2. Annual Report

International Helmholtz Network

Helmholtz-CAS

"Research Centre for Environmental Information Science"

RCEIS

Project Number:	HIRN-0002 (T533D313)
Funding:	Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF)
Project Title:	Helmholtz -CAS Research Centre for Environmental Information Science (RCEIS)
Project Team:	Helmholtz Centre for Environmental Research - UFZ German Aerospace Centre (DLR), Dr. Claudia Künzer Karlsruhe Institute of Technology (KIT), Prof. Harald Kunstmann Forschungszentrum Jülich (FZJ), Prof. Harry Vereecken
Project Leader:	Prof. Dr. Olaf Kolditz (UFZ, Environmental Informatics)
Project Coordinator:	Dr. Cui Chen (UFZ, Environmental Informatics)
Report Period:	01.03.2015 – 29.02.2016

RCEIS
Research Centre for Environmental Information Science

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"Research Centre for Environmental Information Science"

RCEIS

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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 second year from March 2015 to February 2016 are presented and the future plans for the third year are introduced as well. The second 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. As highlights of the second RCEIS year, a three-year BMBF project "Managing Water Resources for Urban Catchments" has been successfully

approved and officially stared in April, 2015. The cooperation agreement about this project has been signed in front of Angela Merkel, the Chancellor of German and Keqiang Li, the Prime Minister of China in October, 2015 in Hefei, China. Another three-year DFG-NSFC (German Research Foundation – Natural Science Foundation of China) project about a cooperation group "A modeling platform prototype for environmental system dynamics" has been approved as well and started in July, 2015.

RCEIS Activity Time Table (2nd Year)

No.	When	Activities
1	12.03.2015	DFG-NSFC (Deutsch Forschungsgemeinschaft – Natural Science Foundation of China) proposal about Cooperation Group "A modeling platform prototype for environmental system dynamics" was submitted.
2	25.03.2015	The notice of the grant for the BMBF CLIENT project "Managing Water Resources for Urban Catchments" was received from the project management agency KIT.
3	01.04.2015	The BMBF CLIENT project "Managing Water Resources – Urban Catchments" officially started.
4	13.04.2015	Coordination and – Networking Meeting at BMBF in Bonn for the CLIENT-Projects: SINOWASSER, SIGN, Urban Catchments in the context of Mega-Water Program in China.
5	28.04.2015	1st Workshop on BMBF CLIENT project "Managing Water Resources for Urban Catchments" at UFZ, Leipzig
6	07.05.2015	Kick-off event of the German BMBF CLIENT Water Projects in Beijing Sino-German cooperation within the Mega-Water-Program (MWP) of China
7	10.05 – 12.05.2015	2nd Workshop on BMBF CLIENT Project "Managing Water Resources for Urban Catchments" in Chaohu, China
8	09.06.2015	Dean of the College of Environmental & Resource Sciences of Zhejiang University (Professor Weiping Liu) of China visiting UFZ
9	22.06.2015	Meeting with Frau Chelioti at Helmholtz Association Office in Berlin
10	29.06.2015	Project meeting for BMBF CLIENT Project "Managing Water Resources for

		Urban Catchments" at UFZ
11	11.07 and 23.07.2015	RCEIS telephone conferences
12	31.08.2015	Business Forum of China in Dresden, organized by Saxony Economic Development Corporation
13	08.09.2015	The Consulate General of the People's Republic of China in Germany visiting UFZ
14	15.09.2015	South China Institute of Environmental Sciences, Ministry of Environmental Protection of China visiting UFZ
15	17.09-18.09.2015	BMBF-Workshop „Resources and Sustainability international" in Bonn
16	21.09-27.09.2015	Workshop and Research visiting program of DFG-NSFC Project: A Cooperation Group about "A modeling platform prototype for environmental system dynamics" in Germany Visiting tour: Leipzig-Dresden-Bremen
17	25.09.2015	DFG (Dr. Wolfgang Wachtel) visiting UFZ
18	28.09 – 03.10.2015	3rd Workshop on BMBF CLIENT Project "Managing Water Resources for Urban Catchments" in Leipzig Project study tour in Germany Leipzig-Chemnitz-Dresden-Magdeburg-Hannover-Kiel
19	19.10-21.10.2015	Saxony delegation and entrepreneurs travel in Beijing, Wuhan, Chongqing China, under the guidance of Minister of State Thomas Schmidt (Saxon State Ministry for Environment and Agriculture)
20	22.10.2015	Visiting Institute of Rock and Soil Mechanics, China Academy of Sciences, Wuhan, China
21	26.10-28.10.2015	Sino-German Symposium about "Sustainable Utilization of Geothermal Energy in China and Germany" in Beijing, China
22	29.10-01.11.2015	4th Workshop on BMBF CLIENT Project "Managing Water Resources for Urban Catchments" in Chaohu, China
23	30.10.2015	Signing ceremony of the cooperation agreement for BMBF Project "Urban

		Catchments" in front of Chinese and German leaders, Hefei, China
24	30.10.2015	Belmont Forum proposal about "Sustainable management of water resources and ecosystem services in the Heihe river basin" was submitted
25	01.11.2015	Visiting Tongji University in Shanghai
26	15.11 – 18.11.2015	Delegation of Chinese Research Academy of Environmental Sciences visiting UFZ
27	14.12.2015	Interview with Chinese Newspaper "People's Daily" at UFZ
28	01.2016	Magazine "China Contact" published an article about Saxony solutions for the environmental problems in China
29	12.01.2016	UFZ and TONGJI signing the cooperation agreement in Leipzig
30	12.01.2016	BMBF CLIENT project "Urban Catchments" interview with Chinese Newspaper "People's Daily" at Rappbode-dam
31	13.01.2016	Ministry of Science and Technology (MOST) of China visiting UFZ
32	18.01.2016	Chinese newspaper of People's Daily publishing the article about BMBF CLIENT Project "Urban Catchments"
33	10.02.2016	SPD-Member (Simone Lang) from Saxon Landtag visiting UFZ
34	14.03-20.03.2016	Visiting Tongji University, Shanghai; Hubei Research Academy of Environmental Sciences, Wuhan; China Research Academy of Environmental Sciences, Peking; Institute of Geology and Geophysics, China Academy of Sciences, Peking.
	Upcoming events in the third year	
	13.04 – 14.04.2016	4th Germany-China Innovation Conference, Berlin
	19.04.2016	1. Status Meeting of BMBF CLIENT Project "Urban Catchments"
	21.04.2016	RCEIS Annual Meeting at UFZ
	16.05 – 22.05.2016	Saxony delegation and entrepreneurs travel in China, under the guidance of Minister of State Martin Dulig (The Saxon State Minister for Economic Af-

		fairs , Labour and Transport)
	23.05 – 29.05.2016	BMBF CLIENT project "Managing Water Resources for Urban Catchments" Study tour in Shanghai, Nanjing and Chaohu, China
	10.2016	EU project SUSTAIN HO2 final workshop in Beijing
	10.2016	Helmholtz Association Chairman Prof. Wiestler visiting China

RCEIS Activity Map (2nd 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 TONGJI
3b	Poyang Lake	DFG-NSFC project about a Cooperation Group "A modeling platform prototype for environmental system dynamics"	CAS-IGSNRR UFZ KIT DLR
4	Heihe River Basin	Water resource management of Heihe River: Optimising irrigation in oasis desert eco-systems	FZJ CAS-IGSNRR

5	Heihe River Basin	Belmont Forum proposal about "Sustainable management of water resources and ecosystem services in the Heihe river basin"	UFZ CAS-IGSNRR TU Dresden Virginia Uni
6	Han River basin	BMBF CLIENT II Proposal about "Design of an Environmental Information System (EIS) for the Han River Basin in Hubei"	UFZ HRAES HTWK

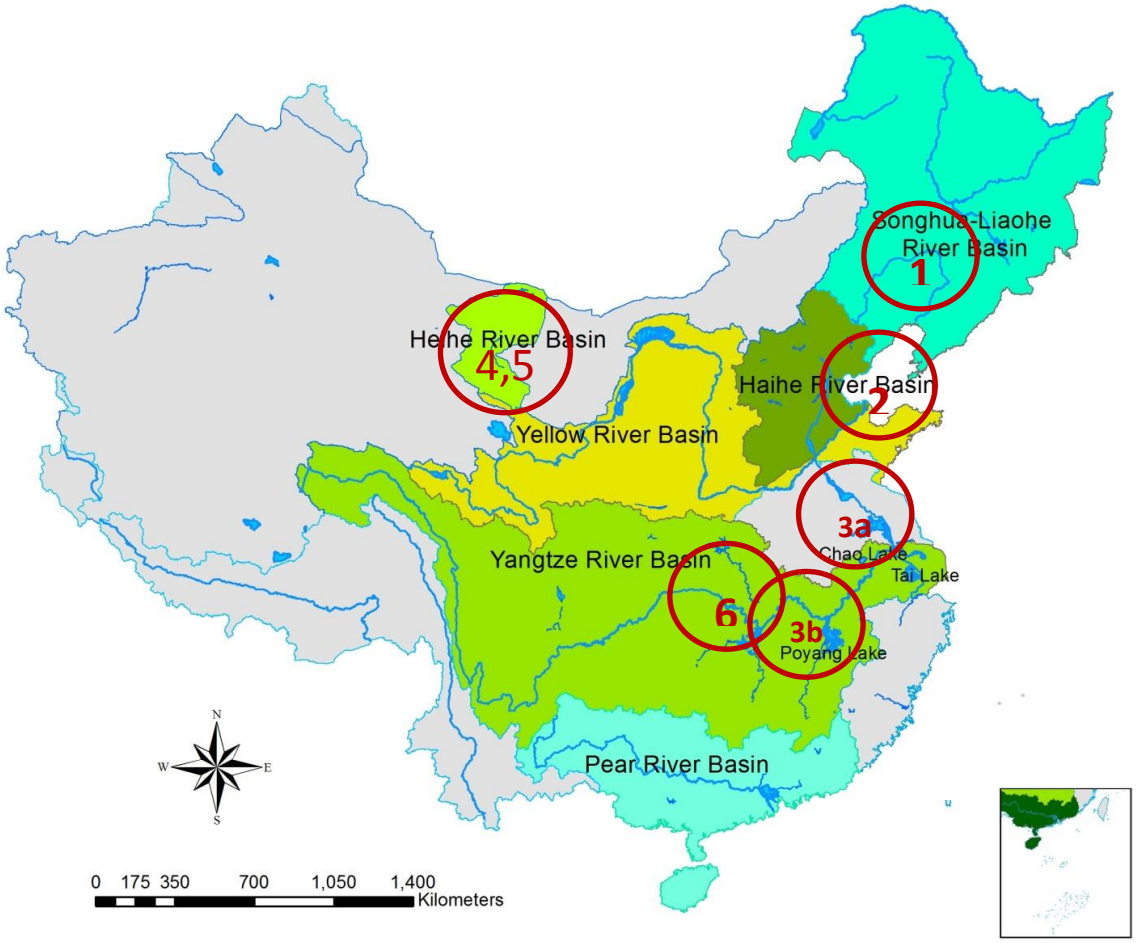


Fig.1 RCEIS study area in China

Sino-German Activities and Networking

1. The Consulate General of the People's Republic of China in Germany visiting UFZ

On 08 September, 2015, Dr. Qinghua Zhao, the lead of the Science and Technology Section of the Consulate General of the People's Republic of China in Germany visited UFZ. Scientific Director from UFZ, Prof. Georg Teutsch has given a warm welcome to the Chinese guests. Prof. Teutsch gave an overall introduction about the research areas at UFZ and the projects related to China. Both sides discussed about the Germany-China relationship, especially for the research collaboration in the last years. In the phase of 13th Five Year plan of China, UFZ and China is going strengthen their relationship, especially in the area of environmental issues.

