign "2015 Science Year: Future City" of the German Federal Ministry of Education and Research. Both sides will take this as an opportunity to strengthen cooperation in the future in urban water, land and air as the focus of environmental science and technology cooperation and innovation partners' relations.

As scientific project manager for Sino-German cooperation projects at UFZ, Dr. Cui Chen from department of environmental informatics has joined the Hamburg Summit and could take this chance to extend the Helmholtz network with other experts from the business, political and academic world from both China and Germany.

## **5. Chinese Research Academy of Environmental Research (CRAES) visiting UFZ**

How can Chinese society tackle the environmental problems that have resulted from the stunning economic growth in recent decades? To what extent can the European experience and achievements in environmental protection in China to be transferred? Seven Chinese professors of Chinese Research Academy of Environmental Sciences (CRAES) in Beijing were trying to find the solutions for above questions during their visit to UFZ in Leipzig and Magdeburg sites between 9 and 12 November 2014. The guests came in the context of the European Union promoted project "Sustain H2O" at the UFZ.

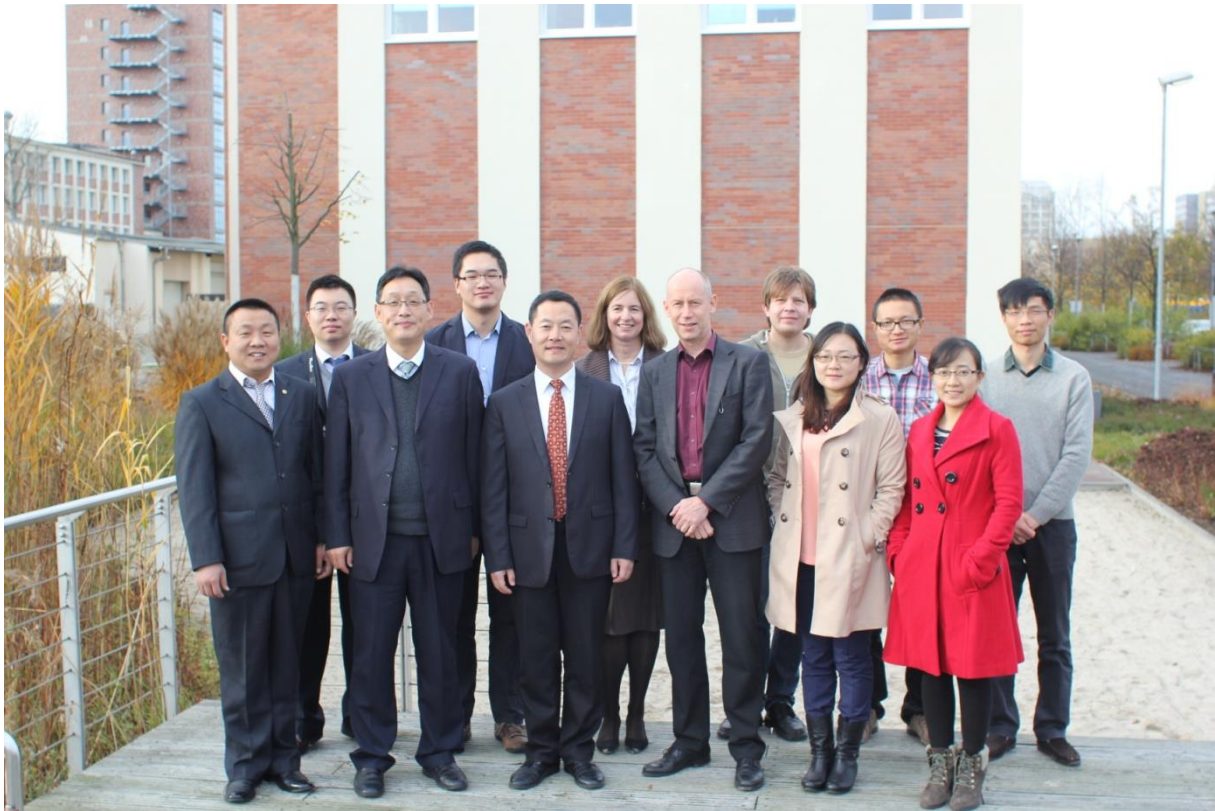


Fig. 4 The delegation of CRAES visiting UFZ, Photo from Lars Bilke, UFZ on 09-12, Nov, 2014

In the "Sustain H2O" project, the UFZ and the British PEER partner CEH (Centre for Eco-Hydrology) are trying to find the methods to reduce the water pollution in the Songhua-Liaohe River Basin in northeast China and to achieve a more sustainable usage of water resources. The Department of Environmental Informatics at UFZ as a project partner deal with the following tasks within the following scope of the project:

- Providing information on European directives and their exemplary application in the field of water management, water conservation, environmental risk assessment and remediation,
- organization of study tours to Germany and courses in China,
- modeling of three-dimensional reactive contaminant transport in groundwater in the selected sub-basins of the Songhua-Liaohe area using the data and modeling platform OpenGeoSys ([www.opengeosys.org](http://www.opengeosys.org))

The academic program of the study tour was divided into two days. On the first day, the guests visited the Department of Environmental Informatics, monitoring and exploration technologies, groundwater remediation and System Ecotoxicology at Leipzig. Here, the Visualization Center (VisLab), the Direct Push exploration method and the mesocosms were introduced. In the end, the Vice President of the Chinese Research Academy of Environmental Sciences, Prof. Yonghui Song, presented the progress in the Chinese program to reduce water pollution.

On the second day, the delegation visited the Department lake research and ecology from UFZ in Magdeburg and inspected the local MOBICOS pilot plant. Furthermore, they visited the environmen-

tal and biotechnology Center of the UFZ and the Central German refurbishment and disposal company. The recently opened biological groundwater remediation plant in Leuna presented their work.

We are very thankful to the Department Lake Research (SEEFO), River Ecology (FLOEK), Environmental Informatics (ENVINF), groundwater remediation (GWS), Monitoring and Exploration Technologies (MET), System Ecotoxicology (Ökotox) and the Environmental and Biotechnology (UBZ) for the active support of the study tour of our Chinese project partners.

## **6. Visiting Key Laboratory of Poyang Lake Wetland and Watershed Research (Jiangxi Normal University), Nanchang, China**

On 23, November, 2014, Prof. Olaf Kolditz, Dr. Cui Chen from UFZ and PhD student from KIT have visited Key Laboratory of Poyang Lake Wetland and Watershed Research, Jiangxi Normal university after the invitation from Prof. Yeqiao Wang from this labor. Prof. Wang has introduced their laboratory and the 3D virtual Geographical Environment Visualization Centre. He has also discussed with us about his research project in the area of Poyang Lake. Prof. Kolditz has introduced the international journal of environmental Earth Sciences and encouraged the scientists and phd students to submit their research results on this journal.

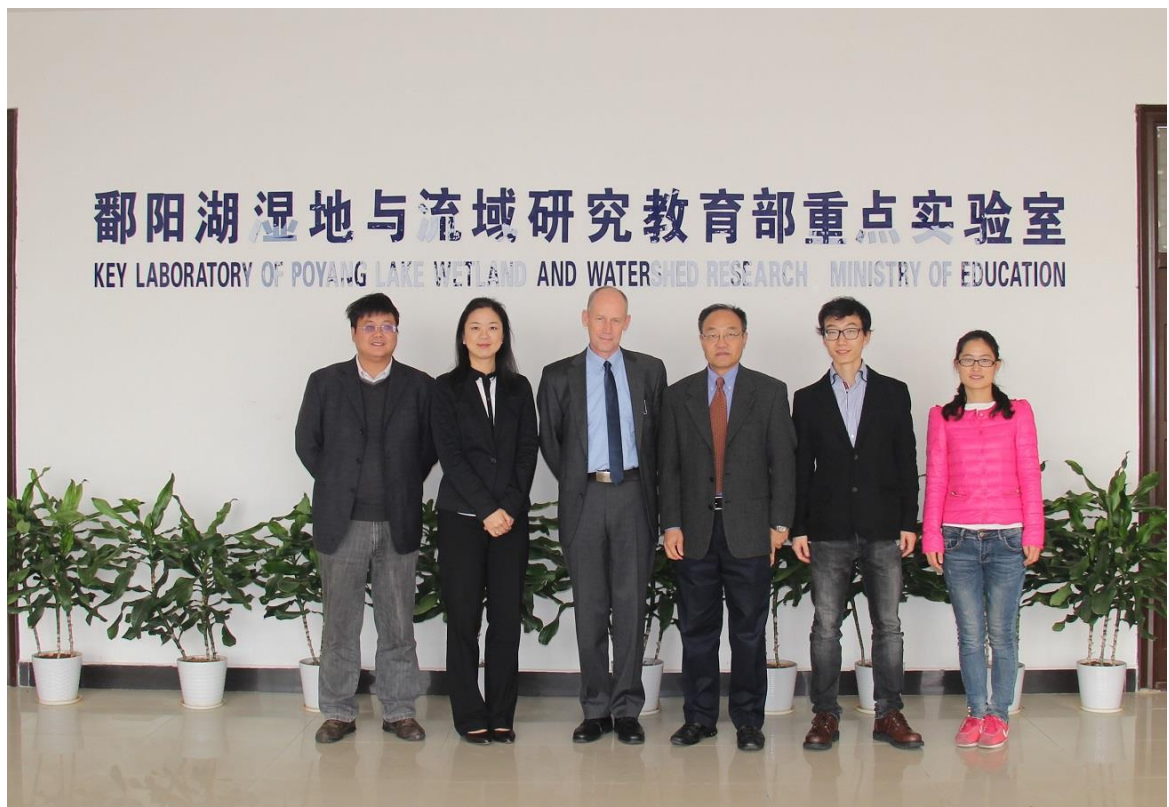


Fig. 5 visiting Key Laboratory of Poyang Lake Wetland and Watershed Research, on 23, Nov, 2014

