

# Metadata

<b>Dataset Name</b>	CMIP6 Hudson Bay Sea Ice Thickness Phenology
<b>Dataset General Type</b>	Climate Model
<b>Dataset Type</b>	Dataset
<b>Dataset Level</b>	2
<b>Program Website</b>	<a href="https://umanitoba.ca/earth-observation-science/julienne-stroeve-project-page">https://umanitoba.ca/earth-observation-science/julienne-stroeve-project-page</a>
<b>Keyword Vocabulary</b>	
<b>Keyword Vocabulary URL</b>	
<b>Theme</b>	
<b>Title</b>	Cryosphere
<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/fr/group/cryosphere">https://canwin-datahub.ad.umanitoba.ca/data/fr/group/cryosphere</a>
<b>Dataset Status</b>	Complete
<b>Maintenance and Update Frequency</b>	Not planned
<b>Dataset Last Revision Date</b>	2024-08-26
<b>Dataset DOI</b>	
<b>Metadata Creation Date</b>	2024
<b>Publisher</b>	CanWIN

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## Dataset Collection Start Date

1920-01-01

## Dataset Collection End Date

2100-01-01

**Sample  
Collection**

**Sample  
Collection 1**

- Sampling  
Instrument  
Name**
- Standardized  
Sampling  
Instrument  
Name**
- Sample  
Collection  
Method Name**
- Comment**
- Method Link**
- Method  
Summary**
- Method  
Description  
Type**      **Methods**

**Activity  
Collection  
Type**

**Preferred  
citation**

**Analytical  
Instrument**

**Analytical  
Instrument 1**

- Analytical  
Instrument  
Name**
- Standardized  
Analytical  
Instrument  
Name**
- Analytical  
Instrument  
Identifier Id**
- Analytical  
Instrument  
Title Type**      **Alternative Title**

<b>Analytical Instrument Identifier Type</b>	
<b>Analytical Method</b>	
<b>Analytical Method 1</b>	
<b>Analytical Method Name</b>	
<b>Method Link</b>	
<b>Method Summary</b>	
<b>Laboratory</b>	
<b>Comments</b>	
<b>Variables Measured</b>	
<b>License Name</b>	Creative Commons Attribution 4.0 International
<b>Licence Type</b>	Open
<b>Embargo Date</b>	
<b>Licence URL</b>	<a href="https://spdx.org/licenses">https://spdx.org/licenses</a>
<b>Terms of Access</b>	CanWIN datasets are licensed individually, however most are licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0) Public License. Details for the licence applied can be found using the Licence URL link provided with each dataset. By using data and information provided on this site you accept the terms and conditions of the License. Unless otherwise specified, the license grants the rights to the public to use and share the data and results derived therefrom as long as the proper acknowledgment is given to the data licensor (citation), that any alteration to the data is clearly indicated, and that a link to the original data and the license is made available.
<b>Terms of Use</b>	By accessing this data you agree to [CanWIN's Terms of Use](/data/publication/canwin-data-statement/resource/5b942a87-ef4e-466e-8319-f588844e89c0).
<b>Awards</b>	
<b>Awards 1</b>	
<b>Award Title</b>	
<b>Website</b>	
<b>Funder Name</b>	
<b>Funder Identifier Code</b>	

**Funder  
Identifier Type**

**Funder  
Identifier  
Scheme**

**Grant Number**

**Related  
Resources**

**Related  
Resources 1**

**Related  
Resource  
Name**

**Resource  
Code**

**Identifier Type**

**Relationship  
To This  
Dataset**

**Resource Type**      Online Resource

**Type**

**Series Name**

**Publications**

**Publications 1**

**Publication  
Name**

**Identifier Code**

**Identifier Type**

**Relationship to  
this dataset**

**Resource Type**      Online Resource

**Publication  
Type**

**Spatial  
regions**

northern-hemisphere

<b>Spatial extent West Bound Longitude</b>
<b>Spatial extent East Bound Longitude</b>
<b>Spatial extent South Bound Latitude</b>
<b>Spatial extent North Bound Latitude</b>

