

ISO 19131 Quebec Agroclimatic Atlas – Data Product Specifications

Revision: A

Data product specifications: Quebec Agroclimatic Atlas

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Data product specifications: Quebec Agroclimatic Atlas Data

1. Overview

1.1. Informal description

In order to facilitate decision making, the agricultural sector needs appropriate climate information that translates the impact of present and future climate on crops and agricultural systems. However, in Quebec, this information was either outdated or hard to find, a situation that was deplored by agricultural stakeholders.

To address this problem, in 2010, the Commission Agrométéorologie of the Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ) teamed up with a number of other organizations to develop the Agroclimatic Atlas of Quebec.

The Agroclimatic Atlas of Quebec is hosted at www.agrometeo.org, a website that agricultural stakeholders already routinely use to find current weather information. A number of the datasets sourced by this website pertain to degree-days, frost-free days, crop heat units, precipitation and potential evapotranspiration data collected and interpolated to a regular grid spacing of 10 km for two thirty year periods, 1974-2003 and 1979-2008.

1.2. Data product specification - metadata

This section provides metadata about the creation of this data product specification.

Data product specification – title:	Quebec Agroclimatic Atlas Data
Data product specification - reference date:	
Data product specification - responsible party:	Agriculture and Agri-Food Canada
Data product specification – language:	English, French
Data product specification - topic category:	Climatology/Meteorology/Atmosphere

1.3. Terms and definitions

- Feature attribute
characteristic of a feature
- Class
description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [UML Semantics]

NOTE: A class does not always have an associated geometry (e.g. the metadata class).

- Feature
abstraction of real world phenomena
- Object
entity with a well-defined boundary and identity that encapsulates state and behaviour [UML Semantics]
NOTE: An object is an instance of a class.
- Package
grouping of a set of classes, relationships, and even other packages with a view to organizing the model into more abstract structures

1.4. Abbreviations

AAFC Agriculture and Agri-Food Canada

2. SPECIFICATION SCOPE

This data specification has only one scope, the general scope.

NOTE: The term 'specification scope' originates from the International Standard ISO19131. 'Specification scope' does not express the purpose for the creation of a data specification or the potential use of data, but identifies partitions of the data specification where specific requirements apply.

3. DATA PRODUCT IDENTIFICATION

3.1. Data Series identification

3.1.1. Cumulative degree-days (base of 0, 5, 10) from April to October

Title	Quebec Agroclimate - Cumulative degree-days (base of 0, 5, 10) from April to October (CLI_DJ_MOY_79_08)
Alternate Title	
Abstract	<p>Average degree-days (base of 0, 5 or 10 °C) accumulated between April 1 and October 31. The calculation is based on the period from 1979 to 2008 (30 years).</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>Cumulative thermal units are used in the agriculture field to evaluate the development of vegetables and pests during the growing season. They are based on the close relationship between their development and the temperature. Cumulative thermal units can be used to predict when certain major stages of development will be reached, such as the flowering date, maturity at harvest and peak insect population (CRAAQ, 2012).</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	Raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	Accumulation between April 1 (Julian day 91) and October 31 (Julian day 304) of exceeded average daily temperature in relation to a temperature threshold, T_{base} .

	<p>Units: Degree-days</p> <p>Formula:</p> $DD = \sum_{d=91}^{304} DD_d$ <p>in which</p> $DD_d = \max[0, (T_{avg_d} - T_{base})]$ $T_{base} = \{0^{\circ}\text{C}, 5^{\circ}\text{C}, 10^{\circ}\text{C}\}$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope identification	series
Feature Attribute Names	Average Degree Days, Base 0 (DJ_MOY_B0_NO) Average Degree Days, Base 5 (DJ_MOY_B5_NO) Average Degree Days, Base 10 (DJ_MOY_B10_NO)

3.1.2. Average date of last spring frost ($T_{min} \leq 0, -1, -2, -3$ or -4°C)

Title	Quebec Agroclimate - Average date of last spring frost ($T_{min} \leq 0, -1, -2, -3$ or -4°C) (CLI_GEL_MOY_PRI_79_08)
Alternate Title	
Abstract	<p>Average date of last spring frost ($T_{min} \leq 0, -1, -2, -3$ or -4°C) based on the period from 1979 to 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>These values give a general indication of the frost risk for a region, but they are not necessarily representative of a specific site. Frost risk varies locally depending on a number of factors, particularly topography and proximity to a body of water.</p> <p>The date of the last spring frost corresponds to the last day on which the minimum daily temperature was less than or equal to freezing temperature, i.e. a temperature low enough to damage vegetables. That temperature varies between 0 and -5°C</p>