## **7. Visiting Chinese Institute of Water resources and Hydropower - IWHR, Beijing**



On 25, November, 2014, Prof. Olaf Kolditz, Dr. Cui Chen from UFZ and Mr. Yinwei Ma, the representative from Saxon State, Germany, have visited Chinese Institute of Water resources and Hydropower – IWHR, which belongs to Chinese Ministry of Water Resources - MWR, Beijing. After the visit of Vice minister Qihua Cai from Chinese Ministry of Water Resources at the State Ministry of Environment and Agriculture (SMUL) in Dresden in September 2014, it was an honor and a great pleasure for us to have the possibility to visit the Ministry of Water Resources in China.

As representatives of the "Center for Advanced Water Research (CAWR)" Prof. Dr. Kolditz and Dr. Chen, they have visited IWHR. They discussed the further proceeding of joint future activities in the area of water science and technology. There is great chance to have cooperation under the framework of China Mega Water Programme. By the support from Ministry of Water Resources and Ministry of Science and Technology (MOST), the joint proposal were discussed and considered. Dr. Yanliang Du from IWHR has been invited to Germany for the research exchange.

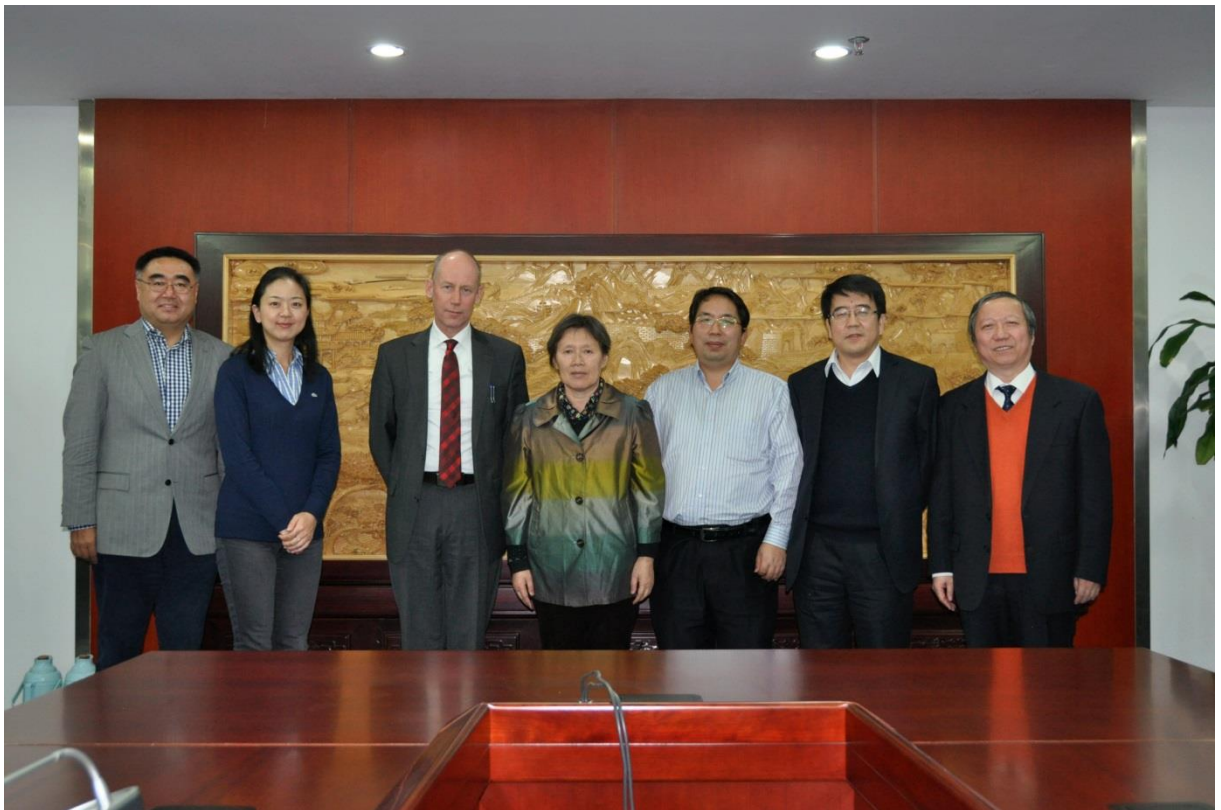


Fig.6 visiting Chinese Institute of Water resources and Hydropower – IWHR on 25, Nov, 2014

## **8. Chinese delegation from Hubei Province visiting UFZ**

On 09.12.2014 a Chinese delegation comprising representatives from various Chinese research institutes and departments of Hubei Province with a focus in the field of environmental sciences visited UFZ.



Fig.7 Director of Hubei Academy of Environmental Sciences Zhang Gang (left) during the delegation visit at UFZ, on 09, Dec, 2014

The Chinese visitors from Hubei Province (Hubei province is the Saxony's partner) including the Hubei Academy of Environmental Sciences were impressed by the variety of water research at UFZ and the activities of the Center for Advanced Water Research (CAWR) and RCEIS in China. After the presentations from TU Dresden and UFZ who founded the joint Centre of the Excellence in the field of inter- and transdisciplinary water research, the head of the delegation were interested in cooperation with the CAWR particularly in the area of drinking water quality and treatment.

The delegation visit was organized in the cooperation with the Saxony State Ministry for Environment and Agriculture (SMUL), the Saxony Economic Development and the Educational Institute of Saxon economy and this is regarded as an important activity to strengthen the cooperation of CAWR, RCEIS and the federal state of Saxony.

## 9. Visiting Hubei Research Academy of Environmental Sciences in Wuhan, China

On 25, Feb, 2015, Dr. Cui Chen has visited Hubei Research Academy of Environmental Sciences (HRAES) in Wuhan China. Three topics were the major focus regarding the future cooperation:

- 1) HRAES is very interested in the Environmental Modeling software OpenGeoSys ([www.opengeosys.org](http://www.opengeosys.org)) and would like to take some OGS courses in the near future. The idea is that, by using OGS, they want to do the 3D visualization for the Danjing Reservoir which is the major water resources transferred from South to North China for the Water Divison Program. They want to simulate the reservoir as dynamic lake and its 3D visualization for the lake modeling. This is part of a sub project in the context of Mega Water Program in China.

