LANCANG-MEKONG NEWSLETTER

July 2022, No. 8

Project Title:
Climate Change and Water Resources in Great Rivers Region in Southeast and South Asia

Principal Investigator:

Deliang CHEN, University of Gothenburg, Sweden
Junguo LIU, Southern University of Science and Technology, China

Participating Institutions:

Southern University of Science and Technology
Institute of Tibetan Plateau Research, CAS
Institute of Atmospheric Physics, CAS
Institute of Geographic Sciences and Natural Resources Research, CAS
Beijing Normal University
University of Gothenburg

Project Period:

March 2018 – February 2023

"Climate Change and Water Resources in Great Rivers Region in Southeast and South Asia"

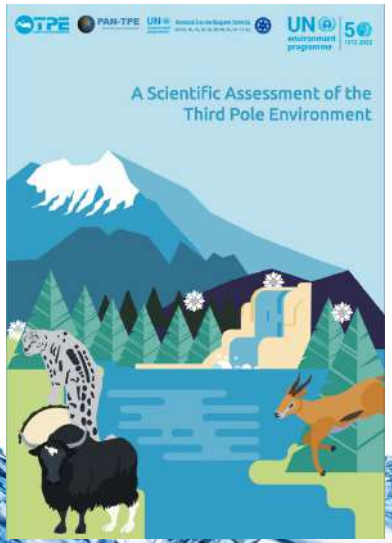
Project Office

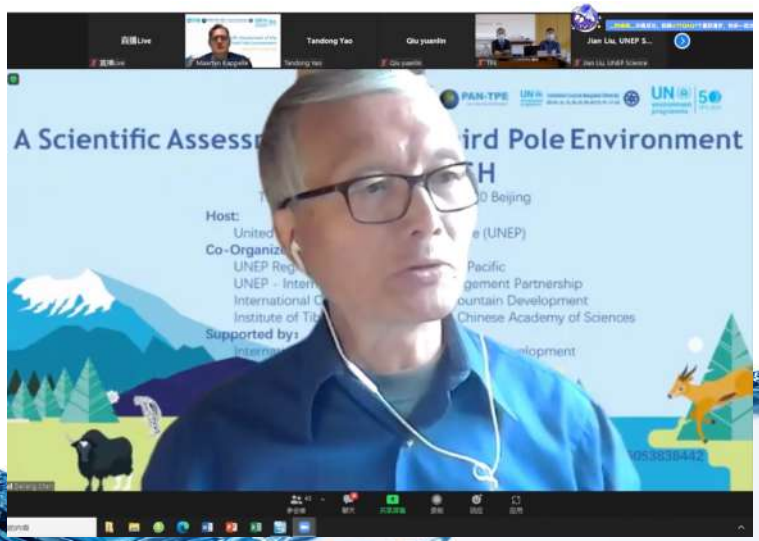
April 28

UNEP Launch Event: A Scientific Assessment of the Third Pole Environment

A Scientific Assessment of the Third Pole Environment (TPE) was officially presented and released by UNEP. Three co-chairs of TPE including **Professor Deliang CHEN** introduced the report at the event on April 28.

The report, A Scientific Assessment of the Third Pole Environment, is the first comprehensive assessment of environmental changes in the Tibetan Plateau (Third Pole) that aims to present the latest knowledge on climate, freshwater bodies, ecosystems and biodiversity, and human impact on the environment. It considers the changes that have taken place in the regional environment over the past 2,000 years and especially the changes today. It also looks to the future and provides a scientifically sound evaluation of a region with the largest complex of alpine ecosystems and freshwater systems in the world.





April 27-28

International Workshop on Water Resources and Climate Change in the Lancang-Mekong River Basin

On April 27-28, the project team held a virtual International Workshop on Water Resources and Climate Change in the Lancang-Mekong River Basin. The project workshops are used as a platform to bring together leading scientists from different disciplines who share a research interest in the Lancang-Mekong River Basin region and wish to communicate their latest research results.

11 world well-known scholars of the project international advisory board (IAB) participated in the workshop to discuss major issues related the burgeoning climate and water resources issues in the Lancang-Mekong River. The experts also gave many valuable comments and suggestions on the presentations and the implementation of the project.

April 27-28

International Workshop on Water Resources and Climate Change in the Lancang-Mekong River Basin (continued)

The project group tried to make the best use of the inputs from the IAB at the workshop on 27-28 April, focusing on the academic growth of participants of our project, particularly the junior researchers. We first collected responses from the speakers of the workshop. Then, we organized a meeting on 6 June to reflect on the inputs and to agree on our responses. All participants of the project were invited. We finalized the responses based on the discussion in the meeting. A summary of the project outcomes is shown below.

Table 1. Summary of the project outcomes 2018-2021

Catogory	Indicator
Publications	177 scientific papers, including publications in *Science, Nature, Nature Sustainability, Nature Climate Change*
Patent and international standard	• 3 Patent • 1 Software Copyright
Report	Water Resources in the Lancang-Mekong River Basin (to be published end or early 2023)
Datasets	• Dynamical downscaling product over the Third Pole Region and Soutl (WRF, 3km, 1979-2020, http://biggeo.gvc.gu.se/TPReanalysis/) • High resolution basin-scale drainage network https://data.tpdc.ac.cn/en/data/512bb48e-d3c7-4964-9578-a4da92a • Heat maps for risk assessment of high arsenic groundwater utilizatior Southeast Asian countries
Modeling	• Drainage network extraction using RS Stream Burning • WAYS (Water and ecosYstem Simulator)
Number of PhD students and postdocs supported, and the degrees achieved	39 PhD students and 20 postdocs have been supported by our project. 18 achieved their PhD degrees

April 27-28

International Workshop on Water Resources and Climate Change in the Lancang-Mekong River Basin (continued)

The project team has so far published 177 scientific papers, including those published in *Science*, *Nature*, *Nature Sustainability*, and *Nature Climate Change*. Figure 1 presents the annual publications of the project. Figure 2 shows keywords of journal names where the papers were published. For example, the top three leading journals are *Journal of Hydrology, International Journal of Climatology, and Geophysical Research Letters*.

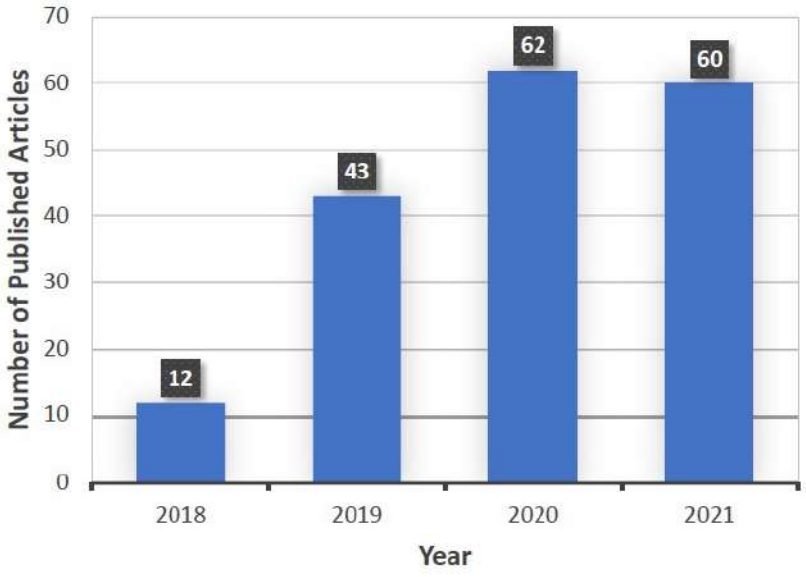


Figure 1: Annual publications of the project.

