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.

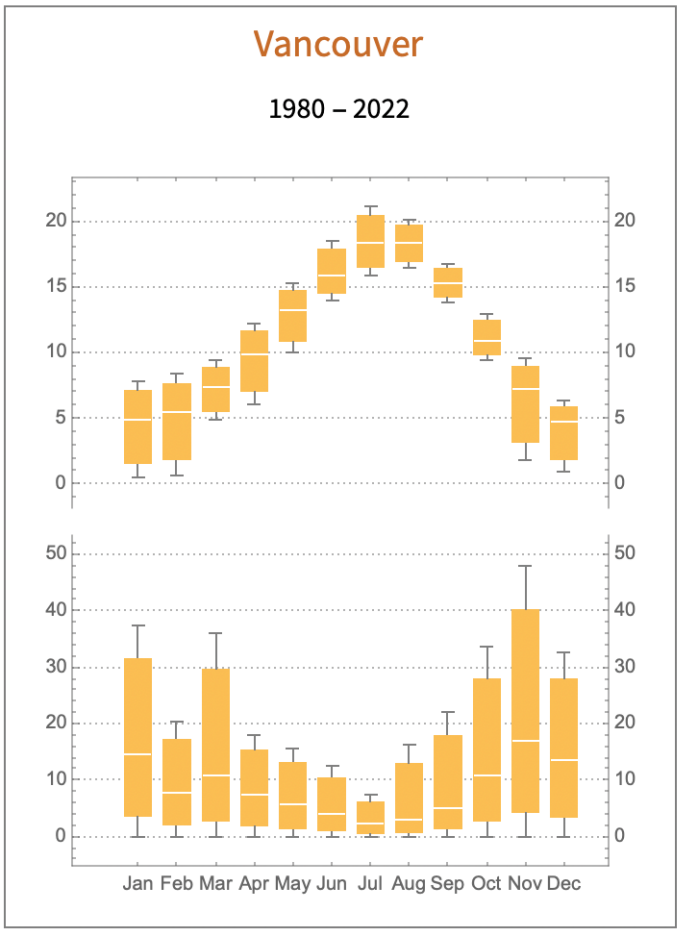
See: https://en.wikipedia.org/wiki/Climograph.

Examples (images)

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

```
In[328]:= climograph[ Vancouver CITY ]
```

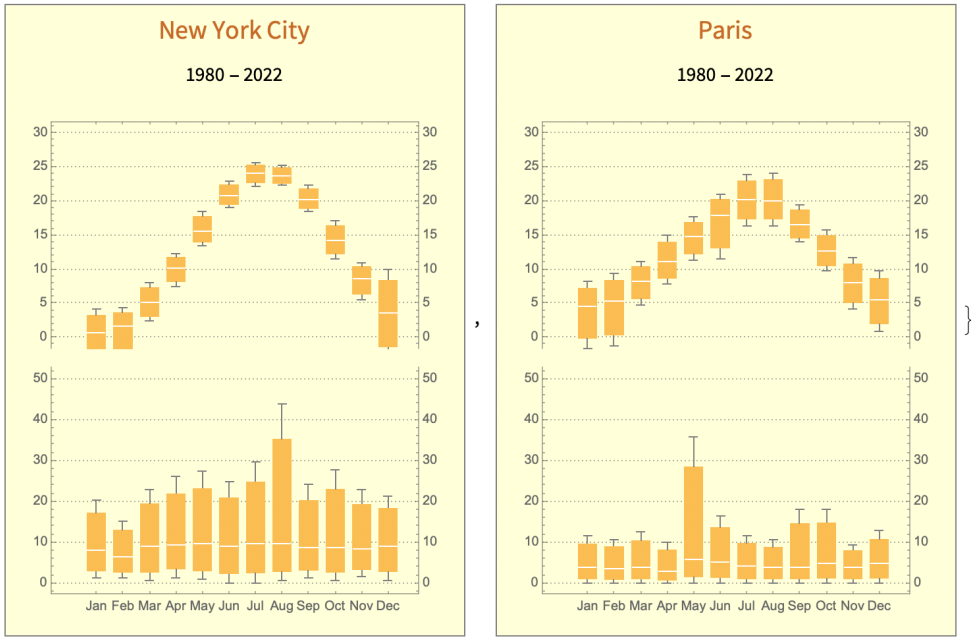
Out[328]=



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

In[329]:=
```
climograph[{New York City CITY, Paris CITY}
 , TemperaturePlotRange → {0, 30}
 , PrecipitationPlotRange → {0, 50}
 , Background → LightYellow
]
```