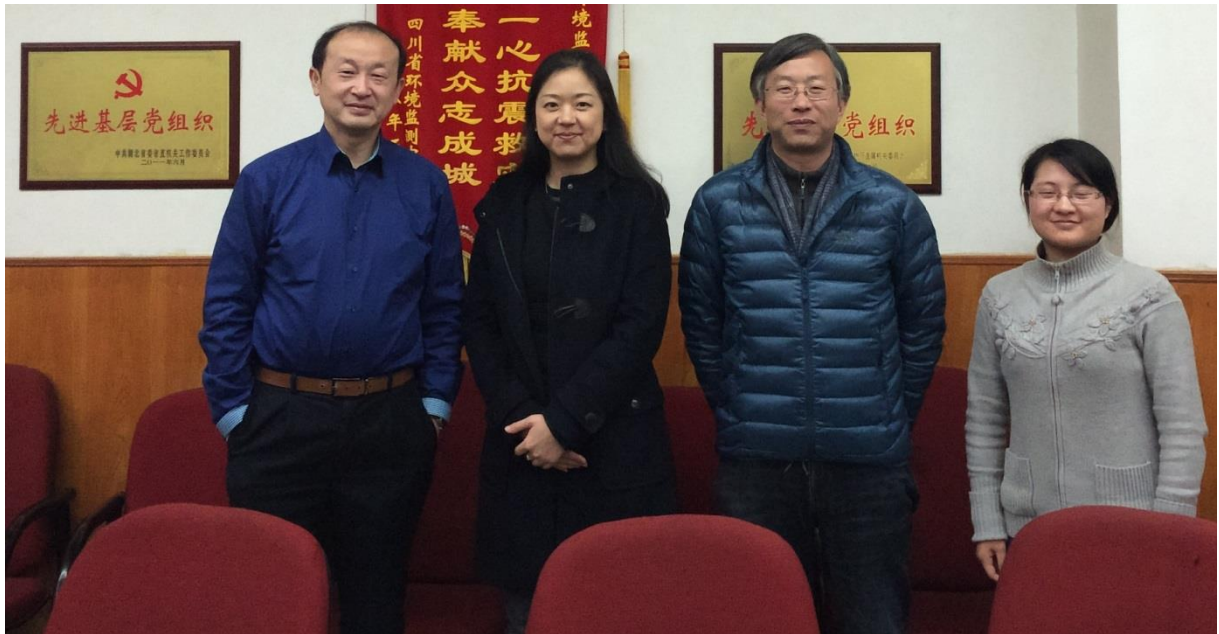


Fig. 8 Visiting Hubei Research Academy of Environmental Sciences on 25, Feb, 2015

- 2) Try to get the financial support from the Hubei Ministry of Environmental Protection for an international cooperation project in the context of Chinese Water Division Program. The major research area will be the Hanjiang River basin, which are the major water resources for the Water Division Program. In this proposal, the impact of the Water Division Program on the water environment, such as the Water quantity, water quality (such as the algal blooms) will be carefully studied.
- 3) International funding possibility for the project inside Hubei province is discussed.

## 10. Visiting Institute of Rock and Soil Mechanics, Chinese Academy of Sciences , Wuhan

On 26, February, 2015, Dr. Cui Chen has visited the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan. Prof. Qi Li has presented his recent research in the area of CO<sub>2</sub> storage and utility.

# Conference / Workshop

## 1. Sino-German Symposium on Sustainable Water Management and Ecosystem Restorations in Poyang Lake Basin

From November 17 to 23, 2014, the Sino-German Symposium on Sustainable Water Management and Ecosystem Restorations in Poyang Lake Basin successfully took place in Nanchang City, Jiangxi Province, China. 16 scientists from Germany and over 25 from the Chinese side have attended this symposium. It was funded by the Sino-German Centre for Science Promotion (DFG/NSFC).

The symposium brought together Chinese and German researchers from different disciplines (Hydrology, Ecology, Climate Research and Information Science) as well as involving authorities and



stakeholder from the Poyang lake basin. It was jointly organized by Prof. Olaf Kolditz and Dr. Cui Chen from Department of Environmental Informatics from UFZ and Prof. Tianxiang Yue from Institute of Geographical Sciences and Natural Resources Research from Chinese Academy of Sciences (CAS).

From German side, the participants were Gerrit Schüürmann, Matthias Kästner, Antonis Chatzinotas, Michael Strauch, Karsten Rinke, Cui Chen, Olaf Kolditz from UFZ and the others were from TU Dresden, TU Darmstadt, Karlsruhe Institute for Technology (KIT), German Aerospace Centre (DLR) and University Kiel and Hochschule Weihenstephan-Triesdorf. From Chinese side, the participants were Yue Tian-Xiang et al. from CAS, and others from Tsinghua University, Office of the Mountain-River-Lake Development Committee of Jiangxi Province, Nanjing University, Jiangxi normal University, Jiangxi Agricultural University, Sichuan Agricultural University, China Institute of Water Resources and Hydropower Research, China Institute of Water Resources and Hydropower Research, Beijing Normal University, and so on.



Fig. 9 The Sino-German Symposium – the first RCEIS workshop on 17-23.Nov.2014

The symposium consisted of two-day's technical program with eight sessions and two-day's field excursions to investigate the Poyang Lake region. The participants also joined the opening ceremonies of the 14th World Living Lakes Conference and the 3rd World Low-carbon and Eco-economy Conference which took place at the same time in Nanchang as well. Diverse topics have been presented and discussed about the hydro- and ecosystems for the Poyang Lake area. The groups discussed about the topics and possible project collaborations among German and Chinese scientists. The symposium took advantage of the expertise from scientists of both countries and it is an important impetus for exchange of experiences between the two countries. The Symposium is also regarded as the first RCEIS (Helmholtz-CAS Centre for Environmental Information Sciences) workshop. A further bilateral cooperative research project and a special issue of the journal "Earth and Environmental Science" were formed at last, as the outcomes of this symposium.

Several joint research topics were discussed on the final day for project collaborations among German and Chinese scientists. These topics are listed as following:



#### Water Dynamics

- Basin hydrology, water balance, groundwater interactions, wetland dynamics
- Hydrodynamics, water level fluctuations
- Climate feedbacks

#### Pollutants/Sediment Dynamics

- Chemical water quality
- Nutrients and contaminants: loading (sources), processing, interactions
- Sediments: loading (sources), processing, interactions
- Emerging pollutants

#### Aquatic Ecosystem Dynamics

- Biological water quality, eutrophication
- Interaction organisms-pollutants
- Wetlands (source/sinks for pollutants)
- Running waters, lake, wetland

#### Synthesis

- Environmental information system, regionalization of data (vs. global data)
- Incentives mechanisms (industry, stakeholder), emission trade
- Governance, scenarios (authorities), industrial development, eco-economics
- Risk Management, behavioral accounting
- Land management, solution consulting, scenarios (method developing)

The scientific program addressed a wide range of problems in the field of hydrosystem and ecosystem in the Poyang lake basin area. The topics covered recent or current scientific projects on Poyang lake basin about its ecology environmental quality change, assessment of the climate impact, sustainable development of integrated approach, ecosystem dynamics of lakes, monitoring and modeling techniques and so on. In addition to the invited participants, some young scientists from universities and institutes from Jiangxi province and Germany took the chance to attend this symposium.

The symposium provided an optimal platform for scientists and researchers from both countries to exchange ideas and opinions and to plan future bilateral cooperation projects. It strengthened the already close cooperation between German and Chinese specialists for productive research and development in the area of environmental research. Furthermore, it promoted future cooperation on young scientist exchange program.

## **2. Open Space Workshop „German-Chinese Cooperation in Water and Environmental Information Sciences“**

On 17-18, June, 2014, the 5.WRHC (Water Research Horizon Conference) took place in botanical garden, Berlin. Under this framework, RCEIS has organized an Open Space Workshop on 18. June. 2014. 16 participants have joined the Open Space Workshop „German-Chinese Cooperation in Water and Environmental Information Sciences“. Prof. Olaf Kolditz welcomed the participants and gave an overview of BMBF Project Frame Program “Internationale Partnerschaften für nachhaltige Klimaschutz- und Umwelttechnologien und –dienstleistungen (CLIENT)” with respect to China. The grand opening of the SEMIZENTRAL - demonstration project in Qingdao on 27, April, 2014 (refer to the presentation of Prof. Cornel on 17.06.2014 at the WRHC 2014) and the kick-off of the Sino-German Innovation Center for program “Clean Water” in Zhangjiang Hi-tech Park in Shanghai on 30. April.2014 were highlighted as unique and new opportunities for the German-Chinese cooperation in water science and technology. The innovation center is managed by Tongji University through association which will be built from research institutions, universities and companies.

Prof. Tian-Xiang Yue from CAS (China Academy of Sciences, Institute of Geographical Sciences and Natural Resources Research) has given a keynote talk about the precipitation change trend and scenarios in China. This keynote talk was an excellent overview on Climate research in China as well. He concluded that the north China would have more precipitation in the future which may affect the strategy of China South-to-North Water Division Project.

Dr. Cui Chen has introduced the International Helmholtz Network - RCEIS (Sino-German Research Center for Environmental Information Sciences) and announced the first RCEIS Workshop about Poyang Lake which would be held in autumn 2014. A joint proposal together with CAS for funding opportunity of the workshop was planned to be submitted to Sino-German Center for Research Promotion in Beijing at the beginning of July, 2014. This workshop shall attract more researchers from Germany and China working in water science.

### **3. Sino-German workshop “A global analysis of long term evapotranspiration time series derived from lysimeter systems”**

Rapid socioeconomic development and an increase in population density caused an extensive exploitation of the water and land resources in several regions in China. Sharp decrease in water resources and deterioration of the hydrological environment require a sustainable water management strategy and an in depth analysis of the full water cycle. One strategy to achieve improved water resources management is to provide techniques for a reduced water loss by evapotranspiration is. Lysimeter systems are considered an appropriate and accurate measurement system for estimating actual evapotranspiration.

