Comparison between Energy-Plus Typical Meteorological Year and 15-years long-term data for Montevideo

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EPS TMY evaluation (Montevideo)

In this document we present a preliminary evaluation of the Typical Meteorological Years (TMY) dataset for Montevideo city, Uruguay, that is contained in the EnergyPlus building design software. Global horizontal irradiation (GHI), mean, maximum and minumum temperature, relative humidity and atmospheric pressure is considered. The time-series for these variables are compared with long-term data from the period between the years 2000 and 2015. Temperature, relative humidity and atmospheric pressure were measured in ground at a high-quality national conventional meteorological station in the Carrasco area (Montevideo). Global horizontal irradiation is estimated by satellite through a low-uncertainty model developed locally at the national Solar Energy Laboratory (LES, UdelaR) which uses visible channel images from the GOES-East satellite. This model has been proposed and evaluated in [1, 2, 3, 4].

The comparison is presented in the following way for each of the six variables:

- The daily Cumulative Distribution Function (CDF) for each month of the EPS TMY is compared with the daily CDF obtained from the 15-years records (long-term CDF).
- Monthly comparison is presented in a bar plot showing the EPS TMY monthly mean and the 15-years data monthly mean.
- Differences between these monthly averages are presented in bar plot in absolute and relative terms.
- FS statistic is calculated respect to long-term CDF for each month. This statistic is presented for each variable separatelly in each of the following Sections.

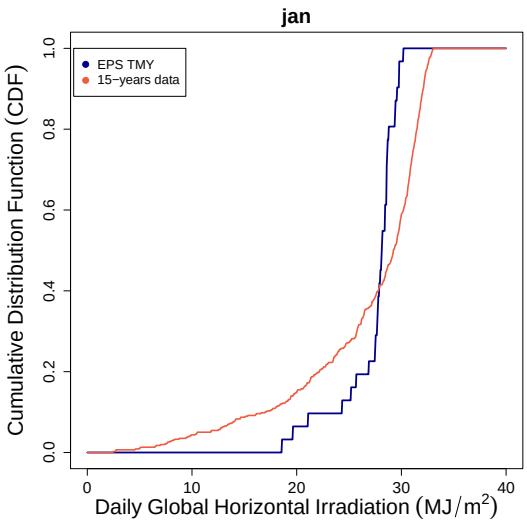
Weighted FS statistic

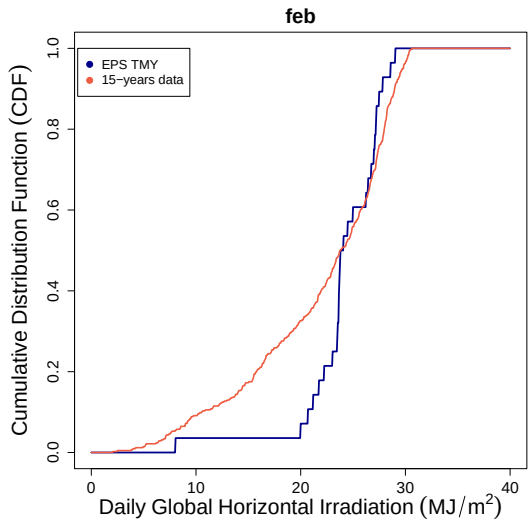
To obtain an unique FS statistic for each month a weighting law shall be used. In the following Table, the unique FS statistic is presented for the EPS TMY and the Uruguay's TMY (AMTUes) [5] using the same weighting law that was used in the AMTUes. These weigths are: 6/12 for global horizontal irradiation, 2/12 for mean temperature y 1/12 for maximum and minimum temperature, relative humidity and atmospheric pressure.

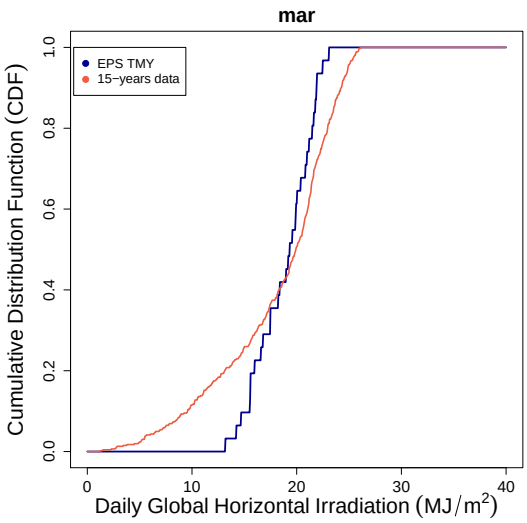
FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.131	0.104	0.104	0.100	0.079	0.111	0.089	0.107	0.108	0.078	0.100	0.118
AMTU	0.053	0.058	0.048	0.049	0.043	0.040	0.034	0.056	0.046	0.051	0.048	0.058

