Climograph

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Project home: https://github.com/StevenBlack/climographs

Introduction

The motivation for this repository is, given a location, create its clomograph.

See: https://en.wikipedia.org/wiki/Climograph.

Static Examples (these are images)

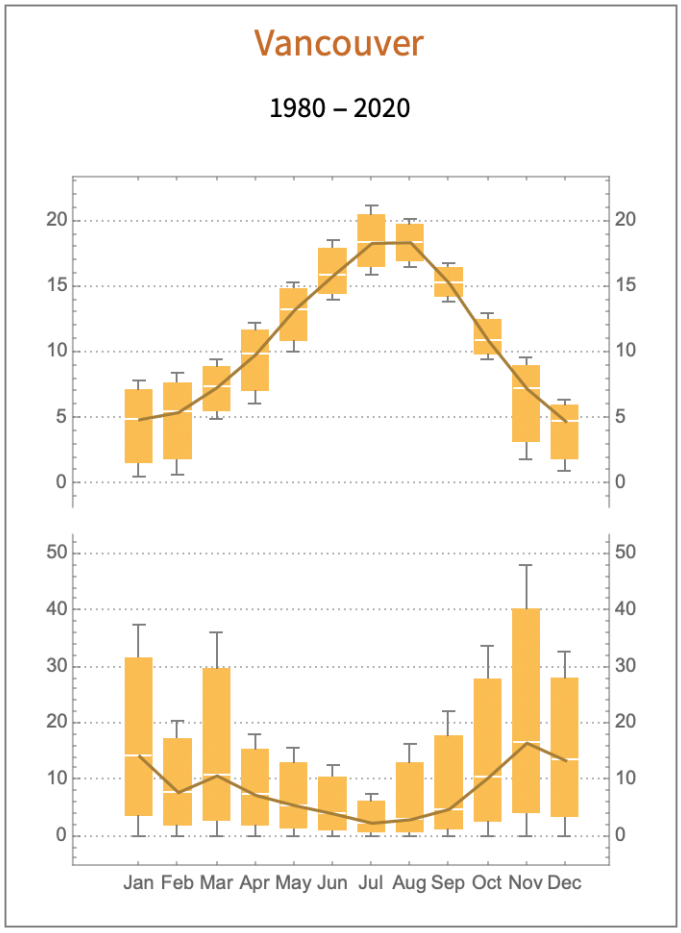
Example: You can pass a single location Entity and get its climograph.

In[990]:=

In[991]:=

In[20]:= `climograph[ Vancouver CITY ]`

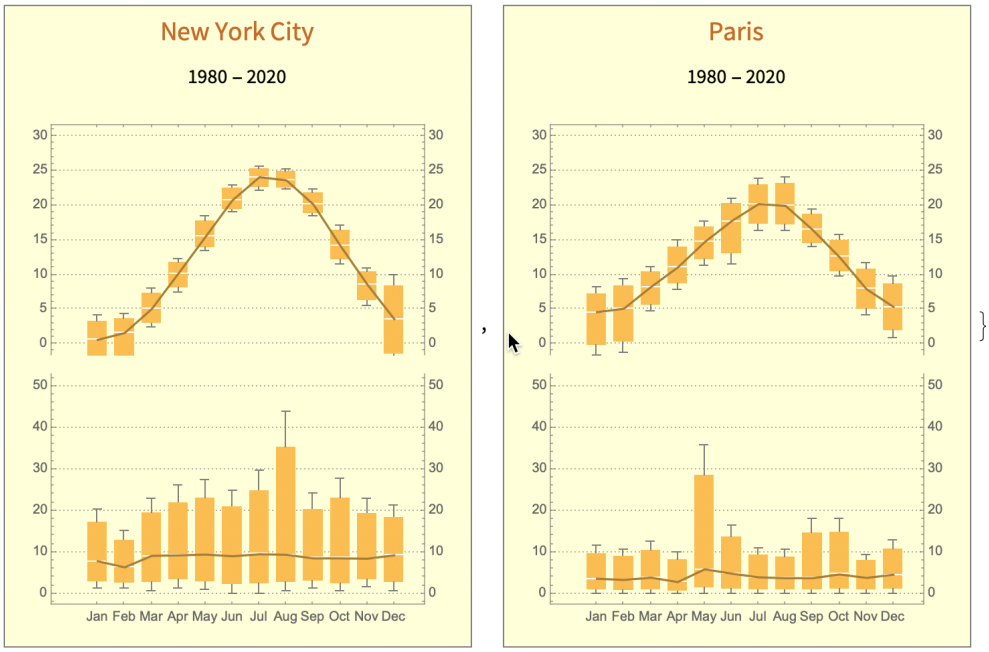
Out[20]=



Example: You can pass a list of location Entities and get a list of their climographs.

```
In[21]:= climograph[{New York City CITY, Paris CITY}
  , TemperaturePlotRange → {0, 30}
  , PrecipitationPlotRange → {0, 50}
  , Background → LightYellow
 ]
```