Therefore, Forschungszentrum Jülich currently plans a workshop on “A global analysis of long term evapotranspiration time series derived from lysimeter systems”, scheduled for the 24th to 27th of November 2015 to take place in Beijing. The organization of the workshop is mainly managed by Prof. Mingan Shao and Dr. Thomas Pütz.

## **Projects**

Until now, the RCEIS has strongly supported the projects application and ongoing projects in the three sponsors: European Union, BMBF and DFG. Furthermore, RCEIS is trying to get more chances for the joint cooperation with China in the area of environmental information sciences, water sciences and geothermal energy.

## **1. EU EuropeAid Project SUSTAIN H2O**

### **EU-China Environmental Sustainability Programme**

#### **Demonstration of Pollution Discharge Management for Water Quality Improvement in the Songhuajiang-Liaohe River Basin (SUSTAIN H2O)**

This is an EU funded cooperation project with China Research Academy of Environmental Sciences. RCEIS has supported strongly for the project management and the developing process of this project. The major aim is to develop and demonstrate management tools and practices for pollution reduction and water quality improvement in the Songhuajiang-Liaohe River Basin (SLRB) to achieve the water pollution control designated in the “12th Five-Year Plan” of China.

SUSTAIN H2O will initiate a range of research activities and generate new resources including the development of risk source identification and assessment methods, water source pollution prevention and risk reduction strategies and decision making and management guidelines.

UFZ will review the legislation, methodologies and techniques about water risk assessment and sensitive water body management and will develop a groundwater contamination model for the demonstration areas in SLRB.

This project has started in September 2013 and will end up in August 2016. Erik Nixdorf, as PhD student, is now working on this project and trying to find out the scientific solutions. He would also give courses in China for the environmental modeling software OpenGeoSys which is used as simulation platform in this project. The first study tour about this project has been successfully taken place in Germany in November 2014. The Chinese cooperation partners are: Chinese Research Academy of Environmental Sciences (CRAES), Haerbin Research Academy of Environmental Sciences (HRAES) and Liaoning Research Academy of Environmental Sciences (LRAES).

## **2. BMBF Project “Managing Water Resources for Urban Catchments”**

### **BMBF CLIENT Projects Urban Catchments and its Kick-off meeting on 07.05.2015 in Beijing and Shanghai**

Besides the joint research funded by EU, the Federal Ministry of Education and Research (BMBF) initiated the research and development project CLIENT (International Partnerships for Sustainable Technologies and Services for Climate Protection and the Environment). The key areas are technologies and innovations for sustainable developments in the areas of: climate protection, use of resources, land management and water management which includes the water sanitation technologies, urban water resources and planning tool development. On 27.April.2014, German State Secretary Dr. Georg Schuette opened the worldwide first STC (Semi centralized supply and treatment sys-

tems) in Qingdao. The kick-off of the Sino-German Innovation Centre for the program “Clean Water” in Shanghai took place on 30.April.2014. This centre is dedicated for new opportunities in the German-Chinese cooperation in water science and technology. The innovation centre is managed by Tongji University through association which will be built from research institutions, universities and companies. The background is that, rapid economic development and population growth in China go hand-in-hand with increasing urbanisation, involving growing mega-cities, industrialization, and intensified agriculture. As a result, natural resources are increasingly stressed and productive management strategies towards sustainable planning are urgently needed. Pollution containing hazardous substances for environmental and human health, depletion of water resources as a result of overexploitation, soil degradation and air pollution in mega-cities are increasing at an alarming rate. The Chinese government recognizes the importance and complexity of the situation and has initiated a program entitled “Major Water Program of Science and Technology for Water Pollution and Governance” (2006-2020). Germany is the only foreign partner for the Mega Water Program in the area of Water science and technology. BMBF has initiated three CLIENT projects: Urban Catchment (led by UFZ), SIGH (led by Prof. Tiehm, TZW), and SINOWASSER (led by Prof. Dohmann an der RWTH Aachen)

UFZ, TU Dresden and several industry partners have submitted the joint proposal to BMBF in August 2014. In March 2015, the proposal has been successfully approved by BMBF and the total funding budget is about 2,25 Million Euro for the period of three years. The cooperation partners from Chinese side are: Tongji University, in Shanghai, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences; Institute of Hydrobiology, Chinese Academy of Sciences, Beijing. This project started from 01, April, 2015. The overall objective of the project is the development of water management system solutions for a sustainable improvement of water quality in Chaohu City and Chao Lake. The "Urban Water Resources Management" (EWRM) concept will be developed as an innovative approach that includes both an efficient urban water management in urban and suburban areas as well as the interaction with the aquatic ecosystems. With the help of an online comprehensive environmental information system, water utility data and models for planning purposes and the regional water management are provided. The main task of is the development of methods and tools for the successive integration of all available information for water management in the region Chao-hu. UFZ will also serve as the project leader for the whole project.

BMBF is planning the official Kick-off Sino-German Cooperation within the China Major Water Program in Beijing. Federal State Secretary Dr. Georg Schütte and Minister Gang Wan, Chinese Ministry of Science and Technology (Most) will join the opening ceremony.

The second Workshop about “Urban Catchment” will be held on 10-12.May.2015, Chaohu City in China.

### **3. NSFC-DFG Project: Cooperation Group Proposal**

#### **National Science Foundation China – Deutsche Forschungsgemeinschaft (NSFC-DFG) Project**

##### **Cooperation group about “A modeling platform prototype for environmental system dynamics”**

As the first outcome of this Sino-German Symposium on Sustainable Water Management and Ecosystem Restorations in Poyang Lake Basin, a joint proposal about “A modeling platform prototype for

environmental system dynamics” for an international cooperation project from Sino-German Centre for Science Promotion has been submitted in January 2015. The general goal for this initiative is to build a Sino-German research network by leading Chinese scientists with their research groups and German experts in the field of environmental informatics, hydrology, climatology and remote sensing (satellite born earth observation). This initiative will form the basis for intensive exchange of research methods and knowledge, and is intended to the development of bilateral research project proposals e.g. to the Ministry of Science and Technology of the People's Republic of China (MOST), National Natural Science Foundation of China (NSFC), German Research Foundation (DFG), German Federal Ministry for Education and Research (BMBF) and/or European Commission (EC). The Poyang Lake (PL) is an appropriate and prominent investigation area, well suited for the interdisciplinary eco-hydrology research concept. The Poyang Lake wetland is of international importance. More than 300,000 waterfowls migrate from Siberia to the wetland as a winter staging ground. The biodiversity value of Poyang Lake is noteworthy, particularly because of the sizable human population present within its system. Therefore, in the middle term, the hereby suggested research activities will concern the water and ecosystem management aspects and in the long term, the impact of climate change on the eco-and hydrosystems evolution will be studied.

The total participants from both sides are divided into four cooperation groups and the general objective will be approached by conducting the following four model-oriented objectives:

- 1) Models for simulating water resources changes
- 2) Models for detecting land-cover changes
- 3) Models for modeling ecosystem-change driving forces
- 4) A modelling platform prototype: to integrate the models for water-resource change, land-cover change and driving forces of the changes, to simulate the interactive mechanisms taking Poyang Lake Basin as an example, and to realize dynamic visualization of the land-cover and water-resource change as well as their interactions.

This initiative is coordinated by Prof. Dr.-Ing. Olaf Kolditz, Helmholtz-Centre for Environmental Research and Technische Universität Dresden, Germany, and Prof. Dr. Tian-Xiang Yue, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, China, who are the acting directors of RCEIS.

**4. *we are even thinking about a DFG/NNSF initiative for a Transregio Collaborative Research Centre (CRC) in Water Research***

## **Helmholtz RCEIS Partner Activities**

### **1. Karlsruhe Institute of Technology (KIT)**

**Project coordinator: Prof. Harald Kunstmann**

Promotion of young scientists is one of the goals of the German-Chinese cooperation in the framework of RCEIS. Young scientists in the field of environmental sciences are granted funds by RCEIS for the purpose of scientific and technological exchange and of networking establishment with senior scientists, especially for the Chinese with German education background. Jianhui Wei is a PhD student at the Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research (KIT/IMK-IFU), Germany. His supervisors are Dr. Hans Richard Knoche and Prof. Dr. Harald Kunstmann. Jianhui Wei's research investigates what and to which extent evapotranspiring water of the Poyang Lake region returns as precipitation in Southeast China, and what are the water residence times in the atmosphere.