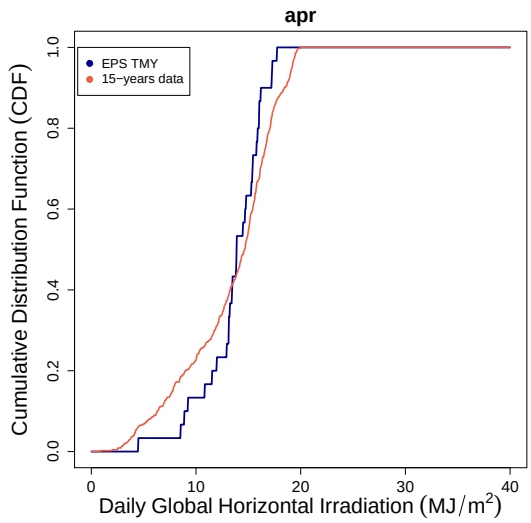
Montevideo, March 20, 2018

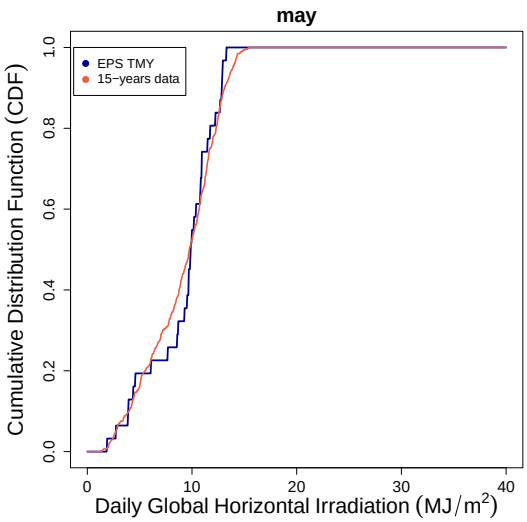
1 Global Horizontal Irradiation

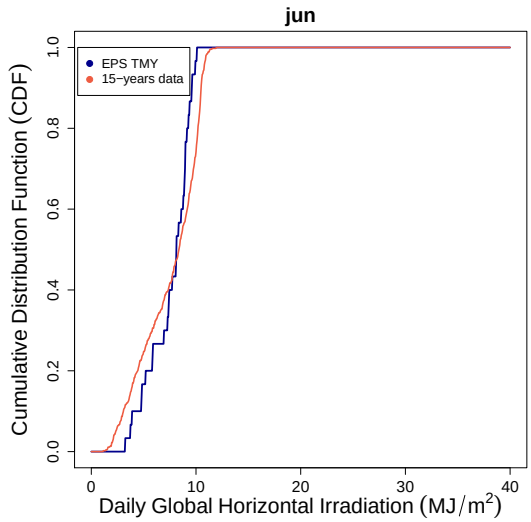


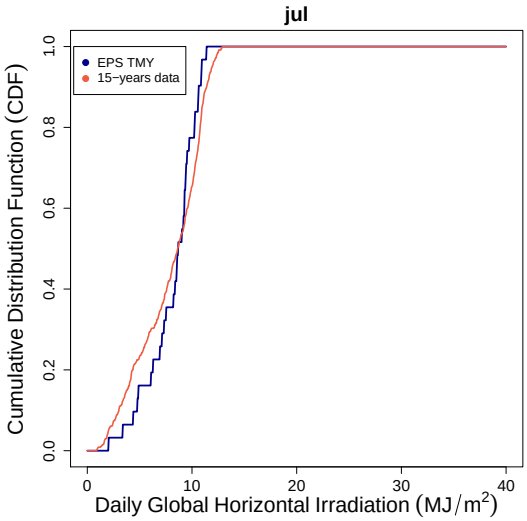


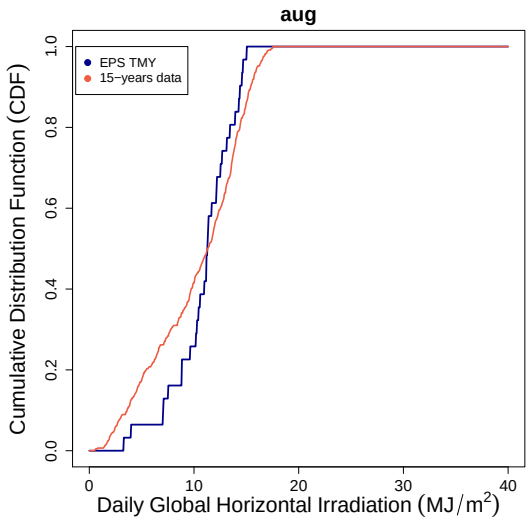









jul
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)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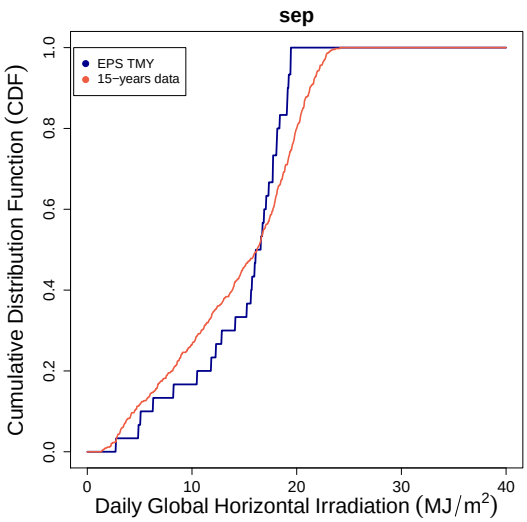
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)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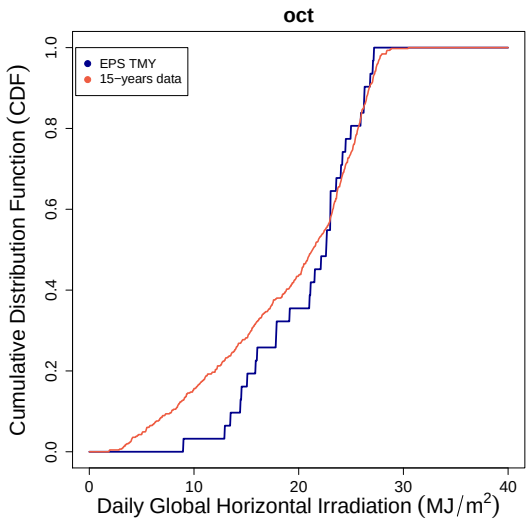
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)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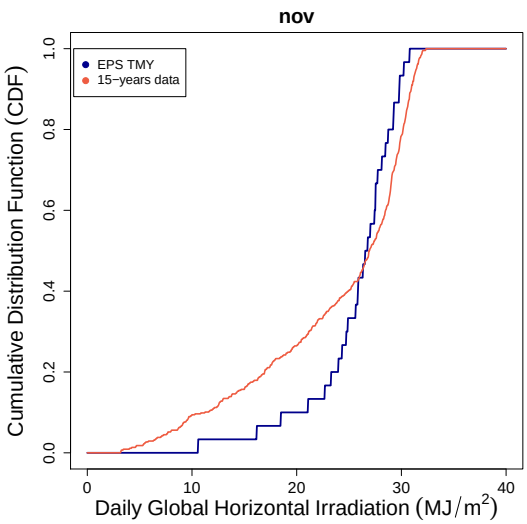
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)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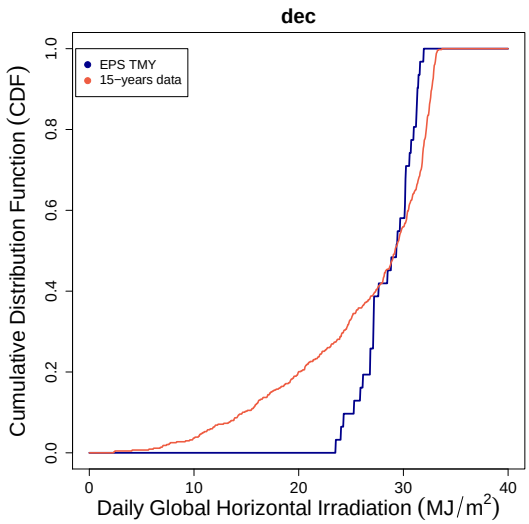
15−years data
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)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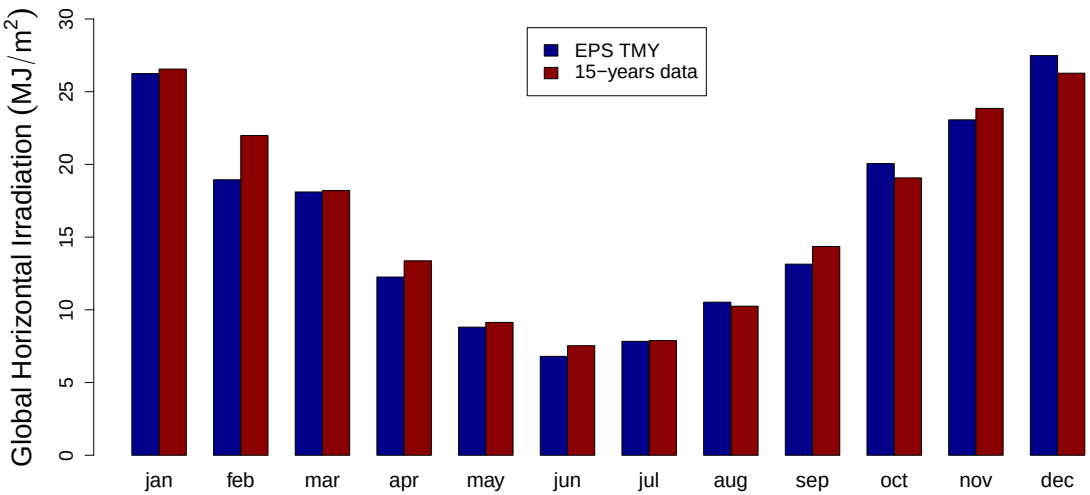
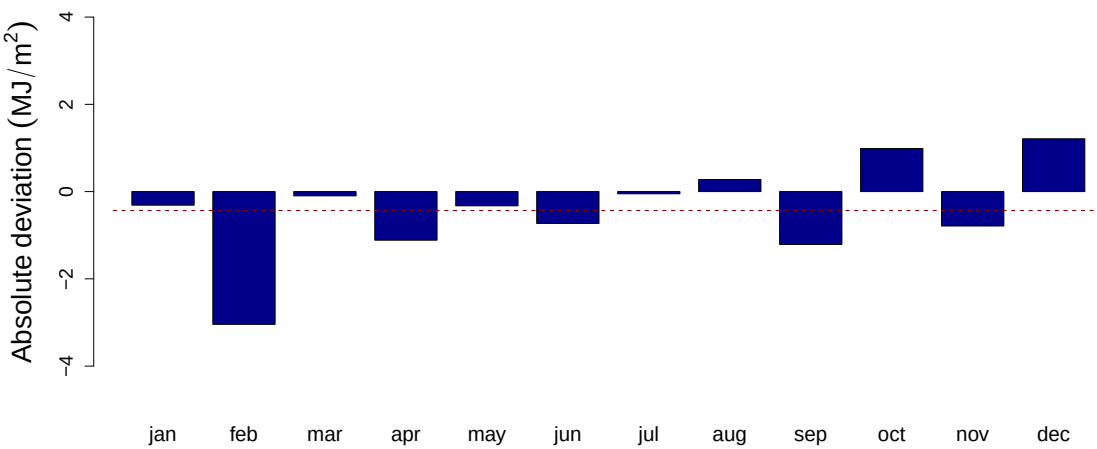
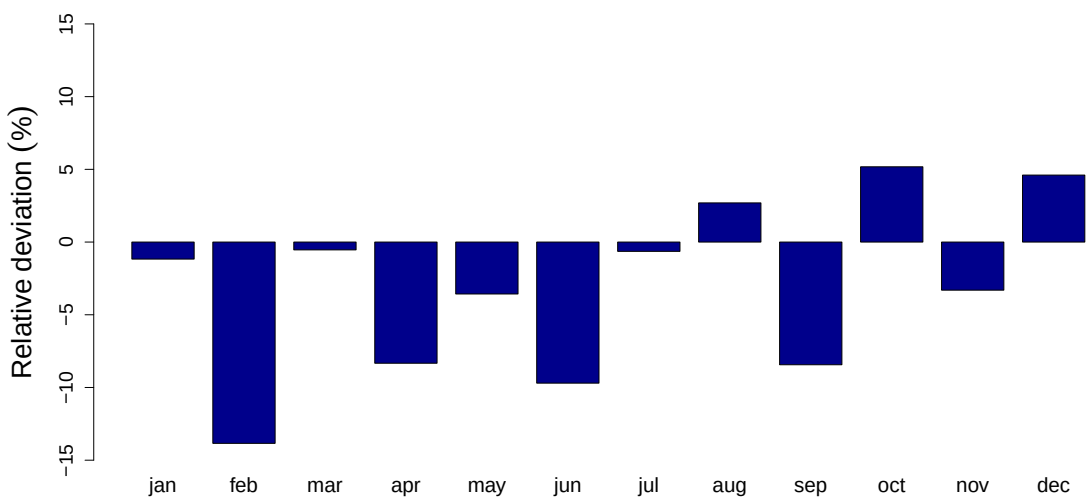
15−years data
Cumulative Distribution Function (CDF)
Daily Global Horizontal Irradiation (MJ/m²)

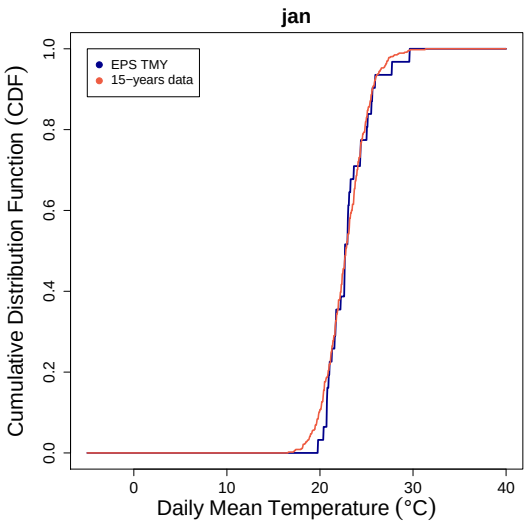


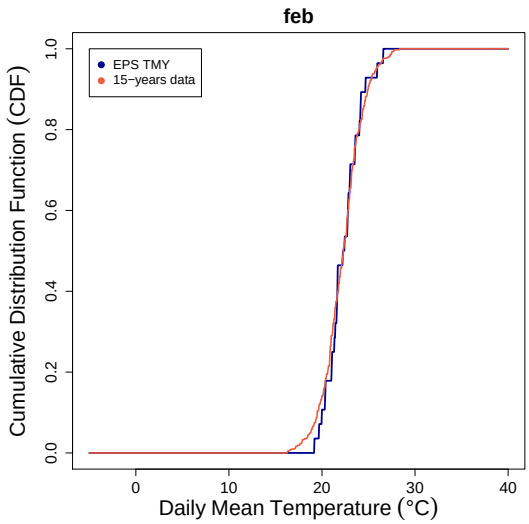


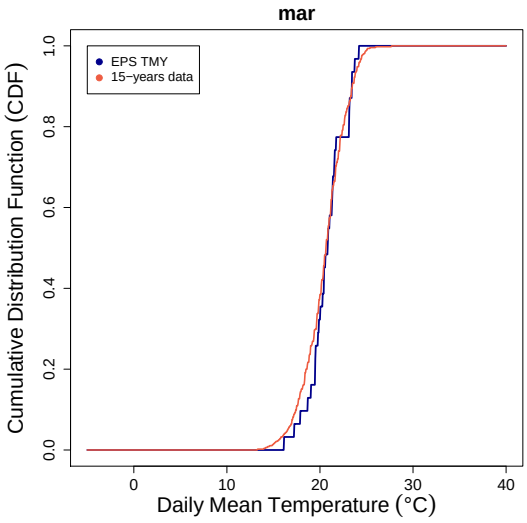


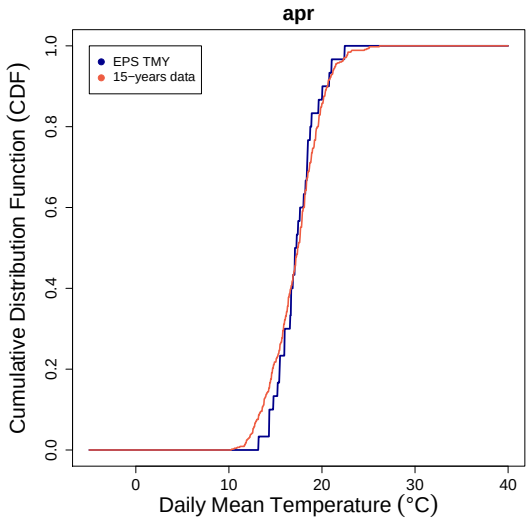
FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.1834	0.1110	0.1098	0.0940	0.0479	0.1078	0.0816	0.0969	0.0933	0.0652	0.1121	0.1313
AMTU	0.0317	0.0516	0.0501	0.0503	0.0388	0.0236	0.0268	0.0468	0.0277	0.0391	0.0468	0.0459