Out[21]=



Definition

In[1064]:=

```
ClearAll[Climograph];
(* These are the options, and the defaults, provided
 by the function *)
Options[iClimograph] = {
   "LocationStyle" → "Subsection"
   , "YearRangeStyle" → "Text"
   , "StartDate" → {1980, 1, 1}
   , "EndDate" → {2020, 12, 31}

   , "ChartStyle" → Automatic

   , "Background" → White
   , "PlotTheme" → Automatic

   , "TemperaturePlotRange" → Automatic
   , "TemperatureJoined" → True
   , "TemperatureAxisLabel" → "Temperature"

   , "PrecipitationPlotRange" → Automatic
   , "PrecipitationJoined" → True
```

```
    , "PrecipitationAxisLabel" → "Precipitation"

    , "InnerFrame" → None
    , "InnerFrameStyle" → Automatic

    , "Frame" → True
    , "FrameStyle" → Gray
   };

(* The interface for when a GeoPosition is passed. *)
Climograph[location_GeoPosition, opts : OptionsPattern[iClimograph]] :=
 iClimograph[First[GeoNearest["City", location, 1]], opts]

(* The interface for passing a single Entity and options. *)
Climograph[location_Entity, opts : OptionsPattern[iClimograph]] :=
  iClimograph[location, opts];

(* The interface for passing a list of Entities with options. *)
Climograph[locations_List, opts : OptionsPattern[iClimograph]] :=
  iClimograph[#, opts] & /@ locations;

(* The interface for when nothing is passed. *)
Climograph[] :=
  iClimograph[First[GeoNearest[Entity["City"], $GeoLocation, 1]]];

(* This function does the work *)
iClimograph[location_, OptionsPattern[]] := (
    startDate = OptionValue["StartDate"];
    endDate = OptionValue["EndDate"];

    (* Temperature plot - the upper plot *)
    tempByMonth =
     WeatherData[location, "MeanTemperature", {startDate, endDate, "Month"}];
    tempGroupByMonth =
     GroupBy[tempByMonth["DatePath"], DateValue[First[#], "MonthNameShort"] &];
    tempMinMaxMean = {Min[Map[Last, #]], Max[Map[Last, #]], Mean[Map[Last, #]]} & /@
      tempGroupByMonth;
    tempRange = OptionValue["TemperaturePlotRange"];
    If[ tempRange == Automatic,
     (
      maxTemp = Max[tempByMonth[[2]][[1]][[1]]];
      minTemp = Min[tempByMonth[[2]][[1]][[1]]];
      tempRange = {minTemp, maxTemp} // QuantityMagnitude;
     ), Nothing];

    ptemp = BoxWhiskerChart[
      tempMinMaxMean
```

```
  , ChartStyle → OptionValue["ChartStyle"]
  , Joined → OptionValue["TemperatureJoined"]
  , Frame → {{True, True}, {None, True}}
  , FrameTicks → {{All, All}, {None, All}}
  , FrameLabel → {Automatic, OptionValue["TemperatureAxisLabel"]}
  (*, FrameLabel→{{"left","right"},{"bottom","top"}}*)
  , PlotTheme → OptionValue["PlotTheme"]
  , PlotRange → OptionValue["TemperaturePlotRange"]
  , Ticks → All
 ];


(* Precipitation plot - the lower plot *)
precipByMonth = DeleteMissing[WeatherData[location,
   "TotalPrecipitation", {startDate, endDate, "Month"}]];
precipGroupByMonth = GroupBy[
  precipByMonth["DatePath"], DateValue[First[#], "MonthNameShort"] &];
precipMeanByMonth = Mean[Map[Last, #]] & /@ precipGroupByMonth;
precipMinMaxMean =
 {Min[Map[Last, #]], Max[Map[Last, #]], Mean[Map[Last, #]]} & /@
  precipGroupByMonth;
maxPrecip = Max[precipByMonth[[2]][[1]][[1]]];
minPrecip = 0; (* By definition *)
If[ precipRange == Automatic,
 (
  maxPrecip = Max[precipByMonth[[2]][[1]][[1]]];
  precipRange = {minPrecip, maxPrecip} // QuantityMagnitude;
 ), Nothing];

pprecip = BoxWhiskerChart[
  precipMinMaxMean
  , ChartStyle → OptionValue["ChartStyle"]
  , ChartLabels → Automatic
  , Joined → OptionValue["PrecipitationJoined"]
  , Frame → {{True, True}, {True, None}}
  , FrameTicks → {{All, All}, Automatic}
  , FrameLabel → {Automatic, OptionValue["PrecipitationAxisLabel"]}
  (*, FrameLabel→{{"left","right"},{"bottom","top"}}*)
  , PlotTheme → OptionValue["PlotTheme"]
  , PlotRange → OptionValue["PrecipitationPlotRange"]
  , Ticks → All
 ];
(* Joining the precipitation
 and temperature plots together, and returning *)
Return[
 GraphicsColumn[
  {TextCell[location["Name"], OptionValue["LocationStyle"]],
```

```
    TextCell[ToString[startDate[[1]]] <> " - " <> ToString[endDate[[1]]],
     OptionValue["YearRangeStyle"]],
    GraphicsColumn[
     {ptemp, pprecip}
     , Frame → OptionValue["InnerFrame"]
     , FrameStyle → OptionValue["InnerFrameStyle"]
     , Background → OptionValue["Background"]
    ]
   },
   Frame → OptionValue["Frame"]
   , FrameStyle → OptionValue["FrameStyle"]
   , Background → OptionValue["Background"]
  ]
 ]
);
```