Fig. 2: China Embassy in Germany visiting UFZ (08 September, 2015).

2. 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 second visit to UFZ in Leipzig and Magdeburg sites between 15 and 18

November 2015. The guests came in the context of the European Union promoted project "Sustain H2O" at the UFZ.

Fig. 3: The delegation of CRAES visiting UFZ, Photo from Lars Bilke, UFZ on 15-18, Nov, 2015

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)

The academic program of the second study tour was divided into two days. On the first day, the guests visited the Department of Environmental Informatics and nature conservation research at Leipzig. In the end, Prof. Yuan Peng presented the progress in the Chinese program for nationwide environmental risk assessment of industrial sites. On the second day, the delegation visited the Institute of water chemistry and urban water management at Technische Universität Dresden, which is also the cooperation partner for the BMBF CLIENT project “Managing Water Resources for the Urban Catchments” Furthermore, they visited Saxon State Ministry for the Environment and Agriculture

(SMUL) and took closer look at the wastewater treatment industries in Germany and got to know the difference between China and Germany for the treatment technologies. We are very thankful to the department of ecotoxicology, TU Dresden and SMUL for the active support of the study tour of our Chinese project partners.

3. Delegation from Ministry of Science and Technology of China was visiting the Helmholtz Centre for Environmental Research - UFZ

The delegation from Ministry of Science and Technology of China (MOST) led by Mr. YANG Zhe visited UFZ on 12- 13.Jan. 2016. A new cooperation agreement has been signed by both UFZ and Tongji University. Sino-German collaboration projects in the area of clean water and renewable energies have been presented and intensively discussed.

The high-ranked delegation from Office of National Major Project of MOST was led by Mr. YANG Zhe, the Deputy Director-General, accompanied by Dr. GAO Changan and Dr. TANG Jiaowen. Mr. YANG is responsible for 5 of 10 Major Programs in China including the Major Water Program. The Dean of the Faculty of Environmental Sciences and Technology, Prof. DAI Xiaohu, was also a member of the delegation. Dr. Rüdiger Furrer from the Project Management Agency Karlsruhe on behalf of the Federal Ministry of Education and Research (BMBF) jointed the meeting at UFZ as well. The major purpose of their visit was comprehensive information about the ongoing Sino-German cooperation activities and discussion about the potential contribution within the framework of the BMBF-CLIENT program and the Chinese Mega-Water Program in the 13th five years plan (FYP 2016-2020).

On 12 January, 2016, the joint cooperation agreement between UFZ and Tongji University has been renewed under the new challenges of the 13th FYP. The joint research agenda is to continue the development of Urban Catchments concepts for integrated water management of lake cities in the North-China plain such as Chaohu.

Fig. 4: The cooperation agreement between UFZ and TONGJI University (Prof. DAI) has been renewed in the context of the 13. Five years plan of China, Leipzig, 12.01.2016:

On 13. January 2016, the MoST delegation was warmly welcomed by Prof. Georg Teutsch, the Scientific Director of UFZ, who has given a general introduction to major research topics at UFZ and the importance of s strategic cooperation with China in Environmental Science and Technology (see Fig.1, fotography by A. Künzelmann). The recently published general BMBF-China Strategy will be the basis for the development of a corresponding UFZ-China Strategy in Environmental Science and Technology. More details about the BMBF CLIENT project "Managing Water Resources for Urban Catchments" (www.ufz.de/urbancatchments) has been introduced during a workshop in the UFZ Visualization Centre (VISLAB) afterwards. "Urban Catchments" is part of the "Innovation Cluster – Major Water" (http://sino-german-major-water.net/de/) within the German-Chinese cooperation of the Major-Water Program in China. Prof. Olaf Kolditz, as the project coordinator, gave an overall introduction to the project and its current status. Dr. Karsten Rink has shown the status of the Environmental Information System for the Chao-Lake Urban Catchment built with scientific modeling platform OpenGeoSys (www.opengeosys.org) (see Fig. 2, fotography by O. Kolditz). The project partners from TU Dresden (Prof. Thomas Berendonk) and industries (Dr. Frank Neubert) have presented the progress of Work Packages B (System Lake) and D (Monitoring and Software Development). Furthermore, Ursula Schmitz introduced the international affairs at UFZ with focus on China. The Centre for Advanced Water Research (CAWR) by UFZ and TU Dresden is a key player in the Sino-German cooperation in water science. Dr. Cui Chen presented the history, background, ongoing projects and future activities within the Sino-German Network RCEIS (Research Centre for Environmental Information Science, www.ufz.de/rceis), which is funded by the Helmholtz Association and the Chinese Academy

of Sciences (CAS) in the frame of the Helmholtz International Research Network (HIRN) and (PIFI) CAS President's International Fellowship Initiative. Prof. Haibing Shao (UFZ and TU Freiberg) reported about the Sino-German Geothermal Research Centre which has been recently proposed by China Academy of Sciences (Institute of Geology and Geophysics) and several Helmholtz Centres (UFZ, GFZ KIT) with University partners. Finally, the participants discussed the challenges and opportunities of the Sino-German collaboration within the 13th FYP (2016-2020). Both the Chinese and German parties see a huge potential in the collaboration which should be properly organized at a strategic level to foster successful cooperation with visible impact on both societies.

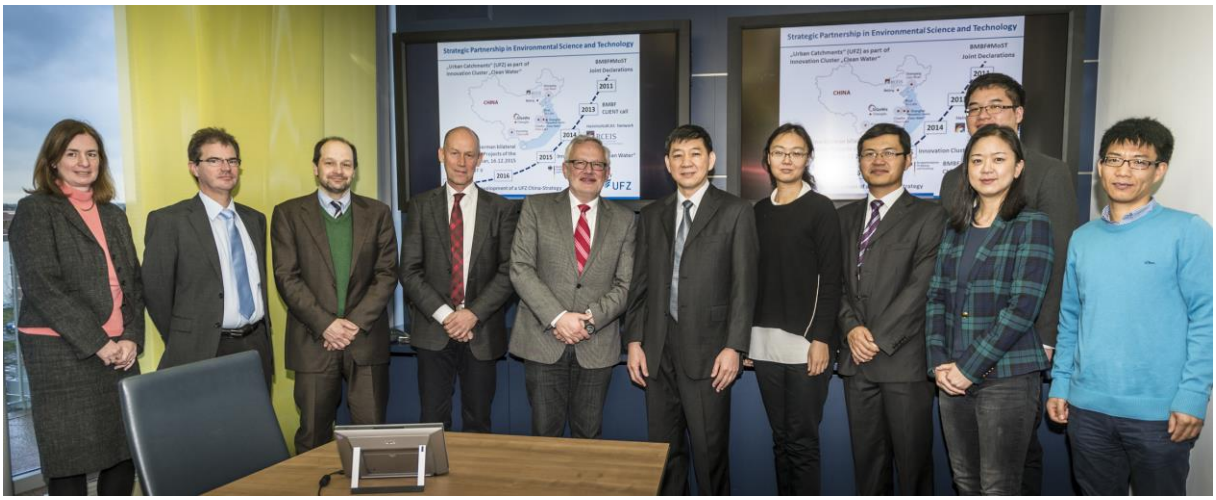


Fig. 5: Delegation visit of the Ministry of Science and Technology (Mr. YANG, Deputy General Director) to discuss strategic cooperation between China and Germany in environmental science and technology, Leipzig, 13.01.2016

4. The signing ceremony of the cooperation agreement between UFZ and CLMA

On 30 October, 2015, the signing ceremony of the cooperation agreement between UFZ and CLMA took place in front of the Chinese Prime Minister Keqiang Li and German Chancellor Angela Merkel during her visit in China. This is an important milestone for the Sino-German cooperation within the Major-Water Program. As representatives of the BMBF CLIENT project "Managing Water Resources for Urban Catchments"", Prof. Dr. Kolditz and Dr. Chen and Nicole Umlauf (BMBF project office – clean water) from German side, and Mrs. Xiaohong Tang, the vice-director of Chaohu Lake Management Authority from Chinese side, have joined this ceremony.