## Data and Resources

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/93f78046-d2bc-480f-b4c8-87ac860fc9cd/download/cmip6_biascorrected-and-weightedmean_historical-ssp585_1920-2099.csv">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/93f78046-d2bc-480f-b4c8-87ac860fc9cd/download/cmip6_biascorrected-and-weightedmean_historical-ssp585_1920-2099.csv</a>
<b>Name</b>	Multi-Model Means of Hudson Bay Sea Ice Thickness Phenology
<b>Description</b>	<p>Multi-model means from 1920-2099 for continuous ice-free period (IFP), last retreat day (LRD) and first advance day (FAD) using either a delta-shift bias correction (BC) or weighted mean (WM). Three regions are used: Hudson Bay (including James Bay, but excluding Hudson Strait and Foxe Basin), western Hudson Bay, and southern Hudson Bay. The latter two regions are commonly used for dividing the polar bear population in Hudson Bay. (e.g., <a href="https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends">https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends</a>) The bias correction is conducted by comparing the observational average of sea ice phenology from the 1979-2021 passive microwave record to the years in each model for which the temperature anomaly relative to 1850-1900 is in the same range as recorded by the Berkeley Earth surface temperature dataset. For each model simulation, the difference in average IFP, LRD, and FAD for those years sharing the same temperature anomaly range is considered the bias, and this bias is subtracted from all years of data before calculating a multi-model mean from the first ensemble member (replicate) of each model. The weighted mean has two factors. First, a model simulation receives more weight if it shows better performance (relative to the passive microwave record for sea ice phenology and the Berkeley Earth surface temperature record) for that same period 1979-2021. Second, model simulations that show more independence from other simulations also receive more weight. In this way, it is possible to use multiple simulations (up to 7) from each participating model. The bias-corrected mean uses 20 simulations total, whereas the weighted mean uses 49.</p>
<b>Format</b>	CSV
<b>Resource Category</b>	data

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/686b471d-d0e7-467b-bbee-84bf9d7cc5e1/download/cmip6_biascorrected-and-weightedse_historical-ssp585_1920-2099.csv">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/686b471d-d0e7-467b-bbee-84bf9d7cc5e1/download/cmip6_biascorrected-and-weightedse_historical-ssp585_1920-2099.csv</a>
<b>Name</b>	Standard Error for Hudson Bay Sea Ice Thickness Phenology
<b>Description</b>	Standard error for multi-model means from 1920-2099 for continuous ice-free period (IFP), last retreat day (LRD) and first advance day (FAD) using either a delta-shift bias correction (BC) or weighted mean (WM). Three regions are used: Hudson Bay (including James Bay, but excluding Hudson Strait and Foxe Basin), western Hudson Bay, and southern Hudson Bay. The latter two regions are commonly used for dividing the polar bear population in Hudson Bay. (e.g., <a href="https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends">https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends</a> ) The bias correction is conducted by comparing the observational average of sea ice phenology from the 1979-2021 passive microwave record to the years in each model for which the temperature anomaly relative to 1850-1900 is in the same range as recorded by the Berkeley Earth surface temperature dataset. For each model simulation, the difference in average IFP, LRD, and FAD for those years sharing the same temperature anomaly range is considered the bias, and this bias is subtracted from all years of data before calculating a multi-model mean from the first ensemble member (replicate) of each model. The weighted mean has two factors. First, a model simulation receives more weight if it shows better performance (relative to the passive microwave record for sea ice phenology and the Berkeley Earth surface temperature record) for that same period 1979-2021. Second, model simulations that show more independence from other simulations also receive more weight. In this way, it is possible to use multiple simulations (up to 7) from each participating model. The bias-corrected mean uses 20 simulations total, whereas the weighted mean uses 49.
<b>Format</b>	CSV
<b>Resource Category</b>	data

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/3a46d32d-71eb-44dc-b573-686aaf732cd8/download/cmip6_thicknessphenology_10cm_regional-reghb3_historical.zip">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/3a46d32d-71eb-44dc-b573-686aaf732cd8/download/cmip6_thicknessphenology_10cm_regional-reghb3_historical.zip</a>
<b>Name</b>	Hudson Bay Sea Ice Thickness Phenology - Historical
<b>Description</b>	Regional averages from 1920-2013 (Historical experiment from CMIP6) for continuous ice-free period (IFP), last retreat day (LRD) and first advance day (FAD) using either a delta-shift bias correction (BC) or weighted mean (WM). Three regions are used: Hudson Bay (including James Bay, but excluding Hudson Strait and Foxe Basin), western Hudson Bay, and southern Hudson Bay. The latter two regions are commonly used for dividing the polar bear population in Hudson Bay. (e.g., <a href="https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends">https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends</a> )
<b>Format</b>	ZIP
<b>Resource Category</b>	data

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/fe336342-b180-4293-b6d1-014da62ccf95/download/cmip6_thicknessphenology_10cm_regional-reghb3_ssp585.zip">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/fe336342-b180-4293-b6d1-014da62ccf95/download/cmip6_thicknessphenology_10cm_regional-reghb3_ssp585.zip</a>
<b>Name</b>	Hudson Bay Sea Ice Thickness Phenology - SSP585

