



中国科学院青藏高原研究所

Institute of Tibetan Plateau Research
Chinese Academy of Sciences

National Tibetan Plateau/Third Pole Environment Data Center (TPDC)

Min Feng

TPDC & Institute of Tibetan Plateau Research, Chinese Academy of Sciences



青藏高原地球系统与资源环境重点实验室

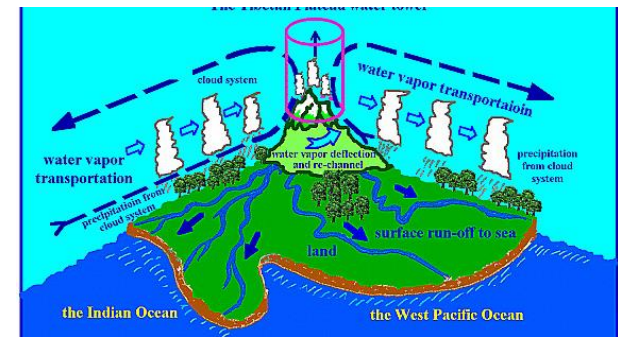
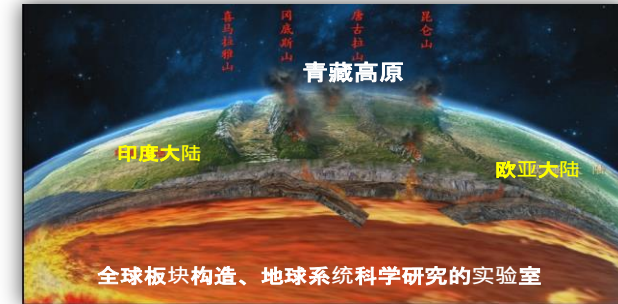
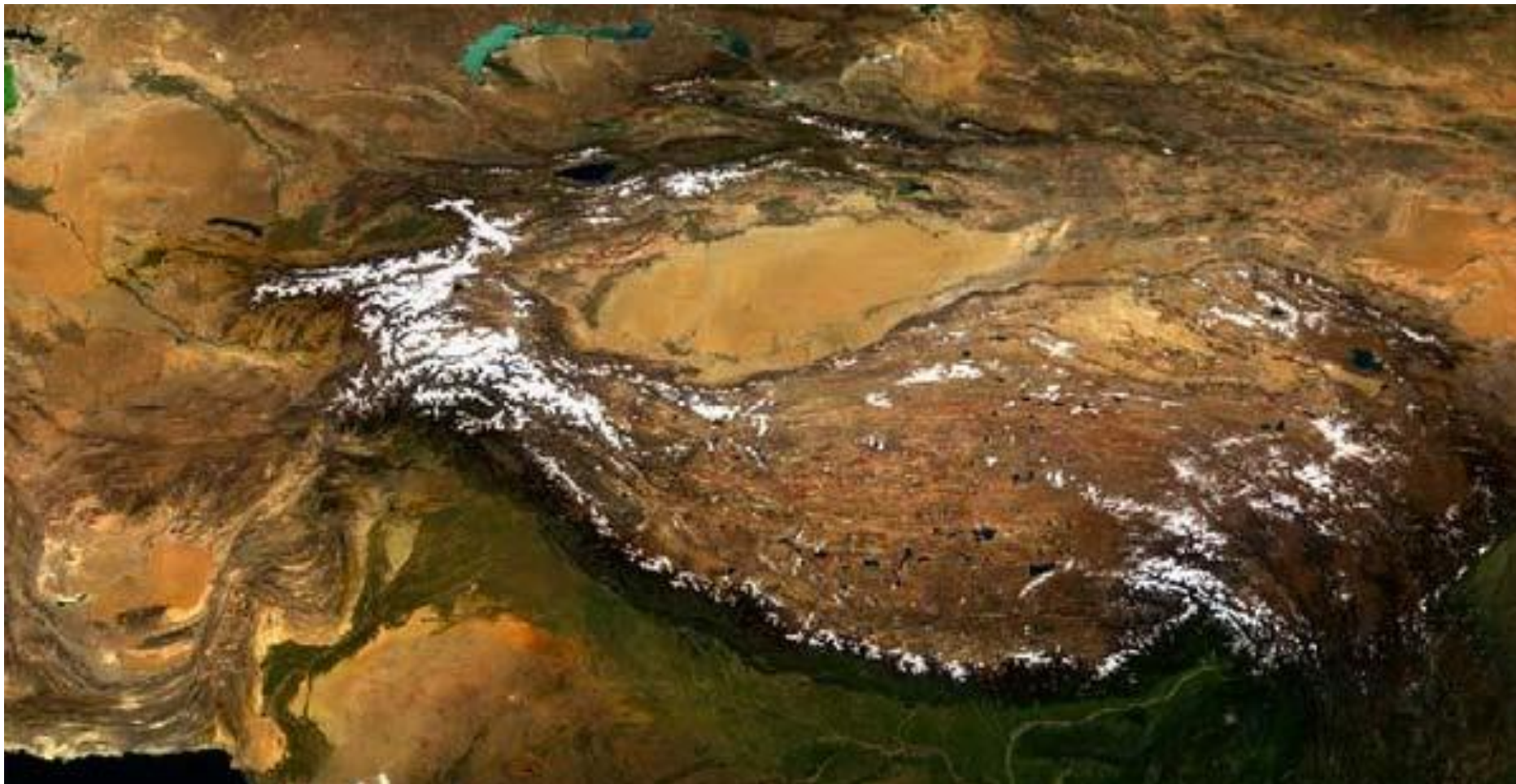
Key Laboratory of Tibetan Plateau Earth System, Environment and Resources



TPDC 国家青藏高原科学数据中心

Tibetan Plateau

The Tibetan Plateau, characterized by its unique multi-spherical features, is a region significantly impacted by global changes.





National Tibetan Plateau/Third Pole Environment Data Center (TPDC)

<https://data.tpdc.ac.cn>

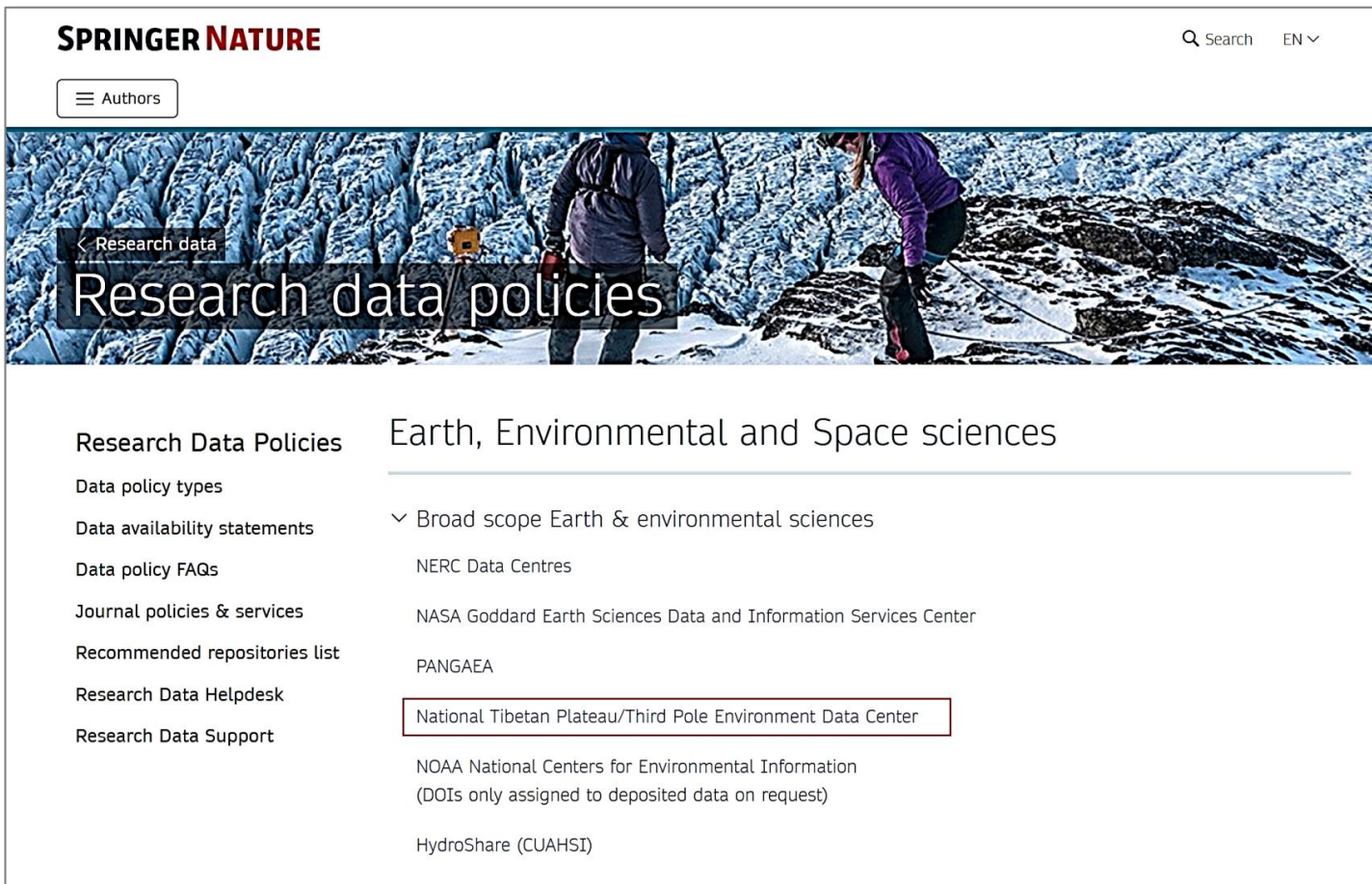


- ❑ Established in **2019**
- ❑ A **national data center** dedicated to promoting scientific data for the **Tibetan Plateau** and its surrounding regions
- ❑ Users > **140,000** Datasets > **8,500** Downloads: **685 TB** Views: **~32M**



5316 datasets (~62%) are openly available for downloading without registration

4 sub-centers in China

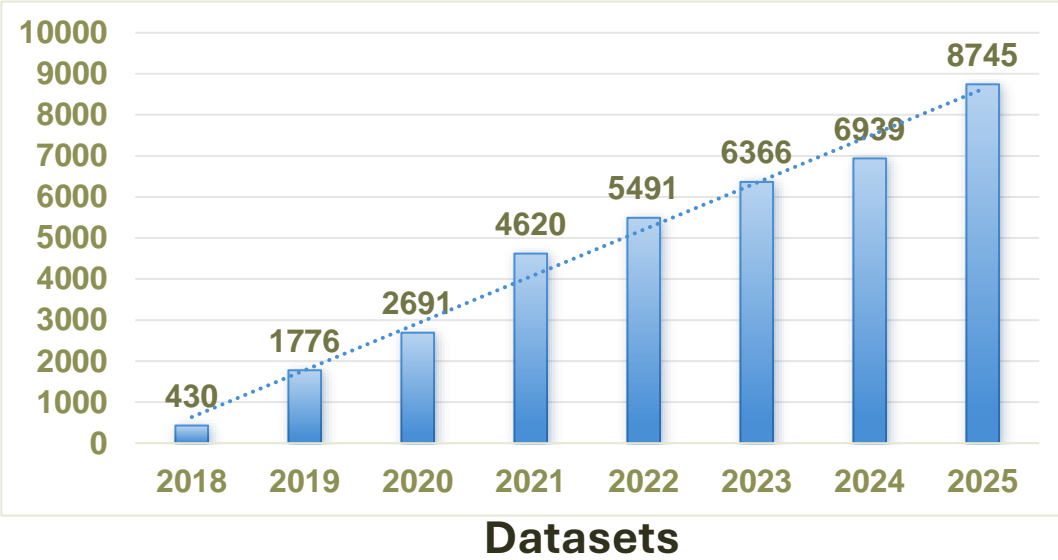


The screenshot shows the Springer Nature website's 'Research data policies' page. The header includes the Springer Nature logo, a search bar, and a language dropdown set to 'EN'. A navigation menu on the left lists: Authors, Research data, Research Data Policies, Data policy types, Data availability statements, Data policy FAQs, Journal policies & services, Recommended repositories list, Research Data Helpdesk, and Research Data Support. The main content area is titled 'Research data policies' and 'Earth, Environmental and Space sciences'. A dropdown menu is open under 'Broad scope Earth & environmental sciences', listing several data centers. The 'National Tibetan Plateau/Third Pole Environment Data Center' is highlighted with a red border.