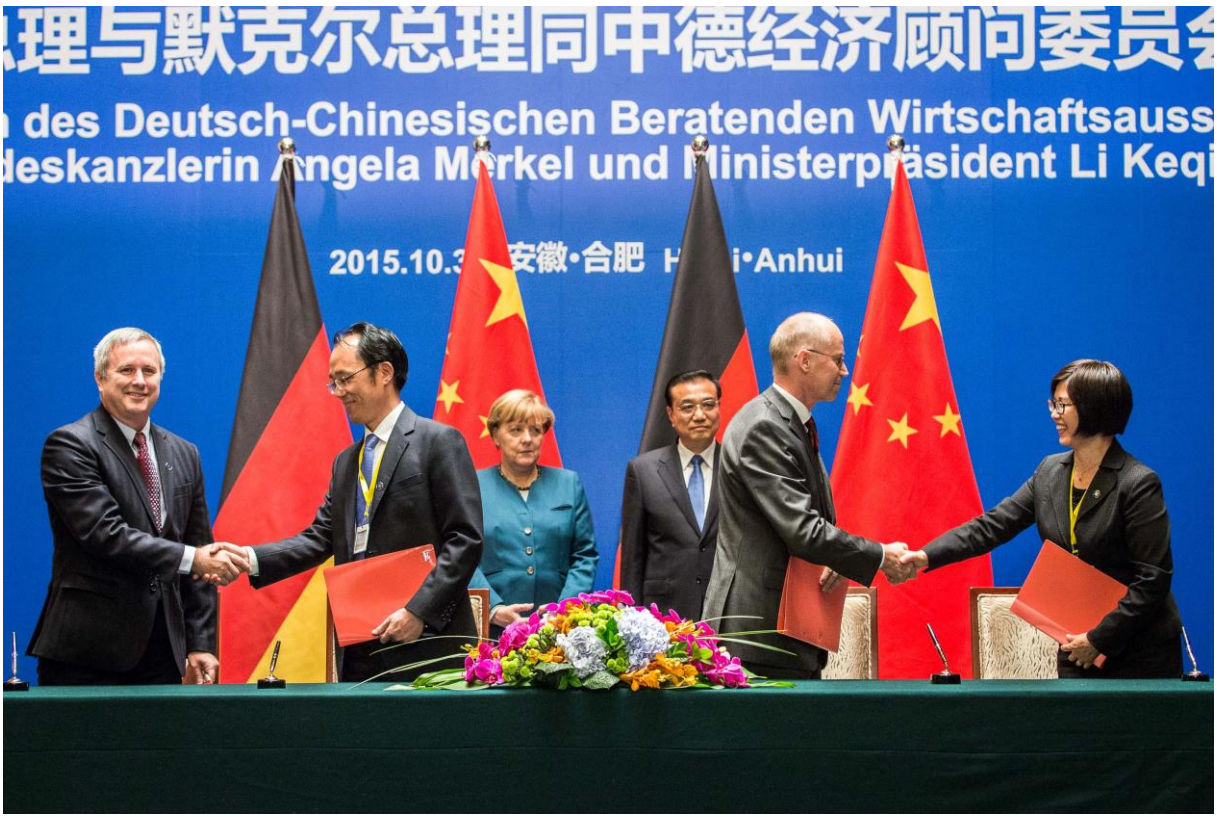


Fig.6: The signing ceremony of the cooperation agreement between UFZ and CLMA took place during the visit of the German Chancellor Angela Merkel in China. This is an important milestone for the Sino-German cooperation within the Major-Water Program (30 October, 2015)

5. Saxony delegation and entrepreneurs travel in Beijing, Wuhan, Chongqing China

On 19 October to 21 October, 2015, Saxony delegation and entrepreneurs travel in Beijing, Wuhan, Chongqing China, under the guidance of Minister of State Thomas Schmidt (Saxon State Ministry for Environment and Agriculture). Hubei province is the Saxony's partner since 2007.

The delegation has visited Hubei Environmental Protection Bureau (MPB, Hubei), changjiang water resources commission, Hubei provincial government and Hubei Province agriculture department.

Fig.7: The delegation visiting Hubei Environmental Protection Bureau on 20 October, 2015

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.

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

On 22 October, 2015, Prof. Olaf Kolditz and Dr. Cui Chen have visited the Institute of Rock and Soil Mechanics (IRSM), Chinese Academy of Sciences, Wuhan. Prof. Qi Li has presented his recent research in the area of CO2 storage and utility. Prof. Kolditz has given a lecture about “Challenges in Geosciences” for the students and staff in the institute. They have met Prof. Xia-Ting Feng from IRSM and discussed about the possible cooperation in geothermal engineering. They also visited the IRSM-SKL laboratory, mainly sections related with Carbon Capture Utilization and Storage (CCUS).

Fig.8: Visiting Institute of Rock and Soil Mechanics, Chinese Academy of Sciences , Wuhan 22 October, 2015

7. SPD-Member from Saxony Landtag visiting UFZ

Am 10.02.2016 hat Frau Simone Lang das UFZ besucht, um sich über die Forschungsaktivitäten des Helmholtz-Zentrums zu informieren. Frau Lang ist Mitglied des sächsischen Landtags und Sprecherin für Umweltpolitik, Verbraucherschutz sowie für Seniorenpolitik. Der Kontakt mit Frau Lang kam während der Delegationsreise des Staatsminister Thomas Schmidt (Sächsisches Staatsministerium für Umwelt und Landwirtschaft) nach China im Oktober 2015 zustande (siehe Telegraf: http://www.intranet.ufz.de/index.php?de=31339&nb_item=669). Hubei ist die Partnerprovinz des Freistaates Sachsen, mit dem das UFZ wissenschaftliche Kontakte unterhält. Im Gespräch mit Frau Lang haben Frau Dr. Chen und Prof. Kolditz sie über das UFZ und die China-Aktivitäten in der Umweltforschung informiert. Im VISLAB konnte sich Frau Lang ein Bild über den Stand des Umweltinformationssystems für die Stadt Chaohu machen, die sich in der Nachbarprovinz von Hubei in Anhui befindet. Im Mai ist eine weitere Delegationsreise des sächsischen Ministers für Wirtschaft StM Martin Dulig (Staatsministerium für Wirtschaft, Arbeit und Verkehr) geplant.

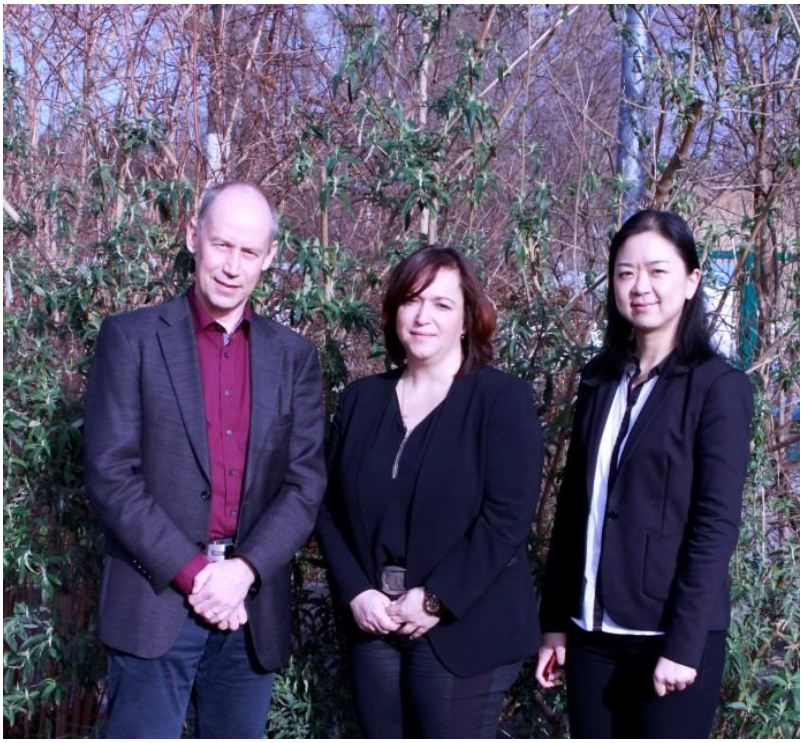


Fig.9: SPD-Member (Simone Lang) from Saxony Landtag visiting UFZ on 10 Feb, 2016

Conference / Workshop

1. 2nd Workshop on BMBF CLIENT Project "Managing Water Resources for Urban Catchments" in Chaohu, China

From May 10 to 12, 2015, the second workshop on BMBF CLIENT Project "Managing Water Resources for Urban Catchments" took place in Chaohu, China. "Urban Catchments" is part of the German project cluster within the German-Chinese cooperation to the Mega-Water Program in China. The German project cluster is funded by the Federal Ministry of Education and Research (BMBF) in the area of "International Partnerships for Sustainable Technologies and Services for Climate Protection and the Environment" (CLIENT) under the "Research for Sustainable Development" framework programme. This project officially started from 01.April.2015 and will last for three years.

During the three-day workshop, the project participants from Germany have met the Chinese cooperation partners in Chaohu. Chaohu Lake Management Authority has helped to organize the workshop. From German side, Helmholtz Centre for environmental research in Leipzig is coordinating the whole project. In addition, technische Universität Dresden (Technical University of Dresden) and several companies are also involved in this project, and they are: AMC – Analytik und Messtechnik GmbH, Chemnitz; bbe Moldaenke, Kiel; Institut für technisch-wissenschaftliche Hydrologie GmbH (itwh), Hanover; OpenGeoSys e.V., Leipzig-Kiel and WISUTEC Umwelttechnik GmbH, Chemnitz. From Chinese side, Chaohu Lake Management Authority (CLMA); Chaohu City; Tongji University, Shanghai;

Chinese Research Academy of Environmental Sciences (CRAES); Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (NIGLAS) and Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan have also sent their representatives to join the workshop. One the first day, the German participants have presented their project ideas which are: (A). Urban water management; (B). Decentralized wastewater management; (C). Lake Chao; (D). Environmental information system. The Chinese participants have presented their previous and on-going projects in the Chaohu Lake region. On the second day, the participants have made the field trip to the Chaohu project related places in order to get more detailed information about the problems and current situation in this area.

The workshop was regarded to be very successful and both Chinese and German participants have set up the networks and identified their cooperation partners for their specific project topic. This is really helpful for the future cooperation and for the implementation of the project concept in Chaohu.

Fig. 10: The second Workshop of BMBF CLIENT Project “Managing Water Resources for Urban Catchments” in Chaohu, China (10-12 May, 2015)

Pilot region: Lake Chao currently exhibits extremely high levels of pollution (some areas are at the worst Level V). The causes are not only the lacking capacity of water treatment used in industry and in-tense regional agriculture, but also the lack of integrated plans for resilient environmental engineering for urban and rural areas. Many scientific studies have examined the most prevalent pollutants—lake and river sediments contain sometimes high levels of heavy metals, alkylbenzene, and pesticides—but research on technical solutions to improve the water quality has not been substantial. Summer algal blooms in Lake Chao are regular occurrences due to extremely high phosphorus

imports, which then results in high levels of cyanotoxins (microcystin, in particular). Lake Chao is the most important source of drinking water in the area, and this severe human health hazard presents an urgent need for action towards improving the water quality.

The overall goal of the project is the development of sanitary and environmental engineering system solutions for sustained water quality improvement in the city of Chaohu. It will involve an innovative approach—**Urban Water Resources Management (UWRM)**—that provides for efficient sanitary systems in urban and rural areas as well as with the needs of natural aquatic ecosystems. Lake Chao plays a central role as the ecological and economic resource and drinking water source for the city of Chaohu to be protected for future generations. This R&D project contributes greatly to the sustainable development of the Chaohu region and Anhui Provincial Government's master plan "Ecological Lake City of Chaohu."

2. Workshop of the DFG-NSFC Sino-German Cooperation Group "Poyang Lake Basin"

From September 20 to 28, 2015, DFG-NSFC Sino-German Cooperation Group "Modelling Platform Prototype for Environmental System Dynamics - Poyang Lake Basin" conducted the first workshop in Leipzig/Dresden. As the first outcome of this Sino-German Symposium on Sustainable Water Management and Ecosystem Restorations in Poyang Lake Basin (on 16.12.2014), a joint proposal about "A modeling platform prototype for environmental system dynamics" for Sino-German cooperation group has been approved by Sino-German Center for Research Promotion. The project has officially started from 01.07.2015 and will last for three years.