<b>Description</b>	Regional averages from 2015-2099 (SSP585 experiment of CMIP6) for continuous ice-free period (IFP), last retreat day (LRD) and first advance day (FAD) using either a delta-shift bias correction (BC) or weighted mean (WM). Three regions are used: Hudson Bay (including James Bay, but excluding Hudson Strait and Foxe Basin), western Hudson Bay, and southern Hudson Bay. The latter two regions are commonly used for dividing the polar bear population in Hudson Bay. (e.g., <a href="https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends">https://polarbearagreement.org/polar-bear-biology/population-distribution-and-trends</a> ).
<b>Format</b>	ZIP
<b>Resource Category</b>	data

  

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/29d654cf-b0d6-4e39-845d-3c6a3521d16d/download/cmip6_bias-corrected-by-t2mamly_historical-ssp585_baselineyears_1979-2021_multimodelmean.nc">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/29d654cf-b0d6-4e39-845d-3c6a3521d16d/download/cmip6_bias-corrected-by-t2mamly_historical-ssp585_baselineyears_1979-2021_multimodelmean.nc</a>
<b>Name</b>	Bias-corrected Multi-Model Average Grids
<b>Description</b>	The continuous ice-covered period (cip), advance day (fad), and retreat day (lrd) are defined using a sea ice thickness threshold of 10 cm. Each "year" is from September 1, Year 1 to August 31, Year 2 and dates are given as units of "days starting January 1 of Year 1". Original data source is 20 simulations from the historical and shared socioeconomic pathway 5-8.5 (ssp585) experiments from the Coupled Model Intercomparison Project version 6 (CMIP6). This thickness phenology for each model simulation (one simulation per model) was bias-corrected relative to average phenology derived from Bootstrap and NASA Team algorithms applied to passive microwave data for the period 1979-2021. For each model, the average modelled ice-covered period for years in which the temperature anomaly relative to 1850-1900 fell within the range observed in the Berkeley Earth Surface Temperature record for 1979-2021 was compared to the satellite observations. The difference was used as a bias adjustment, applied to all years. Next, an equally weighted multi-model mean was calculated for each 0.5°C global temperature anomaly bin (i.e., tanom = "1°C" means $0.5^{\circ}\text{C} \leq T' < 1.5^{\circ}\text{C}$ ).
<b>Format</b>	NetCDF
<b>Resource Category</b>	data

  

<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/74953700-730b-4b28-a35d-67224f508708/download/cmip6_weighted-average-by-t2mamly_historical-ssp585_baselineyears_1979-2021.nc">https://canwin-datahub.ad.umanitoba.ca/data/dataset/66847fce-c9ca-429f-979b-effc44202997/resource/74953700-730b-4b28-a35d-67224f508708/download/cmip6_weighted-average-by-t2mamly_historical-ssp585_baselineyears_1979-2021.nc</a>
<b>Name</b>	Weighted Multi-Model Average Grids
<b>Description</b>	The continuous ice-covered period (cip), advance day (fad), and retreat day (lrd) are defined using a sea ice thickness threshold of 10 cm. Each "year" is from September 1, Year 1 to August 31, Year 2 and dates are given as units of "days starting January 1 of Year 1". Original data source is 49 simulations from the historical and shared socioeconomic pathway 5-8.5 (ssp585) experiments from the 20 models participating in the Coupled Model Intercomparison Project version 6 (CMIP6). A weighted average of the simulations was calculated for each 0.5°C global temperature anomaly bin (i.e., tanom = "1°C" means $0.5^{\circ}\text{C} \leq T' < 1.5^{\circ}\text{C}$ ). Weights were determined using a balance of model performance and independence, following the general framework of Knutti et al. (2017; <a href="https://doi.org/10.1002/2016gl072012">https://doi.org/10.1002/2016gl072012</a> ). "Performance" was assessed by comparing modelled sea ice and temperature variables to observed values. More specifically, the compared variables were the averages and trends of sea ice retreat and advance, the ice-free period, and regional 2-m air temperature over western and southern sectors of Hudson Bay for the period 1979-2021. For sea ice, the observational reference was the average phenology derived from Bootstrap and NASA Team algorithms applied to passive microwave data. For temperature, the Berkeley Earth Surface Temperature dataset was used. The weighting parameters were sigma_D = 0.49 and sigma_S = 0.50.

<b>Format</b>	NetCDF
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<b>Resource Category</b>	data
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## Related Publications

<b>Title</b>	Ice-free period too long for Southern and Western Hudson Bay polar bear populations if global warming exceeds 1.6 to 2.6 °C
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<b>URL</b>	<a href="https://canwin-datahub.ad.umanitoba.ca/data/fr/publication/udson-bay-polar-bear-projections-2024">https://canwin-datahub.ad.umanitoba.ca/data/fr/publication/udson-bay-polar-bear-projections-2024</a>
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