data below are daily data

from 2019 23th March to 31st May

and from 2020 23th March to 31st May

NO_2

The lockdown has impact on emission of NO_2, NO_2 emission(23thMarch-31thMay) in 2019 higher than NO_2 emission(23thMarch-31thMay) in 2020.

```
> summary(TTN_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  13.68   28.02   35.37   35.15   42.73   72.07
> summary(TTT_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.442  12.172  15.717  18.273  21.366  46.450
> t.test(TTN_m_m_no2, TTT_m_m_no2)

        Welch Two Sample t-test

data:  TTN_m_m_no2 and TTT_m_m_no2
t = 9.6797, df = 131.47, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 13.43157 20.33153
sample estimates:
mean of x mean of y
 35.15424  18.27269

> wilcox.test(TTN_m_m_no2, TTT_m_m_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_no2 and TTT_m_m_no2
W = 4318, p-value = 7.086e-15
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

The lockdown has impact on emission of PM2.5, PM2.5 emission(23thMarch-31thMay) in 2019 higher than PM2.5 emission(23thMarch-31thMay) in 2020.

```
> summary(TTN_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.175   8.305  10.997  14.961  15.919  52.312
> summary(TTT_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.144   5.803   7.833   9.652  12.249  28.856
> t.test(TTN_m_m_pm2.5, TTT_m_m_pm2.5)

        Welch Two Sample t-test

data:  TTN_m_m_pm2.5 and TTT_m_m_pm2.5
t = 3.9052, df = 110.92, p-value = 0.0001621
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 2.615364 8.003627
sample estimates:
mean of x mean of y
14.961088  9.651592

> wilcox.test(TTN_m_m_pm2.5, TTT_m_m_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_pm2.5 and TTT_m_m_pm2.5
W = 3498, p-value = 1.268e-05
alternative hypothesis: true location shift is not equal to 0
```

O_3

The lockdown has impact on emission of O_3, O_3 emission(23thMarch-31thMay) in 2020 higher than O_3 emission(23thMarch-31thMay) in 2019.

```
> summary(TTN_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  14.42   38.84   46.52   45.90   53.15   97.16
> summary(TTT_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  31.33   48.45   57.42   57.34   65.59   83.22
> t.test(TTN_m_m_o3, TTT_m_m_o3)

        Welch Two Sample t-test

data:  TTN_m_m_o3 and TTT_m_m_o3
t = -5.5915, df = 133.56, p-value = 1.22e-07
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -15.483179  -7.391681
sample estimates:
mean of x mean of y
 45.90414  57.34157

> wilcox.test(TTN_m_m_o3, TTT_m_m_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_o3 and TTT_m_m_o3
W = 1183, p-value = 1.304e-07
alternative hypothesis: true location shift is not equal to 0
```

NO

The lockdown has impact on emission of NO,
NO emission(23thMarch-31thMay) in 2019 higher than
NO emission(23thMarch-31thMay) in 2020.

```
> summary(TTN_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.471   4.583   7.935   8.933  11.023  36.125
> summary(TTT_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.6868  1.3306  1.8775  3.2304  3.2051 16.4891
> t.test(TTN_m_m_no, TTT_m_m_no)

        Welch Two Sample t-test

data:  TTN_m_m_no and TTT_m_m_no
t = 6.6889, df = 108.62, p-value = 1.012e-09
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 4.012590 7.391948
sample estimates:
mean of x mean of y
 8.932690  3.230421

> wilcox.test(TTN_m_m_no, TTT_m_m_no)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_no and TTT_m_m_no
W = 4253, p-value = 5.821e-14
alternative hypothesis: true location shift is not equal to 0
```

SO_2

The lockdown has impact on emission of SO_2, SO_2 emission(23thMarch-31thMay) in 2019 higher than SO_2 emission(23thMarch-31thMay) in 2020.

```
> summary(TTN_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.423   1.935   2.542   2.644   3.149   4.937
> summary(TTT_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.4481  0.8187  1.1630  1.2523  1.5745  2.8586
> t.test(TTN_m_m_so2, TTT_m_m_so2)

        Welch Two Sample t-test

data:  TTN_m_m_so2 and TTT_m_m_so2
t = 11.359, df = 114.44, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 1.148795 1.634120
sample estimates:
mean of x mean of y
 2.643774  1.252316

> wilcox.test(TTN_m_m_so2, TTT_m_m_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_so2 and TTT_m_m_so2
W = 4563, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

ws， t.test 的结果应该显示p值应该>0.05，意味着零假设是正确的，也就是说2020年和2019年之间的 ws的差异是由随机误差导致的

The results of t.test and Wilcoxon Rank Sum Test show that p-value>0.05, which means that the null hypothesis is correct, that is, the difference in ws between 2020 and 2019 is caused by random error.

```
> summary(TTN_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.450   2.281   2.640   2.965   3.630   7.104
> summary(TTT_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.300   2.254   2.685   3.056   3.658   6.842
> t.test(TTN_m_m_ws, TTT_m_m_ws)

        Welch Two Sample t-test

data:  TTN_m_m_ws and TTT_m_m_ws
t = -0.46293, df = 136.09, p-value = 0.6442
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.4816781  0.2989400
sample estimates:
mean of x mean of y
  2.96494   3.05631

> wilcox.test(TTN_m_m_ws, TTT_m_m_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_ws and TTT_m_m_ws
W = 2400, p-value = 0.8366
alternative hypothesis: true location shift is not equal to 0
```

