PDU - projekt 2

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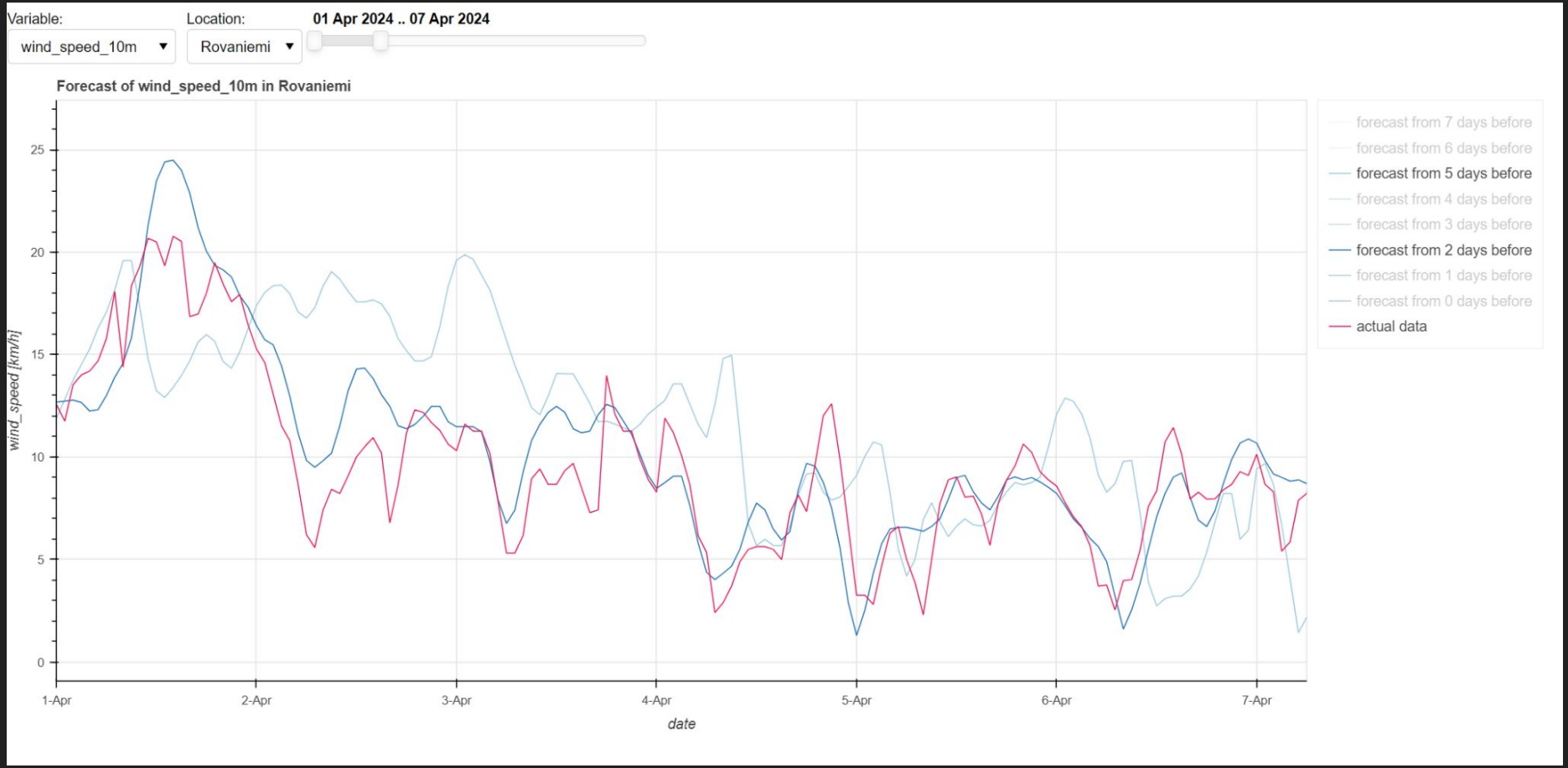
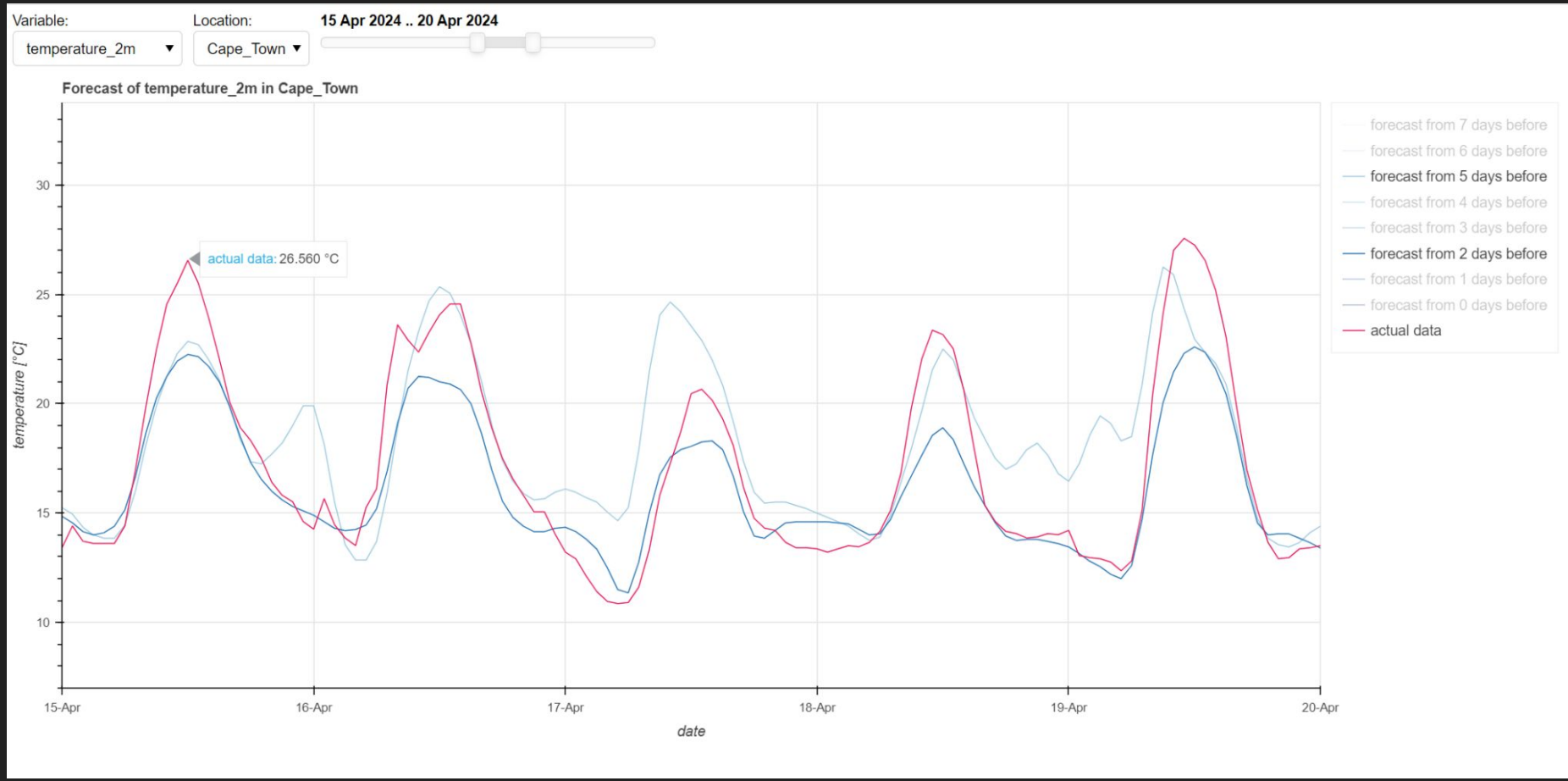
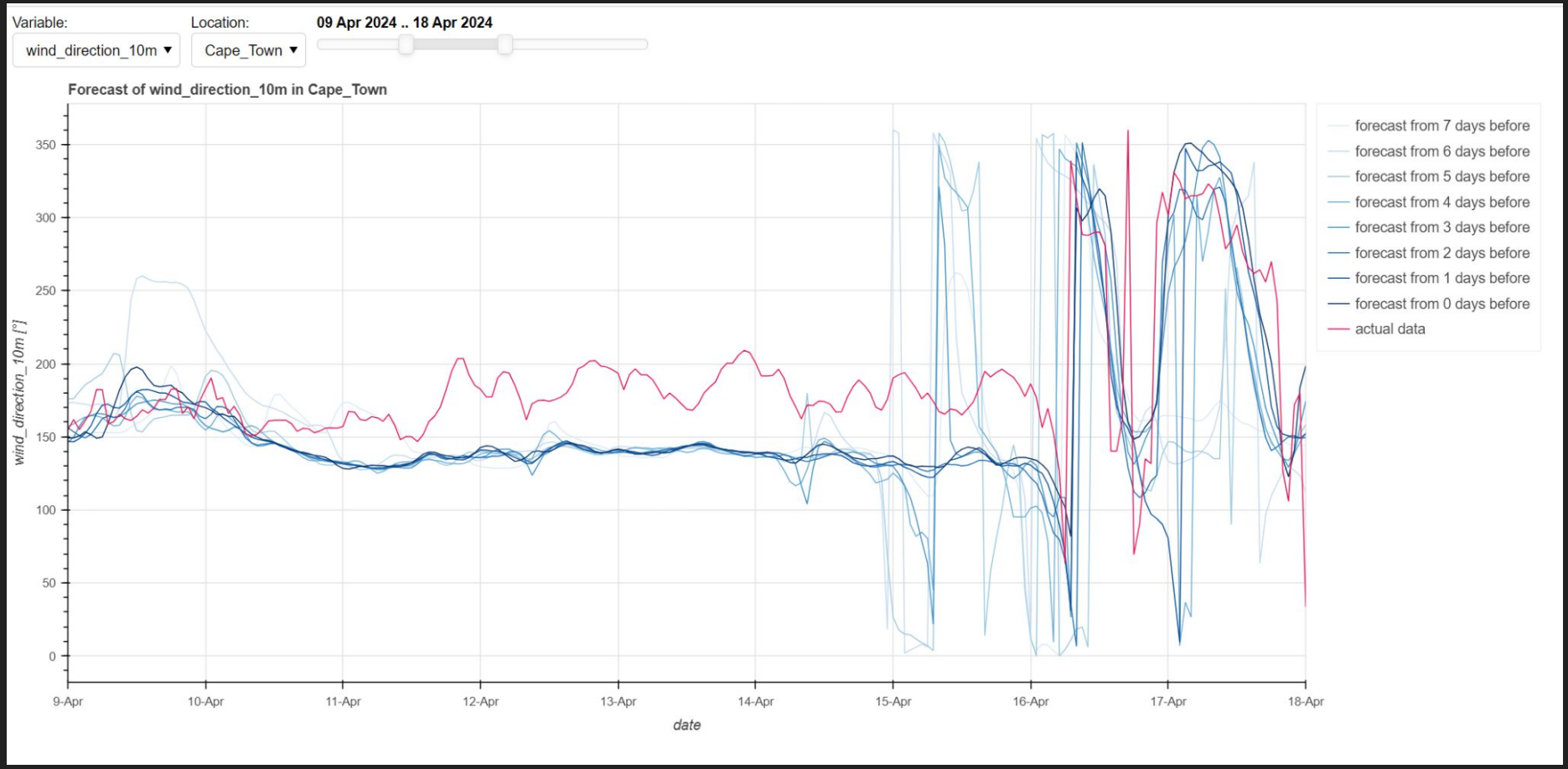
Forecast accuracy analysis


Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape Town
Iceland
Sweden
Norway
Russia
United Kingdom
Germany
Ukraine
Kazakhstan
Mongolia
France
Italy
Spain
China
South
Afghanistan
Iraq
Iran
Pakistan
Algeria
Libya
Egypt
Saudi Arabia
India
Thailand
Mali
Niger
Sudan
Chad
Nigeria
Ethiopia
Indonesia
Brazil
Tanzania
Angola
Namibia
Botswana
Madagascar
North Atlantic Ocean
South Atlantic Ocean
Indian Ocean

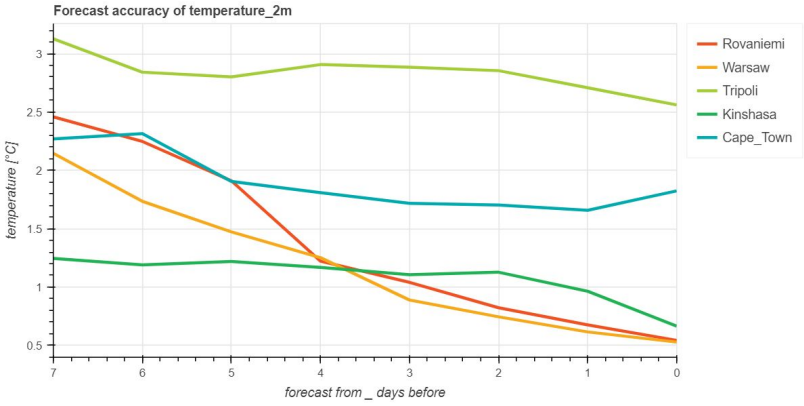

Variable:
wind_speed_10m
Location:
Rovaniemi
01 Apr 2024 .. 07 Apr 2024
Forecast of wind_speed_10m in Rovaniemi
wind_speed [km/h]
0
5
10
15
20
25
1-Apr
2-Apr
3-Apr
4-Apr
5-Apr
6-Apr
7-Apr
date
forecast from 7 days before
forecast from 6 days before
forecast from 5 days before
forecast from 4 days before
forecast from 3 days before
forecast from 2 days before
forecast from 1 days before
forecast from 0 days before
actual data


Variable:
temperature_2m
Location:
Cape_Town
15 Apr 2024 .. 20 Apr 2024
Forecast of temperature_2m in Cape_Town
actual data: 26.560 °C
forecast from 7 days before
forecast from 6 days before
forecast from 5 days before
forecast from 4 days before
forecast from 3 days before
forecast from 2 days before
forecast from 1 days before
forecast from 0 days before
actual data
temperature [°C]
30
25
20
15
10
15-Apr
16-Apr
17-Apr
18-Apr
19-Apr
20-Apr
date


Variable:
wind_direction_10m
Location:
Cape_Town
09 Apr 2024 .. 18 Apr 2024
Forecast of wind_direction_10m in Cape_Town
wind_direction_10m [°]
0
50
100
150
200
250
300
350
9-Apr
10-Apr
11-Apr
12-Apr
13-Apr
14-Apr
15-Apr
16-Apr
17-Apr
18-Apr
date
forecast from 7 days before
forecast from 6 days before
forecast from 5 days before
forecast from 4 days before
forecast from 3 days before
forecast from 2 days before
forecast from 1 days before
forecast from 0 days before
actual data