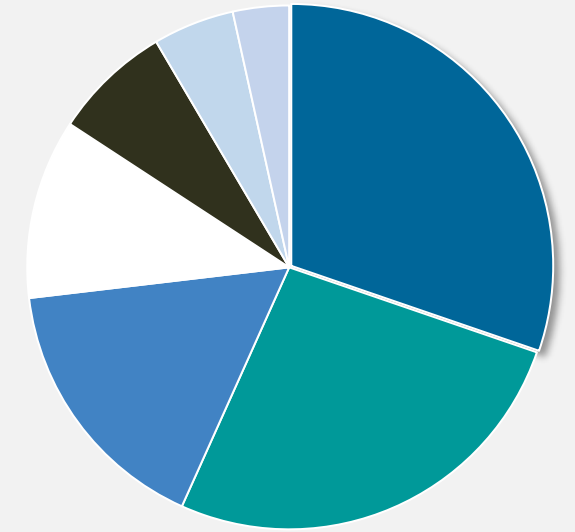
Research Data Policies	Earth, Environmental and Space sciences
Data policy types	
Data availability statements	✓ Broad scope Earth & environmental sciences
Data policy FAQs	NERC Data Centres
Journal policies & services	NASA Goddard Earth Sciences Data and Information Services Center
Recommended repositories list	PANGAEA
Research Data Helpdesk	National Tibetan Plateau/Third Pole Environment Data Center
Research Data Support	NOAA National Centers for Environmental Information (DOIs only assigned to deposited data on request)
	HydroShare (CUAHSI)

- ❑ The first data center in China certified by *Springer Nature* as a scientific data repository (July 2020)
- ❑ A trusted digital repository of the *AGU*, *ESSD* and *Data in Brief*
- ❑ The first Chinese member of *enabling FAIR data* program led by AGU
- ❑ Member of *DataCite*

Data resources



- Terrestrial Surface
- Human-nature Relationship
- Atmosphere
- Solid Earth
- Cryosphere
- Remote Sensing Technology
- Palaeoenvironment

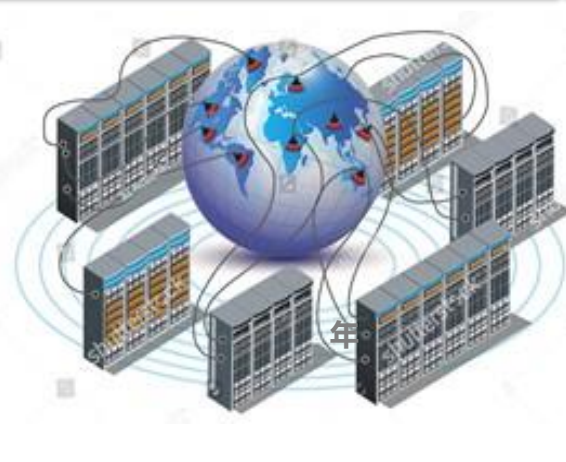


Data grocery store

Data library

Data lab

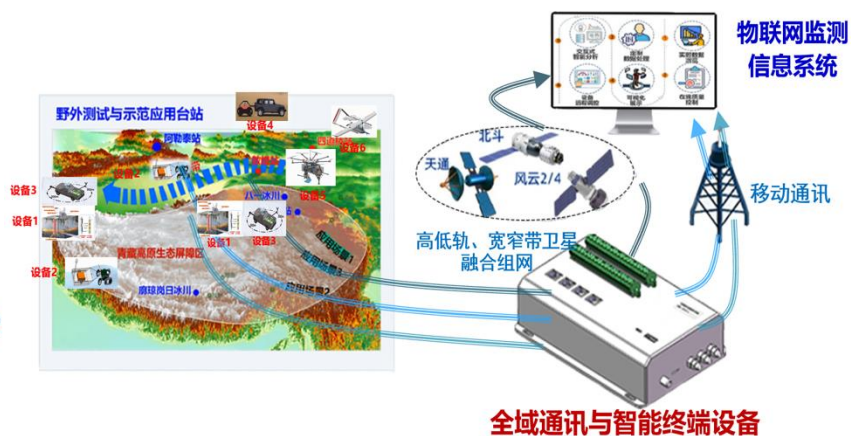
Digital twin



Develop extreme environment observation and data transmission technologies to achieve a leap from traditional point-based and sectional observations to wide-area, time-series intelligent monitoring.



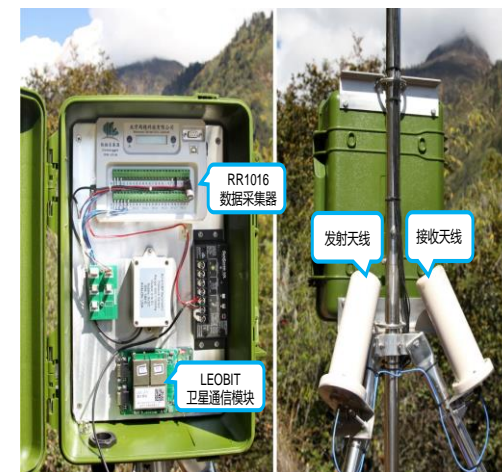
UAV-based runoff measurement system



Long-distance communication and intelligent terminal devices



Bionic eagle eye




Satellite Internet of Things (IoT) terminal

- ❑ 5 types of observation equipment and communication terminals
- ❑ Enables real-time monitoring and data transmission in extreme environments

Second Tibetan Plateau scientific expedition 2,209 datasets >220TB


The Second Tibetan Plateau Scientific Expedition (STEP) program




Brief Introduction: Second Tibetan Plateau Scientific Expedition Program

Number of Datasets: 698


Sorting ▾ Keyword(s) 🔍

- **Stratigraphic column of Ordovician Tha Manao Formation in Wat Mong Kratae section, western Thailand**


Paleozoic strata are well developed in the western Thailand area, but the detailed palaeontological research is still lacking for the Ordovician in study area. Abundant conodonts and cephalopod samples from the Tha Manao Formation in western Thailand (Sibumasu terrane, Dapingian Wat Mong Krat...

🕒 2022-02-26 👁 382 📄 0
- **Characteristic parameters and data of field investigation on the impact of disaster chain on major line engineering structures**

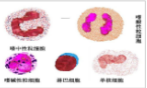
On the basis of field scientific research, this parameter set integrates the parameters of debris flow disaster chain and landslide disaster chain observed along important roads in Himalayan and Hengduan Mountains. The regional scope covers Nyingchi, Shannan, Bomi, Basu, Shigatse, Ali and other regions ...

🕒 2022-02-26 👁 379 📄 0
- **Carbon and oxygen isotopic features of marine carbonate rocks from the Wat Mong Kratae section in western Thailand (470-467 Ma)**

Carbon cycle is controlled by relative changes in carbon fluxes of global atmosphere, hydrosphere, lithosphere, and biosphere. During the geological history, carbon isotope excursions usually occur in the critical period. Carbon isotope positive excursions are recognized to be related to abundant organic buri...

🕒 2022-02-26 👁 406 📄 0
- **Carbon and oxygen isotopic features of marine carbonate rocks from the Shuangdiandaban section in Ali area, Tibet (359-340 Ma)**

In South China, standard Carboniferous $\delta^{13}\text{C}_{\text{carb}}$ curves have been established, but the isotopic patterns and values in different sections and regions can be quite different. Before the use of $\delta^{13}\text{C}_{\text{carb}}$ records to reveal global marine carbon cycling, it is necessary to conduct sedimentary facies and diagenesis analys...

🕒 2022-02-26 👁 422 📄 0
- **Systemic inflammatory and oxidative stress index of native Tibetans on the Tibetan Plateau (2021)**

The data set contains the systemic inflammatory oxidative stress indexes collected from native Tibetans in Lhasa and Nyingchi in Tibet Autonomous Region for four follow-up visits. The project carried out four follow-up surveys in Lhasa and Nyingchi from May to June and September to October 2021, and a total ...

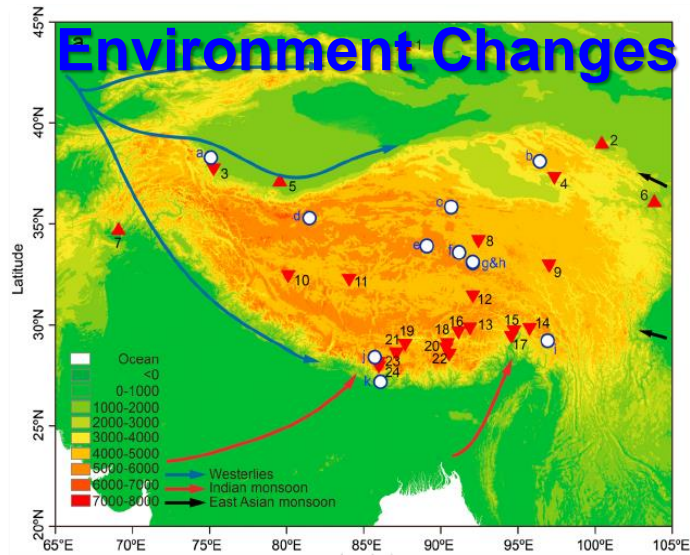
🕒 2022-02-25 👁 494 📄 0



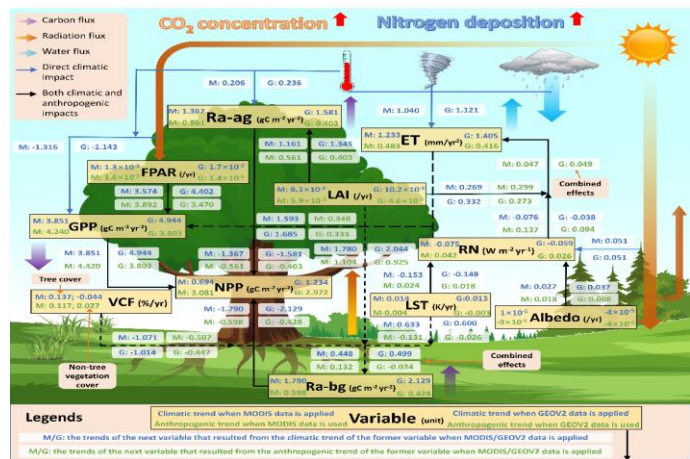
<https://data.tpdc.ac.cn/en/special/step>