Fig. 11: Participants of the 1st Workshop of the Sino-German Cooperation Group in Leipzig/Dresden (20-28.09.2015).

The Chinese participants are representing the Institute of Geographical Sciences and Natural Resources Research of the Chinese Academy of Sciences (CAS-IGSNRR), the Mountain-River-Lake Development Committee of Jinangxi Province and the Beijing Normal University. From the German side, UFZ, TU Dresden, TU Darmstadt, CAU Kiel, Hochschule Weihenstephan, DLR and KIT are involved.

During the workshop, the participants successfully developed a proposal concept dealing with the System: Lake -Poyang. The envisaged project is dedicated to gain a better understanding of the system lake including the analysis of multiple (natural and antropogenic) stresses on aquatic ecosystems. The Poyang Lake Basin is selected as the case study for the proposal because of its unique dynamic nature due to seasonal changes of the water body (lake, river and wetlands). Moreover the Poyang Lake is a unique winter time refugium for many birds species.

The Sino-German Cooperation Group is funded by the German Research Foundation (DFG) and National Science Foundations of China (NSFC). The funding under grant GZ 1167 workshop is greatly acknowledged. This project started officially from July 01, 2015 and will last for three years. The project coordinator is UFZ from German side and CAS-IGSNRR from Chinese side.

3. Sino-German Symposium about “Sustainable Utilization of Geothermal Energy in China and Germany” in Beijing, China

From October 26 to 28, 2015, the Sino-German Symposium on “Sustainable Utilization of Geothermal Energy in China and Germany” took place in Beijing, China. It was funded by the Sino-German Centre for Science Promotion (DFG/NSFC).

The Sino-German Symposium brought together Chinese and German researchers as well as scientists from Switzerland, Australia and USA representing different geoscientific disciplines (Hydrogeology, Structure Geology, Geophysics, Geochemistry, Environmental, Information and Social Sciences) as well as involving companies, authorities and stakeholder. It was jointly organized by the Helmholtz Center for Environmental Research – UFZ / TU Dresden (Department of Environmental Informatics / Applied Environmental Systems Analysis) and the Institute of Geology and Geophysics, Chinese Academy of Sciences (CAS).

Fig.12: Delegates of the 1st Sino-German Symposium on Geothermal Energy Research

Over 120 delegates attended the 1st Sino-German Symposium on Geothermal Energy Research in Beijing from 25-29.10.2015 (see Figure 1). From the German side, scientists from 7 Universities (TU Dresden, CAU Kiel, TU Clausthal, TU BA Freiberg and RWTH Aachen, Universities of Bochum and Stuttgart), 4 German National Research Centers (Helmholtz Centre for Environmental Research UFZ, German Research Centre for Geosciences GFZ, Karlsruhe Institute of Technology KIT, and Federal Institute of Geosciences and Mineral Resources BGR) and German companies (GEOS Freiberg) participated the symposium. From the Chinese side, the participants were from several CAS Institutes (IGG, IRSM, GIEC), and many related universities and institutes working in the field of geothermal research (Beijing Normal, China University of Geosciences, China University of Mining and Technology, Jilin, Nanjing, Shandong Jianzhu, Tjianjin, Tsinghua). From geothermal industry SinoPec Star Petroleum Co., Ltd. and Zhongrui New Energy Technology Co., Ltd. joined the symposium. Even stakeholders have been involved into the conference (Tibet Autonomous Region Bureau, Beijing Institute of Hydrogeology and Engineering Geology). Recently, Herrenknecht AG, a worldwide market leader in mechanized tunnelling technology, expressed their interest joining the Sino-German initiative for geothermal research.

The major theme of this symposium was about “Sustainable Utilization of Geothermal Energy”, which included four topics: (1) Sustainable utilization of shallow geothermal systems; (2) Sustainable utilization of hydrothermal systems; (3) Enhanced Geothermal Systems and (4) Geothermal Reservoir Engineering and Monitoring. In the last section of the symposium, a panel discussion was organized to make a summary on the symposium and discuss next steps of the initiative. On October 28th, the delegates visited the Xiongxian geothermal field during the conference excursion.

During the symposium, several joint research topics were discussed for project collaborations among German and Chinese scientists. All the delegates agreed continuing the international collaboration and decided to establish a **“Sino-German Geothermal Research Center” (SG-GRC)** which will act as a joint research organization in order to initiate and coordinate future activities. The general goal for

the cooperation in future is to build a Sino-German research network by leading Chinese and German experts with their research groups and expertise in the field of geothermal energy. This initiative will form the basis for intensive exchange of research methods and knowledge as well as practical experience provided by the involved industry partners.

The symposium takes great advantage of the expertise from scientists of both China and Germany, and it is an important impetus for exchange of experiences between the two countries. It enhances the personal exchange in the multi-disciplinary research areas through new contacts and networks.

4. Sino-German workshop "A global analysis of long term evapotranspiration time series derived from lysimeter systems"

Evapotranspiration (ET) is a major component of the terrestrial water cycle. Recent studies based on analysis of experimental and observations-based data have shown that over the last decades the magnitude of ET (both potential and actual) has been affected by global climate change although the sign and size of the change in ET differ strongly between regions around the globe.

Recent reports based on the analysis of Epan data showed a decrease in evaporative demand of the atmosphere across the globe. Several factors have been reported in literature that is considered to be responsible. These include: increased cloud cover, reduction in wind speed, increase in water vapour pressure combined with temperature increase, increase in relative humidity combined with decrease in radiation. Other studies have however indicated that ET is increasing based on a correct analysis of Epan data.

Despite the fact that lysimeter systems, especially the weighing based systems, are ideal tools to determine actual ET, no global assessment has been made of available data at present that might be valuable to assess the impact of climate change on actual ET. This is surprising as lysimeter systems have been operated in many countries sometimes for several decades. A screening of literature showed that many data are either not reported or made available through research reports rather than peer reviewed literature.

To establish a database of long-term actual ET, drainage and precipitation time series including weather variables obtained from lysimeter systems and sites with a minimum length of 20 years across the globe. The fragmentation and lack of systematic standard in this important measurement hinder it's broader acceptance – hence through reflection on available records not only that a reconciled and usable record will be produced, but it will also be examined objectively and lay foundation for future lysimeter data collection. Therefore, improved understanding of lysimeter research progresses in China and Germany is necessary, to meet the raising awareness of advanced technologies including the lysimeter data processing, long term data analysis, etc. A Sino-German Lysimeter Workshop is planned for August 14-16, 2016, in Beijing, China, hosted by the Beijing Normal University. Scientists, managers, students as well as representatives of instrument companies, who have researched or are interested in lysimeter, hydrology, meteorology, ecology and remote sensing technology, are invited to the workshop to share research results and discuss ET ground observations technology. The official language of the workshop will be English. The organizing committee consists of Prof. Harry Vereecken, Prof. Shaomin Liu, and Prof. Xin Li, including Dr. Thomas Pütz and Dr. Zhongli Zhu. The workshop includes a field trip to visit lysimeters in the agricultural region in Huailai

county (115° 46′ 59.569″ E; 40° 20′ 55.093″ N, 488.3 m a.s.l.), 70 km northwest of Beijing; guided by Dr. Zhu, Prof. Liu, and Prof. Xiao.

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 Pullution 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”

The overall goal of the project Urban Catchments is the development of sanitary and environmental engineering system solutions for sustained water quality improvement in Chaohu City. It will involve an innovative approach: urban water resources management (UWRM) that provides for efficient sanitary systems in urban and rural areas as well as for the needs of natural aquatic ecosystems. Chao Lake plays a central role as the ecological and economic resource and drinking water source for

Chaohu City to be protected for future generations. This project contributes greatly to the sustainable development of the Chaohu region and to Anhui provincial government's master plan "Ecological Lake – Chaohu City".

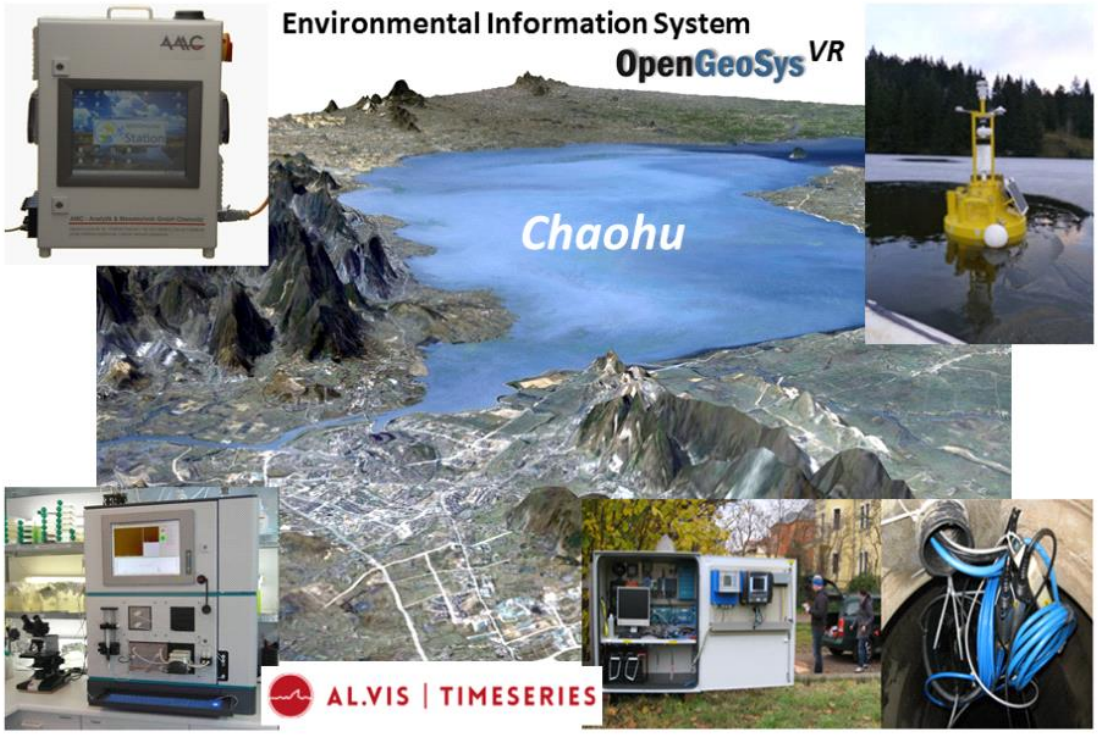


Fig. 13 Urban Catchments' environmental information system (EIS) for early warning of drinking water supply in Chaohu. It shows elements of Chao Lake (upper right), the Urban Observatory (lower right), biomonitor (lower left) and the data station (upper left) for technical data integration. The EIS is embedded in a virtual reality environment to provide a realistic geographic context. EIS implementation is independent on specific site conditions and therefore easily transferable to other regions. Data integration conducted by K. Rink using OpenGeoSysDataExplorer (UFZ)