Live Examples

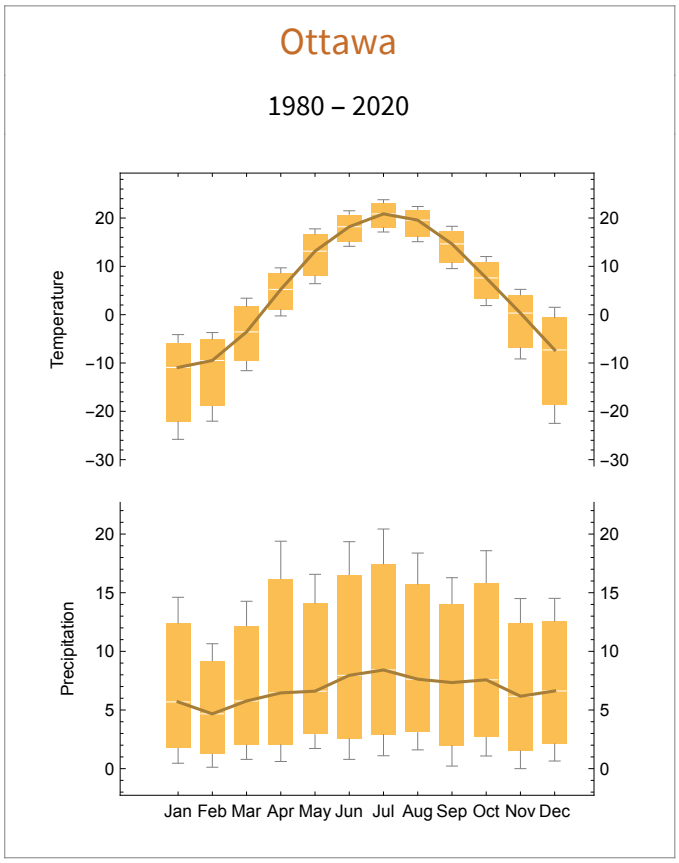
Example 1: default climograph

This call with no options produces a default climograph.

In[1073]:=

```
Climograph[ Ottawa CITY ]
```

Out[1073]=



Example 2: normalizing scales across climographs

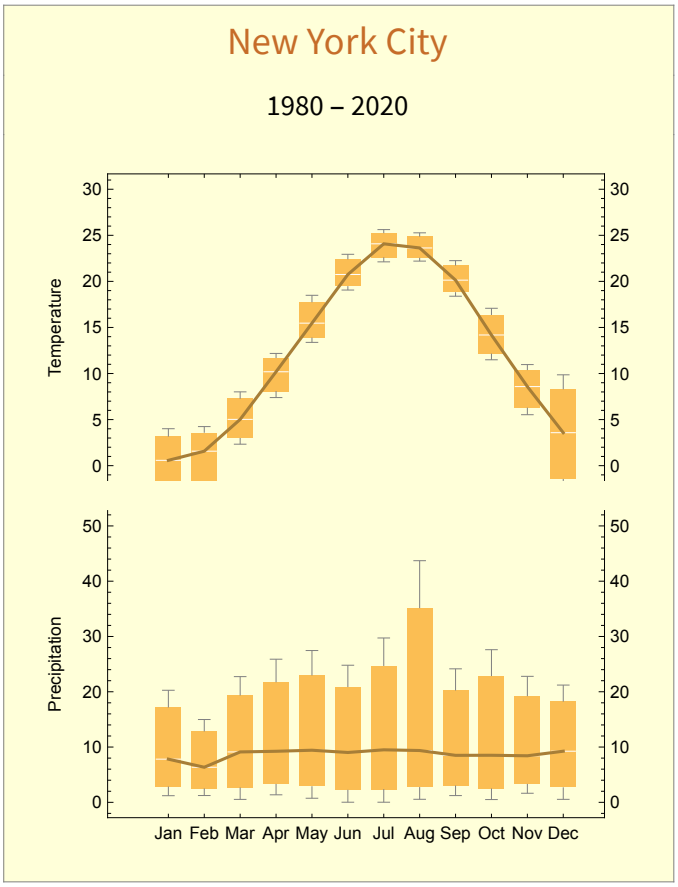
This call uses options to set the background color, and normalizes the vertical ranges for both the temperature and precipitation plots .

