

Open-Source Participation Survey Overview (Task 10-2)

```
## Loading required package: ggplot2

## Loading required package: reshape2

# importing our data
data = data.import()

## Warning in if (is.na(value)) name = "NA" else if (value >= 348.75 || value
## <= : the condition has length > 1 and only the first element will be used

head(data)
```

```
##           dtPosix           dt           dt_iso city_id
## 1 2017-01-01 00:00:00 1483228800 2017-01-01 00:00:00 +0000 UTC 2950159
## 2 2017-01-01 01:00:00 1483232400 2017-01-01 01:00:00 +0000 UTC 2950159
## 3 2017-01-01 02:00:00 1483236000 2017-01-01 02:00:00 +0000 UTC 2950159
## 4 2017-01-01 03:00:00 1483239600 2017-01-01 03:00:00 +0000 UTC 2950159
## 5 2017-01-01 04:00:00 1483243200 2017-01-01 04:00:00 +0000 UTC 2950159
## 6 2017-01-01 05:00:00 1483246800 2017-01-01 05:00:00 +0000 UTC 2950159
##      temp temp_min temp_max pressure humidity wind_speed wind_deg rain_3h
## 1 276.64 276.15 277.15 1023 86 4 240 NA
## 2 276.13 275.15 277.15 1022 86 3 220 NA
## 3 275.99 275.15 277.15 1022 86 3 230 NA
## 4 276.13 275.15 277.15 1021 80 4 230 NA
## 5 276.13 275.15 277.15 1020 80 4 240 NA
## 6 276.13 275.15 277.15 1019 80 3 230 NA
##      clouds_all weather_id weather_main weather_description weather_icon
## 1 90 804 Clouds overcast clouds 04n
## 2 75 803 Clouds broken clouds 04n
## 3 90 804 Clouds overcast clouds 04n
## 4 90 804 Clouds overcast clouds 04n
## 5 90 804 Clouds overcast clouds 04n
## 6 90 804 Clouds overcast clouds 04n
##      weekday hours chb.all chb.background chb.traffic cht.all
## 1 sun 0 1.725000 0.8 2.65 1.250000
## 2 sun 1 6.866667 1.8 9.40 1.666667
## 3 sun 2 2.566667 1.6 3.05 2.333333
## 4 sun 3 1.633333 1.2 1.85 1.333333
## 5 sun 4 1.500000 0.9 1.80 1.666667
## 6 sun 5 1.133333 0.9 1.25 2.000000
##      cht.background cht.traffic co.all co.traffic no2.all no2.background
## 1 1 1.5 0.40 0.40 28.37500 29.20
## 2 1 2.0 0.80 0.80 40.81250 46.80
## 3 1 3.0 0.50 0.50 39.00000 39.80
## 4 1 1.5 0.35 0.35 29.80000 27.00
## 5 1 2.0 0.35 0.35 26.66667 25.75
## 6 1 2.5 0.30 0.30 25.06250 25.00
##      no2.traffic no2.suburb no.all no.background no.traffic no.suburb
## 1 38.83333 15.0 14.00000 2.60 34.83333 0.4
## 2 53.66667 19.4 54.93750 26.60 123.50000 1.0
## 3 51.50000 23.2 19.75000 10.00 43.33333 1.2
## 4 41.33333 18.2 15.00000 2.75 35.33333 0.4
## 5 36.50000 15.6 11.13333 1.75 26.50000 0.2
```

```
## 6      33.83333      14.6  9.06250      2.00  22.16667      0.4
##      nox.all nox.background nox.traffic nox.suburb  o3.all o3.background
## 1  48.81250      33.40   89.00000      16.0 35.16667      29.5
## 2 124.06250      87.40  240.83333      20.6 25.33333      9.5
## 3   69.06250      54.60  117.83333      25.0 26.16667      18.5
## 4   52.60000      31.50   95.00000      18.6 29.50000      24.0
## 5   43.66667      28.75   76.83333      15.8 32.50000      27.5
## 6   38.87500      27.60   68.00000      15.2 32.33333      29.0
##      o3.traffic o3.suburb  pm10.all pm10.background pm10.traffic pm10.suburb
## 1      NA      38.00  65.09091      47.66667      96.2   30.66667
## 2      NA      33.25 283.72727      211.66667      465.4   53.00000
## 3      NA      30.00 119.72727      114.66667      141.8   88.00000
## 4      NA      32.25  50.54545      48.00000      51.6   51.33333
## 5      NA      35.00  35.09091      32.33333      38.2   32.66667
## 6      NA      34.00  27.81818      23.66667      31.6   25.66667
##      so2.all so2.background so2.traffic wind.deg.name
## 1      1      1      NA      WSW
## 2     356      13     699      SW
## 3      27      5      49      SW
## 4       7      2     12      SW
## 5       4      0      8      WSW
## 6       4      3      5      SW
```

Overview

```
summary(data)
```

```
##      dtPosix      dt
## Min.   :2017-01-01 00:00:00 Min.   :1.483e+09
## 1st Qu.:2017-04-01 10:45:00 1st Qu.:1.491e+09
## Median :2017-07-03 15:30:00 Median :1.499e+09
## Mean   :2017-07-03 03:05:03 Mean   :1.499e+09
## 3rd Qu.:2017-10-04 02:15:00 3rd Qu.:1.507e+09
## Max.   :2017-12-31 23:00:00 Max.   :1.515e+09
##      NA's      :37
##      dt_iso      city_id      temp
## 2017-03-18 06:00:00 +0000 UTC: 3 Min.   :2950159 Min.   :263.1
## 2017-03-30 01:00:00 +0000 UTC: 3 1st Qu.:2950159 1st Qu.:277.1
## 2017-03-30 02:00:00 +0000 UTC: 3 Median :2950159 Median :283.1
## 2017-03-30 03:00:00 +0000 UTC: 3 Mean   :2950159 Mean   :283.4
## 2017-03-30 04:00:00 +0000 UTC: 3 3rd Qu.:2950159 3rd Qu.:289.1
## (Other)      :9104 Max.   :2950159 Max.   :305.1
## NA's      : 37 NA's      :37 NA's      :37
##      temp_min      temp_max      pressure      humidity
## Min.   :261.1 Min.   :263.7 Min.   : 980 Min.   : 14.00
## 1st Qu.:277.1 1st Qu.:277.4 1st Qu.:1010 1st Qu.: 67.00
## Median :283.1 Median :283.1 Median :1016 Median : 81.00
## Mean   :283.0 Mean   :283.7 Mean   :1015 Mean   : 77.17
## 3rd Qu.:289.1 3rd Qu.:289.1 3rd Qu.:1021 3rd Qu.: 93.00
## Max.   :305.1 Max.   :305.1 Max.   :1043 Max.   :100.00
## NA's   :37 NA's   :37 NA's   :37 NA's   :37
##      wind_speed      wind_deg      rain_3h      clouds_all
## Min.   : 0.00 Min.   : 0.0 Min.   :0.118 Min.   : 0.00
## 1st Qu.: 2.00 1st Qu.:120.0 1st Qu.:0.150 1st Qu.: 0.00
```

```

## Median : 3.00 Median :230.0 Median :0.380 Median : 75.00
## Mean : 3.43 Mean :197.5 Mean :0.672 Mean : 45.13
## 3rd Qu.: 5.00 3rd Qu.:270.0 3rd Qu.:0.889 3rd Qu.: 75.00
## Max. :14.00 Max. :360.0 Max. :9.865 Max. :100.00
## NA's :37 NA's :37 NA's :9066 NA's :37
## weather_id weather_main weather_description weather_icon
## Min. :200.0 Clouds :3434 Sky is Clear :2972 01n :1593
## 1st Qu.:701.0 Clear :2973 broken clouds :2380 04d :1390
## Median :800.0 Rain :1195 light rain : 803 01d :1379
## Mean :728.3 Mist : 598 mist : 598 04n :1171
## 3rd Qu.:803.0 Fog : 383 scattered clouds: 536 50n : 673
## Max. :804.0 (Other): 536 (Other) :1830 (Other):2913
## NA's :37 NA's : 37 NA's : 37 NA's : 37
## weekday hours chb.all chb.background
## sun :1331 4 : 392 Min. :0.2000 Min. :0.1000
## wed :1316 6 : 392 1st Qu.:0.6667 1st Qu.:0.5000
## fri :1314 1 : 391 Median :0.9333 Median :0.7000
## thu :1303 3 : 390 Mean :1.1730 Mean :0.9167
## tue :1290 2 : 389 3rd Qu.:1.3667 3rd Qu.:1.1000
## (Other):2565 (Other):7165 Max. :8.9000 Max. :9.8000
## NA's : 37 NA's : 37 NA's :1 NA's :162
## chb.traffic cht.all cht.background cht.traffic
## Min. :0.200 Min. : 0.000 Min. : 0.00 Min. : 0.000
## 1st Qu.:0.750 1st Qu.: 1.333 1st Qu.: 1.00 1st Qu.: 1.500
## Median :1.050 Median : 2.000 Median : 1.00 Median : 2.500
## Mean :1.303 Mean : 2.483 Mean : 1.81 Mean : 2.819
## 3rd Qu.:1.550 3rd Qu.: 3.000 3rd Qu.: 2.00 3rd Qu.: 3.500
## Max. :9.400 Max. :19.667 Max. :24.00 Max. :18.500
## NA's :9 NA's :1 NA's :161 NA's :4
## co.all co.traffic no2.all no2.background
## Min. :0.1000 Min. :0.1000 Min. : 3.929 Min. : 4.00
## 1st Qu.:0.2667 1st Qu.:0.2667 1st Qu.: 19.750 1st Qu.: 15.40
## Median :0.3500 Median :0.3500 Median : 27.625 Median : 22.40
## Mean :0.3867 Mean :0.3867 Mean : 29.279 Mean : 25.35
## 3rd Qu.:0.4500 3rd Qu.:0.4500 3rd Qu.: 36.806 3rd Qu.: 32.60
## Max. :2.2500 Max. :2.2500 Max. :144.062 Max. :171.40
## NA's :1 NA's :1 NA's :1 NA's :1
## no2.traffic no2.suburb no.all no.background
## Min. : 4.00 Min. : 1.20 Min. : 0.4375 Min. : 0.000
## 1st Qu.: 31.00 1st Qu.: 6.60 1st Qu.: 6.4375 1st Qu.: 1.250
## Median : 44.83 Median :10.80 Median : 13.0000 Median : 2.800
## Mean : 45.88 Mean :12.94 Mean : 17.8855 Mean : 6.473
## 3rd Qu.: 58.33 3rd Qu.:17.00 3rd Qu.: 23.0000 3rd Qu.: 6.000
## Max. :187.67 Max. :66.40 Max. :273.3125 Max. :361.800
## NA's :1 NA's :1 NA's :1 NA's :1
## no.traffic no.suburb nox.all nox.background
## Min. : 1.167 Min. : 0.000 Min. : 6.00 Min. : 5.20
## 1st Qu.: 15.333 1st Qu.: 0.200 1st Qu.: 30.69 1st Qu.: 18.20
## Median : 31.143 Median : 0.400 Median : 48.27 Median : 27.00
## Mean : 40.297 Mean : 1.783 Mean : 56.59 Mean : 35.22
## 3rd Qu.: 53.500 3rd Qu.: 1.200 3rd Qu.: 71.00 3rd Qu.: 41.60
## Max. :419.667 Max. :90.000 Max. :561.44 Max. :723.80
## NA's :1 NA's :1 NA's :1 NA's :1
## nox.traffic nox.suburb o3.all o3.background

```

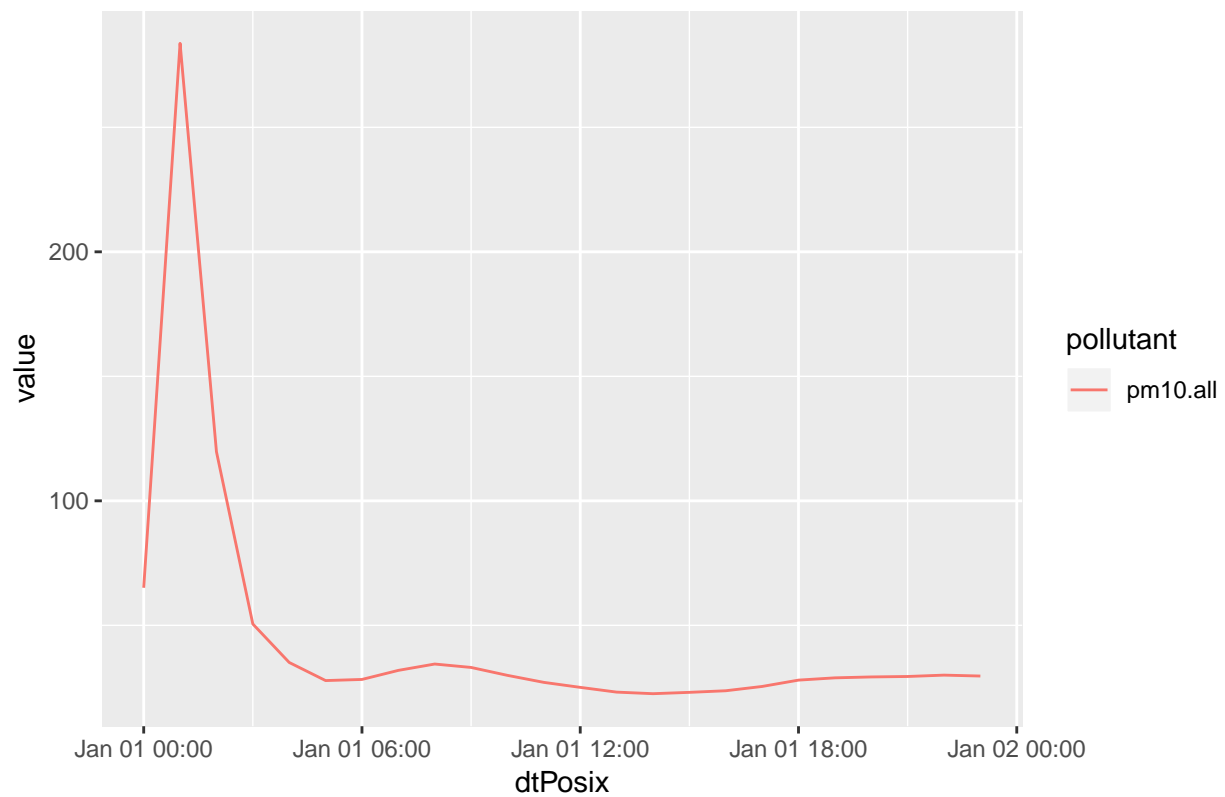
```
## Min.      : 7.833   Min.      : 1.60   Min.      : 0.50   Min.      : 0.00
## 1st Qu.: 55.333   1st Qu.: 7.00   1st Qu.: 24.17   1st Qu.: 20.00
## Median : 94.000   Median : 11.60   Median : 42.50   Median : 38.50
## Mean    :107.422   Mean    : 15.66   Mean    : 44.07   Mean    : 40.46
## 3rd Qu.:140.333   3rd Qu.: 19.25   3rd Qu.: 60.67   3rd Qu.: 57.50
## Max.    :828.500   Max.    :189.20   Max.    :142.67   Max.    :138.00
## NA's    :1       NA's    :1       NA's    :1       NA's    :2
## o3.traffic  o3.suburb      pm10.all      pm10.background
## Min.      : 1.0    Min.      : 0.25   Min.      : 4.00   Min.      : 3.333
## 1st Qu.:11.0    1st Qu.: 25.62   1st Qu.: 13.91   1st Qu.: 12.667
## Median :25.0    Median : 45.00   Median : 18.82   Median : 17.667
## Mean    :24.3    Mean    : 45.94   Mean    : 22.70   Mean    : 21.351
## 3rd Qu.:35.0    3rd Qu.: 63.00   3rd Qu.: 27.70   3rd Qu.: 26.333
## Max.    :72.0    Max.    :145.00   Max.    :283.73   Max.    :211.667
## NA's    :8469   NA's    :1       NA's    :1       NA's    :1
## pm10.traffic pm10.suburb      so2.all      so2.background
## Min.      : 5.00   Min.      : 3.00   Min.      : 0.000   Min.      : 0.000
## 1st Qu.: 16.80   1st Qu.: 10.00   1st Qu.: 0.500   1st Qu.: 0.000
## Median : 22.40   Median : 14.00   Median : 1.000   Median : 1.000
## Mean    : 26.68   Mean    : 17.29   Mean    : 1.522   Mean    : 1.198
## 3rd Qu.: 32.20   3rd Qu.: 21.33   3rd Qu.: 1.500   3rd Qu.: 1.000
## Max.    :465.40   Max.    :106.33   Max.    :356.000   Max.    :27.000
## NA's    :1       NA's    :1       NA's    :4       NA's    :27
## so2.traffic  wind.deg.name
## Min.      : 0.000   Length:9156
## 1st Qu.: 1.000   Class :character
## Median : 1.000   Mode  :character
## Mean    : 1.844
## 3rd Qu.: 2.000
## Max.    :699.000
## NA's    :54
```

pm10 over the year

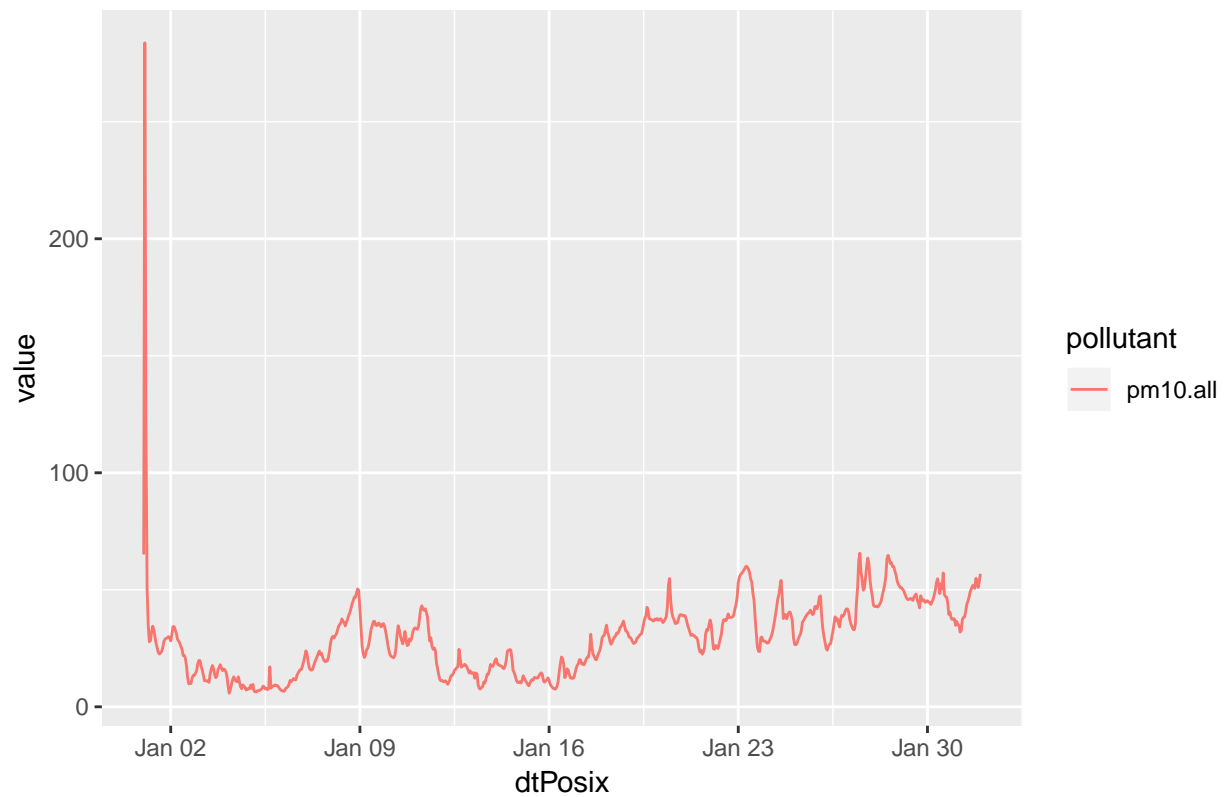
```
pollutant = "pm10.all"

plot.pollutant(data, pollutant, month = "01", day = "01", title = "1. January with silvester fireworks p
```

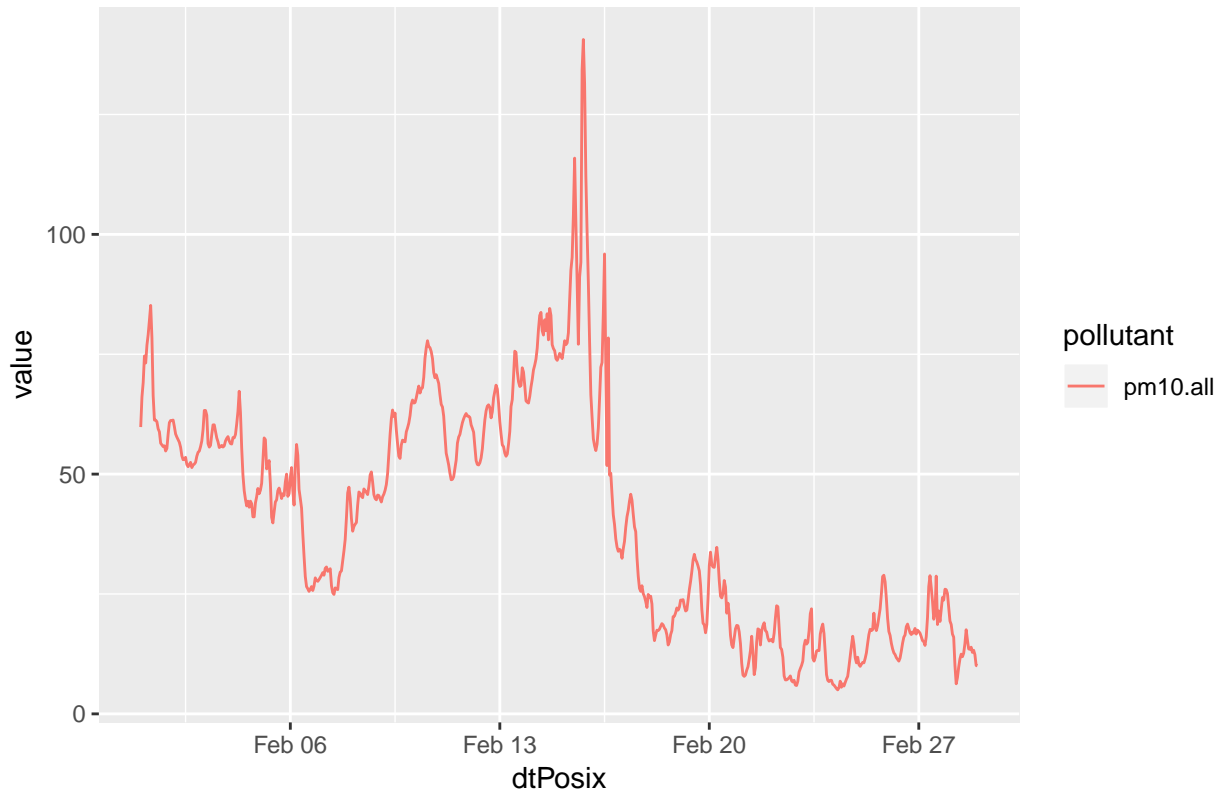
1. January with silvester firework peak



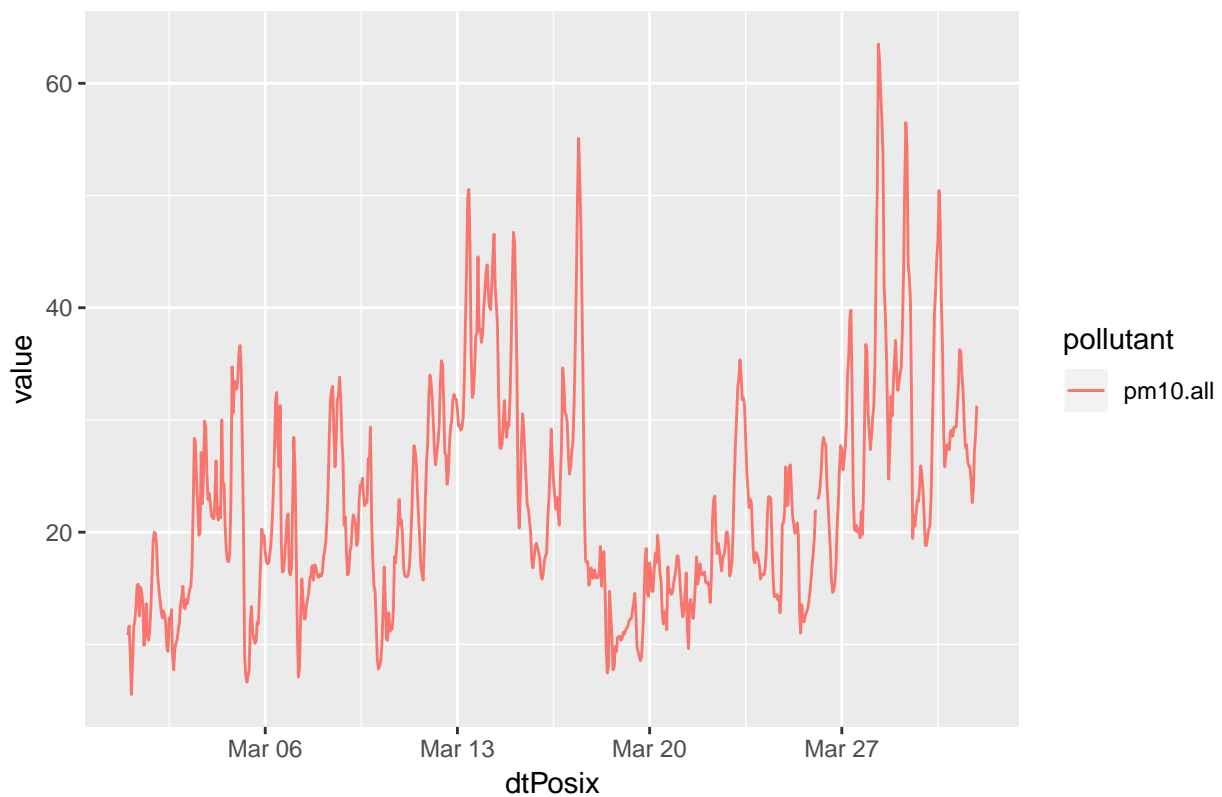
```
plot.pollutant(data, pollutant, month = "01")
```



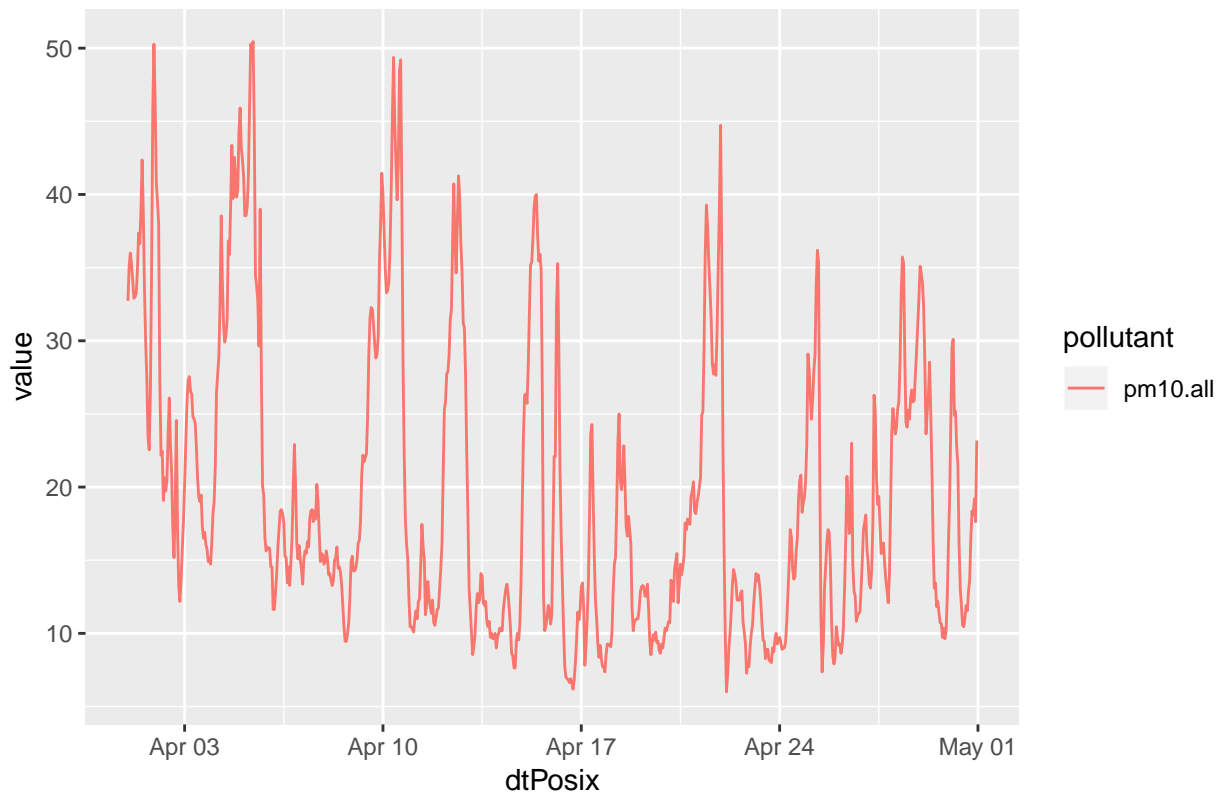
```
plot.pollutant(data, pollutant, month = "02")
```



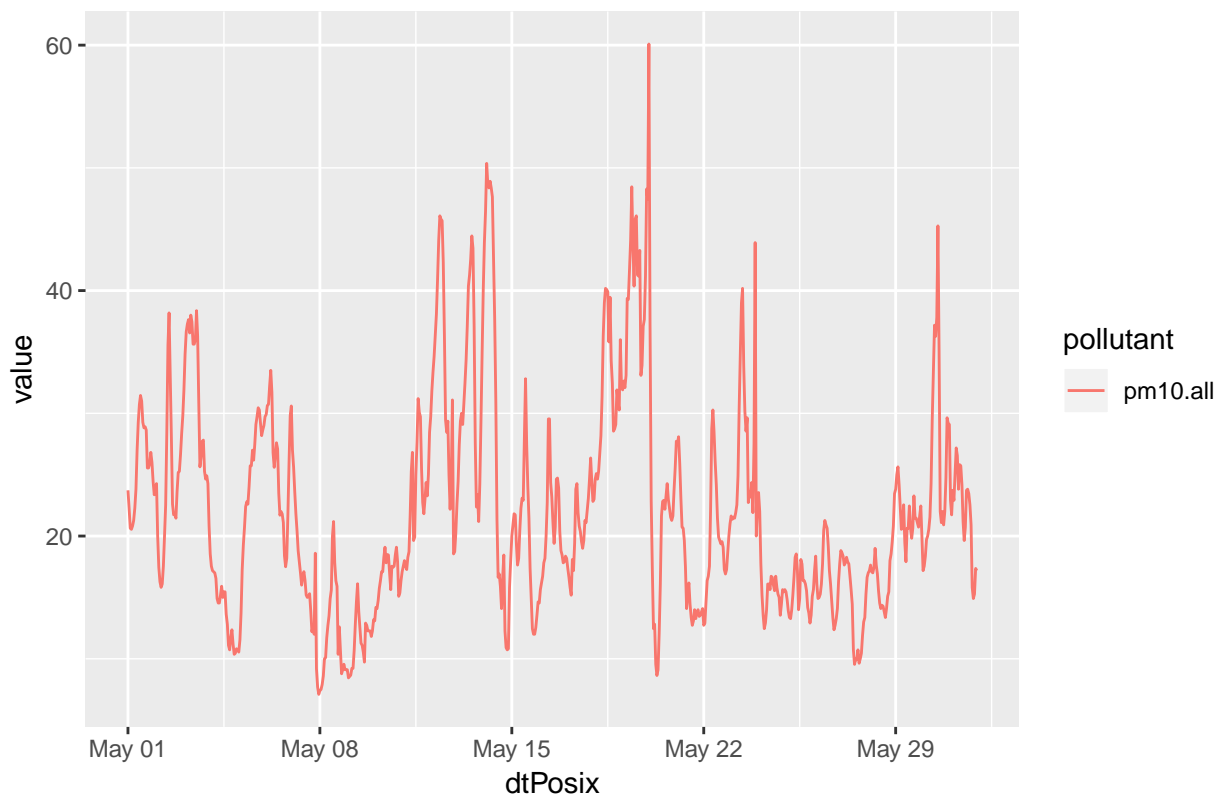
```
plot.pollutant(data, pollutant, month = "03")
```



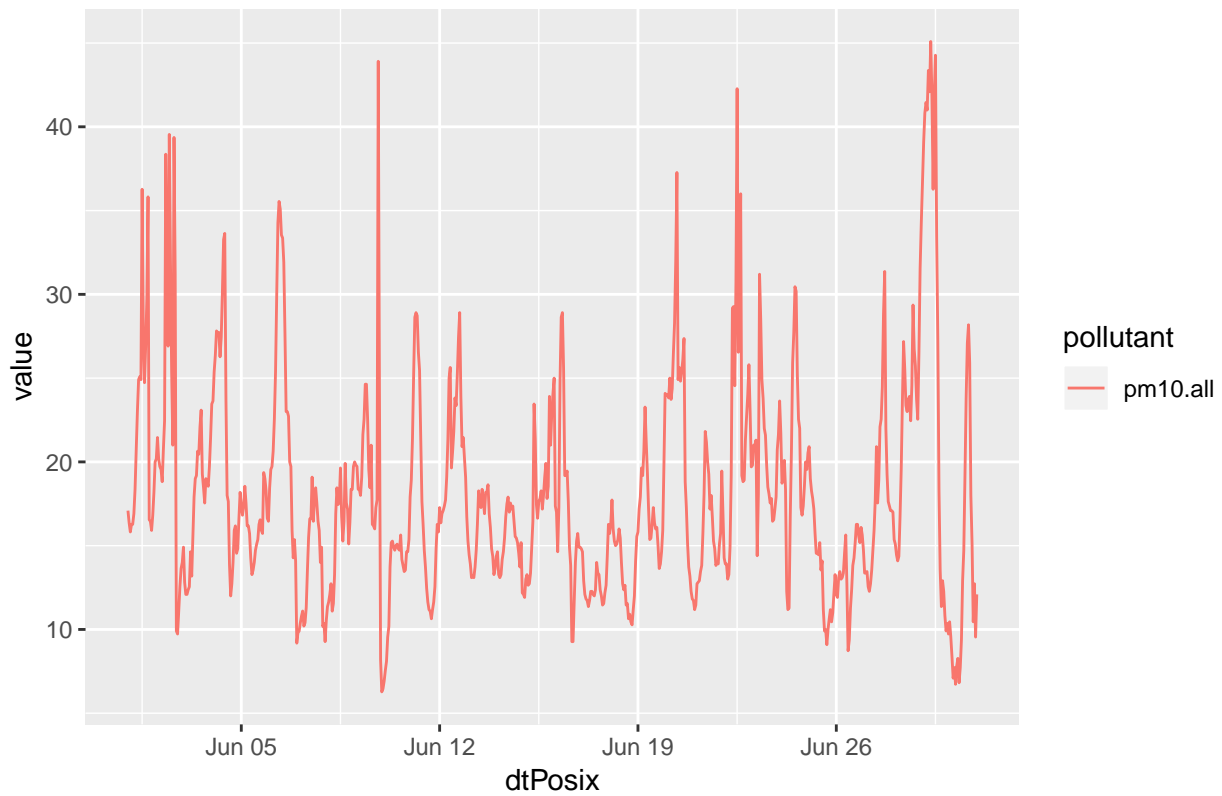
```
plot.pollutant(data, pollutant, month = "04")
```



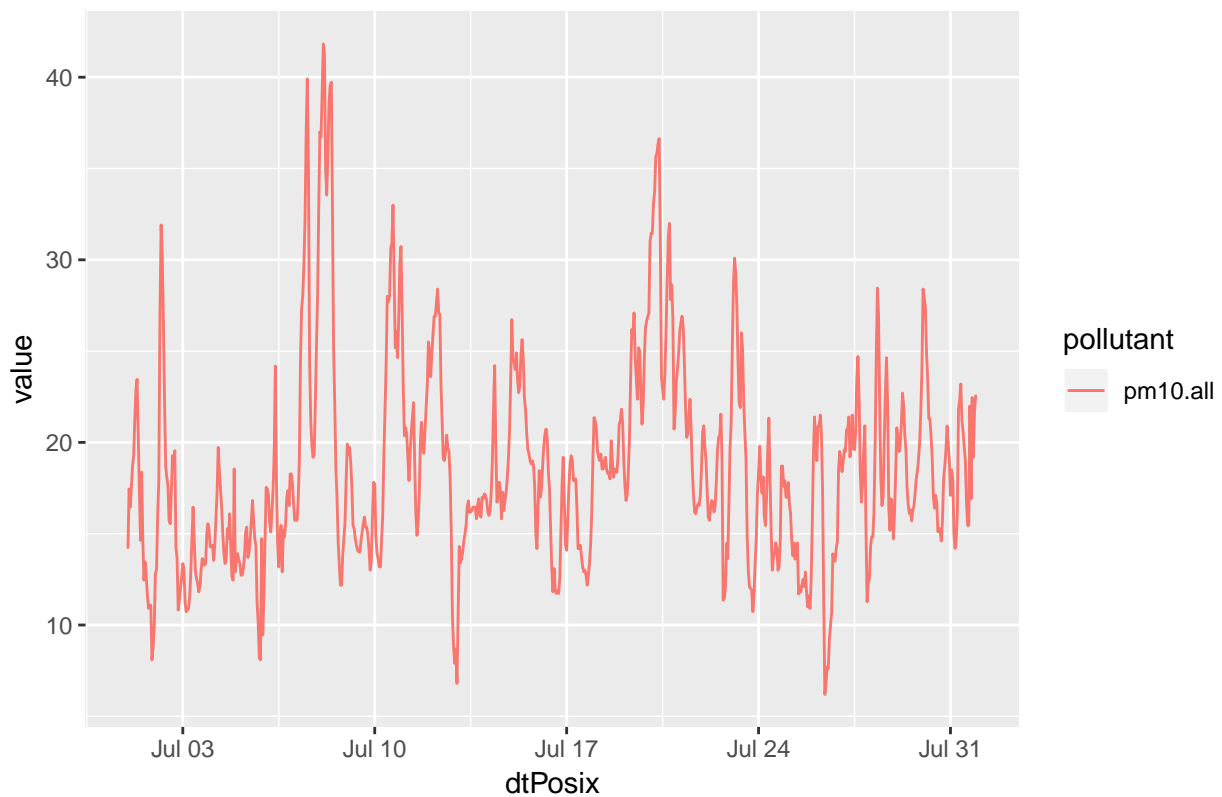
```
plot.pollutant(data, pollutant, month = "05")
```