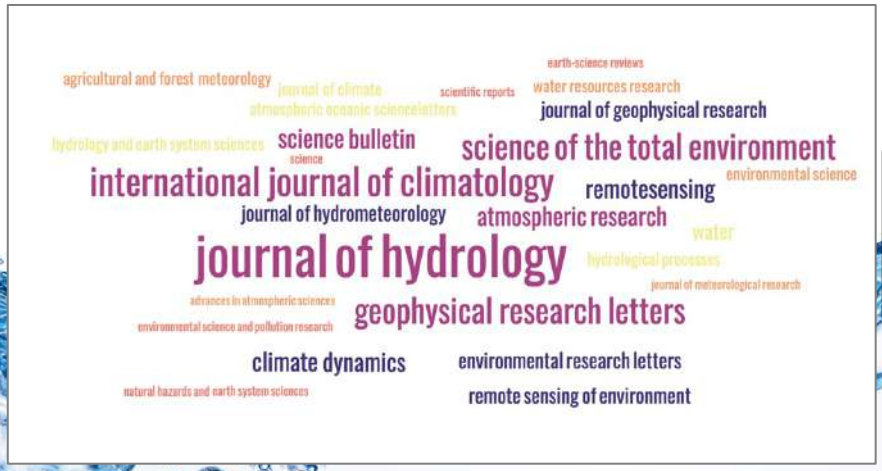
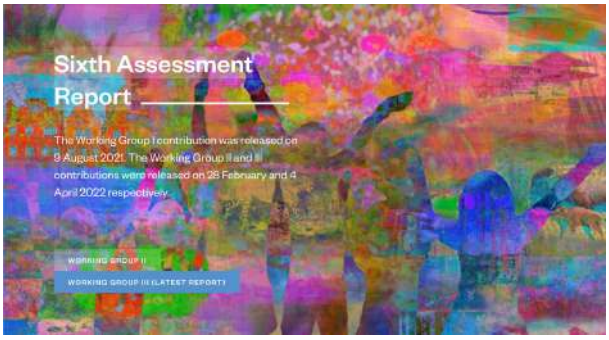


Figure 2: Journal keywords for the publications supported by the project.

March 11

Professor Deliang CHEN and Professor Junguo LIU actively engaged in the IPCC AR6



The IPCC (International Panel of Climate Change) released the Working Group I (WGI) contribution to the sixth Assessment Report (AR6) on August 9, 2021, and the Working Group II (WGII) contribution on March 11, 2022.

Professor Deliang CHEN is the Coordinating Lead Author of the IPCC AR6 WGI. **Professor Junguo LIU** is the Lead Author of the IPCC AR6 WGII.

The AR6 consists of contributions from each of the three IPCC Working Groups and a Synthesis Report (SYR), which integrates the Working Group contributions and the Special Reports produced in the cycle. The WGI contribution to the AR6 addresses the most up-to-date physical understanding of the climate system and climate change, bringing together the latest advances in climate science. WGII assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change and options for adapting to it.

Deliang CHEN

Junguo LIU

March 11

Professor Deliang CHEN and Professor Junguo LIU actively engaged in the IPCC AR6 (continued)

Professor Deliang CHEN presented on the "Online Interpretation of the First Working Group Report of the IPCC Sixth Assessment Report" online workshop.

Professor Deliang CHEN has published one interpretation article related to IPCC AR6:

- CHEN Deliang, LAI Hui-Wen. Interpretation of the IPCC AR6 WGI report in terms of its context, structure, and methods. Climate Change Research, 2021, 17(6): 636-643. doi: 10.12006/j.issn.1673-1719.2021.224

March 11

Professor Deliang CHEN and Professor Junguo LIU actively engaged in the IPCC AR6 (continued)

Professor Junguo LIU has been engaged in a series of IPCC WGII Launch Events Series.

On March 11, he presented “Climate Resilient Development Pathways” in the IPCC WGII Report Kick-off Event. He was interviewed by nearly 10 Chinese journalists.

On March 16, he presented at the Adaptation Action Coalition Webinar “Turning Science into Adaptation Action: Joint session on Water & Infrastructure”.

ADAPTATION ACTION COALITION

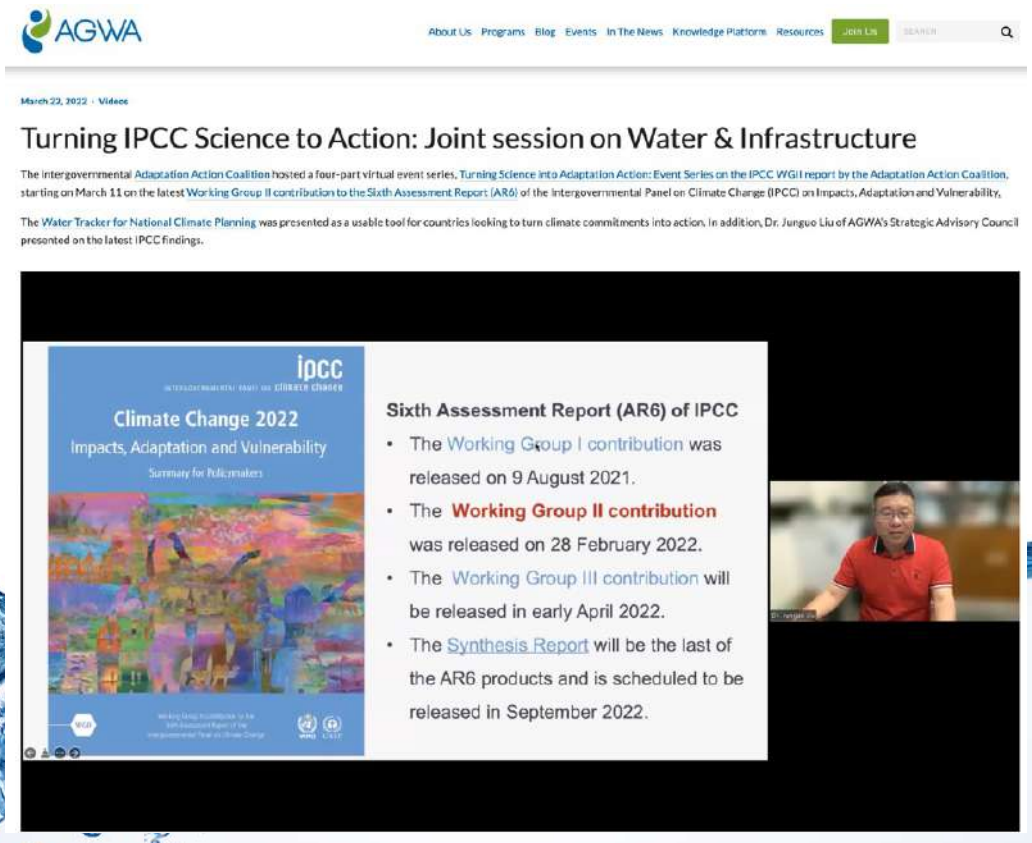
AAC / IPCC WGII Report Launch Event Series

Concept Note

Working Title: IPCC WGII Event Series by the Adaptation Action Coalition: Turning Adaptation Science to Action

What: A four-part public, virtual event series linking IPCC WGII report launch with AAC workstreams
Hosts: AAC Secretariat (WRI), Workstream lead organizations, AAC co-chairs, steering committee and member countries
Audience: Public, with targeted outreach to AAC member countries and prospective members
Series Dates: ~March 11-30
Platform: Virtual (Zoom) and shared recordings

Session	Host/co-host	Invited Speakers & Agenda	Dates (proposed)	Time
WGII Report Kick-off: Overview of the science behind the IPCC WGII report and the road ahead for adaptation action	AAC Secretariat	WGII co-chair Debra Roberts (confirmed), Nigel Topping (tbc), Anne-Marie Trevelyan (tbc), Other high-level adaptation advocates	March 11 (Friday)	9-10am EDT
Turning science to action: Joint technical session on IPCC guidance for the Water & Infrastructure sectors	AAC + AGWA & CCRI	Author of WGII chapter on water + AGWA speaker; Author of WGII chapter on Infrastructure + CCRI speaker 5 mins intro 15 min - presentation from Water IPCC author on science 10 mins - AGWA rep on turning science to adaptation action 15 min - presentation from Infrastructure IPCC author on science 10 mins - CCRI rep on turning science to adaptation action	March 16 (Weds) (tbc)	8-9:30am EDT (tbc)



March 11

Professor Deliang CHEN and Professor Junguo LIU actively engaged in the IPCC AR6 (continued)

On March 23, **Professor Junguo LIU** presented “Water Scarcity and Nature-based Solutions in a Changing Climate” on the 2022 World Meteorological Day Thailand Online Seminar.