In[1000]:=

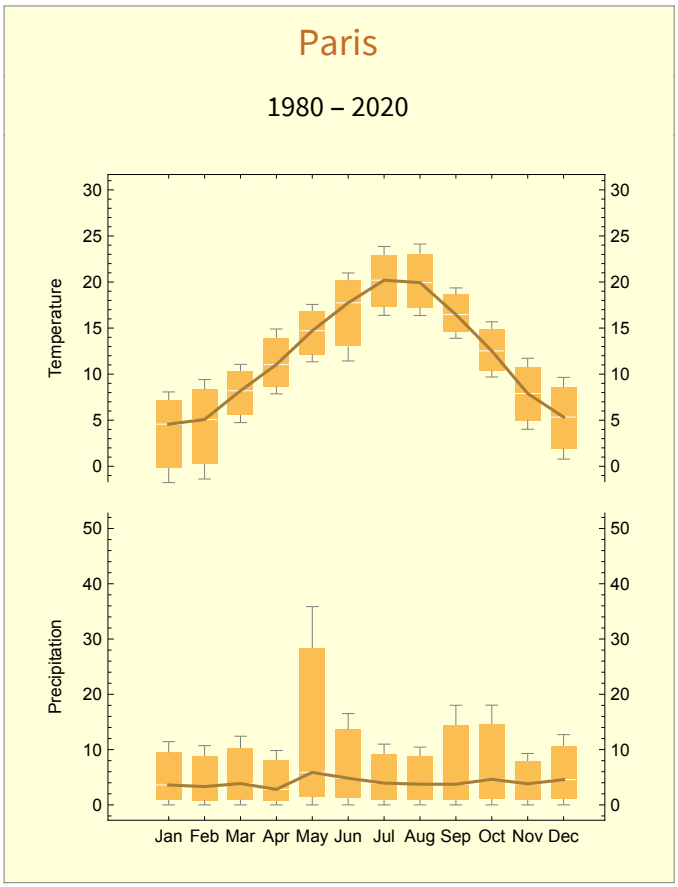
```
Climograph[{ New York City CITY , Paris CITY }
  , TemperaturePlotRange → {0, 30}
  , PrecipitationPlotRange → {0, 50}
  , Background → LightYellow
]
```

Out[1000]=

{


New York City
1980 – 2020
Temperature
Precipitation
0
5
10
15
20
25
30
0
10
20
30
40
50
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

,



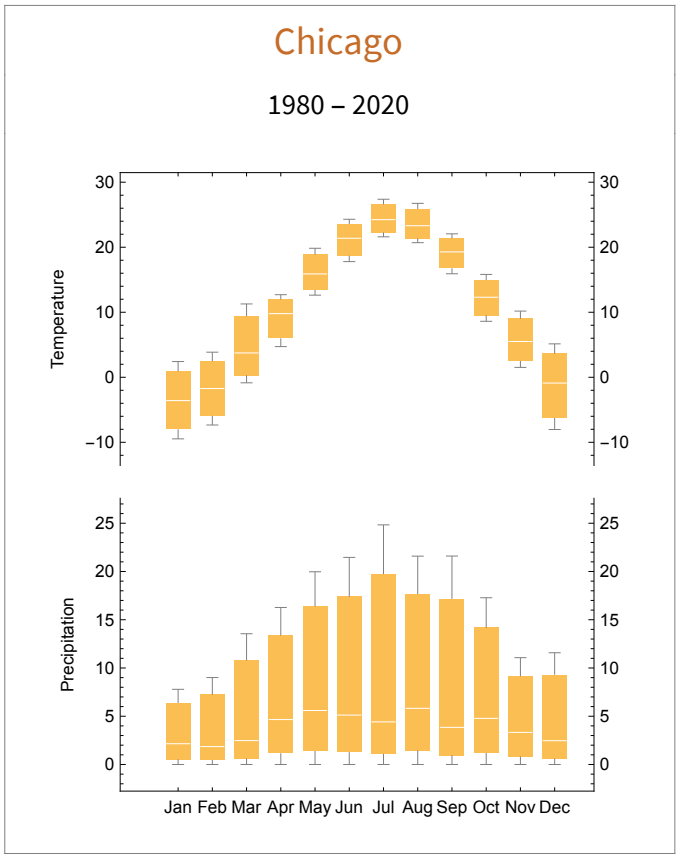
Example 3: omit joining bars

This call uses options to omit the lines joining temperature and precipitation mean values .