	<p>depending on the crop.</p> <p>Spring frost can cause significant damage to crops, depending on their phenological stage at the time of exposure. For several annual crops, the date of the last spring frost can help with decisions about seeding earlier and minimizing risks to crops.</p> <p>It is important to consider the date of the last spring frost when choosing a crop or cultivar for a region.</p>
Purpose	<p>This data was created by AAFC during the “Agroclimatic Atlas of Quebec” project which was led by the “Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)” in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC’s Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>The last day after winter on which the minimum daily temperature is less than or equal to a freezing temperature threshold, T_{freez}. The last frost day is sought between January 1 (Julian day 1) and July 31 (Julian day 212) inclusively.</p> <p>Units: Date or Julian day</p> <p>Formula:</p> $LSF_{T_{freez}} = \max\{d T_{min_j} \leq T_{freez}\}$ <p>in which</p> $T_{freez} = \{-4^{\circ}\text{C}, -3^{\circ}\text{C}, -2^{\circ}\text{C}, -1^{\circ}\text{C}, 0^{\circ}\text{C}\}$ $d = 1, \dots, 212$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	<p>Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca</p>
Keywords	<p>Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation</p>

Scope identification	series
Feature Attribute Names	<p>Average last spring frost day, base 0 (GEL_MOY_PRI_B0_DATE)</p> <p>Average last spring frost day, base -1 (GEL_MOY_PRI_BM1_DATE)</p> <p>Average last spring frost day, base -2 (GEL_MOY_PRI_BM2_DATE)</p> <p>Average last spring frost day, base -3 (GEL_MOY_PRI_BM3_DATE)</p> <p>Average last spring frost day, base -4 (GEL_MOY_PRI_BM4_DATE)</p>

3.1.3. Average date of the first autumn frost (Tmin ≤ 0, -1, -2, -3 or -4 °C)

Title	Quebec Agroclimate - Average date of the first autumn frost (Tmin ≤ 0, -1, -2, -3 or -4 °C) (CLI_GEL_MOY_AUT_79_08)
Alternate Title	
Abstract	<p>Average date of the first autumn frost (Tmin ≤ 0, -1, -2, -3 or -4 °C) based on the period from 1979 to 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>These values give a general indication of the frost risk for a region, but they are not necessarily representative of a specific site. Frost risk varies locally depending on a number of factors, particularly topography and proximity to a body of water.</p> <p>The first autumn frost is associated with the first day on which the minimum daily temperature is less than or equal to lethal temperature. Like the last spring frost, this indicator is associated with various levels of probability linked to risks of crop growth ending or potential damage to crops.</p> <p>It is important to consider the date of the last spring frost when choosing a crop or cultivar for a region.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>

Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>The first day of fall on which the minimum daily temperature is less than or equal to a freezing temperature threshold, T_{freez}. The first frost day is predicted between August 1 (Julian day 213) and December 31 (Julian day 365) inclusively.</p> <p>Units: Date or Julian day</p> <p>Formula:</p> $FAF_{T_{freez}} = \min\{d T_{min_d} \leq T_{freez}\}$ <p>in which</p> $T_{freez} = \{-4^{\circ}\text{C}, -3^{\circ}\text{C}, -2^{\circ}\text{C}, -1^{\circ}\text{C}, 0^{\circ}\text{C}\}$ $d = 213, \dots, 365$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope identification	series
Feature Attribute Names	Average first autumn frost day, base 0 (GEL_MOY_AUT_B0_DATE) Average first autumn frost day, base -1 (GEL_MOY_AUT_BM1_DATE) Average first autumn frost day, base -2 (GEL_MOY_AUT_BM2_DATE) Average first autumn frost day, base -3 (GEL_MOY_AUT_BM3_DATE) Average first autumn frost day, base -4 (GEL_MOY_AUT_BM4_DATE)

3.1.4. Average length of the frost-free season ($T_{min} > 0, -1, -2, -3$ or -4°C)

Title	Quebec Agroclimate - Average length of the frost-free season ($T_{min} > 0, -1, -2, -3$ or -4°C) (CLI_GEL_SSGEL_PRI_79_08)
Alternate Title	
Abstract	Average number of consecutive days with a minimum temperature higher than a freezing temperature threshold ($0, -1, -2, -3$ or -4°C), i.e.,

	<p>between the last spring frost and the first autumn frost. The calculation is based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>These values give a general indication of the frost risk for a region, but they are not necessarily representative of a specific site. Frost risk varies locally depending on a number of factors, particularly topography and proximity to a body of water.</p> <p>The length of the frost-free season is an important criterion to consider in evaluating the potential of a crop or cultivar in a given region.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>The number of days between the last spring frost and the first autumn frost according to a freezing temperature threshold, T_{freez}.</p> <p>Units: Days</p> <p>Formula :</p> $LFFS_{T_{freez}} = FAF_{T_{freez}} - LSF_{T_{freez}}$ <p>in which</p> $T_{freez} = \{-4^{\circ}\text{C}, -3^{\circ}\text{C}, -2^{\circ}\text{C}, -1^{\circ}\text{C}, 0^{\circ}\text{C}\}$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca

Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope identification	series
Feature Attribute Names	Frost free season length, base 0 (SSGEL_MOY_B0_NO) Frost free season length, base -1 (SSGEL_MOY_BM1_NO) Frost free season length, base -2 (SSGEL_MOY_BM2_NO) Frost free season length, base -3 (SSGEL_MOY_BM3_NO) Frost free season length, base -4 (SSGEL_MOY_BM4_NO)