From Prof. Tandong Yao

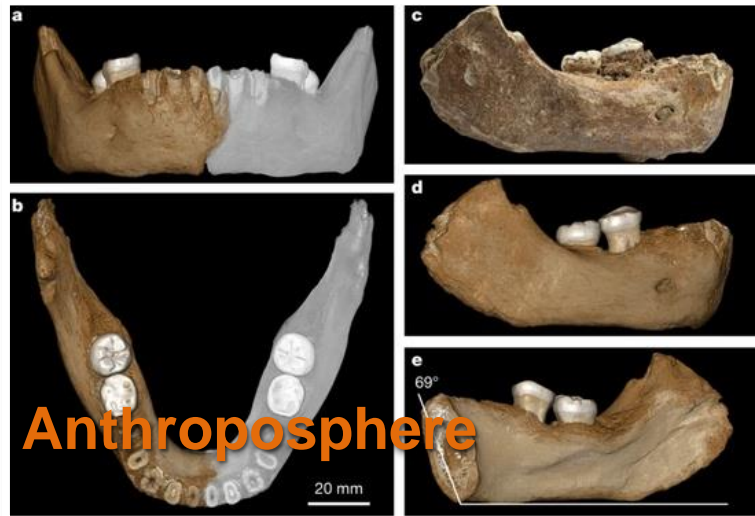
Publication associated datasets



1. Yao et al., 2012, *NC* DOI: 10.11888/Hydro.tpd.c.270100
2. Yao et al., 2013, *RG* DOI: 10.11888/Hydro.tpd.c.270940
3. Gao et al., 2011, *JC* DOI: 10.11888/Hydro.tpd.c.270937
4. Gao et al., 2016, *CD* DOI: 10.11888/Hydro.tpd.c.270938

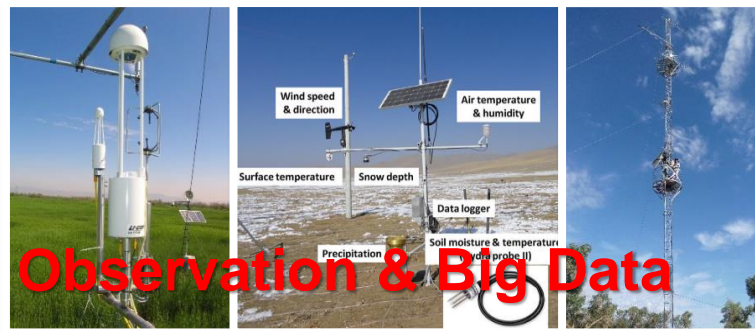


Chen et al., 2021, *GCB* DOI: 10.11888/Ecol.tpd.c.271667



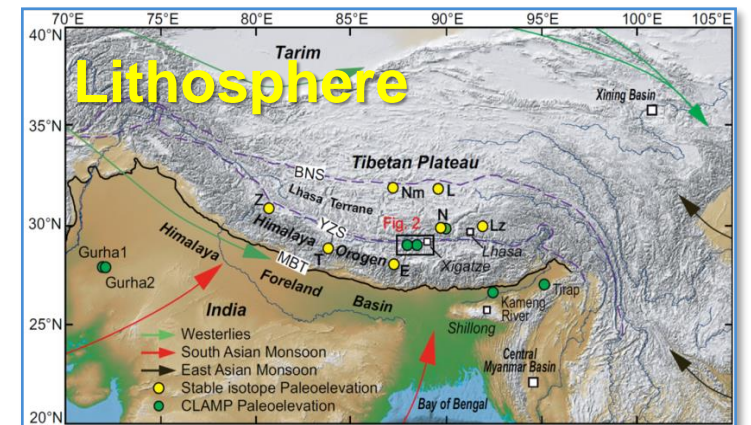
Anthroposphere

1. Chen et al., 2015, *Science* DOI: 10.11888/Paleoenv.tpd.c.270105
2. Chen et al., 2019, *Nature* DOI: 10.11888/Paleoenv.tpd.c.270296
3. Chen et al., 2008, *QSR* DOI: 10.11888/Paleoenv.tpd.c.270066
4. Zhang et al., 2020, *Science* DOI: 10.11888/Socioeco.tpd.c.271078

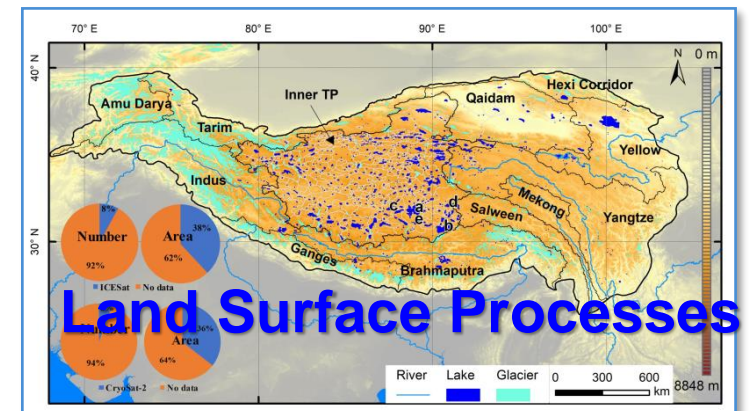


Observation & Big Data

1. Li et al., 2013, *BAMS* <https://data.tpd.c.ac.cn/en/special/heihe/>
2. Tang et al., 2019, *ESSD* DOI: 10.11888/Meteoro.tpd.c.270112
3. He et al., 2020, *SD* DOI: 10.11888/AtmosphericPhysics.tpe.249369.file
4. Ma et al., 2020, *ESSD* DOI: 10.11888/Meteoro.tpd.c.270910.
5. Yang et al., 2020, *SCES* DOI: 10.11888/AtmosphericPhysics.tpe.249448.file

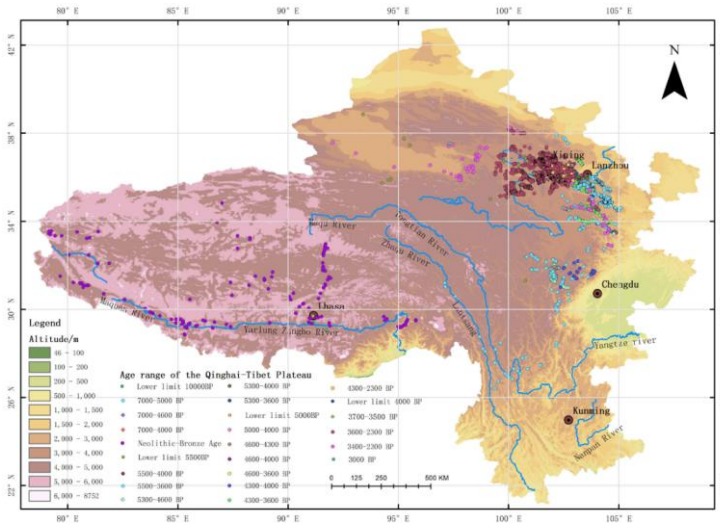


1. Ding et al., 2017, *Geology* DOI: 10.11888/Geo.tpd.c.270351
2. Huang et al., 2013, *CSB* DOI: 10.11888/Geo.tpd.c.270351
3. Huang et al., 2015, *Lithos* DOI: 10.11888/Geology.tpe.249415

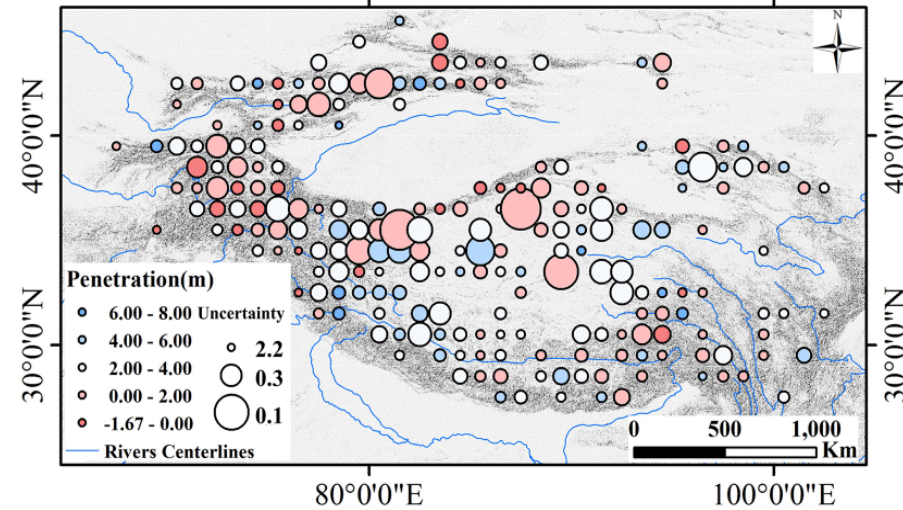


1. Zhang et al., 2019, *RSE* DOI: 10.11888/Hydro.tpd.c.271169
2. Zhang et al., 2017, *GRL* DOI: 10.11888/Hydro.tpd.c.270303
3. Zhang et al., 2014, *CSB* DOI: 10.11888/Hydro.tpd.c.270302
4. Zhang et al., 2011, *RSE* DOI: 10.11888/Lake.tpe.249466.file

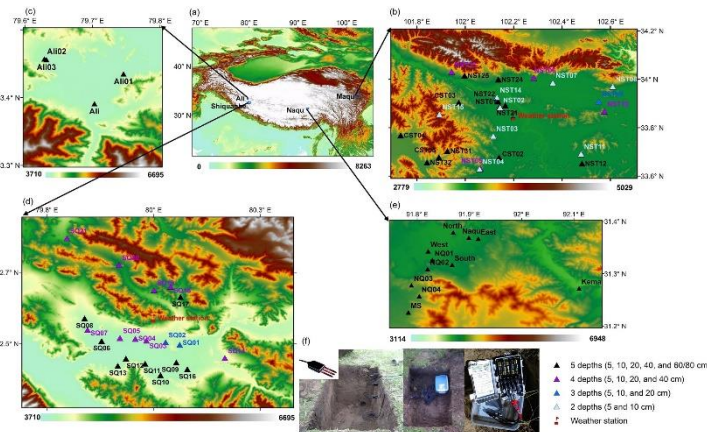
Publication associated datasets



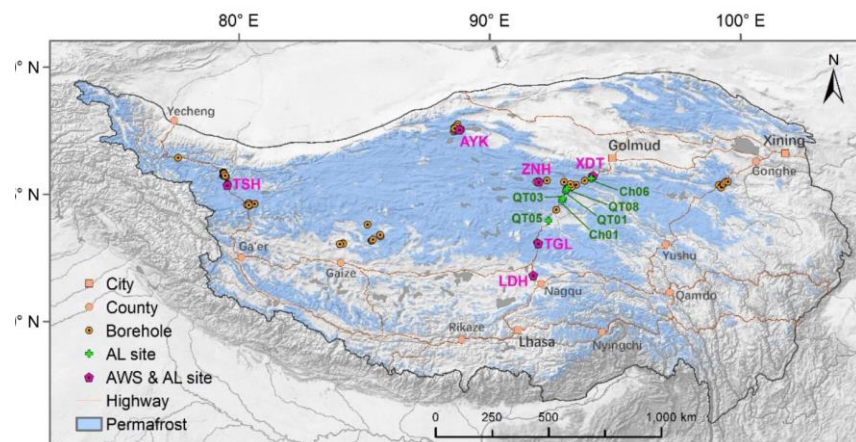
董广辉等. 2021. 青藏高原及周边地区史前时代遗址分布数据. DOI: [10.11888/Paleoenv.tpcd.270997](https://doi.org/10.11888/Paleoenv.tpcd.270997) *Science*