In[1001]:=

```
Climograph[ Chicago CITY ,
 TemperatureJoined → False, PrecipitationJoined → False]
```

Out[1001]=

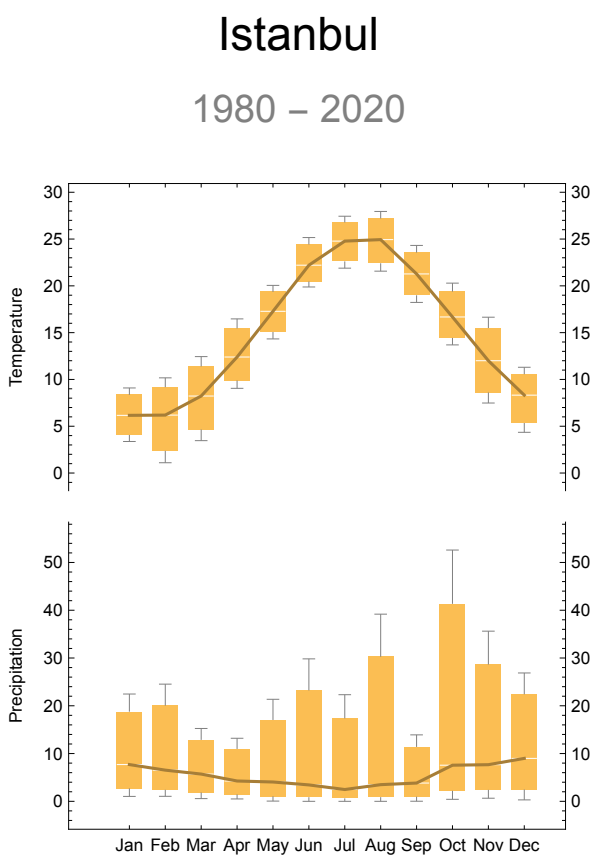


Example 4: omit the outer frame

This call uses options to not show an outer frame, and applies a custom styles to the location and year range.

```
Climograph[ Istanbul CITY
  , Frame → False
  , LocationStyle → {Black, 24}
  , YearRangeStyle → {Gray, 20}
]
```

Out[1002]=



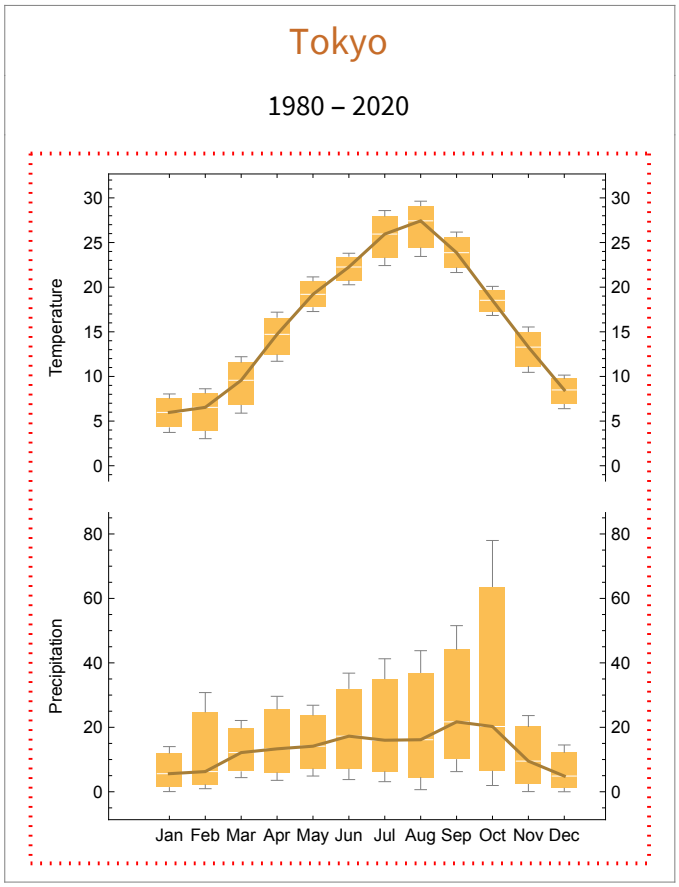
Example 5: styling the inner frame

This call uses options to show the inner frame with a particular style.

In[1003]:=

```
Climograph[
 Tokyo CITY
 , InnerFrame → True
 , InnerFrameStyle → Directive[Red, Dotted, Thick]
]
```