Out[329]=



The Code

In[323]:=
```
ClearAll[climograph];
(* These are the options, and the defaults, provided
 by the function *)
Options[climographx] = {
   "StartDate" → {1980, 1, 1}
   , "EndDate" → {2022, 12, 31}
   , "InnerFrame" → None
   , "InnerFrameStyle" → LightGray
   , "TemperaturePlotRange" → Automatic
   , "TemperatureJoined" → True
   , "PrecipitationPlotRange" → Automatic
   , "PrecipitationJoined" → True
   , "Background" → White
   , "Frame" → True
   , "FrameStyle" → Gray
  };

(* The interface for passing a single Entity and options. *)
climograph[location_Entity, opts : OptionsPattern[climographx]] := (
   Return[climographx[location, opts]];
  );
```

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

(* This function does the work *)
climographx[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
      , Joined → TemperatureJoined
      , Frame → {{True, True}, {None, True}}
      , FrameTicks → {{All, All}, {None, All}}
      , PlotTheme → "Detailed"
      , 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
  , ChartLabels → Automatic
  , Joined → PrecipitationJoined → True
  , Frame → {{True, True}, {True, None}}
  , FrameTicks → {{All, All}, Automatic}
  , PlotTheme → "Detailed"
  , PlotRange → OptionValue["PrecipitationPlotRange"]
  , Ticks → All
 ];

(* Joining the precipitation
 and temperature plots together, and returning *)
Return[
 GraphicsColumn[
  {TextCell[location["Name"], "Subsection"],
   TextCell[
    ToString[startDate[[1]]] <> " - " <> ToString[endDate[[1]]], "Text"],
   GraphicsColumn[
    {ptemp, pprecip}
    , Frame → OptionValue["InnerFrame"]
    , FrameStyle → OptionValue["InnerFrameStyle"]
    , Background → OptionValue["Background"]
   ]
  },
  Frame → OptionValue["Frame"]
  , FrameStyle → OptionValue["FrameStyle"]
  , Background → OptionValue["Background"]
 ]
]
);
```

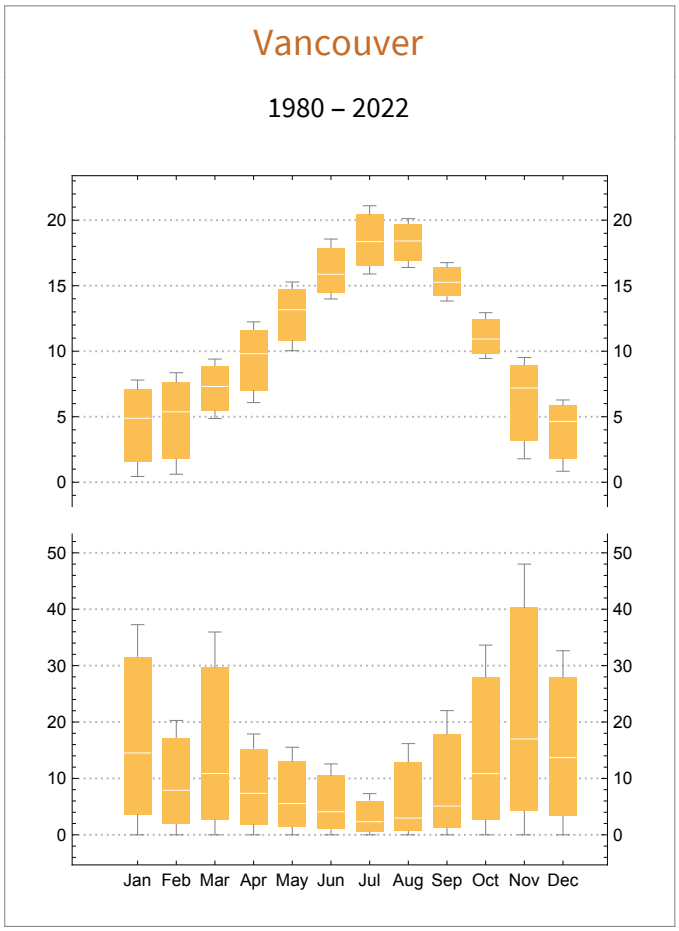
Live Examples

Example 1: This call with no options produces a default climograph.

In[328]:=