Professor Junguo LIU has published two interpretation articles related to IPCC AR6:

- LIU Junguo, MENG Ying, ZHANG Xue-Jing. Interpretation of IPCC AR6 report: Groundwater. Climate Change Research, doi: 10.12006/j.issn.1673-1719.2022.036.
- LIU Junguo, CHEN He, TIAN Zhan. Interpretation of IPCC AR6: climate change and water security. Climate Change Research, doi: 10.12006/j.issn.1673-1719.2022.051.

May 26

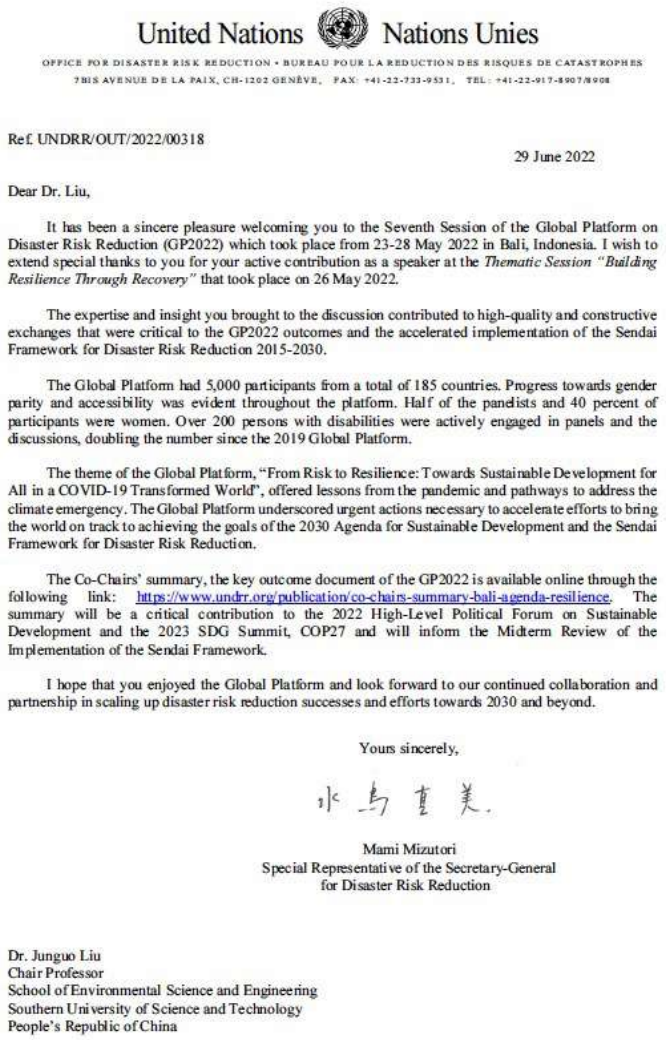
Professor Junguo LIU speaks at the 7th session of the Global Platform for Disaster Risk Reduction

On May 25-27, 2022, the 7th Session of the Global Platform for Disaster Risk Reduction (GP2022) was held in Bali, Indonesia in a combination of online and offline methods, with the theme of "From Risk to Resilience: Global Sustainable Development under the Impact of the Epidemic".

Chair Professor Junguo LIU of the School of Environmental Science and Engineering, Southern University of Science and Technology, was invited to participate in this conference and delivered a presentation at the special session “Building Resilience Through Recovery”. Professor LIU addressed the importance of stepwise ecological restoration, carbon neutrality, and nature-based solutions for green recovery and biodiversity conservation. These topics are important for Disaster Risk Reduction for the Lancang-Mekong River Basin.

The GP2022 brought together the Disaster Risk Reduction and climate communities around a concrete goal: finding solutions to scale up climate adaptation. And several early warning initiatives showed interesting parallels in taking this agenda forward.

Professor Junguo LIU speaks at the 7th session of the Global Platform for Disaster Risk Reduction (continued)



United Nations Nations Unies

OFFICE FOR DISASTER RISK REDUCTION • BUREAU POUR LA REDUCTION DES RISQUES DE CATASTROPHES
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Ref. UNDRR/OUT/2022/00318

29 June 2022

Dear Dr. Liu,

It has been a sincere pleasure welcoming you to the Seventh Session of the Global Platform on Disaster Risk Reduction (GP2022) which took place from 23-28 May 2022 in Bali, Indonesia. I wish to extend special thanks to you for your active contribution as a speaker at the *Thematic Session "Building Resilience Through Recovery"* that took place on 26 May 2022.

The expertise and insight you brought to the discussion contributed to high-quality and constructive exchanges that were critical to the GP2022 outcomes and the accelerated implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030.

The Global Platform had 5,000 participants from a total of 185 countries. Progress towards gender parity and accessibility was evident throughout the platform. Half of the panelists and 40 percent of participants were women. Over 200 persons with disabilities were actively engaged in panels and the discussions, doubling the number since the 2019 Global Platform.

The theme of the Global Platform, "From Risk to Resilience: Towards Sustainable Development for All in a COVID-19 Transformed World", offered lessons from the pandemic and pathways to address the climate emergency. The Global Platform underscored urgent actions necessary to accelerate efforts to bring the world on track to achieving the goals of the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction.

The Co-Chairs' summary, the key outcome document of the GP2022 is available online through the following link: https://www.undrr.org/publication/co-chairs-summary-bali-agenda-resilience. The summary will be a critical contribution to the 2022 High-Level Political Forum on Sustainable Development and the 2023 SDG Summit, COP27 and will inform the Midterm Review of the Implementation of the Sendai Framework.

I hope that you enjoyed the Global Platform and look forward to our continued collaboration and partnership in scaling up disaster risk reduction successes and efforts towards 2030 and beyond.

Yours sincerely,

水鳥真美.

Mami Mizutori
Special Representative of the Secretary-General
for Disaster Risk Reduction

Dr. Junguo Liu
Chair Professor
School of Environmental Science and Engineering
Southern University of Science and Technology
People's Republic of China

After the Session, the Special Representative of the United Nations Secretary-General for Disaster Risk Reduction, Ms. Mami Mizutori, has sent special thank to **Professor Junguo LIU**'s active contribution, saying that "The expertise and insight you brought to the discussion contributed to high-quality and constructive exchanges that were critical to the GPI2020 outcomes and the accelerated implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030."

February 15

Many project members ranked on the 2021 Highly Cited lists

Many project members ranked highly cited by international rankings. Stanford University has recently released an update of the list that comprises *the top 2% scientists* in various scientific fields. Among other scholars, Professor **Deliang CHEN**, Professor **Junguo LIU**, Professor **Qingyun DUAN**, Professor **Xuejie GAO**, Professor **Yan ZHENG**, and Associate Professor **Lian FENG** have been recognized on the updated list of Top 2% Scientists Worldwide.

Professor **Junguo LIU** and Associate Professor **Zhenzhong ZENG** are listed as *the top 1% Highly Cited Researchers* identified by Clarivate. The list of Highly Cited Researchers for 2021 identifies scientists and social scientists who have demonstrated significant and broad influence through publication of multiple highly-cited papers during the last decade.

Professor **Junguo LIU** and Associate Professor **Zhenzhong ZENG** are also listed as the *Elsevier 2021 Highly Cited Chinese Researchers*. The number of people on the 2021 list has risen from about 2000 in previous years to 4,701, which has attracted great attention from many media and scholars at home and abroad.

