News Letter (December 2018)

Climate and Water Resources in Mainland Southeast Asia

About the Project

The project “Climate and Water Resources in Mainland Southeast Asia” (or “Lancang-Mekong”) is an important part of the “Strategy Pilot Project of Science and Technology (Class A) -- The Pan-Third-Pole Environmental Change and Green Silk Road Construction” that was launched by Chinese Academy of Sciences and led by Prof. Tandong Yao. The Lancang-Mekong project is jointly undertaken by six universities and institutions, including the Southern University of Science and Technology (SUSTech), the Institute of Tibetan Plateau Research of CAS, the Institute of Atmospheric Physics of CAS, the Institute of Geographic Sciences and Natural Resources Research of CAS, Beijing Normal University, and the University of Gothenburg in Sweden. The project focuses on key scientific issues including climate change, water resources, ecological environment, and human health in the Mainland Southeast Asia, in particular the Lancang-Mekong River Basin.

Co-PIs of the project

Prof. Deliang Chen

Prof. Deliang Chen is the August Röhss Chair at the Department of Earth Sciences of the University of Gothenburg, Sweden.

He is an internationally renowned climate researcher and has extensive experience with science for policy. Deliang Chen is an elected member of six Academies in the world including the Royal Swedish Academy of Sciences, the World Academy of Sciences, and the Chinese Academy of Sciences. He has served on numerous international and national committees and boards, as well as advised various governmental, intergovernmental, and international non-governmental bodies including funding agencies. He has been instrumental in the international research program – The Third Pole Environment – which focuses on climate and environment changes, and their impact on water resources, ecosystems, and disaster/risk over the Tibetan Plateau and its surroundings.”

Prof. Junguo Liu

Prof. Liu is a professor and associate dean at the School of Environment of the Southern University of Science and Technology (SUSTech)

He has earned an excellent international reputation through his contributions to water resources research and ecological restoration. He is a Lead Author of the IPCC Sixth Assessment Report, a target leader of the Decade Program 2013-2022 (Panta Rhei) of the International Association for Hydrological Sciences (IAHS). He is also the president of the Society for Ecological Rehabilitation of Beijing, and the Chair of the Union of Societies for Ecological Restoration and Environmental Protection. He has led a pioneering work on advancing water resources assessment in coupled human-natural systems, in particular for global hydrology research and water scarcity assessment. He is author of about 150 publications, including articles in Science, Nature, and PNAS.

18-23 May

NEWS

From May 18 to May 23, Professor Junguo Liu, Professor Yan Zheng, and Dr. Ganquan Mao from Southern University of Science and Technology made their trip to Cambodia to carry out investigation and survey on the project “Climate and Water Resources in Mainland Southeast Asia”.

Research Team Visited Cambodia

During the trip, research team organized a seminar together with the Royal University of Phnom Penh, the Cambodian Institute of Technology, the Zaman International University in Cambodia, and the Cambodian Development Resources Institute (CDRI). Prof. Junguo Liu and Prof. Yan Zheng introduced the project and the basic information of “The Belt and Road Initiative” Environmental Research Institute of SUSTech to the leaders and experts of the Cambodian delegation. At the end of seminar, the Cambodian delegation expressed a clear willingness to cooperate with SUSTech.

Furthermore, the SUSTech group visited the CDRI, and learned from the CDRI’s experts about their research work and experiences in water resources, agriculture, and the ecological environment, as well as the preparation works for the Cambodian-China Research Center, a new center that will soon be open and supported by the Chinese Embassy in Cambodia.

During this trip the Chinese hydrogeological survey team of 16 experts (3 from SUSTech and 13 from China Geological Survey) conducted hydrogeological investigations in Phnom Penh, Kampong Chhnang and Pursat. The aim of the investigation was considering the hydrological conditions, water quality, and fishermen's living conditions in the Tonle Sap Lake, the largest lake in Southeast Asia, and conducted surveys on the groundwater utilization in Pursat. Furthermore, the Chinese delegation visited the Ministry of Mines and Energy of Cambodia and attended the meeting on “Joint Survey of Hydrogeological and Environment Geological between China and Cambodia” to discuss the new cooperation model between China and Cambodia for the coming years 2018-2019.

A Sub-project Meeting Held on August 6-7, 2018

From 6th to 7th August, 2018, a meeting of sub-project ‘Projections of Future Water resources and their Uncertainty in the Mainland Southeast Asia’ focusing on cooperation between the Institute of Geographic Sciences and Natural Resources Research and University of Gothenburg was held in Zhangbei County, China. Prof. Deliang Chen attended this workshop and addressed the international frontiers in water security research. He emphasized the importance of Pan-Third Pole research and provided the future research directions for the project implementation.