```
climograph[ Vancouver CITY ]
```

Out[328]=

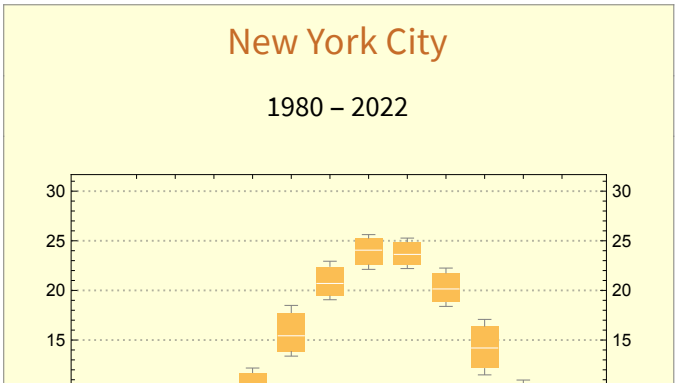


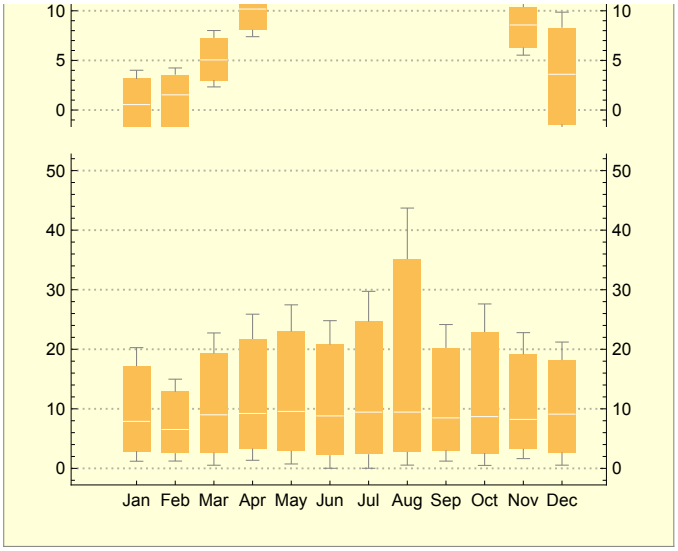
Example 2: This call uses options to set the background color, and normalizes the vertical ranges for both the temperature and precipitation plots.

In[329]:=

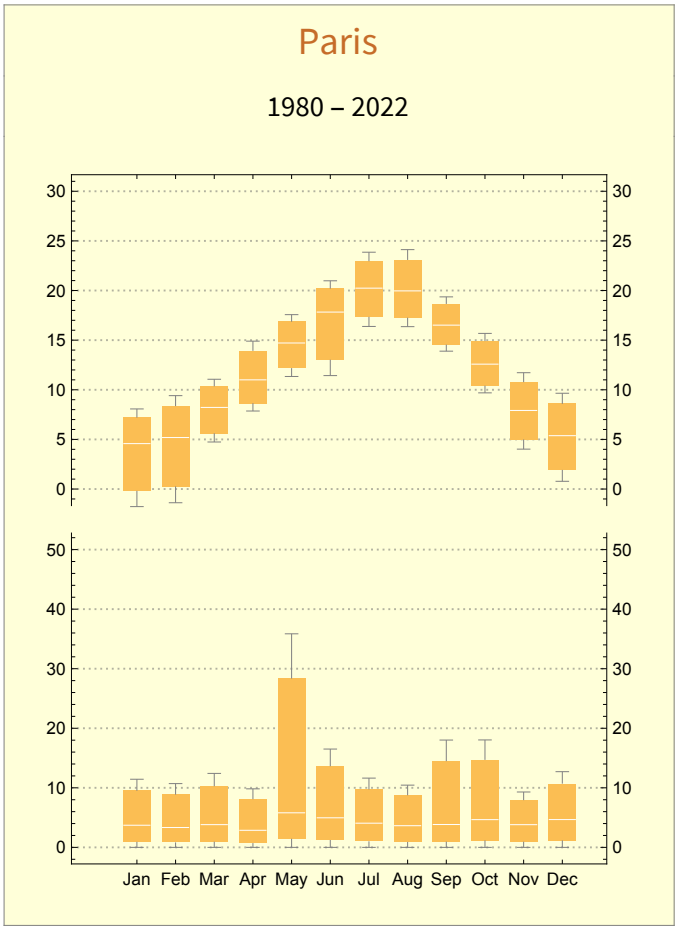
```
climograph[{ New York City CITY , Paris CITY }
  , TemperaturePlotRange → {0, 30}
  , PrecipitationPlotRange → {0, 50}
  , Background → LightYellow
]
```

Out[329]=





,



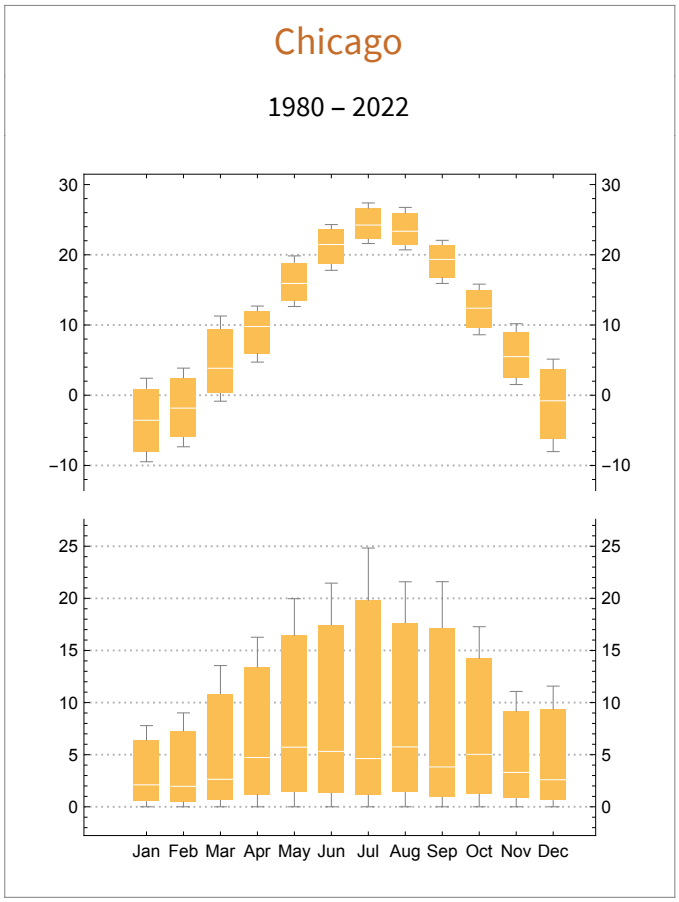