January 26

Professor Junguo LIU elected the 2021 American Association for the Advancement of Science (AAAS) Fellow

Chair Professor Junguo LIU of the School of Environmental Sciences and Engineering at the Southern University of Science and Technology (SUSTech), was elected as a Fellow of the American Association for the Advancement of Science (AAAS) in 2021 in recognition of his distinguished contributions to spatially explicit water and nitrogen flux accounting in ecosystem, and for river restoration, both in China and at a global level.

The AAAS Council elected 564 members as 2021 Fellows of AAAS. Election as a Fellow honors members whose efforts on behalf of the advancement of science or its applications in service to society have distinguished them among their peers and colleagues.

AAAS

The American Association for the Advancement of Science certifies that

Junguo Liu

was elected a

FELLOW

For groundbreaking contributions to spatially explicit water and nitrogen flux accounting in ecosystems, and for river restoration, both in China and at a global level

this 20th day of October 2021

in testimony whereof the President and the Chief Executive Officer have hereunto set their hands and the seal of the Association.

Susan Amara, President

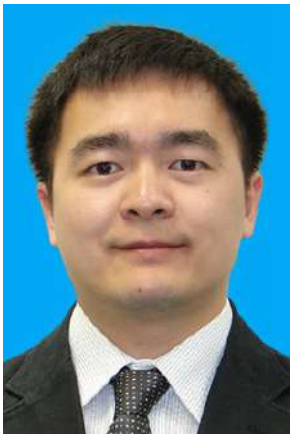
Sudip Parikh, Chief Executive Officer

January 21

Professor Qiuhong TANG receives 2021 Youth Science and Technology Award from the Chinese Academy of Sciences

On January 20, **Professor Qiuhong TANG** at Institute of Geographic Sciences and Natural Resources Research, the Chinese Academy of Sciences (CAS), received the 2021 Youth Science and Technology Award from the CAS.

The Youth Science and Technology Award of the CAS aims to recognize a group of advanced figures and young experts who have made outstanding contributions to the scientific and technological innovation activities of the CAS. The CAS awarded a total of ten young researchers with the 2021 Youth Science and Technology Award.



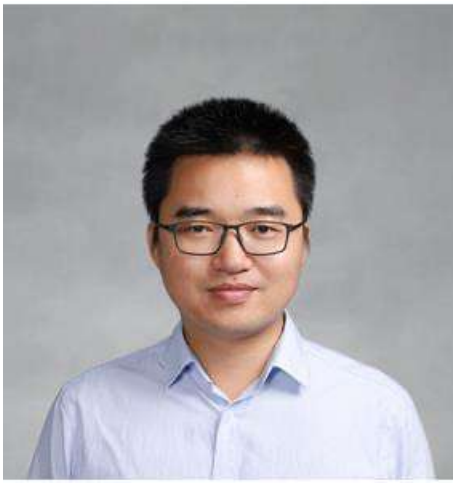
Professor Qiuhong TANG joined the CAS in 2010. He has been engaged in modeling and predicting the land surface hydrologic processes and understanding changes in the terrestrial water cycle and water resources related to human-induced climate change, disturbance of human activity, and natural variability.

June 5

Professor Lian FENG wins 2021 Youth Science and Technology Award from the Geographical Society of China

On June 5, **Lian FENG**, Associate Professor of the School of Environmental Science and Engineering at the Southern University of Science and Technology (SUSTech), received the 2021 Youth Science and Technology Award from the Geographical Society of China (GSC).

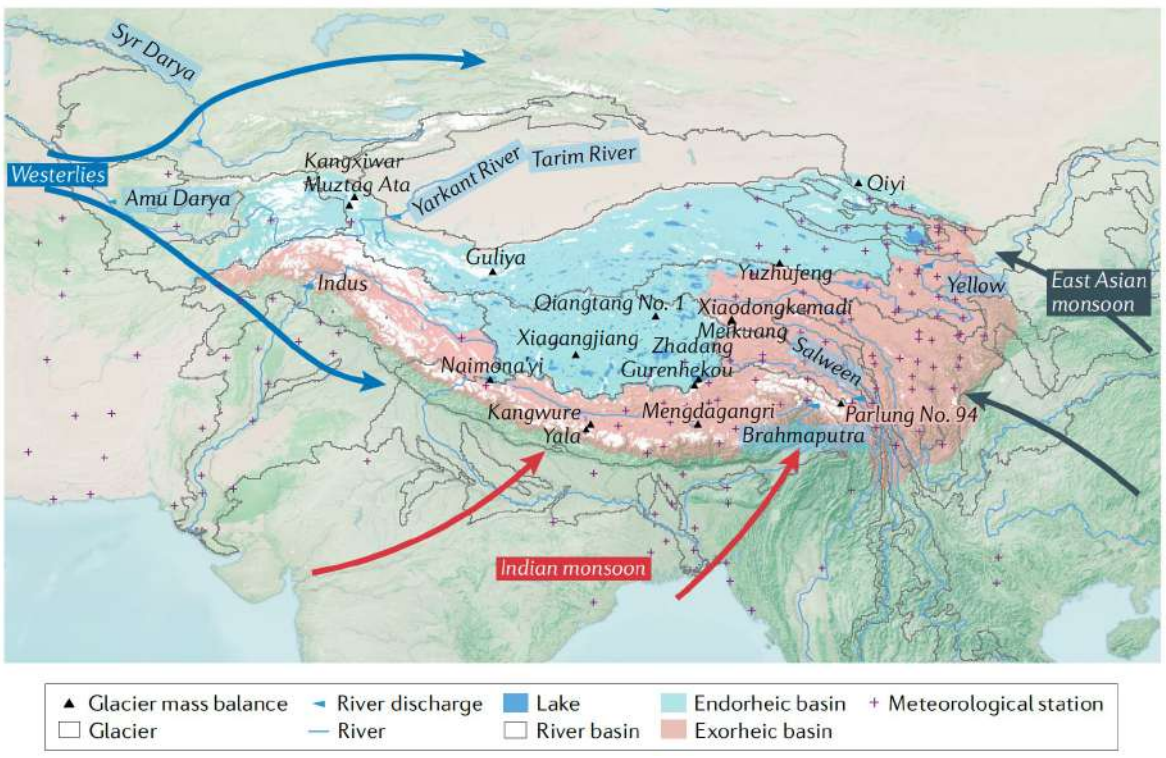
The Youth Science and Technology Award from GSC aims to promote the growth of talents of China's geographical sciences organizations and recognize exceptional young geographical science and technology workers who have made outstanding contributions to geographical science and technology work. It is selected every two years, with at most ten recipients each time.



Professor Lian FENG joined SUSTech in 2017. He has been engaged in the theory, method, and application of remote sensing of inland and coastal water environments. Prof. FENG has published more than 50 SCI papers in top journals such as Nature, Nature Geoscience, Remote Sensing of Environment, Environmental Science & Technology.

TPE Scientists address the Imbalance of the Asian Water Tower

The Hindu Kush–Karakoram–Himalayan system, named the Third Pole because it is the largest global store of frozen water after the polar regions, provides a reliable water supply to almost 2 billion people. Marked atmospheric warming has changed the balance of this so-called Asian water tower and altered water resources in downstream countries. **Prof. Tandong YAO and Prof. Deliang CHEN, and an international team** published a review on Nature Reviews Earth & Environment, synthesize observational evidence and model projections that describe an imbalance in the Asian water tower caused by accelerated transformation of ice and snow into liquid water. The phase change is associated with a south–north disparity due to the spatio-temporal interaction between the westerlies and the Indian monsoon.



A corresponding spatial imbalance is exhibited by alterations in freshwater resources in endorheic or exorheic basins. Global warming is expected to amplify this imbalance, alleviating water scarcity in the Yellow and Yangtze River basins and increasing scarcity in the Indus and Amu Darya River basins. However, the future of the Asian water tower remains highly uncertain. Accurate predictions of future water supply require the establishment of comprehensive monitoring stations in data-scarce regions and the development of advanced coupled atmosphere–cryosphere–hydrology models. Such models are needed to inform the development of actionable policies for sustainable water resource management.

