Typical plant phenological observation dataset of Chinese phenological observation network, Beijing (1963-2012)

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Abstract: Typical Plant Phenological Observation Dataset of Chinese Phenological Observation Network, Beijing (TPPOD_CPON_BJ for short) includes the observational records about three phenophases (first leaf date, first flowering date and full leaf coloring date) of apricot (*Prunus armeniaca*), black locust (*Robinia pseudoacacia*), lilac (*Syringa oblata*), and wild chrysanthemum (*Dendranthema indicum*). To a certain degree, this dataset could represent the phenological change in North China, and also can provide scientific support for studying the response and adaptation of plants to global climatic changes.

Keywords: Beijing; first leaf date; first flowering date; full leaf coloring date; observation
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1 Introduction

Phenology is a branch domain of science, which focuses on studies the relationship between the periodic changes of natural plants (including crops), or animals and environmental factors (including climate, hydrology, and soil factors)[1]. Dates of phenological phenomena (e.g. leaf expansion, flowering, fruiting etc.) are the most indicators to direct and effective geographic information describing the phenological change and can help the studies in influences of the global change on the surface of biosphere. Typical plant phenological observation dataset of Chinese phenological observation network, Beijing (TPPOD_CPON_BJ) is a data set of observation records of phenophase, which can reflect the phenological characteristics of typical plants in Beijing. In most cases, this dataset could represent the phenological change in Northern China, and it also can provide scientific support for global change research. Besides, publishing the dataset could be an example to enhance research data sharing in China.

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2 Metadata of the TPPOD_CPON_BJ

The descriptions of the Typical Plant Phenological Observation Dataset of Chinese Phenological Observation Network, Beijing (TPPOD_CPON_BJ for short) dataset are recorded. These information include the dataset full name, dataset short name, corresponding author, authors, geographical region of the dataset content, year of the dataset, number of the dataset tiles, dataset spatial and temporal resolution, dataset format and size, data publisher, data sharing platform and contact information, technical editors, foundation and the data sharing policy. Table 1 below summarizes the main metadata elements of the TPPOD_CPON_BJ dataset.

Table 1 Summary of the TPPOD_CPON_BJ metadata

Full name of dataset	Typical Plant Phenological Observation Dataset of Chinese Phenological Observation Network, Beijing		
Short name of dataset	TPPOD_CPON_BJ		
Corresponding author:	GE Quansheng (geqs@igsnrr.ac.cn)		
Authors	GE Quansheng, Institute of Geographic Sciences and Natural Resources Research, CAS, geqs@igsnrr.ac.cn DAI Junhu, Institute of Geographic Sciences and Natural Resources Research, CAS, daijh@igsnrr.ac.cn LIU Haolong, Institute of Geographic Sciences and Natural Resources Research, CAS, liuhl@igsnrr.ac.cn XU Qiongyao, Institute of Geographic Sciences and Natural Resources Research, CAS, xuqy@igsnrr.ac.cn WANG Huanjiong, Institute of Geographic Sciences and Natural Resources Research, CAS, wanghj.12b@issnrr.ac.cn		
Geographical region	The observation station, Beijing, located at the northeast edge of the North China Plain, is to the south of Yanshan Mountains and adjacent to Tianjin city and Hebei province. Beijing has a north-temperate semi-humid continental monsoon climate. The winter is cold and dry with little precipitation. But it has abundant rainfall and high temperature in summertime. The annual frost free period is between 180 and 200 days. The annual precipitation is concentrated in June to August (History of Beijing Meteorological records, 1999). The location of the phenological observation is in the Summer Palace which is about 15 km from the center of Beijing city. The Summer Palace (center coordinates is 116°16′E, 39°59′N) covers an area of about 290 hm^2, with very abundant plant species distributed there. Plants we observed are dominant species in semi-natural vegetation communities of warm temperate deciduous broad-leaved forest.		
Year of the dataset	January 1, 1963-December 30, 2012		
Spatial resolution	Fixed location		
Data format	TPPOD_CPON_BJ.xls	Dataset size	22.17 KB
	TPPOD_CPON_BJ.txt		0.87 KB
	STATION.docx		18.36 KB
Publisher	Global Change Research Data Publishing and Repository, DOI:10.3974/		
Data access and services platform	Global Change Research Data Publishing and Repository, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR/CAS), http://www.geodoi.ac.cn Address: No. 11A Datun Road, Chaoyang District, Beijing 100101, China		
Academic editors	LIU Chuang, SHI Ruixiang, JIANG Dong, HE Shujin		
Data sharing policy	The authors of the dataset agree to publish the data here according to the Article I of Data Sharing Policy of the Global Change Data Publishing and Repository, which states that the dataset can be used freely for research, education, and decision making; any users for commercial uses should get formal permission from IGSNRR/CAS.		