With the funding of his travel to the first RCEIS workshop in November 2014, i.e. the Sino-German Symposium on Sustainable Water Management and Ecosystem Restoration in Poyang Lake Basin, he had an opportunity to present his research on a novel evapotranspiration tagging algorithm. The key result of his presentation was about the different roles of transpiration and evaporation from the Poyang Lake region in the atmospheric water cycle over Southeast China. In addition to scientific discussions on the potential proposals, field trips to Poyang Lake National Nature Reserve and two important hydrological stations (Xingzi and Hukou) around the Poyang Lake also offered good the welcome opportunity to visit again the real Poyang Lake.

On 21<sup>st</sup> November 2014, Prof. Olaf Kolditz, Dr. Cui Chen, and Jianhui Wei were invited to visit the Key Laboratory of Poyang Lake Wetland and Watershed Research - Ministry of education, accompanied by director Prof. Yeqiao Wang and deputy director Prof. Chaoyang Fang. Prof. Yeqiao Wang introduced the organization of his laboratory and the ongoing research projects about the Poyang Lake region by several funding institutions. Benefit gained from this visit on one hand includes the promotion of the currently scientific contributions of the research on the Chinese side, which potentially increases the possibility of further cooperation. On the other hand, Jianhui Wei was motivated by Prof. Yeqiao Wang as well to keep on doing his research still on the Poyang Lake region in the framework of RCEIS in the near future.

Moreover, Jianhui Wei, as the representative of KIT, amongst other German partner institutions of RCEIS, participated the official open ceremony of RCEIS in the Institute of Geographical and Natural Resources Research of the Chinese Academy Sciences in Beijing China on 22<sup>nd</sup> November 2014.

In summary, many young scientists like Jianhui Wei have been granted funds by RCEIS with great achievements made in 2014 and will be promoted much strongly for a long-term period aiming to further extend the German-Chinese cooperation and to enhance their relationship in the next following years.

## **2. German Aerospace Centre (DLR)**

### **Project coordinator: Dr. Claudia Künzer**

The Sino-German research project DELIGHT (Delta Information System for the Geo-Environmental and Human Habitat Transition) is a BMBF funded multi-disciplinary project, which started in 2013 and has been associated to the RCEIS initiative in 2014. In DELIGHT two large German research institutions (DLR and University Hannover) together with 4 German small and medium enterprises

(Brockmann Consult, Hydromod Service GmbH, plan+risk consult, and SLU) jointly work together with Chinese research partners from universities and CAS research institutions such as IGSNRR in Beijing. The focus region of DELIGHT, the Yellow River Delta in Shandong province, faces extreme changes of the natural environment, due to fast growing urban areas, expansion of oil industry and other industry related activities, as well as repeated river-rerouting and coastal reconstruction. Besides many other challenges, the shrinking availability of clean water resources for a continuously growing population is a main threat. Waste water treatment plants are hardly existing, and oil- and chemical industry release their effluents unfiltered into Yellow River Delta water resources and wetlands. Within DELIGHT applied research is conducted to support informed decision making in the context of water and land resource management. Up to date geospatial information derived from Earth observation data, which helps to quantify delta dynamics over time and supports the identification of pollution sources, hydrodynamic and hydrologic analyses related to water flow processes as well as pollution fate, Bohai Sea water constituent characterization, as well as future modeling scenarios with respect to delta salinity developments and future land use change are performed. All information derived is handed over to local stakeholders in a comprehensive Delta Information System that supports discussion processes in the context of the the National Yellow River Delta Plan implementation.

In June 2014 Dr. Claudia Kuenzer visited the group of Dr. Jiang TONG of the Chinese Meteorological Administration (CMA) in Beijing for a scientific exchange on conducted and envisaged research activities at DLR and CMA. Furthermore, DLR participated in the opening ceremony and official inauguration of the Sino-German Centre for Environmental Information Science, RCEIS, at IGSNRR in Beijing on 22nd November 2014. RCEIS was already and will be further promoted in the context of Dr. Kuenzer's stays in China in the context of a CAS guest professorship at the Institute of Remote Sensing and Digital Earth (RADI).

In the framework of young scientist exchange initiative of RCEIS Mr. Song Zeyang, a PhD student from Beijing, spent one year at DLR in 2014 based on an NSFC grant. While RCEIS was not the main focus of his stay, he contributed to DLR RCEIS activities via research on Poyang Lake, where he was involved in literature search, network establishment, and data processing to reveal inundation dynamics on Poyang lake based on a daily-resolved intra-annual time series of MODIS data from 2013 (see below).



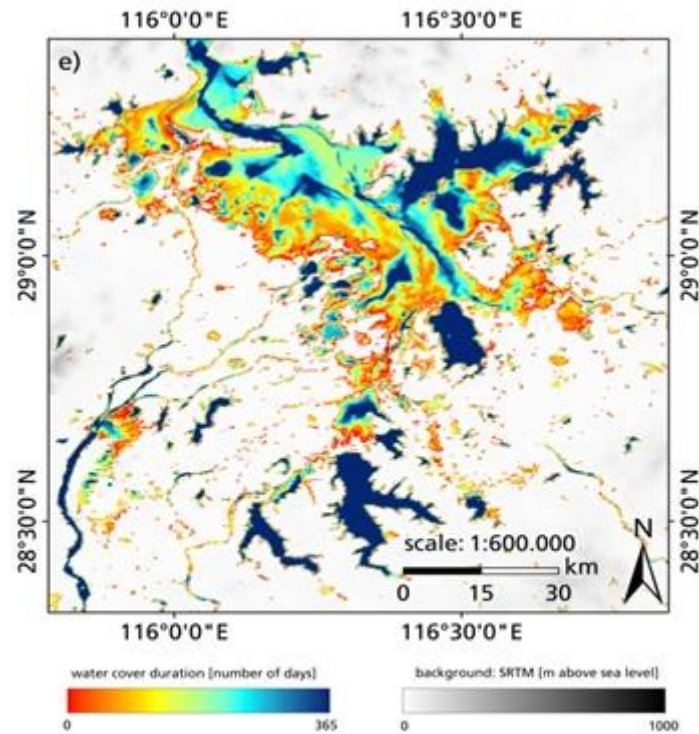


Fig. 10 Study area

Inundation pattern of Poyang lake, derived from daily available 250m MODIS data, a full intra-annual time series of 365 x 2 (2 acquisitions per day from the Terra and Aqua platforms) has been processed. The map depicts duration of water coverage between 0 and 365 days.

Moreover, DLR contributed to the RCEIS publication, mentioned below, on the German-Chinese co-operation in the water sector.

Related to budget planning and expenditure of funds DLR did not yet spend the allocated funds in 2014 and has received permission from UFZ to shift these funds into 2015, as in 2015 a larger work load within RCEIS is to be expected. All expenses in 2014 were covered by own resources.

### 3. Forschungszentrum Jülich (FZJ)

#### Project coordinator: Prof. Harry Vereecken

In the first year, Forschungszentrum Jülich has the following contributions and achievements in the context of the RCEIS project.

#### Project “Water resource management of Heihe River: Optimising irrigation in oasis desert ecosystems (WP5)”

The recent development of the non-invasive cosmic-ray soil moisture sensing technique contributes to filling the gap between point-scale and regional scale soil moisture measurements. In this study, it was tested whether neutron counts allow correcting for a systematic error in the model forcings.



Lack of data for water management often causes systematic input errors to land surface models. Here, a data assimilation procedure was tested for an irrigated corn field where no irrigation data were available as model input although for the area a significant amount of water was irrigated. The measured cosmic-ray neutron counts and Moderate-Resolution Imaging Spectroradiometer (MODIS) land surface temperature (LST) products were jointly assimilated into the Community Land Model (CLM) with the local ensemble transform Kalman filter. Different data assimilation scenarios were evaluated, with assimilation of LST and/or cosmic-ray neutron counts, and possibly parameter estimation of leaf area index (LAI). The results show that the direct assimilation of cosmic-ray neutron counts can improve the soil moisture and evapotranspiration (ET) estimation significantly, correcting for lack of information on irrigation amounts. The joint assimilation of neutron counts and LST could further improve the ET estimation, but the information content of neutron counts exceeded the one of LST. Additional improvement was achieved by calibrating LAI, which after calibration was also closer to independent field measurements. It was concluded that assimilation of neutron counts was useful for ET and soil moisture estimation even if the model has a systematic bias like neglecting irrigation. However, also the assimilation of LST helped to correct the systematic model bias introduced by neglecting irrigation and LST could be used to update soil moisture with state augmentation.

### **Lysimeter workshop**

Rapid socioeconomic development and an increase in population density caused an extensive exploitation of the water and land resources in several regions in China. Sharp decrease in water resources and deterioration of the hydrological environment require a sustainable water management strategy and an in depth analysis of the full water cycle. One strategy to achieve improved water resources management is to provide techniques for a reduced water loss by evapotranspiration. Lysimeter systems are considered an appropriate and accurate measurement system for estimating actual evapotranspiration.