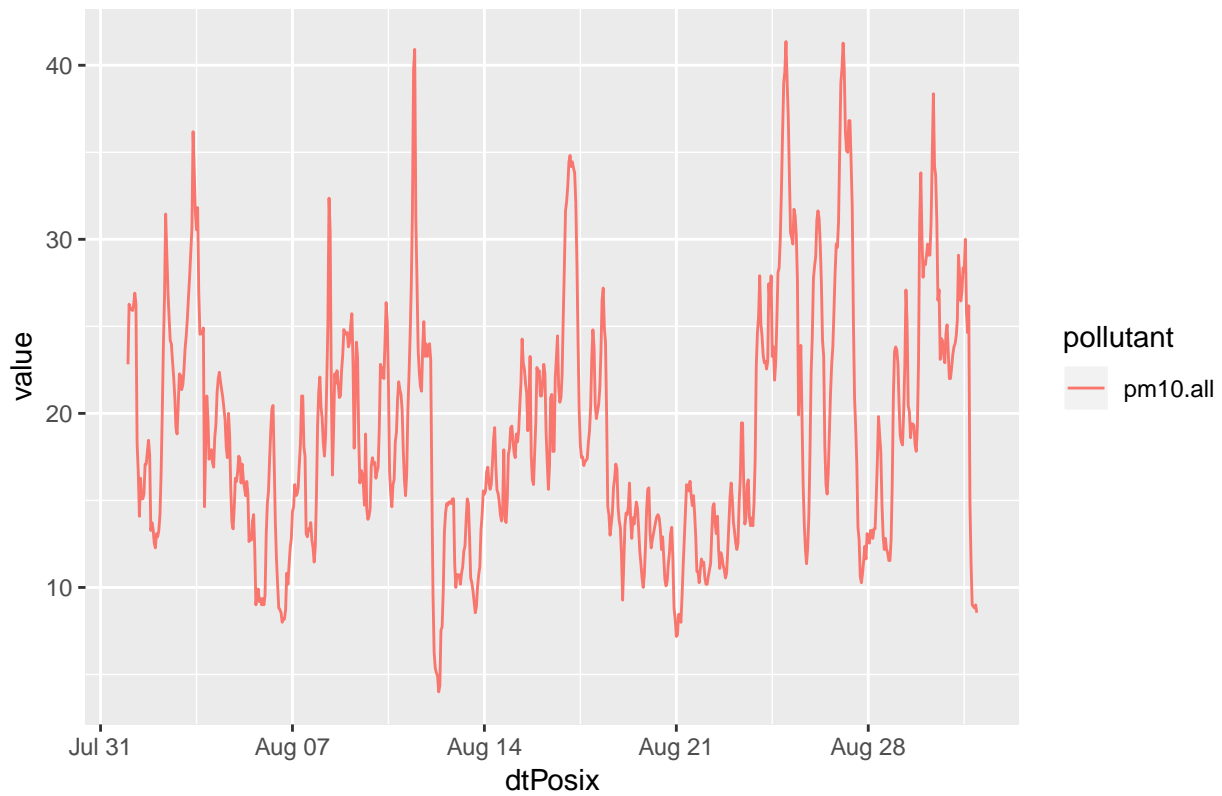
```
plot.pollutant(data, pollutant, month = "06")
```



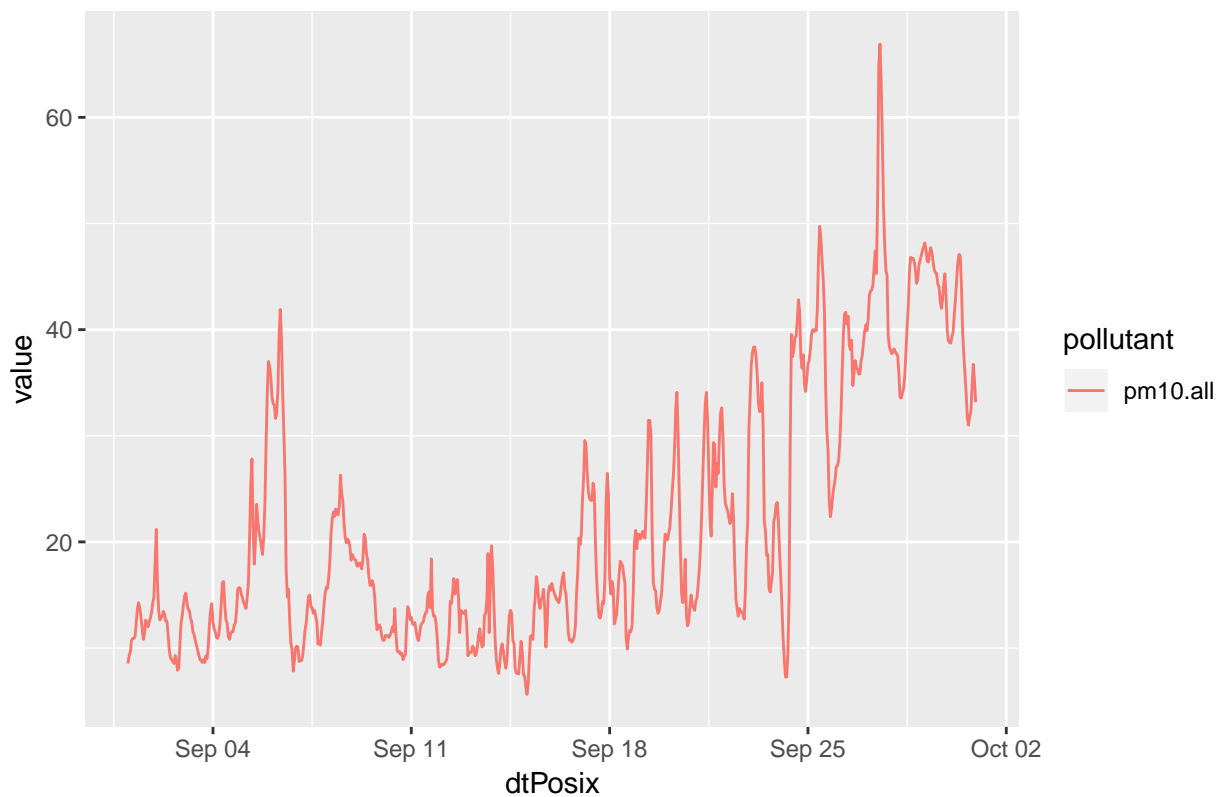
```
plot.pollutant(data, pollutant, month = "07")
```



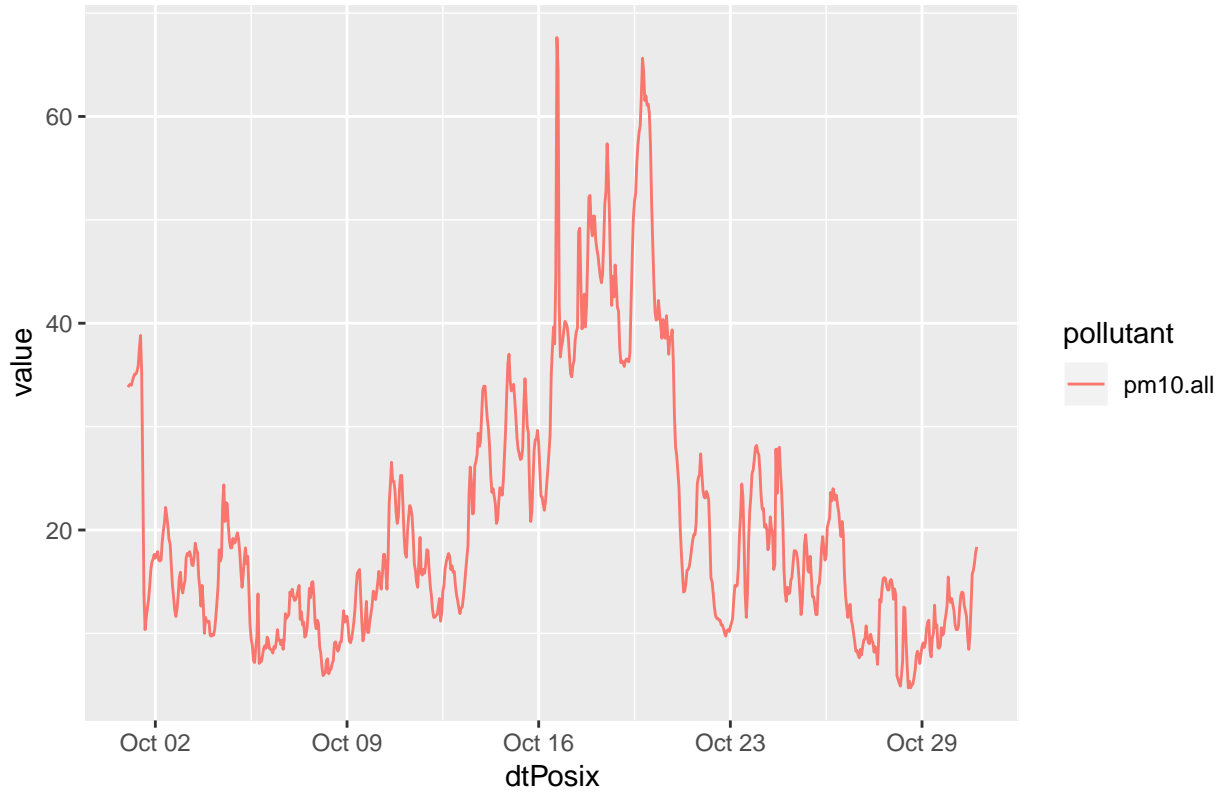

```
plot.pollutant(data, pollutant, month = "08")
```



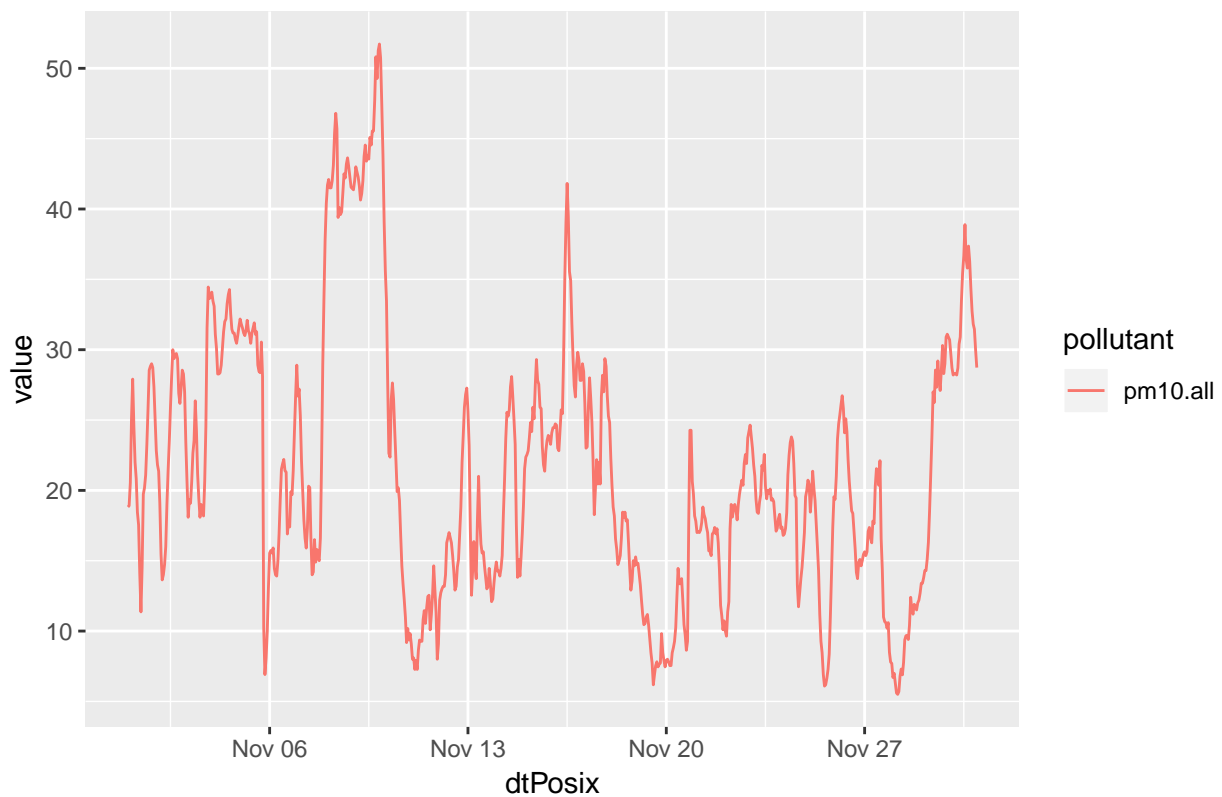
```
plot.pollutant(data, pollutant, month = "09")
```



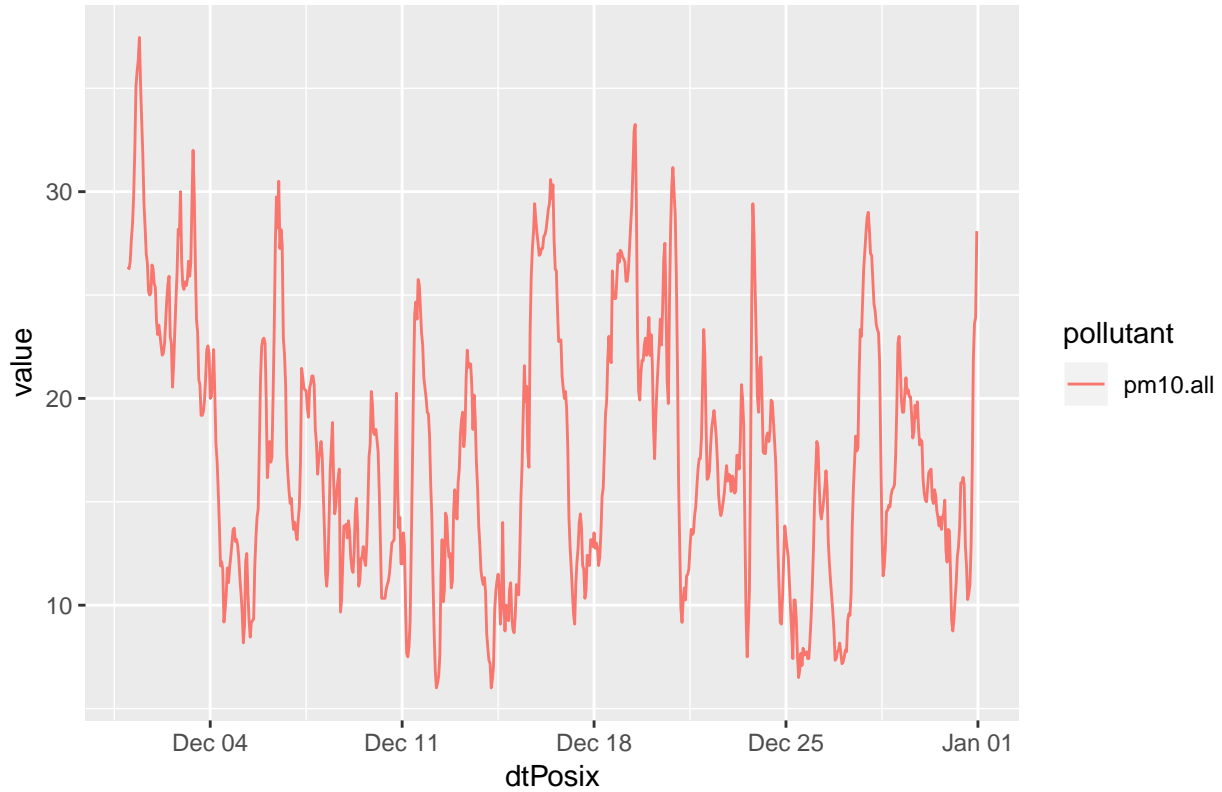
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```



```
plot.pollutant(data, pollutant, month = "12")
```

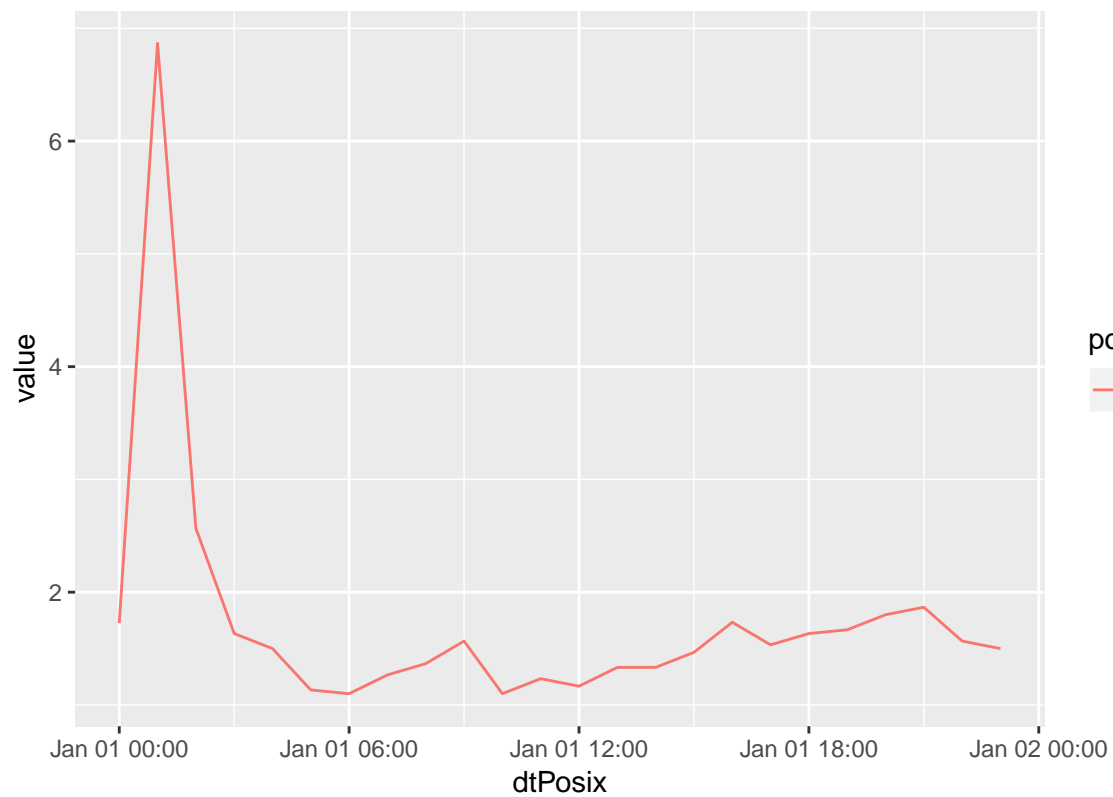


chb over the year

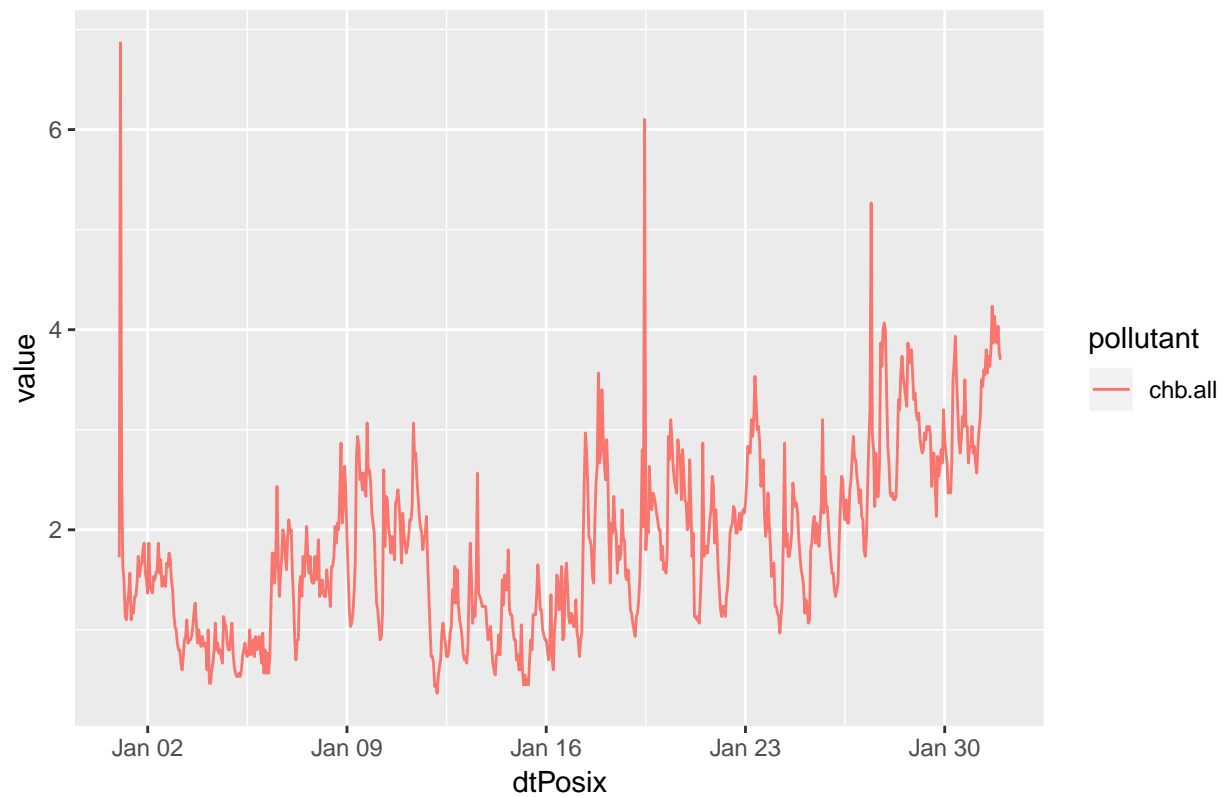
```
pollutant = "chb.all"
```

```
plot.pollutant(data, pollutant, month = "01", day = "01", title = "1. January with silvester firework p
```

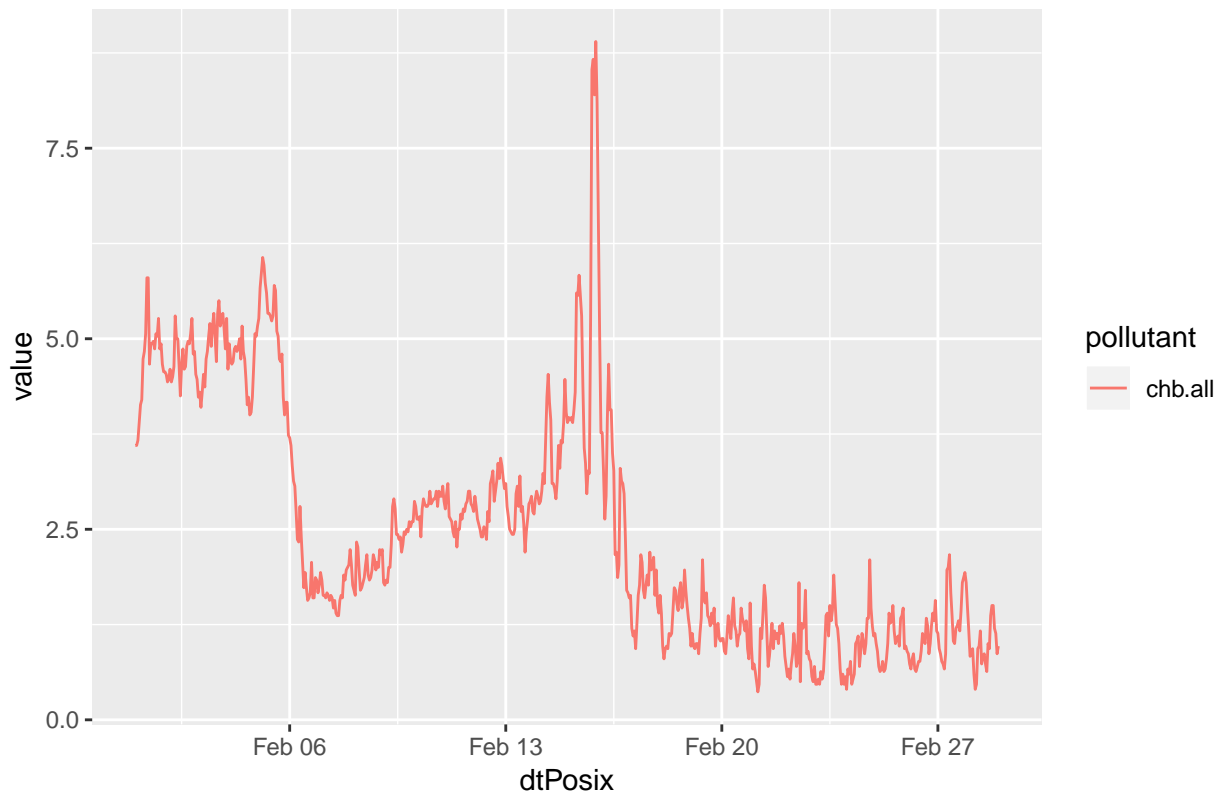
1. January with silvester firework peak



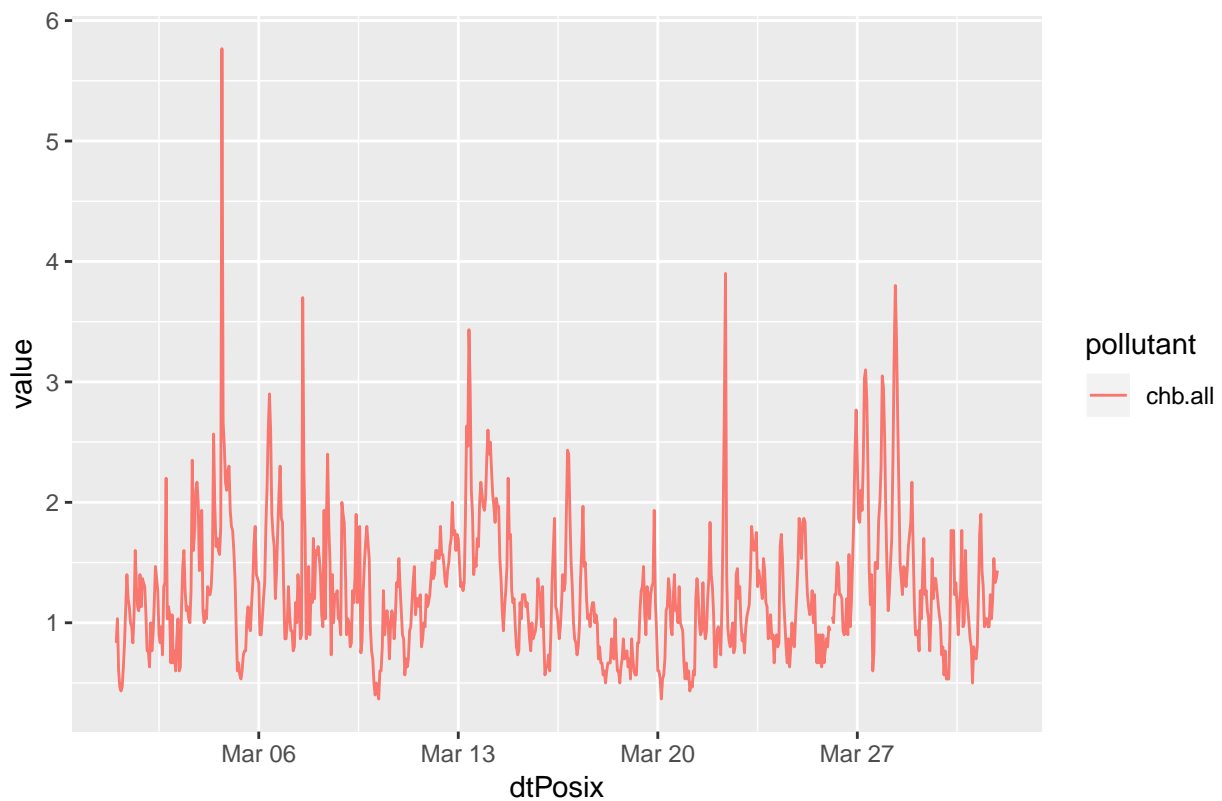
```
plot.pollutant(data, pollutant, month = "01")
```



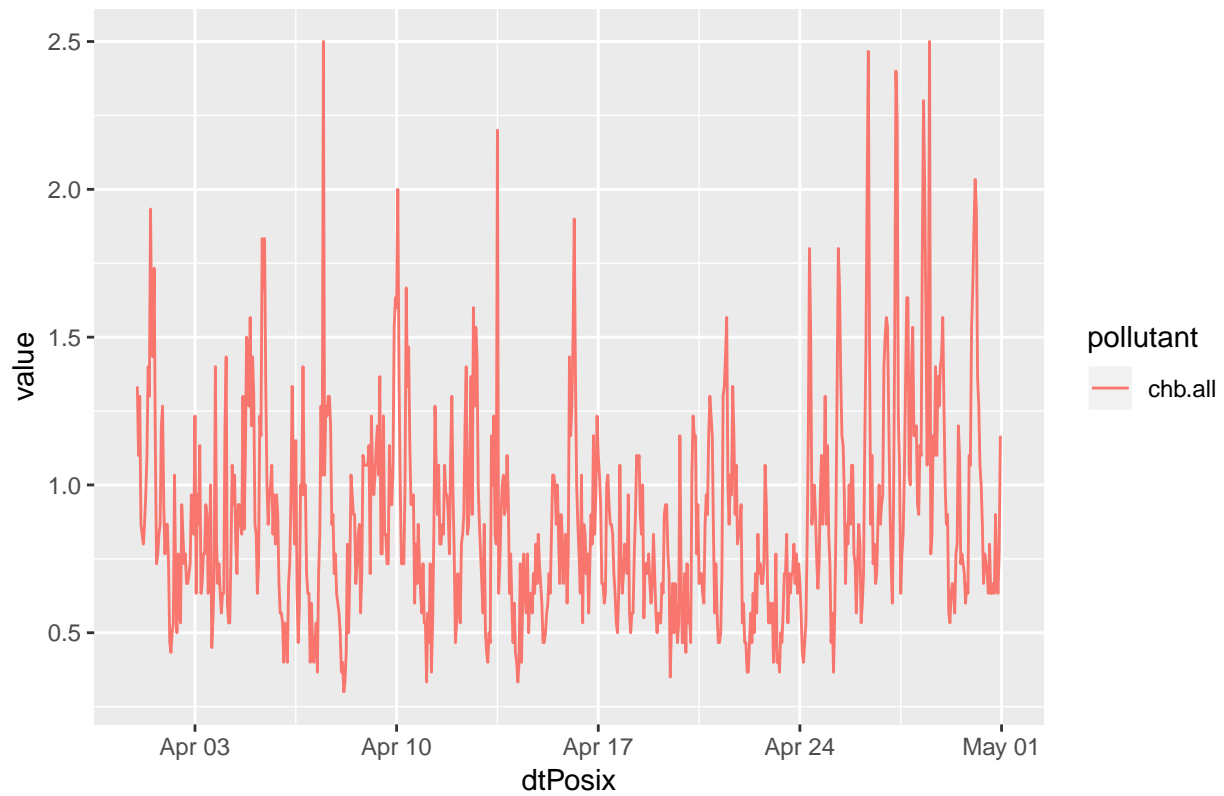
```
plot.pollutant(data, pollutant, month = "02")
```



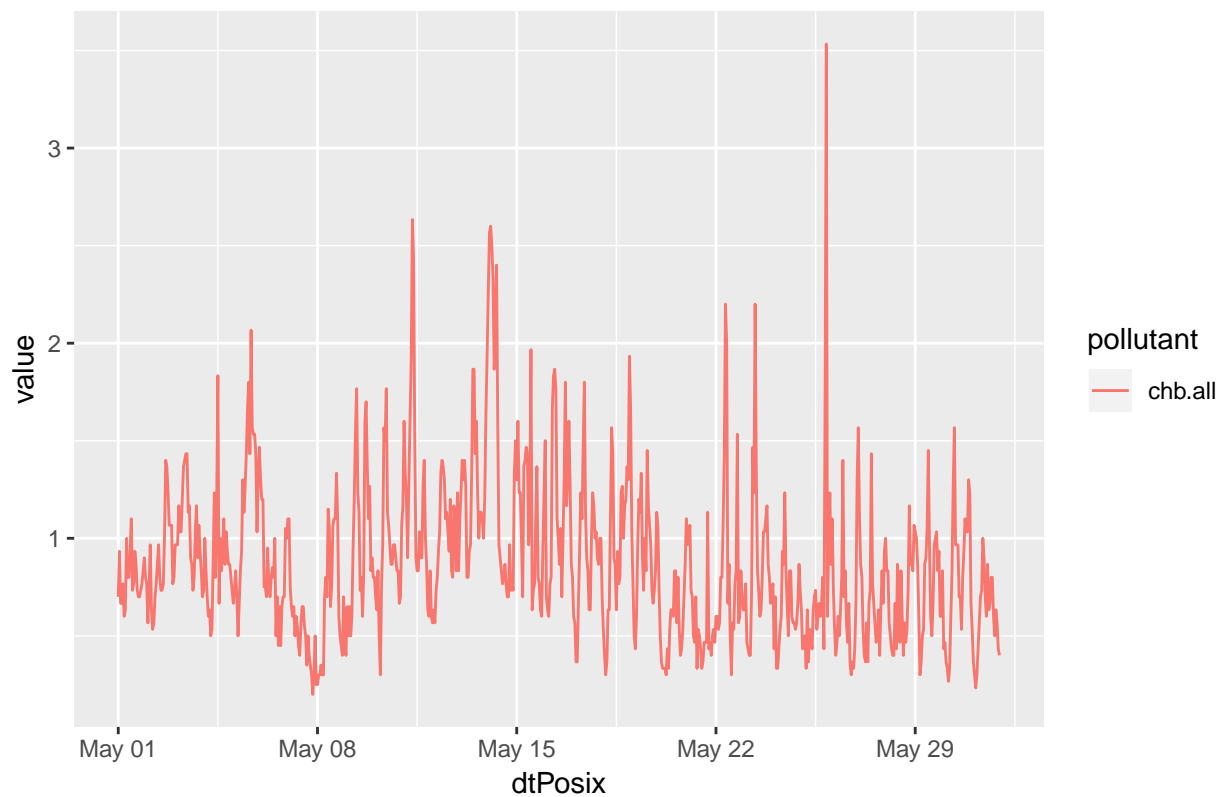
```
plot.pollutant(data, pollutant, month = "03")
```



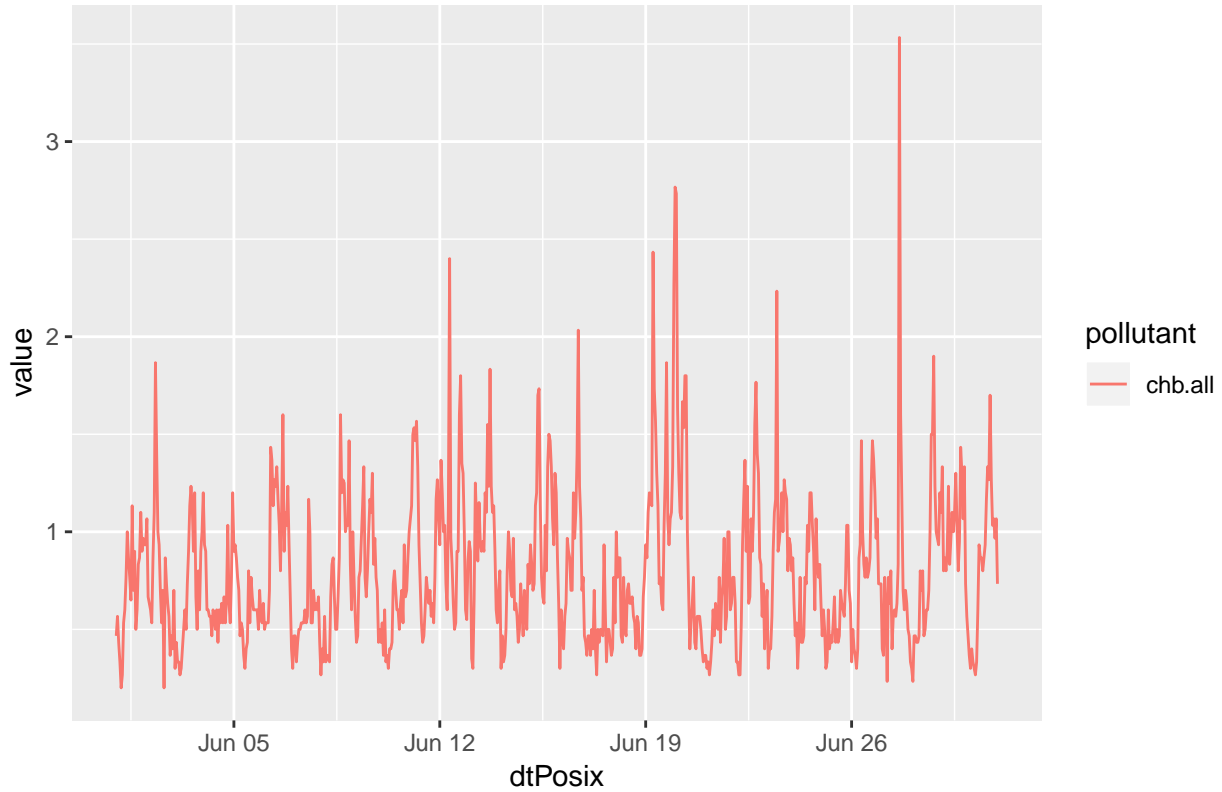
```
plot.pollutant(data, pollutant, month = "04")
```



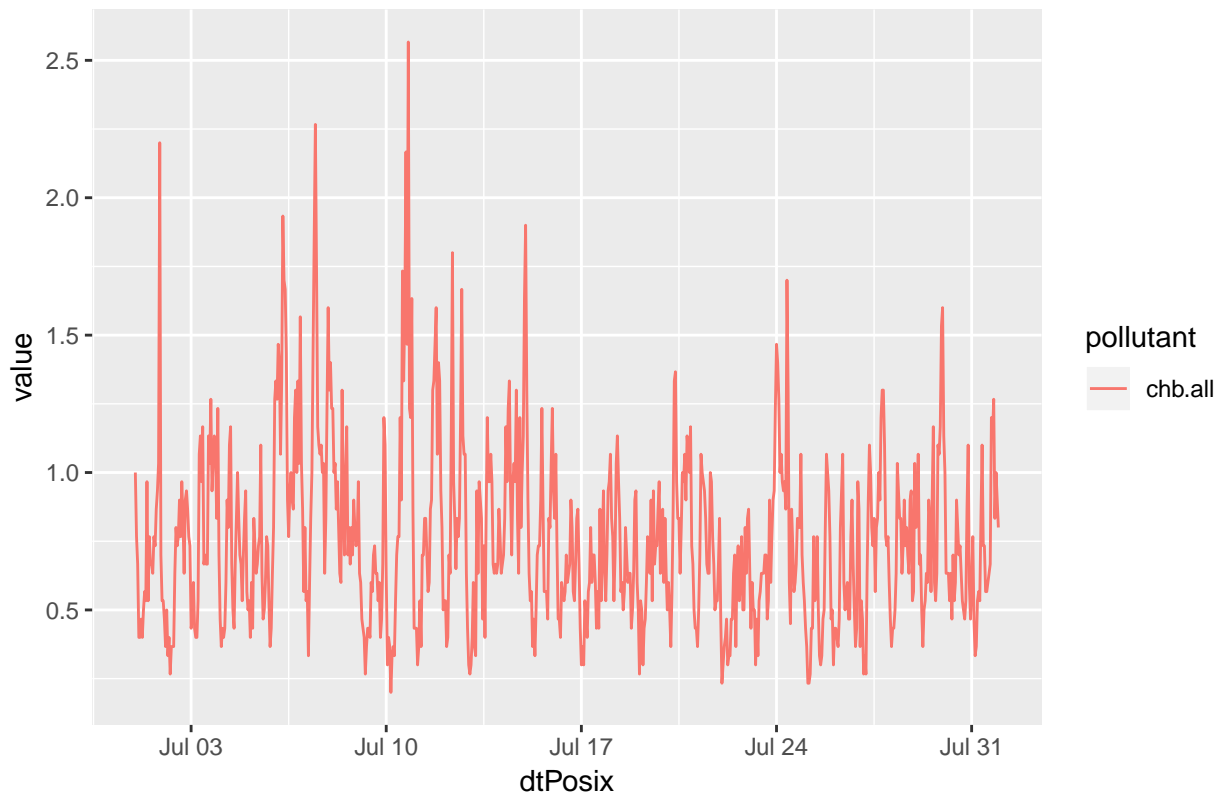
```
plot.pollutant(data, pollutant, month = "05")
```