3.2. Data product identification

3.2.1. Average start date of the accumulation period of corn heat units (CHU)

Title	Quebec Agroclimate - Average start date of the accumulation period of corn heat units (CHU) (CLI_UTM_MOY_DEBUT_79_08)
Alternate Title	
Abstract	<p>Average start date of the accumulation period of corn heat units (CHU) is based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>CHU are used to predict the arrival of phenological stages of corn, such as maturity, during the growing season. They are also used to describe regional potential for corn production. Furthermore, CHU are used to describe the thermal requirements of various hybrids and cultivars in order to reach maturity.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>

Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>Using the approach proposed by the CHU working group formed as part of the agroclimatic atlas project, the CHU accumulation starts at the first occurrence of a five-day moving average of an average daily temperature (ADT5) greater than or equal to 12.8 °C. The CHU accumulation start date (ASD_CHU) corresponds to the fifth day of this moving window. The first five-day window starts with the median from the 1971–2000 period for the last spring frost in relation to a freezing temperature of 0 °C (MED_DGP0).</p> <p>Units: Date</p> <p>Formula:</p> $SOA_CHU = \min\{d MAT5_d \geq 12.8^\circ\text{C}\}$ <p>in which</p> $MAT5_d = \frac{Tavg_{d-4} + Tavg_{d-3} + Tavg_{d-2} + Tavg_{d-1} + Tavg_d}{5}$ $d \geq MED_LSFO + 4$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Average CHU start date (UTM_MOY_DEBUT_DATE)

3.2.2. Average end date of the accumulation period of corn heat units (CHU)

Title	Quebec Agroclimate - Average end date of the
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	accumulation period of corn heat units (CHU) (CLI_UTM_MOY_FIN_79_08)
Alternate Title	
Abstract	<p>Average end date of the accumulation period of corn heat units (CHU) is based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>CHU are used to predict the arrival of phenological stages of corn, such as maturity, during the growing season. They are also used to describe regional potential for corn production. Furthermore, CHU are used to describe the thermal requirements of various hybrids and cultivars in order to reach maturity.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>Using the approach proposed by the CHU working group formed as part of the agroclimatic atlas project, the end of CHU accumulation (EOA_CHU) corresponds to the first autumn frost in relation to a freezing temperature of -2 °C (FAF_{-2°C}).</p> <p>Units: Date</p> <p>Formula:</p> $EOA_CHU = FAF_{-2^{\circ}C}$ <p>in which</p> $FAF_{-2^{\circ}C} = \min\{d T_{min,d} \leq -2^{\circ}C\}$ <p>d= 213,...,365</p>

	The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Average CHU end date (UTM_MOY_FIN_DATE)

3.2.3. Expected accumulated CHU 8 of 10 years (80% probability)

Title	Quebec Agroclimate - Expected accumulated CHU 8 of 10 years (80% probability) (CLI_UTM_C20_LONG_79_08)
Alternate Title	
Abstract	<p>Minimum number of CHU that can be expected 8 of 10 years (80% probability) during the growing season. This calculation is based on the period between 1979 and 2008 (30 years).</p> <p>This analysis was based on temperature values interpolated at 10 using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>CHU are used to predict the arrival of phenological stages of corn, such as maturity, during the growing season. They are also used to describe regional potential for corn production. Furthermore, CHU are used to describe the thermal requirements of various hybrids and cultivars in order to reach maturity.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	

	<p>The sum of daily CHU (CHU_d) over the period between the previously mentioned start date (ASD_CHU) and end date (AED_CHU). The calculation of daily CHU is based on the formula by Bootsma et al., 1999.</p> <p>Units: CHU</p> <p>Formula:</p> $CHU = \sum_{d=ASD_CHU}^{AED_CHU} CHU_d$ <p>in which</p> $CHU_d = \frac{1}{2}(Ymax_d + Ymin_d)$ $Ymax_d = \begin{cases} 3.33(Tmax_d - 10) - 0.084(Tmax_d - 10)^2 & \text{if } Tmax_d > 10^\circ\text{C} \\ 0 & \text{if } Tmax_d \leq 10^\circ\text{C} \end{cases}$ $Ymin_d = \begin{cases} 1.8(Tmin_d - 4.44) & \text{if } Tmin_d > 4.44^\circ\text{C} \\ 0 & \text{if } Tmin_d \leq 4.44^\circ\text{C} \end{cases}$ <p>The 80% probability of having an accumulation greater than a given CHU value corresponds to the 20th percentile of the 30 seasonal sums from 1979 to 2008 (in ascending order).</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Minimum CHU (UTM_C20_LONGUEUR_VAL)

3.2.4. Average start date of the growing season

Title	Quebec Agroclimate - Average start date of the growing season (CLI_SC_MOY_DEBUT_79_08)
Alternate Title	
Abstract	<p>Average start date of the growing season ($T_{avg} \geq 5.5^\circ\text{C}$) based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>The length of the growing season is associated with</p>