Prof. Qiuhong Tang from the Institute of Geographic Sciences and Natural Resources Research, CAS chaired the meeting and shared his views on water security research of transboundary river basin. Prof. Youcun Qi showed his research on weather radar and proposed a research on spatial and temporal variation of vertical profile of reflectivity. Profs. Shifeng Zhang, Dongmei Han, and Haiyan Fang presented their works on hydroelectric energy, saline intrusion, and soil erosion and their future implementation plans, respectively. Ms. Aifang Chen, a PhD student from the Department of Earth Sciences, University of Gothenburg, demonstrated the reliability of precipitation data over the Mekong River Basin.

Project members and collaborators of the Strategic Priority Research Program, including Prof. Pedram Attarod, Dr. Yin Tang, Dr. Qinghuan Zhang, Dr. Ximeng Xu, Mr. Zhongwei Huang, Guoqiang Jia, Binod Baniya, and Gebremedhin Gebremeskel Haile attended the meeting and joined in the discussion of future research addressing water security issues in the Mainland Southeast Asia. This meeting promoted the communications among the project members and partners, as well as provided a guidance of future research work for the sub-project of the Strategic Priority Research Program of CAS.

Conference and Field Trip in Laos

From August 11 to August 17, project team visited Vientiane, Laos to co-organize and participate in the International Meeting on “Land Cover/Land Use Changes and Water Energy Food (WEF) Nexus in Southeast Asia”. The aim of participation in this international meeting was to improve the knowledge of research team members on the WEF Nexus throughout the Mekong River Basin, which is the focal point of the Lancang-Mekong project.

The meeting organizer planned a two-day field trip for the research group members and other international experts (mainly from NASA, Michigan State University and Virginia Tech, USA; SUSTech, China; University of Gothenburg, Sweden; and Beijing Normal University, China). During the field trip, participants visited NAM MANG3 hydropower plant, Mekong River Basin and newly developed Urban region in the north of Vientiane (the capital of Laos).

During the last four days of the trip, participants attended in four-days conference, focusing on WEF Nexus in Southeast Asia. About 120 experts from 10 different countries (China, Vietnam, Laos, Philippine, Myanmar, Cambodia, France, Thailand, USA, and South Korea) . Experts from different sciences discussed about climate and LCLU changes, extreme hydro-climatic events, agricultural production, energy services, and socio-economic issues in Southeast Asia, particularly the Mekong River Basin. The SUSTech, Chinese Academy of Science (CAS), and University of Gothenburg were three of the main sponsors for this conference.

19 September

NEWS

The Lancang-Mekong River Basin Water Management and Sustainable Development International Forum

On September 19, a senior researcher Minh Nguyen from the Australian commonwealth scientific and industrial research organization (CSIRO), Dr. Nguyen Hieu Trung and Dr Dang Kieu Nhan from Vietnam Can Tho University, came together to visit the Institute of Geographic Sciences and Resources, Chinese academy of sciences. And they also did the international academic communication in Lancang - Mekong river basin water management and sustainable development forum. Researcher Qiuhong Tang, associate researcher Shifeng Zhang, associate researcher Haiyan Fang, associate researcher Xiaomang Liu and associate researcher Dongmei Han of our institute also participated in the forum and reported on the recent research contents on water management in Lancang and Mekong river basin respectively.

In the beginning, Dr Nguyen Hieu Trung made a report based on the influence of climate change and rising sea level to the sustainability of Mekong river delta. Then, Dr Dang Kieu Nhan communicated the landscape social ecosystem in the Mekong river delta and approaches to improve the regional ecosystem recovery with audience. After that, researcher Minh Nguyen made some exploration to the adoption problem of Lancang-Mekong river basin to the climate change. In the end, researcher Qiuhong Tang, associate researcher Shifeng Zhang, associate researcher Haiyan Fang, associate researcher Xiaomang Liu and associate researcher Dongmei Han made some reports based on the “climate change versus the water resources and food safety in the Lancang-Mekong river basin”, “Hydropower resources in the Lancang-Mekong river basin”, “Simulation of erosion and sediment yield in the Lancang-Mekong river basin”, “Runoff and evaporation in the Lancang-Mekong river basin” and “Seawater intrusion in the Lancang-Mekong river basin” respectively. All the participants made a deeper discussion for the problems and further cooperation.

This forum effectively strengthened the communication among the experts of the climate change of Mekong river basin, based on which the solid connection was built to provide a solid and powerful foundation for the research work in the project from China Academy of Science, which was for the priority research project 4.