Out[1003]=

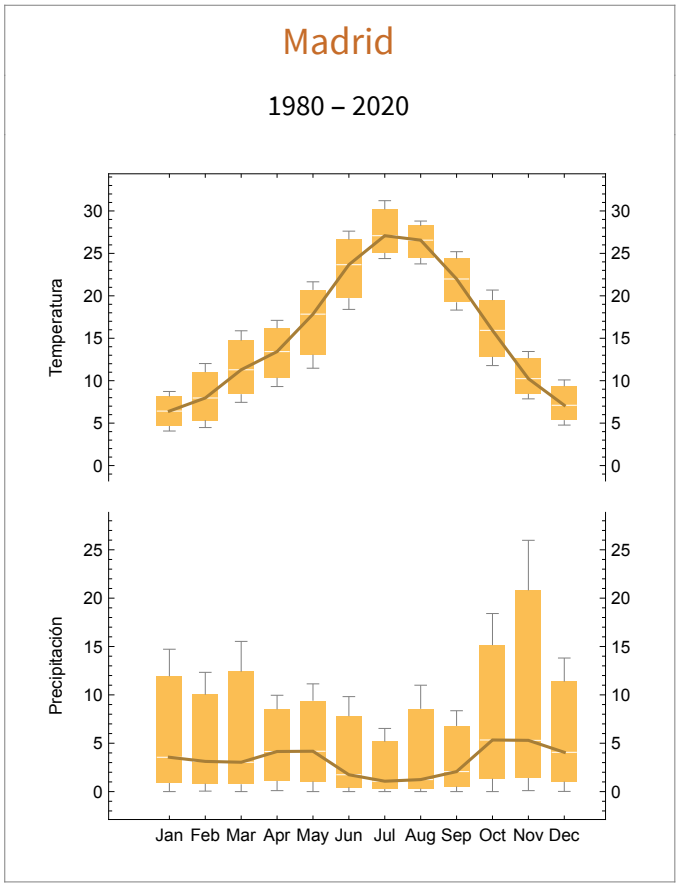


Example 6: set the axis labels for temperature and precipitation

In[1004]:=

```
Climograph[ Madrid CITY
 , TemperatureAxisLabel → "Temperatura"
 , PrecipitationAxisLabel → "Precipitación"
]
```