Therefore, FZJ currently plans a workshop on “A global analysis of long term evapotranspiration time series derived from lysimeter systems”, scheduled for the 24th to 27th of November 2015 to take place in Beijing. The organization of the workshop is mainly managed by Prof. Mingan Shao and Dr. Thomas Pütz. The following researchers are involved in the organization, which allows for high visibility:

Steve Evett, ARS USDA, Bushland, TX, USA

Johann Fank, Joanneum Research, Graz, Austria

Harrie-Jan Hendricks-Franssen, IBG-3, Juelich, Germany

Hangsheng Lin, PSU, University Park, PA, USA

Thomas Pütz, IBG-3, Juelich, Germany

Mingan Shao, IGSNRR, Beijing, China

Harry Vereecken, IBG-3, Juelich, Germany

## **Related Partners**

**Centre for Advanced Water Research - CAWR**

CAWR is one of Europe's largest centres for water research with a workforce that includes over 500 researchers in water area. It is a strategic cooperation between UFZ and TU Dresden and its competence covers a wide range of topics: water quality, water resources management, urban water as well as social-scientific aspects of water policy, societal change and environmental change. The partners of CAWR are successfully cooperating with China since many years. In addition, CAWR was actively participating in the recent BMBF-CLIENT project for "Managing Water Resources for Urban Catchments" in Chaohu City, China.

## RCEIS Webpage

The Internet webpage for RCEIS has been constructed and will be regularly updated. The content of the webpage will be presented in English and Chinese (under preparation). The RCEIS webpage can introduce the aim, scientific methods, vision of the RCEIS project. It also presents the ongoing projects, workshops, Sino-German events and activities. It lists the cooperation partners and related projects which are strongly supported by RCEIS. The scientific outcomes are also included in the context of RCEIS. The webpage was developed by the support from Leslie Jakobs from UFZ and will be updated by the project coordinator Dr. Cui Chen from time to time.

We can access the RCEIS webpage through the following link:

[www.ufz.de/rceis](http://www.ufz.de/rceis)

The second step is the set-up of a professional webpage, such as: [www.RCEIS.org](http://www.RCEIS.org)

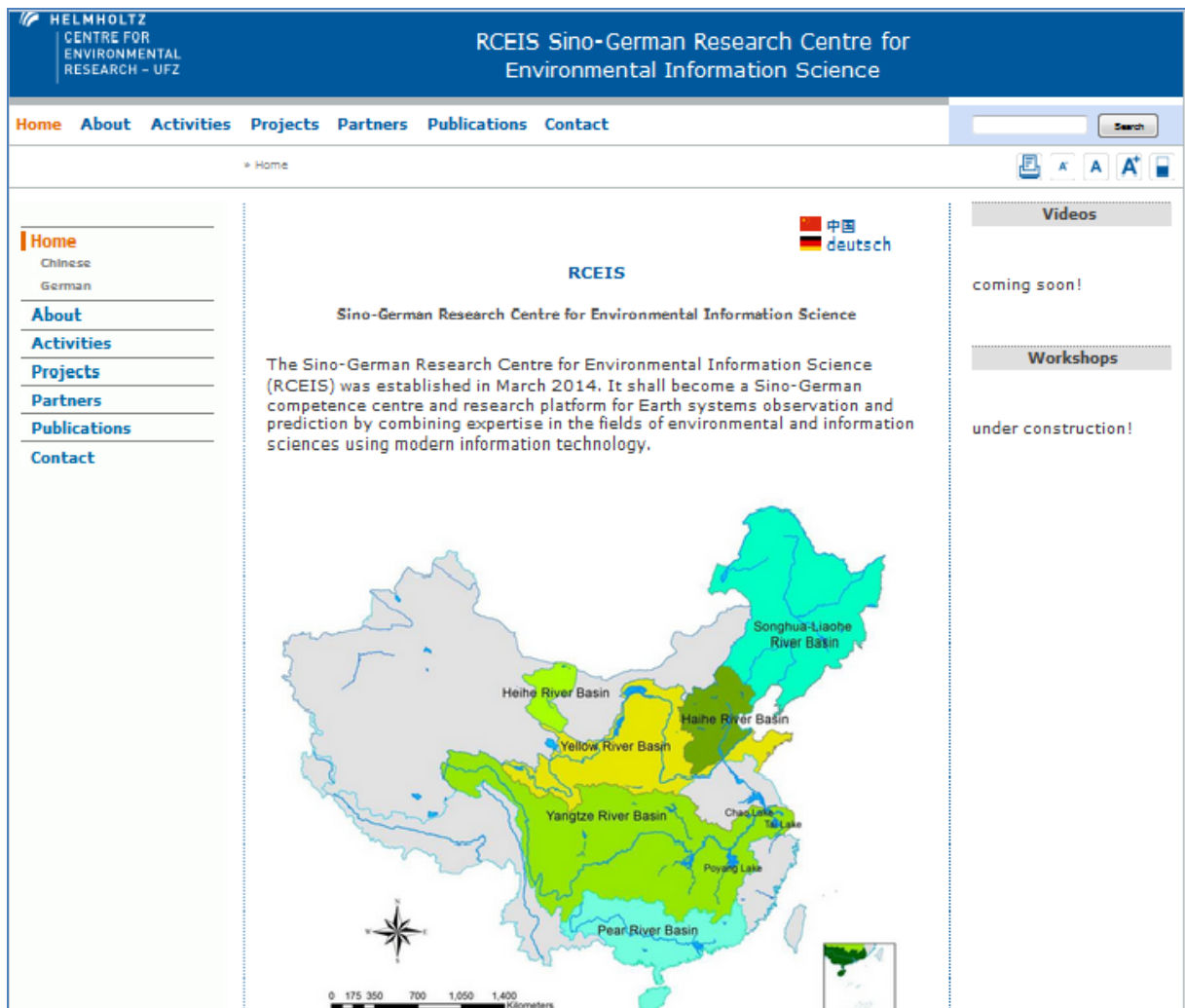


Fig. 11 RCEIS webpage

## Publications

Recently, there are several papers published in the international journal of Environmental Earth Sciences (EES) regarding the current severe environmental problems in China. The special issue titled “Environmental Problems and Solutions in China” was published in 2011 and more than 20 scientific papers have declared the current environmental situation, programs and solutions. As a result of the suggested workshop, an interdisciplinary Thematic Issue and a book project on the Poyang Lake will be published in an international journal to compile the current status of research in the investigation area.

In addition to that, there are several thematic issues related to China are under preparation:

**Thematic Issues** in Environmental Earth Sciences on several lakes in China (forthcoming 2015):

- Erhai Lake
- Liao River Basin

- Tai Lake
- Dianchi Lake
- Chao Lake

**Thematic Issue** about “Developing Dynamic VGEs for Geographic Research” is under preparation, which will publish the paper presented on the international conference for Virtual Geographical Environment in HongKong, on 04 – 09, November, 2014. The Prof. Hui Lin, Dr. Min Chen from the Chinese University of Hong Kong and Dr. Cui Chen are the guest editors.

**Thematic Issue** about “Environment and Health in China” is under preparation. This TI will publish the recent scientific results in the surface modeling, geographical information sciences and the health problems in China. Prof. Tianxiang Yue from CAS and Prof. Bin Xu from Tsinghua University, Olaf Kolditz and Cui Chen from UFZ are guest editors.

More information about the paper can be found on the RCEIS webpage.

**A strategic paper**, corresponding author (Dr. Cui Chen) on Challenges and opportunities of German-Chinese cooperation in water science and technology as part of the Water Research Horizon Conference 2014 has been published in January 2015 on Journal EES.