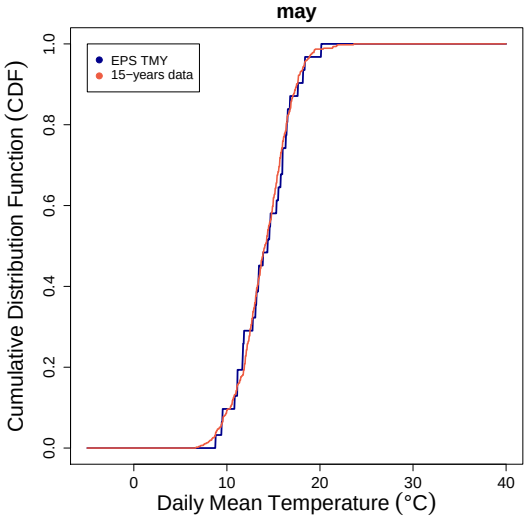
2 Mean Temperature

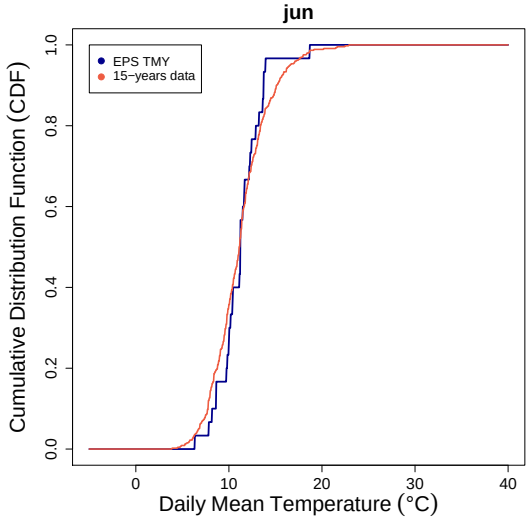


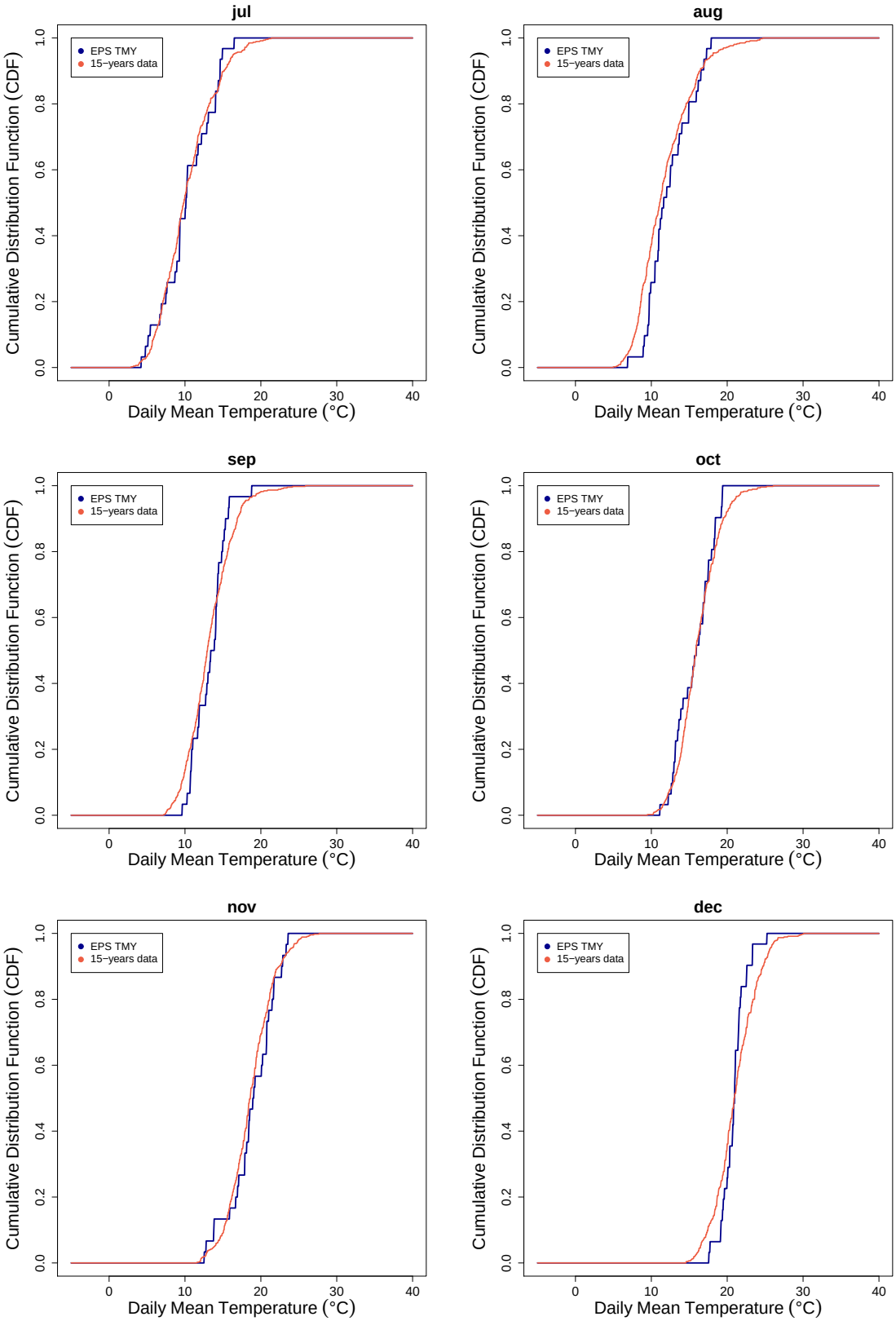








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EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Mean Temperature (°C)
0.0
0.2
0.4
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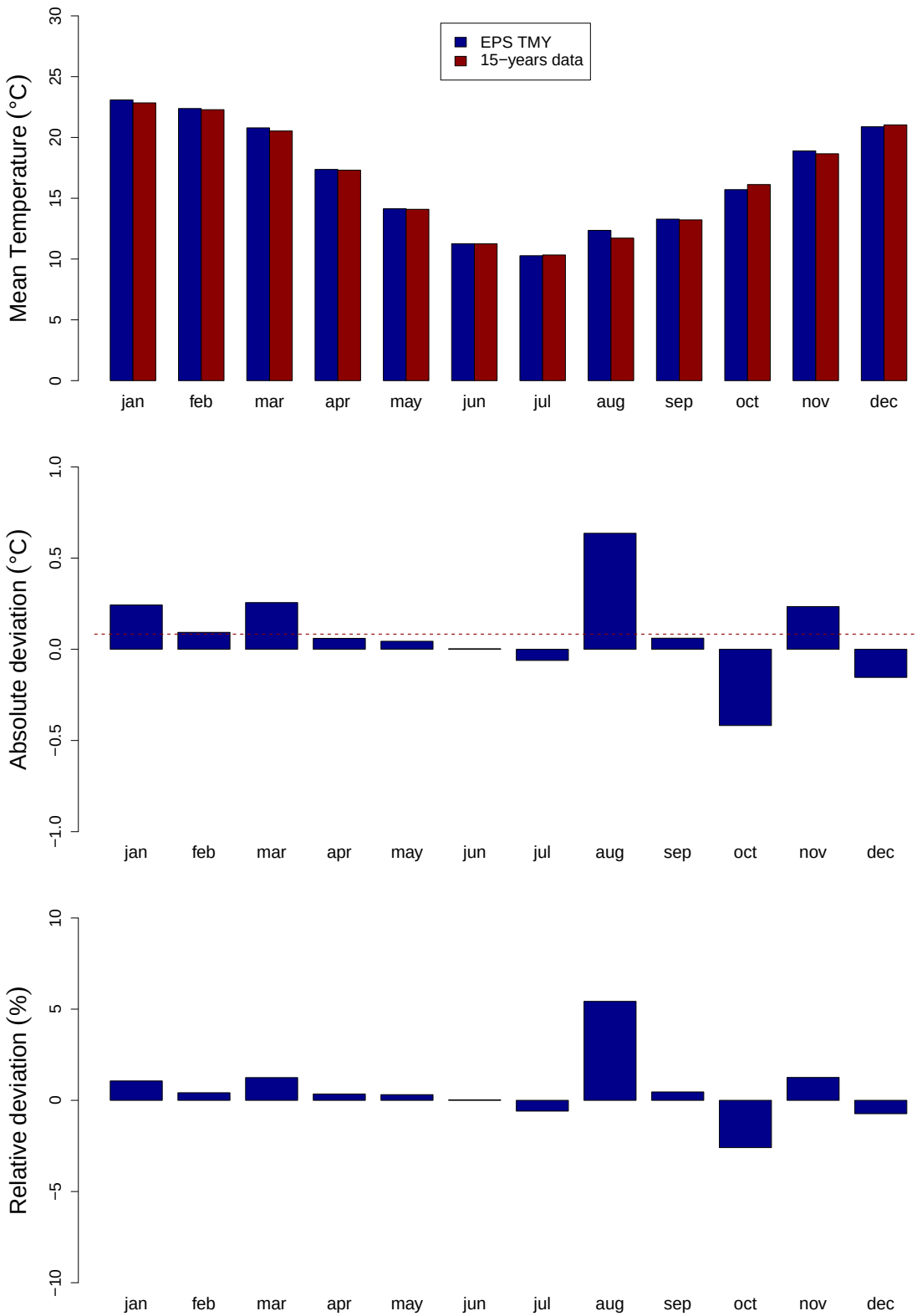
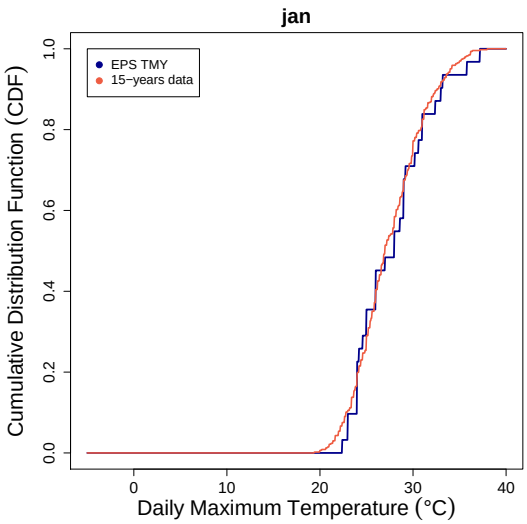
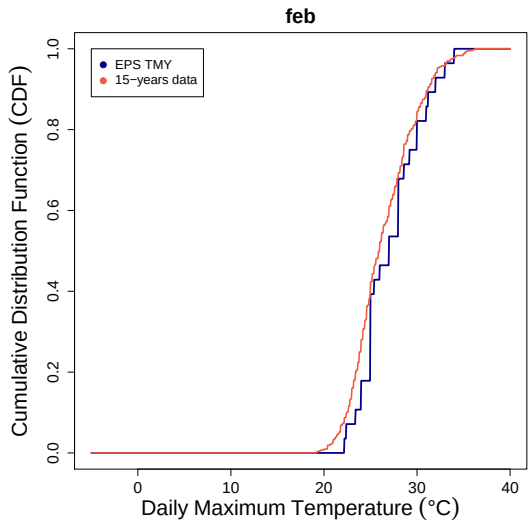
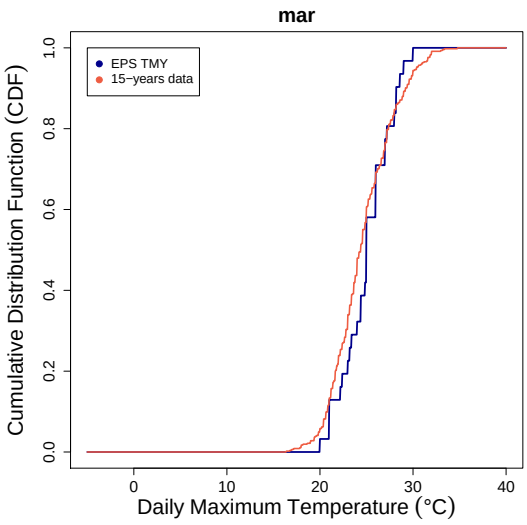