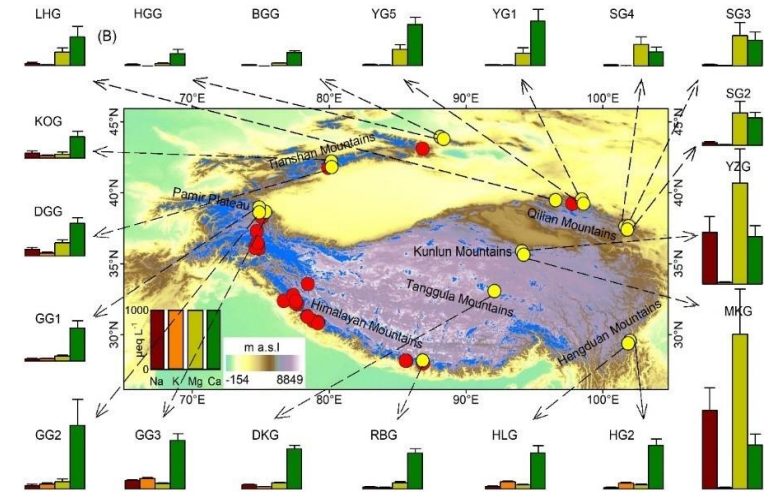
江利明. (2021). 高亚洲冰川1° × 1° 网格的SRTM C/X波段雷达穿透深度差异数据集 (2000). DOI: [10.11888/Glacio.tpcd.271279](https://doi.org/10.11888/Glacio.tpcd.271279). *IEEE J-STARS*



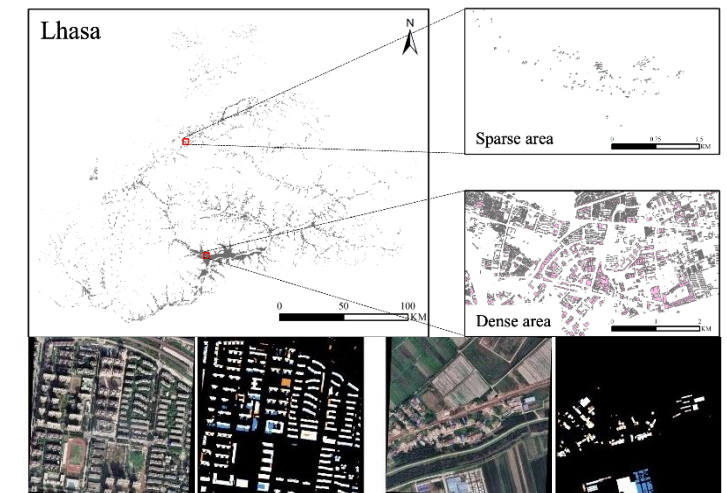
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赵林等. 2022. 青藏高原多年冻土综合监测数据集 (2002-2018). DOI: [10.11888/Geocry.tpcd.271107](https://doi.org/10.11888/Geocry.tpcd.271107) *ESSD*



李向应. (2021). 全球冰川水化学与化学风化数据集. DOI: [10.11888/Glacio.tpcd.271705](https://doi.org/10.11888/Glacio.tpcd.271705). *Nature Communication*



陈晏等. 2020. 拉萨城市建筑物屋顶矢量数据集. DOI: [10.11888/Geogra.tpcd.271702](https://doi.org/10.11888/Geogra.tpcd.271702) *Scientific Data*

Published over 460 papers, include 82 papers published in 2025

nature communications

Article <https://doi.org/10.1038/s41467-025-61968-8>

Leveraging multinational enterprises to reduce the escalating regional carbon inequality in China

nature communications

Article <https://doi.org/10.1038/s41467-025-59178-3>

Polar regions are critical in achieving global sustainable development goals

Received: 29 October 2024
Accepted: 11 April 2025
Published online: 24 April 2025

Xin Li¹, Huadong Guo², Guodong Cheng^{3,4}, Xiaoyu Song³, Youhua Ran⁵, Min Feng⁶, Tao Che³, Xinwu Li², Lei Wang⁶, Anmin Duan⁵, Donghui Shangguan³, Deliang Chen⁶, Rui Jin³, Jie Deng³, Jianbin Su¹ & Bin Cao¹

As important components of global commons, environmental changes in polar regions are crucial to the local and global sustainability. However, they have received little attention in the current framework of sustainable development goals (SDGs). This study examines the impacts of climate change in polar regions, emphasizing the interconnectedness of these areas with other parts of the global system. Here we show that polar regions are a limiting factor in achieving global SDGs, similar to the “shortest stave” in Liebig’s barrel, primarily due to the teleconnection effects of climate tipping elements. Proactive actions should ensure polar regions aren’t left behind in achieving global SDGs. We proposed a specific SDG target and five indicators for the interconnected effect of the cryosphere on climate actions and incorporate considerations for Indigenous peoples in polar regions. With the right actions and strengthened global partnerships, polar regions can be pivotal for advancing global sustainable development.

Science Bulletin

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journal homepage: www.elsevier.com/locate/scib

Article

Underestimated number and significance of rock glaciers on the Tibetan Plateau

Min Feng^{1,2,4}, Jinhao Xu^{1,3}, Xuefei Zhang⁵, Dezhao Yan⁶, Xin Li^{1,2,4}, Andreas Käab⁷, Fahu Chen^{1,2}, Guodong Cheng^{1,2,4}

National Tibetan Plateau Data Center, State Key Laboratory of Tibetan Plateau Earth System and Resource Environment, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China
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Alpine Palaeontology and Human Adaptation Group, State Key Laboratory of Tibetan Plateau Earth System, Environment and Resources, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China
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Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China

Rock glaciers, periglacial landforms with tongue- or lobe-shaped streams of slowly deforming frozen debris, play an important role in periglacial mountainous regions. The understanding of rock glaciers and their geomorphological role at regional scales has been considerably hampered due to survey difficulties. We employ an automated approach for identifying rock glaciers and compile for the first time a complete rock glacier survey over the entire Tibetan Plateau. We find over 130,000 individual rock glaciers, much more than expected from previous inventories over any areas on Earth, also suggesting that the global number of rock glaciers is significantly underestimated today. We reveal an underestimated source of water storage to the Asian Water Tower and an enormous material flux due to rock glacier creep, which warrants consideration for its potential impact on downstreams. This result is also important for improving the modelling of mountain permafrost for a better anticipation of climate change impacts. © 2025 Science China Press. Published by Elsevier B.V. and Science China Press. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

BRIEF COMMUNICATION

National Science Review
12: mwaf041, 2025
<https://doi.org/10.1093/nsr/mwaf041>
Advance access publication 11 February 2025

Patterns and change rates of glacial lake water levels across High Mountain Asia

Yingzheng Wang^{1,2}, Donghai Zheng^{1,*}, Guoqing Zhang¹, Jonathan L. Carrivick³, Tobias Bolch⁴, Weiwei Ren¹, Lei Guo⁵, Jianbin Su¹, Shiwei Yuan¹ and Xin Li^{1,*}

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(12) 发明专利申请

(21) 申请号: 202310239949.7
(22) 申请日: 2023.03.14
(71) 申请人: 中国科学院青藏高原研究所
地址: 100181 北京市朝阳区林萃路16号院3号楼
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(12) 发明专利申请

(21) 申请号: 202411157813.2
(22) 申请日: 2024.11.06
(71) 申请人: 中国科学院青藏高原研究所
地址: 100101 北京市朝阳区林萃路16号院3号楼
(72) 发明人: 唐易洁 冯志斌 冯敏 徐金祥 魏国
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专利代理人: 冯志斌 冯敏 徐金祥

(54) 发明名称
基于环境特征的山湖区湖泊识别方法和装置


(57) 摘要
本发明公开了一种基于环境特征的山湖区湖泊识别方法和装置,所述方法包括:获取山区水体和地表数据;基于所述数据,计算综合水体指数,以增强水体的光谱特征;并得到光谱增强影像;基于所述光谱增强影像,计算水体指数;根据所述水体指数,识别山区湖泊;并验证所述山区湖泊的准确性;将所述山区湖泊的遥感影像,输入所述山区湖泊识别模型中,以得到所述山区湖泊的识别结果;所述方法还包括:将所述山区湖泊的识别结果,输入所述山区湖泊识别模型中,以得到所述山区湖泊的识别结果;所述方法还包括:将所述山区湖泊的识别结果,输入所述山区湖泊识别模型中,以得到所述山区湖泊的识别结果。

SPRINGER NATURE Sustainable Development Goals Series

Xin Li · Anmin Duan · Donghui Shangguan · Lei Wang · Chaolun Li · Tao Che · Xinwu Li · Rui Jin · Youhua Ran

The Three Poles of the Earth: Challenges to Sustainable Development in Fragile Environments

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2 in Nature Communications

8 in Science Bulletin (IF=21)

2 patents

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Review Article | Published: 02 May 2023

Big Data in Earth system science and progress towards a digital twin

Xin Li [✉](#), Min Feng [✉](#), Youhua Ran, Yang Su, Feng Liu, Chunlin Huang, Huanfeng Shen, Qing Xiao, Jianbin Su, Shiwei Yuan & Huadong Guo

Nature Reviews Earth & Environment 4, 319–332 (2023) | [Cite this article](#)