**Chen C**, Börnick H, Cai QH, Dai XH, Jähnig SC, Kong YL, Krebs P, Kuenzer C, Kunstmann H, Liu Y, Nixdorf E, Pang ZH, Rode M, Schueth C, Song YH, Yue TX, Zhou KX, Zhang J and Kolditz O (2015): Challenges and opportunities of German-Chinese cooperation in water science and technology. *Environ Earth Sci.*, 73: 4861-4871, doi: 10.1007/s12665-015-4149-5

**Chen C**, Hagemann S, Liu J (2014): Assessment of impact of climate change on the blue and green water resources in large river basins in China. *Environ Earth Sci.*, doi: 10.1007/s12665-014-3782-8

Song Y, Liu R, Sun YY, Lei K, **Kolditz O** (2015): Waste Water Treatment and Pollution Control in the Liao River Basin. *Environ. Earth Sci.*, doi: 10.1007/s12665-015-4333-7

Wang CL, Zhao N, Yue TX, Zhao MW and **Chen C** (2015): Change trend of monthly precipitation in China with an improved surface modeling method. *Environ Earth Sci.*, doi: 10.1007/s12665-014-4012-0

X. Han, H.-J. H. Franssen, R. Rosolem, R. Jin, X. Li, and H. Vereecken (2015): Correction of systematic model forcing bias of CLM using assimilation of cosmic-ray Neutrons and land surface temperature: a study in the Heihe Catchment, China. *Hydrol. Earth Syst. Sci.* 19, 615-629, doi: 10.5194/hess-19-615-2015

X. Han, R. Jin, X. Li, and S. Wang (2014): Soil Moisture Estimation Using Cosmic-Ray Soil Moisture Sensing at Heterogeneous Farmland. *IEEE Geoscience and Remote Sensing Letters* 11, NO. 9, 1659-1663

**A View Paper** about “POP related Pollution of Water Resources in China: Overview about current Status, Challenges and European Experiences” in the context of the EU SUSTAIN H2O project has been submitted to EES. The PhD student Erik Nixdorf is the corresponding author.

**Nixdorf E**, **Chen C**, Sun Y.Y and Kolditz O (2015): POP related Pollution of Water Resources in China: Over-view about current Status, Challenges and European Experiences. *Environ Earth Sci.*, accepted.

# Future strategy and plan

For the second year, we are planning more networking activities, events and trying to get more joint projects with our cooperation partners in China and with RCEIS partners in Germany as well.

The following workshops are coming soon and some are still in the preparation:

## 1. 4<sup>th</sup> Sino-German Energy Conference, 29-31, May, 2015 in Chengdu, China

Sino-German Conference 2015 invites interested parties from academia, industry and government authorities to contribute, discuss and present scientific papers and new technologies on the theme “Clean Energy Systems in the Subsurface and CCUS: Energy Production, Storage and Conversion”. In this regard, it is intended to publish two volumes in form of thematic issues with the ISI journal Environmental Earth Sciences: The first volume will be published as a thematic issue “Unconventional Natural Gas”, with 50 contributions in the field of unconventional Gas including coal bed methane, tight and shale gas and compressed H<sub>2</sub>. The volume will comprise 25 contributions from China and another 25 from global sources; the second volume will also be a thematic issue “Underground Energy Systems” with 50 journal articles as a contribution to the forthcoming 4th Sino-German conference 2015, of which China will have 20 contributions and 30 will come from global sources.

## 2. BMBF project “Urban Catchment” workshop in China on 10-12, May, 2015, Chaohu, China

Right after the official BMBF Kickoff meeting for the three CLIENT projects in Beijing and Shanghai, we will take the opportunity to bring the project partners from Germany and China together to have a two-day workshop in the study area: Chaohu. On the first day of the workshop, presentations will be given by the participants and the ideas will be exchanged. Hopefully the project related important questions can be answered after the workshop, such as, where to get the data, and who is the contact persons and to what extent, the Germany sides can be supported by the local authorities. On the second day of the workshop, we are going to have a field trip to investigate the study area Chaohu.

## 3. Sino-German workshop for Geothermal Energy in September, 2015 in China

UFZ and Institute of Geology and Geophysics, Chinese Academy of Sciences will prepare a joint proposal about a Sino-German workshop for geothermal energy and will submit it to Sino-German Centre for Science Foundation (Joint centre NSFC-DFG in Beijing). If the proposal gets approved, the workshop will be held in September, 2015. This activity will extend the RCEIS network to the Energy branches in China and Germany.

## 4. BMBF project “Urban Catchment” workshop in China in October, 2015, Chaohu, China

## 5. RCEIS workshops in China and Germany

In year 2015, one workshop in Germany and one visiting program in China will be planned.

The future strategy for RCEIS is still under discussion.

# Appendices

## Appendix 1: RCEIS partners and on-going projects



The network is open and explicitly invites further participants.

**(A1) The Helmholtz Centre for Environmental Research - UFZ** is a national centre of excellence for integrative environmental research. It was established in 1991 as the only centre in the Helmholtz Association exclusively devoted to environmental research in a great variety of fields. Founded in response to the severe pollution prevailing in East Germany, the UFZ has become a world-wide acknowledged centre of expertise in the remediation and restoration of contaminated landscapes, as well as the preservation of biodiversity, natural landscapes and water resources.

Principle Investigators (PIs):

- Olaf Kolditz is Head of the Department of Environmental Informatics at the UFZ and Professor for Applied Environmental System Analysis at Technische Universität Dresden. He is the Speaker of the Helmholtz Graduate School for Environmental Research - HIGRADE.
- Haibing Shao is PostDoc at the Department of Environmental Informatics and Visiting Professor at the Chinese Academy of Sciences with the Guangzhou Institute of Energy Conversion (CAS-GIEC).

Ongoing Sino-German research activities:

- RCEIS: The idea and concept of a Sino-German “Research Centre for Environmental Information Science” has been developed during 2 workshops in October 2012 and May 2013 in Beijing together with CAS-IGSNRR (Prof. YUE, Prof. XU)
- CSC: more than 10 finished and on-going CSC PhD projects in Environmental Sciences, e.g. the NANKOU project with Beijing Hydrological Centre concerning groundwater remediation in Beijing
- DAAD-CSC: with CAS-GIEG on geothermal resources in China and gas hydrates in marine systems (related to Pearl River delta)
- EuropeAid: with CRAES on restoration of the Songhua-Liaohe River system in north-eastern China (“Demonstration of Pollution Discharge Management for Water Quality Improvement in the Songhuajiang-Liaohe River Basin, EU-China Environmental Sustainability Programme, EuropeAid/133-582/L/ACT/CN-1 funded by the European Commission)

- BMBF-CLIENT definition project “Urban Catchments”: with TONGJI University on restoration of the Lake Chao (Anhui Province, related to Yangtze River)
- Helmholtz-CAS Joint Research Group (HCJRG) “Gas hydrate deposits in the South China Sea and their production by thermo-chemical activation and depressurization” CAS-GIEC and GEOMAR (scheduled for funding)
- HIGRADE: Helmholtz Graduate School for Environmental Research at the UFZ, currently 15 PhD students from China are completing the PhD program. Olaf Kolditz-brings in his HIGRADE experience for the supervision of the Young Scientists Program and the development of the RCEIS PhD School.

## **(A2) German Aerospace Centre – DLR**

The research and development work conducted by DLR in the field of Earth observation covers virtually the entire range of satellite-based Earth observation topics, from innovation in sensor systems and evaluation of data to the preparation and development of new missions, their ground operations and data processing for applications. Using the wide range of expertise at its disposal, DLR works closely with industry, academia, and public sector users to make the entire range of applications of satellite-based remote sensing available for the benefit of society (see DLR Website).

PIs: Claudia Künzer (CAS Visiting Professor)

The Earth Observation Center (EOC) of the German Aerospace Center (DLR) has been and currently is involved in the following China-related activities over the past decade:

- Sino-German Coal Fire Research Initiative (funded by BMBF). Assessing underground coal fires in remote mining regions of north-central and northwest China as well as mining hazards employing remote sensing as well as in-situ geophysical technologies (multi-spectral and thermal airborne and space-borne imaging and mapping, helicopter based magnetics, in-situ geo-electrics, micro-seismic etc.). Coordination and remote sensing/GIS in a large consortium of over 10 partner institutions from science and industry (2001-2009).
- Dr. Claudia Kuenzer was a visiting scientist to Beijing for four months in 2005; half of the time at Beijing Normal University (BNU), half the time at the Institute of Remote Sensing Applications (IRSA-CAS).
- EOC of DLR is coordinating (project lead: Dr. Claudia Kuenzer) the large BMBF-funded Sino-German CLIENT project DELIGHT (Delta Information System for Geo-environmental- and Human Habitat Transition). Over 16 institutions from science and industry contribute on both the German and Chinese sides. The Chinese side’s coordination is with IGSNRR-CAS, Beijing. The project started in May 2013 and will run for 3 years. Focus is the socio-ecological development in the delta, upstream impacts on downstream flows and sediment budgets, as well as the dynamics of the natural environment and the urban sphere.
- Dr. Claudia Kuenzer is PI (Principal Investigator) of the ESA funded project “Assessing flood-, wetland- and land use dynamics of Dongting Lake, China” in the context of the



DRAGON-3 program. Dongting Lake is a Yangtze River flood-path lake, and work in the area (including field work) has been undertaken since 2009 and is on-going. In the context of this project, several Chinese guest researchers have stayed in C. Kuenzer's team "Land Surface Dynamics" of the EOC of DLR.