3 Methods

The data is derived from Chinese Phenological Observation Network (CPON). The representative species with long observation period and good continuity are chose, consisting of apricot (*Prunus armeniaca*), black locust (*Robinia pseudoacacia*), lilac (*Syringa oblata*), and wild chrysanthemum (*Dendranthema indicum*). Three key phases of these plant species are selected, including the first leaf date, first flowering date and full leaf coloring date. The definitions of these phases are as follows[2]:

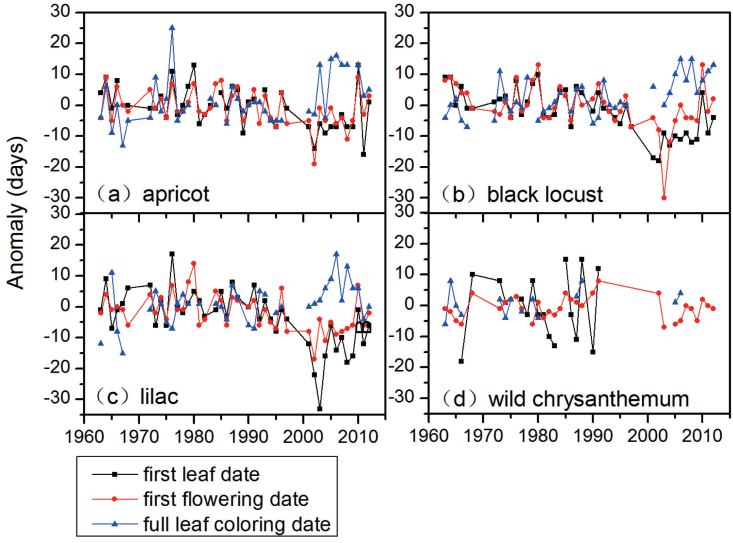

Figure 1 Phenological anomaly (with respect to 1971-2000 mean) from 1963 to 2012 for the four representative plants in Beijing

· Definition of the first leaf date: defined as the date when a fixed individual formed the first fully leaf.

· Definition of the first flowering date: defined as the date when a fixed individual formed the first fully flower.

· Definition of the full leaf coloring date: defined as the date when the individual shows yellow leaves over 90% of their crowns.

The observation data are collected strictly according to the guidelines of Chinese Phenological Observation Standard[2]. A brief description of the measures taken to control the data quality is as follows:

· All observers are fixed, professionally trained;

· All plant species observed are fixed. The observation locations should be flat and open;

· The woody plants have blossomed and born fruit for more than three years of middle ages. The herbaceous plants are several individuals within a certain region;

· Observing and recording the phenological phases simultaneously and daily.

The dataset is processed product through standardizing the original observation records. Phenological anomalies from 1963 to 2012 were calculated by subtracting 1971-2000 mean value from the original time series (Figure 1). Positive or negative anomalies represent that the phenophase is later or earlier than the 1971-2000 mean, respectively.

4 Dataset description

The dataset consists of three parts: TPPOD_CPON_BJ.txt, STATION.doc, and TPPOD_CPON_BJ.xls.

(1) TPPOD_CPON_BJ.txt, a detailed description file of various elements of the data set. Data volume: 0.87 KB.

(2) STATION.docx, this document is a description of the phenological observation location in Beijing—the Summer Palace[3-4]. Data volume: 18.36 KB.

(3) TPPOD_CPON_BJ.xlsx, this document is a date series file of phenological anomaly for 4 typical plants in Beijing. Data volume: 23KB.

5 Dataset quality control and validation

Two steps of the dataset quality control in its procedures. Firstly, a preliminary inspection of the data quality is taken according to the consistency and synchronous of various phenological phases[5]; secondly, the phenological model method (Spring Warming model and UniChill model) is taken to test the statistical effect between phenophases and their influencing factor (temperature) so as to further validate the data[6].

6 Conclusion

The dataset is the firstly published phenological anomaly data in Beijing, China. It describes the annual phenophases of typical species at a single site. It is a key reference data for identifying the impacts of climate change and simulating the change of vegetation productivity. It is also of significant value in fields of agricultural production, landscape planning, tourism management etc.

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