	<p>the period when the weather conditions of a region allow for the growth of a crop. For a given region, it corresponds to the period when the average temperature stays above 5.5 °C. Given that this indicator is directly linked to crop growth and development, it is a particularly important tool in planning and managing long-term agricultural production and when making strategic decisions, such as evaluating a region’s agricultural potential.</p> <p>CRAAQ source</p>
Purpose	<p>This data was created by AAFC during the “Agroclimatic Atlas of Quebec” project which was led by the “Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)” in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC’s Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>The start of the growing season (SGS) after winter corresponds to the fifth day of a period of five consecutive days where the weighted moving average of daily temperatures (WMAT5) is greater than 5.5 °C.</p> <p>Units: Date</p> <p>Formula:</p> $SGS = \min\{d WMAT5_j > 5.5^{\circ}C\}$ <p>in which</p> $WMAT5_d = \frac{Tavg_{d-4} + 4Tavg_{d-3} + 6Tavg_{d-2} + 4Tavg_{d-1} + Tavg_d}{16}$ <p>d= 1, ..., 365</p> <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject

	Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Growing season start date (SC_MOY_DEBUT_DATE)

3.2.5. Average end date of the growing season

Title	Quebec Agroclimate - Average end date of the growing season (CLI_SC_MOY_FIN_79_08)
Alternate Title	
Abstract	<p>Average end date of the growing season (Tavg ≥ 5.5 °C) based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>The length of the growing season is associated with the period when the weather conditions of a region allow for the growth of a crop. For a given region, it corresponds to the period when the average temperature stays above 5.5 °C. Given that this indicator is directly linked to crop growth and development, it is a particularly important tool in planning and managing long-term agricultural production and when making strategic decisions, such as evaluating a region's agricultural potential.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	

Geographic Description	Québec
Supplemental Information	<p>The end of the growing season (<i>EGS</i>) corresponds to the fifth day of a period of five consecutive days where the weighted moving average of daily temperatures (<i>WMAT5</i>) is greater than 5.5 °C for the last time after summer.</p> <p>Units: Date</p> <p>Formula: $EGS = \max\{d WMAT5_d > 5.5^{\circ}C\}$ in which $WMAT5_d = \frac{Tavg_{d-4} + 4Tavg_{d-3} + 6Tavg_{d-2} + 4Tavg_{d-1} + Tavg_d}{16}$ d= 1,...,365</p> <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Growing season end date (SC_MOY_FIN_DATE)

3.2.6. Average length of the growing season

Title	Quebec Agroclimate - Average length of the growing season (CLI_SC_MOY_LONG_79_08)
Alternate Title	
Abstract	<p>Average length of the growing season ($T_{avg} \geq 5.5^{\circ}C$) based on the period between 1979 and 2008.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>The length of the growing season is associated with the period when the weather conditions of a region allow for the growth of a crop. For a given region, it corresponds to the period when the average</p>

	temperature stays above 5.5 °C. Given that this indicator is directly linked to crop growth and development, it is a particularly important tool in planning and managing long-term agricultural production and when making strategic decisions, such as evaluating a region's agricultural potential.
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>The length of the growing season is the number of days between the start (SGS) and end (EGS) of the growing season.</p> <p>Units: Days</p> <p>Formula:</p> $LGS = EGS - SGS$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Growing season length (SC_MOY_LONGUEUR_NO)

3.2.7. Average accumulated precipitation between April 1 and October 31

Title	Quebec Agroclimate - Average accumulated precipitation between April 1 and October 31 (CLI_PPT_AVROCT_MOY_74_03)
Alternate Title	
Abstract	<p>Average accumulated precipitation between April 1 and October 31 is based on the period between 1974 and 2003.</p> <p>This analysis was based on temperature values interpolated at 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>The water inflow provided by precipitation is an index used in a number of production sectors, to manage plot irrigation, evaluation of the agricultural potential of a given region and leaching of pesticides, for example. Accumulated precipitation in the form of rain can be calculated on an annual or monthly basis or over a specific period: for example, from April to October to correspond generally with the growing season. Quantities of rain are thus calculated for a selected territory on a variable time scale. It is important that careful attention be paid to the scale when interpreting the observed weather data. As an example, the accumulation of small quantities of rain on a regular basis over a long period may be equivalent to a higher amount of rain falling during a shorter period, but the impact on the crop is not the same.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec

Supplemental Information	<p>Sum of daily precipitation between April 1 (Julian day 91) and October 31 (Julian day 304).</p> <p>Units: mm</p> <p>Formula:</p> $P = \sum_{d=91}^{304} P_d$ <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Precipitation (PPT_VAL)

3.2.8. Average accumulation of precipitation during the growing season

Title	Quebec Agroclimate - Average accumulation of precipitation during the growing season (CLI_PPT_SC_MOY_74_03)
Alternate Title	
Abstract	<p>Average cumulative precipitation during the growing season ($T_{moy} \geq 5.5 \text{ }^\circ\text{C}$) based on the period from 1974 to 2003.</p> <p>This analysis is based on precipitation values interpolated every 10 km using the ANUSPLIN method, based on climatological data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>The water inflow provided by precipitation is an index used in a number of production sectors, to manage plot irrigation, evaluation of the agricultural potential of a given region and leaching of pesticides, for example. Accumulated precipitation in the form of rain can be calculated on an annual or monthly basis or over a specific period: for example, from April to October to correspond generally with the growing season. Quantities of rain are thus calculated for a selected territory on a variable time scale. It is important that careful</p>

	attention be paid to the scale when interpreting the observed weather data. As an example, the accumulation of small quantities of rain on a regular basis over a long period may be equivalent to a higher amount of rain falling during a shorter period, but the impact on the crop is not the same.
Purpose	<p>This data was created by AAFC during the “Agroclimatic Atlas of Quebec” project which was led by the “Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)” in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC’s Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	<p>Sum of daily precipitation between the beginning (<i>DSC</i>) and end of the growing season (<i>FSC</i>) inclusively.</p> <p>Units: mm</p> <p>Formula:</p> $P_{SC} = \sum_{j=DSC}^{FSC} P_j$ <p>The average of 30 annual values between 1974 and 2003 is then calculated for each grid point every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	<p>Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation</p>
Scope Identification	dataset
Feature Attribute Names	Precipitation (PPT_VAL)

3.2.9. Average accumulation of difference between precipitation and potential evapotranspiration between May 1 and October 31

Title	Quebec Agroclimate - Average accumulation of difference between precipitation and potential evapotranspiration between May 1 and October 31 (CLI_P_ETP_MAI OCT_MOY_74_03)
Alternate Title	
Abstract	<p>Average of the analysis of the difference between precipitation and potential evapotranspiration (P-ETP) from May 1 to October 1, based on the period between 1974 and 2003.</p> <p>The analysis is based on precipitation and temperature values interpolated every 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>Evapotranspiration corresponds to the loss of water from the soil and plant cover by evaporation, and the loss of water from plants through transpiration.</p> <p>The potential evapotranspiration index (ETP) is based on the principle that the growth of a crop is optimal when the usable water reserve is sufficient and there is a balance between water absorbed by the roots and water lost through transpiration. The ETP corresponds to the maximum theoretical possible evaporation and transpiration in given climate conditions.</p> <p>The accumulated difference between precipitation and potential evapotranspiration (P-ETP) gives a general indication of the "climatological" water balance and can be used to make qualitative comparisons between regions in terms of irrigation requirements and risks of drought. However, a specific assessment of water needs for a given culture and a specific location requires knowledge of the actual evapotranspiration which, in addition to climatological factors, also takes into account the characteristics of the plant and the soil.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	
Geographic Description	Québec
Supplemental Information	Cumulative P-ETP water index is defined as the difference between daily potential evapotranspiration and precipitation from May 1 to October 31 inclusively. Potential evapotranspiration is calculated based on the Baier-Robertson formula (1965). It is a

	<p>function of the temperatures (<i>FTmax</i> and <i>FTmin</i>) in °F and the extraterrestrial radiation (<i>Re</i>) in MJ/m²/min. The radiation is calculated using the solar constant (<i>GSC</i>), solar declination (<i>ds</i>, <i>no unit</i>), correction of eccentricity (<i>dr</i>, <i>no unit</i>), the hour angle (Ω) in radians and latitude (<i>LAT</i>) in degrees of the site being studied (station or grid point on a climate model).</p> <p>Units: mm</p> <p>Formula:</p> $C_PETP = \sum_{j=May\ 1}^{Oct\ 31} P_j - ETP_j$ <p>In which</p> $ETP_j = 0.094[-87.03 + 0.928FTmax_j + 0.933(FTmax_j - FTmin_j) + 0.0486Re]$ $FTmax_j = \frac{9}{5}Tmax_j + 32$ $FTmin_j = \frac{9}{5}Tmin_j + 32$ $Re = \frac{1440}{\pi}GSC\ dr \left[\Omega \sin\left(\frac{\pi LAT}{180}\right) \sin(ds) + \cos\left(\frac{\pi LAT}{180}\right) \cos(ds) \sin(\Omega) \right]$ $dr = 1 + 0.33 \left[\cos\left(\frac{2\pi JJ}{365}\right) \right]$ $ds = 0.409 \sin\left(\frac{2\pi JJ}{180} - 1.39\right)$ <p><i>JJ</i> = date in Julians</p> <p><i>GSC</i> = 0.082 MJ/m²/min</p> <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
<p>Constraints</p>	<p>Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca</p>
<p>Keywords</p>	<p>Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation</p>
<p>Scope Identification</p>	<p>dataset</p>
<p>Feature Attribute Names</p>	<p>Precipitation minus evapotranspiration (P_ETP_VAL)</p>

3.2.10. Average accumulated difference between precipitation and potential evapotranspiration during the growing season

Title	Quebec Agroclimate - Average accumulated difference between precipitation and potential evapotranspiration during the growing season (CLI_P_ETP_SC_MOY_74_03)
Alternate Title	
Abstract	<p>Average of the analysis of the difference between precipitation and potential evapotranspiration (P-ETP) during the growing season ($T_{moy} \geq 5.5 \text{ }^\circ\text{C}$), based on the period between 1974 and 2003.</p> <p>The analysis is based on precipitation and temperature values interpolated every 10 km using the ANUSPLIN method, based on data from the Ministère du Développement durable, de l'Environnement et des Parcs du Québec and from Environment Canada.</p> <p>Evapotranspiration corresponds to the loss of water from the soil and plant cover by evaporation, and the loss of water from plants through transpiration.</p> <p>The potential evapotranspiration index (ETP) is based on the principle that the growth of a crop is optimal when the usable water reserve is sufficient and there is a balance between water absorbed by the roots and water lost through transpiration. The ETP corresponds to the maximum theoretical possible evaporation and transpiration in given climate conditions.</p> <p>The accumulated difference between precipitation and potential evapotranspiration (P-ETP) gives a general indication of the "climatological" water balance and can be used to make qualitative comparisons between regions in terms of irrigation requirements and risks of drought. However, a specific assessment of water needs for a given culture and a specific location requires knowledge of the actual evapotranspiration which, in addition to climatological factors, also takes into account the characteristics of the plant and the soil.</p>
Purpose	<p>This data was created by AAFC during the "Agroclimatic Atlas of Quebec" project which was led by the "Centre de référence en agriculture et agroalimentaire du Québec (CRAAQ)" in collaboration with many other organizations (http://www.agrometeo.org/index.php/atlas).</p> <p>The data is also available for download on AAFC's Geospatial Platform for users who wish to integrate the data into their own GIS for further analysis.</p>
Topic Category	Climatology/Meteorology/Atmosphere
Spatial Representation Type	raster, vector
Spatial Resolution	

Geographic Description	Québec
Supplemental Information	<p>Cumulative P-ETP water index is defined as the difference between daily potential evapotranspiration and precipitation from the beginning (<i>DSC</i>) to the end (<i>FSC</i>) of the growing season inclusively. Potential evapotranspiration is calculated based on the Baier-Robertson formula (1965). It is a function of the temperatures (<i>FTmax</i> and <i>FTmin</i>) in °F and the extraterrestrial radiation (<i>Re</i>) in MJ/m²/min. The radiation is calculated using the solar constant (<i>GSC</i>), solar declination (<i>ds, no unit</i>), correction of eccentricity (<i>dr, no unit</i>), the hour angle (Ω) in radians and latitude (<i>LAT</i>) in degrees of the site being studied (station or grid point on a climate model).</p> <p>Units: mm</p> <p>Formula:</p> $C_PETP_{Sc} = \sum_{j=DSC}^{FSC} P_j - ETP_j$ <p>In which</p> $ETP_j = 0.094[-87.03 + 0.928FTmax_j + 0.933(FTmax_j - FTmin_j) + 0.0486Re]$ $FTmax_j = \frac{9}{5}Tmax_j + 32$ $FTmin_j = \frac{9}{5}Tmin_j + 32$ $Re = \frac{1440}{\pi}GSC dr \left[\Omega \sin\left(\frac{\pi LAT}{180}\right) \sin(ds) + \cos\left(\frac{\pi LAT}{180}\right) \cos(ds) \sin(\Omega) \right]$ $dr = 1 + 0.33 \left[\cos\left(\frac{2\pi JJ}{365}\right) \right]$ $ds = 0.409 \sin\left(\frac{2\pi JJ}{180} - 1.39\right)$ <p><i>JJ</i> = date in Julians</p> <p><i>GSC</i> = 0.082 MJ/m²/min</p> <p>The average of the 30 annual values from 1974 to 2003 is then calculated for each of the grid points every 10 km.</p>
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Date: February 1, 2000 Keywords: Farmlands, Crop, Agriculture, Temperature, Precipitation
Scope Identification	dataset
Feature Attribute Names	Precipitation minus evapotranspiration (P_ETP_VAL)

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema



ArcGIS Workspace

«Point»
CLI_SC_MOY_LONG_79_08

«AttributeIndex»
+ FDO_OBJECTID

«SpatialIndex»
+ FDO_Shape

«RequiredField»
+ OBJECTID: esriFieldTypeOID
+ Shape: esriFieldTypeGeometry

«Field»
+ SC_MOY_LONGUEUR_NO: esriFieldTypeSmallInteger

«Point»
CLI_UTM_MOY_FIN_79_08

«AttributeIndex»
+ FDO_OBJECTID

«SpatialIndex»
+ FDO_Shape

«RequiredField»
+ OBJECTID: esriFieldTypeOID
+ Shape: esriFieldTypeGeometry

«Field»
+ UTM_MOY_FIN_DATE: esriFieldTypeSmallInteger

«Point»
CLI_UTM_C20_LONG_79_08

«AttributeIndex»
+ FDO_OBJECTID

«SpatialIndex»
+ FDO_Shape

«RequiredField»
+ OBJECTID: esriFieldTypeOID
+ Shape: esriFieldTypeGeometry

«Field»
+ UTM_C20_LONGUEUR_VAL: esriFieldTypeSingle

«Point»
CLI_UTM_MOY_DEBUT_79_08

«AttributeIndex»
+ FDO_OBJECTID

«SpatialIndex»
+ FDO_Shape

«RequiredField»
+ OBJECTID: esriFieldTypeOID
+ Shape: esriFieldTypeGeometry

«Field»
+ UTM_MOY_DEBUT_DATE: esriFieldTypeSmallInteger

4.2. Feature catalogue – Quebec Agroclimatic Atlas

Title	Quebec Agroclimatic Atlas – Feature Catalogue
Scope	Quebec Agroclimatic Atlas
Version Number	1
Version Date	
Producer	Agriculture and Agri-Food Canada, Government of Canada

System-generated attributes (for example, OBJECTID, Shape, Shape Length and Area) are not defined in the feature catalog.

4.2.1. Feature attributes

4.2.1.1. Average Degree Days, Base 0

Name	Cumulative degree-days from April to October using base of 0 degrees Celsius (DJ_MOY_B0_NO)
Definition	The average degree days (base of 0) accumulated between April 1 and October 31. The calculation is based on the period from 1979 to 2008 (30 years).
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

4.2.1.2. Average Degree Days, Base 5

Name	Cumulative degree-days from April to October using base of 5 degrees Celsius (DJ_MOY_B5_NO)
Definition	The average degree days (base of 5) accumulated between April 1 and October 31. The calculation is based on the period from 1979 to 2008 (30 years).
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

4.2.1.3. Average Degree Days, Base 10

Name	Cumulative degree-days from April to October using base of 10 degrees Celsius (DJ_MOY_B10_NO)
Definition	The average degree days (base of 10) accumulated between April 1 and October 31. The calculation is based on the period from 1979 to 2008 (30 years).
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real

Value Domain Type	0 (not enumerated)
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4.2.1.4. Average last spring frost day, base 0

Name	Average date of the last spring frost using base of 0 degrees Celsius (GEL_MOY_PRI_B0_DATE)
Definition	The average ordinal date of the last spring frost using a base threshold of 0 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.5. Average last spring frost day, base -1

Name	Average date of the last spring frost using base of minus 1 degrees Celsius (GEL_MOY_PRI_BM1_DATE)
Definition	The average ordinal date of the last spring frost using a base threshold of -1 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.6. Average last spring frost day, base -2

Name	Average date of the last spring frost using base of -2 degrees Celsius (GEL_MOY_PRI_BM2_DATE)
Definition	The average ordinal date of the last spring frost using a base threshold of -2 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.7. Average last spring frost day, base -3

Name	Average date of the last spring frost using base of -3 degrees Celsius (GEL_MOY_PRI_BM3_DATE)
Definition	The average ordinal date of the last spring frost using a base threshold of -3 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada

Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.8. Average last spring frost day, base -4

Name	Average date of the last spring frost using base of -4 degrees Celsius (GEL_MOY_PRI_BM4_DATE)
Definition	The average ordinal date of the last spring frost using a base threshold of -4 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.9. Average first autumn frost day, base 0

Name	Average date of first fall frost using base of 0 degrees Celsius (GEL_MOY_AUT_B0_DATE)
Definition	The average ordinal date of the first fall frost using a base threshold of 0 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.10. Average first autumn frost day, base -1

Name	Average date of first fall frost using base of -1 degrees Celsius (GEL_MOY_AUT_BM1_DATE)
Definition	The average ordinal date of the first fall frost using a base threshold of -1 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.11. Average first autumn frost day, base -2

Name	Average date of first fall frost using base of -2 degrees Celsius (GEL_MOY_AUT_BM2_DATE)
Definition	The average ordinal date of the first fall frost using a base threshold of

	-2 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.12. Average first autumn frost day, base -3

Name	Average date of first fall frost using base of -3 degrees Celsius (GEL_MOY_AUT_BM3_DATE)
Definition	The average ordinal date of the first fall frost using a base threshold of -3 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.13. Average first autumn frost day, base -4

Name	Average date of first fall frost using base of -4 degrees Celsius (GEL_MOY_AUT_BM4_DATE)
Definition	The average ordinal date of the first fall frost using a base threshold of -4 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.14. Frost free season length, base 0

Name	Average length of the frost-free season a using base of 0 degrees Celsius (SSGEL_MOY_B0_NO)
Definition	The average length in days between the last spring frost and the first fall frost using a base threshold of 0 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.15. Frost free season length, base -1

Name	Average length of the frost-free season a using base of -1 degrees Celsius (SSGEL_MOY_BM1_NO)
Definition	The average length in days between the last spring frost and the first fall frost using a base threshold of -1 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.16. Frost free season length, base -2

Name	Average length of the frost-free season a using base of -2 degrees Celsius (SSGEL_MOY_BM2_NO)
Definition	The average length in days between the last spring frost and the first fall frost using a base threshold of -2 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.17. Frost free season length, base -3