The 8th TPE Workshop was Held at University of Gothenburg, Sweden

In close collaboration with the TPE (Third Pole Environment) office at the Institute of Tibetan Plateau Research, Chinese Academy of Sciences, the Regional Climate Group (RCG) at the Department of Earth Sciences at University of Gothenburg led by Prof. Deliang Chen, hosted the 8th TPE workshop during September 24-26, 2018. Over 80 experts from 20 countries attended the workshop with a theme on ‘Regional climate change: from pole to pole’. The RCG members actively contributed to the scientific presentations and discussions of the workshop. Among the 53 oral presentations in the workshop, 6 oral presentations were made by the group members.

Lancang-Mekong was Highlighted at Beijing International Dialogue

October 21, The 2018 NGO Beijing international Dialogue – Belt and Road initiatives & Cooperation with People's Livelihood was held in Beijing. The Dialogue was organized and hosted by the Society for Ecological Rehabilitation of Beijing and the theme is “Green innovation leads Cooperation with People's Livelihood for the Belt and Road initiatives”. Prof. Junguo Liu was invited to participate the Dialogue and give the first talk at the opening ceremony. During the speech, Prof. Liu emphasized the important of the cooperation between China and the countries in the region of Belt and Road initiatives and introduced our works in Cambodia and Laos. He also encouraged further collaboration between China and the countries in Mainland Southeast Asia with the support of Beijing Government.

Belt and Road initiatives was launched on 2013. After five years fruitful international cooperation, the 2018 NGO Beijing international Dialogue aims to strengthen non-governmental dialogue, bring together people's wisdom, promote commonwealth, deepen livelihood cooperation, and build a cooperative network with "NGO+" as a new model, and then strengthen international cooperation between NGOs and promote the further development of state relations.

A total of 200 participants from 33 countries, and representatives from more than 20 NGOs attended the event. NGOs including United Nations Industrial Development Organization, United Nations Volunteers, Cambodian Senate, Cambodian Civil Society Coalition, BRICS Traditional World Russian Regional Social Organization, South African BRICS Coordinating Committee for Civil Society Forum, etc.

11-12 November

NEWS

First Lancang-Mekong Water Resources Cooperation Forum was Held in Kunming

On November 11-12, Professor Junguo Liu, was invited to participate in the first Lancang-Mekong Water Resources Cooperation Forum held in the Kunming City, Yunnan Province, China. This forum was an important event for implementating the second meeting of the leaders of the “Lancang-Mekong cooperation”. It was organized by the Ministry of Water Resources of the People's Republic of China (MWR) and the People's Government of Yunnan Province and it was hosted by the International Economic and Technical Cooperation and Exchange Center of MWR and the Lancang-Mekong Water Resources Cooperation Center. The Deputy Minister of MWR Xuebin Tian, the Vice Governor of Yunnan Province Lianghui He, the Deputy Minister of the Ministry of Natural Resources and Environment of Laos Bounkham Vorachith, the Permanent Secretary of the Ministry of Natural Resources and Environment of Thailand Wijam Simachaya, the Counselor of the Department of Asian Affairs of the Ministry of Foreign Affairs of the People's Republic of China Jian Xue attended the forum. Nearly 150 representatives from government departments, scientific research institutions, academic groups, enterprises and relevant international organizations from six member states participated in the forum. Professor Junguo Liu was invited to give a lecture on “Water-Energy-Food Nexus in the Lancang-Mekong River Basin”.

Meeting of Project Progress Report

The workshop was held at the Southern University of Science and Technology (SUSTech) on 18 December. Prof. Deliang Chen and Prof. Junguo Liu attended the workshop while Dr. Tian Zhan and Dr. Masoud Irannezhad chaired the presentations and discussions. The workshop was in particular aimed at two goals;

1. Report research progress of the project and research team achievements.

2. Get advice from Prof. Chen for future project and identify follow-ups for 2019 year's research.

The meeting started with Prof. Junguo Liu welcome talk and his reports about research team progress and achievements during 2018.

During the one-day workshop each team member presented their research progress and their achievement aiming at the scientific improvement of the project. A strong participation at the workshop by team members demonstrated fruitful and dynamic collaboration of team members. From the presentations, two main trends and important developments in project research and progress were identified.

- Improvement of the knowledge of research team members on climate and water resource changes in Mekong River Basin.

- Understanding the Water Energy Food (WEF) Nexus in Mekong River Basin.

The scientific programme of the meeting ended with a lively discussion session, centred on Prof. Deliang Chen and Prof. Junguo Liu comments on the importance of the quality of research activities for the next year. They emphasised that innovation and the quality of the research must be the core part of the research group activities for the future.