The methodology to achieve the project goal deploys the UWRM concept — holistically viewing the urban water network and all levels of the aquatic system according to the principle of emissions (source of pollution) / immissions (contamination). Urban water management involves comprehensive look at all urban resources: the lake as a source of drinking water and asset worthy of protection, restoration of the urban waters network, storm water management, and wastewater treatment. Due to rapid development rates in the demonstration region, suburban and rural areas and the effects of agriculture (non-point pollution sources) will be fully considered. The UWRM concept is based on a regional implementation strategy with flexible decentralized cluster solutions for wastewater treatment. An important basis for successful implementation of the UWRM concept is the establishment of extensive monitoring platforms (urban and lake observatories) for the sources of water pollution as well as the recipient, Chao Lake. The observatories serve as an early warning system for operational water management (drinking water). Long-term monitoring also enables reliable assessment of

measures and any observations of emerging pollutants, such as micropollutants. An Environmental Information System (EIS) will make data available for the UWRM concept, including necessary data infrastructures, interoperable simulation tools, and Web services (Fig. 5). Details of the EIS data workflow are depicted in Fig. 7. The combination of monitoring and modeling platforms in EIS firstly allows for the identification of contaminant sources and paths in the entire catchment, and secondly, is an important tool for the operational water management and long-term water quality prognoses. The modeling platforms examine all levels of the coupled hydrologic system, including soils, groundwater, and surface waters (Beinhorn et al. 2005, Beyer et al. 2006, Centler et al. 2010, Kalbacher et al. 2012, Rink et al. 2012, Rinke et al. 2013).

The implementation concept will be developed in close cooperation with regional stakeholders, public utilities, and development banks (e.g. Asian Development Bank). Demonstration projects involving five German companies play an important role in the cooperation between business and science and the real-world applicability of the outcomes.

The overall project goals, the methodology, and the implementation concept have led to the following project structure for the R&D project “Urban Catchments”, regionally divided into 4 sub-projects: (A) the urban, (B) the suburban/rural areas, (C) Chao Lake and (D) the EIS acting as an integrating element of the project (Fig. 6).

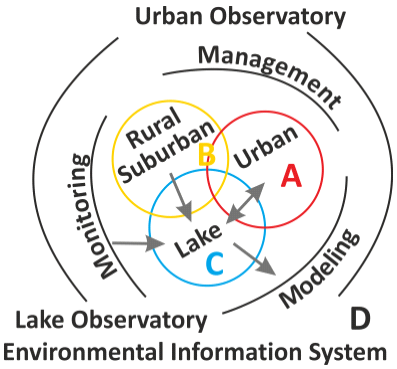


Fig. 14 Urban Catchments’ concept and project structure, which includes methodical elements as well as regional elements: A Urban water management; B Decentralized wastewater management; C Chao Lake, the central asset; and D the lake observatory environmental information system

Definition of the project study area: In response to current programs in the municipality Chaohu, representatives from the leading research institution, Tongji University, recommended that Chao City and the eastern side of the lake become the focus of the project’s model region. Due to rapid urbanization there, suburban and rural areas will be included for expandable decentralized wastewater techniques and for closing the water mass balances of Chao Lake to model the entire catchment area. Efficient management of water resources calls for a monitoring network and modeling tools to plan and construct appropriate measures.

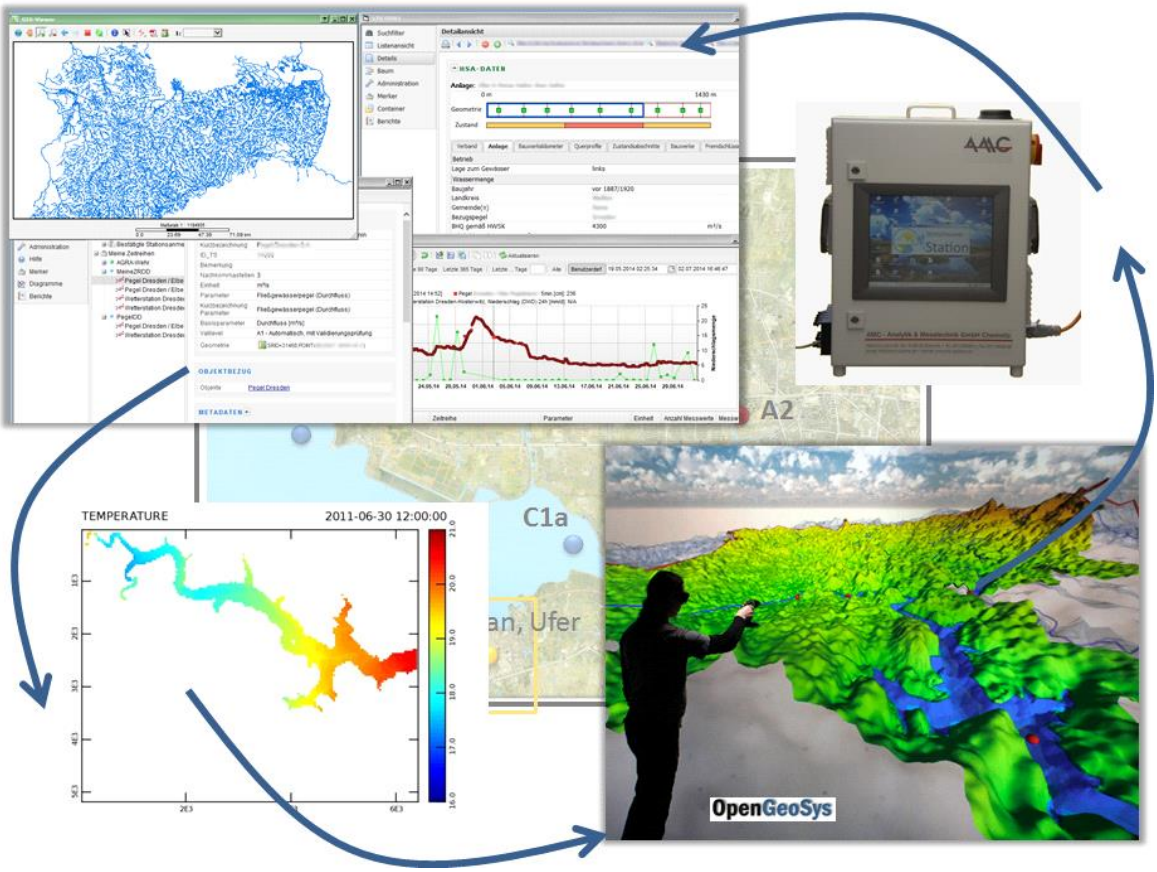


Fig. 15: Data workflow of the Environmental Information System including monitoring (AMC data station), data integration (WISUTEC AL.VIS), modeling (Rinke et al. 2013) as well as visualization elements (Bilke et al. 2014)

In addition to technological and solution-oriented subprojects of the larger R&D project, dealing with the cross-cutting issue of capacity development (CD) shall be pursued. The most important aspects in CD are found in all subprojects in the areas of plant planning, operation, and maintenance; quality assurance; and certification, data management, and software training in the use of the environmental information system (monitoring and modeling).

The following German cooperation partners are engaged in the Urban Catchments pilot project in Chaohu. (Updated information can be found on the project website: www.ufz.de/urbancatchments.)

- Helmholtz Centre for Environmental Research – UFZ
- Technische Universität Dresden (Technical University of Dresden)
- AMC – Analytik und Messtechnik GmbH, Chemnitz
- bbe Moldaenke, Kiel
- Institut für technisch-wissenschaftliche Hydrologie GmbH (itwh), Hanover
- OpenGeoSys e.V., Leipzig-Kiel
- WISUTEC Umwelttechnik GmbH, Chemnitz

Our Chinese cooperation partners are:

- Chaohu Lake Management Authority (CLMA)
- Chaohu City

- Tongji University, Shanghai
- Chinese Research Academy of Environmental Sciences (CRAES)
- Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (NIGLAS)
- Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan

3. NSFC-DFG Project: Cooperation Group

National Science Foundation of 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. Design of an Environmental Information System (EIS) for the Han River Basin in Hubei

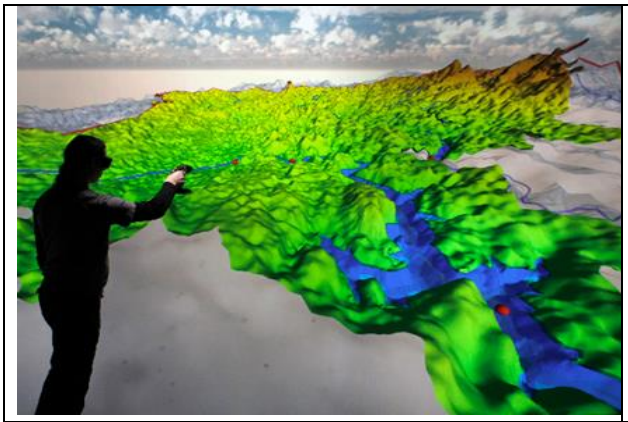
Preamble

During the visit of State Minister Dr. Schmidt in Hubei in October 2015, both sides the Hubei Province of China and the Free State Saxony of Germany expressed their mutual interest to intensify their cooperation in environmental science and technology particularly in water pollution control and water resources management. The present proposal suggests a joint effort in environmental information technology, the development of an Environmental Information System (EIS) for water pollution control and water resources management in the Han River Basin. This project proposal is also dedicated as a contribution to the Major-Water-Program of the 13 Five-Year-Plan (FYP). The "Innovation-Cluster Major Water" funded by the Federal Ministry of Education and Research of Germany (BMBF) is cooperating with Chinese colleagues in the Chao, Dian and Tai Lakes as well as the Liaohe River Basin (www.sino-german-major-water.net)

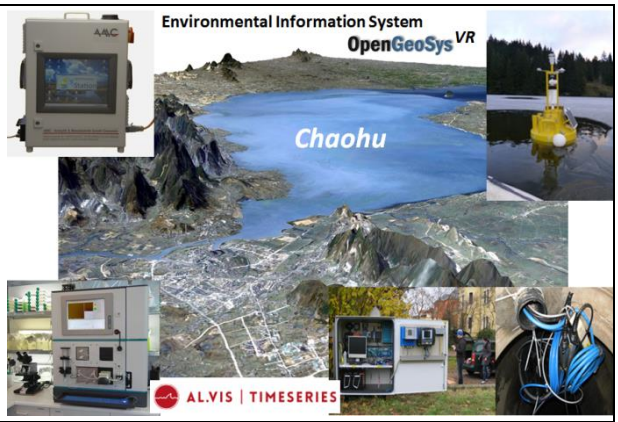
Concept

The basic idea of the project is the development of an Environmental Information System (EIS) as a comprehensive planning tool for water pollution control and water resources management in the Han River Basin. In general EIS contains data integration and analysis platform for online and remote environmental data as well as the integration of modeling tools for prediction and early warning systems.