The results were published in ***Nature Reviews Earth & Environment***
Full article link: **https://doi.org/10.1038/s43017-022-00299-4**

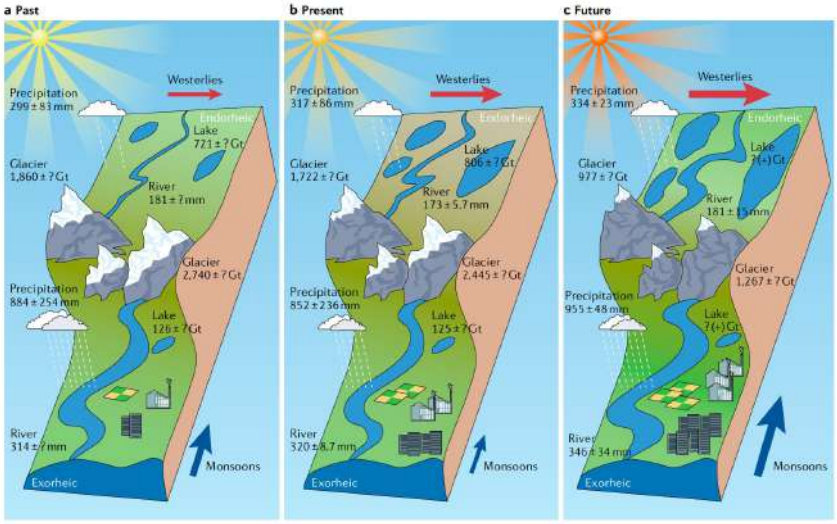


Figure 1: Schematic of the status of the asian water tower in the past, present and future. a–c | Past (1980–1990) (part a), present (2006–2015) (part b) and future (2080–2100) (part c) of the Asian water tower (AWT). Red arrows indicate strength of mid-latitudinal westerlies and blue arrows strength of Indian summer monsoon. Predicted changes in precipitation, run-off and glacier based on World Climate Research Programme (WCRP) Coupled Model Intercomparison Project Phase 5 (CMIP5) simulations under a moderate warming scenario (representative concentration pathway (RCP) 4.5).

Research

Flood Inundation in the Lancang-Mekong River Basin: Assessing the Role of Summer Monsoon

Up to now, a series of studies, including historical flood evolution and future flood projections, have shown signals of increasing floods in the Lancang-Mekong River Basin (LMRB). Though it is well known that precipitation and flood pulses in the LMRB are largely impacted by monsoons, it is unclear to what extent flood inundation characteristics (i.e., inundation frequency, depth, area, and timing) in the basin respond to different monsoon types and monsoon combined effect i.e., the Indian summer monsoon (ISM), the Western North Pacific Monsoon (WNPM), and their combined effect (ISWN). Recently, **Prof. Qiuhong TANG**'s group used an improved hydrological - hydrodynamic model (VIC and CaMa-Flood) to generate flood inundation in the LMRB during 1967–2015, from which the inundation characteristics were extracted and calculated.

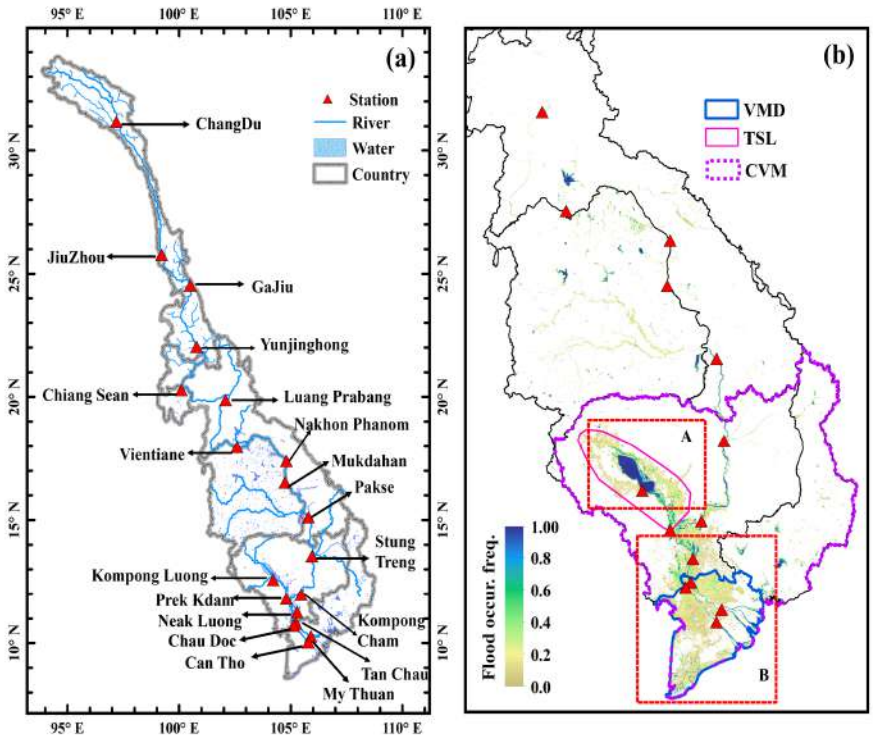


Figure 1: Overview of the basin and the daily flood occurrence frequency distribution

Research

The monsoon impact on inundation characteristics was quantified using the slope from linear regression models. The results show the monsoons and the ISWN overall have a positive impact on inundation frequency, depth, and area, while the inundation timing is usually advanced when the WNPM or the ISWN strengthens but delayed when the ISM strengthens. On average, a unit change in different monsoons can cause, 7.7%–14.2% change in inundation frequency, 5.3%–8.1% change in inundation depth and 4.3 days–5.8 days change in inundation timing for depth, which can also lead to 1.0%–4.3% change in inundation area and 2.8 days–3.8 days change in inundation timing for area.

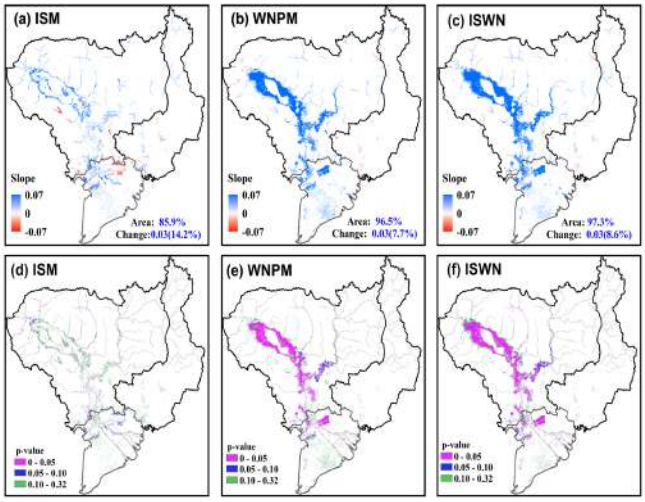


Figure 2: The monsoon impact on inundation frequency.

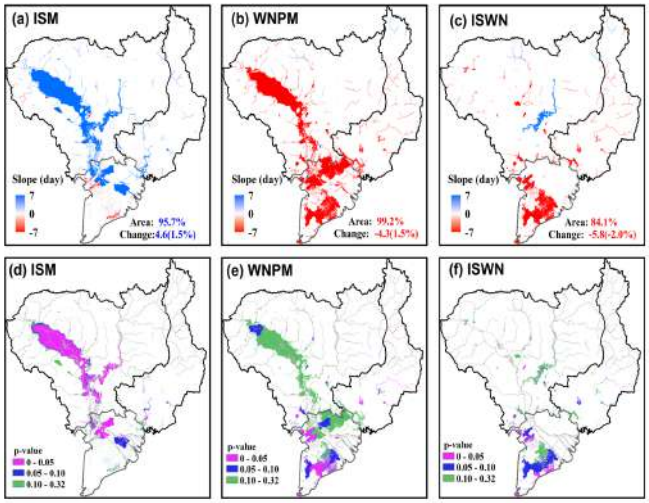


Figure 3: The monsoon impact on inundation depth timing.