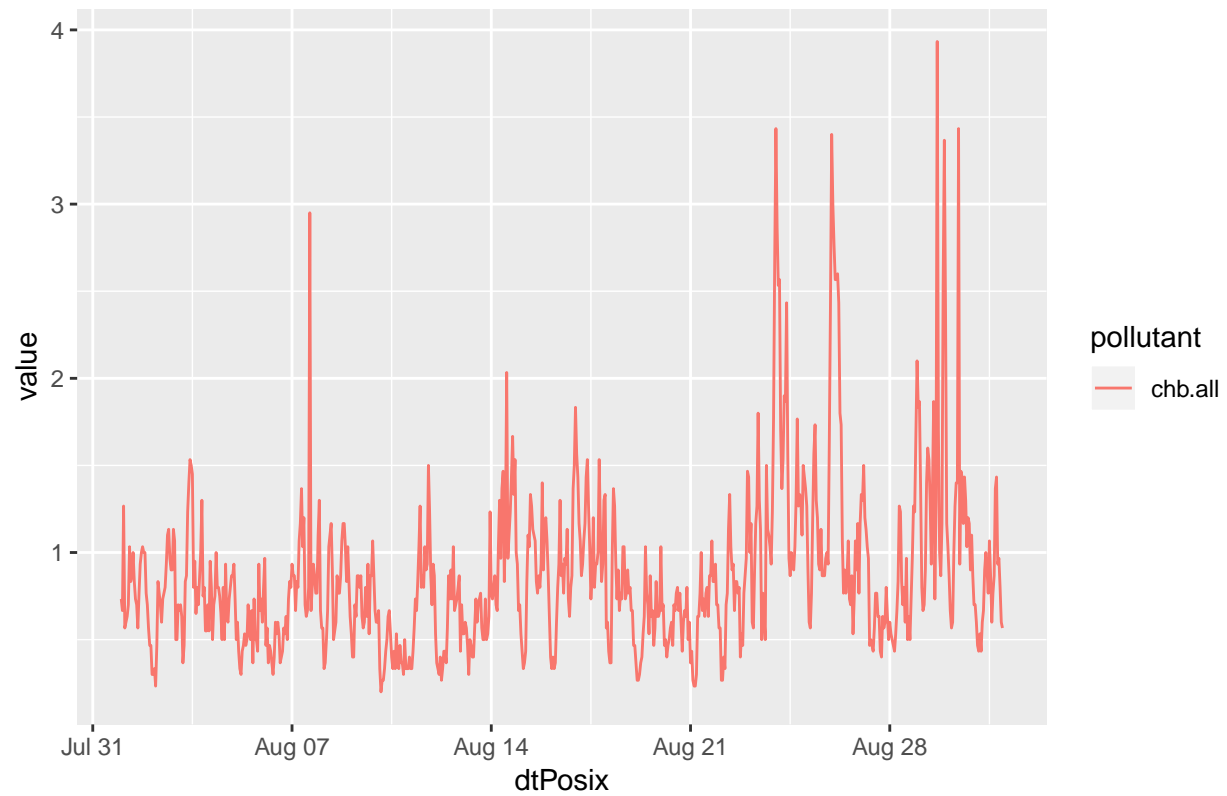
```
plot.pollutant(data, pollutant, month = "06")
```



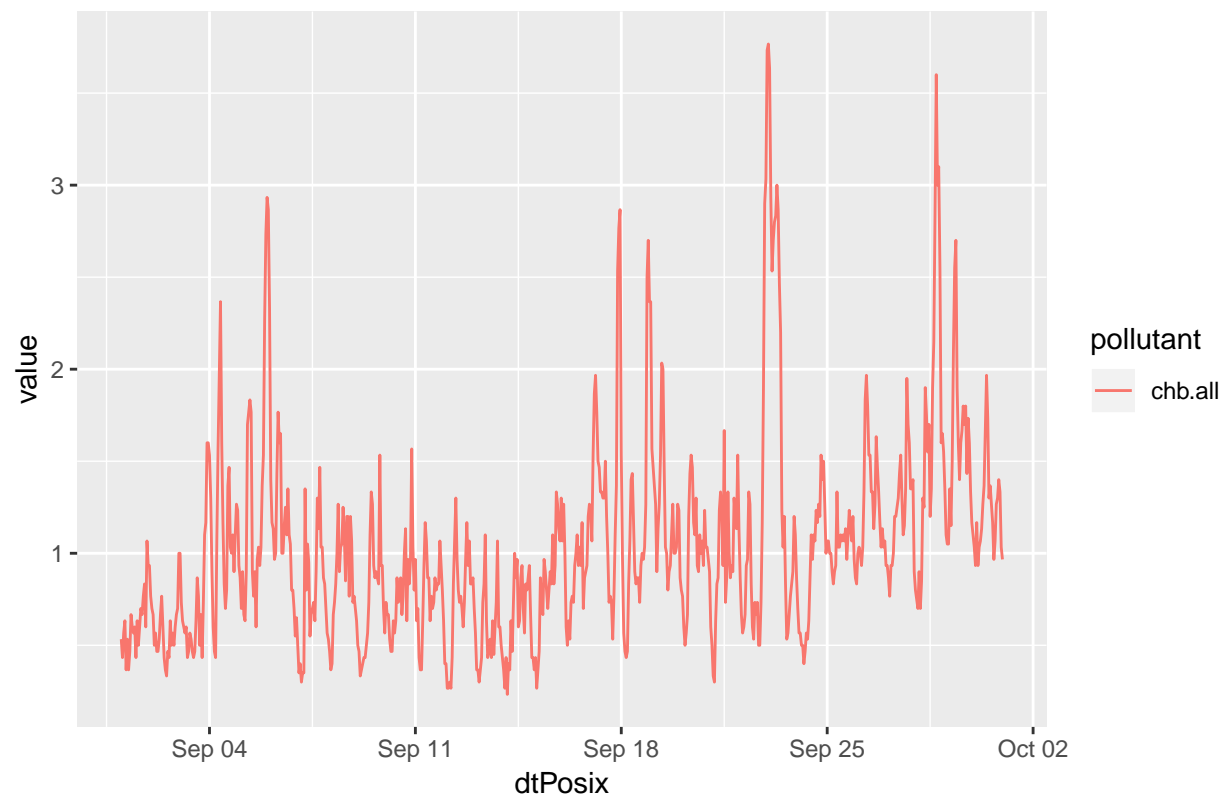
```
plot.pollutant(data, pollutant, month = "07")
```



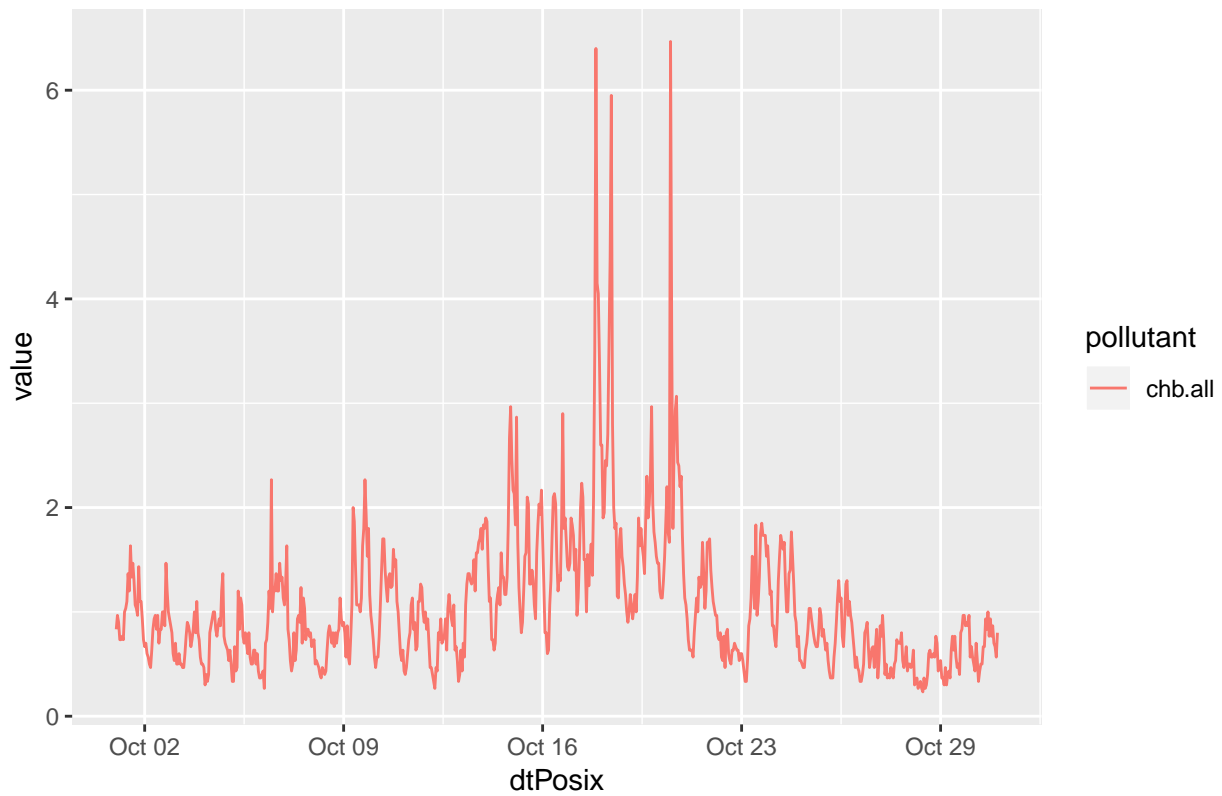
```
plot.pollutant(data, pollutant, month = "08")
```



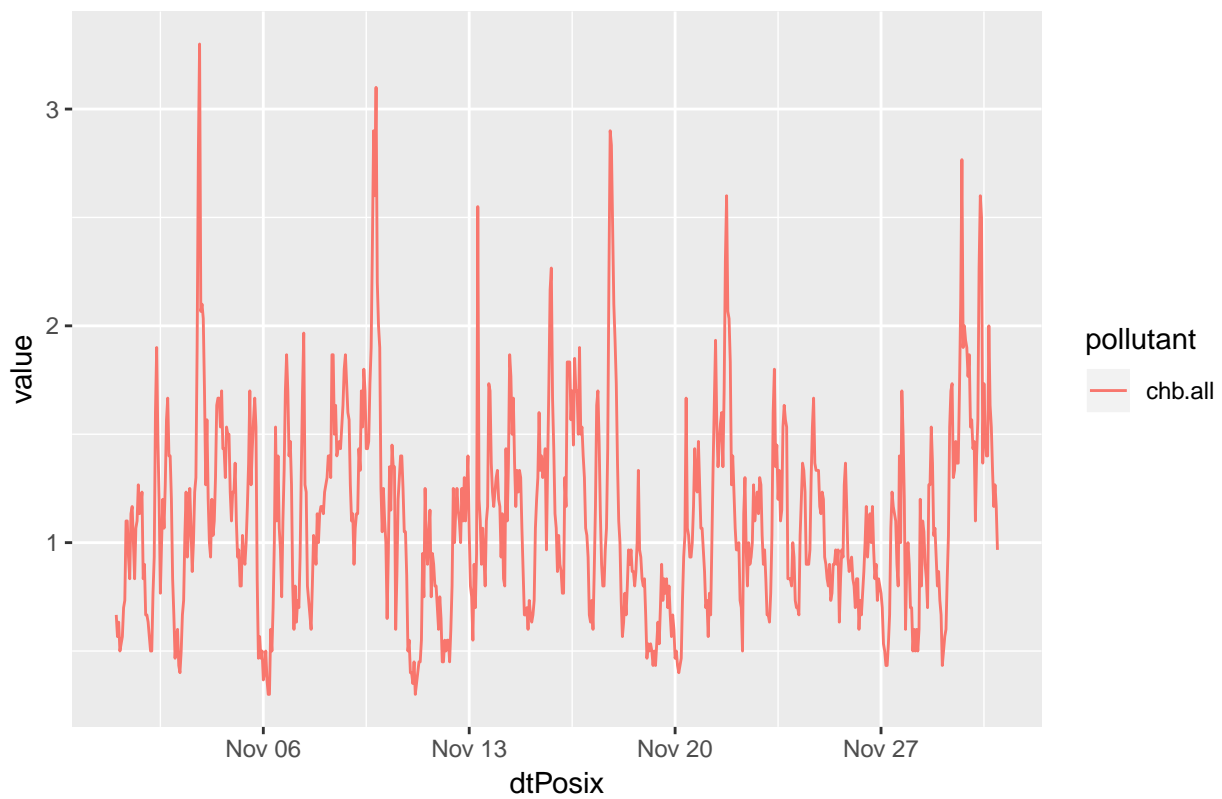
```
plot.pollutant(data, pollutant, month = "09")
```



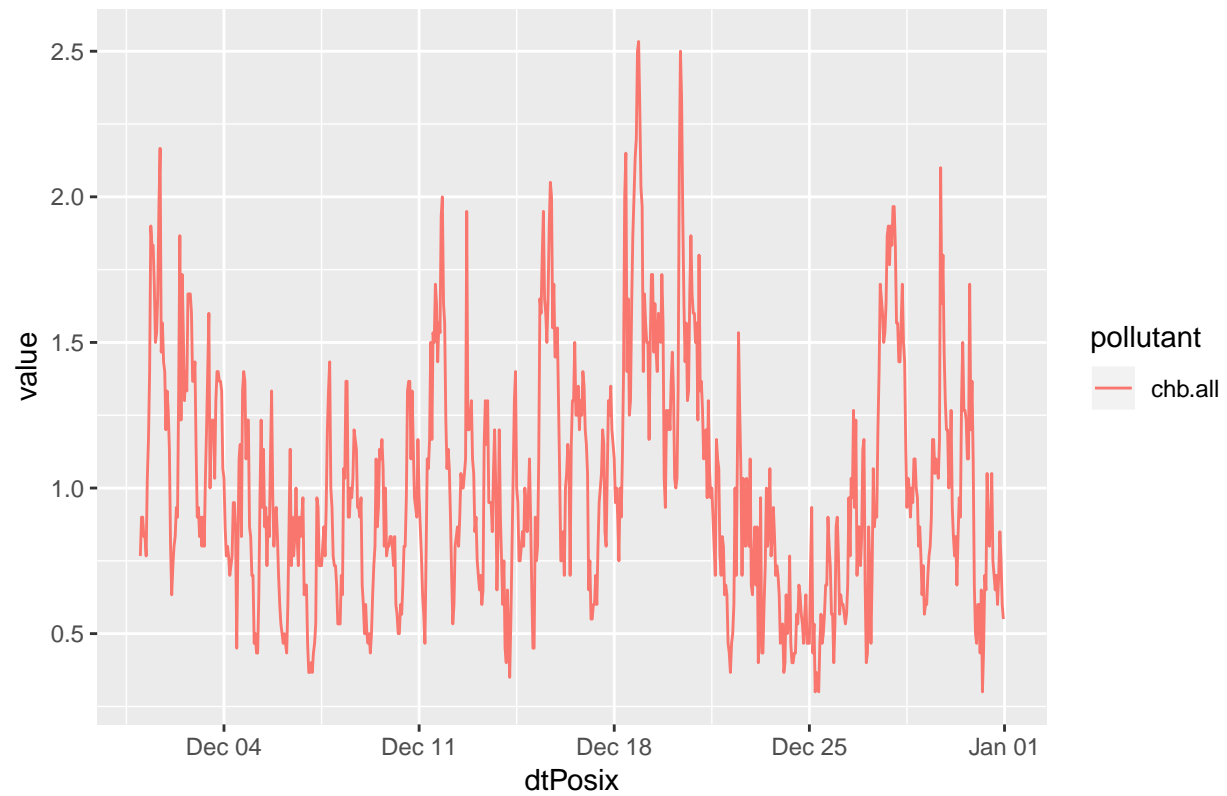

```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```

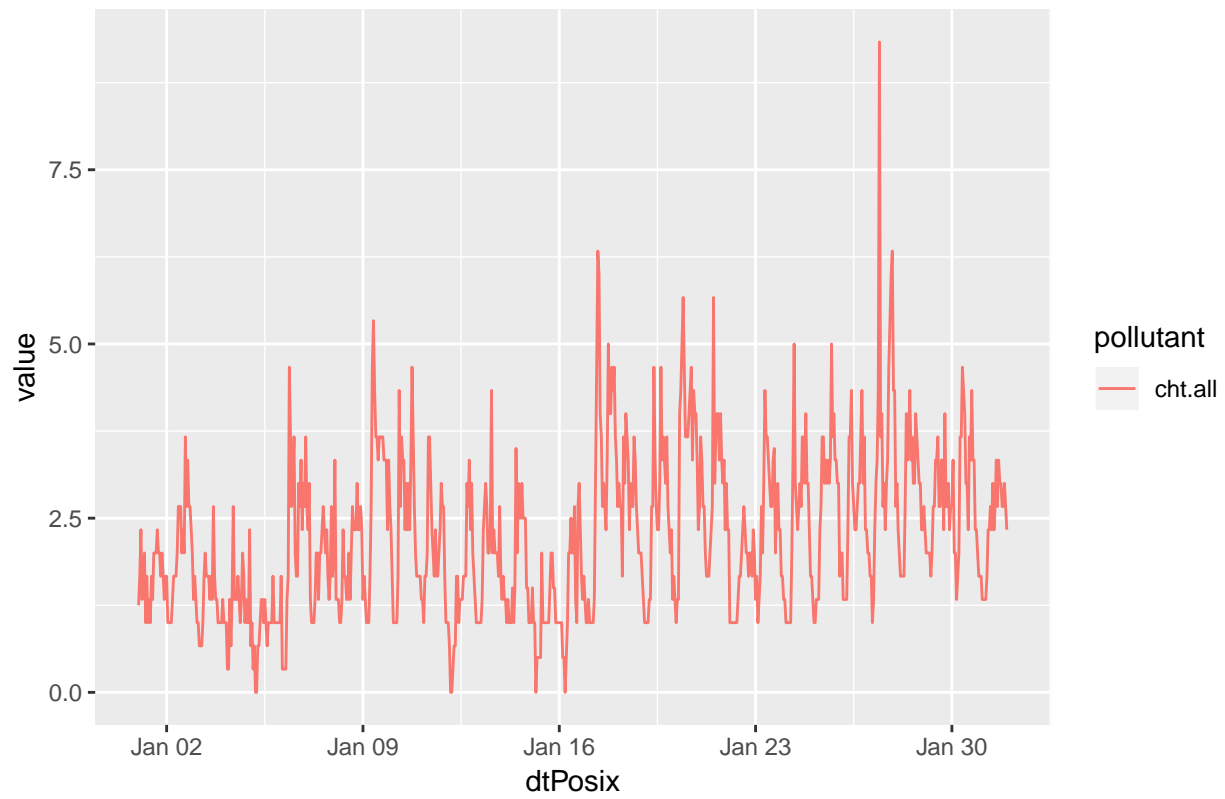