As recent reference projects we refer to the Rappbode Reservoir Project the biggest drinking water reservoir in Germany as part of the TERENO project (Rinke et al. 2013) and recently the project "Managing Water Resources for Urban Catchments - Chaohu" dealing with the development of an EIS as an early warning system for drinking water supply of Chaohu city. New information you can also see at our project Webpage www.ufz.de\urbancatchments.



EIS for the Rappbode Reservoir Basin in Germany



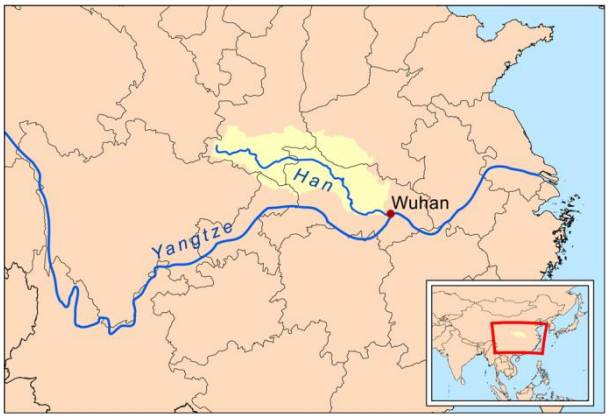
EIS for the Chao Lake Basin in Anhui Province in China

(Rinke et al. 2013)	(www.ufz.de\urbancatchments)

Rinke, K. et al. (2013): Reservoirs as sentinels of catchments: The Rappbode Reservoir Observatory (Harz Mountains, Germany). *Environ. Earth Sci.* **69** (2), 523 - 536

Due to the complexity of the EIS development we recommend a 2-step approach:

1. **Definition project -** serves as a feasibility study for the main project. The outcomes are:
   a. Design of the EIS for the Han River Basin,
   b. Full proposal for the main project adopted to the requirements of the 13 FYP and the CLIENT-2 call by BMBF.
2. **Main project**
   a. Implementation of the EIS in the Han River Basin as a planning tool for water pollution control and water resources management,
   b. Planning and implementation of river restauration measures based on the Han River Basin EIS.



Han River Basin is the longest tributary of the Yangtze River (length of 1,532 kilometres). The Han River rises in southwestern Shaanxi and terminating into the Yangtze at the provincial capital Wuhan (Hubei).

Source: "Hanshuirivermap" by Kmusser - Own work using Digital Chart of the World and GTOPO data.. Licensed under CC BY-SA 3.0 via Commons - https://commons.wikimedia.org/wiki/File:Hanshuiriver-map.png#/media/File:Hanshuirivermap.png

Work plan for the definition project

Most important is the integration of the existing solutions at HRAES into a new system. Therefore, we suggest conducting a feasibility study for the “Design of an Environmental Information Systems for the Han River Basin”.

The feasibility study should be conducted within 3 month with the following major outcomes:

- List of data which should be integrated into the EIS
- Map of online data stations which should be integrated into the EIS
- Software specifications for OGS-DataExplorer (UFZ) – data integration and visualization within geographic context
- Software specifications for AL.VIS (WISUTEC) – data base and time series online data integration
- Hardware specifications for data stations (AMC)

The time schedule for the feasibility study is planned as follows:

Month	Work	Deliverable
1	– Discussion with HRAES experts concerning the requests to the EIS Han River Basin (recommend workshop in Leipzig) – Development of the EIS Han River Basin concept	Detailed work plan
2	– Development of an EIS Han River Basin prototype with basic functionalities and test data sets (these can be provided from data stations in Germany)	Prototype layout (e.g. screenshots to explain functionality)
3	– Continue EIS Han River Basin prototype development – Presentation of the feasibility study of the EIS Han River Basin (second work in Wuhan)	Feasibility study

In order to conduct the feasibility study we ask the funding for 3 person months and travel costs for 2 persons (UFZ and WISUTEC, respectively). A corresponding detailed calculation of project costs will be provided after discussion of the work plan.

Helmholtz RCEIS Partner Activities

1. Karlsruhe Institute of Technology (KIT)

Project coordinator: Prof. Harald Kunstmann

Scientists from the Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research (KIT/IMK-IFU), Germany are granted funds by RCEIS for the purpose of scientific and technological exchange as well as the development of joint research ideas and proposals.

Dr. Sven Wagner is a senior scientist at KIT/IMK-IFU. He is a hydro-meteorologist and has successfully finished the joint Sino-German project, “Long Term Land Use – Precipitation Feedbacks in the Hai River and Poyang Lake Region (PreFeed)” which was a joint program of KIT/IMK-IFU (PI: Prof. Dr. Harald Kunstmann) and the State Key Laboratory of Hydrology, Hohai University (PI: Prof. Zhongbo Yu).

Jianhui Wei, who did his Master in hydrology at Hohai University (Nanjing, China), is a PhD student at KIT/IMK-IFU. His supervisors are Prof. Dr. Harald Kunstmann and Dr. Hans Richard Knoche, both from KIT/IMK-IFU. Jianhui Wei's research investigates what and to which extent evapotranspirating 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 Dr. Wagner’s and Mr. Wei’s travel to the RCEIS workshop in September 2015 at UFZ in Leipzig, i.e. the DFG/NSFC Cooperation Group on “Environmental System Dynamics in the Poyang Lake Basin”, they presented their ongoing research on fully-coupled atmospheric-hydrological modeling and an age-weighted regional evapotranspiration tagging approach. One outcome of the group discussions was to intensify the investigations of land-atmosphere feedback mechanisms for the Poyang Lake basin by using these approaches, because it is particularly important to understand changes in environmental system dynamics, for example, the impact of climate and land-surface changes on regional and long-term scales on the hydrological cycle. In additional to scientific discus-

sions on potential proposals for the Poyang Lake region, challenges of sustainable water management in the changing environment in China, for example, environmental impacts of the South-North Water Transfer project, were discussed with Chinese partners.

For the presentation of the successful Sino-German collaboration on fully coupled model systems Dr. Sven Wagner gave an oral presentation at the AGU Fall Meeting in San Francisco on December 17, 2015. The talk with the title "Modeling Hydrological Processes with a Fully-Coupled Atmospheric-Hydrological Modeling System for the Poyang Lake Basin, China" was presented in the session "Modeling Hydrological Processes and Changes" convened by Yangbo Chen (Sun Yat-Sen University), Kuo-Lin Hsu (University of California Irvine) and Xingnan Zhang (Hohai University). This was an excellent opportunity to present the coupling approach and to meet and discuss possible collaborations in particular with researchers from China.

Benefit gained from this conference and workshop participations funded by RCEIS enhanced the scientific and technological exchange of ongoing research activities about the Poyang Lake Basin. Furthermore, the overlapped research questions of common concern from German and Chinese participants potentially increased the possibility of cooperation in the framework of RCEIS in the near future.

2. German Aerospace Centre (DLR)

Project coordinator: Dr. Claudia Künzer

The Sino-German Cooperation Group (SGCG) met from September 21 – 22, 2015 in Leipzig and Dresden for two workshops. The overall goal of UFZ was to coordinate research interests of thematic subgroups to come up with joint Sino-German project ideas. These project ideas will be handed in to DFG, Germany and NSFC, China in 2016. From DLR Dr. Claudia Kuenzer and Juliane Huth participated in the meetings. First, the SGCG group had a one day meeting at the UFZ Leipzig. DLR contributed to 2 Working Groups – to Working Group 4 on the planned modelling platform related to data contribution and remote sensing data analyses capacity, as well as to Working Group 2 – together with Prof. Lorz/University of Applied Sciences Weihenstephan-Triesdorf, UFZ, and Prof. Guenther/ TU Dresden – for land use derivation and spatio-temporal pattern analyses from remote sensing data sources as a basis for the envisaged land use modelling. Working Group 2 carried out a sub-group workshop at the Technical University of Dresden on September 22, 2015. Individual background in environmental and land use modelling, remote sensing, and legal framework analyses of adaptation strategies were presented from German and Chinese side. Focus region for potential SGCG cooperation is the Poyang Lake, the largest freshwater lake in the Yangtze floodplain. DLR previously conducted first data analyses and processing to reveal inundation dynamics on Poyang Lake based on a daily-resolved intra-annual time series of MODIS satellite data from 2013. Water coverage was derived from daily available 250m MODIS data and 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 which reveals very dynamic areas around the lake (see Figure 16).

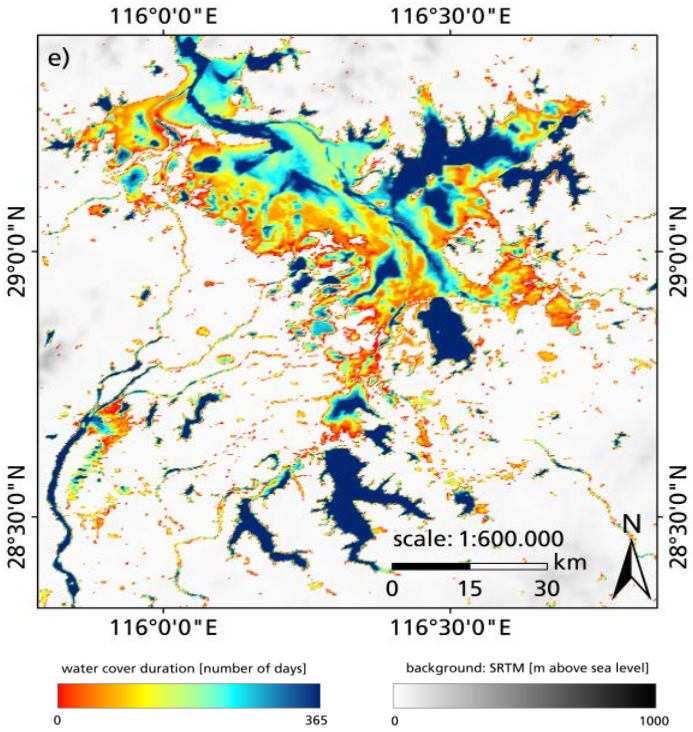


Figure 16: Inundation pattern of Poyang Lake 2013

The second largest floodplain lake is Dongting Lake in the direct neighborhood, only about 300 kilometers west of Poyang. DLR has experience in working in this study region since a few years (within ESA and BMBF projects). Previous data analyses were conducted with foci on e.g. water surface dynamics and land use land cover change from remote sensing data sources to study this Ramsar wetland site. The water surface dynamics of Dongting Lake was derived from SAR satellite data (Envisat-ASAR available until 2012, with a repetition rate of 35 days) where e.g. eight acquisitions were available for 2010 (see Figure 17). Inundation frequency analyses reveal permanently and temporarily water covered parts of the lake area. Temporarily water covered areas can be related to flooding zones at the lake. Furthermore, land use change analyses were conducted for a period of 7 years for 2007 - 2013. Changes were observed related to land use transformation of wetland vegetation (e.g. reed) for industrial use (e.g. paper production). The map in Figure 18 reveals the mentioned land use change at South Dongting Lake within the vicinity of the 3 Ramsar wetland sites in and around the lake.