The workshop finished on Tuesday evening with Laia Arbiol Roca's presentation on the role of WeMO in the occurrence of torrential rainfall in Catalonia (Spain). Laia Arbiol Roca was a visiting PhD student from the University of Barcelona. She invited to SUSTech with a Panta Rhei scholarship that was iniatiated by Prof. Junguo Liu to support the decadal program of the international scientists from International Association of Hydrological Sciences (IAHS).

The IAHS has a community of more than 8000 members in almost 200 countries contributing to the extensive programme of conferences and workshops, online discussions and IAHS publications.

Up to now, Panta Rhei scholarship invited 18 Senior and Junior scholars from different countries, including Sweden, Switzerland, Iran and China to visit Southern University of Science and Technology and share their research achievements and discuss about future collaboration

Evaluations and Improvements of GLDAS 2.0 and 2.1 Forcing Data for Hydrological Simulations in the Tibetan Plateau

Hydro-climatic data are of importance to understand the water cycle and therefore for water resources assessment. Such data are of paramount importance for the Tibetan Plateau (TP) which is the source region of several major Asian rivers, including the Lancang - Mekong River, Yangtze River, Yarlung Tsangpo - Brahmaputra River, Yellow River, among others. The Global Land Data Assimilation System (GLDAS) 2.0 and 2.1 provide abundant fine resolution hydro-climatic data. However, evaluations on their applicability for the TP remain limited.

Led by Junguo Liu and Wei Qi, the School of Environmental Science and Engineering at Southern University of Science and Technology, China, conducted a study to evaluate and improve GLDAS2.0 and GLDAS2.1 forcing data's applicability in basin-scale hydrological applications in the TP. Gauge-based data, a hydrological model, and seven state-of-the-art global precipitation products are utilized to carry out the study in four large basins in the TP, including the Yarlung Tsangpo River basin, Upper Yangtze River basin, Upper Yellow River basin and Upper Lancang River basin.

Results show that GLDAS2.1 shows significant warming trends from 2001 to 2010, whereas GLDAS2.0 shows cooling trends, although only significant in the Upper Yellow River basin. The contrasting trends imply caution should be taken when using them to analyze climate change impacts. On a monthly scale, GLDAS2.1 precipitation on average is closer to the gauge-based data than GLDAS2.0, but both of them have high uncertainty. Therefore, further quality improvements in precipitation are of importance. Combining CMORPH-BLD with GLDAS2.0 forcing data generates more realistic runoff simulation than GLDAS2.1, with Nash-Sutcliffe Efficiency and Relative Bias being 0.85 and 16% on average. The results provide unique insights into the hydro-climatic datasets, and are beneficial for water resources assessment in the TP.

The results were published in *Journal of Geophysical Research: Atmospheres*. Full article link is as below: https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2018JD029116

The Reliability of Mulita-source Precipitation Datasets for the Mekong River Basin Assessed

The sparsely and unevenly distributed rain gauges in the Mekong basin (MB) hinder the reliable monitoring of the spatial features of precipitation over the region. With advances in technology and science, both satellite and reanalysis offer precipitation data with fine spatio-temporal resolutions. We conducted a comprehensive investigation of the spatio-temporal variability of precipitation on the whole MB by using state-of-the-art, multi-source precipitation datasets (satellite and reanalysis precipitation data).

Led by Aifang Chen, the Regional Climate Group from Department of Earth Sciences at University of Gothenburg, Sweden, assessed two satellite based products Tropical Rainfall Measuring Mission [TRMM] and the Precipitation Estimation from Remote Sensing Information using an Artificial Neural Network—Climate Data Record [PERSIANN-CDR]), as well as three reanalysis including Modern-Era Retrospective analysis for Research and Applications (MERRA2), the Climate Forecast System Reanalysis (CFSR) and the European Centre for Medium-Range Weather Forecasts interim reanalysis (ERA-Interim), in comparison with the Asian Precipitation—Highly Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE).

Results show that most of the assessed datasets are able to capture the major climatological characteristics of precipitation in the MB for the 10-year study period (1998–2007). Generally, the two satellite data show higher reliability than the reanalysis products at both spatial and temporal scales across the basin, with the TRMM outperforming when compared to the PERSIANN-CDR. For the reanalysis products, MERRA2 is more reliable in terms of temporal variability, but with some underestimate. CFSR and ERA-Interim are relatively unreliable due to large overestimate. Meanwhile, CFSR is better at capturing the spatial variability of precipitation, while ERA-Interim shows inconsistent spatial patterns but more realistic resembles at the daily precipitation probability. These findings have practical implications for future hydro-climatological studies.

The results were published in *International Journal of Climatology*. Full article link: https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.5670

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