1365 Accesses | 11 Altmetric | [Metrics](#)

Li, et al. 2023, *Nature Review of Earth & Environment*

Science Bulletin 70 (2025) 14–18

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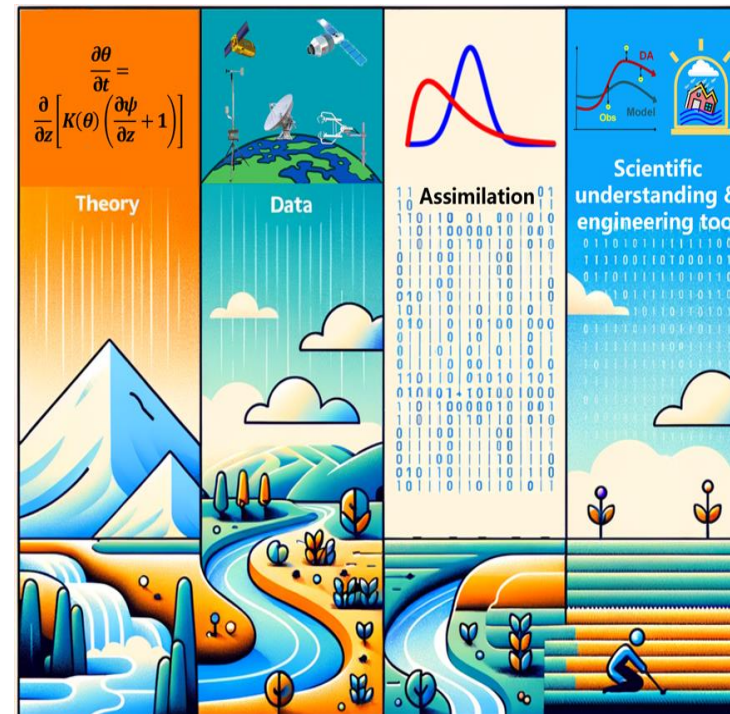
Perspective

Paradigm shifts from data-intensive science to robot scientists

Xin Li ^{a,b,*}, Yanlong Guo ^{a,*}

^aNational Tibetan Plateau Data Center, State Key Laboratory of Tibetan Plateau Earth System, Environment and Resources, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China
^bUniversity of the Chinese Academy of Sciences, Beijing 100049, China

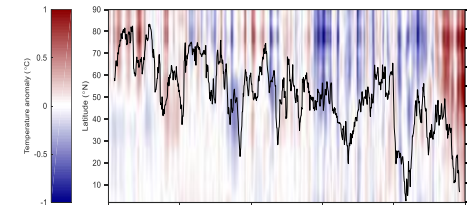
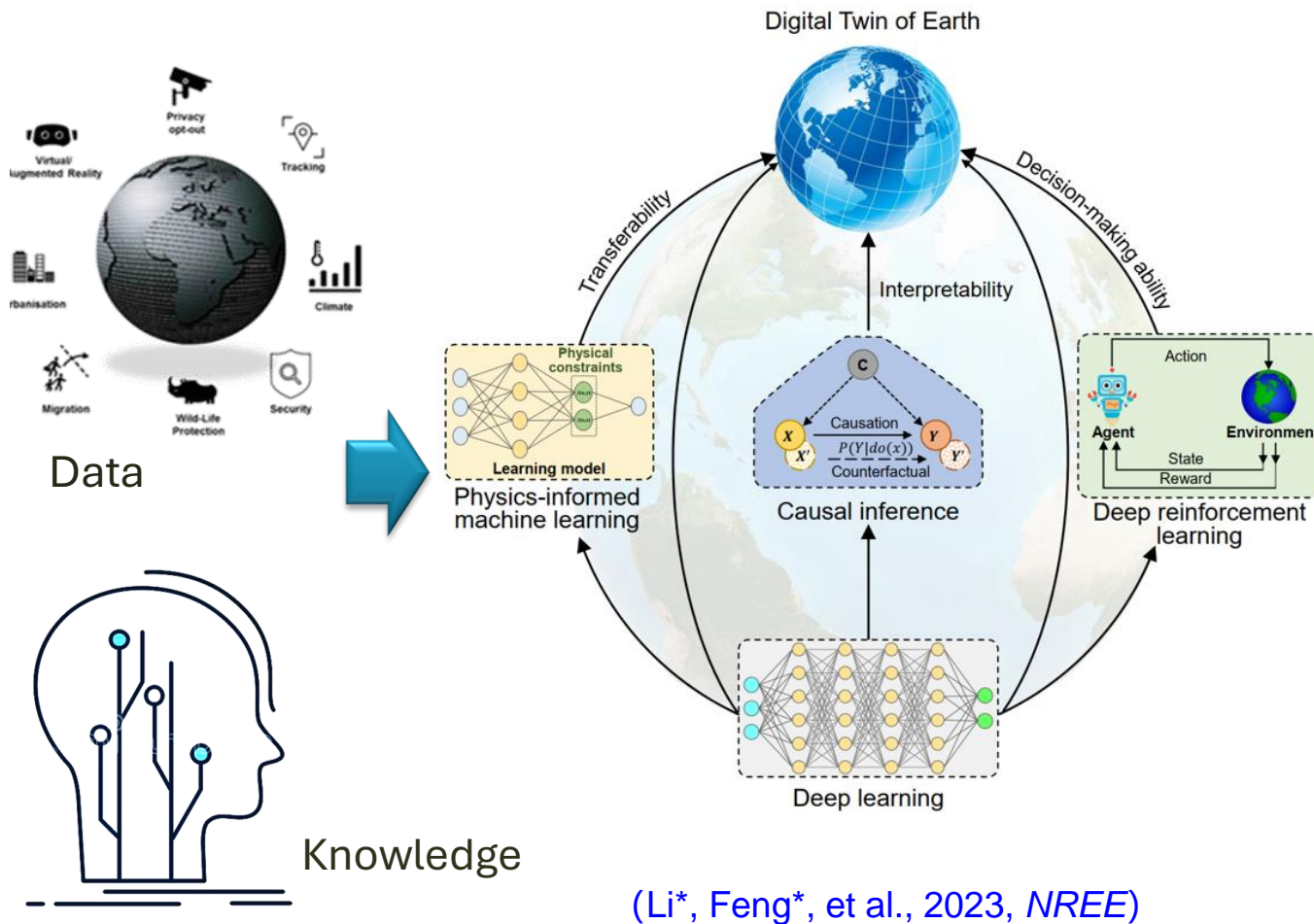
Li and Guo. 2025, *Science Bulletin*



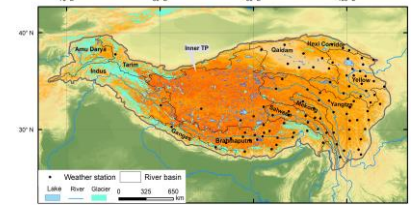
Li, et al. 2024, *Review of Geophysics*

Develop high-quality datasets

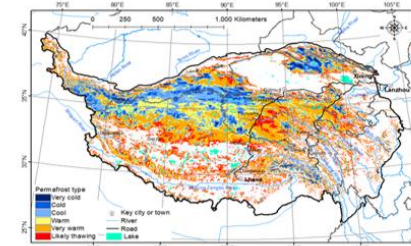
Utilizing new artificial intelligence methods to independently develop high-quality, long-timescale data products, and promoting highly open sharing.



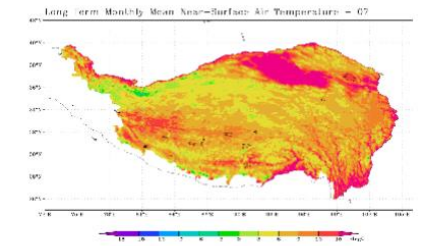
过去千年北半球气温纬向变化及千年北极放大效应指数序列
Fang, Li*, et al, 2021, *NC*



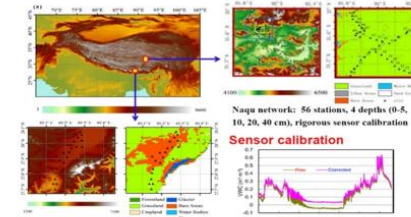
青藏高原湖泊数据集
Zhang, et al, 2023, *NG*



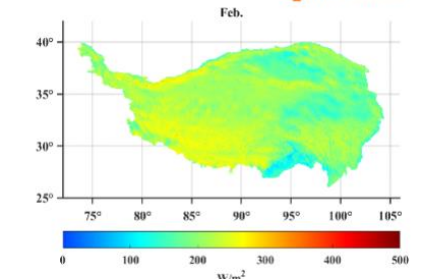
多年冻土潜在热退化数据集(1960s-2000s)
Ran, Li* et al., 2018, *Cryosphere*
Highly Cited Paper



青藏高原地表网格气象数据集 (1979-2018)
He, Yang* et al., 2020, *SD*
Highly Cited Paper

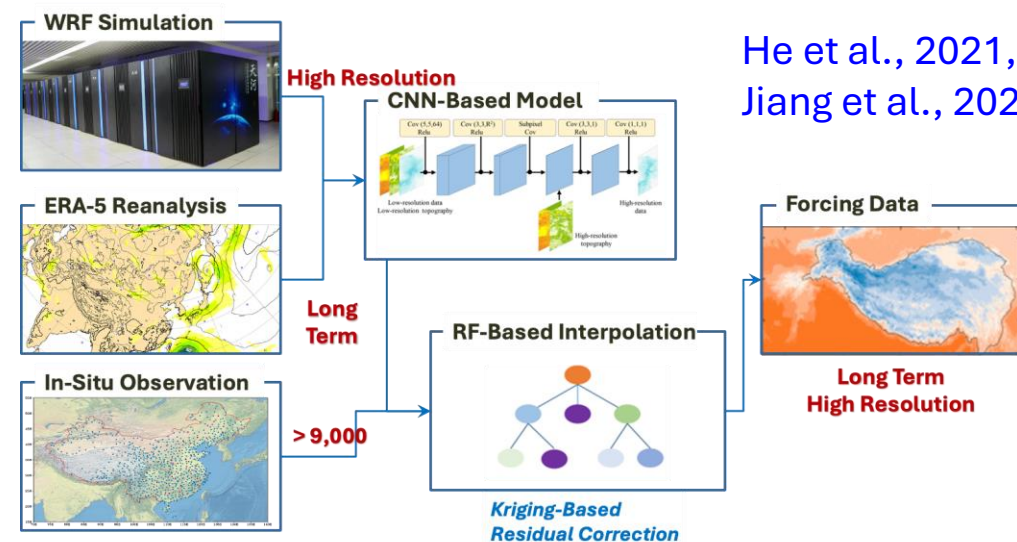
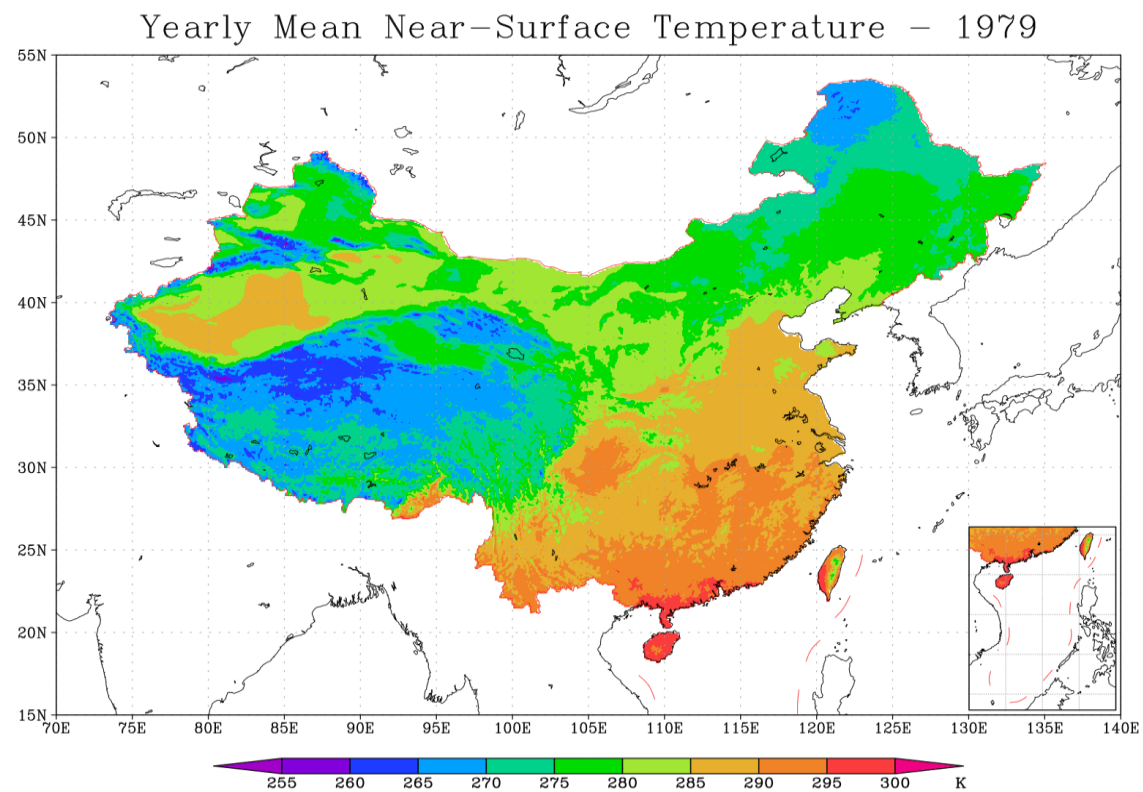