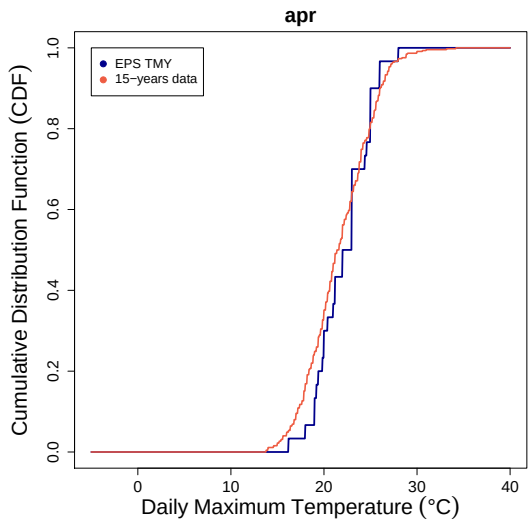
FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.0327	0.0347	0.0353	0.0473	0.0230	0.0559	0.0343	0.0706	0.0663	0.0535	0.0438	0.1015
AMTU	0.0886	0.0788	0.0452	0.0562	0.0338	0.0650	0.0338	0.0515	0.0728	0.0646	0.0459	0.0968

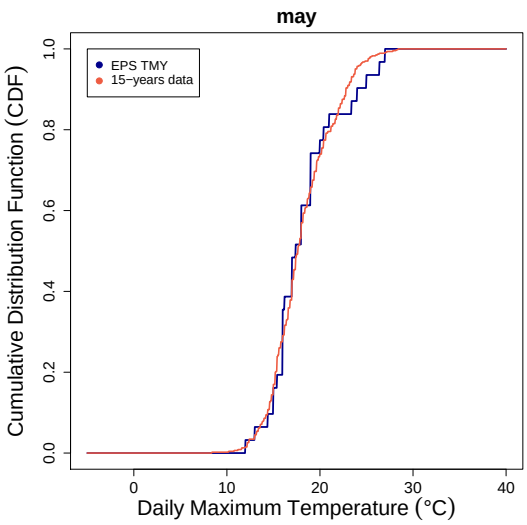
3 Maximum Temperature

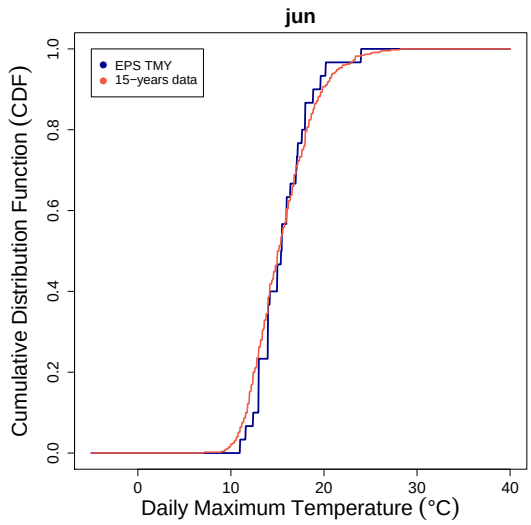


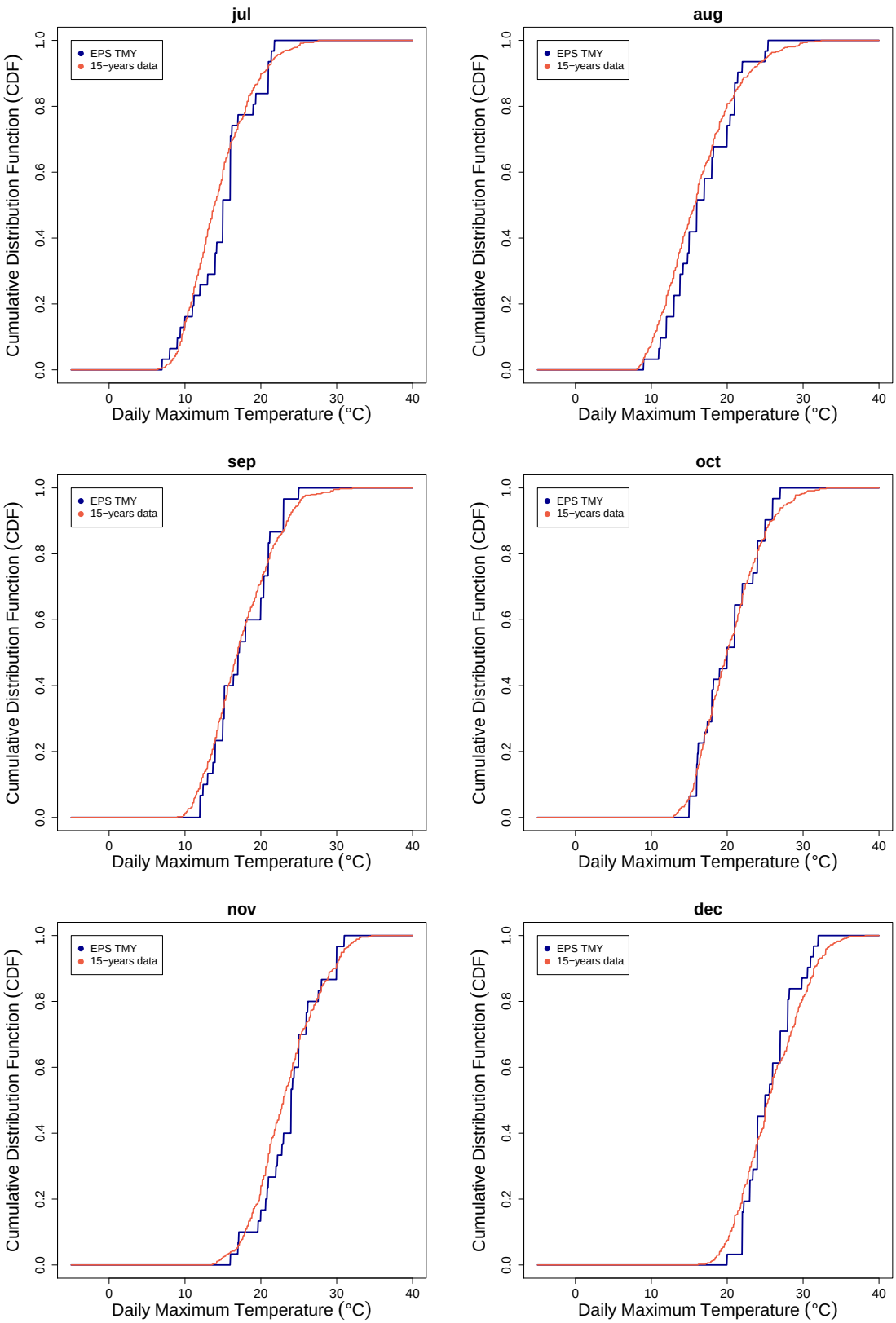











jul
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dec