```
plot.pollutant(data, pollutant, month = "12")
```

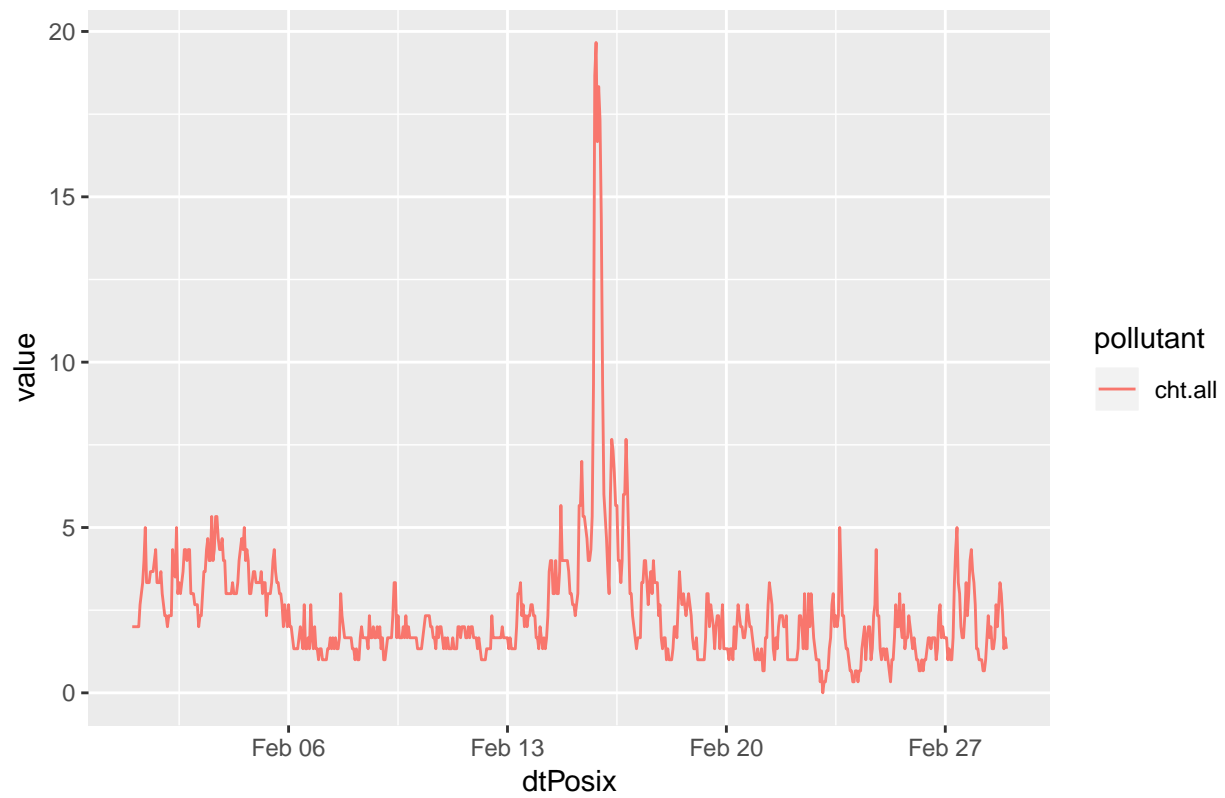


CHT over the year

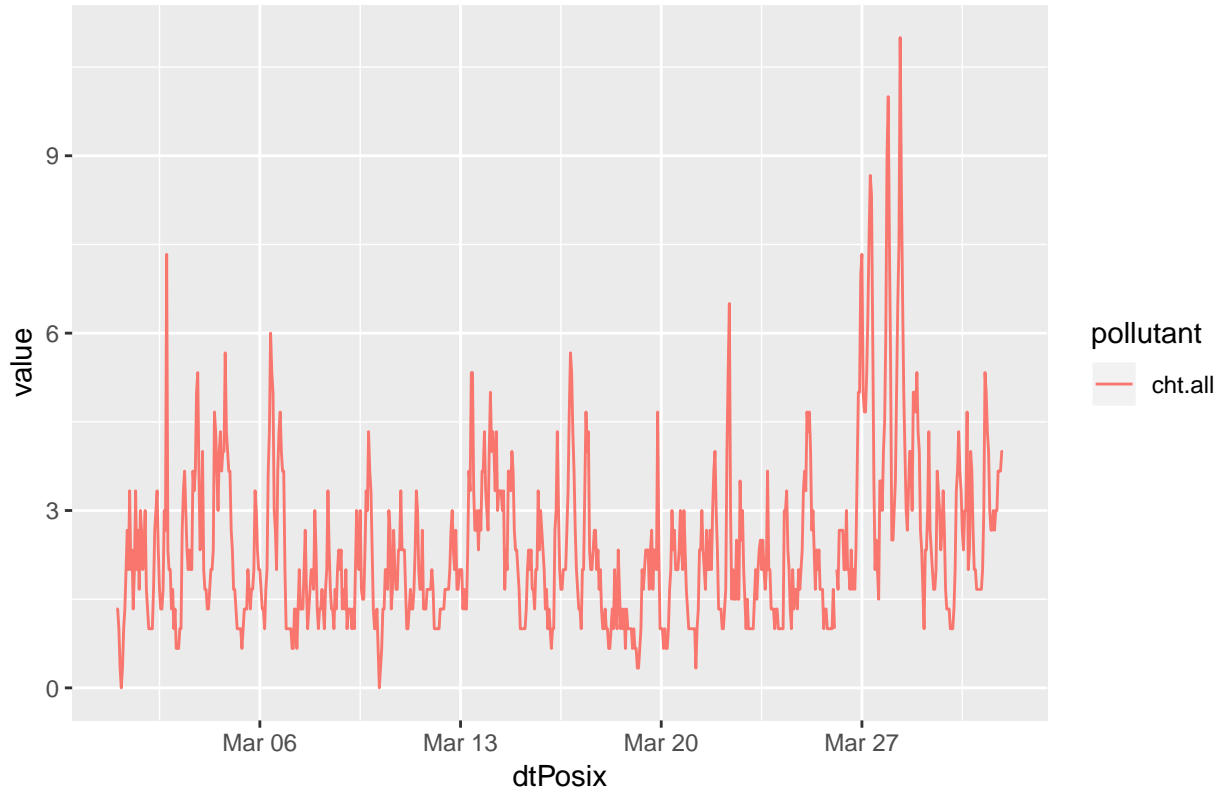
```
pollutant = "cht.all"  
plot.pollutant(data, pollutant, month = "01")
```



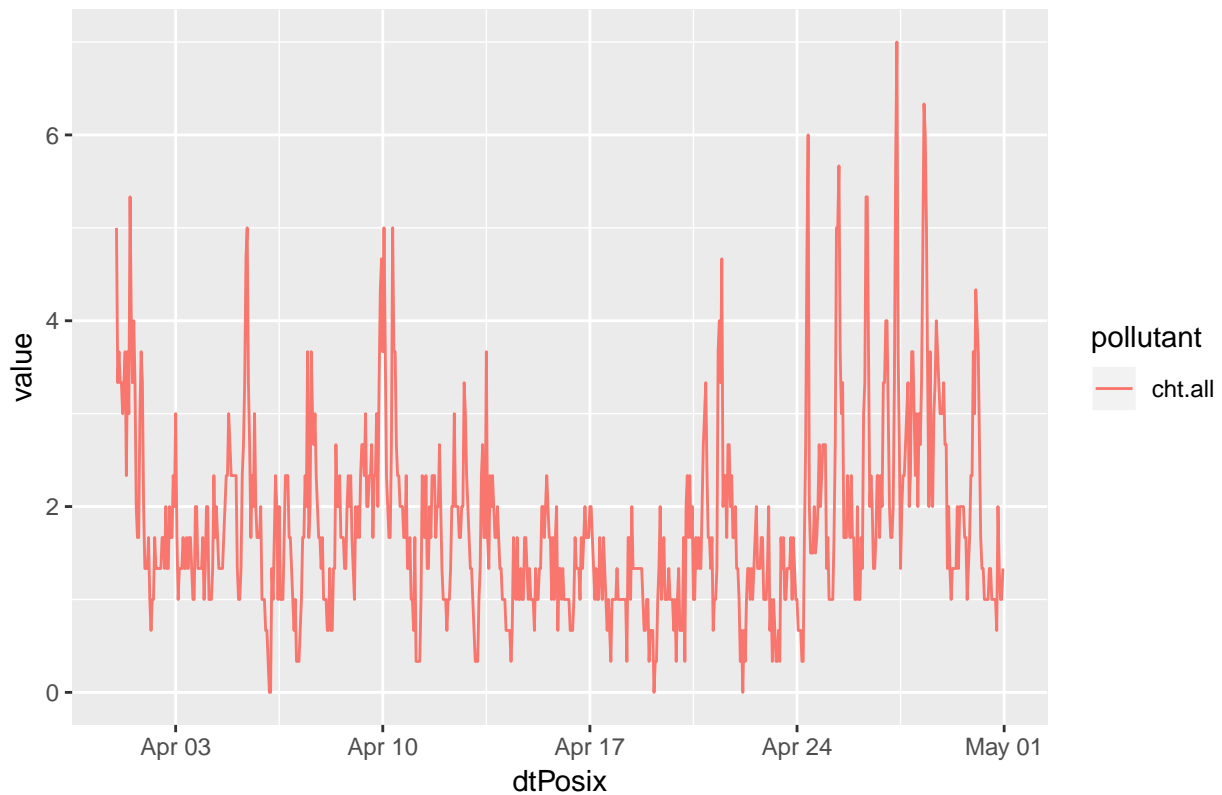
```
plot.pollutant(data, pollutant, month = "02")
```



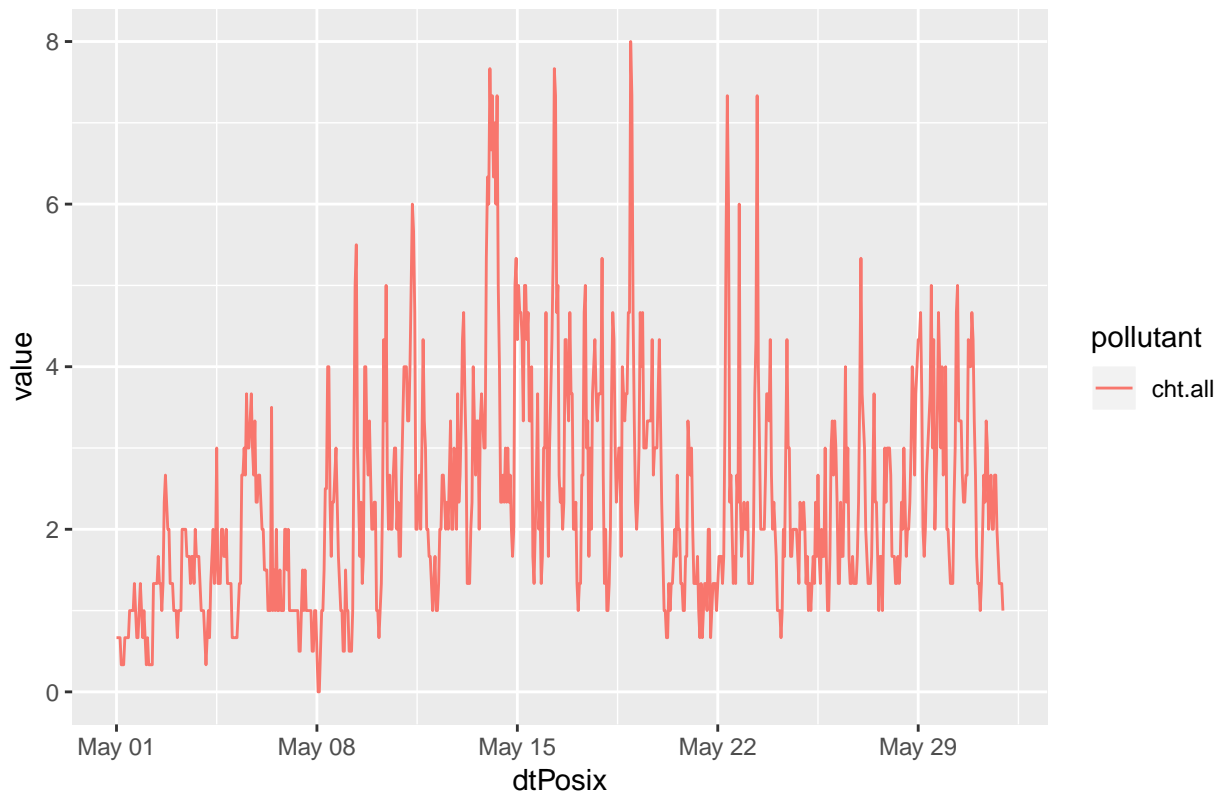
```
plot.pollutant(data, pollutant, month = "03")
```



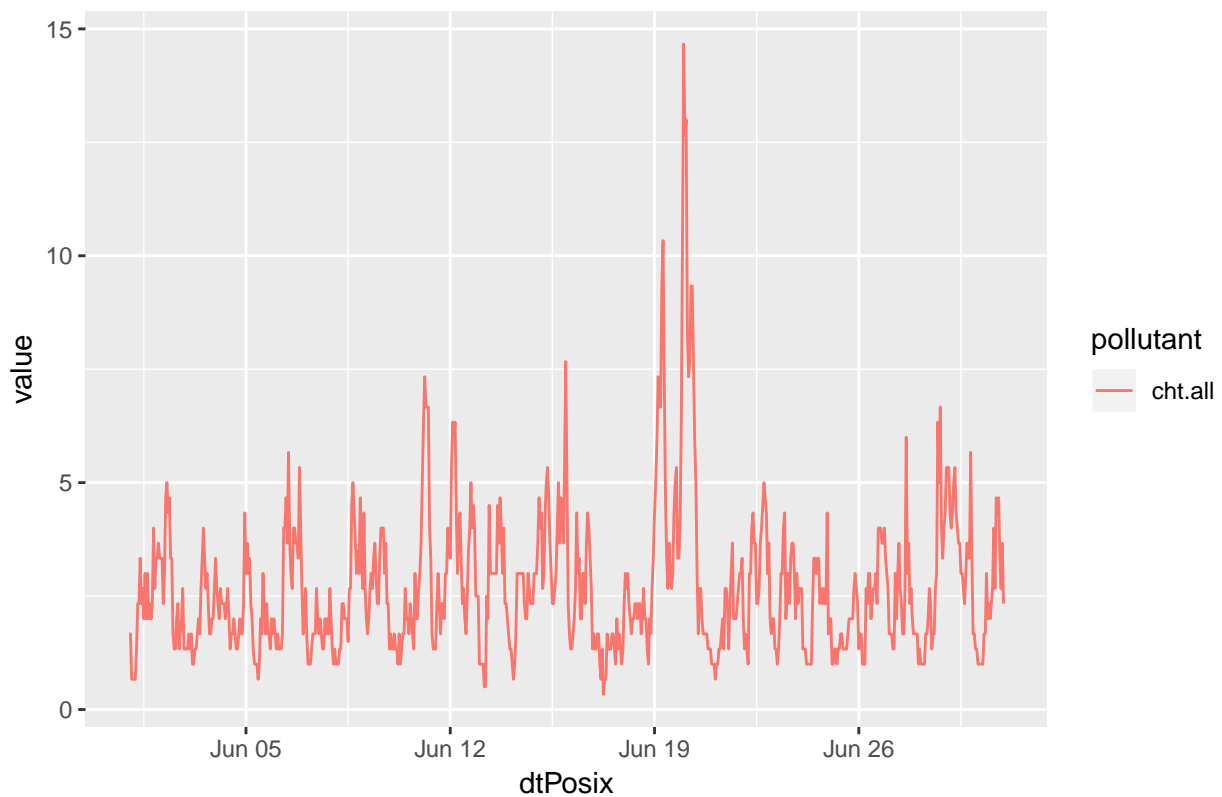
```
plot.pollutant(data, pollutant, month = "04")
```



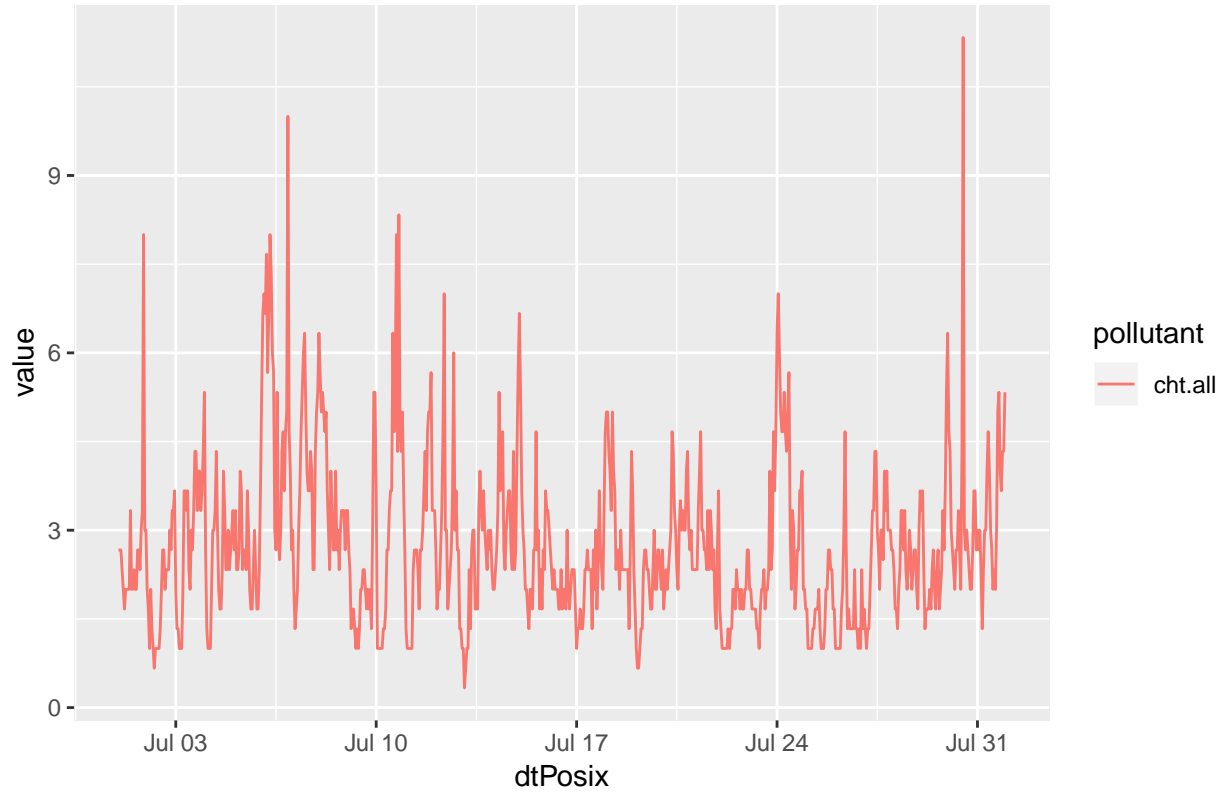
```
plot.pollutant(data, pollutant, month = "05")
```



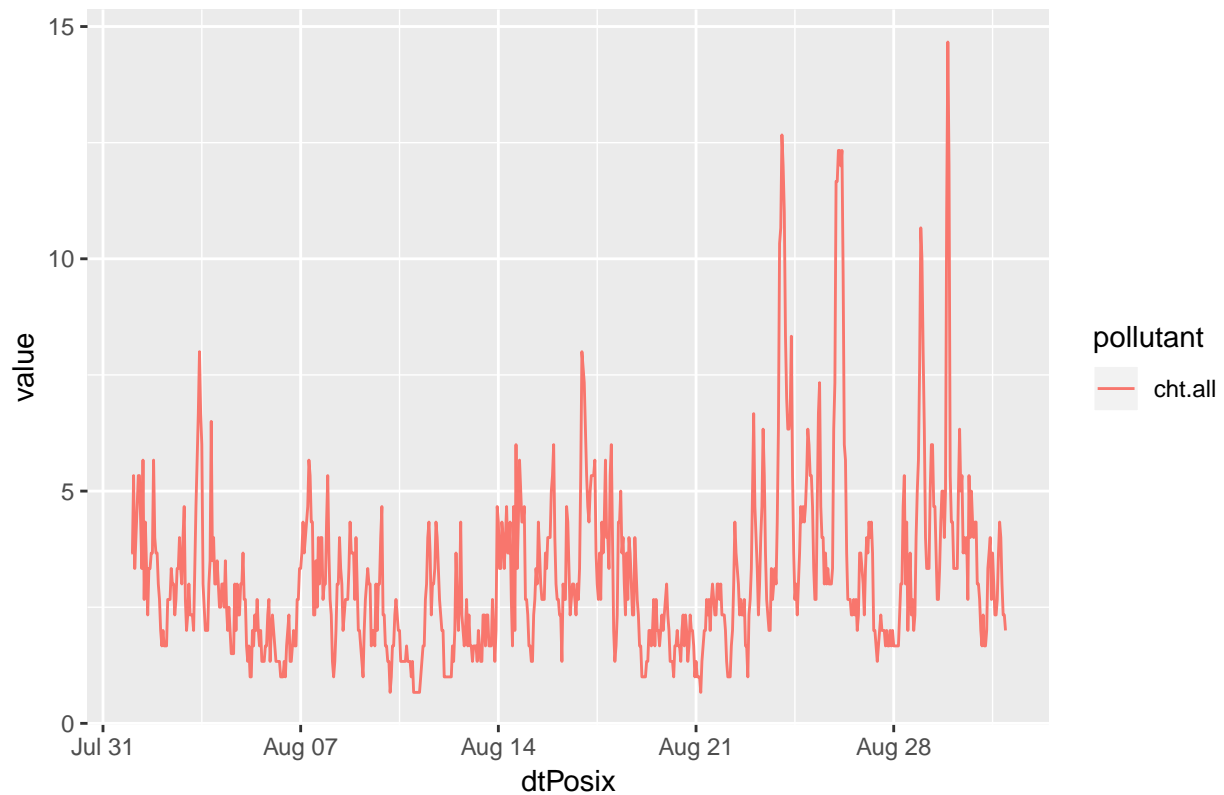
```
plot.pollutant(data, pollutant, month = "06")
```



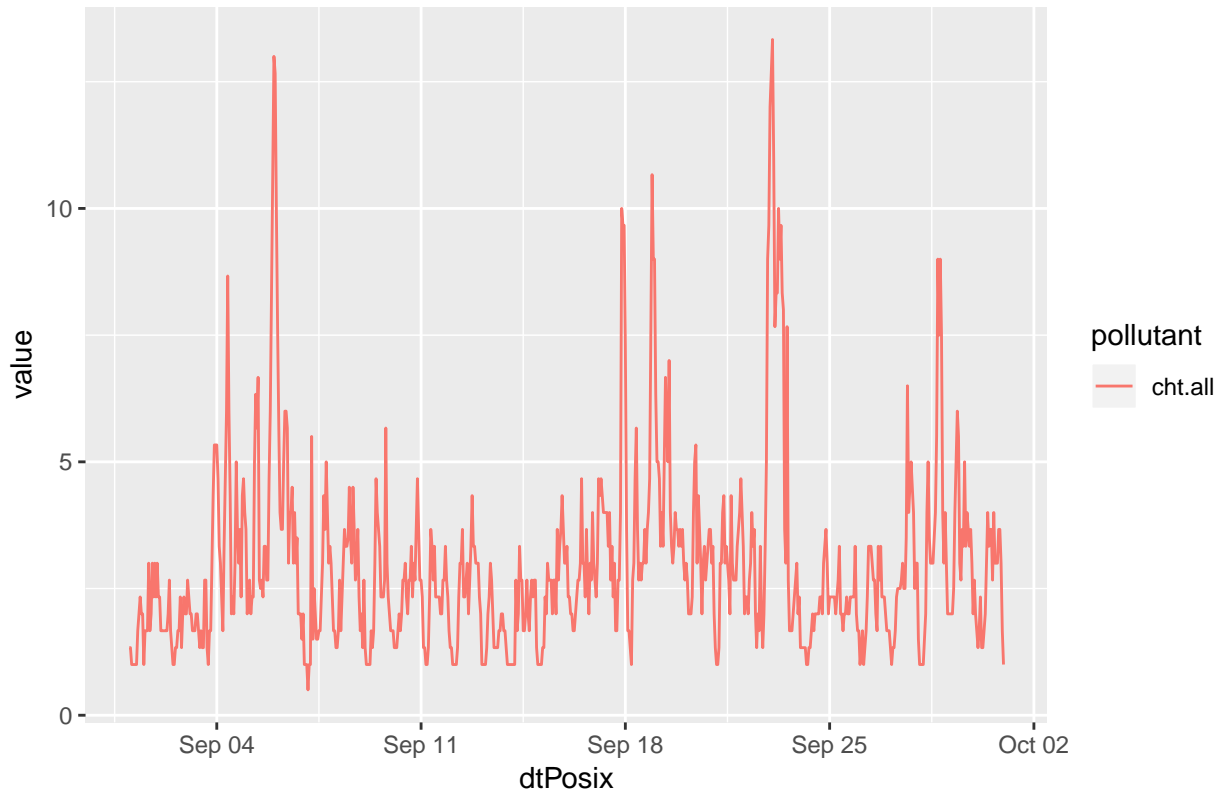
```
plot.pollutant(data, pollutant, month = "07")
```



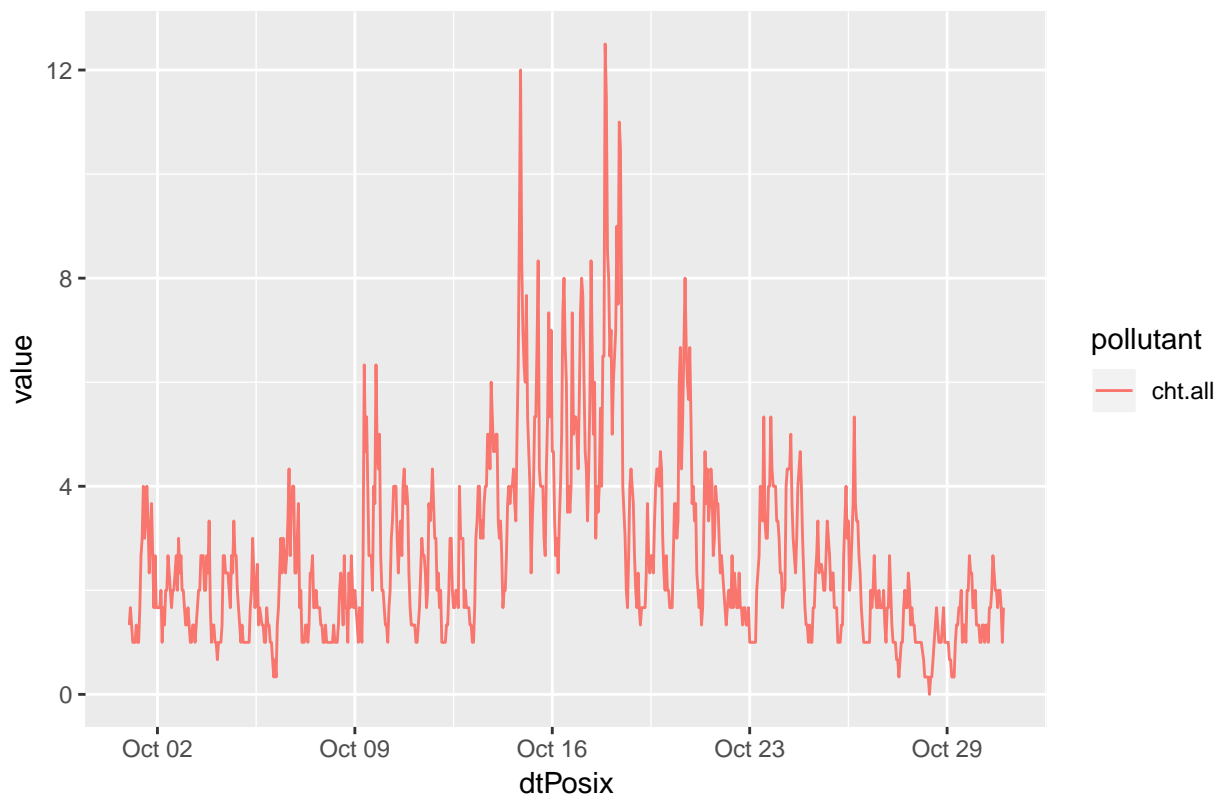
```
plot.pollutant(data, pollutant, month = "08")
```



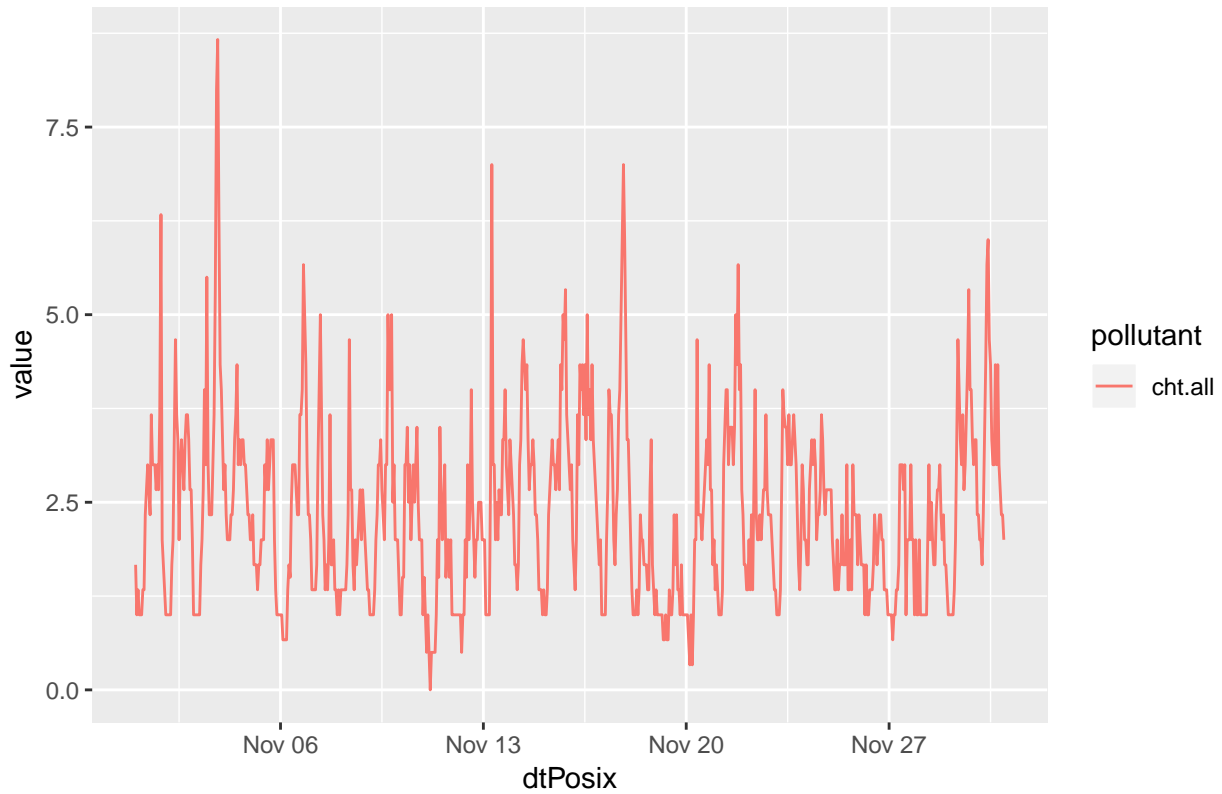
```
plot.pollutant(data, pollutant, month = "09")
```



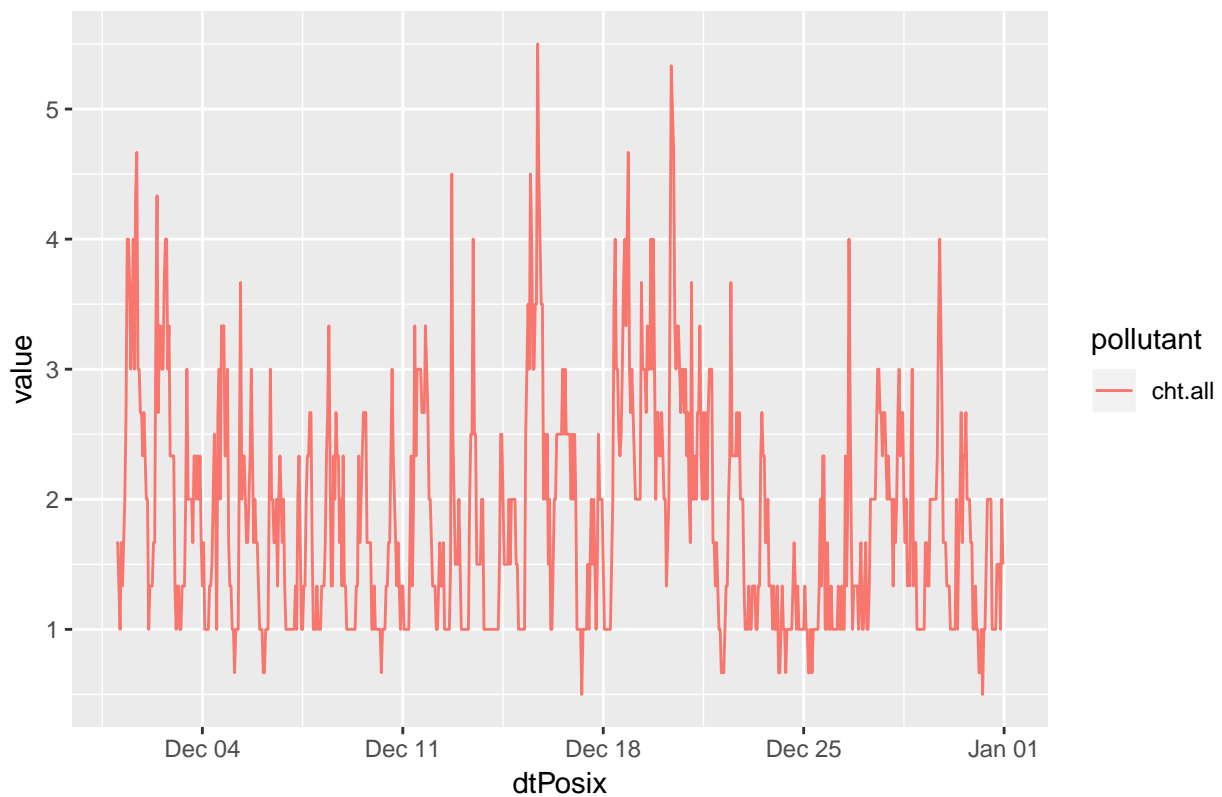
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```



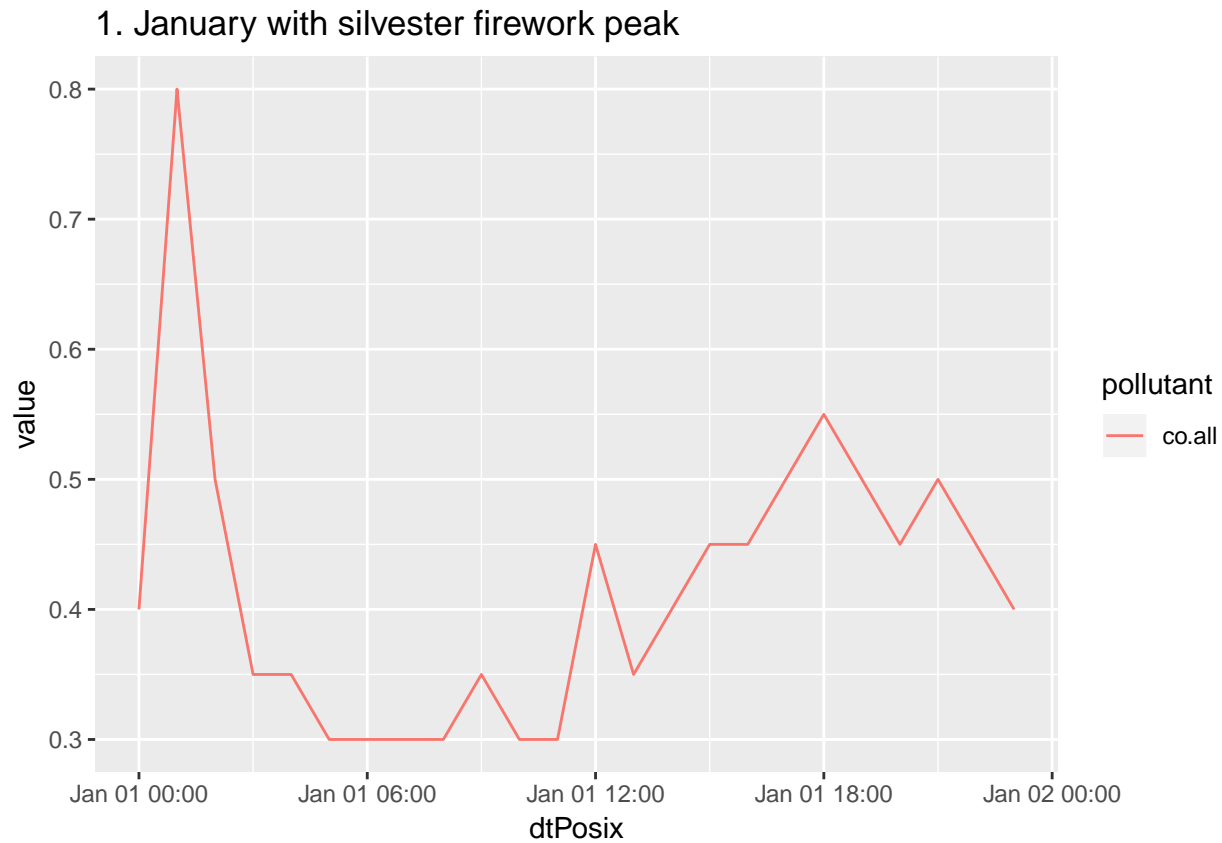
```
plot.pollutant(data, pollutant, month = "12")
```



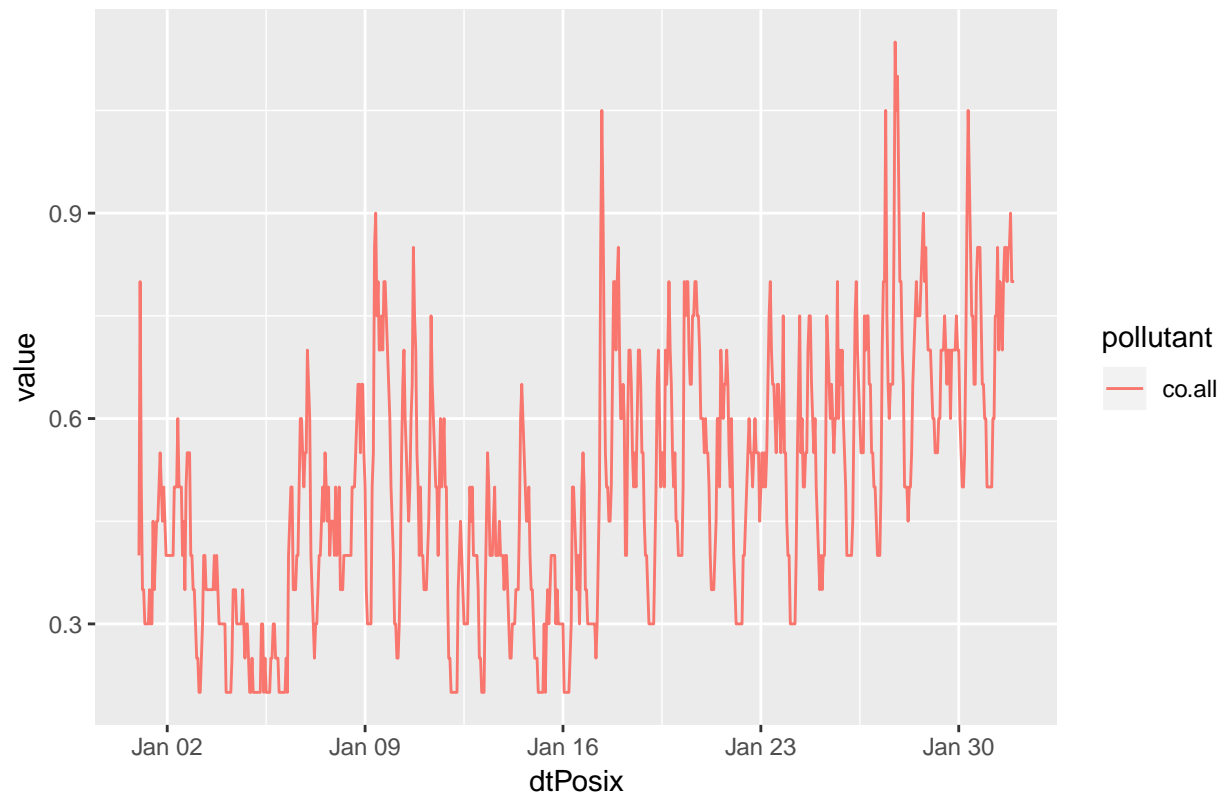
CO over the year