青藏高原土壤温湿度加密观测数据集 (2010-2021)
Chen et al., 2017, *JGR*



青藏高原10km地表短波辐射数据集 (1983.7-2018.12)
Tang et al., 2019, *ESSD*

The independently developed Chinese high-resolution surface meteorological forcing dataset



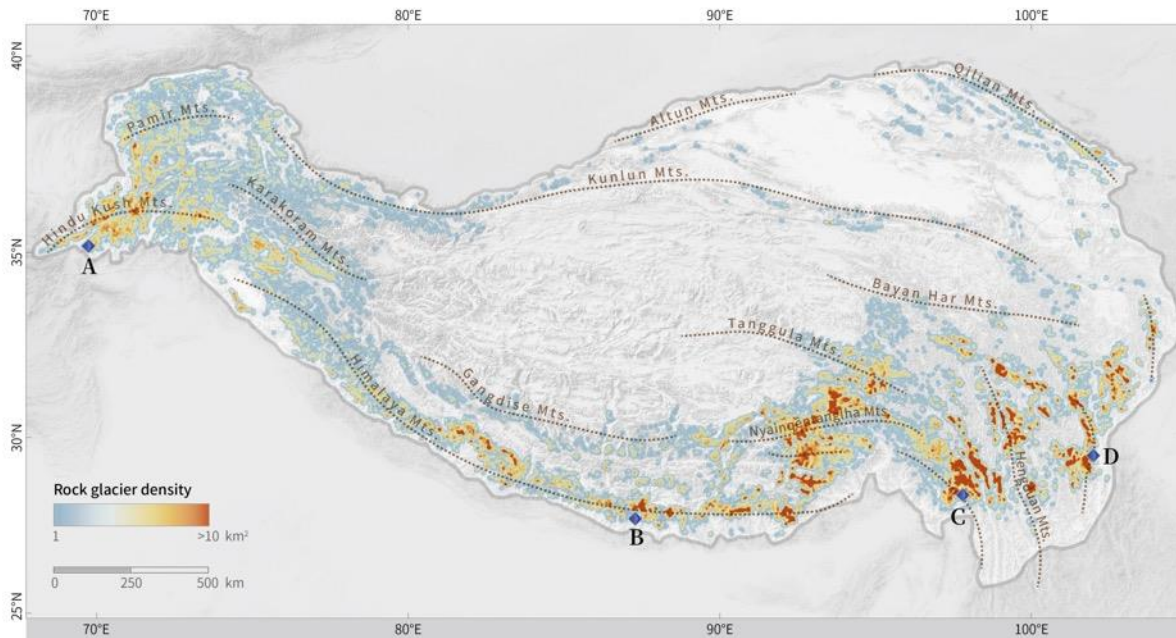
He et al., 2021, *SD*
Jiang et al., 2023, *ESSD*

> 260,000 views and 33,000 downloads, and selected as an ESI top 0.1% hot paper and a top 1% highly cited paper.

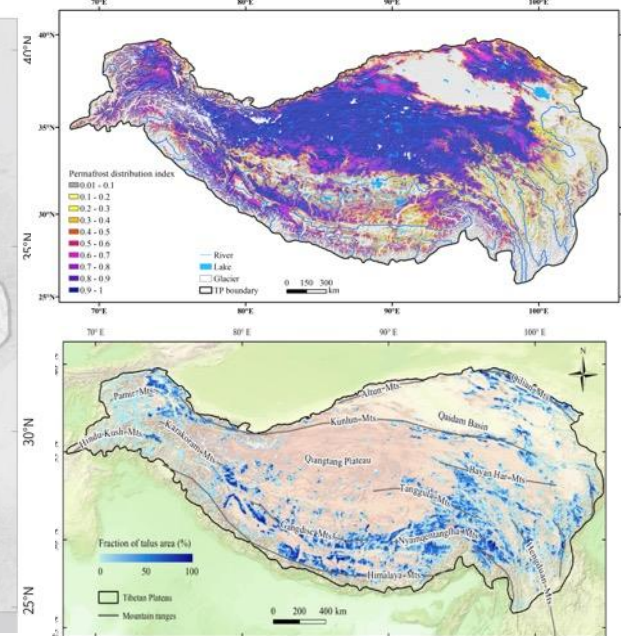
Yang, He et al., (2019). [China meteorological forcing dataset \(1979-2018\)](https://doi.org/10.11888/AtmosphericPhysics.tpe.249369.file). National Tibetan Plateau Data Center, DOI: [10.11888/AtmosphericPhysics.tpe.249369.file](https://doi.org/10.11888/AtmosphericPhysics.tpe.249369.file).

Yang, Jiang et al., (2023). [A high-resolution near-surface meteorological forcing dataset for the TP region \(1979-2020\)](https://doi.org/10.11888/Atmos.tpdc.300398). National Tibetan Plateau Data Center, DOI: [10.11888/Atmos.tpdc.300398](https://doi.org/10.11888/Atmos.tpdc.300398).

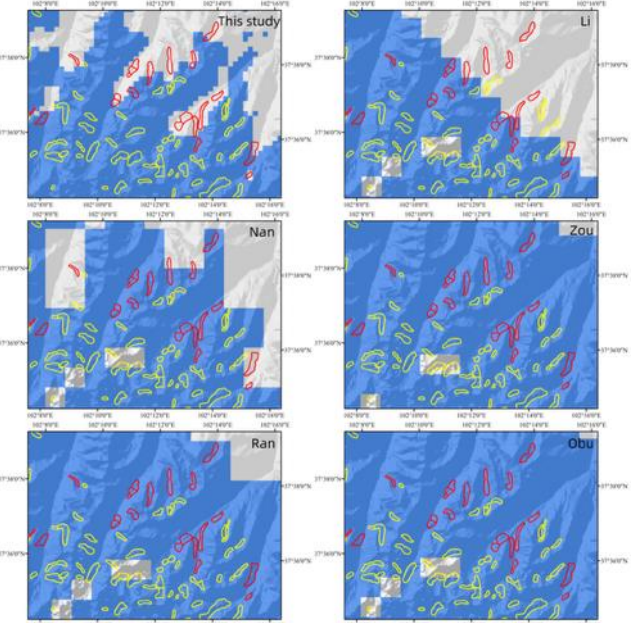
Inventories of rock glaciers, talus, and water bodies



Rock glacier inventory of TP



Talus inventory of TP



Mountainous permafrost

- ❑ Identified +130,000 rock glaciers, more than the total of previously reported worldwide
- ❑ Important refresh water resource reserve.

Feng, et al. *Science Bulletin*, 2025; Jiang, Feng*, *IJDE*, 2025; Hu, Feng*, et al., *IJDE*, 2024; Yan, Feng*, et al., *PPP* 2025; Xu, Feng*, et al. *Water*, 2023; Hu, Feng*, et al. *Water*, 2024; Zhang, Feng*, et al, *SRE*, 2024