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Maximum Temperature (°C)
0.0
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0.8
1.0
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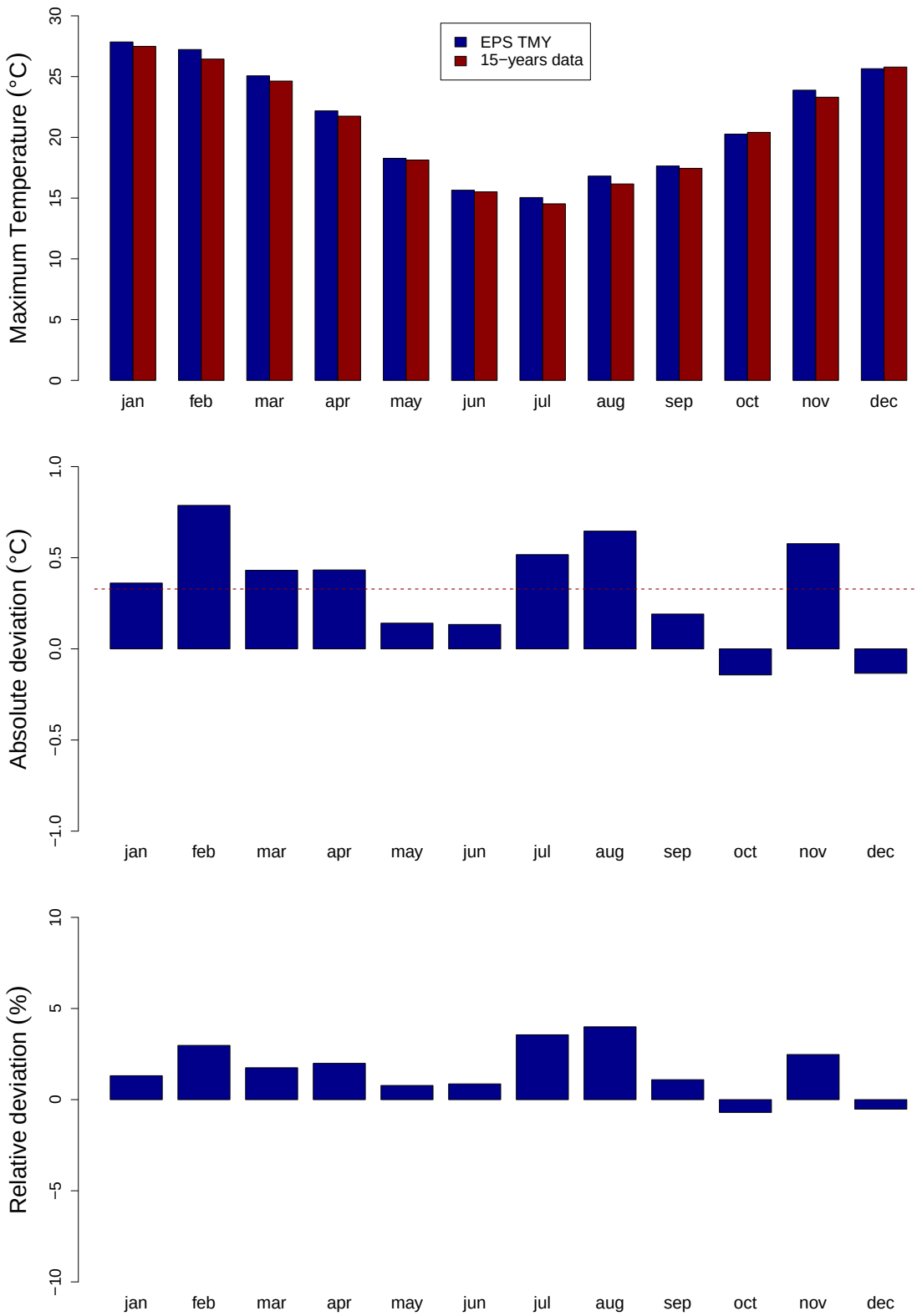
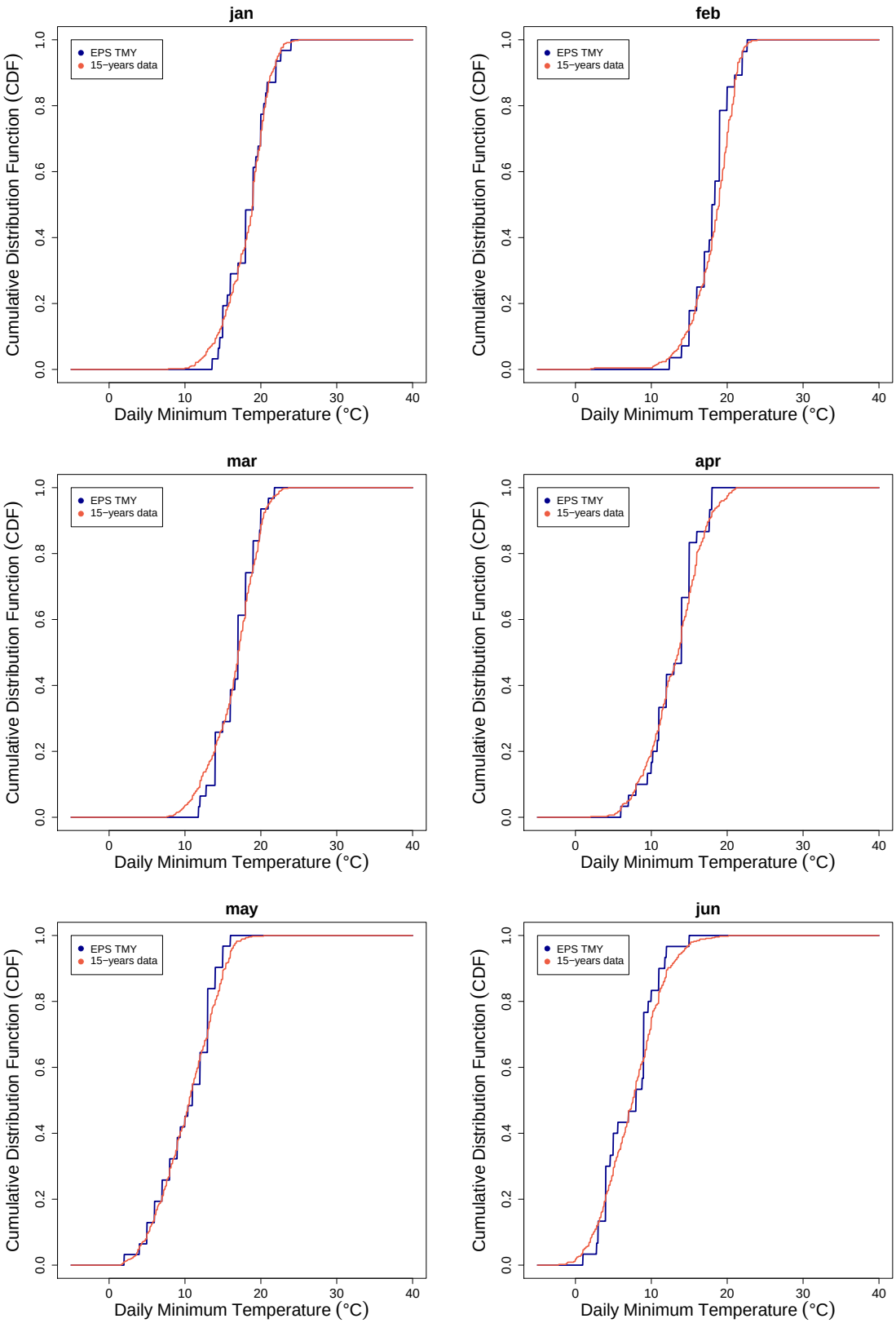
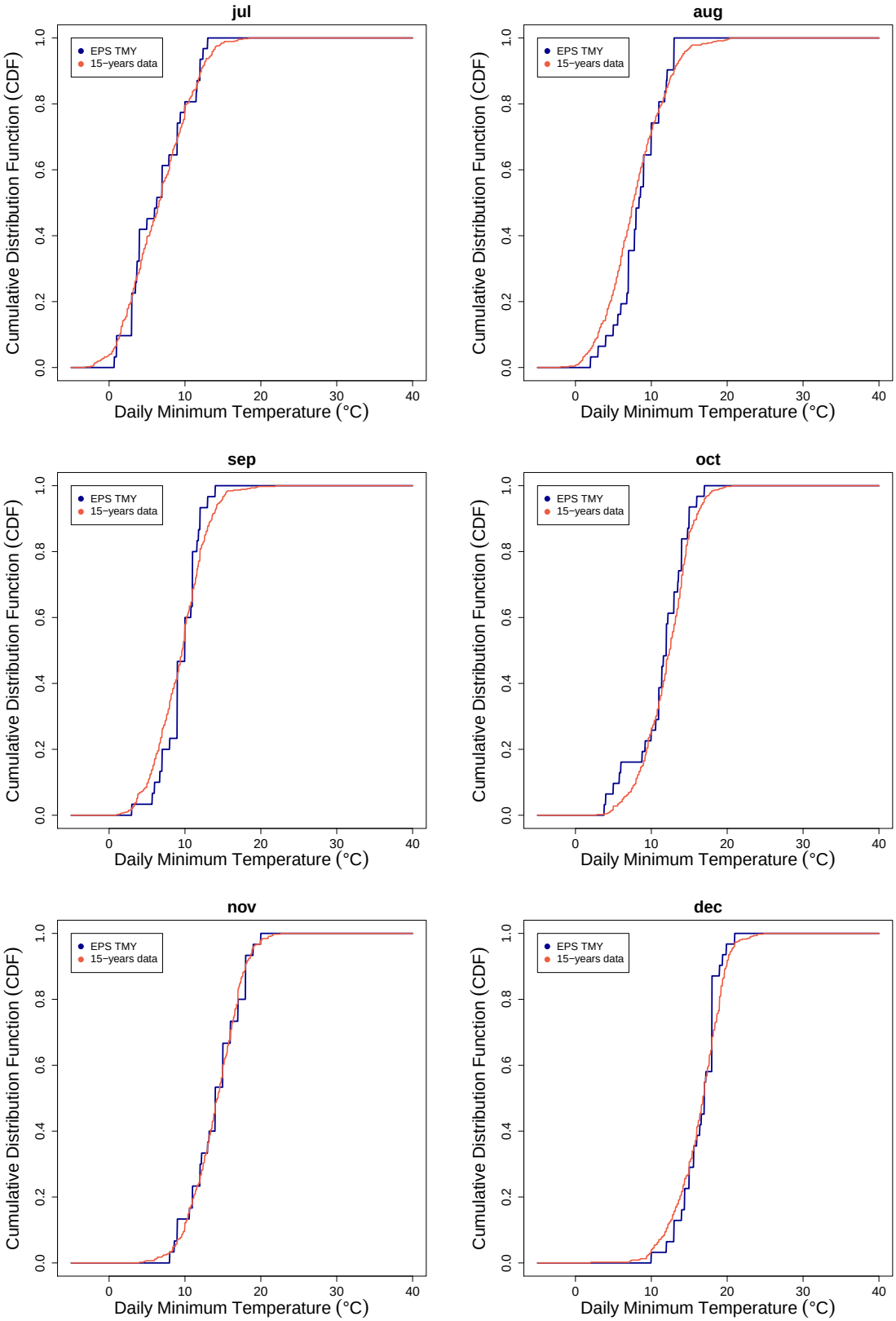


FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.0282	0.0387	0.0515	0.0669	0.0469	0.0345	0.0526	0.0481	0.0379	0.0366	0.0530	0.0673
AMTU	0.1140	0.0447	0.0524	0.0373	0.0428	0.0447	0.0575	0.0493	0.0665	0.0375	0.0479	0.0428