```
pollutant = "co.all"
```

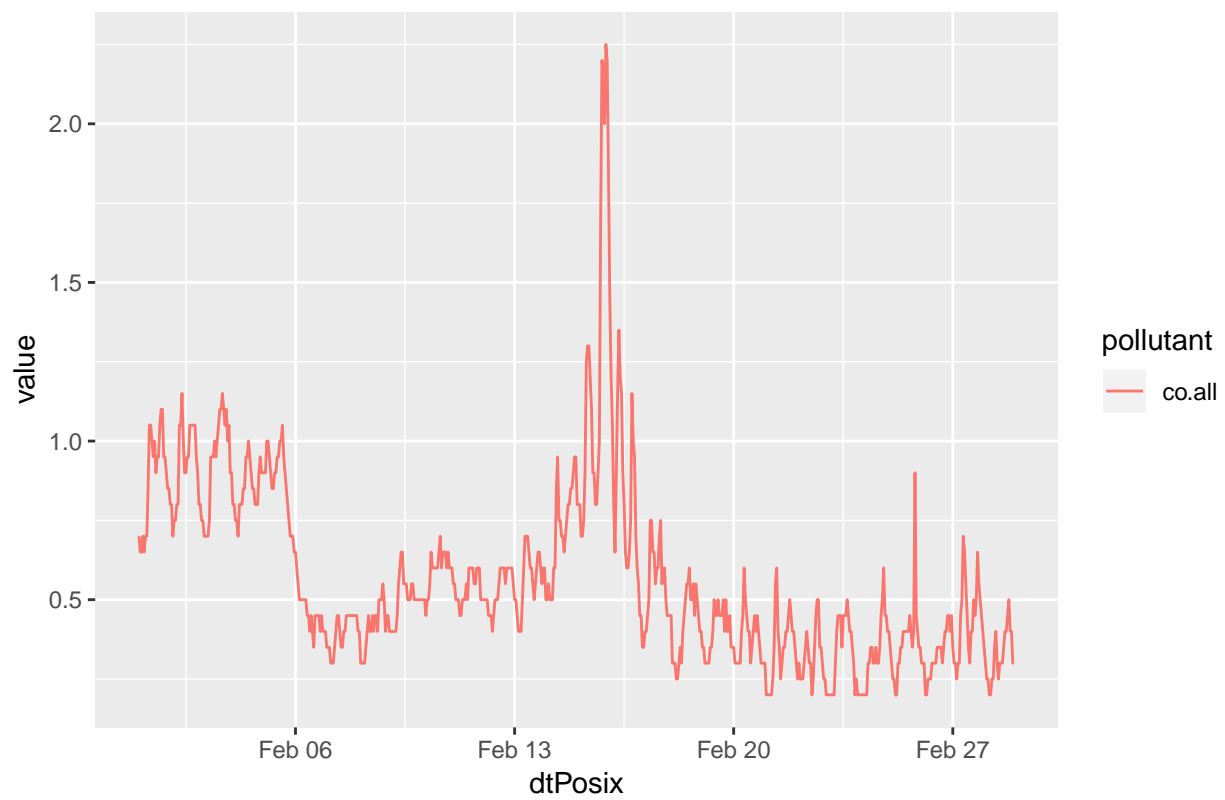
```
plot.pollutant(data, pollutant, month = "01", day = "01", title = "1. January with silvester firework p
```



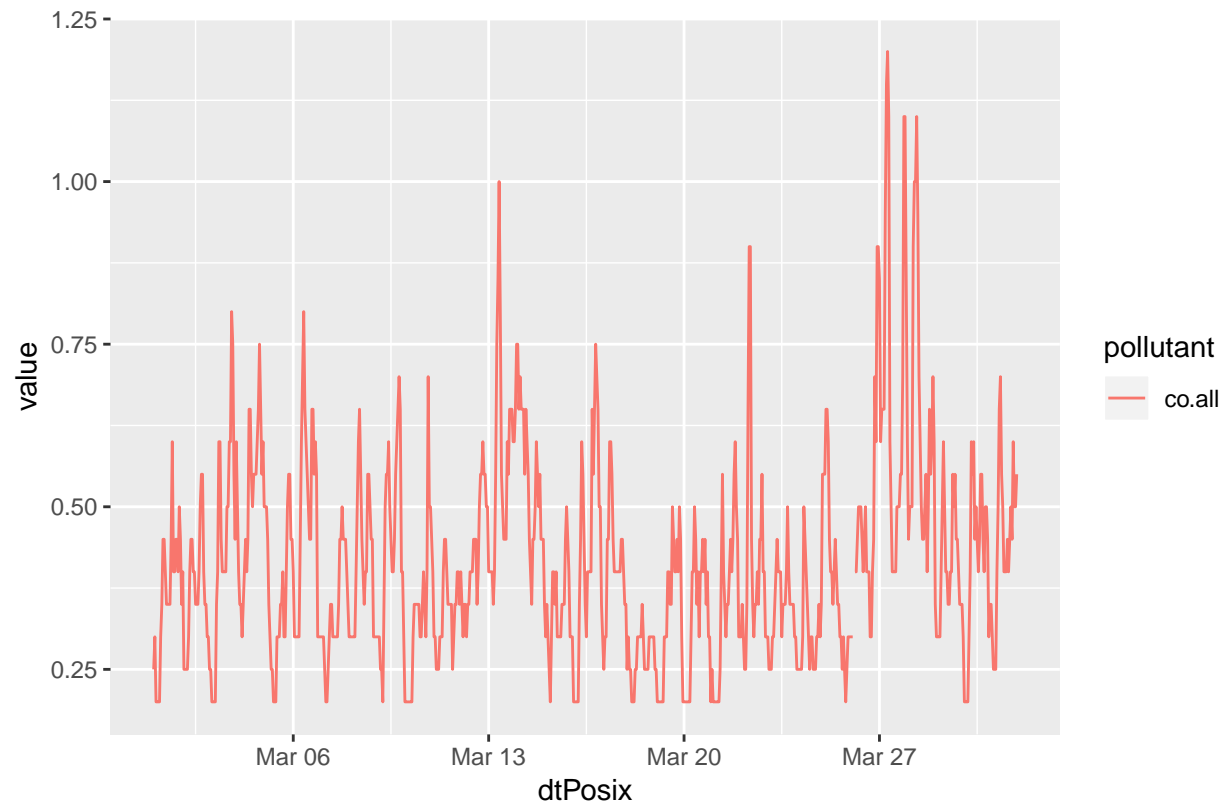
```
plot.pollutant(data, pollutant, month = "01")
```



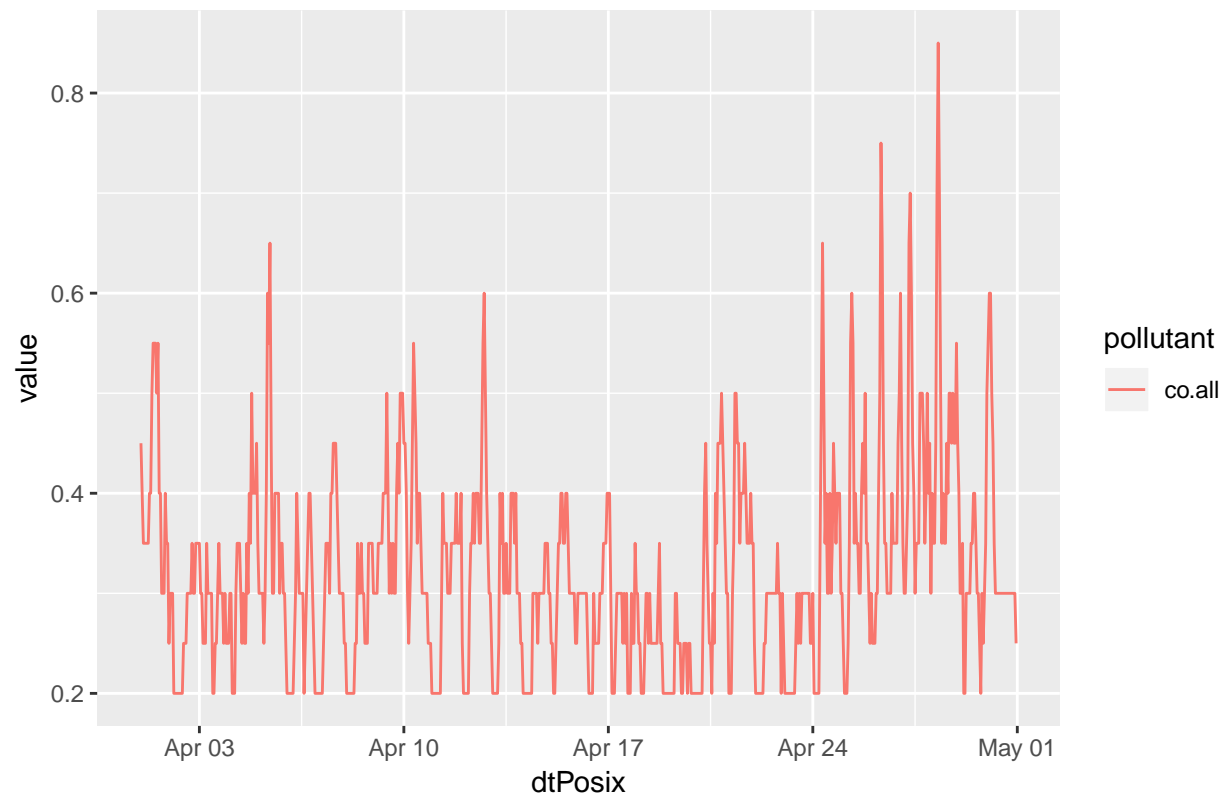
```
plot.pollutant(data, pollutant, month = "02")
```



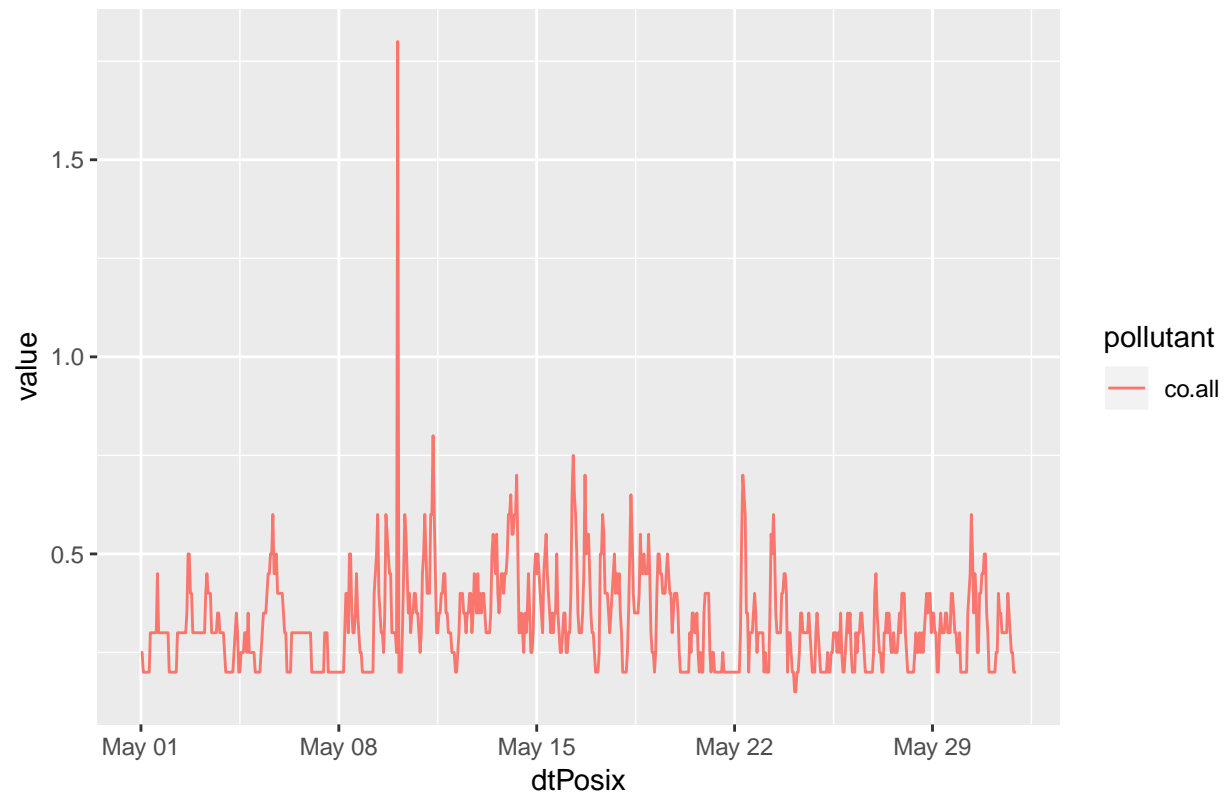
```
plot.pollutant(data, pollutant, month = "03")
```



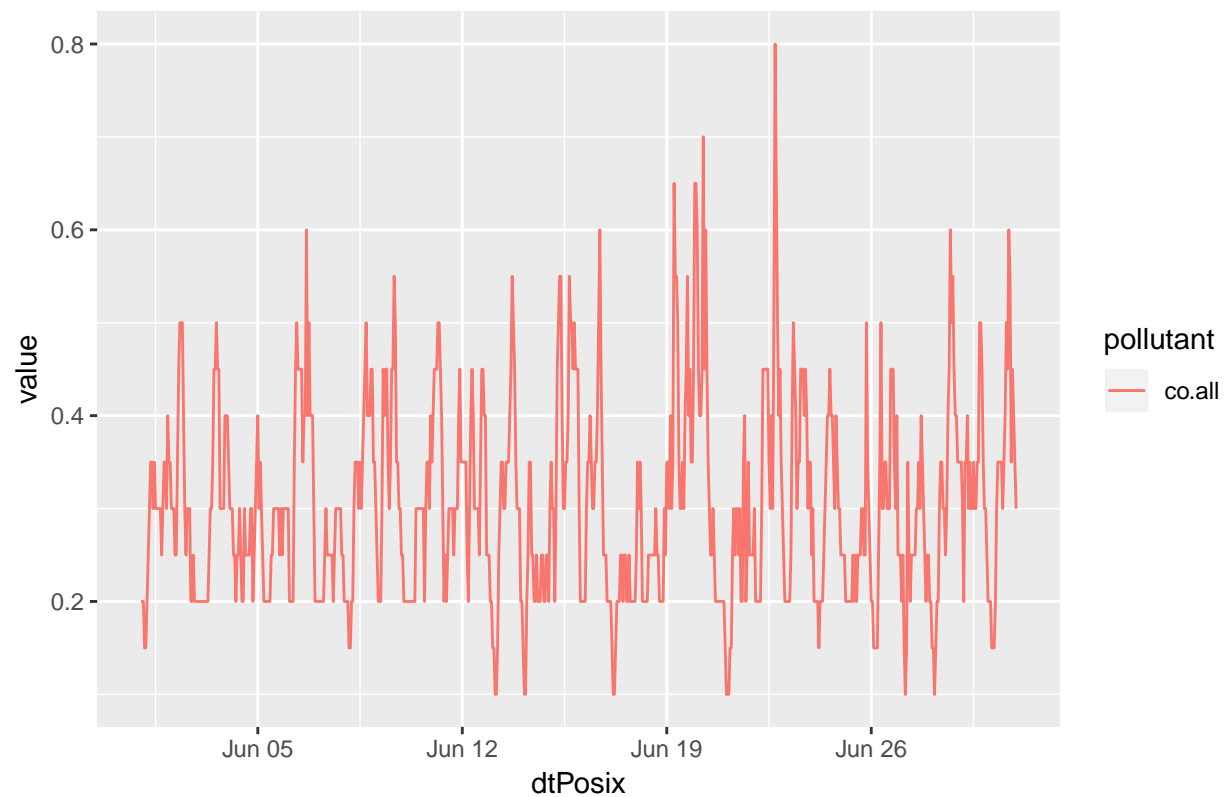
```
plot.pollutant(data, pollutant, month = "04")
```



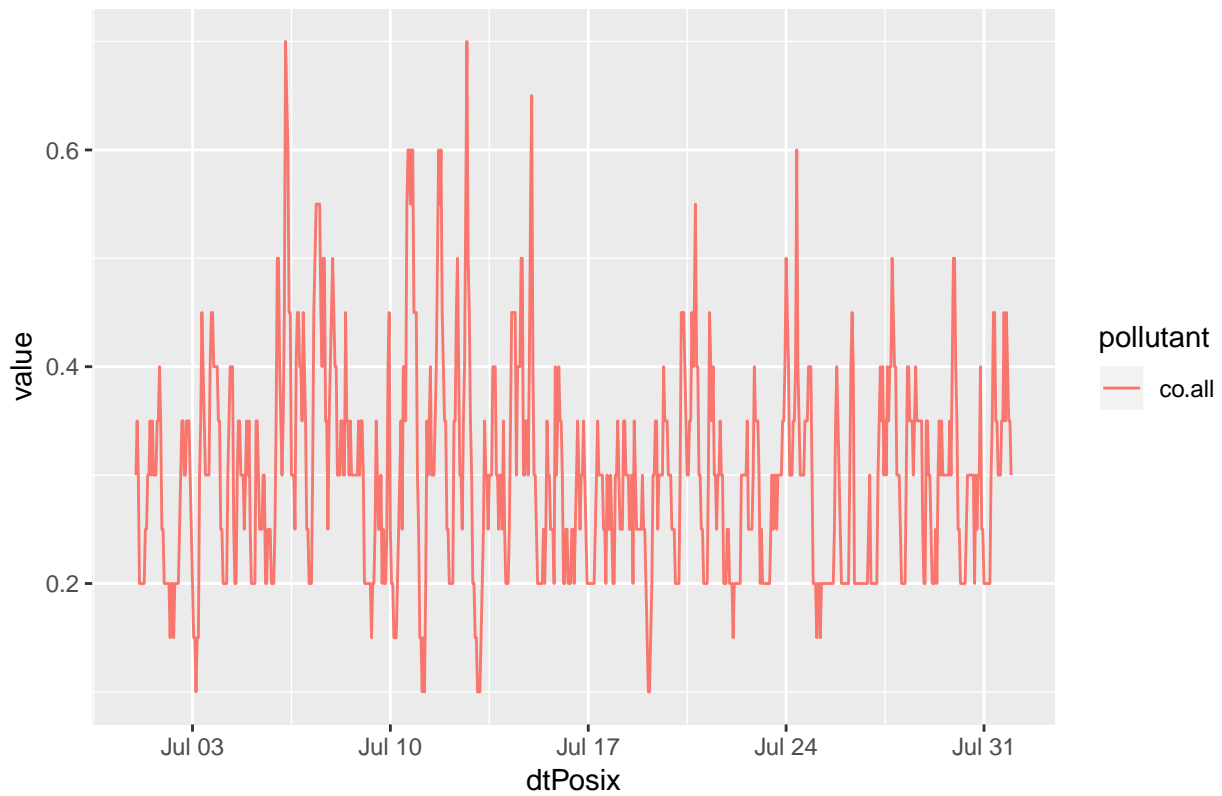
```
plot.pollutant(data, pollutant, month = "05")
```



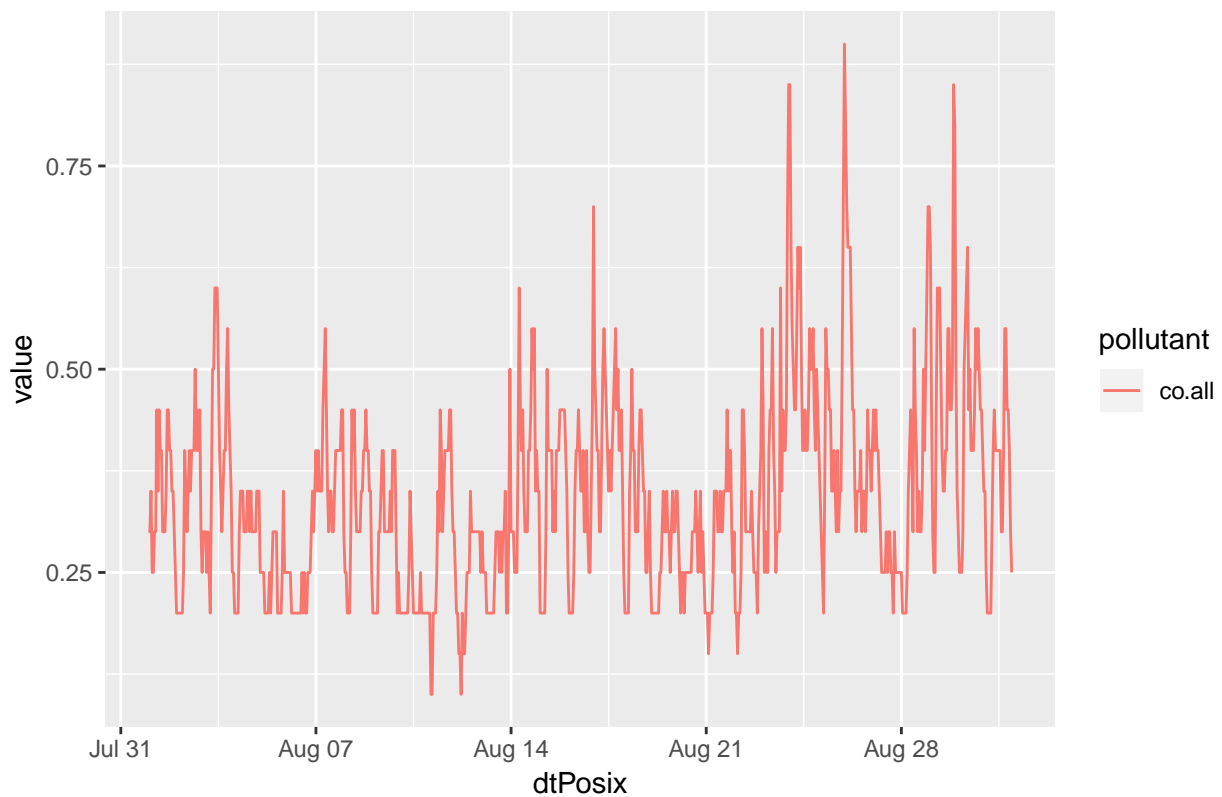
```
plot.pollutant(data, pollutant, month = "06")
```



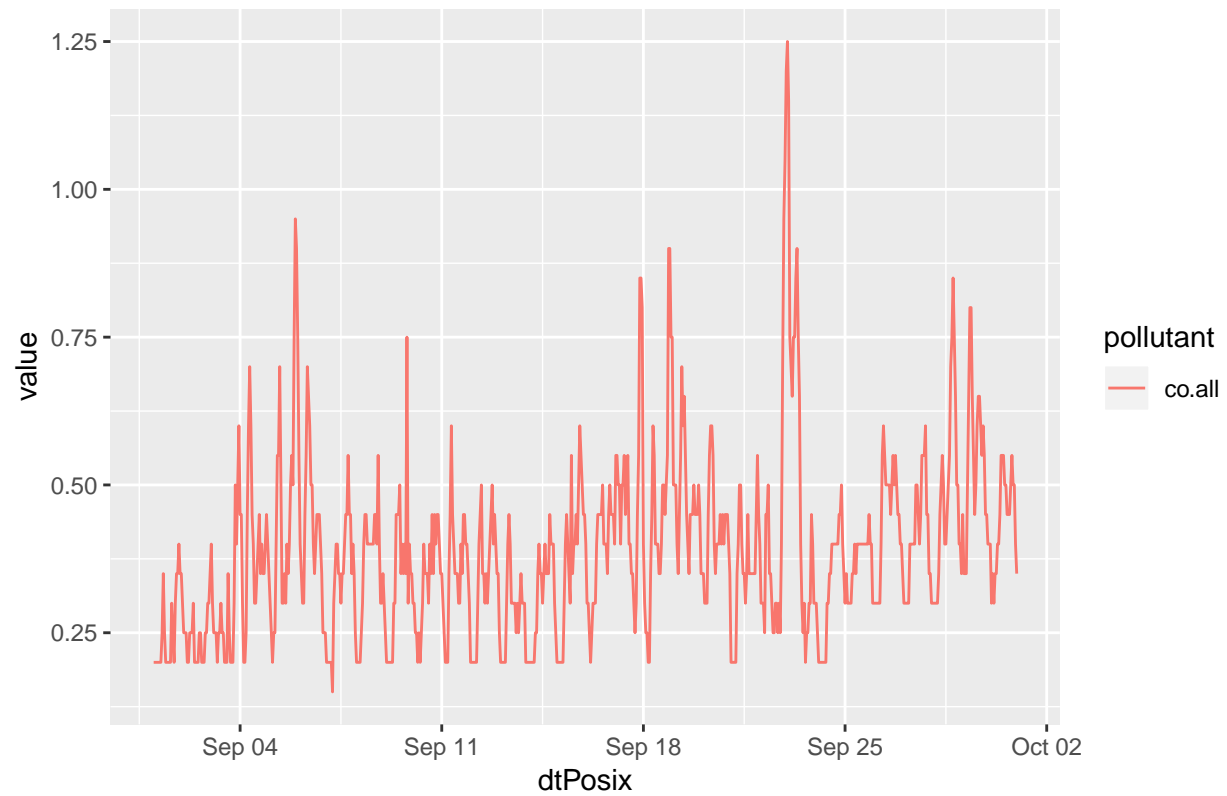
```
plot.pollutant(data, pollutant, month = "07")
```



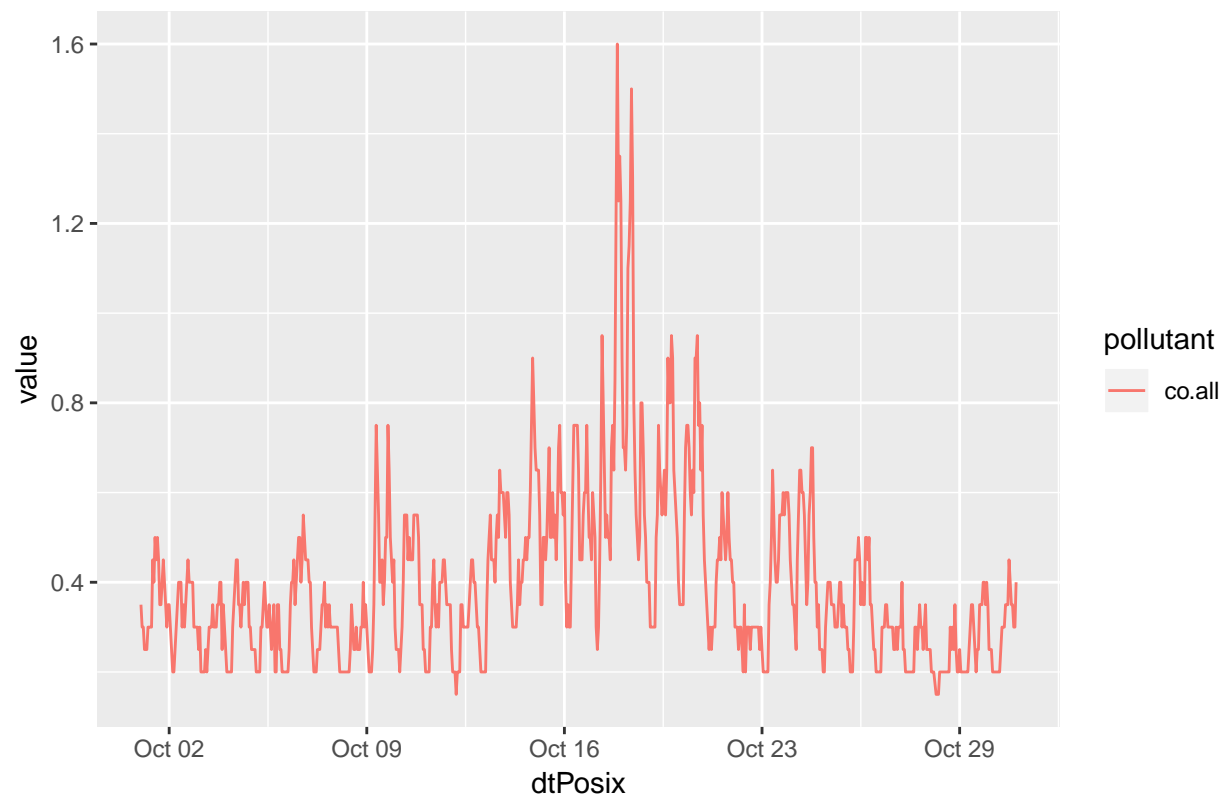
```
plot.pollutant(data, pollutant, month = "08")
```



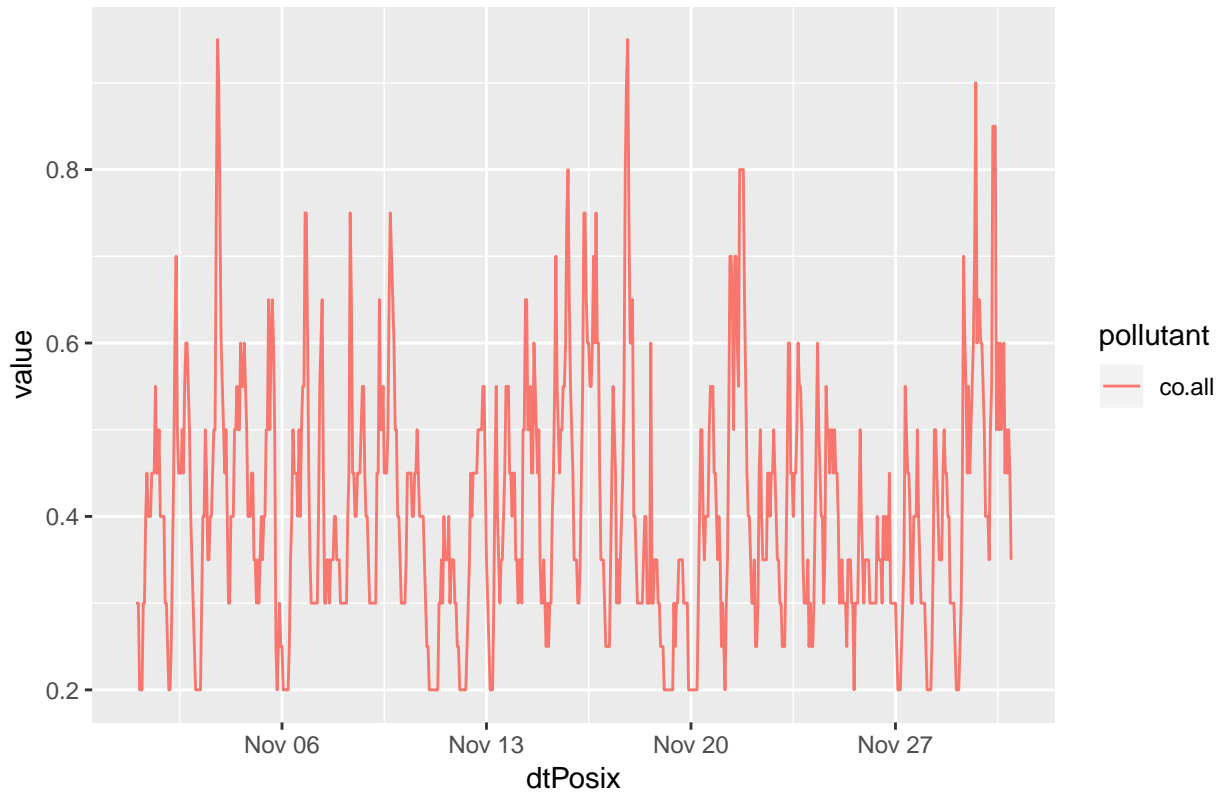
```
plot.pollutant(data, pollutant, month = "09")
```



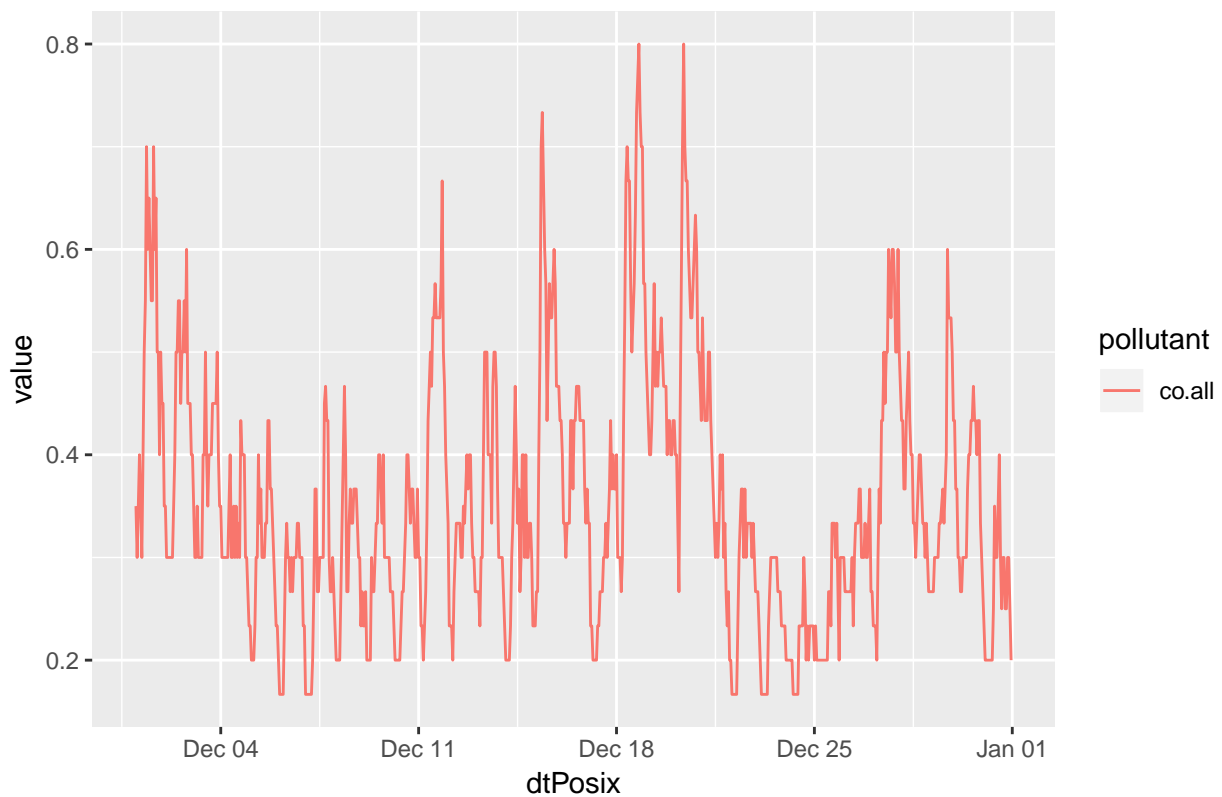
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```



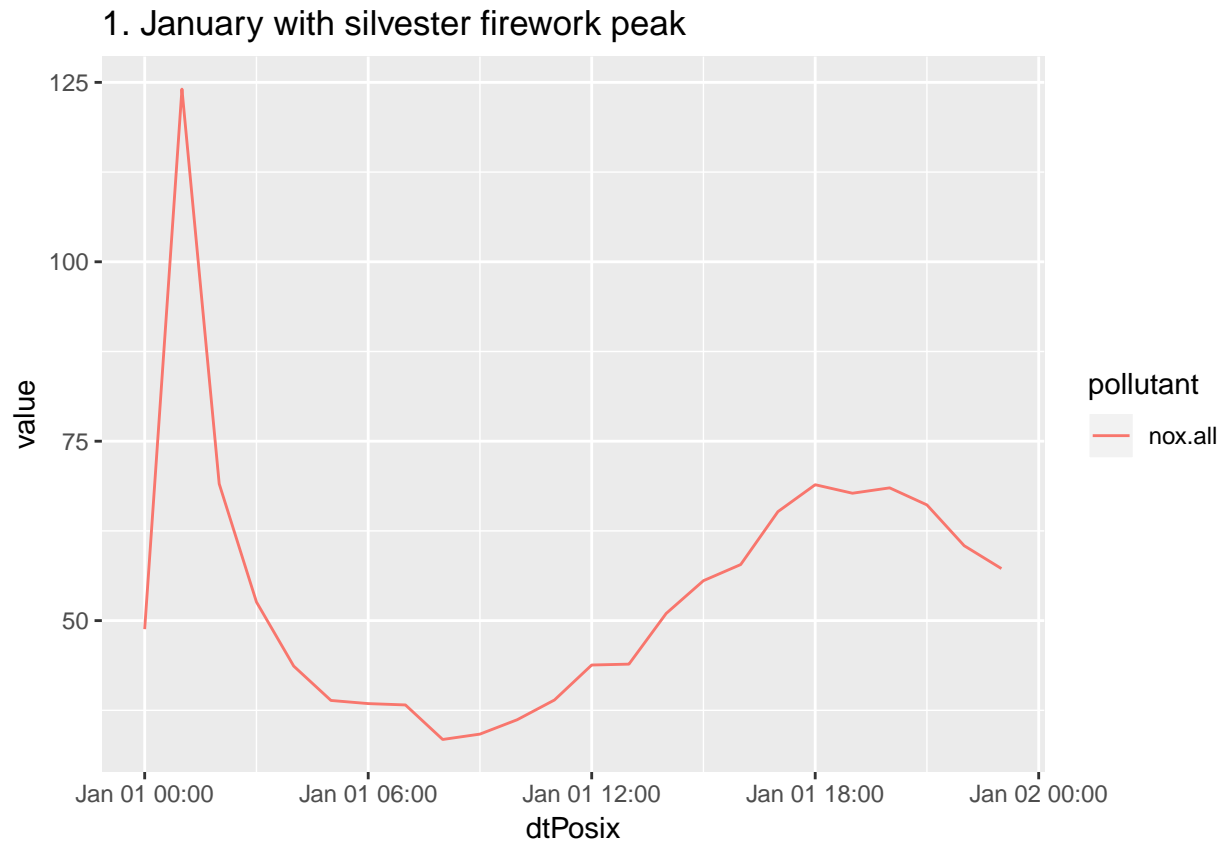
```
plot.pollutant(data, pollutant, month = "12")
```



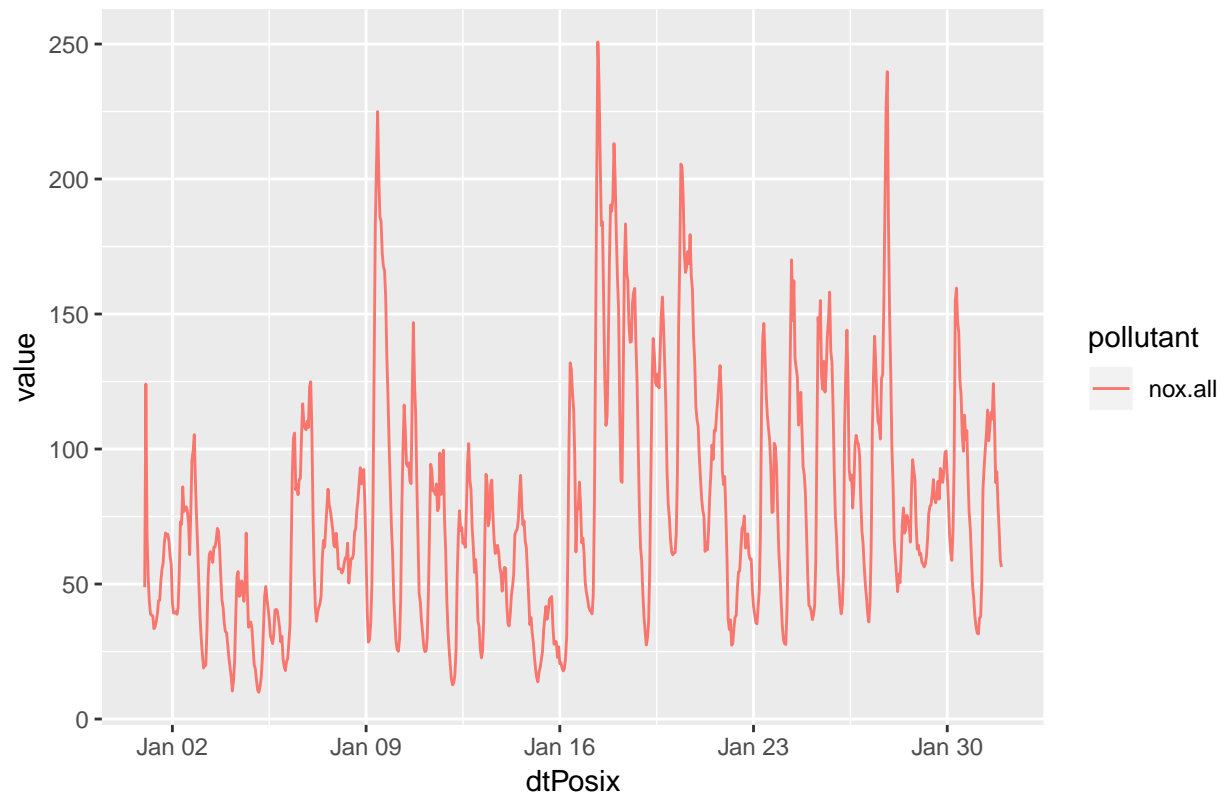
5. NOX over the year