Permafrost datasets

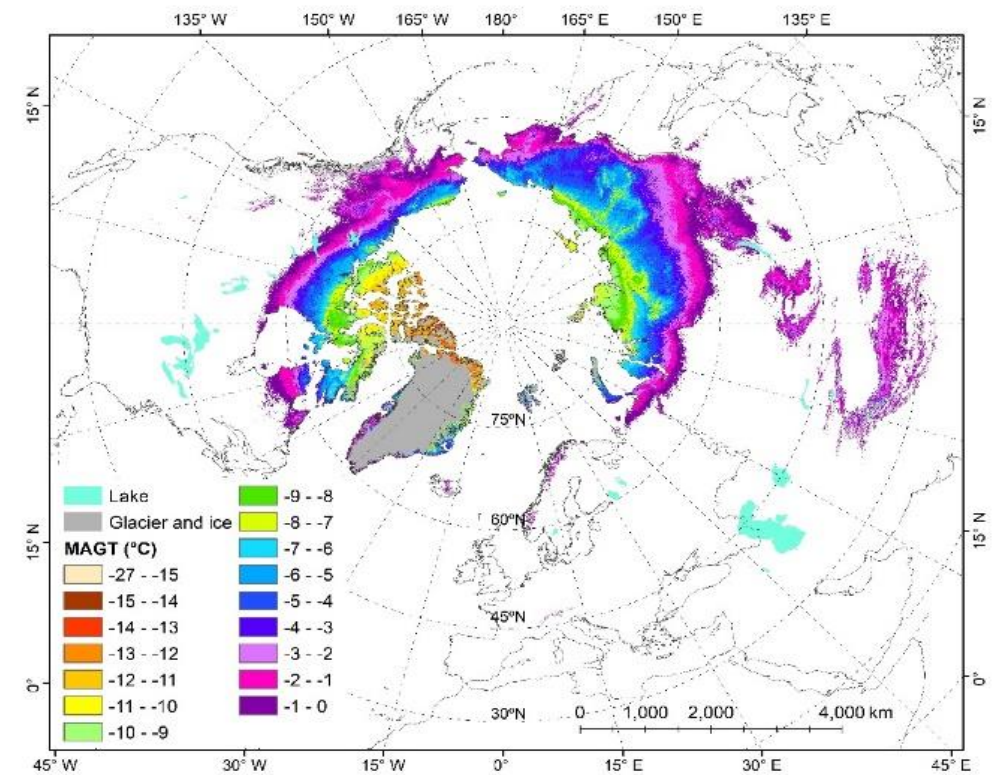
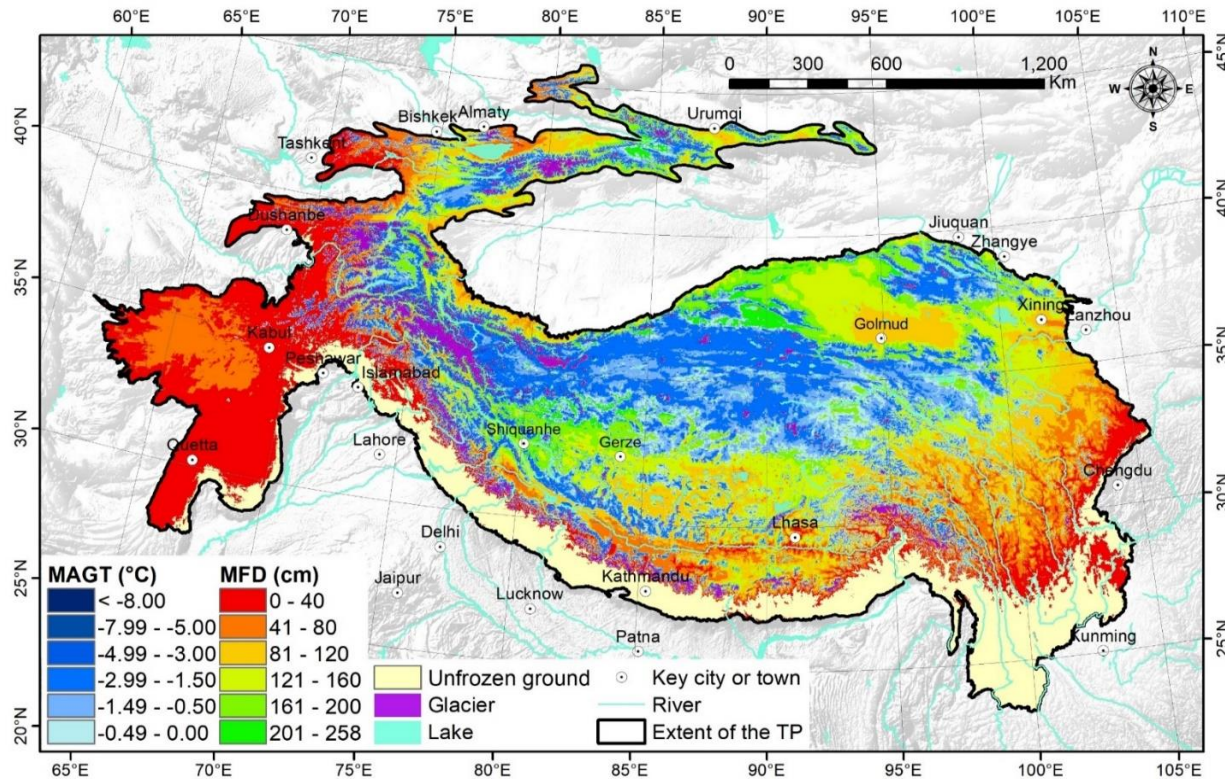
MAGT and ALT with 1-km resolution over the Third pole and the Northern Hemisphere were produced.

DOI: [10.11888/Geogra.tpdc.270672](https://doi.org/10.11888/Geogra.tpdc.270672)

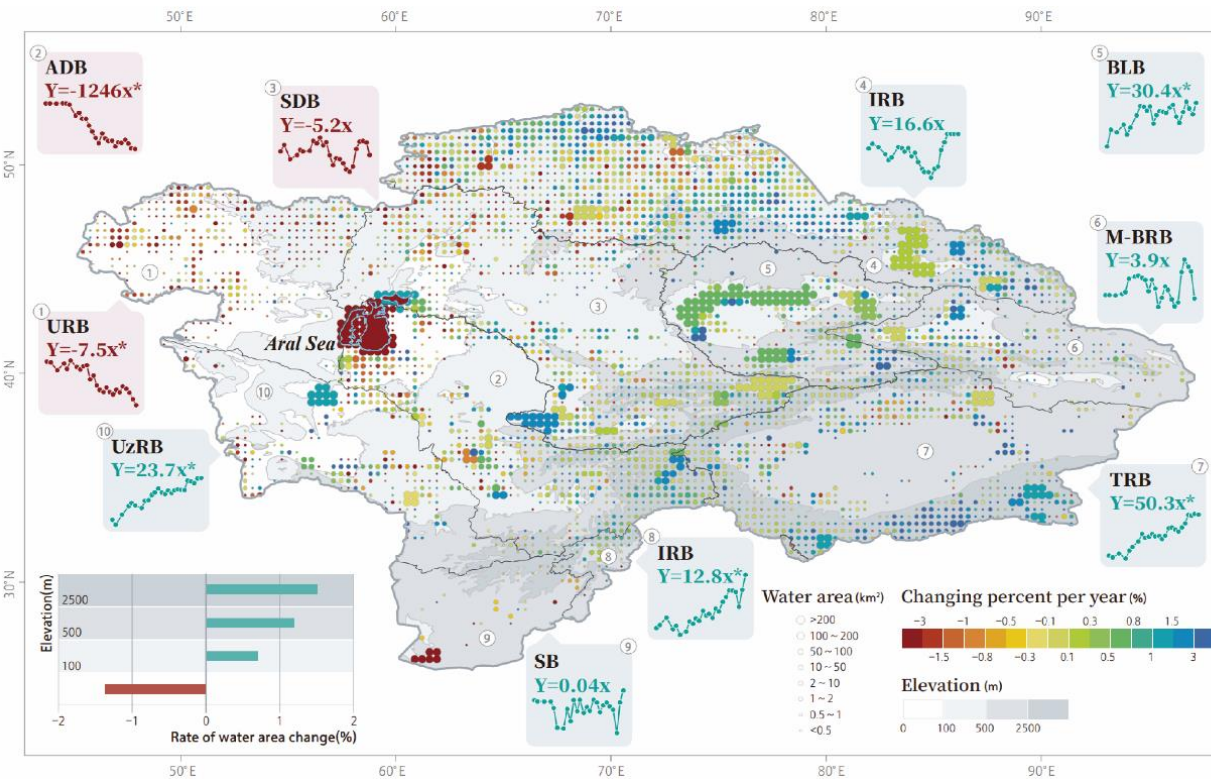
DOI: [10.11888/Geocry.tpdc.271190](https://doi.org/10.11888/Geocry.tpdc.271190)

DOI: [10.11888/Geocry.tpdc.271659](https://doi.org/10.11888/Geocry.tpdc.271659)

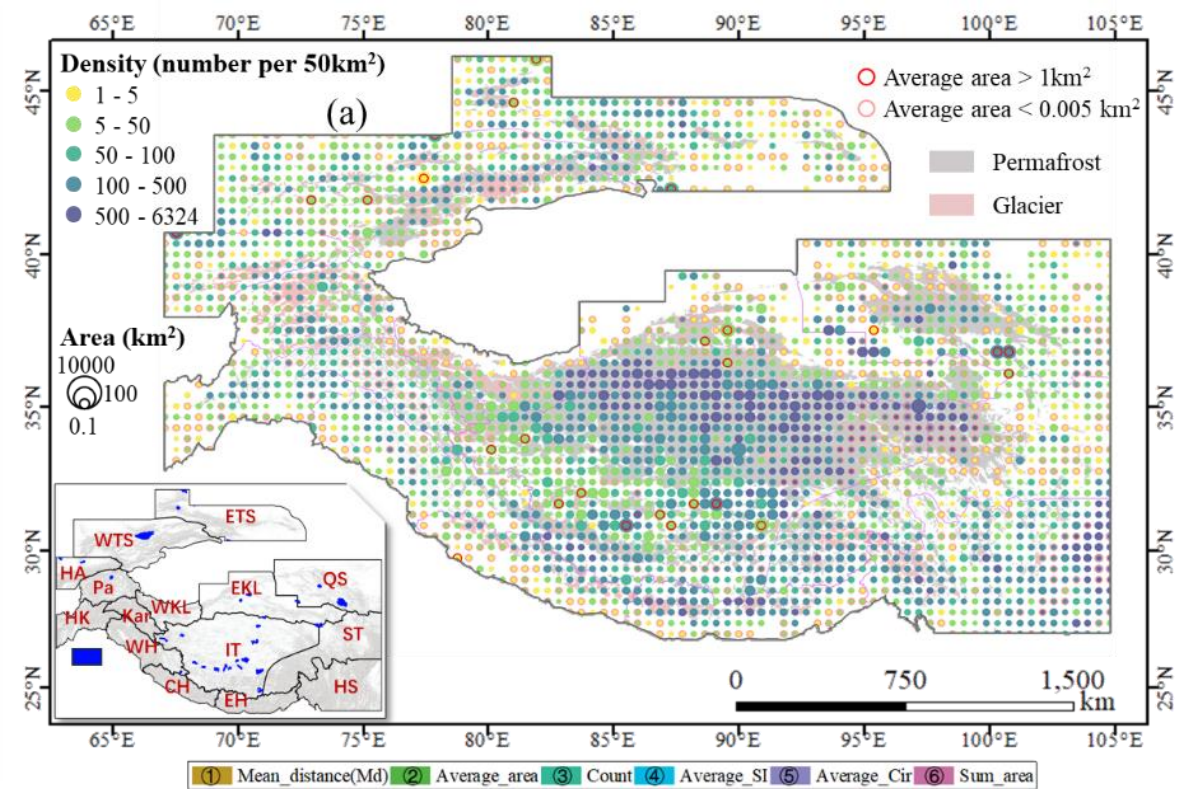
DOI: [10.11888/Geocry.tpdc.271774](https://doi.org/10.11888/Geocry.tpdc.271774)



Fine-scale water body surveys across key arid and high-mountain regions in Central and High-Mountain Asia to improve global small water body mapping accuracy



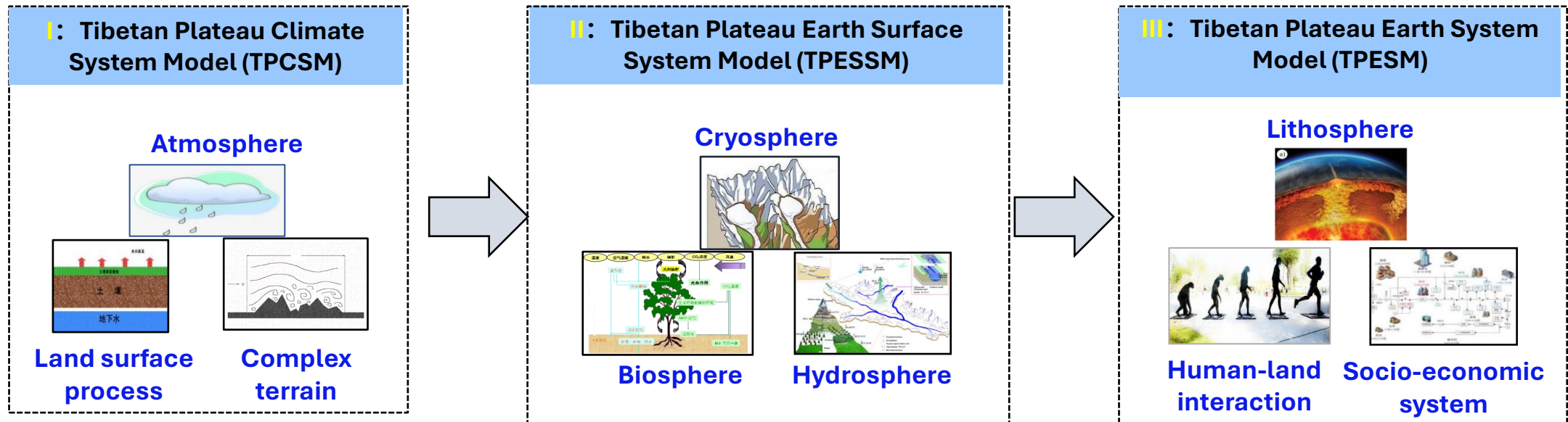
Su et al. *Science Bulletin* 2025



Sui et al. *Scientific Data* 2025

Tibetan Plateau Earth System Model

- ❑ Developing Earth system models for the Tibetan Plateau is the long-term goal of TPDC, aiming to create a fine-scale process model with characteristics unique to the Plateau.
- ❑ We have completed the TPCSM model and moved on to the TPESM development.