- Dr. Claudia Kuenzer was awarded a CAS Visiting Professorship of the Chinese Academy of Sciences (2012/2013) at the Center of Earth Observation and Digital Earth (CEODE); this year fused with the Institute of Remote Sensing Applications, and now named RAD (Institute of Remote Sensing and Digital Earth). In this context, she spends 1-2 months per year at RAD in Beijing.

EOC of DLR is cooperating with a variety of Chinese partner organizations in the context of watershed developments in the upper Mekong basin (Lancangjiang). This cooperation is associated to the BMBF-funded WISDOM project (Water related Information System for the Mekong Delta) lead by Dr. Kuenzer. Lancangjiang related exchange is on-going with colleagues of IGSNRR-CAS, RAD, BNU, and the Kunming Institute of Botany, CAS.

**(A3) Forschungszentrum Jülich – FZJ** develops technologies that benefit research in Germany and worldwide in the areas of health, energy, and climate, as well as information technology. Land use and climate change bring about long-term changes to terrestrial ecosystems. The increasing demand for food and energy has necessitated the intensification of land use and agriculture, resulting in greater strain on fertile arable land and water resources.

The Agrosphere Institute, IBG-3, is part of the Institute of Bio- and Geosciences. It analyses transport and conversion processes in soils and surface near groundwater systems with the aim to contribute to a sustainable use of resources in agro-ecosystems. Agrosphere is coordinating TERENO.

PIs: Harry Vereecken, Stefan Kollet, Carsten Montzka, Harrie-Jan Hendricks-Franssen, Heye Bogaen

- CSC: more than 10 finished and on-going 9 CSC PhD projects in Agricultural- and Geoscience
- Soil moisture network in Hei He with Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI), CAS Lanzhou; Prof. Xin Li
- Predicting hydrological fluxes in the Hai He river basin using remote sensing and data assimilation methods - SP2: Determining hydrological fluxes at lysimeter and footprint scale with Beijing Normal University, School of Geography, Prof. Shaomin Liu
- ESA Dragon 3 project (Close water cycle at the river basin scale using remote sensing data) with Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI), CAS Lanzhou; Prof. Xin Li

**(A4) Karlsruhe Institute of Technology – KIT** was founded 2009 as a merger of Forschungszentrum Karlsruhe (KIT Campus North) and University of Karlsruhe (KIT Campus South). KIT/Campus North is a large-scale research institution of the Helmholtz Association conducting program-oriented provident research on behalf of the Federal Republic of Germany. Its remote lab KIT/IMK-IFU is located in Garmisch-Partenkirchen, and for many years it



has had several successful collaborations with Chinese research institutes (e.g. Institute of Atmospheric Physics, Chinese Academy of Sciences) and universities (e.g. Hohai University in Nanjing - the leading university for hydrology, and the China Agricultural University in Beijing - the leading university for agricultural research). KIT/IMK-IFU has organized two Sino-German symposia funded by Sino-German Center for Research Promotion for the topics “Steppe Ecosystems and Climate and Land Use Changes – Vulnerability, Feedbacks and Possibilities for Adaptation” in 2009 and “Modelling approaches and observational techniques for the quantification of fast environmental changes and its impacts on land use and water resources” in 2011.

PIs: Harald Kunstmann, Klaus Butterbach-Bahl

- Prof. Harald Kunstmann is an expert in the field of climate- and hydrological modeling and is currently leading a DFG-project on the Poyang Lake region and fully coupled atmosphere-hydrology modeling (PREFEED). He also supervises and hosts two Chinese CSC scholars.
- Prof. Butterbach-Bahl is a leading scientist in the field of Biosphere-Atmosphere Exchange and has led several projects in China funded by different agencies (e.g. DFG, CSC, BMBF); he is also professor at the Chinese Academy of Science.

#### **(A5) Involving Universities**

RCEIS explicitly invites universities for participation. TU Dresden, as a member of the BMBF-CLIENT initiative “Urban Catchments” and several CSC PhD projects with different Chinese research institutions (e.g. TONGJI University in Shanghai) are already involved. This process involving universities will be continued.

**(A6) Chinese Partners**

The Helmholtz International Research Network “Helmholtz-CAS Research Centre for Environmental Information Science” (RCEIS) will involve leading Chinese institutions in environmental and landscape research, from the Chinese Academy of Sciences, Universities and Authorities. The Chinese part of the network is coordinated by the Institute for Geographical Sciences and Natural Resources Research of the Chinese Academy of Sciences (CAS-IGSNRR).

Chinese Research Institutions		WPs	PIs
CAS-IGSNRR Chinese lead	Chinese Academy of Sciences, CAS, Beijing Institute for Geographical Sciences and Natural Resources Research	WP2 WP4	Prof. YUE
RCEIS	Research Centre for Environmental Information Science	WP3	
AJU	Anhui JianZhu University, Hefei	WP3	Prof. HUANG
BHC	Beijing Hydrological Centre	WP7	Dr. SUN
BNU	Beijing Normal University, School of Geography	WP5 WP6	Prof. LIU
BU	Beijing University	WP6	NN
CAS-CAREERI	Cold and Arid Regions Environmental and Engineer- ing Research Institute, CAS, Lanzhou	WP5 WP6	Prof. LI
CAS-GIEC	Institute of Energy Conversion, CAS, Guangzhou	WP4	Prof. WU
CAS-IAP	Institute of Atmospheric Physics, CAS, Beijing	WP3	NN
CAS-NIGLAS	Institute of Geography and Limnology, CAS Nanjing	WP3	Prof. KONG Prof. HU
CAS-RCEES	Research Center for Eco-Environmental Science, CAS, Beijing	WP3	Prof. YANG
CAU	China Agricultural University, Beijing		NN
CLMA	Chaohu Lake Management Authority and Chaohu City, Planning Buro	WP3	Mr. ZHANG Mr. WANG Mr. XU (CEOs)
CRAES	Chinese Research Academy on Environmental Sci- ences, Beijing	WP1	Prof. MENG Prof. SONG
HOHAI	Hohai University, Nanjing	WP3	NN
JTU	Jiao Tong University, Shanghai	WP3	NN
NRSCC	National Remote Sensing Center of China, Beijing	WP2	NN
TONGJI	Tongji University, Shanghai	WP3	Prof. DAI
UCAS	University of Chinese Academy of Sciences, Beijing	WP7	Prof. WANG

**Appendix 2: List of abbreviations**

ACROSS	Advanced Remote Sensing – Ground Truth Demo and Test Facilities
AGADAPT	Combining soil moisture data assimilation and weather forecast in real-time irrigation optimization
BMBF	Bundesministerium für Bildung und Forschung
BNU	Beijing Normal University
CAREERI	Cold and Arid Regions Environmental and Engineering Research Institute
CAS	Chinese Academy of Sciences
CEODE	Center of Earth Observation and Digital Earth
CLIENT	Internationale Partnerschaften für nachhaltige Klimaschutz- und Umwelttechnologien und –dienstleistungen
CLM	Community Land Model
CRAES	Chinese Research Academy of Environmental Sciences
CSC	Chinese Scholarship Council
DELIGHT	Delta Information System for Geoenvironmental and Human Habitat Transition
DFG	Deutsche Forschungsgemeinschaft
DLR	Deutsches Zentrum für Luft- und Raumfahrt, German Aerospace Centre
EIS	Environmental Information System
EOC	Earth Observation Centre
ESA	European Space Agency
FZJ	Forschungszentrum Jülich
GIEC	Guangzhou Institute for Energy Conversion
HIGRADE	Helmholtz Graduate School for Environmental Research
IGSNRR	Institute for Geographical Sciences and Natural Resources Research
IRSA	Institute of Remote Sensing Applications
KIT	Karlsruhe Institute of Technology
LoI	Letter of Intent
MOST	Ministry of Science and Technology (MOST) of China
NRSCC	National Remote Sensing Center of China
OGS	OpenGeoSys, <a href="http://www.opengeosys.org">www.opengeosys.org</a>
PI	Principal Investigator
PREFEED	Long Term Land Use - Precipitation Feedbacks in the Hai River and Poyang Lake Region in China
RADI	Institute of Remote Sensing and Digital Earth
RCEES	Research Center for Eco-Environmental Science
RCEIS	Research Centre for Environmental Information Sciences
SLRB	Songhua-Liaohe river basin
SME	Small and Medium Enterprise
TERENO	TERrestrial ENVironmental Observatories ( <a href="http://www.tereno.net">www.tereno.net</a> )
UCAS	University of CAS
UFZ	Helmholtz-Zentrum für Umweltforschung, Helmholtz-Centre for Environmental Research
WISDOM	Water related Information System for the Mekong Delta
YSP	Young Scientists Program