```
pollutant = "nox.all"
```

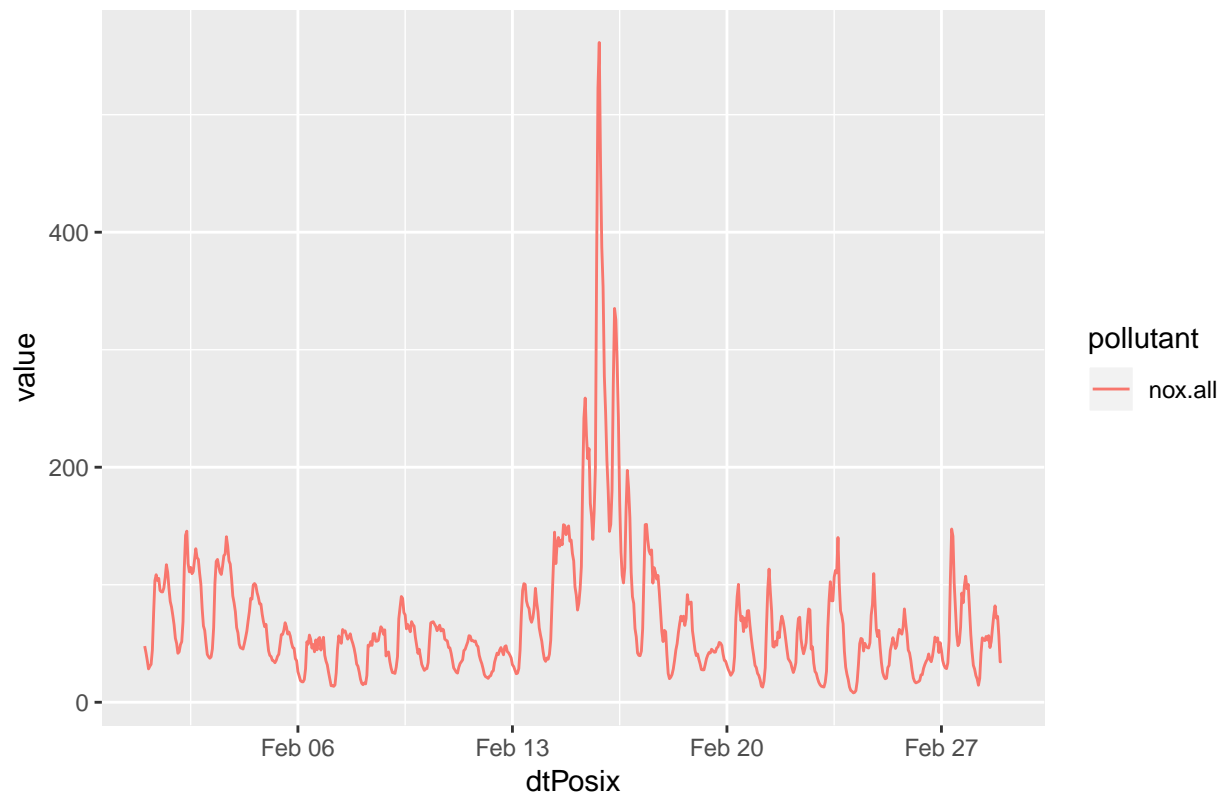
```
plot.pollutant(data, pollutant, month = "01", day = "01", title = "1. January with silvester firework p
```



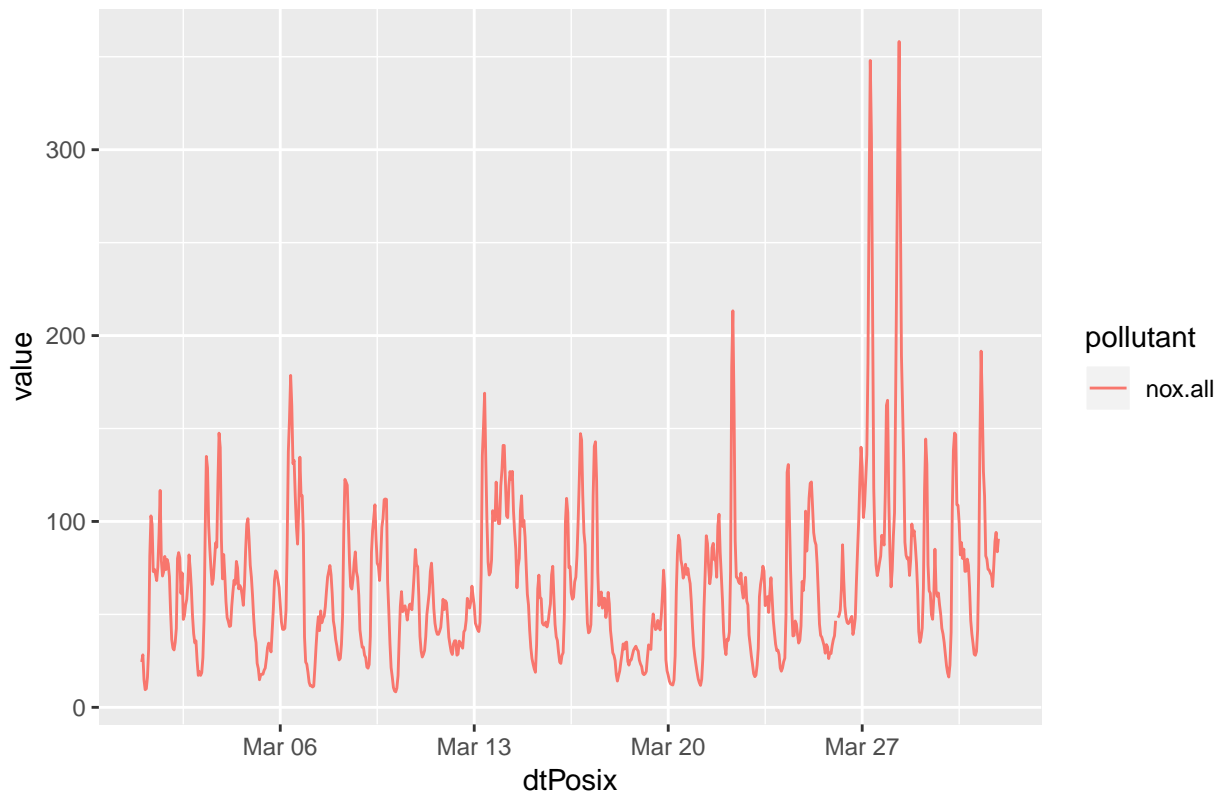
```
plot.pollutant(data, pollutant, month = "01")
```

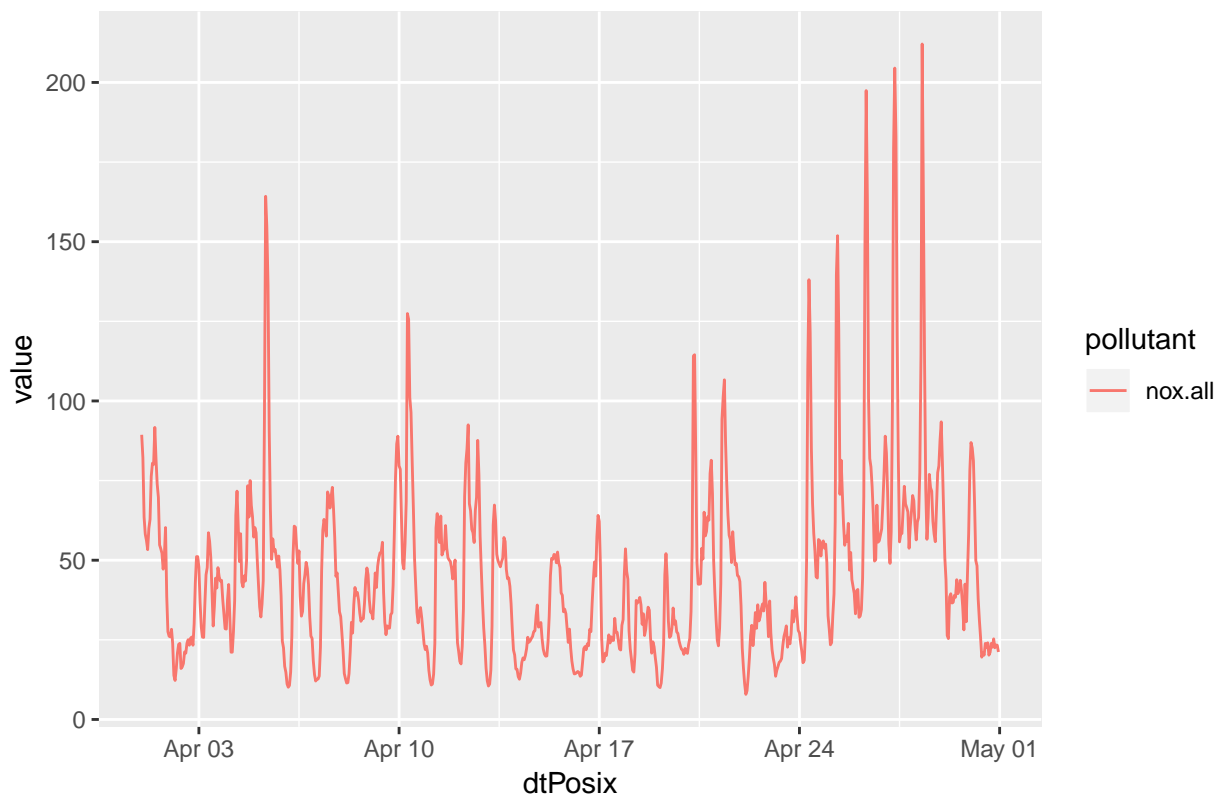
```
plot.pollutant(data, pollutant, month = "02")
```



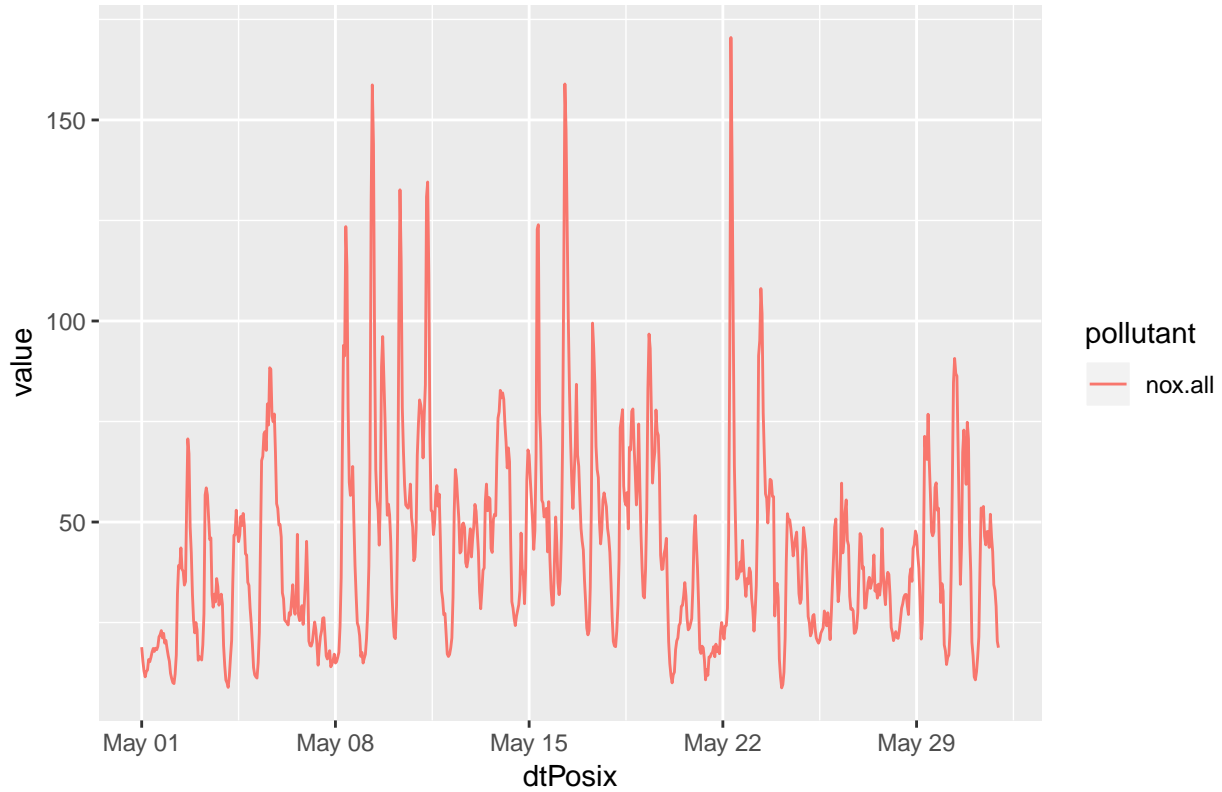
```
plot.pollutant(data, pollutant, month = "03")
```



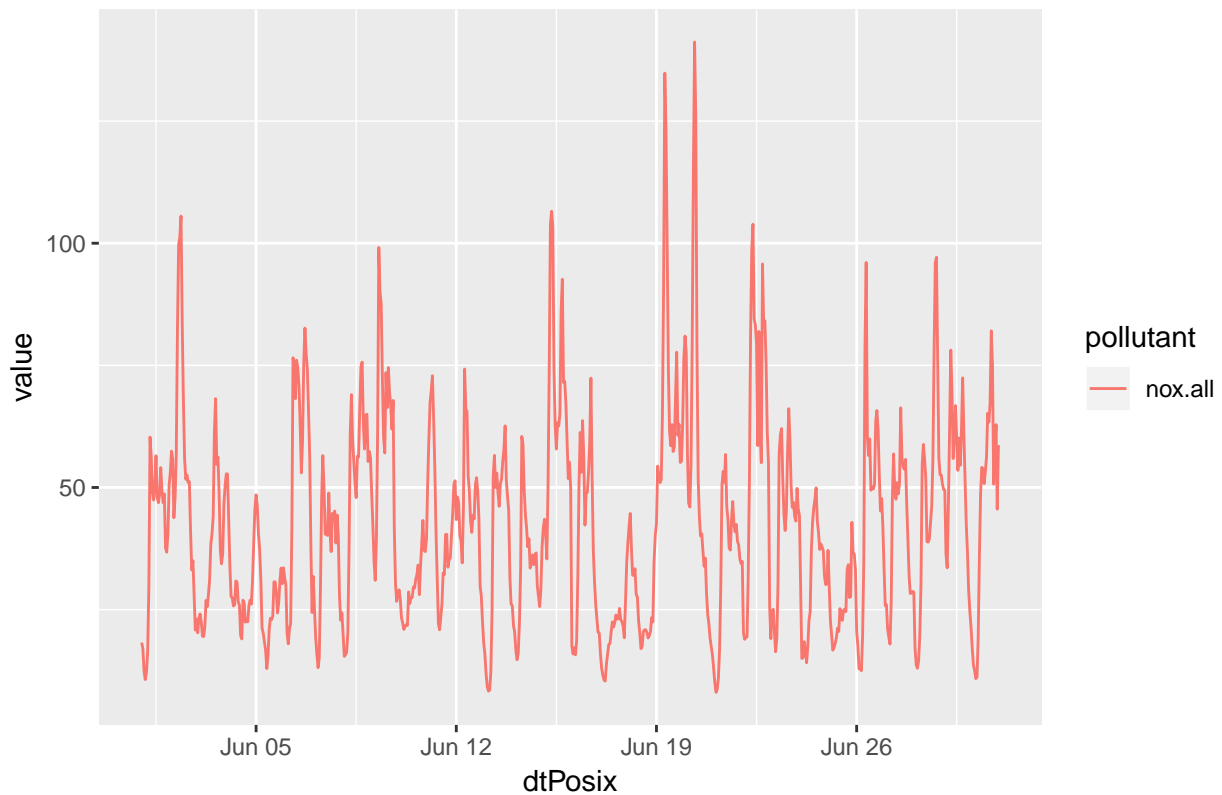
```
plot.pollutant(data, pollutant, month = "04")
```



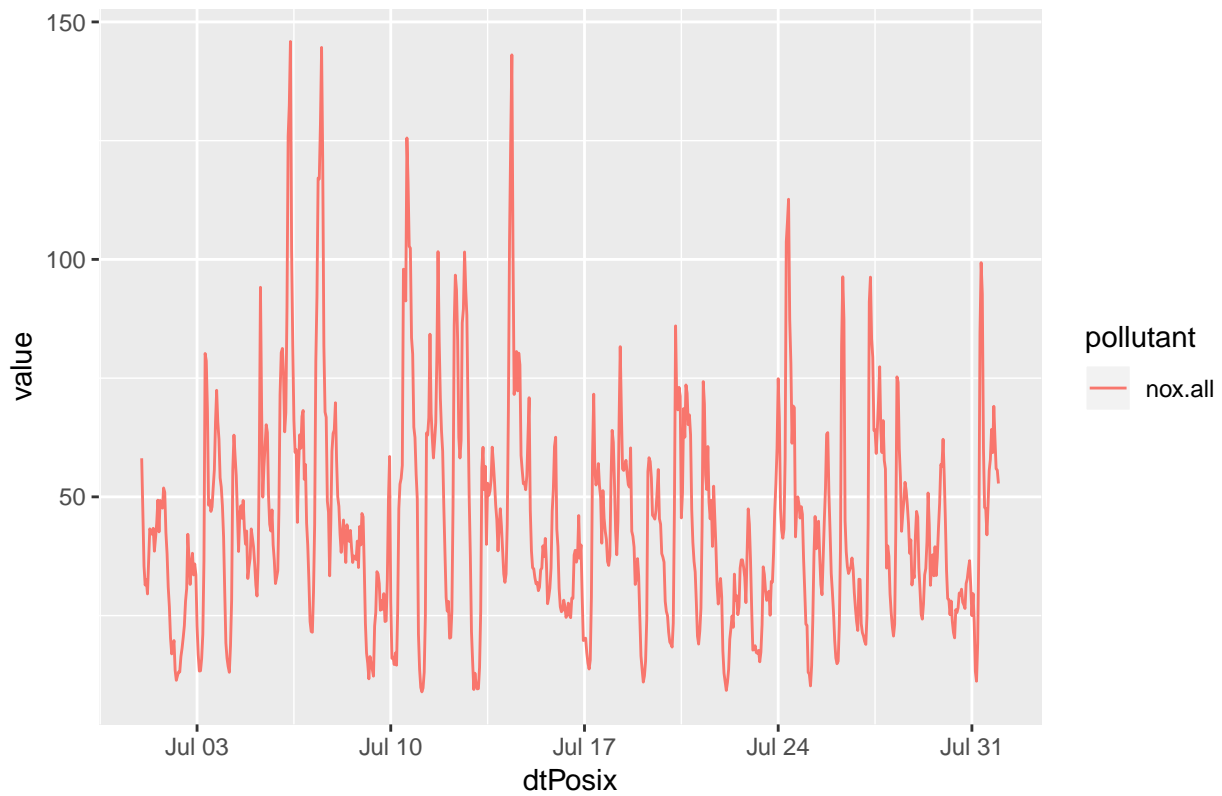
```
plot.pollutant(data, pollutant, month = "05")
```



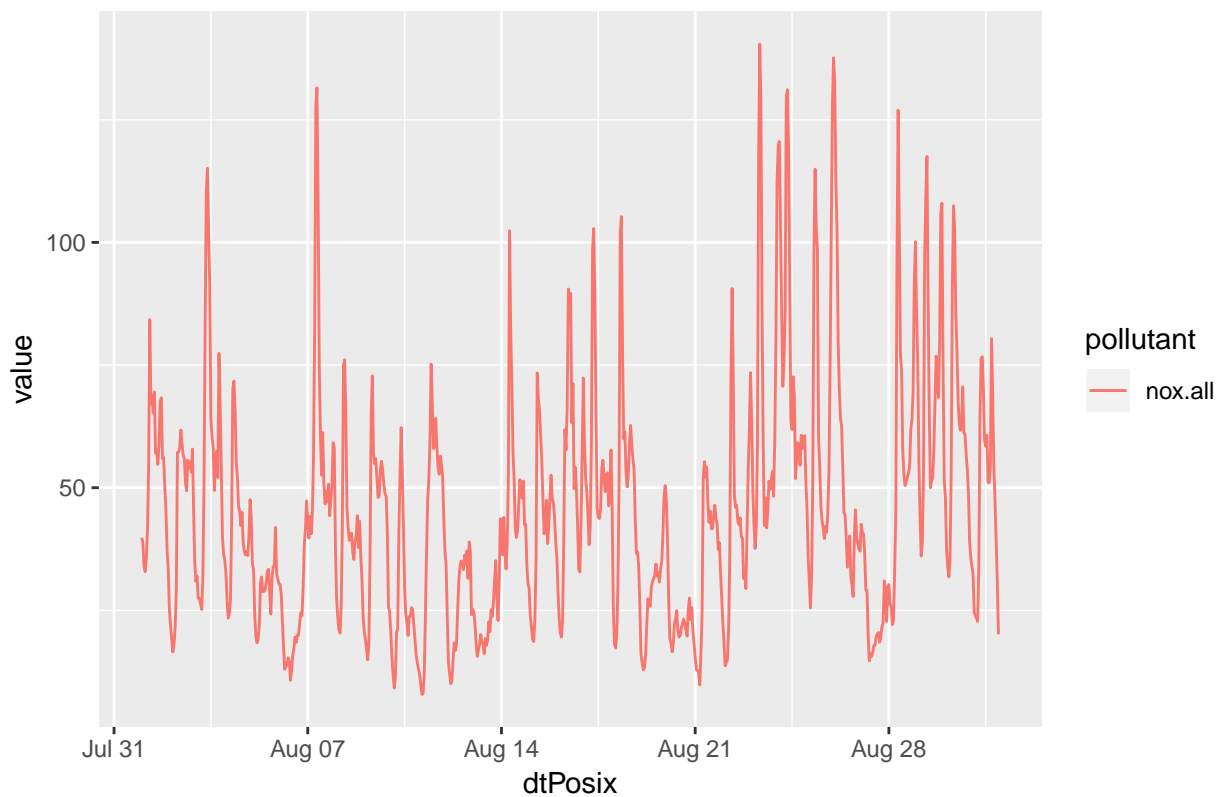
```
plot.pollutant(data, pollutant, month = "06")
```



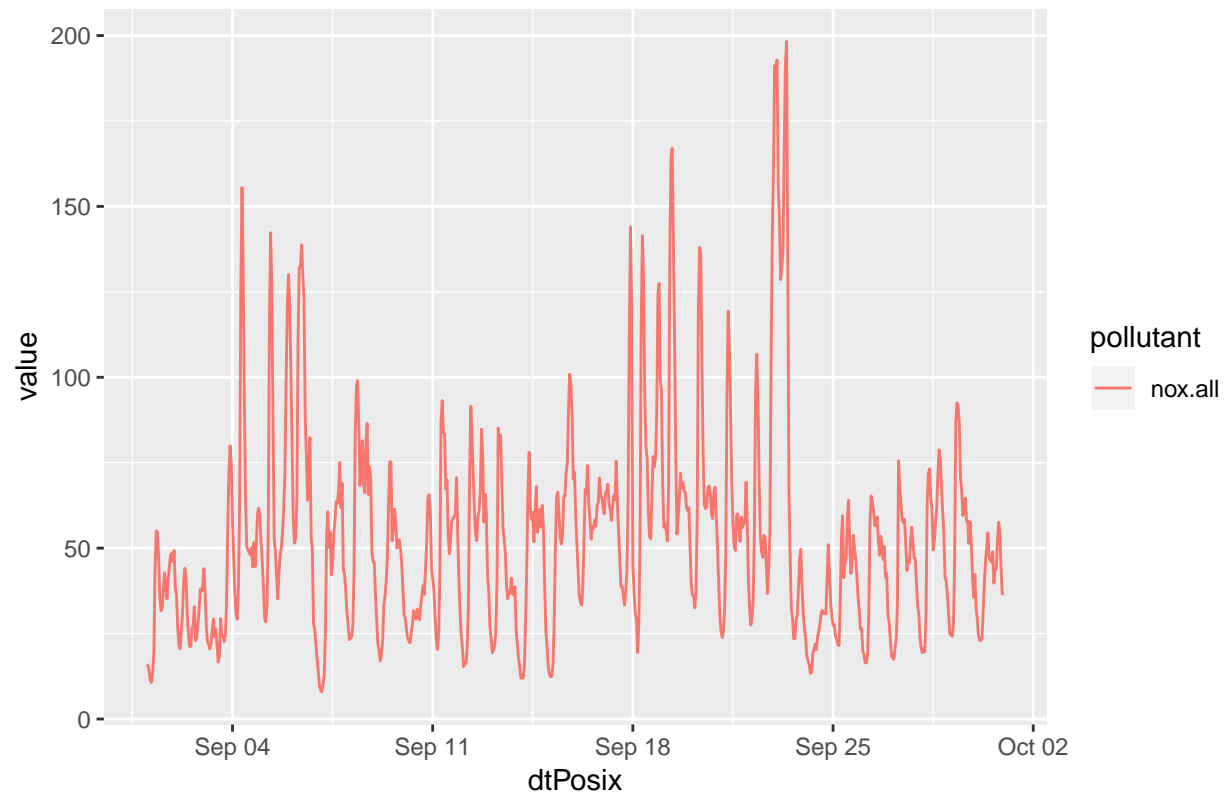
```
plot.pollutant(data, pollutant, month = "07")
```



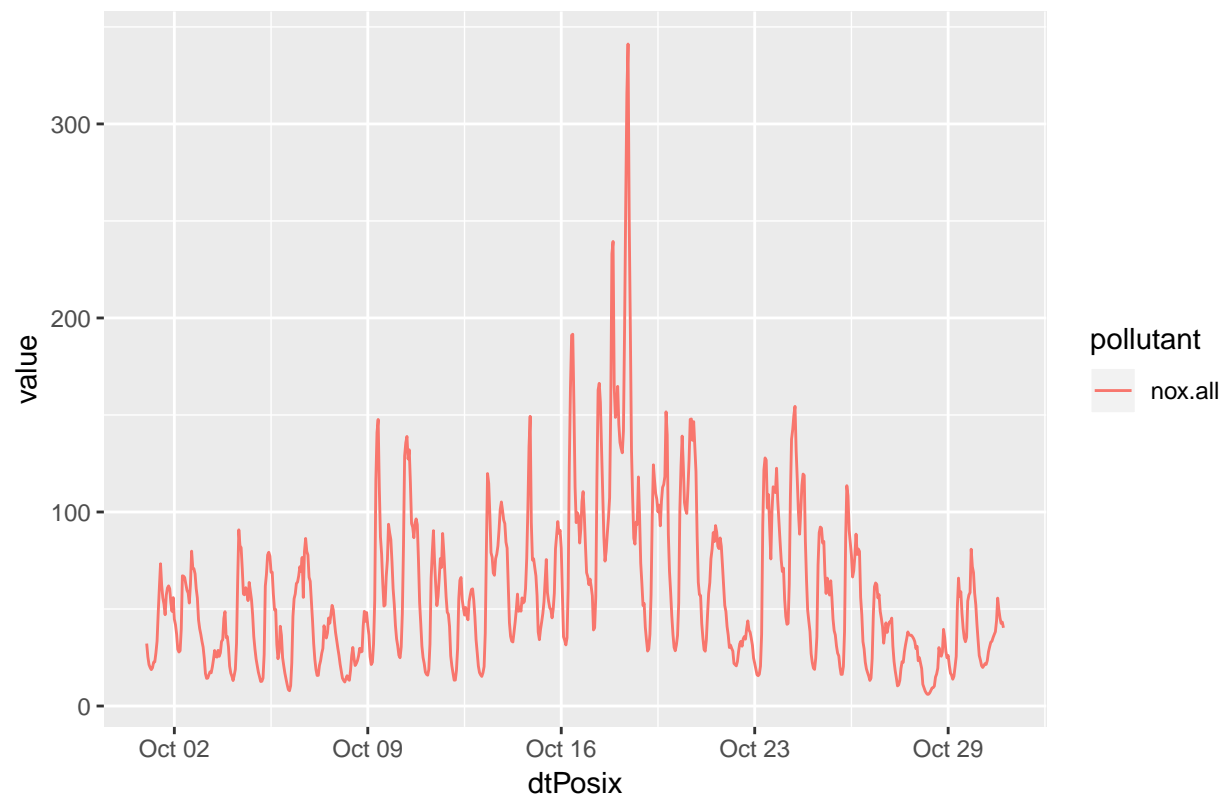
```
plot.pollutant(data, pollutant, month = "08")
```



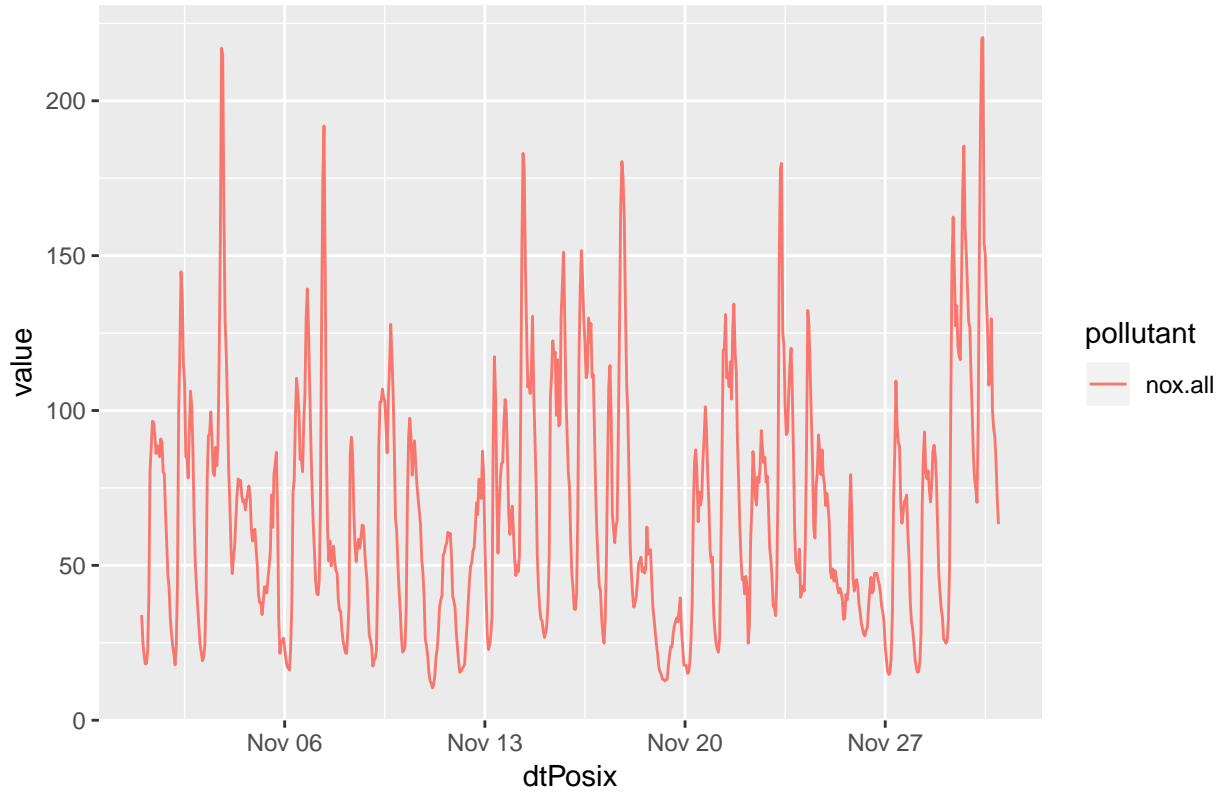
```
plot.pollutant(data, pollutant, month = "09")
```



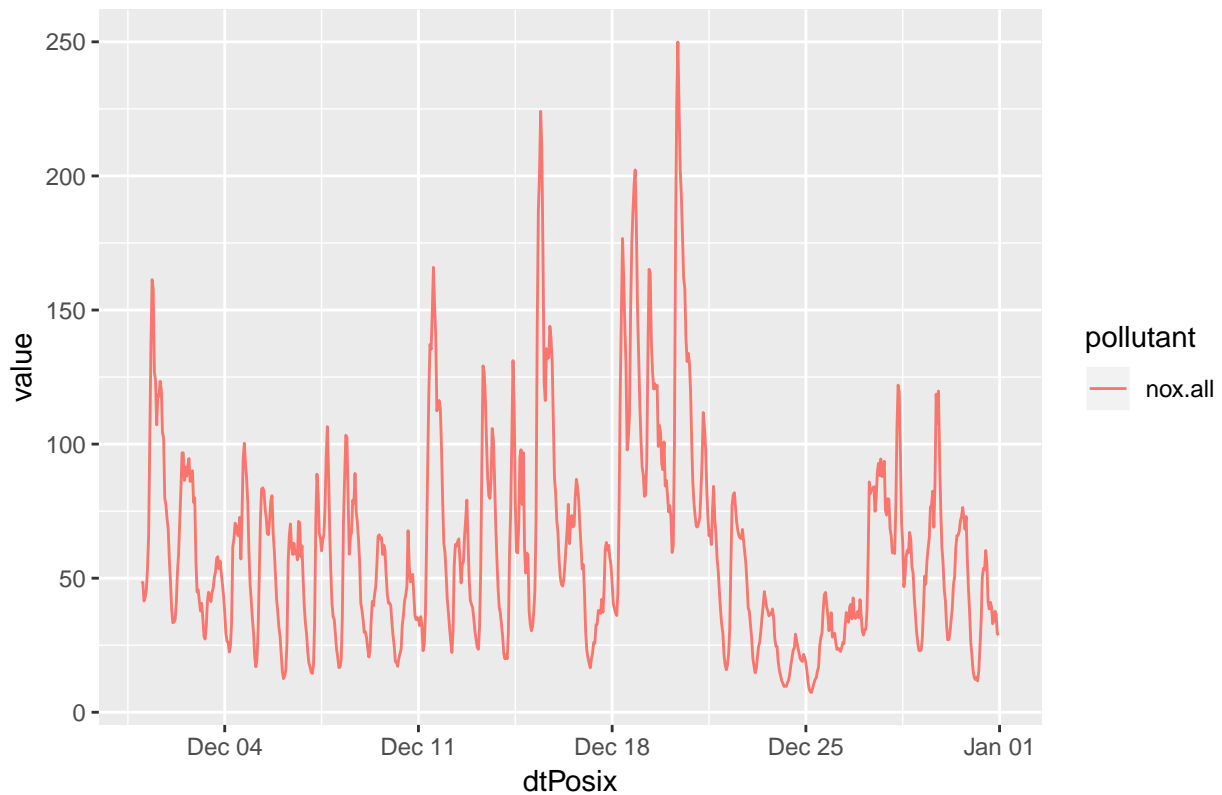
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```

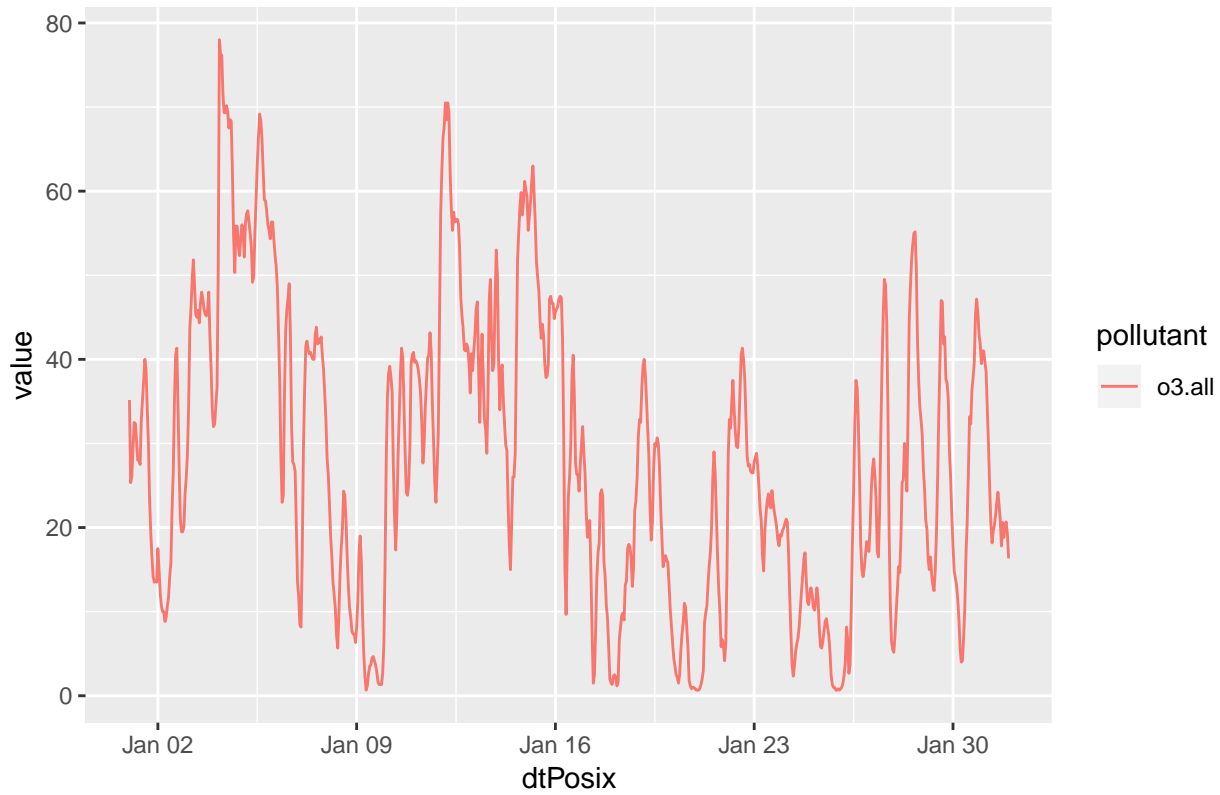


```
plot.pollutant(data, pollutant, month = "12")
```

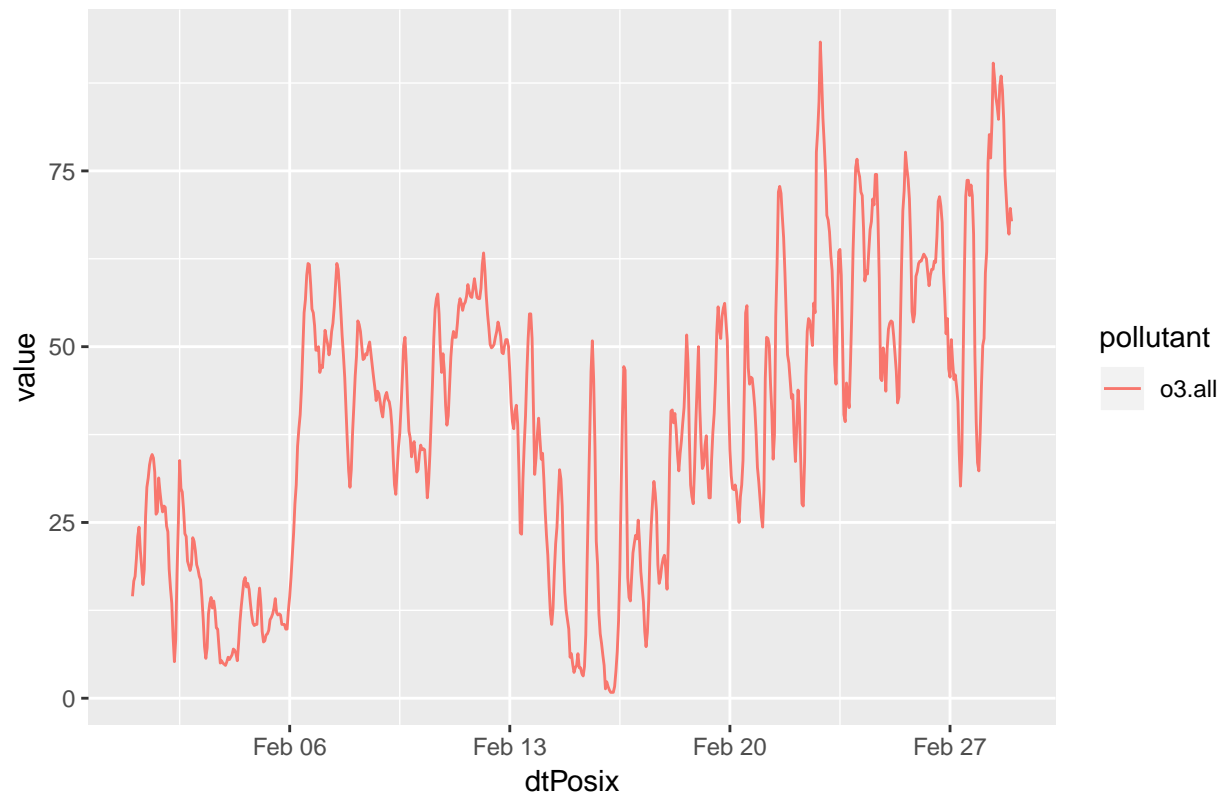


6. O3 over the year

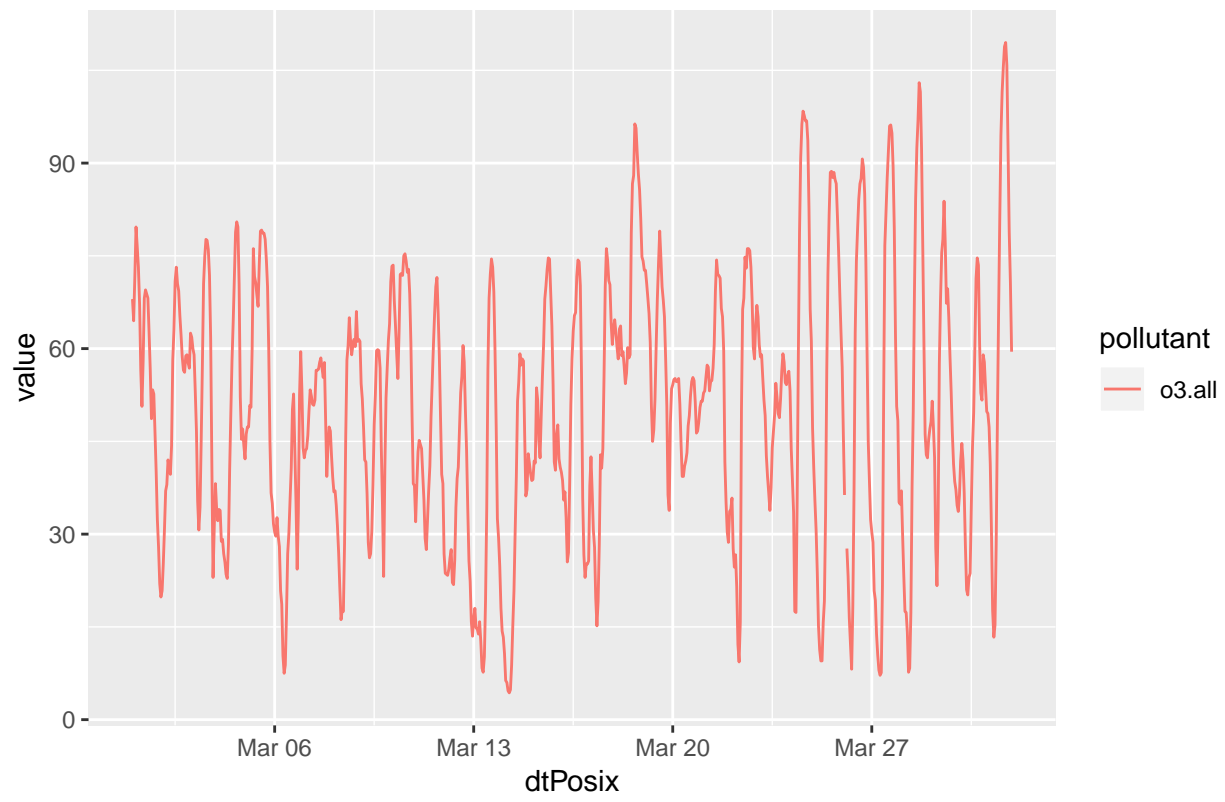
```
pollutant = "o3.all"  
  
plot.pollutant(data, pollutant, month = "01")
```



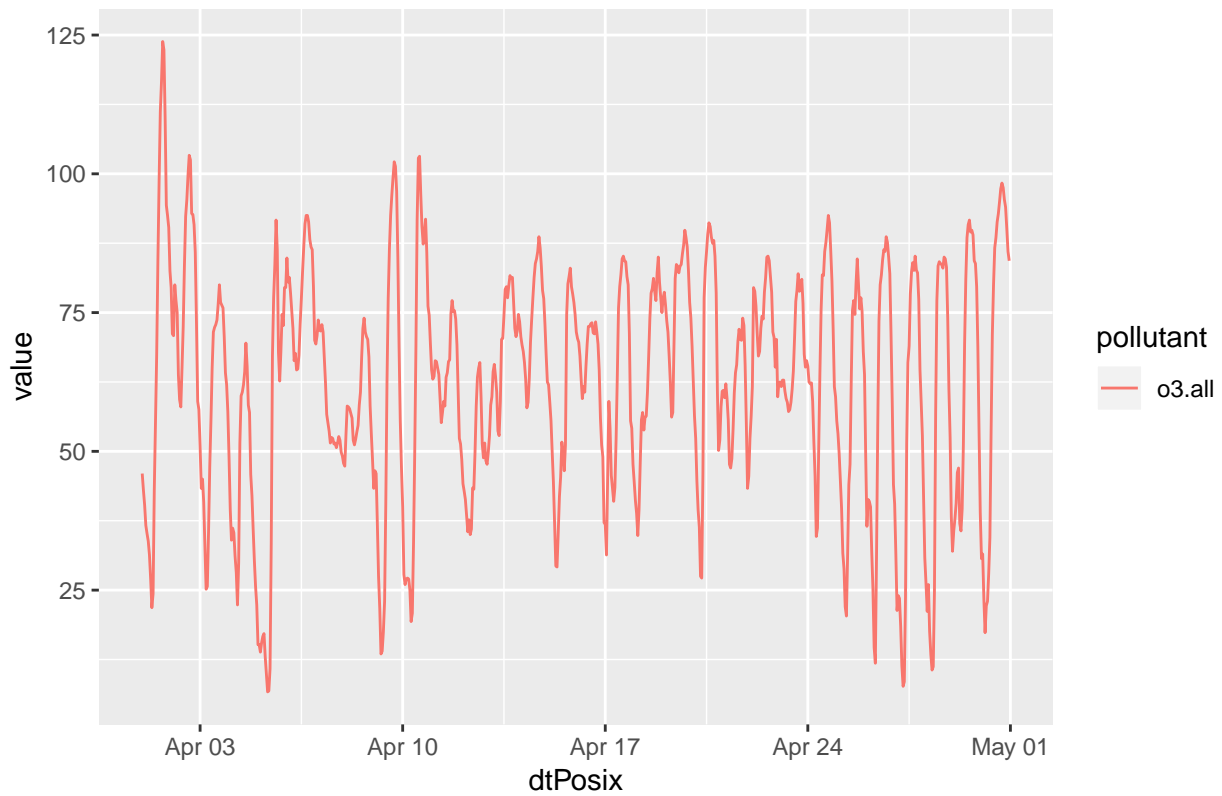
```
plot.pollutant(data, pollutant, month = "02")
```



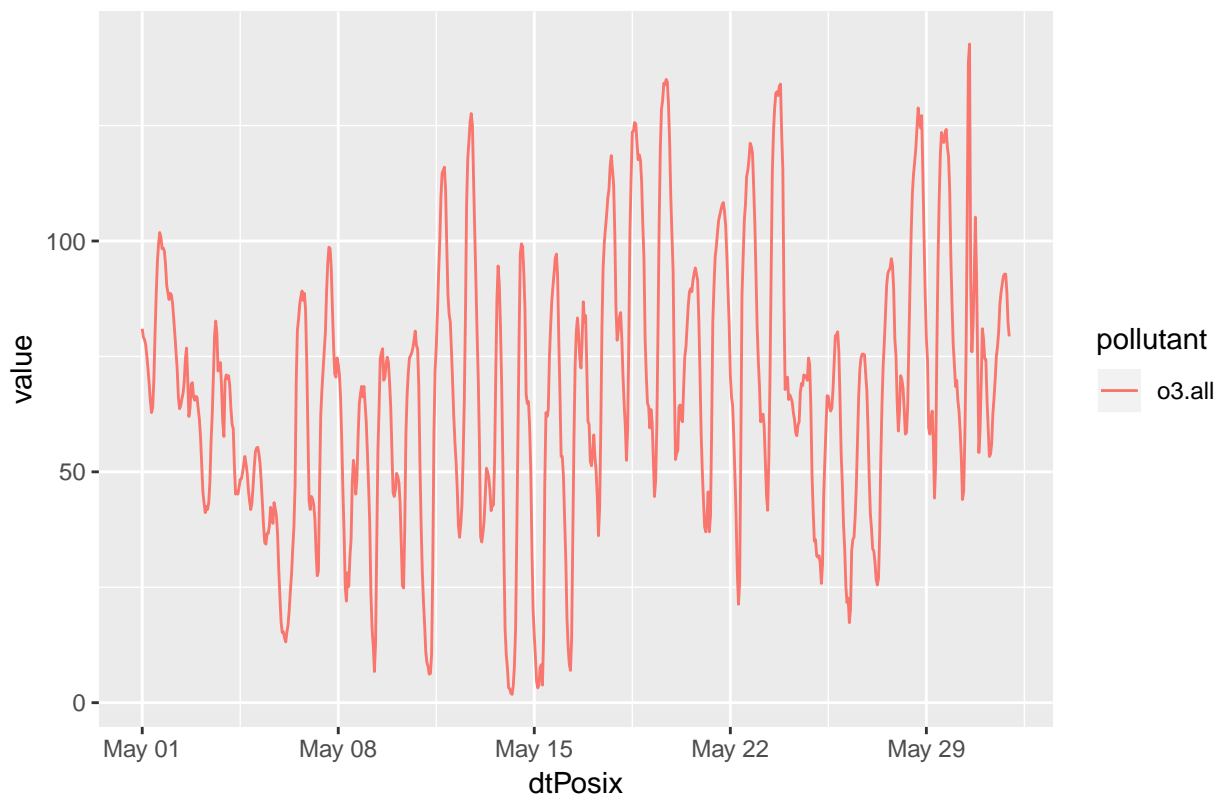
```
plot.pollutant(data, pollutant, month = "03")
```



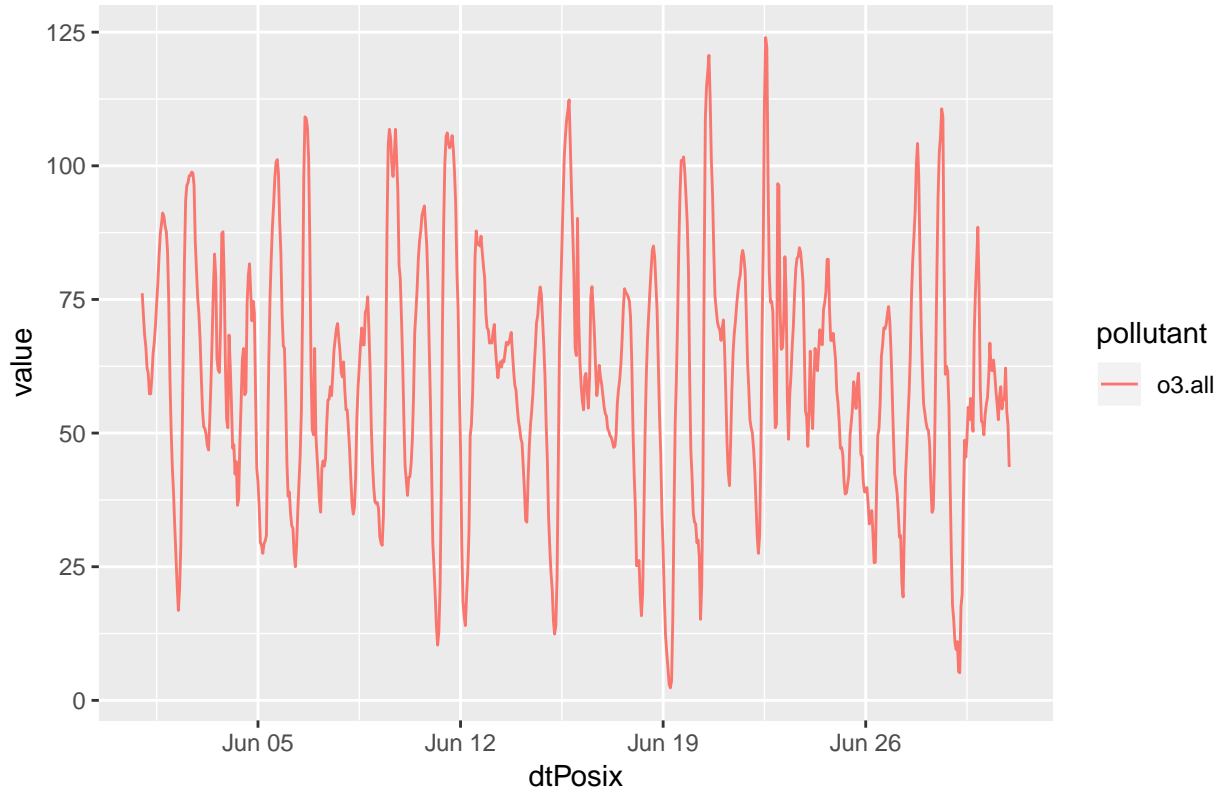