The results were published in ***Journal of Hydrology***
Full article link: **https://doi.org/10.1016/j.jhydrol.2022.128075**

Research

Divergent and changing importance of glaciers and snow as natural water reservoirs

Glaciers and snow are natural water reservoirs in the Tibetan Plateau (TP), affecting ecosystems, water and food security, and more than one billion downstream people. Meltwater volumes are traditionally estimated using the degree-day concept considering only air temperature, which cannot consider the influence from downward solar and longwave radiation, humidity, wind and resultant turbulent heat fluxes. **Prof. Junguo LIU's group** used a physically based energy budget approach considering the full energy balance in seven large river basins in the eastern and southern Tibetan Plateau.

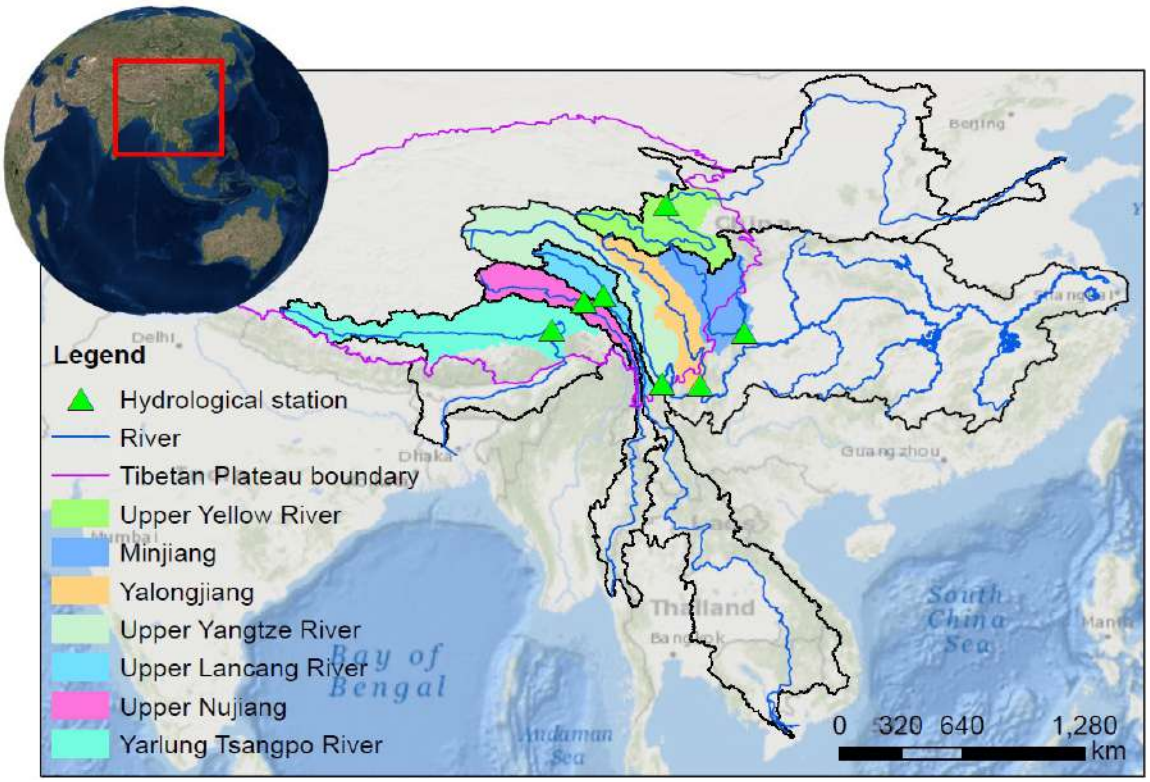


Figure 1: The study region.

For 1982-2011, they estimated that the average glacier melt was 0.32 m water equivalent/year with large spatial variability, and the glacier melt accelerated with a rate of 0.42 mm/year. On average, snow and glacier melt contributed 17.6% of annual river discharge during 1982-2011, including 10.0% from snow and 7.6% from glaciers. Mainly due to decreasing snow melt, glacier and snow melt contributions to discharge would decrease to 11.9% during 2021-2050 under the extreme climate scenario. The study provides critical information on the importance of glaciers and snow as natural water reservoirs to sustain freshwater supplies for people and ecosystems.

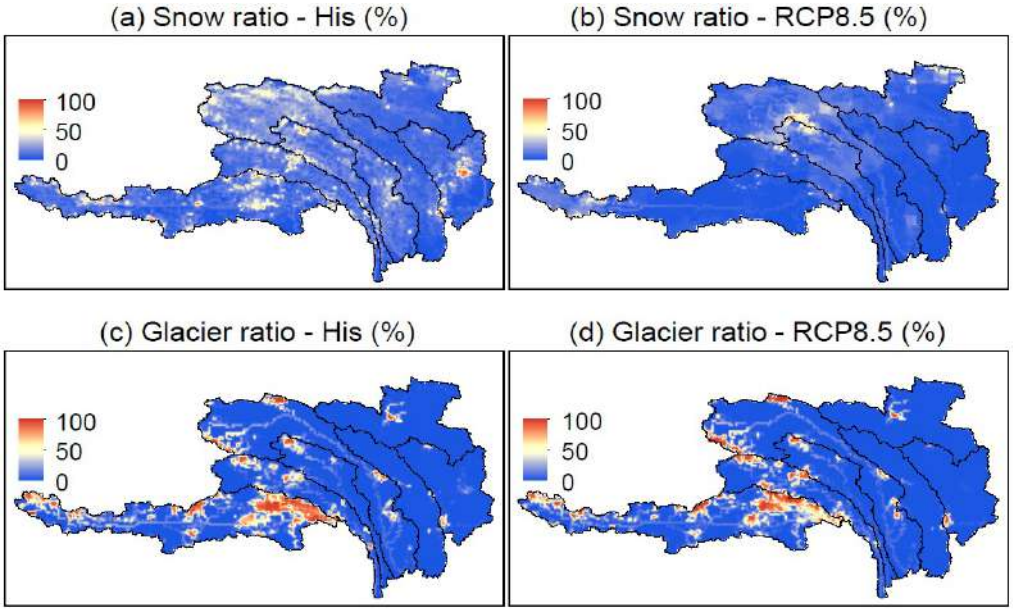


Figure 2: Snow and glacier melt contribution to discharge in the eastern and southern Tibetan Plateau.

The work was published in ***Journal of Geophysical Research: Atmospheres***
Full article link***: https://doi.org/10.1029/2021JD035888.***

Research

Large net forest loss in Cambodia's Tonle Sap Lake protected areas during 1992–2019

Historical land-use practices have caused forest loss in Cambodia's Tonle Sap Lake area (TSLA), the largest freshwater lake in Southeast Asia. However, it remains unclear if this deforestation trend had continued since 2001 when the land was designated as protected areas.

Led by **Dr. Aifang CHEN**, **Prof. Deliang CHEN** and an international research team, investigated forest conversion flows and fragmentation patterns in the TSLA for 1992–2001, 2001–2010, and 2010–2019, using the European Space Agency (ESA) Climate Change Initiative (CCI) Land Cover product. By comparing the land-use/land cover change (LUCC) and forest cover change in the TSLA, the study aimed to provide a better understanding on changes in forest area in the TSLA protected area, which is critical for informing policy decisions and economic values for ecosystem protection.