4 Minimum temperature

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EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Minimum Temperature (°C)
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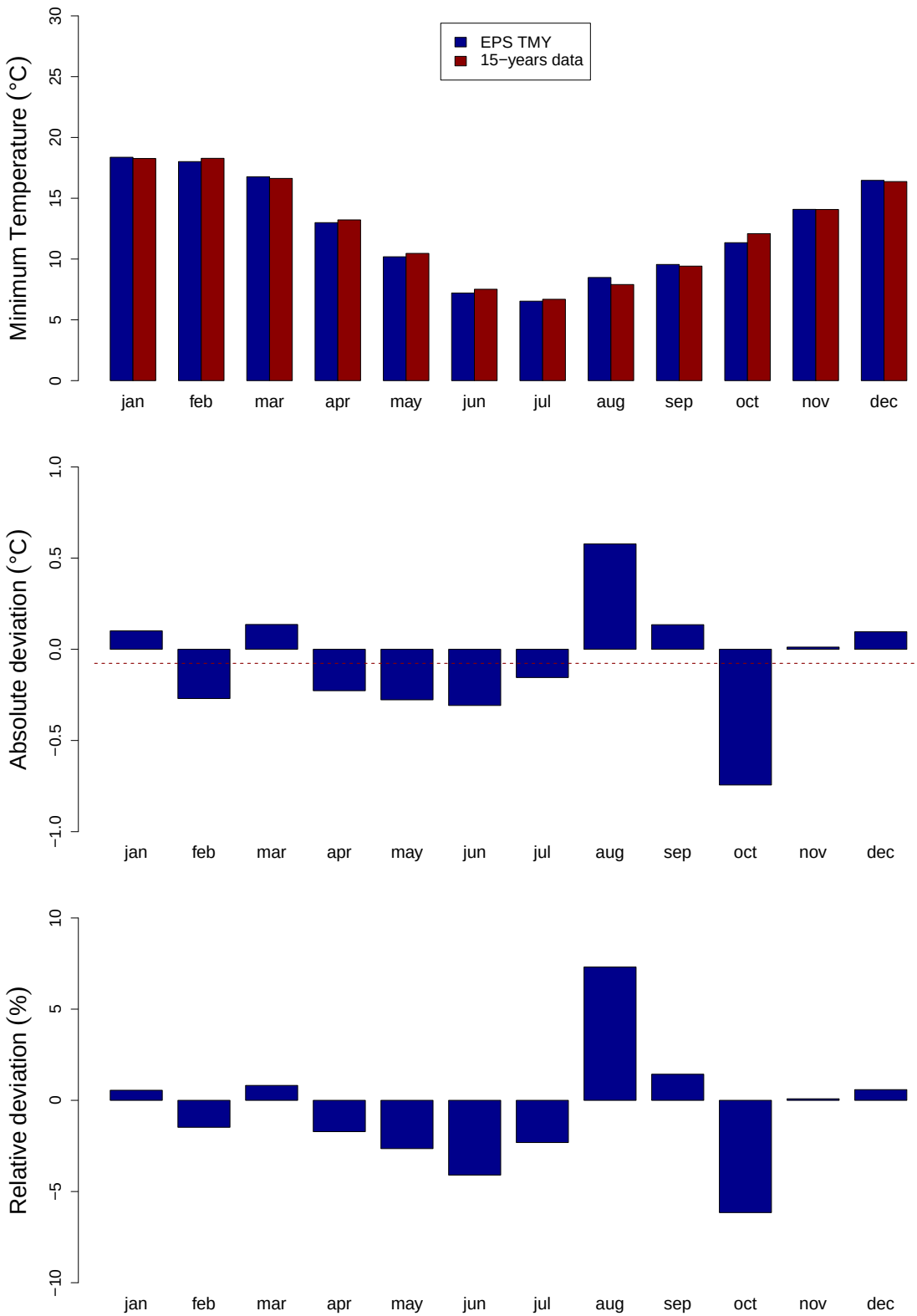
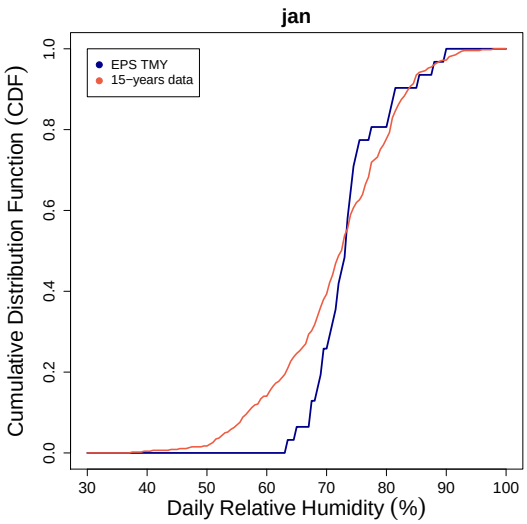
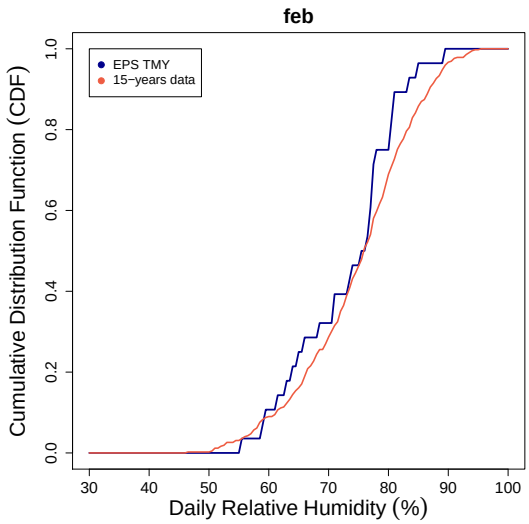
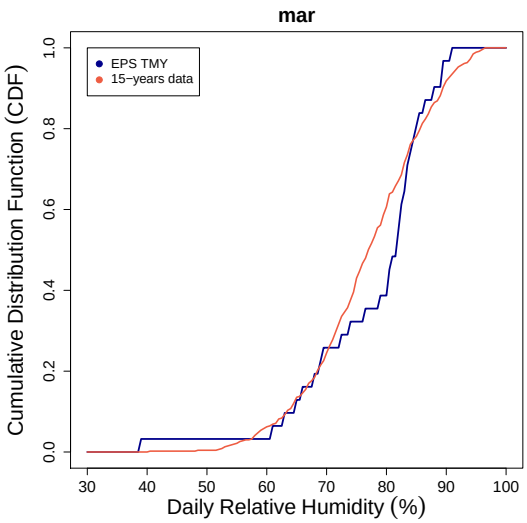


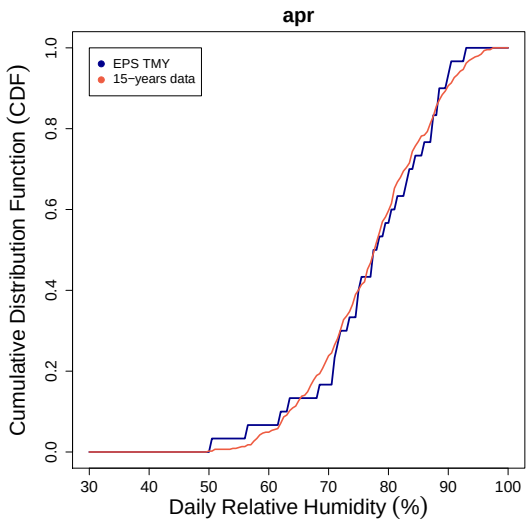
FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.0427	0.0971	0.0581	0.0645	0.0491	0.0765	0.0400	0.0633	0.0660	0.0715	0.0347	0.0739
AMTU	0.0543	0.1029	0.0584	0.0295	0.0467	0.0453	0.0394	0.0783	0.0600	0.0411	0.0529	0.0527

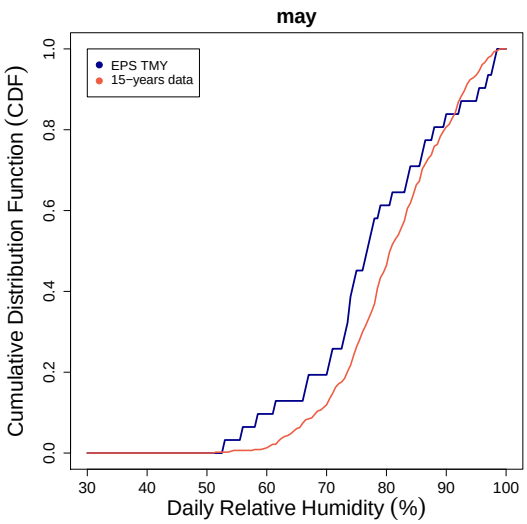
5 Relative Humidity

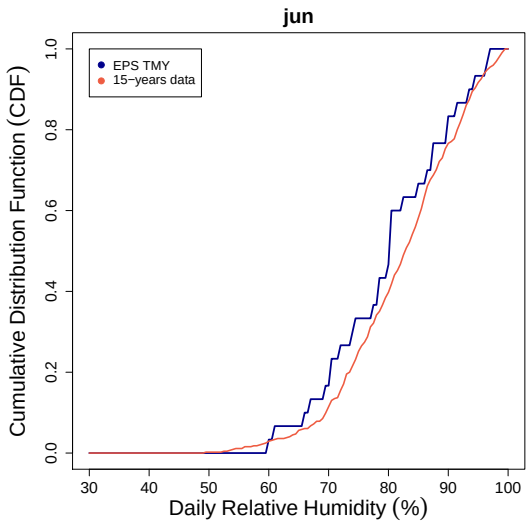


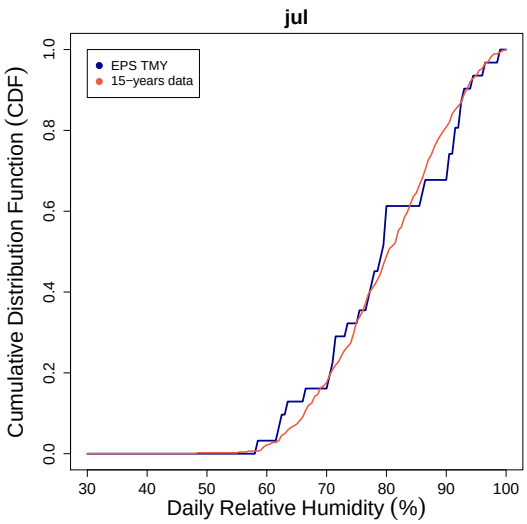


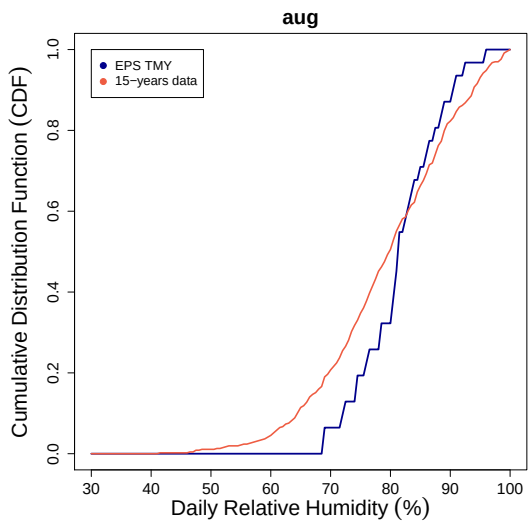


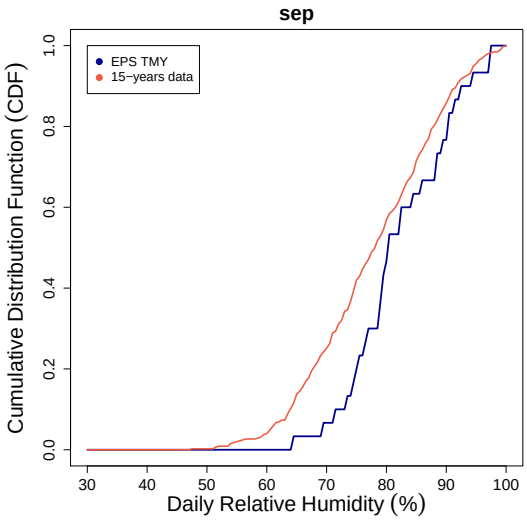







jul
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)