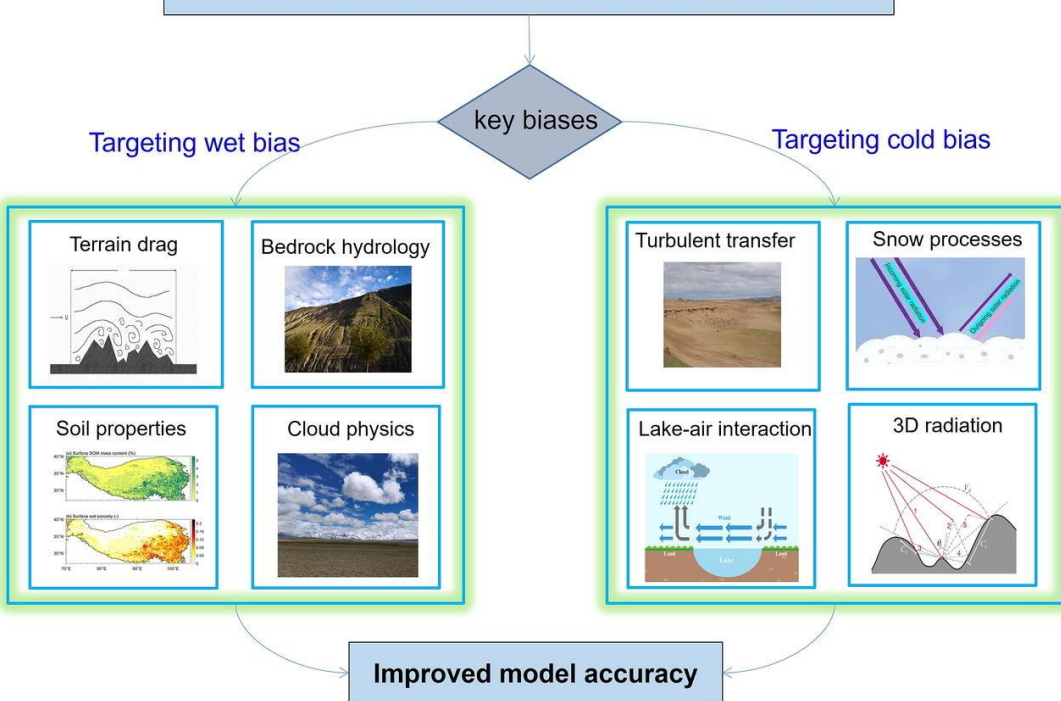


Tibetan Plateau Earth System Model

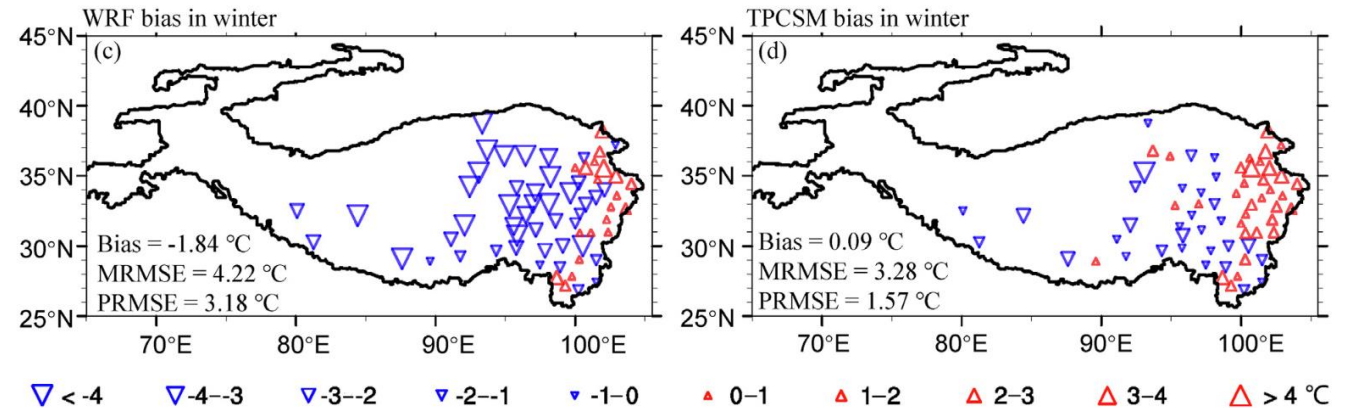
The **Tibetan Plateau Climate System Model (TPCSM)**, developed based on WRF4.0

TPCSM

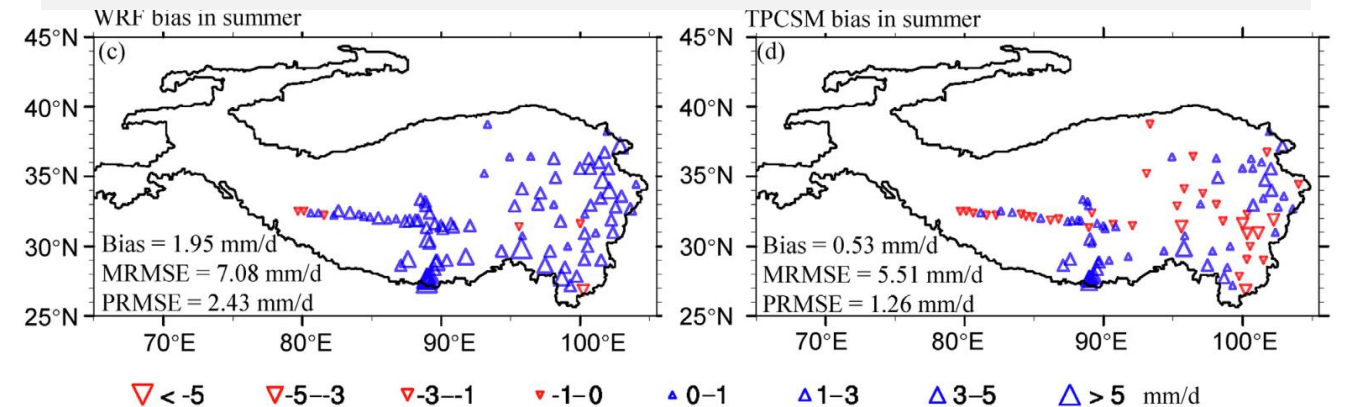
Tibetan Plateau Climate Model Refinements



Bias of water temperature: -1.8 → 0.1 °C

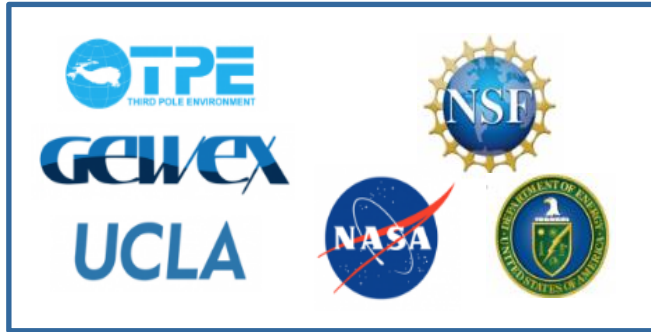


Bias of summer precipitation: 2.0 → 0.5 mm/day



International collaborations

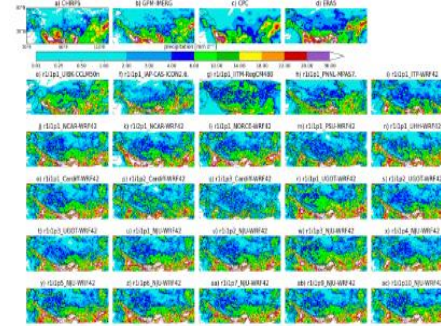
Dedicated to support international programs and cooperation for the Tibetan Plateau.



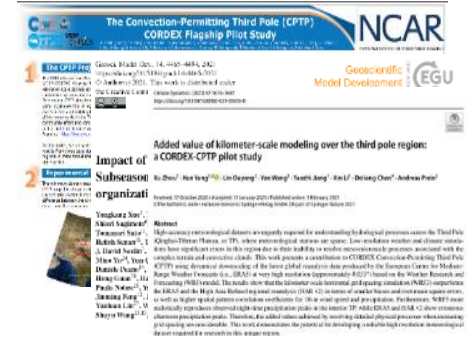
GEWEX LS4P



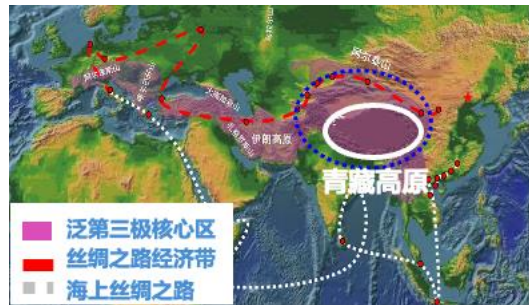
CORDEX-FPS: CPTP



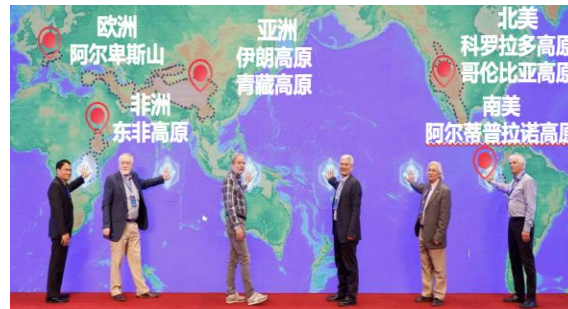
Datasets



Publications



ATES



PlateauPlus



ANSO



Established data and metadata exchange channels with the WMO and ICIMOD





Thank you!

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- <https://data.tpdc.ac.cn>
- data@itpcas.ac.cn
- +86-10-64833041