}

Example 3: This call uses options to omit the lines joining temperature and precipitation mean values.

In[330]:=

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

Out[330]=

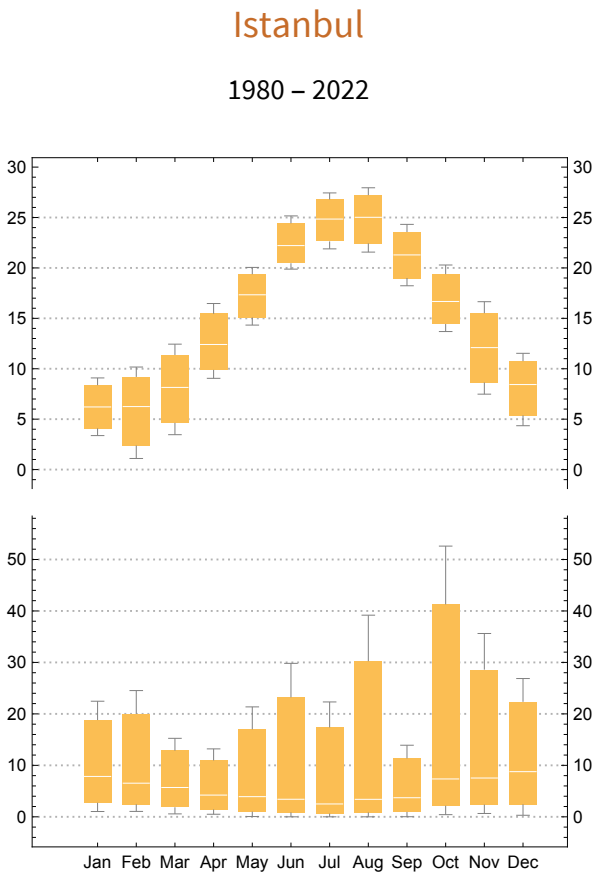


Example 4: This call uses options to not show an outer frame.

In[331]:=

```
climograph[ Istanbul CITY , Frame → False]
```

Out[331]=



Example 5: This call uses options to show the inner frame with a particular style.

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

Out[338]=