Out[1004]=

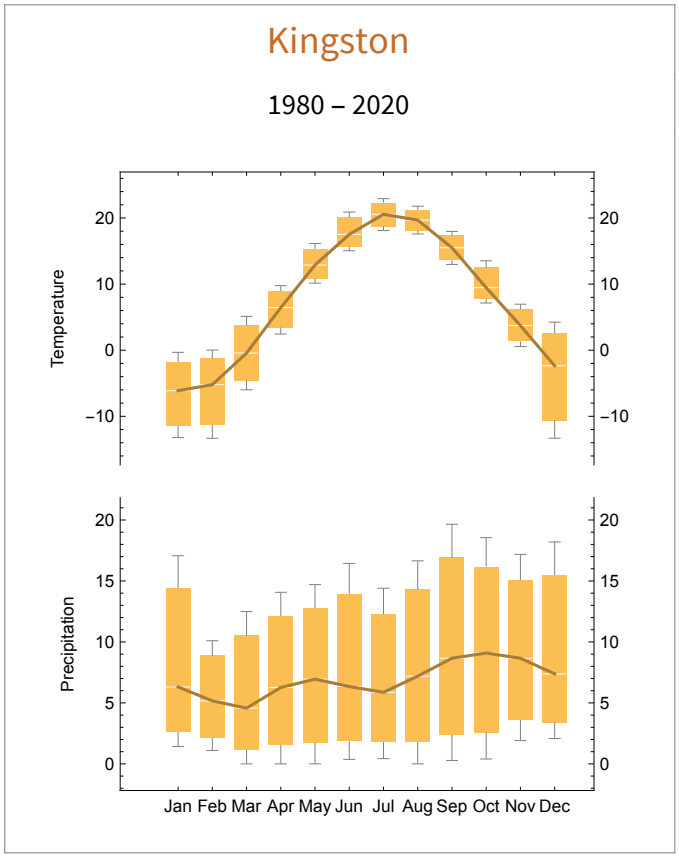


Example 7: uses the current location when no paramers passed

In[1041]:=

```
Climograph[]
```

Out[1041]=

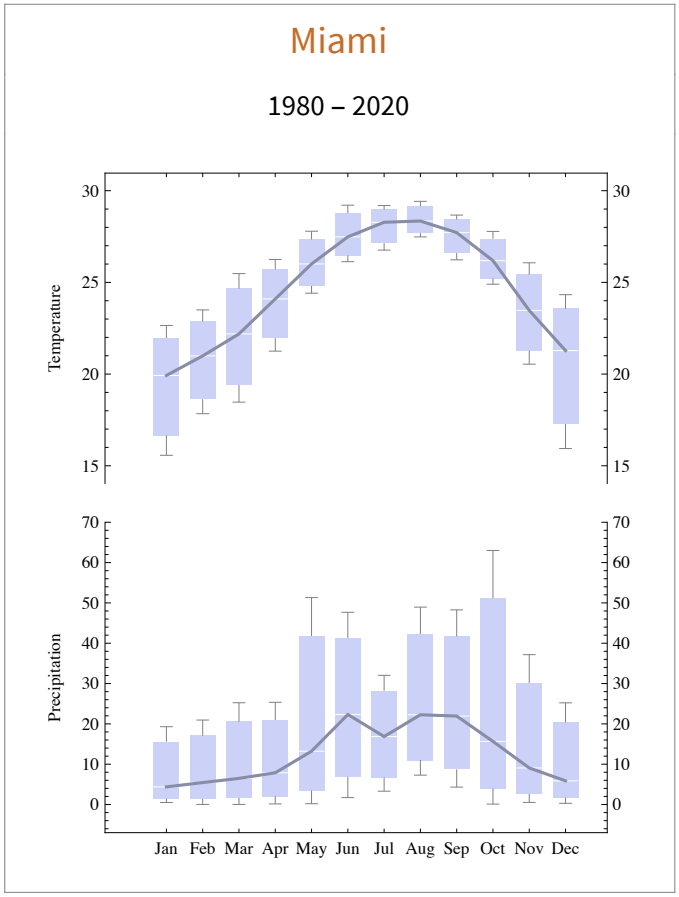


Example 8: Using the PlotTheme option

In[1006]:=

```
Climograph[ Miami CITY , PlotTheme → "Classic"]
```

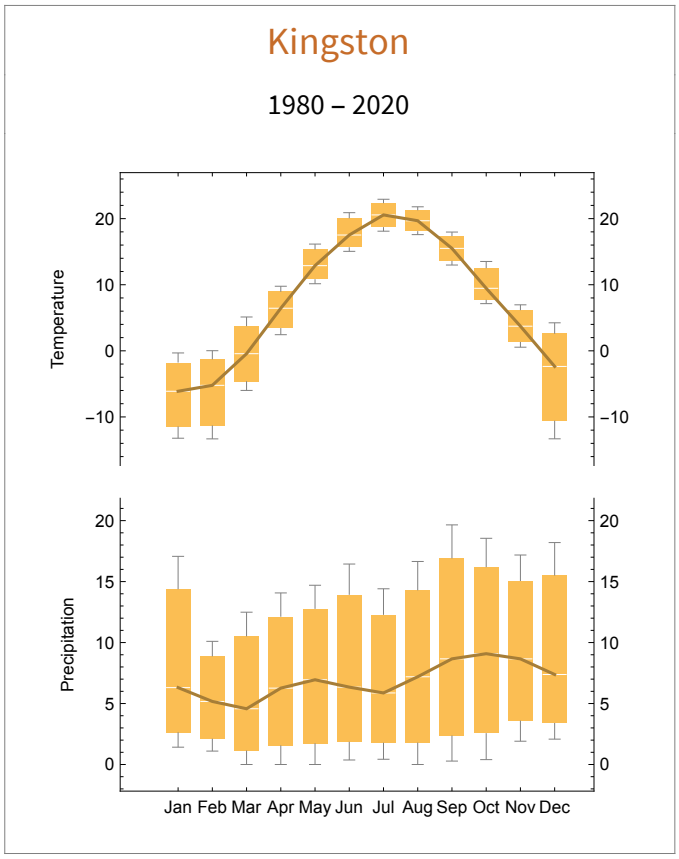
Out[1006]=



In[1071]:=

```
Climograph[Here]
```

Out[1071]=

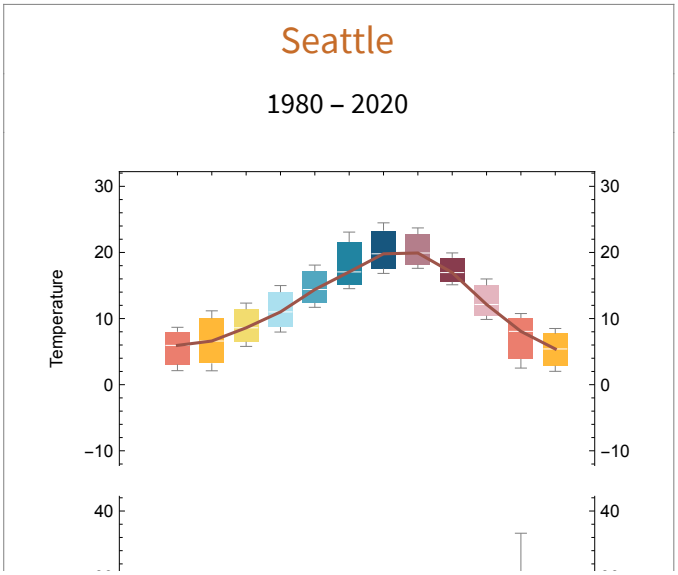


In[1008]:=

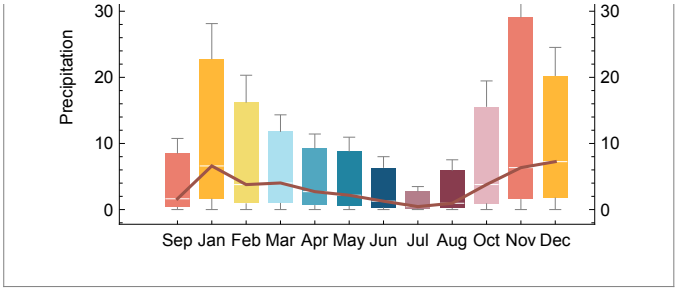
```
Climograph[{Seattle CITY, Denver CITY, Los Angeles CITY}
 , ChartStyle → 24
 , TemperaturePlotRange → {-10, 30}
 , PrecipitationPlotRange → {0, 40}
]
```