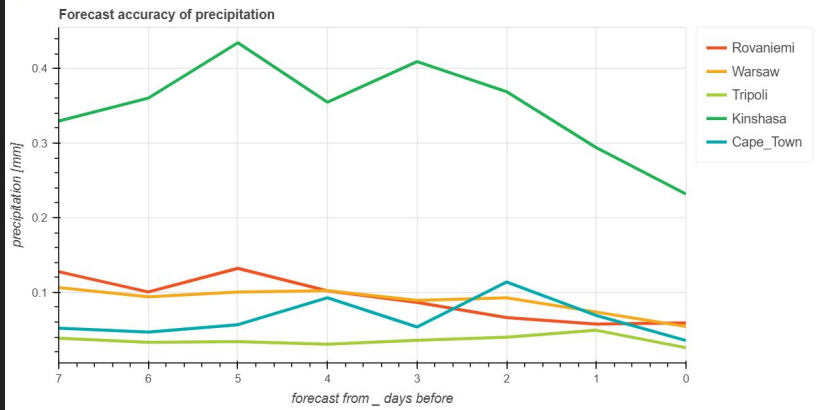
Variable:

temperature_2m



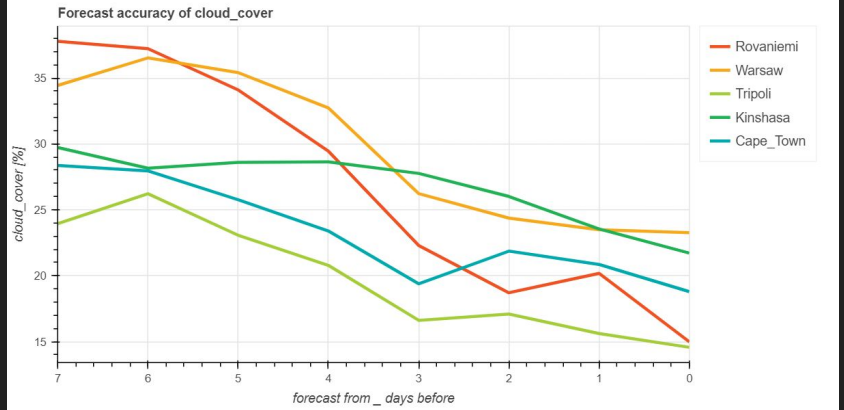
Variable:

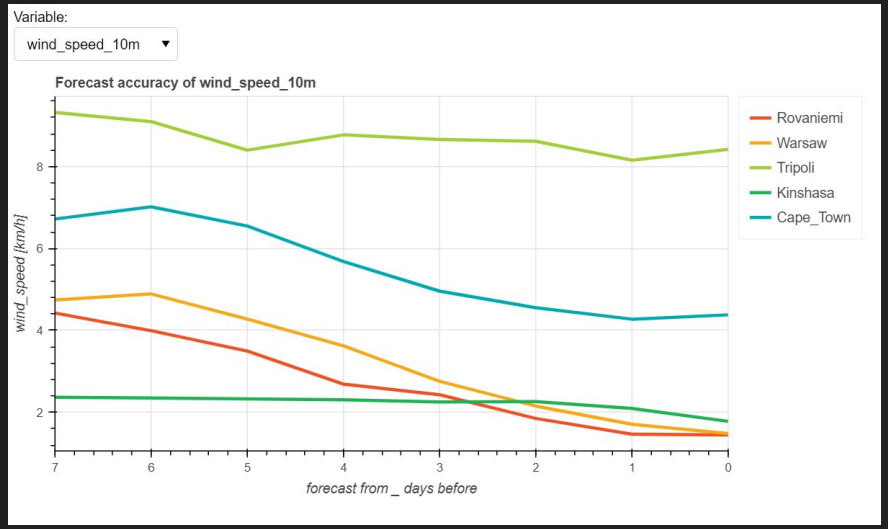
precipitation

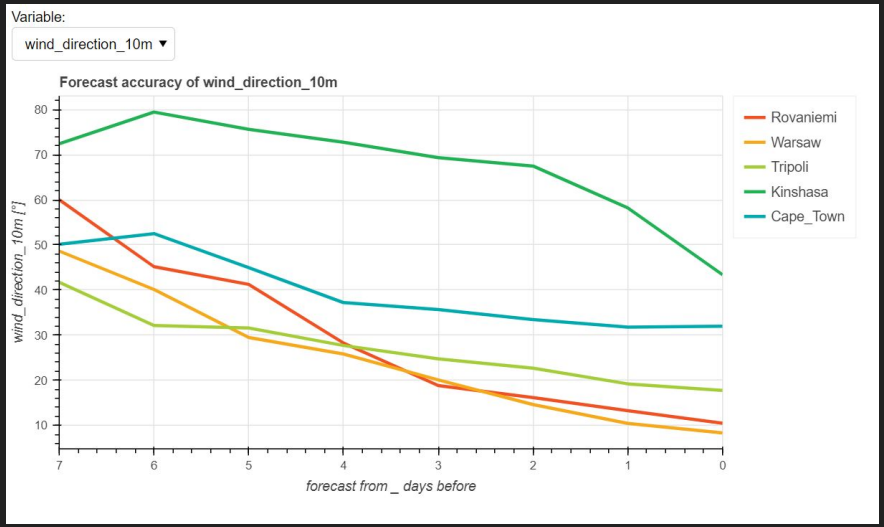


Variable:

cloud_cover




Variable:
wind_speed_10m
Forecast accuracy of wind_speed_10m
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town
wind_speed [km/h]
8
6
4
2
7
6
5
4
3
2
1
0
forecast from _ days before


Variable:
wind_direction_10m
Forecast accuracy of wind_direction_10m
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town
wind_direction_10m [°]
80
70
60
50
40
30
20
10
7
6
5
4
3
2
1
0
forecast from _ days before