```
plot.pollutant(data, pollutant, month = "04")
```



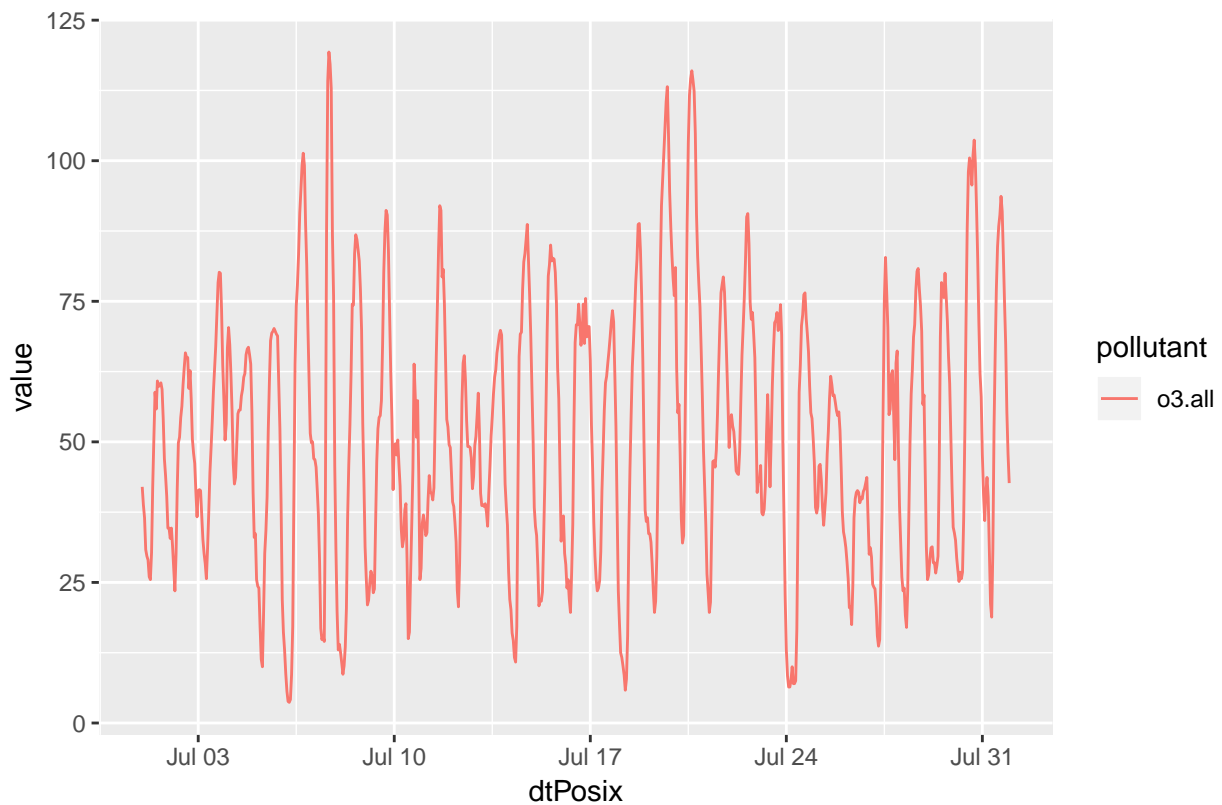
```
plot.pollutant(data, pollutant, month = "05")
```



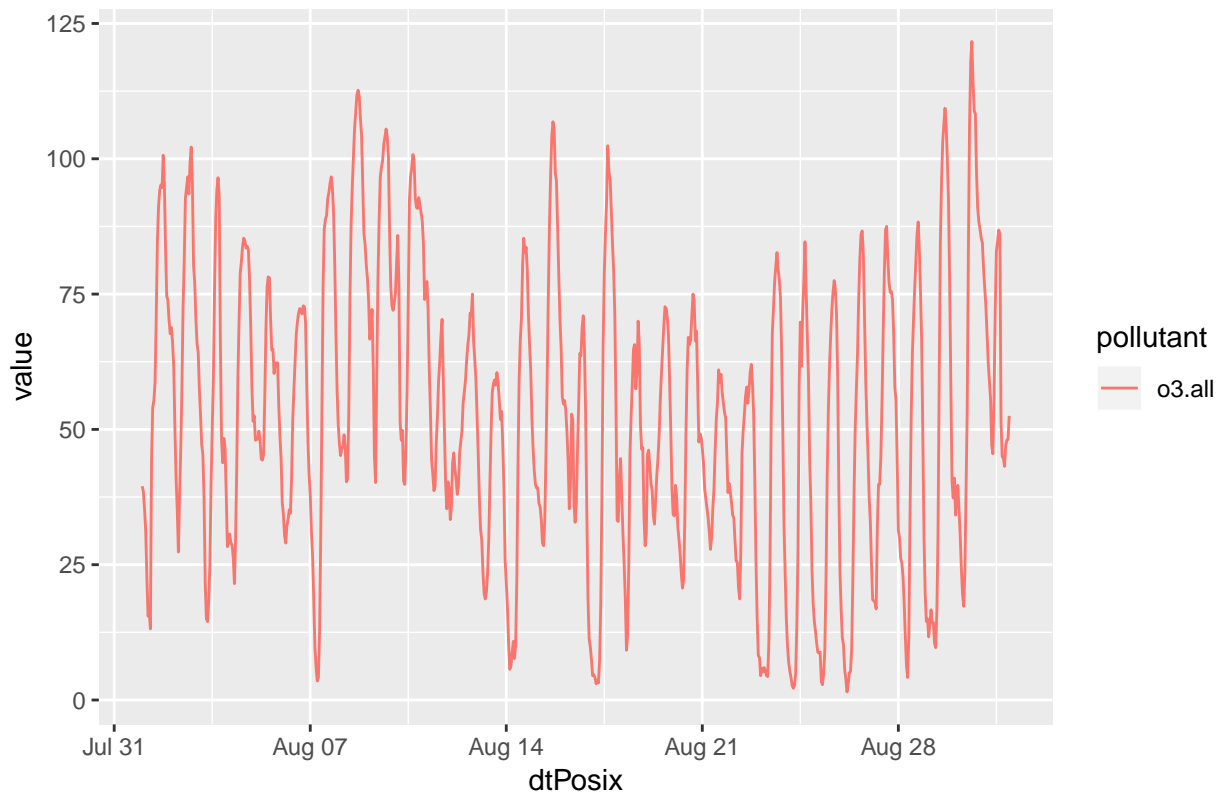
```
plot.pollutant(data, pollutant, month = "06")
```



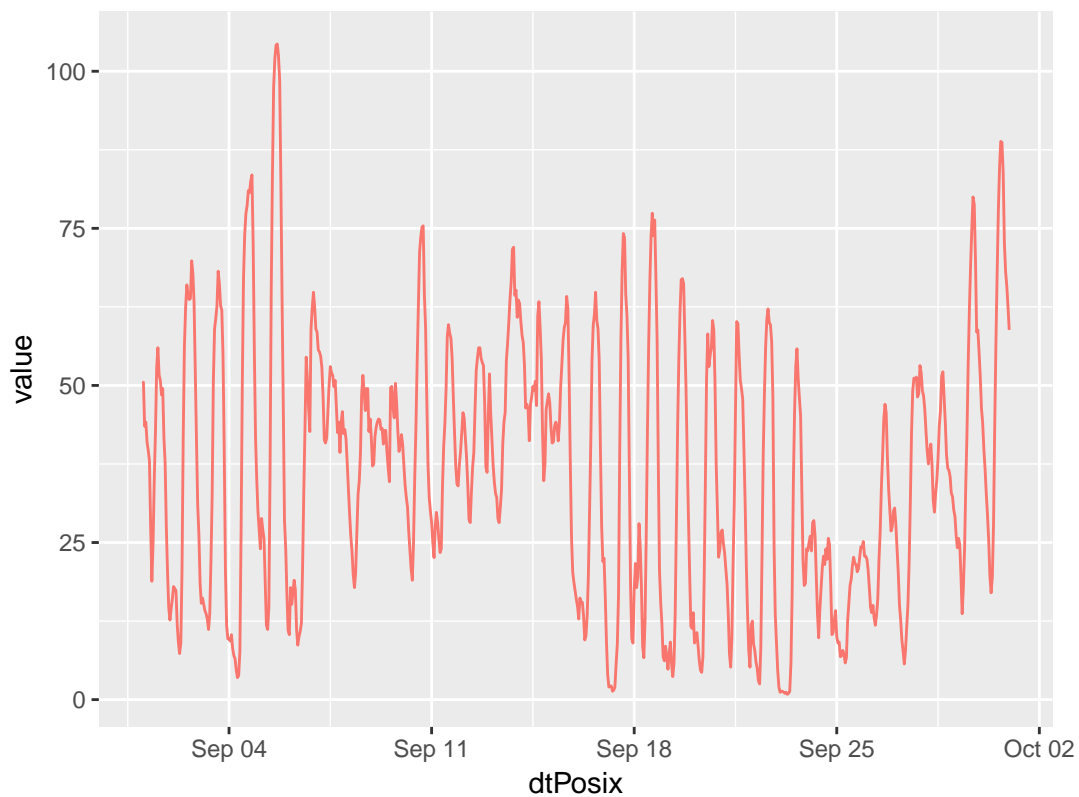
```
plot.pollutant(data, pollutant, month = "07")
```



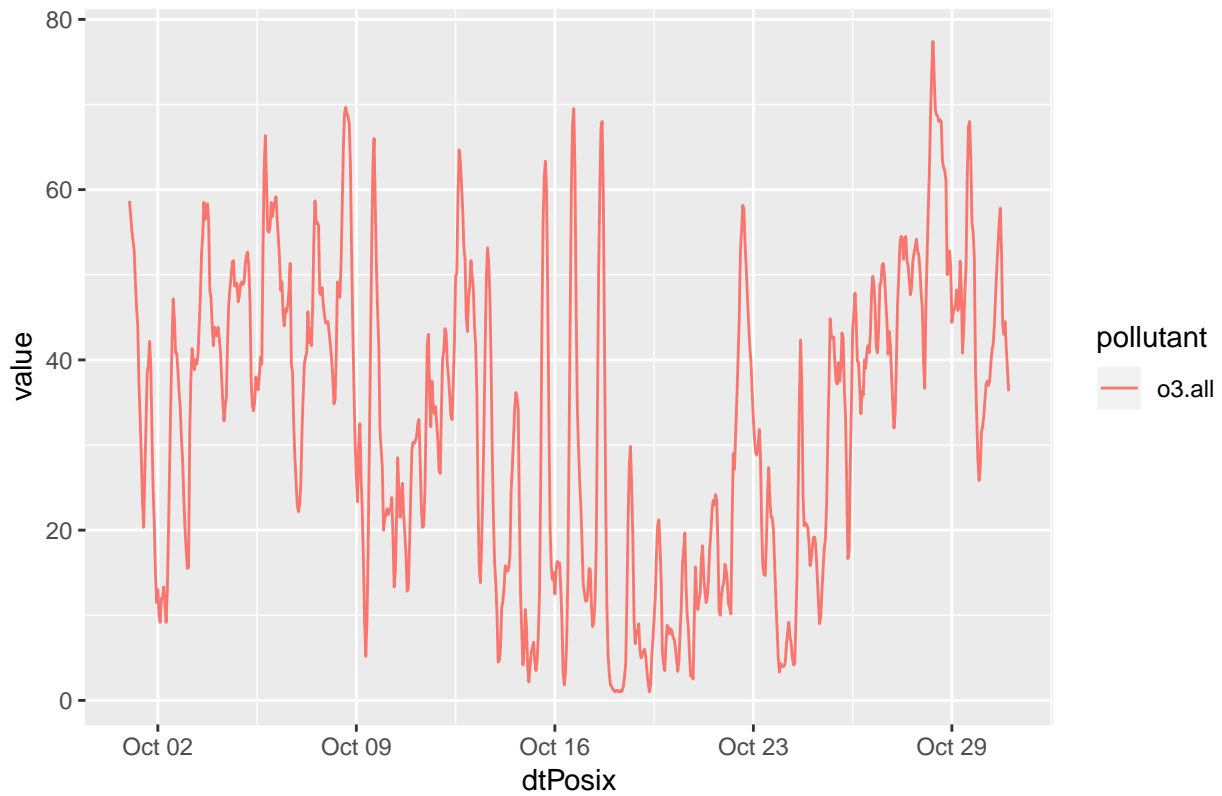
```
plot.pollutant(data, pollutant, month = "08")
```



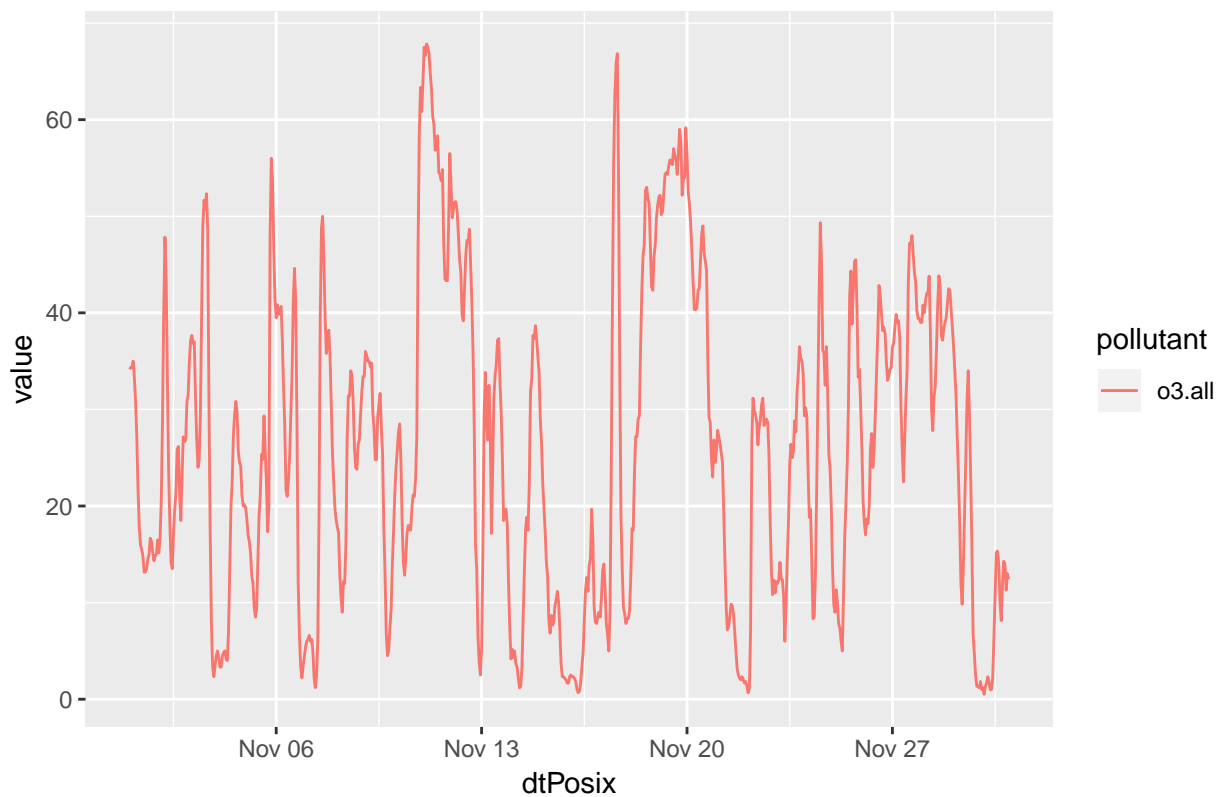
```
plot.pollutant(data, pollutant, month = "09")
```



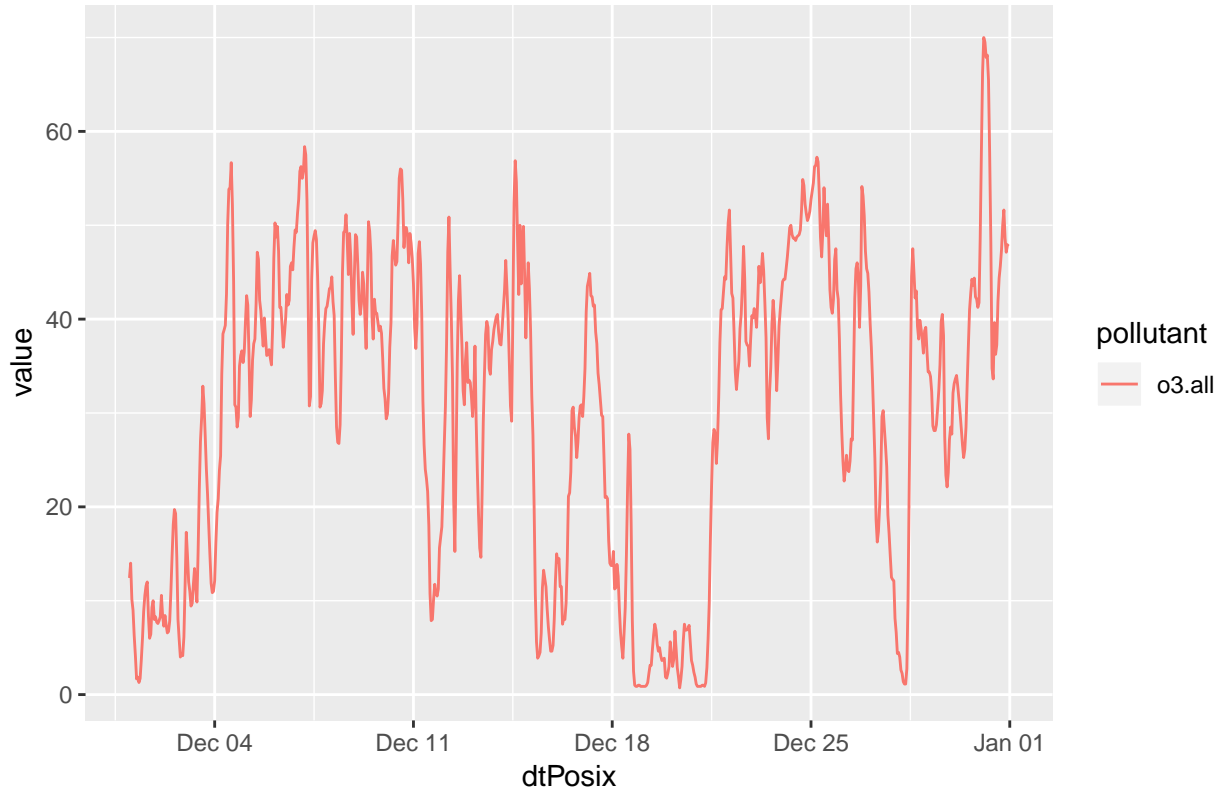
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```



```
plot.pollutant(data, pollutant, month = "12")
```

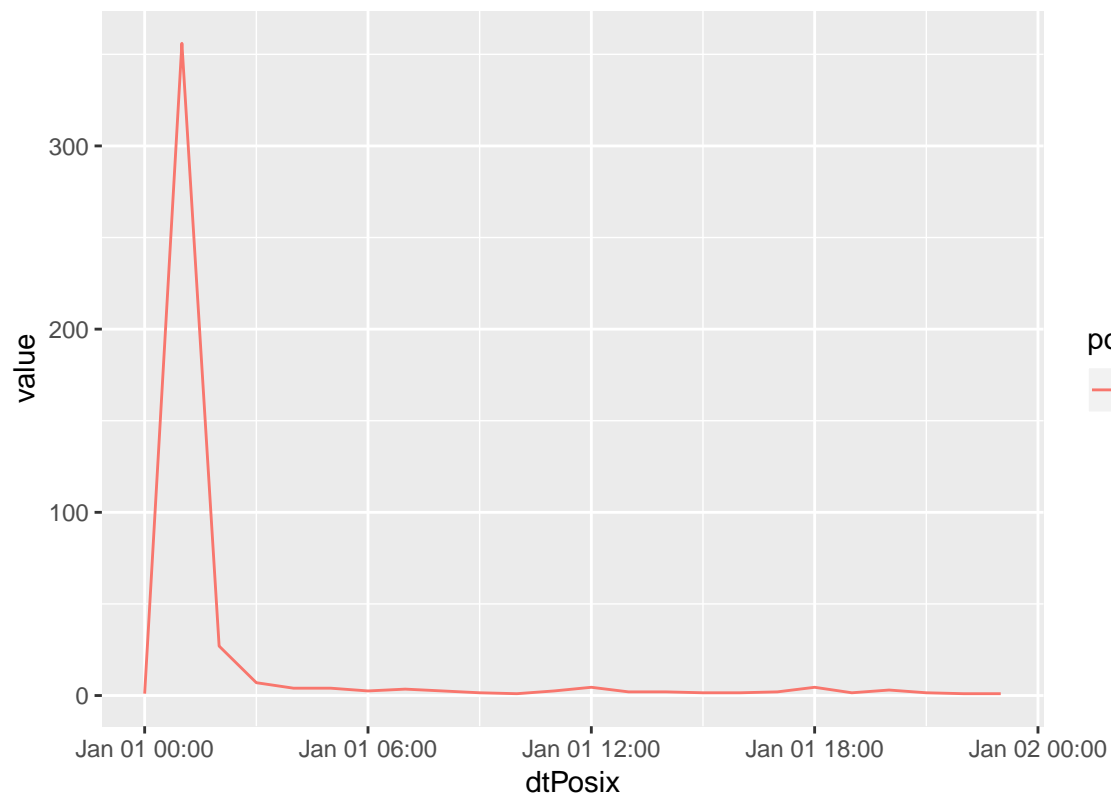


pm10 over the year

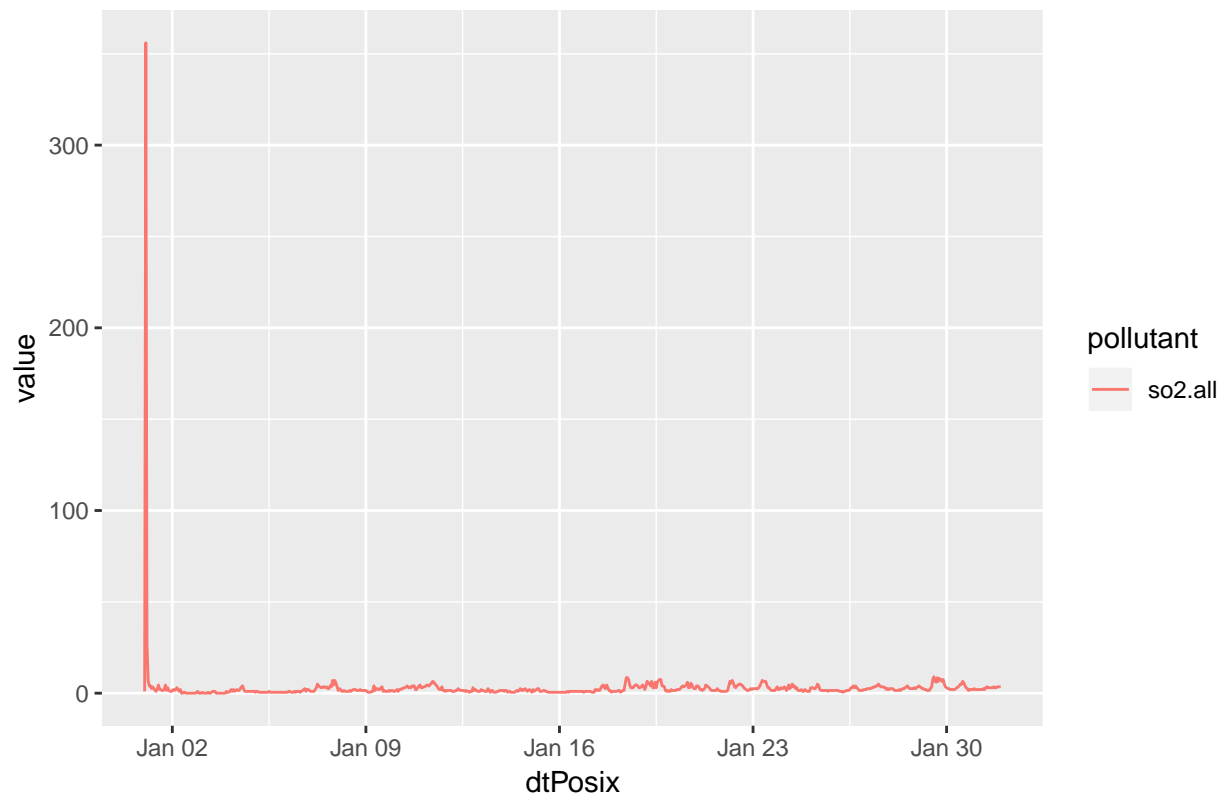
```
pollutant = "so2.all"
```

```
plot.pollutant(data, pollutant, month = "01", day = "01", title = "1. January with silvester firework p
```

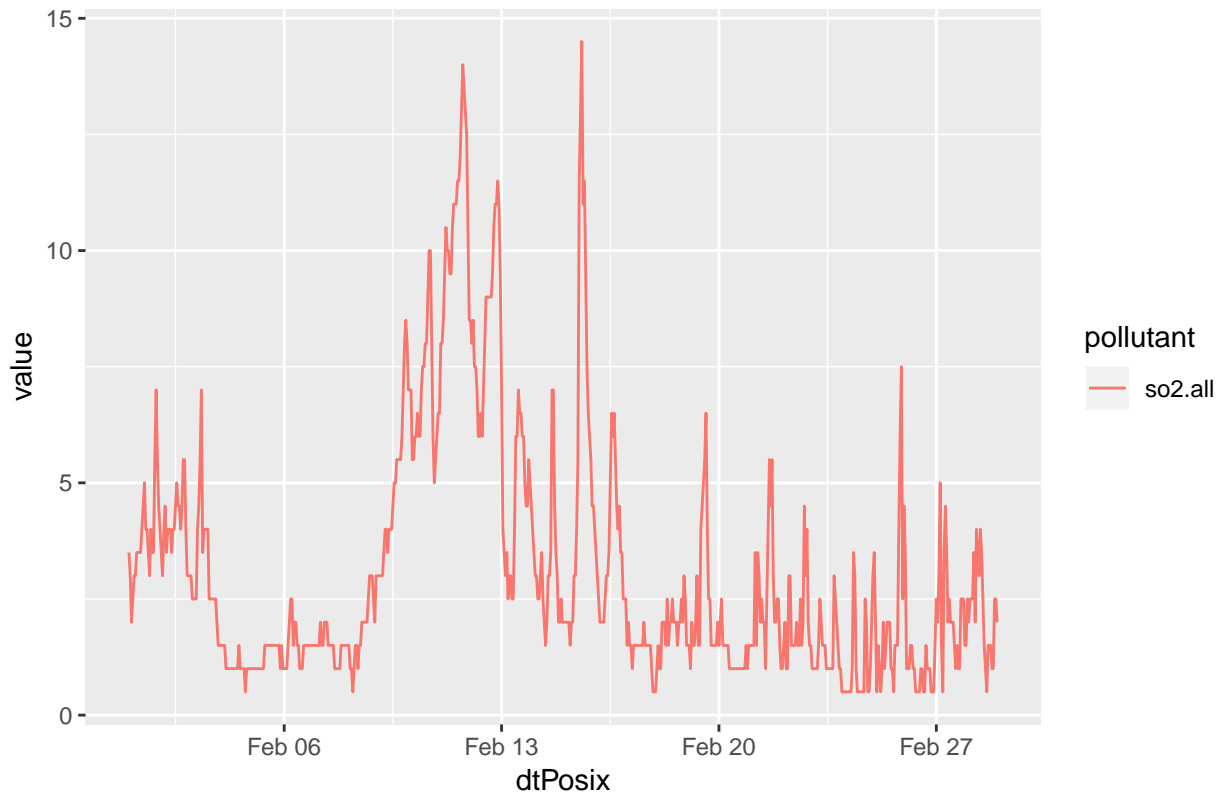
1. January with silvester firework peak



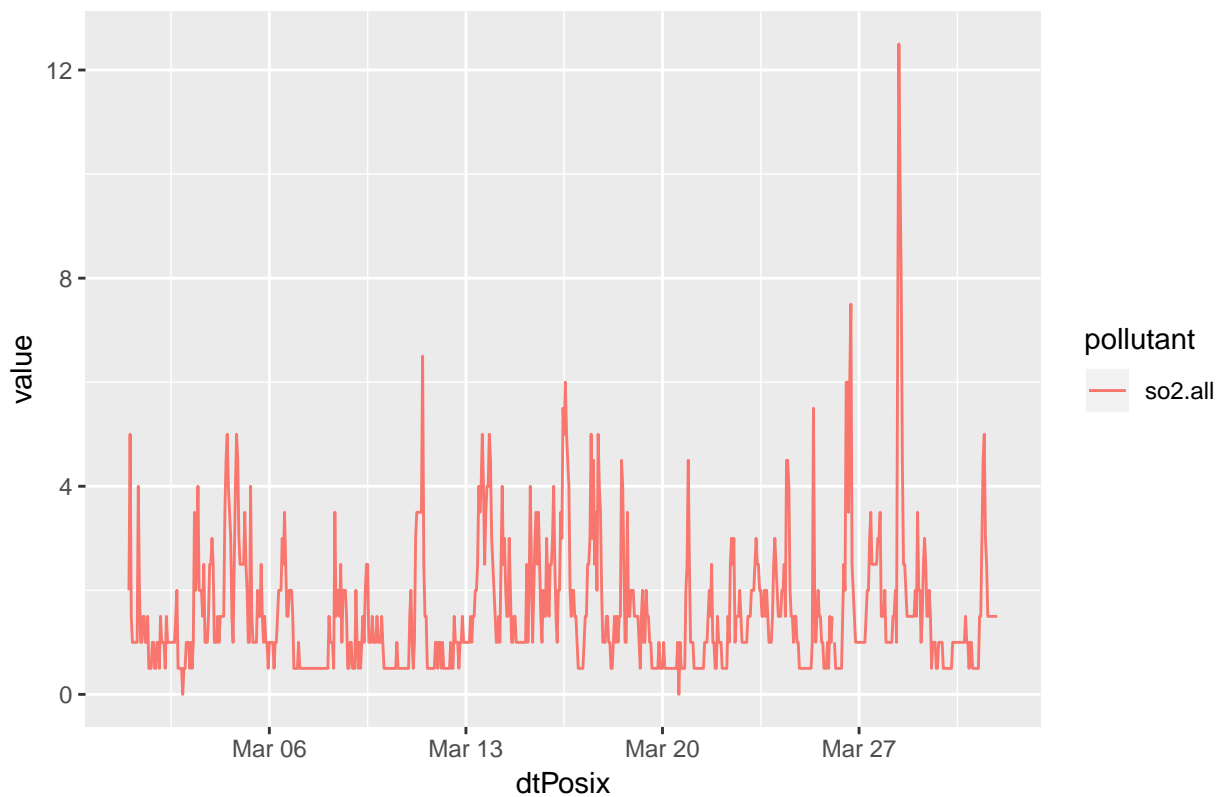
```
plot.pollutant(data, pollutant, month = "01")
```



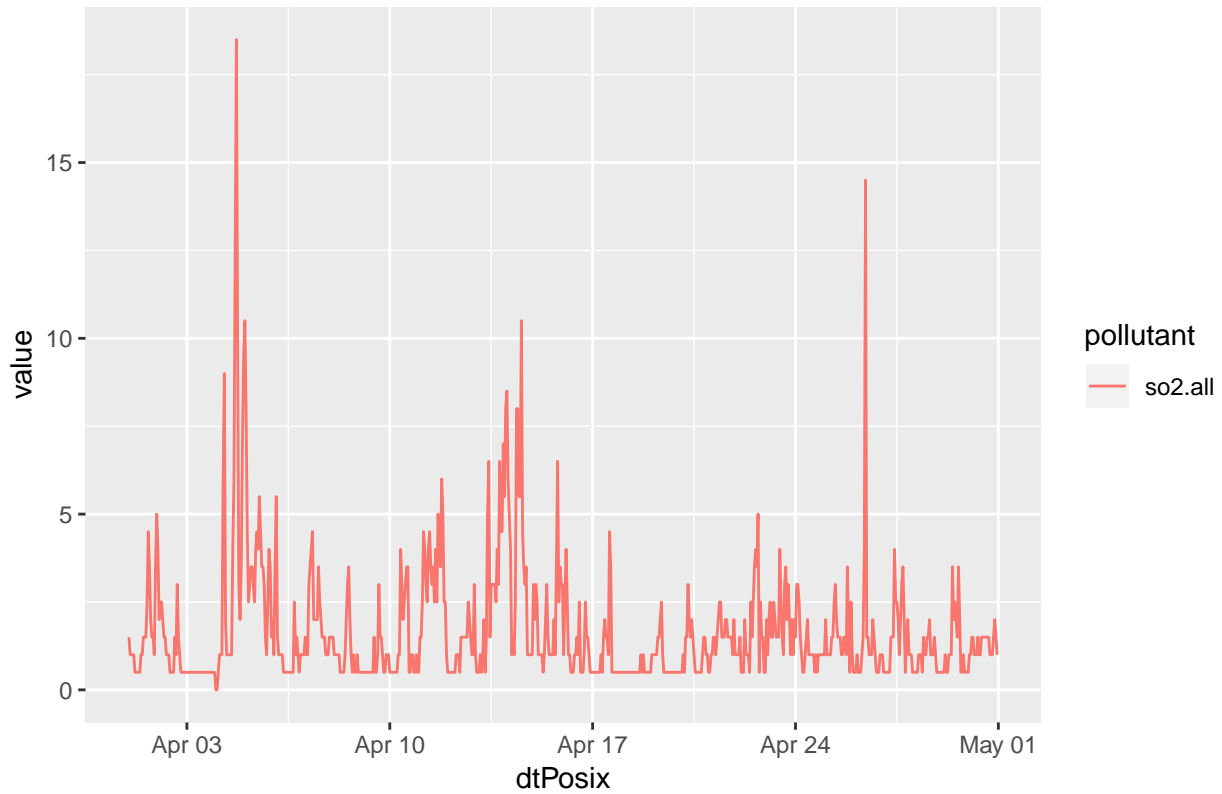
```
plot.pollutant(data, pollutant, month = "02")
```



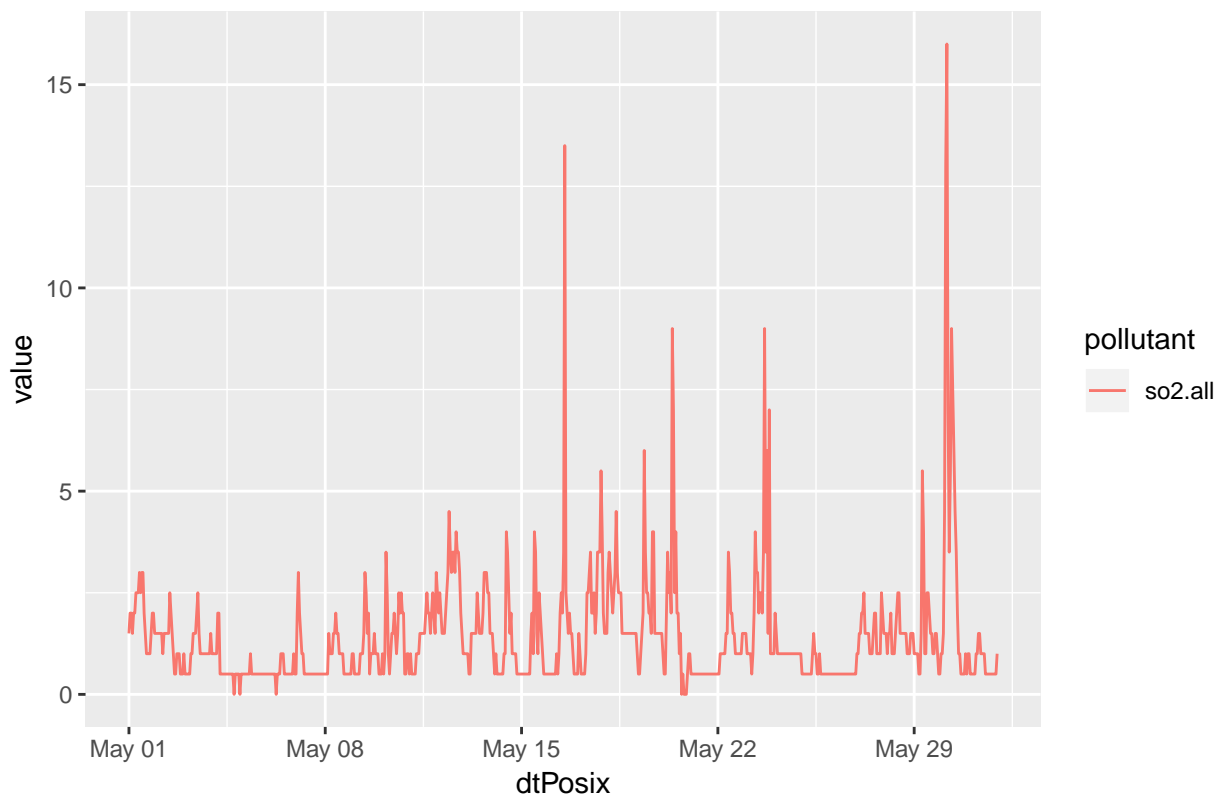
```
plot.pollutant(data, pollutant, month = "03")
```



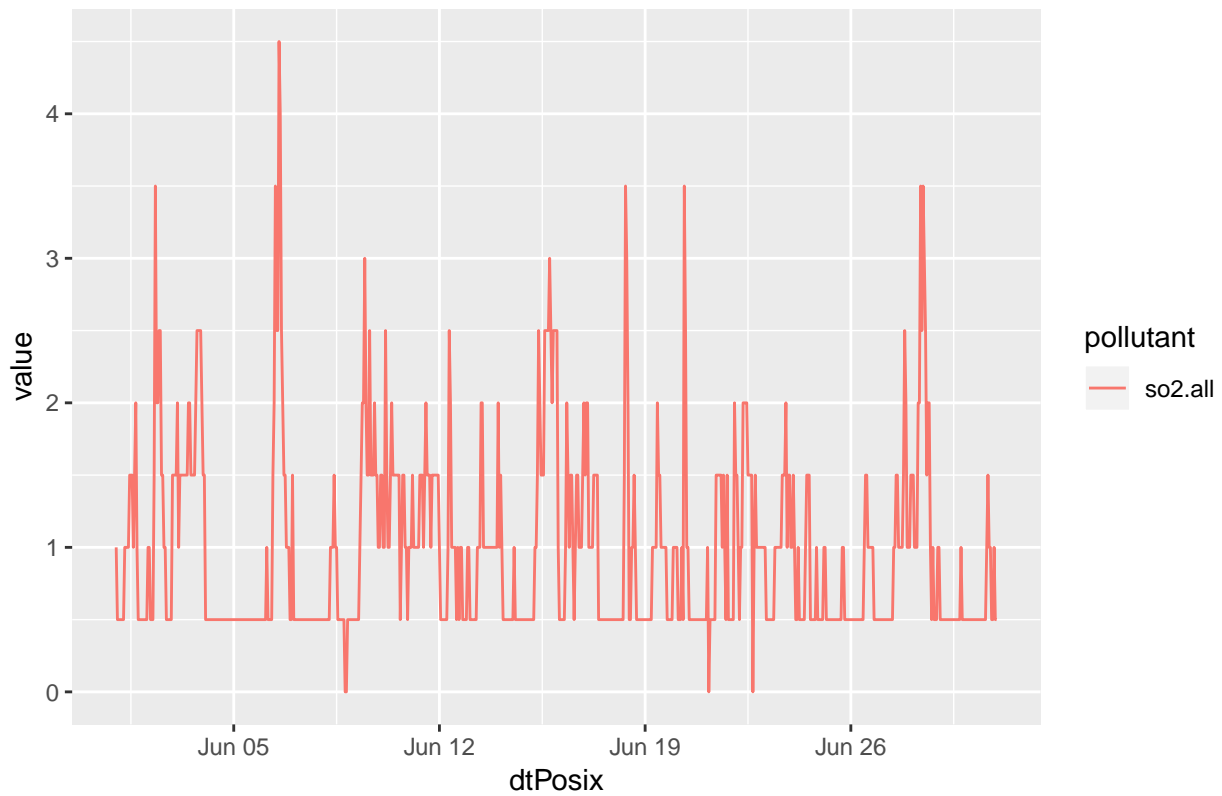
```
plot.pollutant(data, pollutant, month = "04")
```



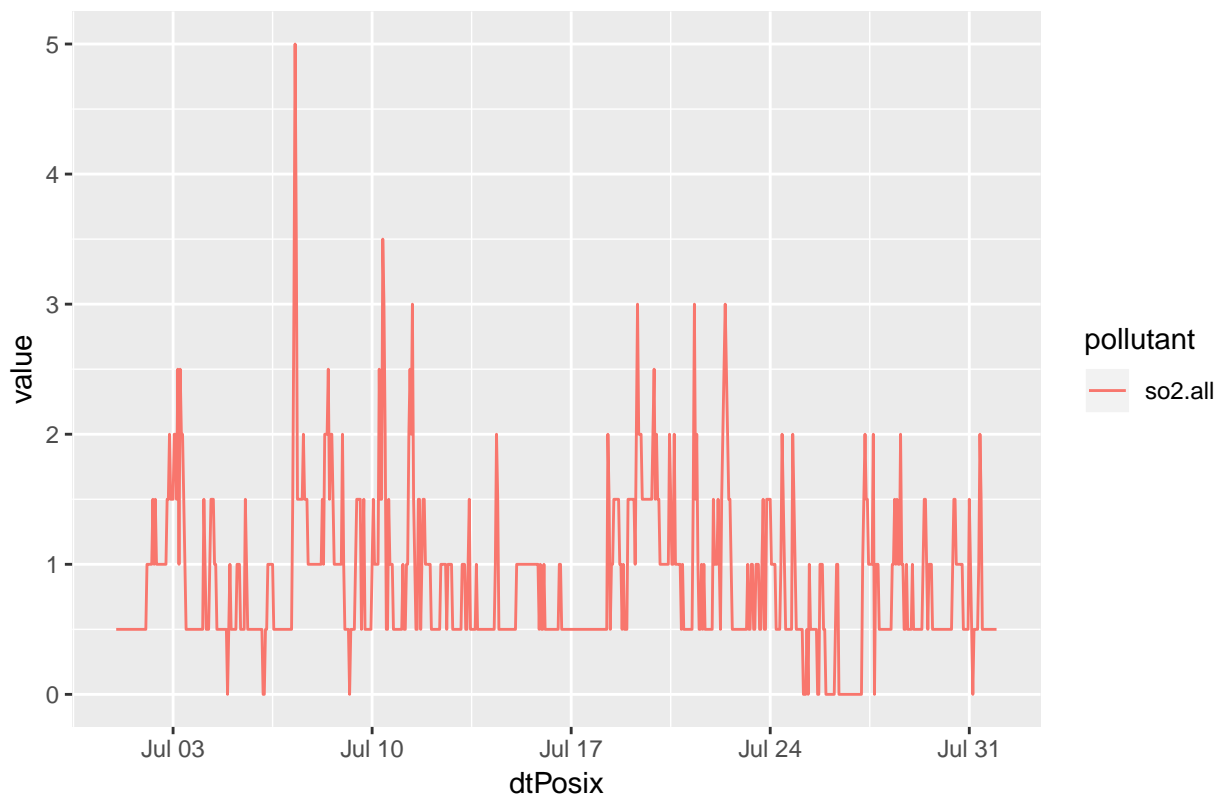
```
plot.pollutant(data, pollutant, month = "05")
```



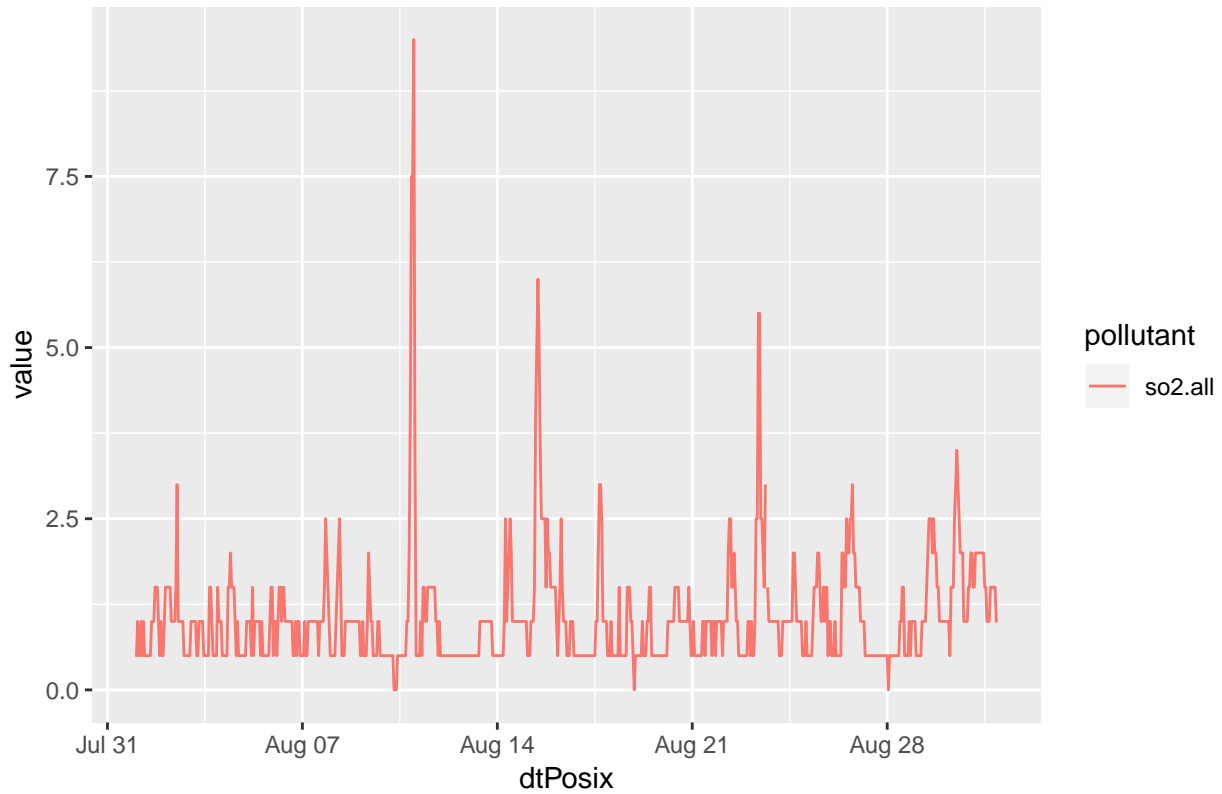