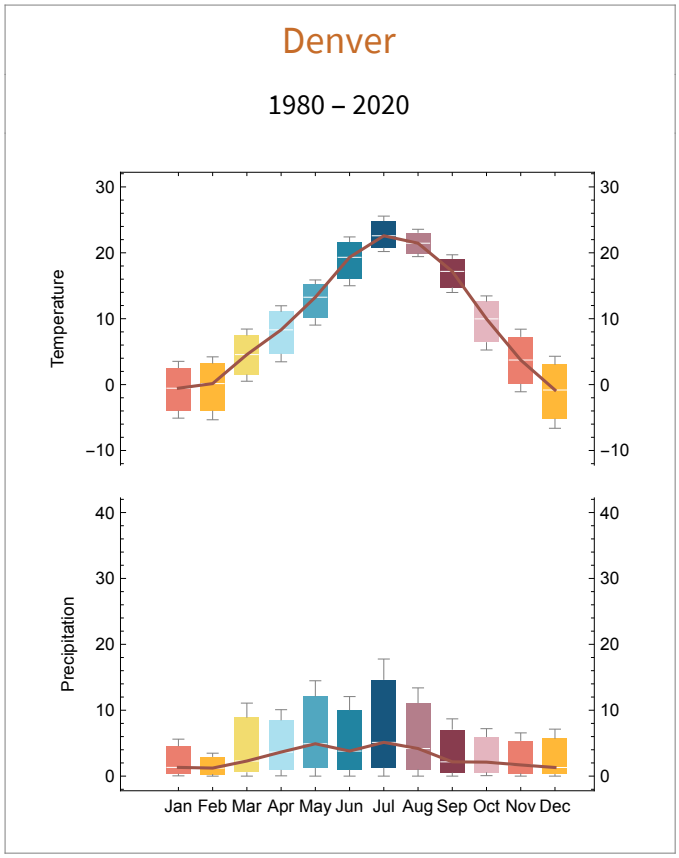
Out[1008]=

{

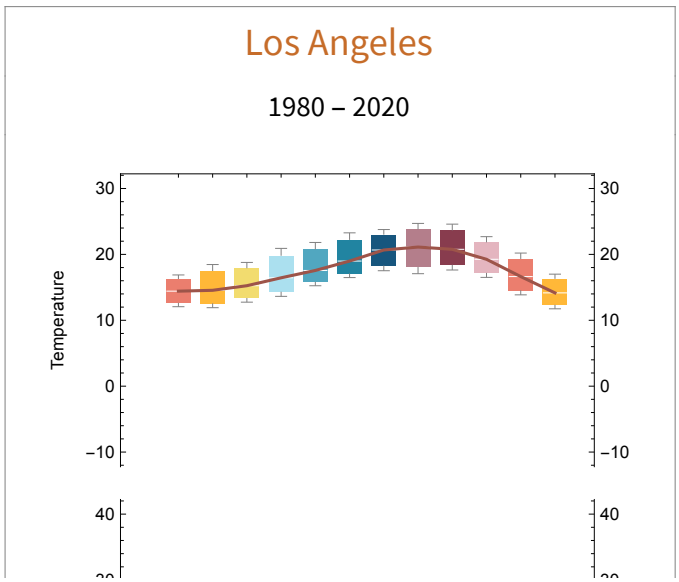


,

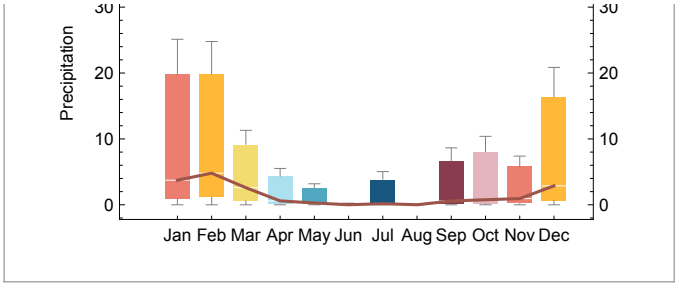

Precipitation
30
20
10
0
Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec


Denver
1980 – 2020
Temperature
30
20
10
0
−10
Precipitation
40
30
20
10
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

,


Los Angeles
1980 – 2020
Temperature
30
20
10
0
−10
40

}


Precipitation
30
20
10
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec