

Dataset Cluster from the Project of “Studies on High-Resolution Proxy-Reconstructed Data and Its Reliability for Millennial Climate Changes over Northern Hemisphere”

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Abstract: In 2017, the National Key R&D Program on Global Change Research of China initiated a project of “Studies on high-resolution proxy-reconstructed data and its reliability for millennial climate changes over northern hemisphere”. The research team have achieved lots of datasets, in which twelve of them were selected to be published here with description papers for each dataset.

Keywords: global changes; collective data publications; millennial climate changes; northern hemisphere

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In 2017, the National Key R&D Program on Global Change Research of China initiated a project of “Studies on high-resolution proxy-reconstructed data and its reliability for millennial climate changes over northern hemisphere”. This project aims to develop high resolution datasets on climate and environmental (e.g., snow-cover and glacier, land use and land cover, and animal distribution) change over the northern hemisphere (NH), through data mining of highly-confident proxies and scattered proxies, new proxy developing for unsampled or few sampled regions and adding the proxy recorded in Chinese historical documents, together with the diagnose of the proxy implications and the assessments of the proxy reliability. This is because that the climate for the past millennium is dominated from the nature forcing only to the joint of nature forcing and human activities. Therefore, the datasets for the past millennium are critical to assess the current global warming and to project the future climate change in the historical context, which is usually focused by international global change research program and IPCC assessment report.

This research project has achieved a series of datasets, in which twelve of them were selected to be published here with description papers for each dataset (Table 1). These

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datasets are reconstructed from various proxies by different approaches, of which includes three temperature series were reconstructed from new tree-ring samples for the past millennium in the regions where existed few proxy before, i.e., the July to August mean temperature series for the Northern Greater Hinggan Mountains, September to October mean temperature series for the Northwest Yunnan and the June to July mean temperature series for the Western Sichuan Plateau, respectively. By the compilation and fusion of the records of stable isotope and accumulations derived from ice-cores, and physiochemical parameters derived from glaciolacustrine sediments, the multi-decadal activities of 22 glaciers in the NH for the last millennium were reconstructed. Based on the high albedo feature of Arctic sea ice, the sea ice-atmospheric circulation model was developed, and then the Arctic summer sea ice extent over the past millennium was also reconstructed driven by the CMIP5 modeled sea level pressure. By fusing ground station observation data and multi-source remote sensing data, the dataset for temporal and spatial variation of snow cover in the Northwestern United States in 2000–2020 was developed. Based on the regionalized identification on the dominant physio-geographical factors that affect reclamation intensity, the global cultivatable land suitability dataset was developed. Based on the historical records such as population, cropping systems and taxation, together with the estimation of cropland area per capita and the assessment of cropland suitability, the cropland datasets in the five countries of Central Asia, Russia, Vietnam, and the USA were developed. Moreover, by synthesizing the historical records and the publications on the history of locust plague, a locust plague dataset for NH in 9 time sections was developed. These publications provide not only the datasets for further study on the NH climate and environmental changes, but also the case studies and methods to reconstruct quantitatively the history of climate and environmental changes.

Table 1 List of datasets selected from the project of “Studies on high-resolution proxy-reconstructed data and its reliability for millennial climate changes over northern hemisphere”

No.	Title of the dataset	DOI of dataset	DOI of data paper
1	Retrieval dataset of historical cropland area in Russia (1000–2000) ^[2]	10.3974/geodb.2022.01.05.V1	10.3974/geodp.2022.02.11
2	Dataset of glaciers changes in northern hemisphere during the past 2000 years ^[3]	10.3974/geodb.2022.02.01.V1	10.3974/geodp.2022.03.03
3	Reconstruction dataset of yearly mean temperature in June–July at Western Sichuan Plateau of China using tree-ring width (1383–2005) ^[4]	10.3974/geodb.2022.02.03.V1	not available
4	Dataset of land reclamation of United States of American during 1000–1780 ^[5]	10.3974/geodb.2022.02.04.V1	10.3974/geodp.2022.02.17
5	Snow cover dataset by multi-source data fusion algorithm—a case study in the northwestern United States ^[6]	10.3974/geodb.2022.02.08.V1	10.3974/geodp.2022.02.15
6	Cultivated land dataset in vietnam based on historical documentation (1500–2000) ^[7]	10.3974/geodb.2022.03.07.V1	10.3974/geodp.2022.03.04
7	Global cultivatable land suitability dataset based on physical-geographic factors ^[8]	10.3974/geodb.2022.04.01.V1	10.3974/geodp.2022.03.08
8	Reconstruction dataset of yearly July–August mean temperature from tree-ring maximum latewood density of <i>Pinus sylvestris</i> var. <i>mongolica</i> at North Greater Khingan Mountains (1781–2013) ^[9]	10.3974/geodb.2022.04.02.V1	10.3974/geodp.2022.03.09
9	Reconstruction dataset of yearly September–October mean temperature from tree-ring maximum latewood density of <i>Abies delavayi</i> Franch. at Northwest Yunnan province of China (1678–2019) ^[10]	10.3974/geodb.2022.04.03.V1	10.3974/geodp.2022.03.02
10	100-km raster dataset of locust plagues for 9 historical periods in the northern hemisphere ^[11]	10.3974/geodb.2022.04.07.V1	10.3974/geodp.2022.03.05
11	Reconstruction dataset of cropland change in five central Asian countries over the last millennium (1000–2000) ^[12]	10.3974/geodb.2022.04.10.V1	10.3974/geodp.2022.03.07
12	Reconstructed dataset of arctic summer sea ice extent (850–2005) ^[13]	10.3974/geodb.2022.05.01.V1	10.3974/geodp.2022.03.06

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