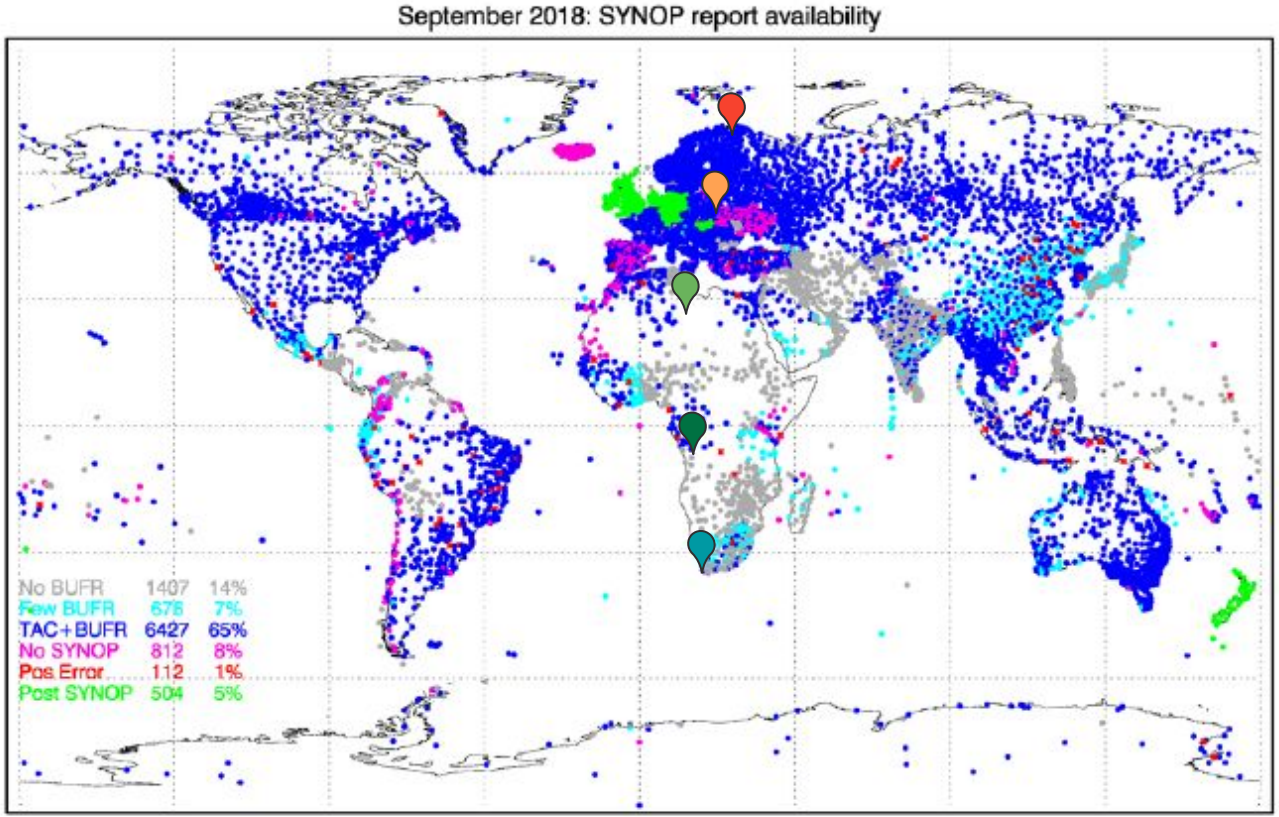


Figure 1: Location of SYNOP stations in September 2018, with colour coding indicating report type. Grey: reporting in TAC only; light blue: partially reporting BUFR; blue: reporting both TAC and BUFR; magenta: BUFR with no TAC reported previously; red: erroneous location information; green: TAC reports stopped, now reporting in BUFR only. The total number of stations reporting in this period was 9941.

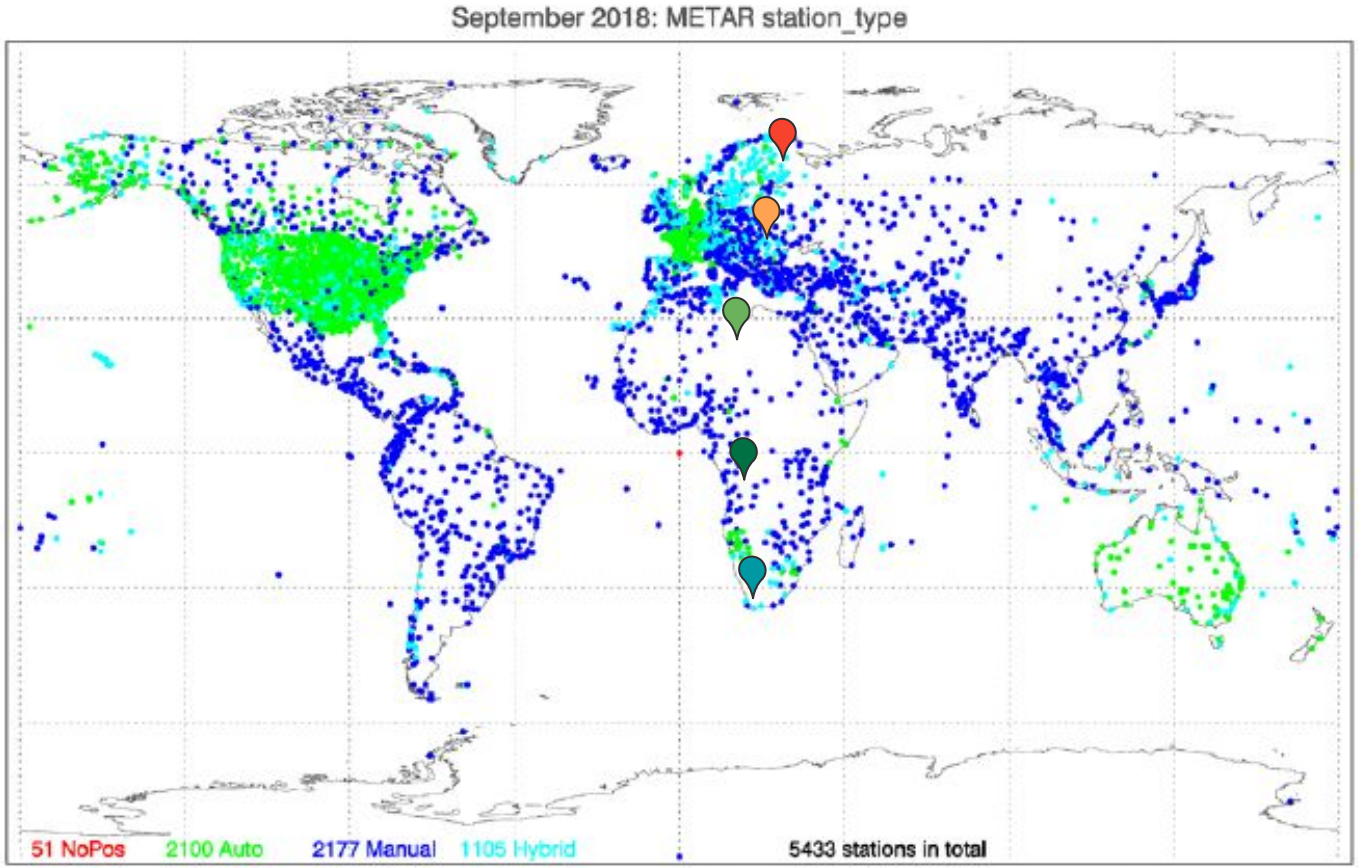
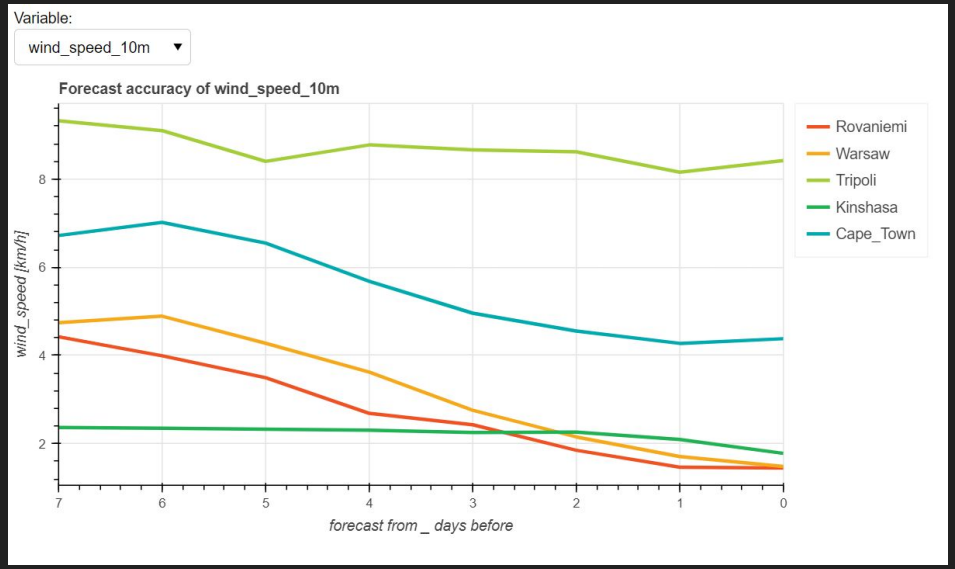
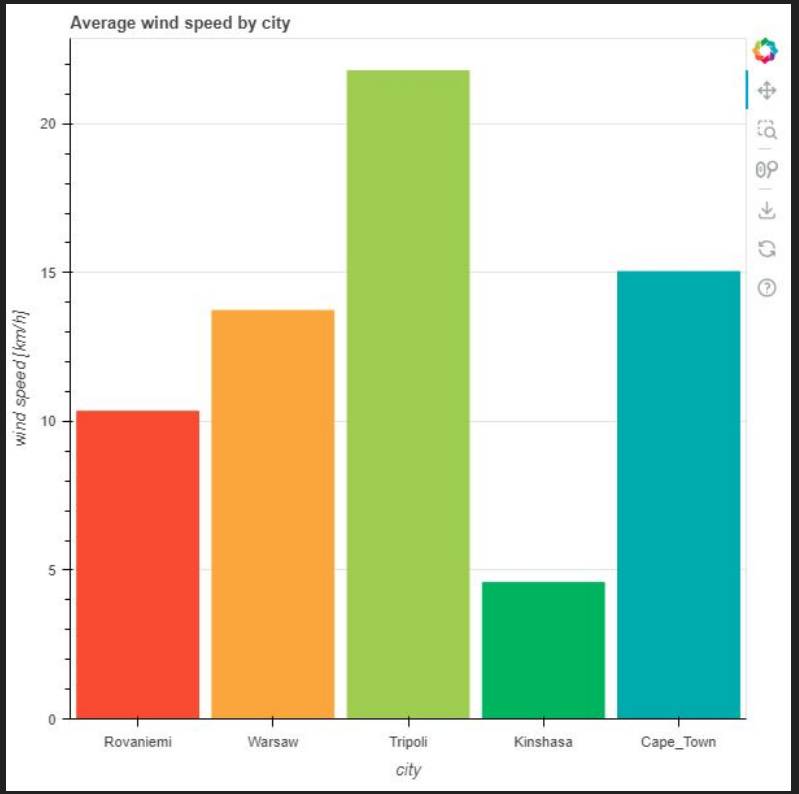
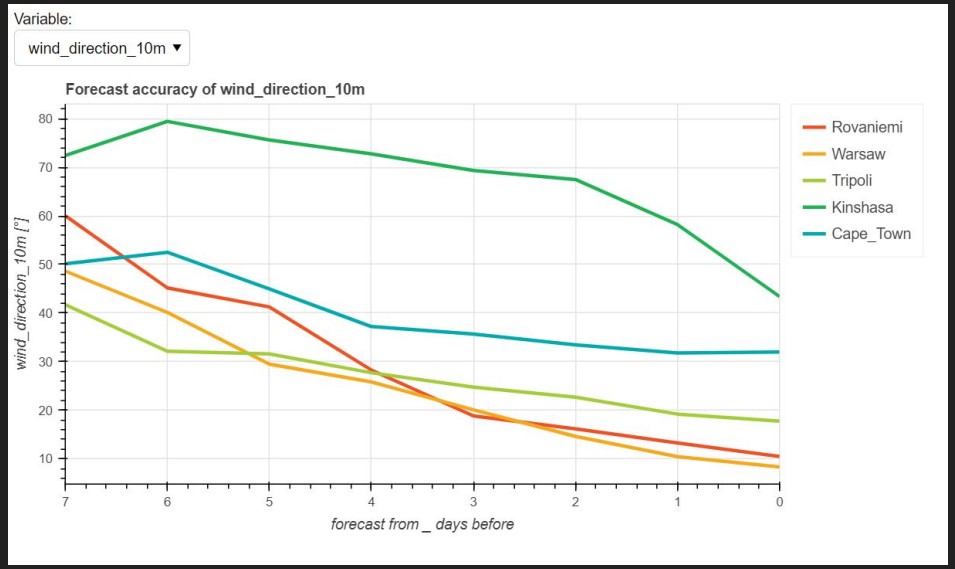
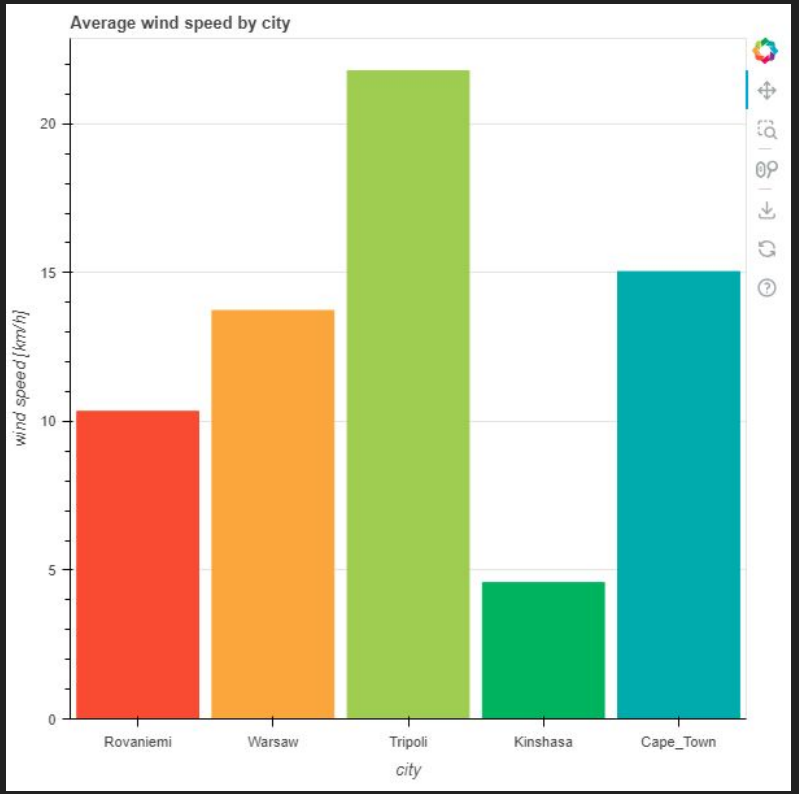


Figure 2: Location of METAR stations in September 2018, with colour coding indicating station type. Red indicates missing position information. The total number of stations reporting in this period was 5433.

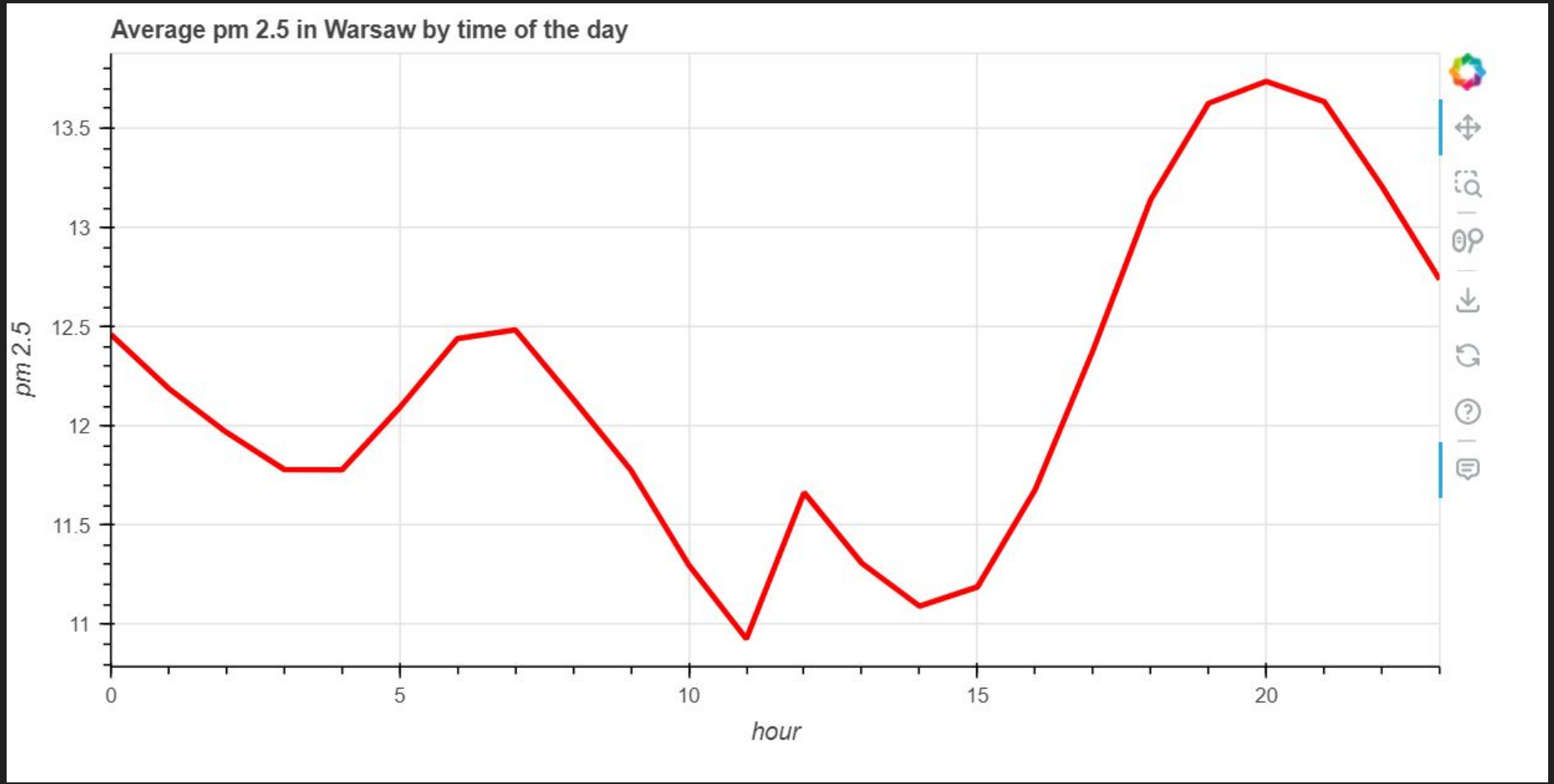

Variable:
wind_speed_10m
Forecast accuracy of wind_speed_10m
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town
wind_speed [km/h]
forecast from _ days before

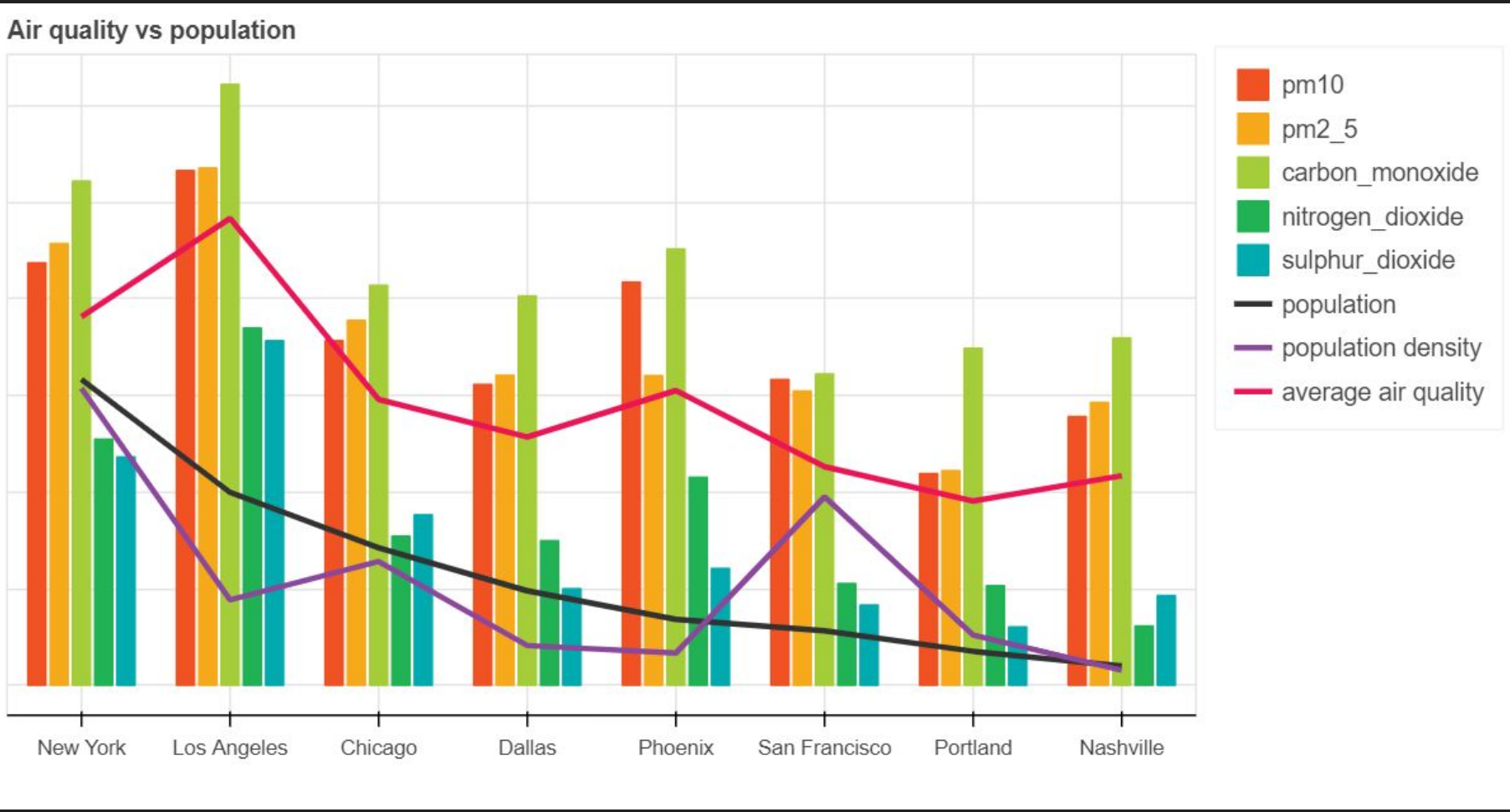

Average wind speed by city
wind speed [km/h]
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town
city


Variable:
wind_direction_10m
Forecast accuracy of wind_direction_10m
wind_direction_10m [°]
forecast from _ days before
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town


Average wind speed by city
wind speed [km/h]
city
Rovaniemi
Warsaw
Tripoli
Kinshasa
Cape_Town

Air pollution analysis


Average pm 2.5 in Warsaw by time of the day
pm 2.5
13.5
13
12.5
12
11.5
11
0
5
10
15
20
hour


Air quality vs population
pm10
pm2_5
carbon_monoxide
nitrogen_dioxide
sulphur_dioxide
population
population density
average air quality
New York
Los Angeles
Chicago
Dallas
Phoenix
San Francisco
Portland
Nashville

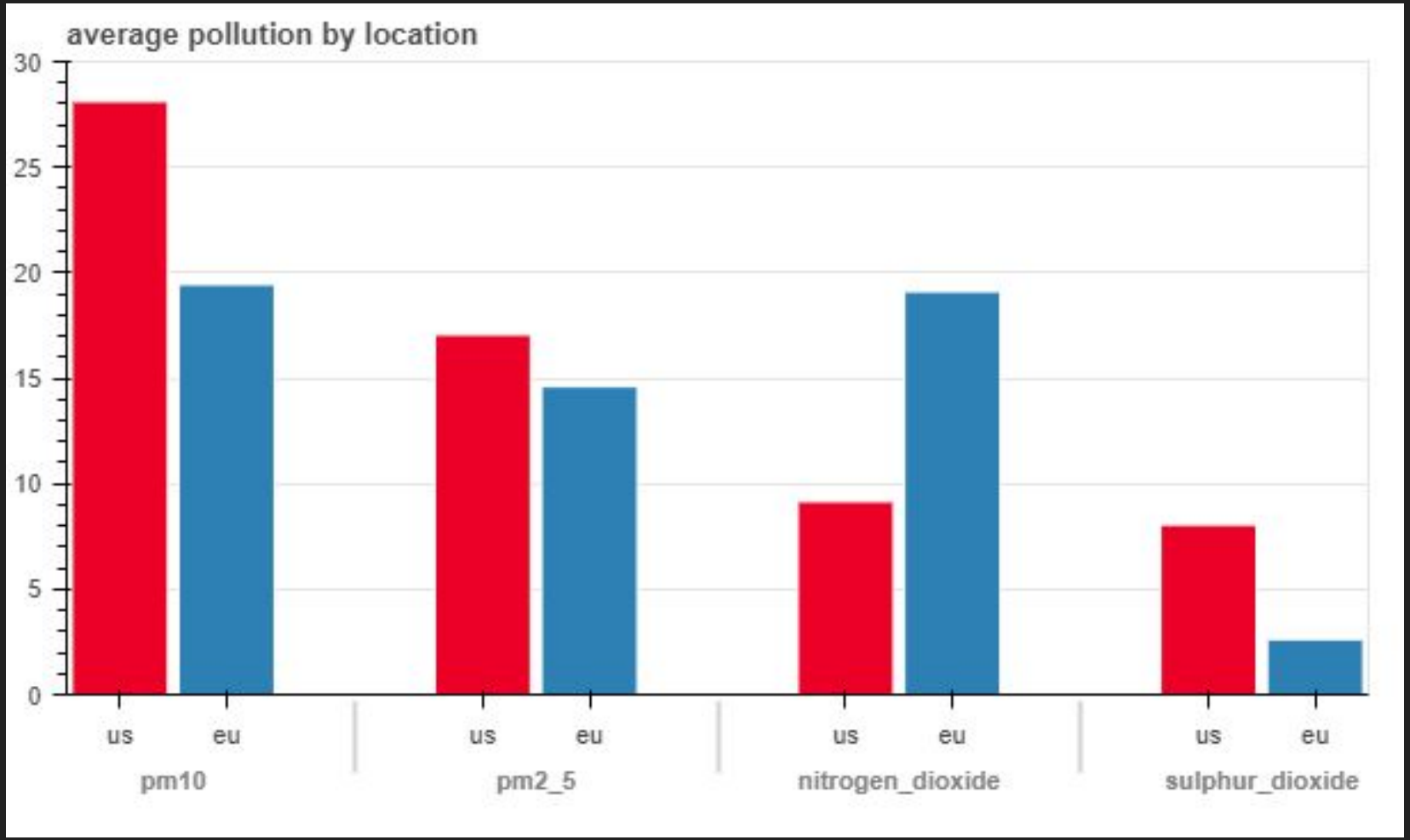

average pollution by location
30
25
20
15
10
5
0
us
eu
pm10
us
eu
pm2_5
us
eu
nitrogen_dioxide
us
eu
sulphur_dioxide

TABLE 1

International Comparison of Ambient Air Quality Standards and Guidelines,[21] as compared with recommendations of the World Health Organization (WHO)

POLLUTANT	WORLD HEALTH ORG	EUROPEAN UNION	AUSTRALIA	UNITED STATES	CANADA
Ozone 8 hour, parts per billion	50	60	80	80	65
Fine particulate 24 hour, micrograms per cubic meter	25	50	25	65	30
Sulphur dioxide 24 hour, ppb	8	48	80	140	115
Nitrogen dioxide Annual, ppb	21	21	30	53	53
Carbon monoxide 8 hour, ppm	9	9	9	9	13
Lead Micrograms per cubic meter	–	0.5	0.5	1.5	–

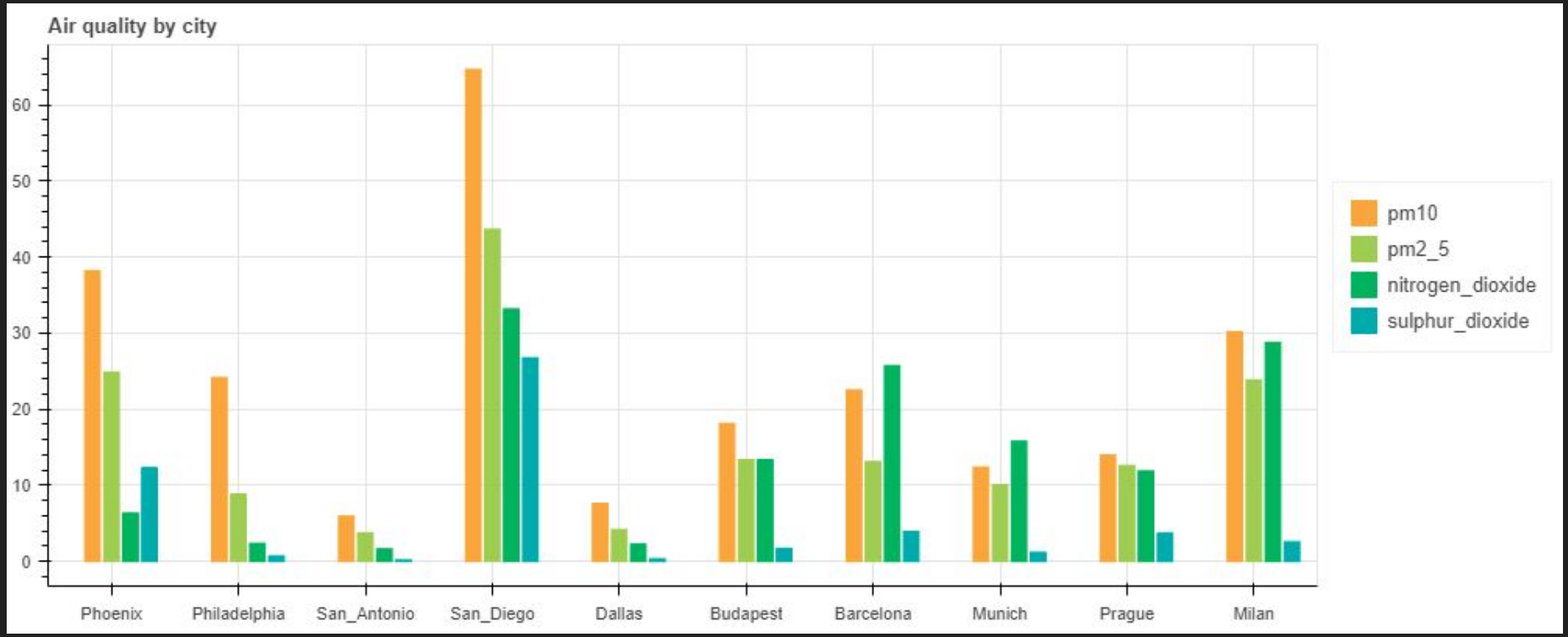
NOTE: A dash (–) indicates that no standard or guideline has been established for a particular parameter.

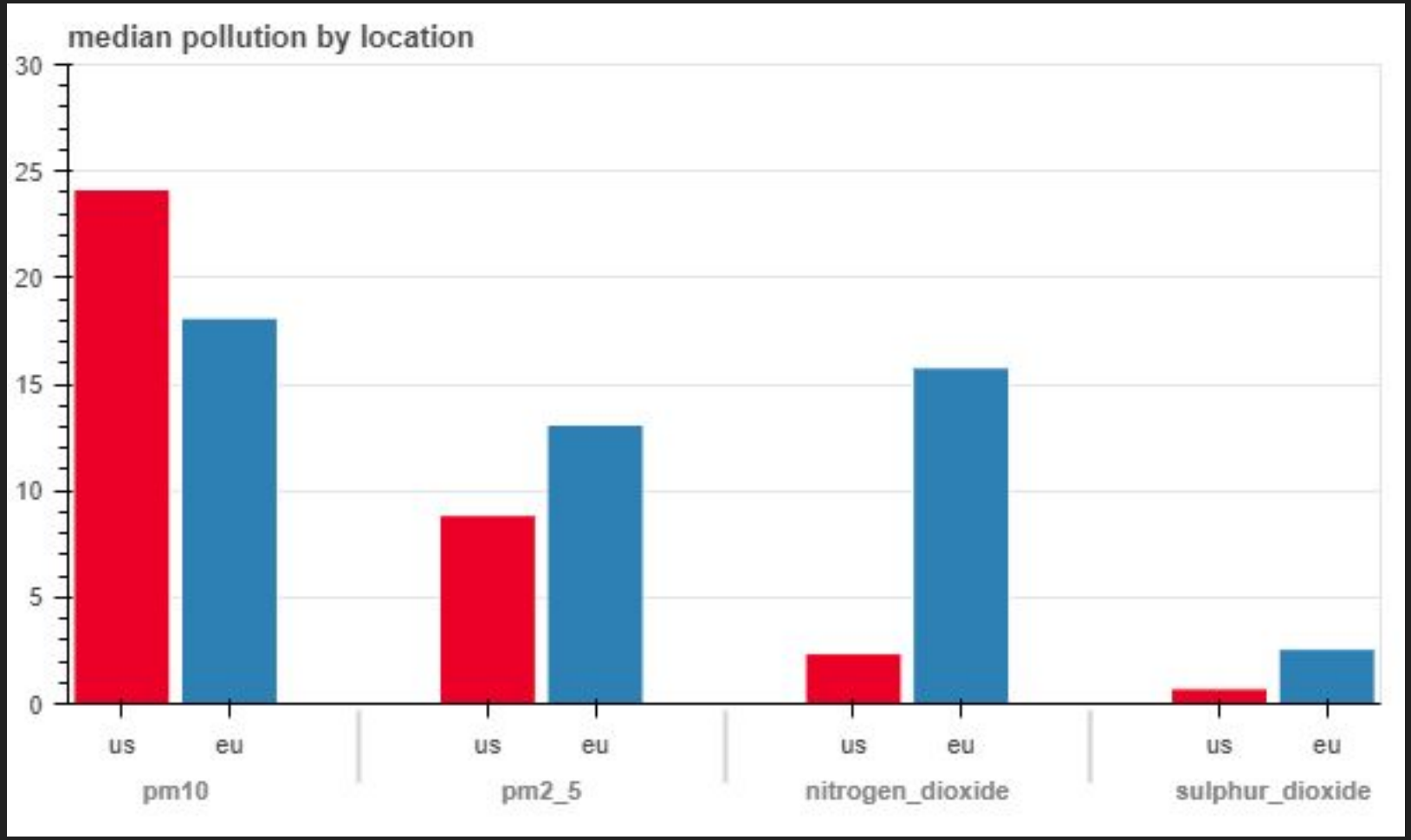
Table 1: Comparison of emission standards for pollutants in the US and EU[4]

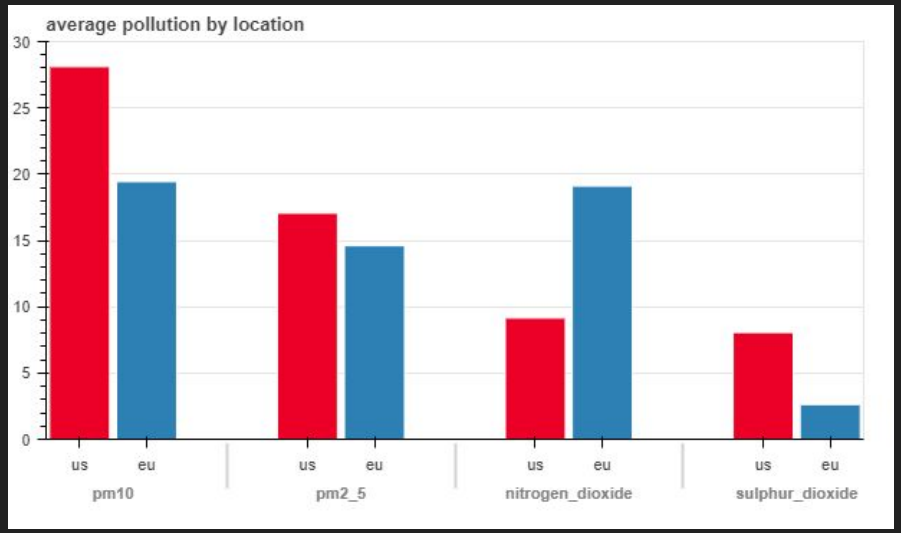
Emissions standards for pollutants (g/km)	US	EU
Nitrogen oxides (NOx)	0.04	0.06/0.08*
Non-methane organic gases (NMOG)	0.06	0.07/na*
Carbon monoxide (CO)	2.61	1.0/0.5*
Carbon Dioxide (CO_2, in 2016)	155	130
Carbon Dioxide (CO_2, in 2020)	132	95
Form of vehicle emission testing	**FTP**	**NEDC**

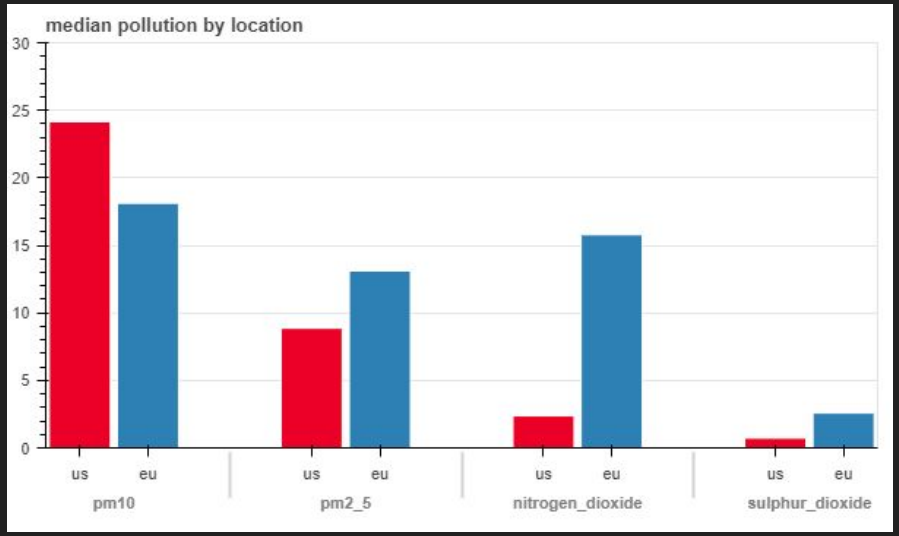
*Petrol / diesel standards
Federal Test Procedure (FTP)
New European Driving Cycle (NEDC)

Sources: DieselNet[5] and Delphi (2015)[6]


Air quality by city
60
50
40
30
20
10
0
Phoenix
Philadelphia
San_Antonio
San_Diego
Dallas
Budapest
Barcelona
Munich
Prague
Milan
pm10
pm2_5
nitrogen_dioxide
sulphur_dioxide


median pollution by location
30
25
20
15
10
5
0
us
eu
pm10
us
eu
pm2_5
us
eu
nitrogen_dioxide
us
eu
sulphur_dioxide


average pollution by location
30
25
20
15
10
5
0
us
eu
pm10
pm2_5
nitrogen_dioxide
sulphur_dioxide


median pollution by location
30
25
20
15
10
5
0
us
eu
pm10
pm2_5
nitrogen_dioxide
sulphur_dioxide

Bibliografia

https://open-meteo.com/en/docs/historical-weather-api

https://open-meteo.com/en/docs/air-quality-api

https://www.ecmwf.int/

https://simplemaps.com/data/us-cities