```
plot.pollutant(data, pollutant, month = "06")
```



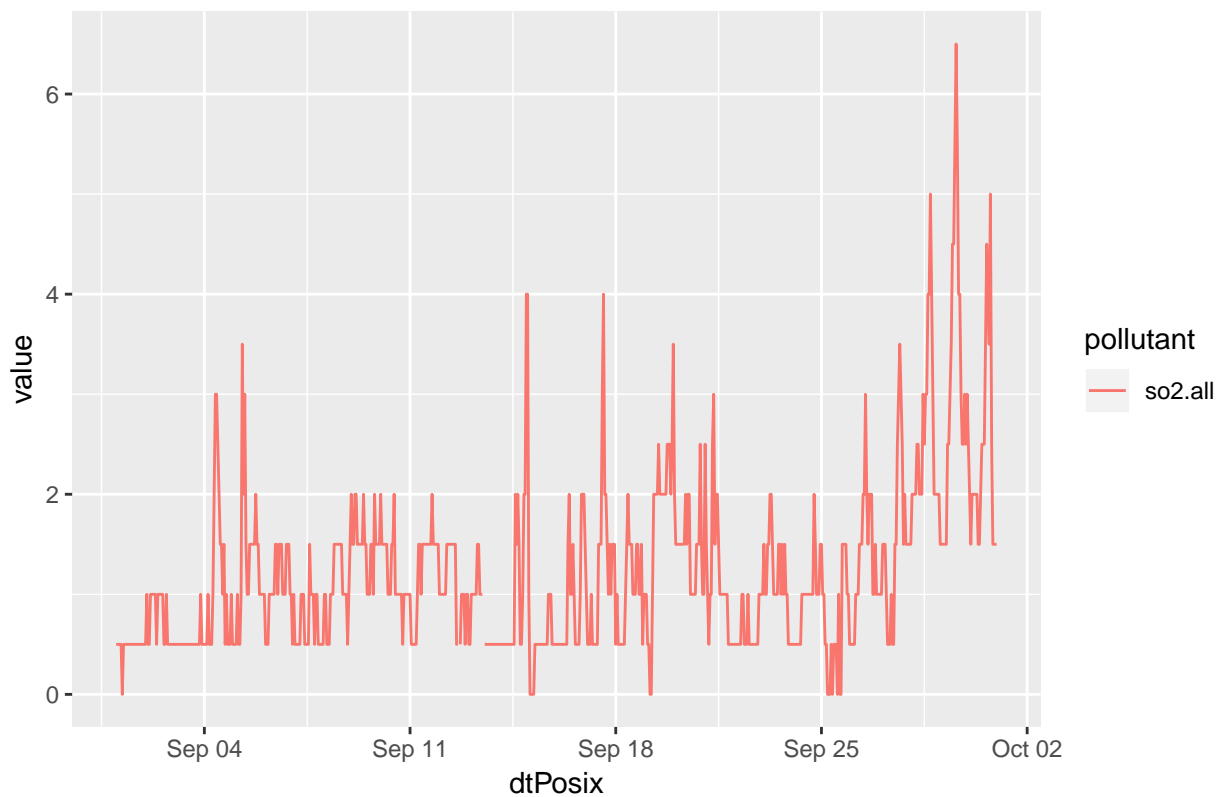
```
plot.pollutant(data, pollutant, month = "07")
```



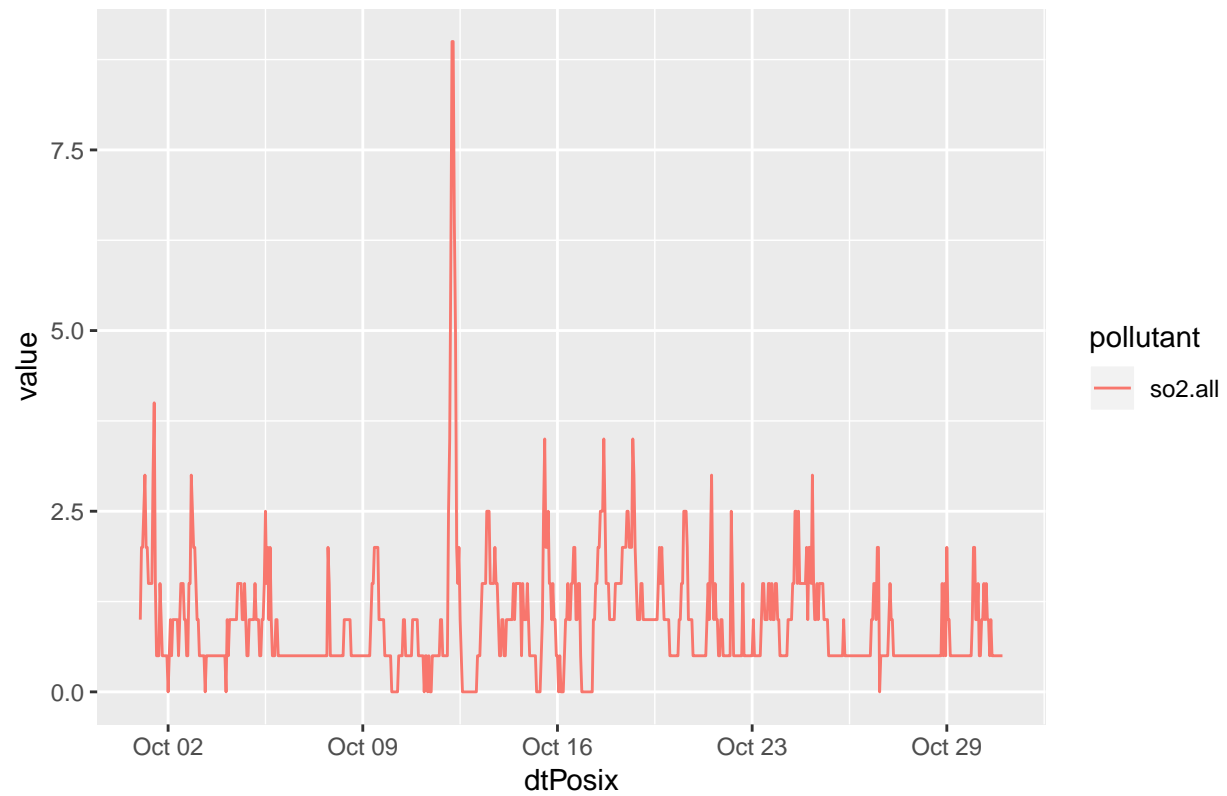
```
plot.pollutant(data, pollutant, month = "08")
```



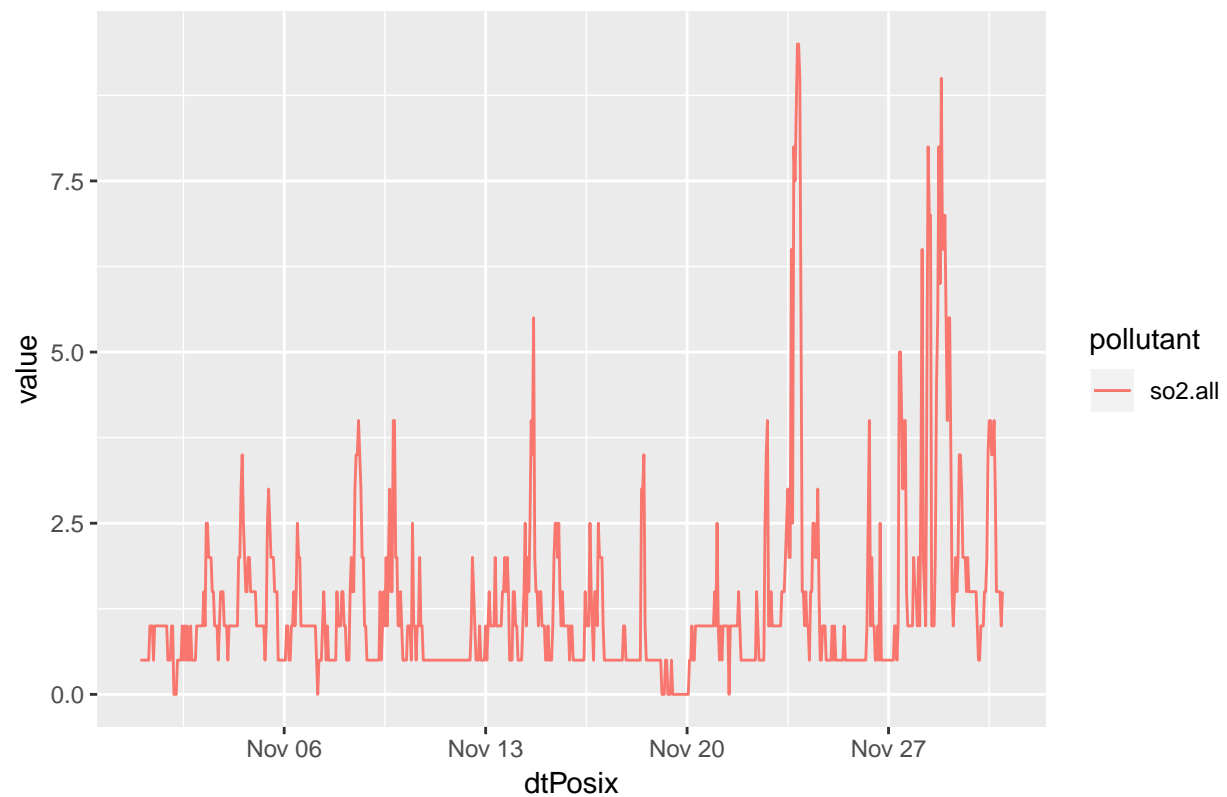
```
plot.pollutant(data, pollutant, month = "09")
```



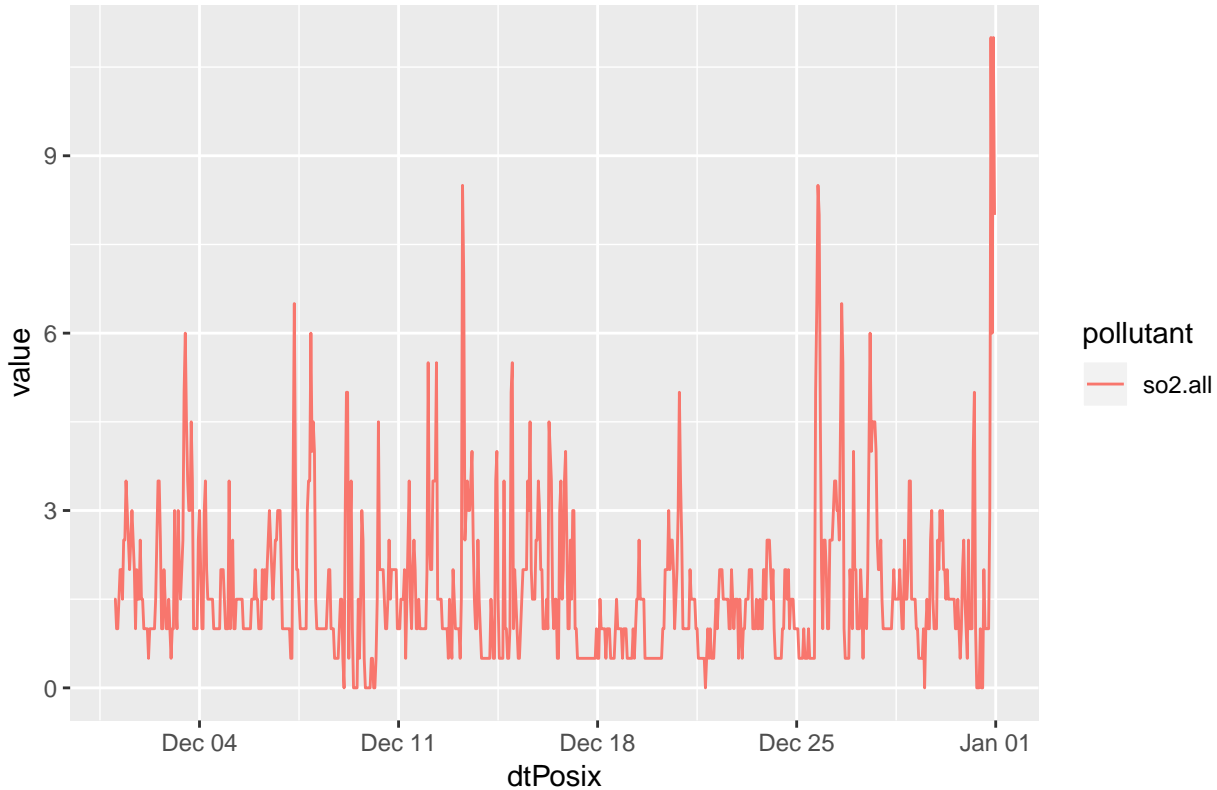
```
plot.pollutant(data, pollutant, month = "10")
```



```
plot.pollutant(data, pollutant, month = "11")
```



```
plot.pollutant(data, pollutant, month = "12")
```



pm10 to wind

```
ddply(data, ~wind_speed, summarise, mean=mean(pm10.all), sd=sd(pm10.all))
```

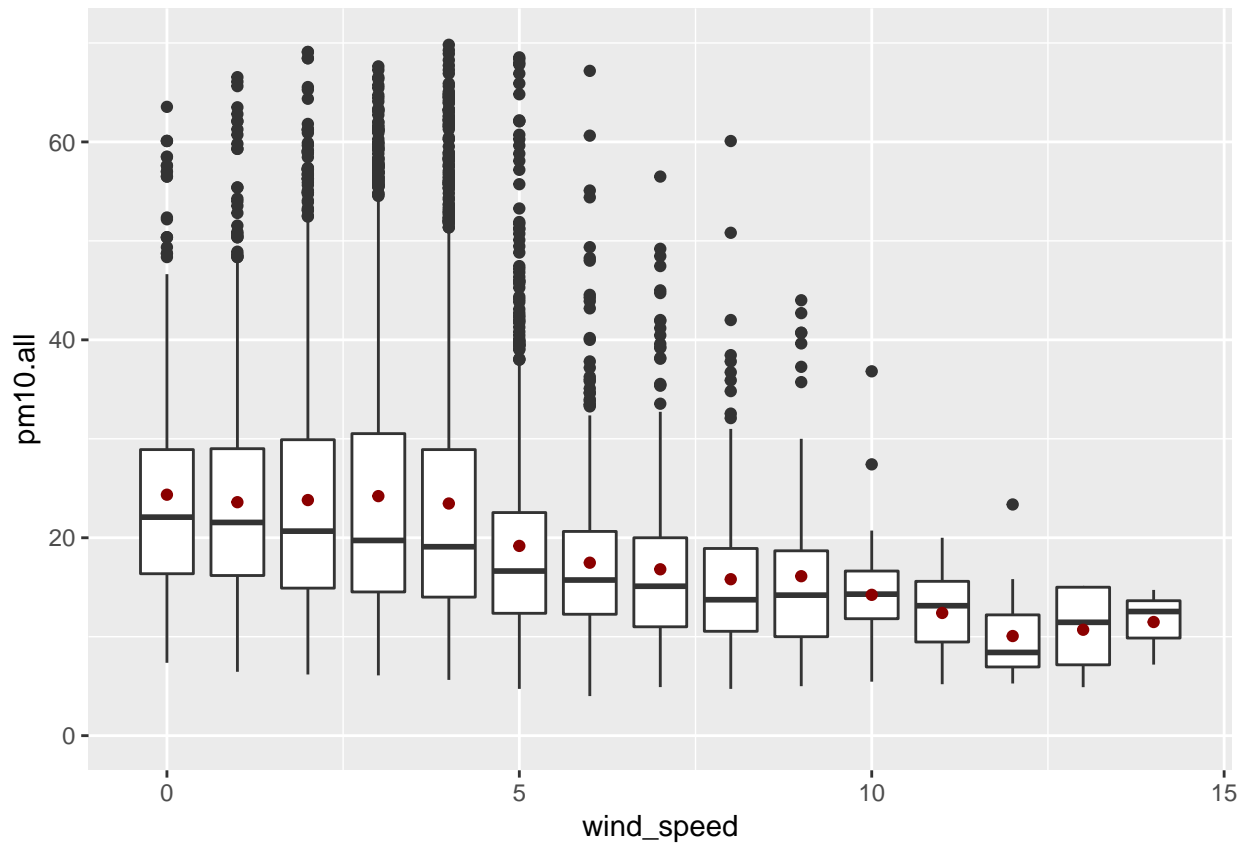
##	wind_speed	mean	sd
## 1	0	NaN	NA
## 2	1	24.62028	12.824234
## 3	2	24.51964	13.627923
## 4	3	24.87149	15.505208
## 5	4	23.70113	14.202870
## 6	5	19.64384	11.409988
## 7	6	17.64411	8.435926
## 8	7	16.81300	8.210615
## 9	8	15.80897	7.954025
## 10	9	16.11355	8.533584
## 11	10	14.22970	5.296145
## 12	11	12.40152	4.317754
## 13	12	10.06764	4.912452
## 14	13	10.70227	5.112376
## 15	14	11.48485	3.882929
## 16	NA	31.43673	23.336396

```
ggplot(data, aes(wind_speed, pm10.all, group = wind_speed)) + geom_boxplot() + ylim(0, 70) + stat_summary
```

```
## Warning: Removed 37 rows containing missing values (stat_boxplot).
```

```
## Warning: Removed 76 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 113 rows containing non-finite values (stat_summary).
```



```
ddply(data, ~wind_deg, summarise, mean=mean(pm10.all), sd=sd(pm10.all))
```

##	wind_deg	mean	sd
## 1	0	23.439081	10.1746729
## 2	8	40.272727	NA
## 3	10	17.366545	7.4357903
## 4	16	30.636364	NA
## 5	18	14.727273	NA
## 6	20	17.325344	7.7000560
## 7	30	17.371488	7.7332944
## 8	33	14.181818	NA
## 9	40	22.655844	8.6880343
## 10	50	27.890775	11.5895915
## 11	55	17.545455	NA
## 12	59	80.181818	NA
## 13	60	26.110281	12.1602315
## 14	62	16.181818	NA
## 15	69	74.515152	1.0653573
## 16	70	31.992737	14.9955120
## 17	71	74.727273	0.4165978
## 18	74	21.000000	NA
## 19	75	12.636364	NA
## 20	76	77.939394	1.3246965
## 21	77	75.909091	1.8652986
## 22	80	35.487062	16.4837790
## 23	84	45.409091	0.7071068

## 24	85	91.339394	4.5842105
## 25	86	82.242424	2.0456229
## 26	89	63.568182	30.5347542
## 27	90	39.520979	16.9210732
## 28	93	81.272727	4.6283353
## 29	94	81.136364	2.0442758
## 30	100	NaN	NA
## 31	104	25.818182	NA
## 32	105	31.636364	NA
## 33	110	33.489284	13.5421474
## 34	111	18.111111	NA
## 35	117	107.418182	7.3809393
## 36	118	83.590909	9.1923882
## 37	120	33.781589	14.6015828
## 38	121	30.575758	6.2458802
## 39	126	23.636364	NA
## 40	130	33.517238	16.1007386
## 41	136	59.454545	NA
## 42	137	14.636364	NA
## 43	140	28.968607	14.7032855
## 44	147	13.363636	NA
## 45	148	19.090909	NA
## 46	150	29.103424	13.4027908
## 47	155	20.636364	NA
## 48	157	20.363636	NA
## 49	158	91.090909	NA
## 50	160	25.472720	11.2991433
## 51	161	28.772727	0.1928473
## 52	170	25.467934	11.0836558
## 53	172	38.000000	NA
## 54	176	123.060606	25.2056555
## 55	179	26.833333	NA
## 56	180	22.827085	9.4772448
## 57	185	15.727273	NA
## 58	186	14.818182	NA
## 59	190	21.448922	8.6939590
## 60	197	114.696970	15.6522998
## 61	200	19.652457	9.2645797
## 62	201	36.909091	NA
## 63	202	18.818182	NA
## 64	205	22.303030	6.6966955
## 65	210	19.371407	8.7276684
## 66	211	54.487273	33.3804699
## 67	212	15.000000	NA
## 68	213	20.636364	NA
## 69	216	41.454545	NA
## 70	218	12.700000	NA
## 71	219	56.939394	2.4331277
## 72	220	19.707808	17.9657803
## 73	221	26.636364	3.1342769
## 74	222	58.363636	3.0788535
## 75	225	48.454545	NA
## 76	229	12.818182	NA
## 77	230	19.526914	10.7201927

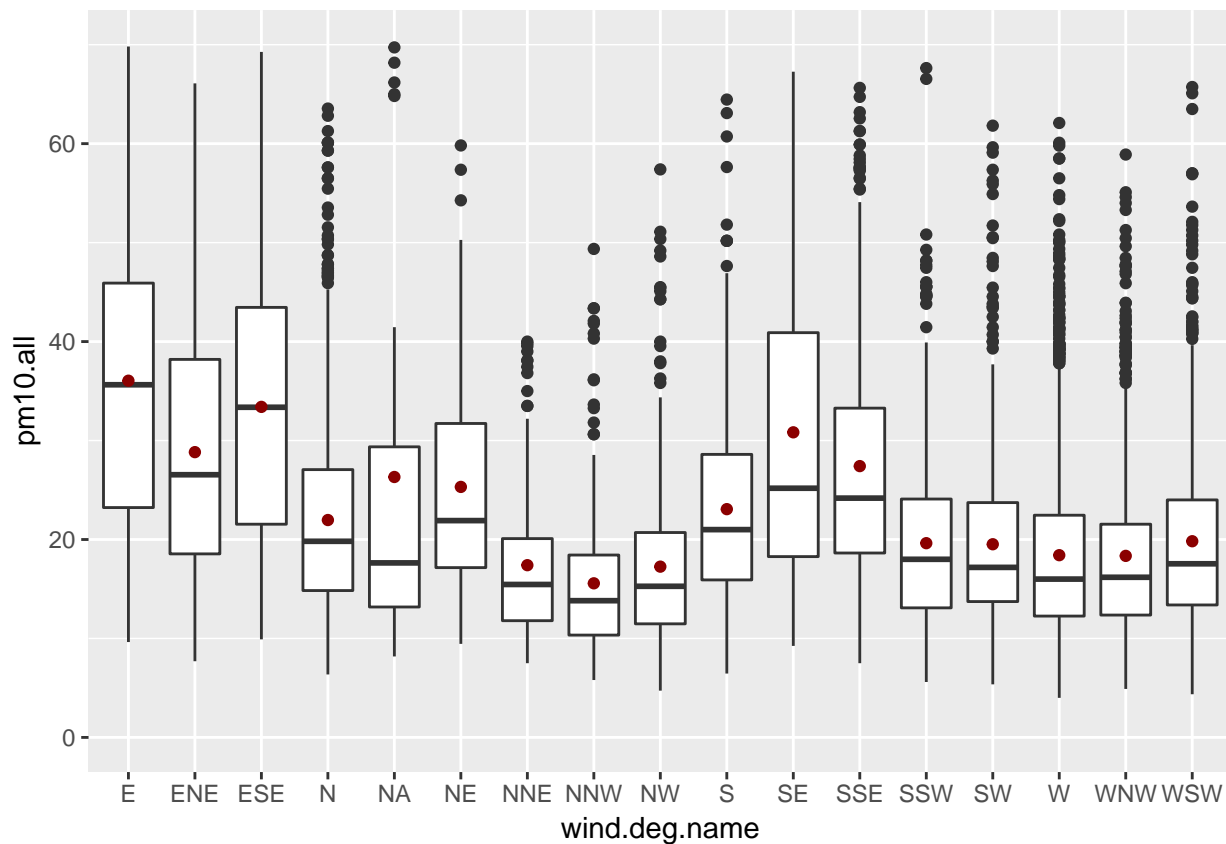
## 78	231	23.522727	8.6123670
## 79	233	22.272727	1.2629495
## 80	236	14.000000	NA
## 81	237	61.295455	18.5616945
## 82	238	25.090909	1.8641906
## 83	239	37.072727	15.6974354
## 84	240	19.414711	8.5060570
## 85	241	29.363636	1.7415676
## 86	242	24.981818	10.8050723
## 87	243	31.533535	10.0001414
## 88	244	30.363636	4.1575382
## 89	245	45.800000	4.3508620
## 90	246	34.077778	0.2268953
## 91	248	21.606061	1.2931266
## 92	250	18.683635	8.4477944
## 93	251	25.849091	7.2634475
## 94	252	34.296296	1.7824014
## 95	254	53.150000	34.5000677
## 96	255	39.545455	1.8785435
## 97	256	59.992593	15.9719250
## 98	258	29.545455	5.0049562
## 99	259	22.262626	6.9836652
## 100	260	19.174200	9.9186656
## 101	261	17.090909	0.5529784
## 102	264	16.409091	2.1570565
## 103	265	13.681818	0.5785419
## 104	266	17.090909	NA
## 105	267	22.151515	3.6998250
## 106	269	41.909091	NA
## 107	270	18.076298	8.6212739
## 108	271	10.181818	NA
## 109	273	18.472727	1.6280090
## 110	275	22.624242	5.1493775
## 111	276	16.696970	1.8946059
## 112	278	18.000000	0.5061604
## 113	279	17.363636	NA
## 114	280	17.837229	8.1001190
## 115	281	14.060606	2.5589469
## 116	282	19.545455	NA
## 117	284	21.975758	14.7755870
## 118	286	18.818182	NA
## 119	287	9.000000	0.8672175
## 120	288	34.866667	5.6923340
## 121	290	18.068338	8.4538859
## 122	293	15.000000	NA
## 123	294	21.090909	NA
## 124	297	18.272727	3.7283812
## 125	298	20.454545	NA
## 126	299	38.592593	0.8111365
## 127	300	17.993842	8.8554372
## 128	302	35.229630	2.3032273
## 129	303	30.681818	2.7641447
## 130	305	16.181818	NA
## 131	308	17.909091	NA

```
## 132      310  17.299177  8.8698140
## 133      314  10.090909         NA
## 134      315  24.575758  1.6023399
## 135      316  20.636364  8.6138462
## 136      317  15.454545         NA
## 137      318  11.545455         NA
## 138      319  14.863636  0.7071068
## 139      320  16.726275  8.1919670
## 140      323  40.000000         NA
## 141      326  19.000000         NA
## 142      327  22.706061 15.2370697
## 143      330  16.404959  7.7005749
## 144      340  14.668506  8.1298567
## 145      348   9.454545         NA
## 146      350  17.205822  9.7601901
## 147      351  15.600000         NA
## 148      353  19.818182         NA
## 149      360  15.270253  5.3834361
## 150       NA  31.436732 23.3363956
```

```
ggplot(data, aes(wind.deg.name, pm10.all, group = wind.deg.name)) + geom_boxplot() + ylim(0, 70) + stat_s
```

```
## Warning: Removed 80 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 80 rows containing non-finite values (stat_summary).
```



```
ddply(data, ~wind_deg, summarise, mean=mean(pm10.all), sd=sd(pm10.all))
```

```
##      wind_deg      mean      sd
```


## 1	0	23.439081	10.1746729
## 2	8	40.272727	NA
## 3	10	17.366545	7.4357903
## 4	16	30.636364	NA
## 5	18	14.727273	NA
## 6	20	17.325344	7.7000560
## 7	30	17.371488	7.7332944
## 8	33	14.181818	NA
## 9	40	22.655844	8.6880343
## 10	50	27.890775	11.5895915
## 11	55	17.545455	NA
## 12	59	80.181818	NA
## 13	60	26.110281	12.1602315
## 14	62	16.181818	NA
## 15	69	74.515152	1.0653573
## 16	70	31.992737	14.9955120
## 17	71	74.727273	0.4165978
## 18	74	21.000000	NA
## 19	75	12.636364	NA
## 20	76	77.939394	1.3246965
## 21	77	75.909091	1.8652986
## 22	80	35.487062	16.4837790
## 23	84	45.409091	0.7071068
## 24	85	91.339394	4.5842105
## 25	86	82.242424	2.0456229
## 26	89	63.568182	30.5347542
## 27	90	39.520979	16.9210732
## 28	93	81.272727	4.6283353
## 29	94	81.136364	2.0442758
## 30	100	NaN	NA
## 31	104	25.818182	NA
## 32	105	31.636364	NA
## 33	110	33.489284	13.5421474
## 34	111	18.111111	NA
## 35	117	107.418182	7.3809393
## 36	118	83.590909	9.1923882
## 37	120	33.781589	14.6015828
## 38	121	30.575758	6.2458802
## 39	126	23.636364	NA
## 40	130	33.517238	16.1007386
## 41	136	59.454545	NA
## 42	137	14.636364	NA
## 43	140	28.968607	14.7032855
## 44	147	13.363636	NA
## 45	148	19.090909	NA
## 46	150	29.103424	13.4027908
## 47	155	20.636364	NA
## 48	157	20.363636	NA
## 49	158	91.090909	NA
## 50	160	25.472720	11.2991433
## 51	161	28.772727	0.1928473
## 52	170	25.467934	11.0836558
## 53	172	38.000000	NA
## 54	176	123.060606	25.2056555

## 55	179	26.833333	NA
## 56	180	22.827085	9.4772448
## 57	185	15.727273	NA
## 58	186	14.818182	NA
## 59	190	21.448922	8.6939590
## 60	197	114.696970	15.6522998
## 61	200	19.652457	9.2645797
## 62	201	36.909091	NA
## 63	202	18.818182	NA
## 64	205	22.303030	6.6966955
## 65	210	19.371407	8.7276684
## 66	211	54.487273	33.3804699
## 67	212	15.000000	NA
## 68	213	20.636364	NA
## 69	216	41.454545	NA
## 70	218	12.700000	NA
## 71	219	56.939394	2.4331277
## 72	220	19.707808	17.9657803
## 73	221	26.636364	3.1342769
## 74	222	58.363636	3.0788535
## 75	225	48.454545	NA
## 76	229	12.818182	NA
## 77	230	19.526914	10.7201927
## 78	231	23.522727	8.6123670
## 79	233	22.272727	1.2629495
## 80	236	14.000000	NA
## 81	237	61.295455	18.5616945
## 82	238	25.090909	1.8641906
## 83	239	37.072727	15.6974354
## 84	240	19.414711	8.5060570
## 85	241	29.363636	1.7415676
## 86	242	24.981818	10.8050723
## 87	243	31.533535	10.0001414
## 88	244	30.363636	4.1575382
## 89	245	45.800000	4.3508620
## 90	246	34.077778	0.2268953
## 91	248	21.606061	1.2931266
## 92	250	18.683635	8.4477944
## 93	251	25.849091	7.2634475
## 94	252	34.296296	1.7824014
## 95	254	53.150000	34.5000677
## 96	255	39.545455	1.8785435
## 97	256	59.992593	15.9719250
## 98	258	29.545455	5.0049562
## 99	259	22.262626	6.9836652
## 100	260	19.174200	9.9186656
## 101	261	17.090909	0.5529784
## 102	264	16.409091	2.1570565
## 103	265	13.681818	0.5785419
## 104	266	17.090909	NA
## 105	267	22.151515	3.6998250
## 106	269	41.909091	NA
## 107	270	18.076298	8.6212739
## 108	271	10.181818	NA

```
## 109      273  18.472727  1.6280090
## 110      275  22.624242  5.1493775
## 111      276  16.696970  1.8946059
## 112      278  18.000000  0.5061604
## 113      279  17.363636      NA
## 114      280  17.837229  8.1001190
## 115      281  14.060606  2.5589469
## 116      282  19.545455      NA
## 117      284  21.975758 14.7755870
## 118      286  18.818182      NA
## 119      287   9.000000  0.8672175
## 120      288  34.866667  5.6923340
## 121      290  18.068338  8.4538859
## 122      293  15.000000      NA
## 123      294  21.090909      NA
## 124      297  18.272727  3.7283812
## 125      298  20.454545      NA
## 126      299  38.592593  0.8111365
## 127      300  17.993842  8.8554372
## 128      302  35.229630  2.3032273
## 129      303  30.681818  2.7641447
## 130      305  16.181818      NA
## 131      308  17.909091      NA
## 132      310  17.299177  8.8698140
## 133      314  10.090909      NA
## 134      315  24.575758  1.6023399
## 135      316  20.636364  8.6138462
## 136      317  15.454545      NA
## 137      318  11.545455      NA
## 138      319  14.863636  0.7071068
## 139      320  16.726275  8.1919670
## 140      323  40.000000      NA
## 141      326  19.000000      NA
## 142      327  22.706061 15.2370697
## 143      330  16.404959  7.7005749
## 144      340  14.668506  8.1298567
## 145      348   9.454545      NA
## 146      350  17.205822  9.7601901
## 147      351  15.600000      NA
## 148      353  19.818182      NA
## 149      360  15.270253  5.3834361
## 150      NA  31.436732 23.3363956
```

```
ggplot(data, aes(wind.deg.name, wind_speed, group = wind.deg.name)) + geom_boxplot() + ylim(0, 15) + sta
```

```
## Warning: Removed 37 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 37 rows containing non-finite values (stat_summary).
```