The two Yangtze floodplain lakes Poyang and Dongting are complementary in terms of ecosystem composition and functions, etc. Furthermore, both lakes face similar threads from anthropogenic induced development upstream and within the project region itself. DLR will contribute gained experience and information on Dongting related research and support future projects at Poyang such as planned for Sino-German Cooperation Group project. Discussions on specific project ideas are ongoing in Working Group 2 and application for funding is planned for upcoming months.

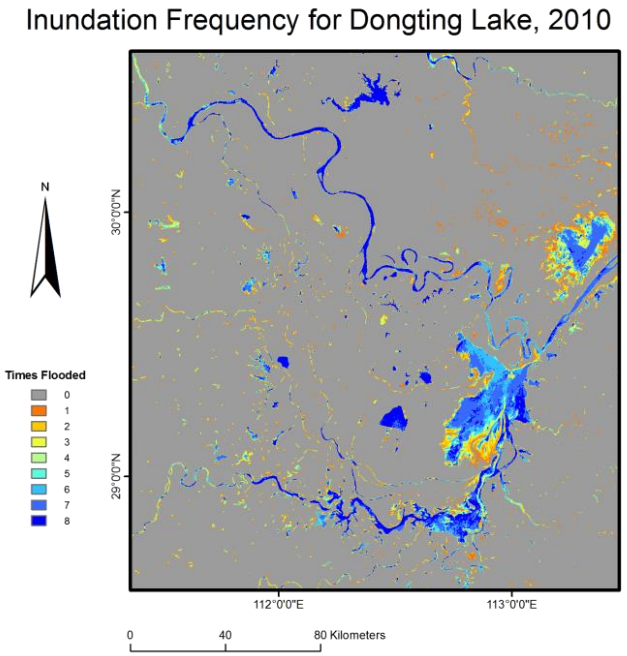


Fig. 17: Water surface dynamics derived from Envisat-ASAR satellite data of 2010. 8 acquisitions from 2010 are combined and depict permanently and temporarily water covered areas. Inundation frequency map reveals a flood year at Dongting Lake.

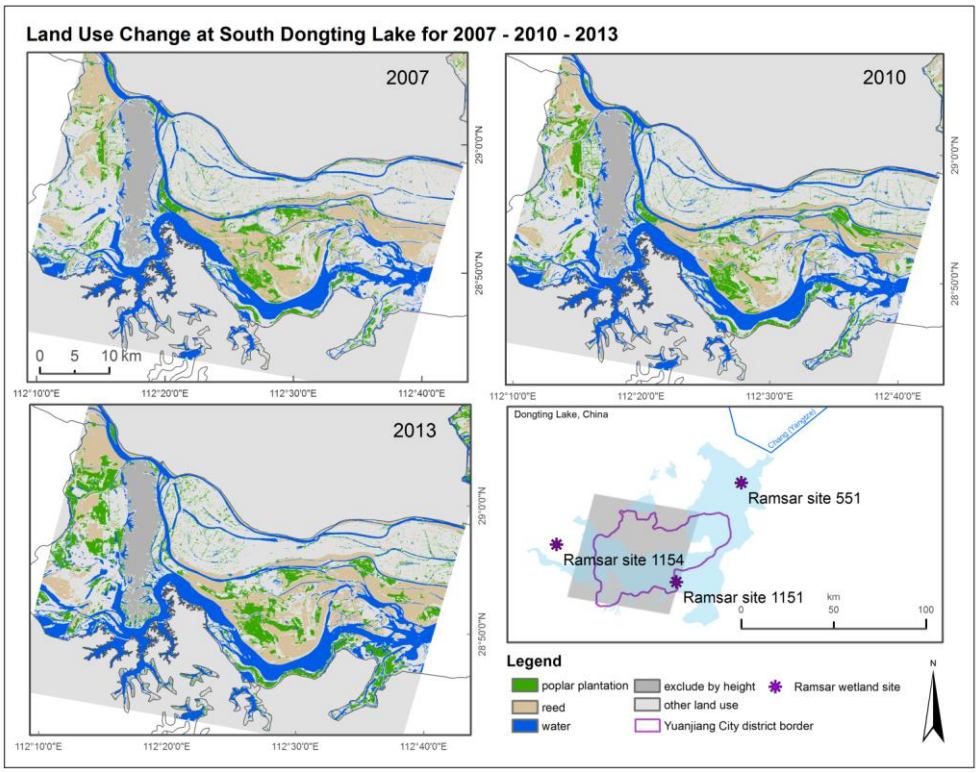


Fig. 18: Change of natural wetland vegetation into economically important vegetation types e.g. for paper production. Remote sensing based analyses with Spot and HJ-1A data from 2007, 2010 and 2013. The overview map depicts the location of the Ramsar wetland sites in and around Dongting Lake (1154, 1151, 551).

For future work related to the two floodplain lakes current satellite data availability was checked for Poyang and Dongting to prepare a multi-source data analyses (see Figure 19).

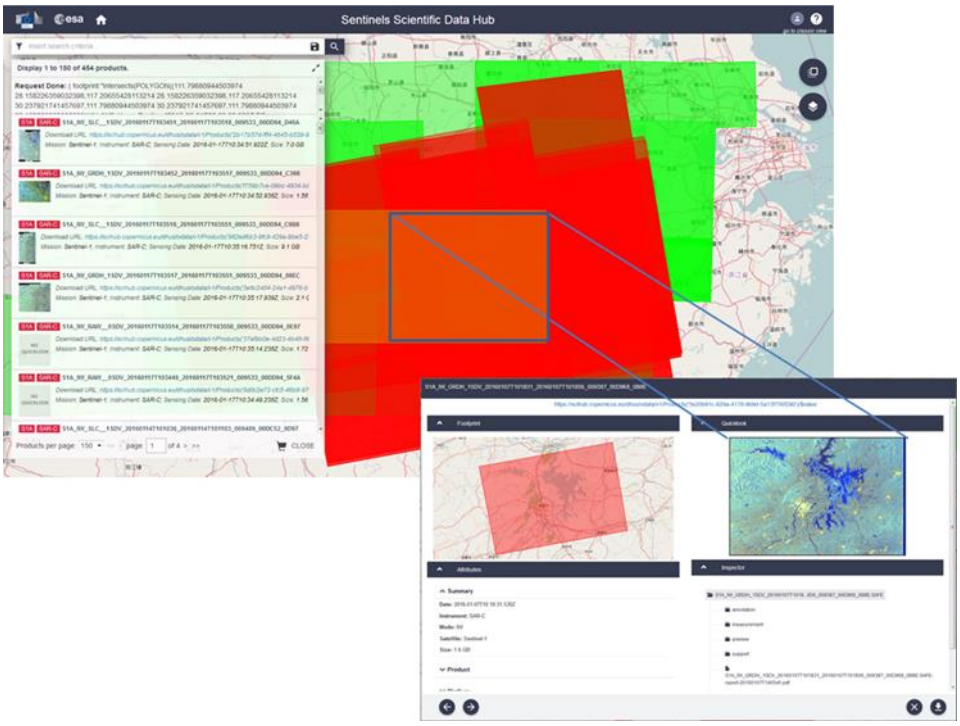


Fig 19: Data search in ESA archive for current availability status of new Sentinel-1 and Sentienl-2 data over Poyang and Dongting Lake – several hundred potential datasets available.

As a follow-up to the SGCG group meeting in Germany several talks were held in Beijing in October 2015. During her stay in China Dr. Claudia Kuenzer visited the colleagues from IGSNRR and RADI to promote RCEIS and to discuss on cooperation and proposal ideas within the SGCG group.

The following recent publications relate to RCEIS:

1. Kuenzer, Claudia, Klein, Igor, Ullmann, Tobias, Georgiou, Efi Foufoula, Baumhauer, Roland and Dech, Stefan (2015) Remote Sensing of River Delta Inundation: Exploiting the Potential of Coarse Spatial Resolution, Temporally-Dense MODIS Time Series. Remote Sensing, 7 (7), p. 8516-8542. DOI: 10.3390/rs70708516.
2. Ottinger, Marco, Clauss, Kersten and Kuenzer, Claudia (2016) Aquaculture: Relevance, Distribution, Impacts and Spatial Assessments – A Review. Ocean & Coastal Management, 119, p. 244-266. DOI: 10.1016/j.ocecoaman.2015.10.015.
3. Huth, Juliane, Ottinger, Marco, Eisfelder, Christina, Liu Gaohuan, and Kuenzer, Claudia (2015): Landnutzungswandel im Delta des Gelben Flusses, China – eine Fernerkundungsanalyse, submitted to Geographische Rundschau, Special Issue Deltaregions in Asia

Earlier in 2015, DLR contributed to the Sino-German Conference on “Environmental Innovation – Sino-German Solutions” that was held at the German Embassy in Beijing on April 28, 2015. A presentation on the preliminary results of the DELIGHT project was given. Furthermore, DLR contributed to a panel talk on success and lessons-learnt of Sino-German research cooperation (such as RCEIS, DELIGHT, etc.).

Besides answering pressing research questions on environmental and hydrodynamic change processes in the Yellow River Delta a strong capacity development component is part of the DELIGHT project. During 2015 the DELIGHT information system was installed for testing purpose and future demonstration in the project region in China. In 2015 two comprehensive information system training courses were held in the stakeholder institution as follow-up to the two courses in 2014. The main stakeholder and future user of the system is the Yellow River Delta Sustainable Development Institute of Shandong Province. Main goals are to train and qualify data manager to use the Yellow River Delta Information System and to integrate own geospatial data sets in the system and use it in their daily routines. Furthermore, system maintenance is trained to qualify technical staff in independent error handling. The information system will be used to support regional planning activities in the Yellow River Delta especially at the stakeholder institution. Their main task is to implement the Yellow River Development Plan - towards finding a balance between industrial development and environmental protection in the vulnerable delta region of the Yellow River. The DELIGHT project will share its experience and gained expertise with the Sino-German Centre for Environmental Information Science (RCEIS).