aug
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)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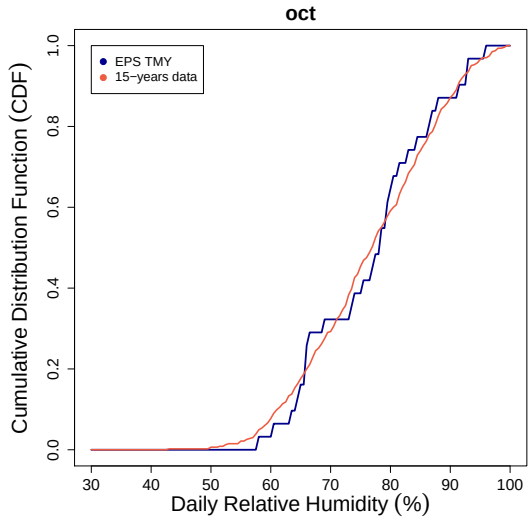
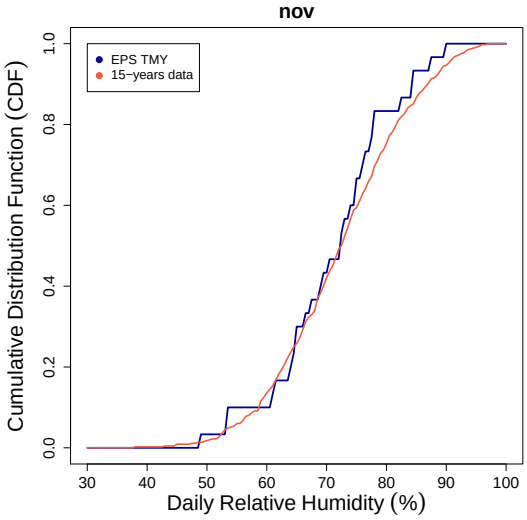
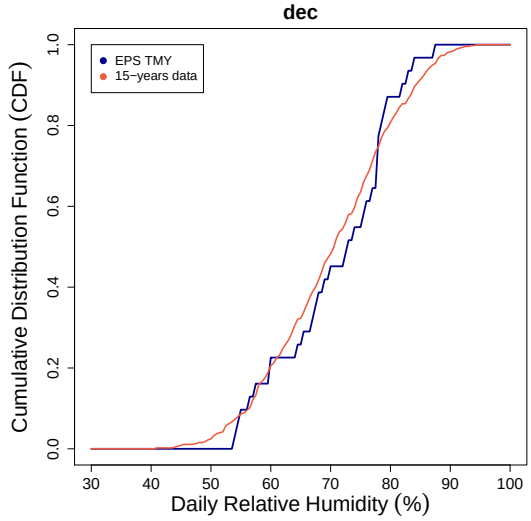
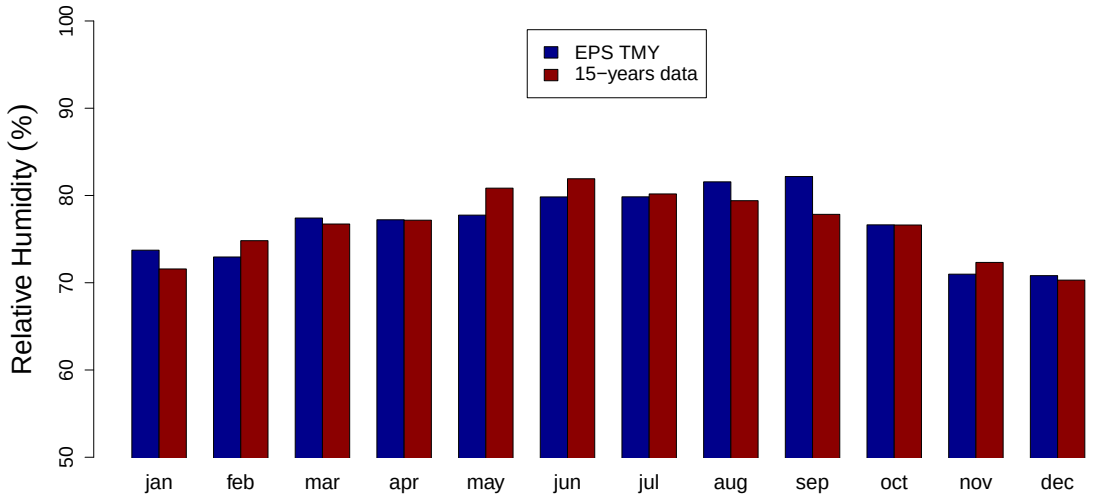
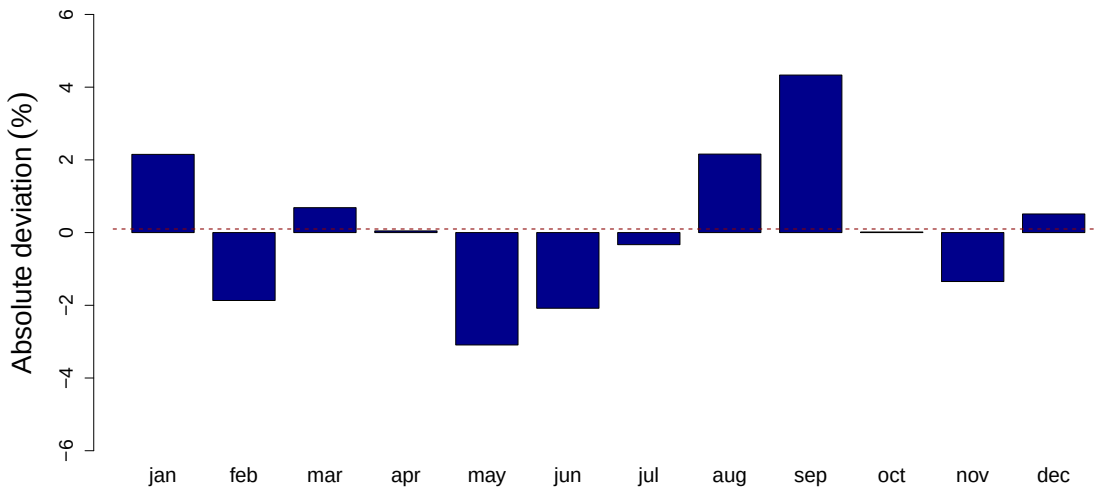
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)

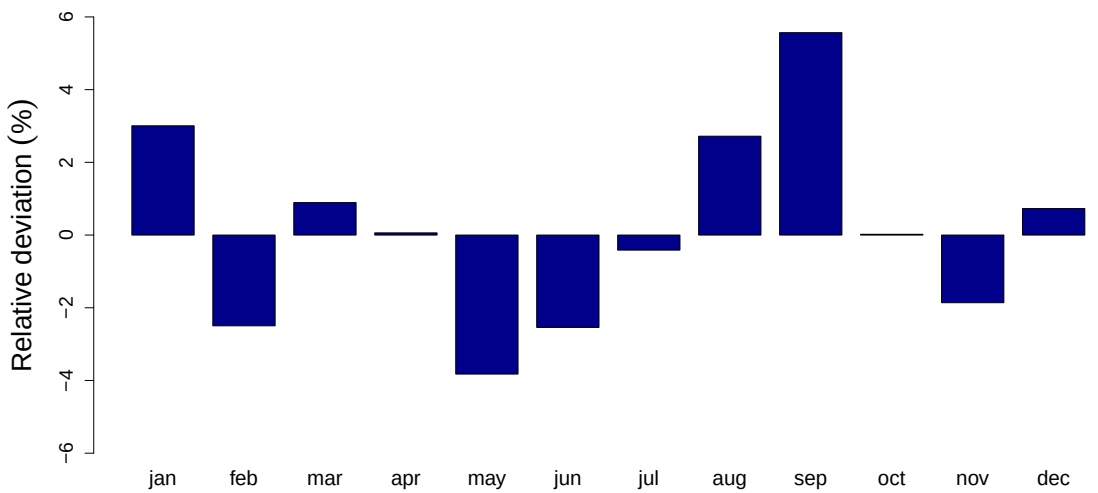

oct
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)


nov
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)


dec
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Relative Humidity (%)

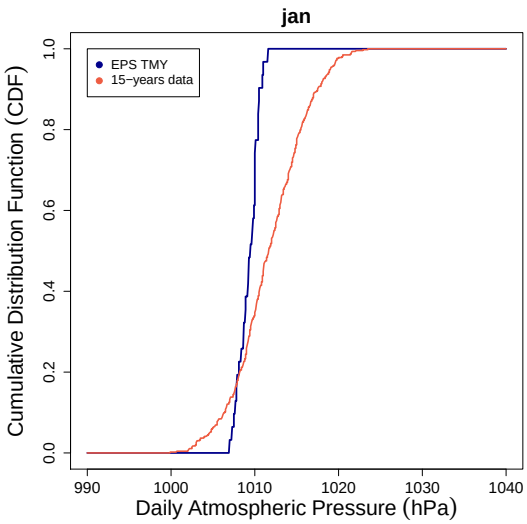


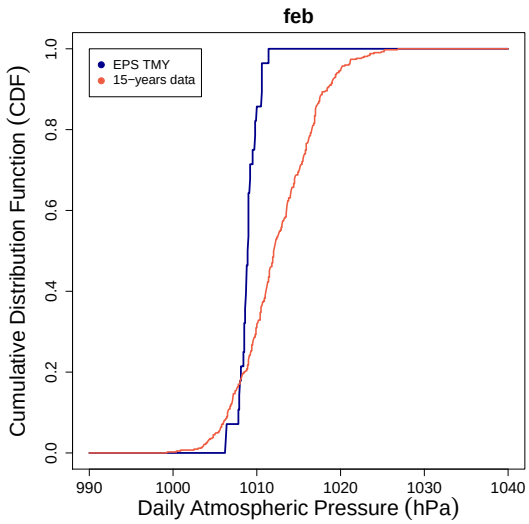


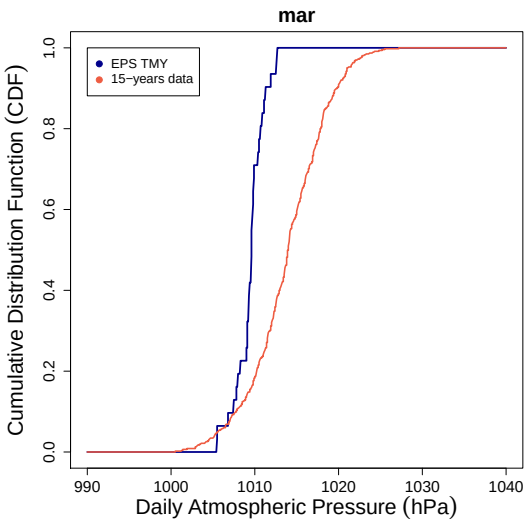


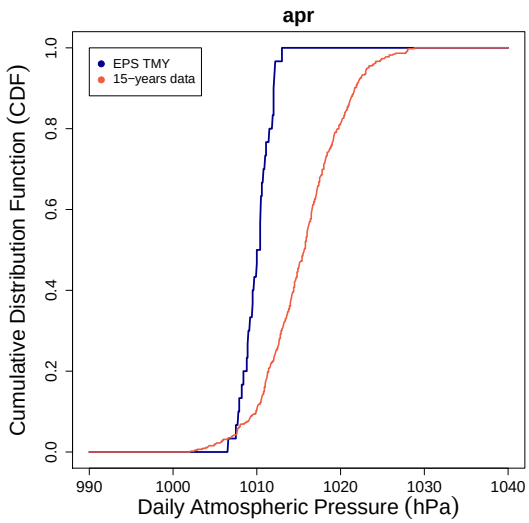
FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.0937	0.0785	0.0632	0.0224	0.1060	0.0840	0.0444	0.0906	0.0983	0.0409	0.0499	0.0447
AMTU	0.0536	0.0658	0.0349	0.0646	0.0560	0.0323	0.0461	0.0951	0.0753	0.0696	0.0756	0.0460