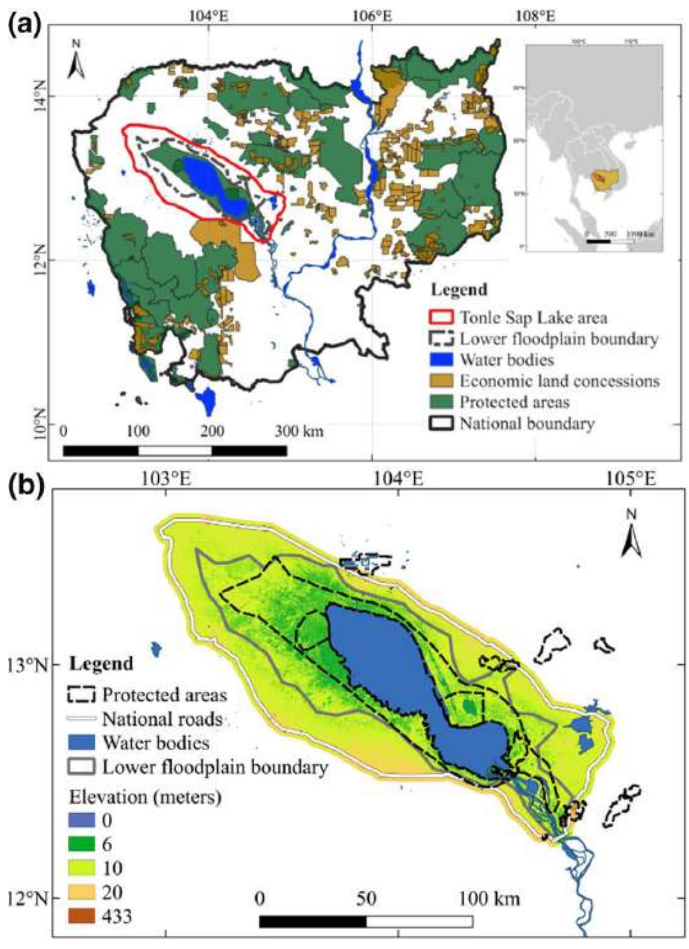


Figure 1: Cambodia and the Tonle Sap Lake area.

Research

Results show substantial forest losses and fragmentations occurring at the lower floodplain where the protected areas are located until 2010, with some forest regain during 2010–2019. The land conversions indicated that forest clearing and agricultural farming were the primary causes for observed extensive forest loss during 1992–2010.

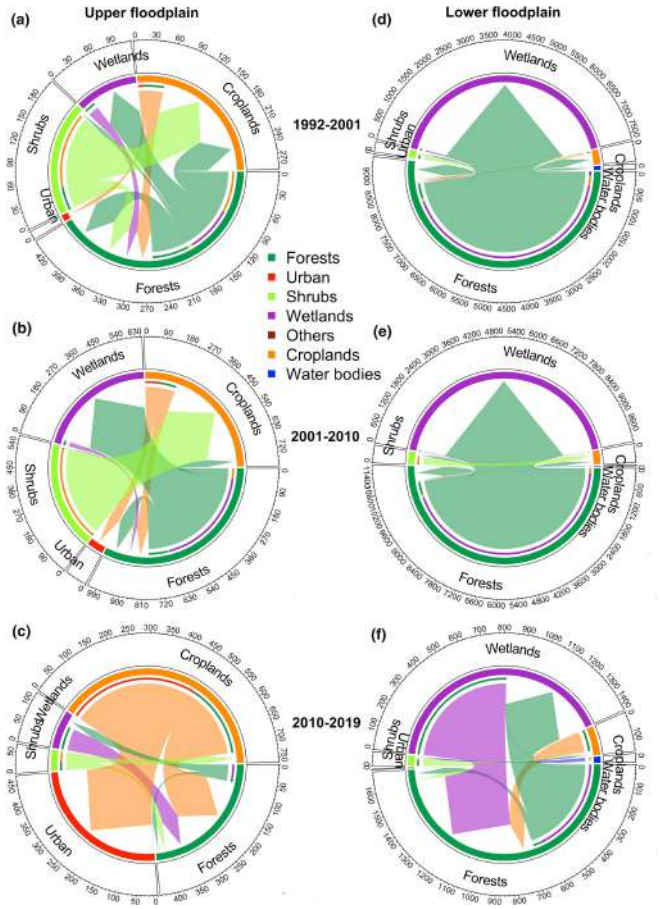


Figure 2: Land cover conversion flow in the Tonle Sap Lake area for a, d 1992–2001, b, e 2001–2010, and c, f 2010–2019: a–c in the upper floodplain, and d–f lower floodplain.

Hence, despite the creating of protected areas in 2001, our findings reveal the persistence of alarming forest loss in the TSLA until 2010. Thus, more effective planning and implementations of forest management and restoration policies are needed for the TSLA.

The results were published in ***Ambio***.

Full article link:

https://doi.org/10.1007/s13280-022-01704-4

Research

Evaluation of six gauge-based gridded climate products for analyzing long-term historical precipitation patterns across the Lancang-Mekong River Basin

Freshwater plays a vital role in global sustainability by improving human lives and protecting nature. In the Lancang-Mekong River Basin (LMRB), sustainable development is principally dependent upon precipitation that predominantly controls freshwater resources availability required for both life and livelihood of ~70 million people.

Led by **Dr. Masoud IRANNEZHAD** and **Prof. Junguo LIU**, this study comprehensively analyzed long-term historical precipitation patterns throughout the LMRB as well as its upper (Lancang River Basin) and lower (Mekong River Basin) parts employing six gauge-based gridded climate products. Accordingly, annual and seasonal (dry and wet) precipitation time series were calculated for three study periods: century-long outlook (1901-2010), mid-past (1951-2010), and recent decades (1981-2010).

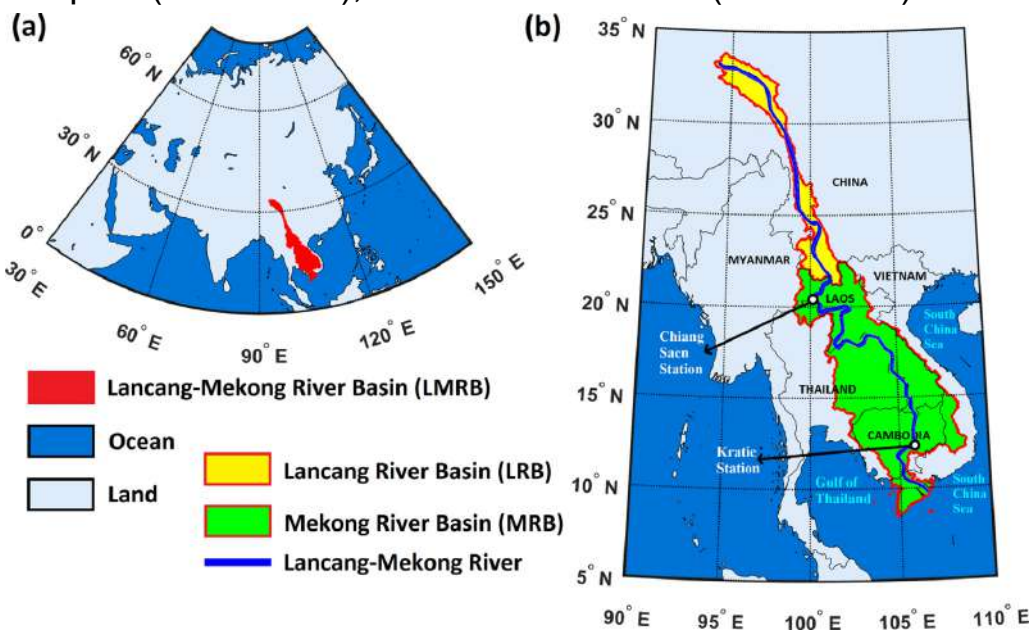


Figure 1: (a) The location of the Lancang-Mekong River Basin (LMRB) and (b) the Lancang River Basin (LRB) and the Mekong River Basin (MRB) .