Recent project activities in DELIGHT include the Hand Over Workshop at the Institute for Sustainable Development of the Yellow River Delta of Shandong Province that was organized by DLR together with IGSNRR (CAS) on April 12 2016 in Dongying City. Beside the Director of this main stakeholder institution further stakeholders from the Yellow River Delta Nature Reserve and the Bureau of Land and Resources took part in the Hand Over ceremony (see group picture Fig. 20). The DELIGHT Information System contains all scientific project results from 3 years of joint research between Germany and China in the fields of e.g. hydrodynamic and water quality analyses of the Yellow River estuary, detailed quantification of the urbanization in Dongying and prognosis of its future development, the analyses of coastal dynamics and land use changes over the last two decades with respect to food supply for this fast developing river delta region as well as to environmental impacts such as salinization of soils etc. Furthermore, the system provides access to map material related to natural resources of the wetlands, and impacts of industrial development. In the first part of the workshop participants presented their project results. In the second part the DELIGHT information system was symbolically handed over to the stakeholder institutions. The system was technically implemented on the comprehensive server infrastructure operated by the Bureau of Land and Resources in Dongying, a governmental institution which closely cooperates with the stakeholder institutions.

Fig 20: Hand Over Ceremony of the DELIGHT Yellow River Delta Information System at the stakeholder institute in Dongying, April 2016.

Furthermore, DLR conducted the fifth and final user training course at the Yellow River Delta Sustainable Development Institute of Shandong Province from 11th to 15th of April 2016. In the data management part, the participants focused on data integration of their own data sets. Furthermore, capacity in the usage of the information system and open source GIS software was developed. In addition, the comprehensive maintenance of the information system was trained to enable the participants to deal with error logging and diagnosis, and overall understanding of system architecture.

Fig 21: DELIGHT Information System Maintenance and Management Training Course, April 2016.

3. Forschungszentrum Jülich (FZJ)

Project coordinator: Prof. Harry Vereecken
by Carsten Montzka, Thomas Pütz, Xujun Han and Harry Vereecken

Data assimilation has become a popular method to integrate observations from multiple sources with land surface models to improve predictions of the water and energy cycles of the soil-vegetation-atmosphere continuum. Multivariate data assimilation refers to the simultaneous assimilation of observation data from multiple model state variables into a simulation model. In recent years, several land data assimilation systems have been developed in different research agencies. Because of the software availability or adaptability, these systems are not easy to apply for the purpose of multivariate land data assimilation research. Therefore, we developed an open source multivariate land data assimilation framework (DasPy) which is implemented using the Python script language mixed with the C++ and Fortran programming languages. The LETKF (Local Ensemble Transform Kalman Filter) is implemented as the main data assimilation algorithm, and uncertainties in the data assimilation can be introduced by perturbed atmospheric forcing data, and represented by perturbed soil and vegetation parameters and model initial conditions. The Community Land Model (CLM) was integrated as the model operator. The implementation allows also parameter estimation (soil properties and/or leaf area index) on the basis of the joint state and parameter estimation approach. The Community Microwave Emission Modelling platform (CMEM), COsmic-ray Soil Moisture Interaction Code (COSMIC) and the Two-Source Formulation (TSF) were integrated as observation operators for the assimilation of L-band passive microwave, cosmic-ray soil moisture probe and land surface temperature measurements, respectively. DasPy has been evaluated in several assimilation studies of neutron count intensity (soil moisture), L-band brightness temperature and land surface temperature. DasPy is parallelized using the hybrid Message Passing Interface and Open Multi-Processing techniques. All the input and output data flows are organized efficiently using the commonly used NetCDF file format. Online 1D and 2D visualization of data assimilation results is also implemented to facilitate the post simulation analysis. In summary, DasPy is a ready to use open source parallel multivariate land data assimilation framework. In a basic configuration, it has already been successfully applied in catchments in Germany and China, but the full potential will be exploited and expanded in the coming future. For more information, see Han et al. 2015 (Publications).

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 Logo

We have two RCEIS logos now. One is used majorly for China-Germany Cooperation Issues and this will be very often used. The Second one will be used for the case that there is international cooperation partners beyond Germany in the joint project.

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. In addition to that, there are several thematic issues related to China have been published:

Thematic Issues in Environmental Earth Sciences on several lakes in China:

- Erhai Lake
- Liao River Basin
- Tai Lake
- Dianchi Lake
- Environment & Health in China I

Thematic Issue about "Developing Dynamic VGEs for Geographic Research" has been published, which includes 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" has been published. This TI includes 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.

The recent publications are:

Dohmann M, **Chen C**, Grambow M, Kolditz O, Krebs P, Schmidt K.R, Subklew G, Tiehm A, Wermter P, Dai X.H, Liao Z.L, Meng W, Song Y.H, Yin D, Zheng B.H (2016): German contributions to the Major Water Program in China - "Innovation -Cluster Major Water", Environ Earth Sci., submitted.

Chen M, Lin H, Kolditz O and **Chen C** (2015): Developing dynamic Virtual Geographic Environments (VGEs) for geographic research, Environ Earth Sci.,74:6975–6980. doi: 10.1007/s12665-015-4761-4

Yue T.X, Xu B, Zhao N, **Chen C*** and Kolditz O (2015): Thematic Issue: Environment and Health in China - I, Environ Earth Sci., 74:6361–6365. doi: 10.1007/s12665-015-4758-z

Chen C, Sun F, Kolditz O (2015): Design and integration of a GIS based data model for the regional hydro-logic simulation in Meijiang watershed, China. Environ Earth Sci., doi: 10.1007/s12665-015-4734-7.

Wang S.R, Zheng B.H, **Chen C**, Dohmann M, Kolditz O (2015): Thematic issue: water of the Erhai and Dianchi Lakes, Environ Earth Sci., 74:3685–3688. doi: 10.1007/s12665-015-4727-6.

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

Han, X.J., X. Li, G.W. He, P. Kumbhar, C. Montzka, S. Kollet, et al. 2015. DasPy 1.0 – The Open Source Multivariate Land Data Assimilation Framework in Combination with the Community Land Model. Geophysical Model Development Discussions.

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

Nixdorf E, **Chen C**, Sun Y.Y and Kolditz O (2015): Persistent organic pollutants contaminate Chinese water resources: overview of the current Status, challenges and European strategies. Environ Earth Sci., doi: 10.1007/s12665-015-4448-x

A joint paper with RCEIS Partner from DLR has now been submitted to EES:

Wohlfaht C, Kuenzer C, **Chen C** and Liu G.H (2016): Social-ecological challenges in the Yellow River Basin (China): a review, Environ Earth Sci., submitted.

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. **4th Germany-China Innovation Conference, Berlin**

The Federal Ministry of Education and Research (BMBF) invites us to participate in the April 13 and 14 at the 4th Sino-German Innovation Conference in Humboldt Carré in Berlin .

Bilateral Innovation Dialogue is given by Minister Prof. Wanka, Federal Ministry of Education and Research, and Minister Prof. Dr. Wan, Ministry of Science and Technology of the People's Republic of China, opened on 13 April at 11.30. In a subsequent „Roundtable" German and Chinese experts will discuss about science and industry for the importance of innovation for common solutions in the area of digitalization, environment and urbanization.

2. 1. Status Meeting of BMBF CLIENT Project "Urban Catchments"

The first project has almost been gone (01.04.2015 -31.03.2016). The 1. Status meeting about the BMBM CLIENT project "Urban Catchments" will take place on 19.April.2016 at UFZ in Leipzip. We will present the current results and discuss about the next steps.

3. RCEIS Annual Meeting at UFZ

Two years have been gone for the RCEIS project (01.03.2014 – 29.02.2016). On 21.April.2016, RCEIS partners, KIT and DLR will come to UFZ to join the annual meeting. We will discuss about the current status and discuss about the next step and future strategy in the next years.

4. Saxony delegation and entrepreneurs travel in China, under the guidance of Minister of State Martin Dulig

From 16-22.05.2016, Saxony delegation and entrepreneurs will travel in China with the guidance of Minister of State Martin Dulig. The delegation will travel several cities in Hubei province. Hubei is the official partner state with Saxon and is one of the most important economic partners in China. The major purpose of the trip is to investigate the possible market for the automobile, mechanical engineering and equipment in Hubei.

5. BMBF CLIENT project "Managing Water Resources for Urban Catchments" Study tour in Shanghai, Nanjing and Chaohu, China

From 20-29.05.2016, BMBF CLIENT project partner from Germany will take a study tour in China to visit their Chinese cooperation partners in Wuhan, Nanjing and Shanghai. We think a good start of the workshop could be a short introduction to Technical University of Dresden and a brief overview of the research activities of the Institute in general. In detail we would like to present our current Sino-German research, in more specific presentations on monitoring and especially biomonitoring. The first will focus on development in Germany and lessons we learned from history. The second will present research results from current monitoring surveys and assessment of specific strategies. Finally our partner bbe-moldaenke could present the most recent developments in online-monitoring. The partners from UFZ working in the subproject about decentralized waste water treatment will also take the tour to visit their partners in China to get well informed about this technology and cooperation possibilities.

6. EU Project SUSTAIN HO2 Final workshop in Beijing

The final workshop about the EU project SUSTAIN HO2 will take place in October, 2016 in Beijing. China Research Academy of Environmental Sciences will organize this workshop. The final results will be presented and further discussion about the future collaboration will be also the focus.

7. Helmholtz Association Chairman Prof. Wiestler visiting China

The new chair of Helmholtz Association Prof. Wiestler is planning to visit China in October, 2016. This will enhance the visibility of Helmholtz Research in China. It would be a great opportunity to introduce RCEIS on the tour.

Finally, the following picture gives the overview about the success and progress of RCEIS in the last two years. UFZ is now preparing a China strategy, in which RCEIS will play an important role in the next 5-10 years.

Fig 22: RCEIS Activities and Strategy Plan

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 northeastern 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 (multispectral 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 RADI (Institute of Remote Sensing and Digital Earth). In this context, she spends 1-2 months per year at RADI in Beijing.
- CSC: application for PhD position related to Coastal Zone Management research - awaiting decision soon

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, RADI, 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 Bogena

- 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 RCEIS	Chinese Academy of Sciences, CAS, Beijing Institute for Geographical Sciences and Natural Resources Research Research Centre for Environmental Information Science	WP2 WP4 WP3	 Prof. YUE
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 Engineering 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 Sciences, Beijing	WP1	Prof. MENG Prof. SONG
HRAES	Hubei Research Academy on Environmental Sciences, Wuhan	WP1	Prof. ZHANG Prof. SHEN
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
HTWK	Hochschule für Technik, Wirtschaft und Kultur Leipzig
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, www.opengeosys.org
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	TERestrial ENvironmental Observatories (www.tereno.net)
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