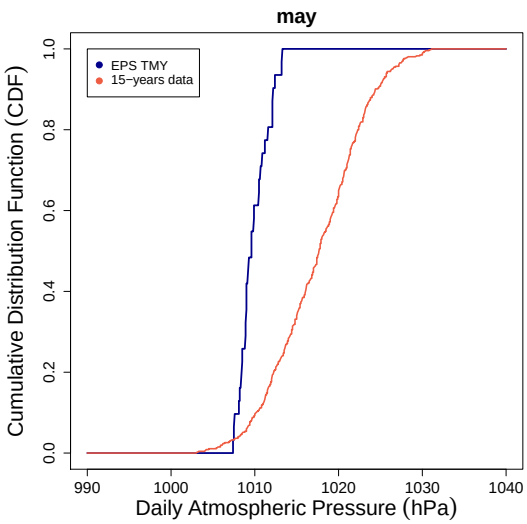
6 Atmospheric Pressure

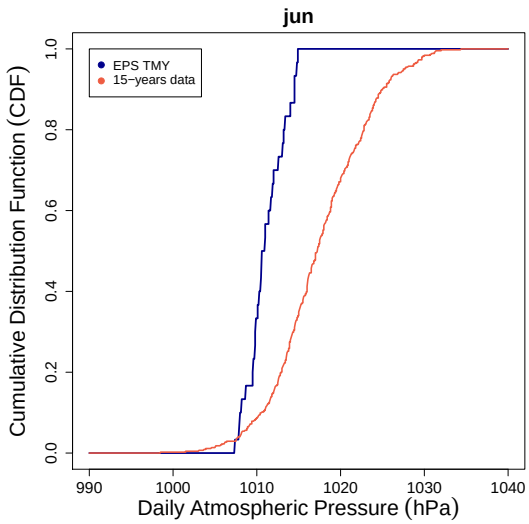


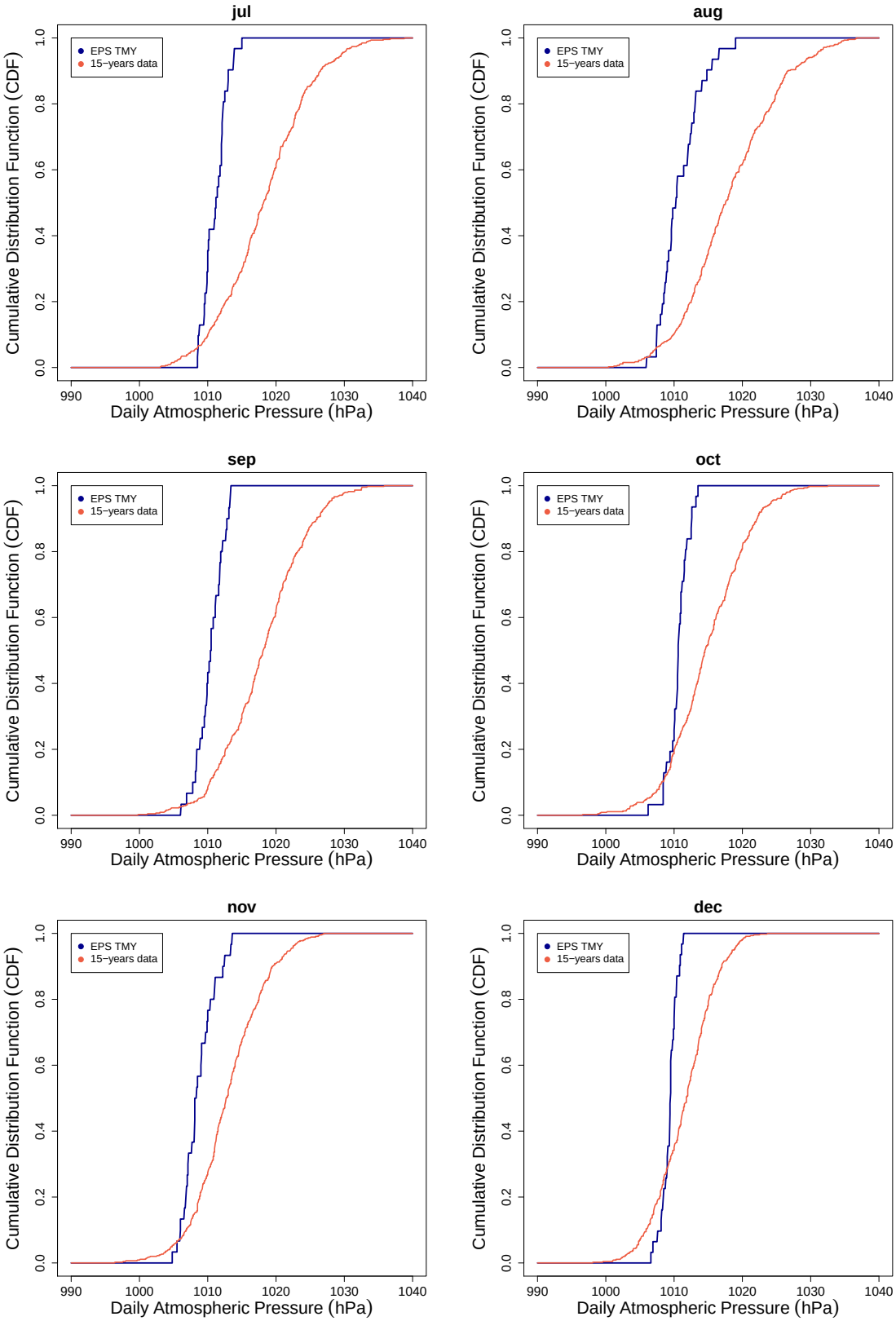


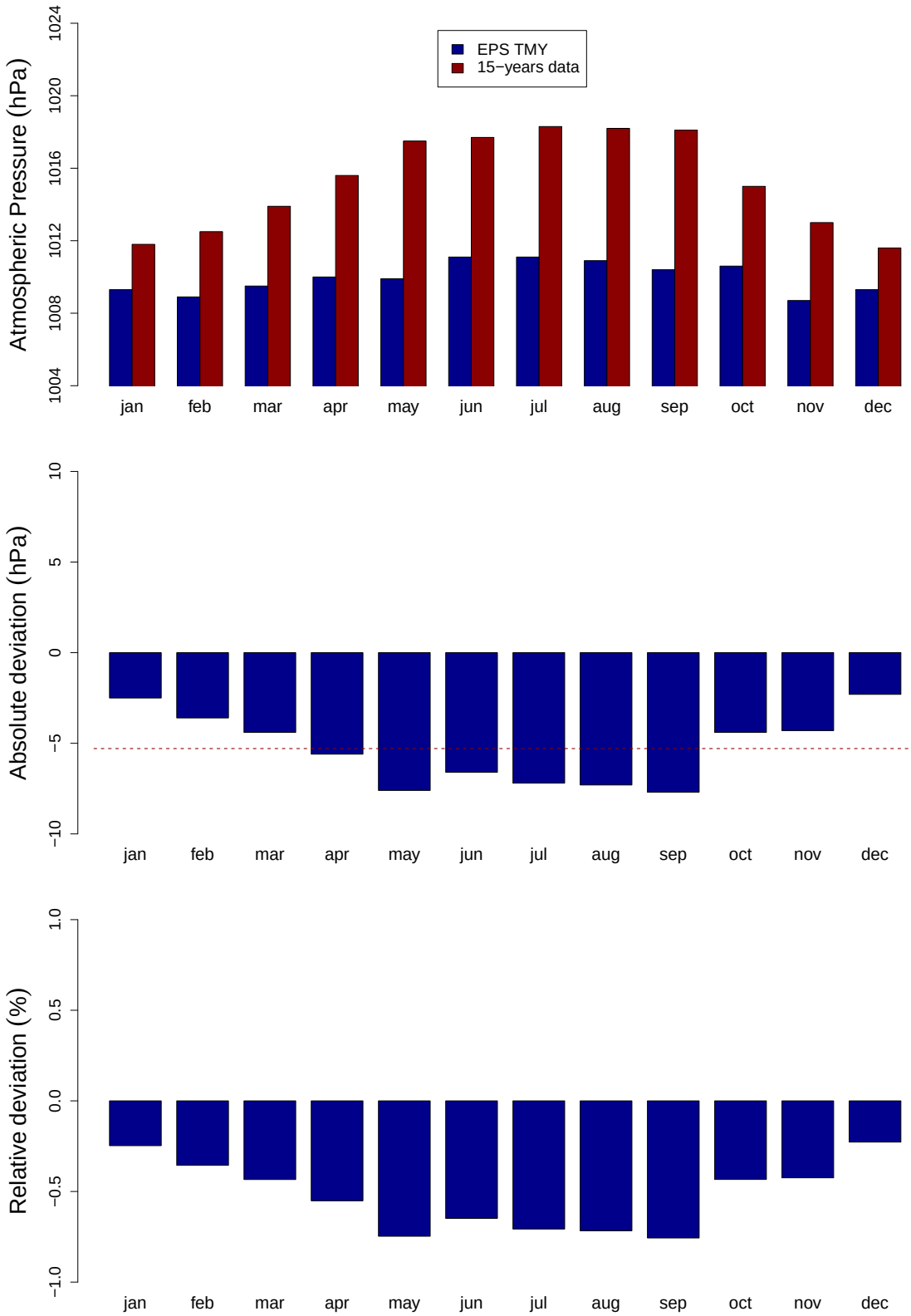









jul
aug
sep
oct
nov
dec
EPS TMY
15−years data
Cumulative Distribution Function (CDF)
Daily Atmospheric Pressure (hPa)
0.0
0.2
0.4
0.6
0.8
1.0
990
1000
1010
1020
1030
1040



FS	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
EPL	0.2438	0.2956	0.3444	0.3877	0.4174	0.3755	0.3748	0.3528	0.4065	0.2912	0.3052	0.2414
AMTU	0.0419	0.0203	0.0399	0.0462	0.0663	0.0798	0.0356	0.0638	0.0418	0.0963	0.0360	0.0876

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