The results generally showed that: all such changes were fundamentally attributed to increases in precipitation variability on both annual and seasonal scales over time; these variations were most strongly associated with the Pacific Decadal Oscillation (PDO), Atlantic Multi-decadal Oscillation (AMO) and East Pacific/North Pacific (EP/NP) pattern in the LMRB and the MRB during 1951-2010, but with the North Sea-Caspian Pattern (NCP) and the Southern Annular Mode (SAM) in the LRB; such relationships got stronger in 1981-2010, while the Southern Oscillation Index (SOI) became the most influential teleconnection for dry season precipitation variability across all basins; and GPCC (APHRODITE) provided the most reliable gauge-based gridded precipitation time series over the LMRB for the years before (after) 1951. These findings lay a foundation for further studies focusing on water resources and sustainable development in the LMRB.

The results were published in ***Geography and Sustainability***.
Full article link: ***https://doi.org/10.1016/j.geosus.2022.03.002***

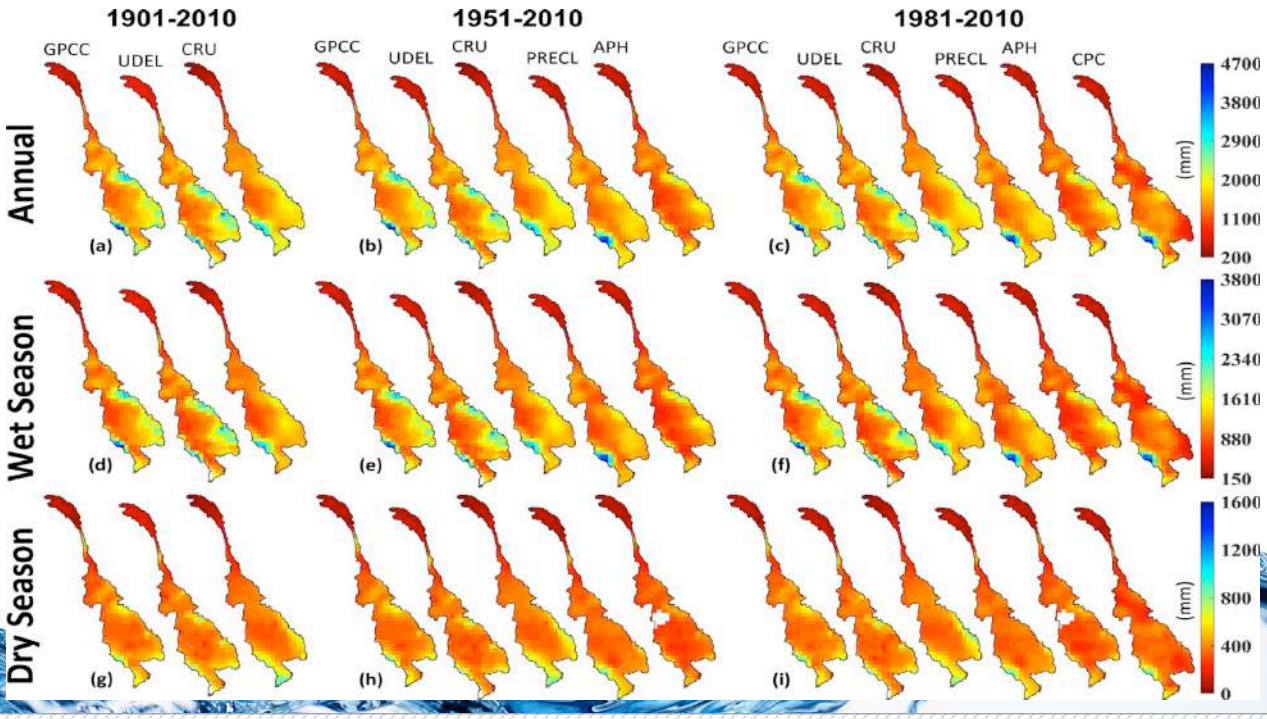


Figure 2: Spatio-temporal variations in historical long-term average values for annual (a-c) and seasonal (d-i) precipitation throughout the LMRB during 1901-2010, 1951-2010, and 1981-2010 based on all six gauge-based gridded climate products of GPCC, UDEL, CRU, PRECL, APHRODITE (APH), and CPC.

Publications

Selected Publications Since 2022

- Ban, Y., Leng, G., & Tang, Q. (2022). Compounding precipitation effect in modulating maize yield response to global warming. *International Journal of Climatology*. https://doi.org/10.1002/joc.7652.
- Gao, K., Duan, A., Chen, D., Wang, J., & Tang, B. (2022). 'Arctic autumn warming since 2002 dominated by changes in moisture modulated by multiple large-scale atmospheric circulations', *Atmospheric Research*, 265: 105879. https://doi.org/10.1016/j.atmosres.2021.105879.
- Hosseini-Moghari, S. M., Sun, S., Tang, Q., & Groisman, P. Y. (2022). Scaling of precipitation extremes with temperature in China's mainland: Evaluation of satellite precipitation data. *Journal of Hydrology*, 606, 127391. https://doi.org/10.1016/j.jhydrol.2021.127391.
- Hosseini-Moghari, S. M., & Tang, Q. Can IMERG Data Capture the Scaling of Precipitation Extremes With Temperature at Different Time Scales?. *Geophysical Research Letters*, 2022, *49*(3), e2021GL096392. https://doi.org/10.1029/2021GL096392.
- Irannezhad, M., Ahmadi, B., Liu, J., Chen, D., & Matthews, J. H. (2021). Global Water Security: A Shining Star in the Dark Sky of Achieving the Sustainable Development Goals, Sustainable Horizons: 100005. https://doi.org/10.1016/j.horiz.2021.100005.

Publications

Selected Publications Since 2022 (continued)

- Li, D., Qi, Y., & Chen, D. (2022). Changes in rain and snow over the Tibetan Plateau based on IMERG and ground-based observation. Journal of Hydrology. 606 127400, DOI: 10.1016/j.jhydrol.2021.127400.
- Liu, B., Tang, Q., Zhao, G., Gao, L., Shen, C., & Pan, B. (2022). Physics-Guided Long Short-Term Memory Network for Streamflow and Flood Simulations in the Lancang–Mekong River Basin. *Water*, 14(9), 1429. https://doi.org/10.3390/w14091429.
- Su, B., Xiao, C., Chen, D., Ying, X., Huang, Y., Guo, R., Zhao, H., Chen, A., & Che, Y. (2022). Mismatch between the population and meltwater developments creates opportunities and risks for global glacier-fed basins. *Science Bulletin* 67, 9-12. https://doi.org/10.1016/j.scib.2021.07.027
- Su, B, Xiao, C., Chen, D., Huang, Che, Y., Zhao, H., Zou, M., Guo, R., Wang, X., & Li. X. (2022). Glacier change in China over past decades: Spatiotemporal patterns and influencing factors, *Earth-Science Reviews*, 226: 103926. https://doi.org/10.1016/j.earscirev.2022.103926.
- Su, B., Xiao, C., Zhao, H., Huang, Y., Dou, T., Wang, X., & Chen, D. (2022). Estimated changes in different forms of precipitation (snow, sleet, and rain) across China: 1961–2016, *Atmospheric Research*, 270: 106078. https://doi.org/10.1016/j.atmosres.2022.106078

Publications

Selected Publications Since 2022 (continued)

- Ullah, S., You, Q., Chen, D., Sachindra, D.A., AghaKouchak, A., Kang, S., Li, M., Zhai, P., & Ullah, W. (2022). Future population exposure to daytime and nighttime heat waves in South Asia. *Earth's Future*. https://doi.org/10.1029/2021EF002511.
- Wang, X., Feng, L., Qi, W., Cai, X., Zheng, Y., Gibson, L., et al. (2022). Continuous loss of global lake ice across two centuries revealed by satellite observations and numerical modeling. Geophysical Research Letters, 49, e2022GL099022. https://doi.org/10.1029/2022GL099022.

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