Name	Average length of the frost-free season a using base of -3 degrees Celsius (SSGEL_MOY_BM3_NO)
Definition	The average length in days between the last spring frost and the first fall frost using a base threshold of -3 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.18. Frost free season length, base -4

Name	Average length of the frost-free season a using base of -4 degrees Celsius (SSGEL_MOY_BM4_NO)
Definition	The average length in days between the last spring frost and the first fall frost using a base threshold of -4 degrees Celsius in a 30 year period (1979-2008) in the agricultural area of Quebec.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.19. Average CHU start date

Name	Average start date of the accumulation period of corn heat units (UTM_MOY_DEBUT_DATE)
Definition	The average start date of the accumulation period of corn heat units (CHU) is based on the period from 1979 – 2008.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.20. Average CHU end date

Name	Average end date of the accumulation period of corn heat units (UTM_MOY_FIN_DATE)
Definition	The average end date of the accumulation period of corn heat units (CHU) is based on the period from 1979 – 2008.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.21. Minimum CHU

Name	Expected accumulated CHU 8 of 10 years (UTM_C20_LONGUEUR_VAL)
Definition	Minimum number of CHU that can be expected 8 of 10 years (80% probability) during the growing season. This calculation is based on the period between 1979 and 2008 (30 years).
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

4.2.1.22. Growing season start date

Name	Average start date of the growing season (SC_MOY_DEBUT_DATE)
Definition	The average start date of the growing season ($T_{avg} \geq 5.5$ °C) based on the period between 1979 and 2008.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.23. Growing season end date

Name	Average end date of the growing season (SC_MOY_FIN_DATE)
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Definition	The average end date of the growing season ($T_{avg} \geq 5.5$ °C) based on the period between 1979 and 2008.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.24. Growing season length

Name	Average length of the growing season (SC_MOY_LONGUEUR_NO)
Definition	The average length of the growing season ($T_{avg} \geq 5.5$ °C) based on the period between 1979 and 2008.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.25. Average accumulated precipitation between April 1 and October 31

Name	Average accumulated precipitation between April 1 and October 31 (PPT_VAL)
Definition	The average accumulated precipitation between April 1 and October 31 is based on the period between 1974 and 2003.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	integer
Value Domain Type	0 (not enumerated)

4.2.1.26. Average accumulation of precipitation during the growing season

Name	Average accumulation of precipitation during the growing season (PPT_VAL)
Definition	The average cumulative precipitation during the growing season ($T_{avg} \geq 5.5$ °C) based on the period between 1974 and 2003.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

4.2.1.27. Average accumulation of difference between precipitation and potential evapotranspiration between May 1 and October 31

Name	The average accumulation of difference between precipitation and potential evapotranspiration (P_ETP_VAL) .
Definition	The average of the difference between precipitation and potential evapotranspiration (P_ETP_VAL) from May 1 to October 1, based on the period between 1974 and 2003.

Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

4.2.1.28. Average accumulation of difference between precipitation and potential evapotranspiration during the growing season

Name	The average accumulation of difference between precipitation and potential evapotranspiration (P_ETP_VAL) .
Definition	The average of the difference between precipitation and potential evapotranspiration (P_ETP_VAL) during the growing season, based on the period between 1974 and 2003.
Aliases	
Producer	Agriculture and Agri-Food Canada, Government of Canada
Value Data Type	real
Value Domain Type	0 (not enumerated)

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Horizontal coordinate reference system:WGS 84

Map projection: -Web Mercator Auxiliary Sphere; EPSG: 3857

Horizontal coordinate reference system:NAD 83

Map projection: -Web Mercator Auxiliary Sphere; EPSG: 9822

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

Measure not used at this time

6.2. Logical consistency

Measure not used at this time

6.3. Positional accuracy

Measure not used at this time

6.4. Temporal accuracy

Measure not used at this time

6.5. Thematic accuracy

Measure not used at this time

6.6. Lineage statement

Lineage Statement	Daily csv files of maximum temperature, minimum temperature and precipitation for the agricultural region of Quebec are accessed through a number of python scripts which take that data and summarize by average and summing (precipitation) over a 30 year period. Precipitation and potential evapotranspiration algorithms are performed from 1974 to 2003 whereas degree days, crop heat units and frost free days are calculated over the 1979 to 2008 period. These csv summaries are then converted to point feature class (make XY event) and then to 10 km geotiffs (point to raster) for the respective weather algorithm calculated.
Scope	Data series, dataset

7. DATA CAPTURE

8. DATA MAINTENANCE

No maintenance

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

File Geodatabase

format name: Esri Geodatabase (File-based)
 format version: 10.1
 specification: A collection of various types of GIS datasets held in a file system folder. (<http://arcgis.com>)
 languages: eng
 character set: utf8

TIF

format name: Tag Interleaved File:
 version: 6.0
 specification: GeoTIFF is format extension for storing georeference and geocoding information in a TIFF 6.0 compliant raster file by tying a raster image to a known model space or map projection.
 languages: eng
 character set: utf8

11. METADATA

The metadata requirements follow the Government of Canada's Treasury Board Standard on Geospatial Data (ISO 19115).