wd， t.test 的结果应该显示p值应该>0.05，意味着零假设是正确的，也就是说2020年和2019年之间的 wd的差异是由随机误差导致的

The results of t.test and Wilcoxon Rank Sum Test show that p-value>0.05, which means that the null hypothesis is correct, that is, the difference in wd between 2020 and 2019 is caused by random error.

```
> summary(TTN_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  58.48  116.93  176.82  179.65  238.56  324.30
> summary(TTT_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  48.54   99.73  173.85  169.03  226.52  301.70
> t.test(TTN_m_m_wd, TTT_m_m_wd)

        Welch Two Sample t-test

data:  TTN_m_m_wd and TTT_m_m_wd
t = 0.87683, df = 137.94, p-value = 0.3821
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -13.33252  34.57824
sample estimates:
mean of x mean of y
 179.6507  169.0278

> wilcox.test(TTN_m_m_wd, TTT_m_m_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_wd and TTT_m_m_wd
W = 2655, p-value = 0.3941
alternative hypothesis: true location shift is not equal to 0
```

temp， t.test 的结果应该显示p值应该>0.05，意味着零假设是正确的，也就是说2020年和2019年之间的 temp 的差异是由随机误差导致的

The results of t.test and Wilcoxon Rank Sum Test show that p-value>0.05, which means that the null hypothesis is correct, that is, the difference in temp between 2020 and 2019 is caused by random error.

```
> summary(TTN_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.112   6.297   8.619   8.879  10.826  15.467
> summary(TTT_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.087   7.222   9.483   9.581  11.757  16.312
> t.test(TTN_m_m_temp, TTT_m_m_temp)

        Welch Two Sample t-test

data:  TTN_m_m_temp and TTT_m_m_temp
t = -1.3392, df = 137.83, p-value = 0.1827
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.7377938  0.3343414
sample estimates:
mean of x mean of y
 8.879464  9.581190

> wilcox.test(TTN_m_m_temp, TTT_m_m_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_temp and TTT_m_m_temp
W = 2143.5, p-value = 0.2022
alternative hypothesis: true location shift is not equal to 0
```

data below are daily data

from whole year of 2019

and from whole year of 2020(does not include data from 29th February 2020, for keeping the total amount of data consistent)

SO_2

```
> summary(TTN_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.6924  1.8427  2.3459  2.4895  3.0676  5.2660
> summary(TTT_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.2492  0.6807  0.9627  1.1638  1.4754  4.7775
> t.test(TTN_so2, TTT_so2)

        Welch Two Sample t-test

data:  TTN_so2 and TTT_so2
t = 22.697, df = 656.68, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 1.210985 1.440362
sample estimates:
mean of x mean of y
 2.489478  1.163805

> wilcox.test(TTN_so2, TTT_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_so2 and TTT_so2
W = 118775, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

NO

```
> summary(TTN_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.471   6.162  10.890  17.080  19.051 134.522
> summary(TTT_no)
    Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
  0.6868   3.1403   5.5448  10.0069  10.5052 100.2824
> t.test(TTN_no, TTT_no)

        Welch Two Sample t-test

data:  TTN_no and TTT_no
t = 5.8885, df = 668.66, p-value = 6.169e-09
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 4.714855 9.432129
sample estimates:
mean of x mean of y
 17.08037  10.00688

> wilcox.test(TTN_no, TTT_no)

        Wilcoxon rank sum test with continuity correction

data:  TTN_no and TTT_no
W = 93384, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

NO_2

```
> summary(TTN_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  10.90   27.12   34.87   36.40   43.72   80.29
> summary(TTT_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.298  17.304  25.409  27.073  34.365  67.161
> t.test(TTN_no2, TTT_no2)

        Welch Two Sample t-test

data:  TTN_no2 and TTT_no2
t = 9.7417, df = 727.04, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  7.444971 11.203114
sample estimates:
mean of x mean of y
 36.39694  27.07290

> wilcox.test(TTN_no2, TTT_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_no2 and TTT_no2
W = 94205, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

```
> summary(TTN_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.962   6.104   8.979  11.329  13.317  54.467
> summary(TTT_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.778   4.841   6.497   8.101   9.575  38.093
> t.test(TTN_pm2.5, TTT_pm2.5)

        Welch Two Sample t-test

data:  TTN_pm2.5 and TTT_pm2.5
t = 6.4998, df = 618.43, p-value = 1.657e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 2.252668 4.203196
sample estimates:
mean of x mean of y
11.329425  8.101494

> wilcox.test(TTN_pm2.5, TTT_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTN_pm2.5 and TTT_pm2.5
W = 88308, p-value = 2.627e-14
alternative hypothesis: true location shift is not equal to 0
```

O_3

```
> summary(TTN_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.217  16.605  26.282  28.502  38.821  97.161
> summary(TTT_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   1.28   24.31   34.82   36.08   46.40   89.78
> t.test(TTN_o3, TTT_o3)

        Welch Two Sample t-test

data:  TTN_o3 and TTT_o3
t = -6.2021, df = 715.1, p-value = 9.422e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -9.982026 -5.181862
sample estimates:
mean of x mean of y
 28.50209  36.08404

> wilcox.test(TTN_o3, TTT_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTN_o3 and TTT_o3
W = 49506, p-value = 1.917e-09
alternative hypothesis: true location shift is not equal to 0
```

wind speed

2019年的wind speed 总体上略低于2020年的wind speed，两者的差异理论上不是由随机误差导致的，因为两个检测的p-value 都小于0.05

```
> summary(TTN_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  0.400   2.275   2.929   3.225   3.946   8.267
> summary(TTT_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.100   2.454   3.212   3.595   4.717  10.338
> t.test(TTN_ws, TTT_ws)

        Welch Two Sample t-test

data:  TTN_ws and TTT_ws
t = -3.3029, df = 707.17, p-value = 0.001005
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.5895183 -0.1499566
sample estimates:
mean of x mean of y
 3.225491  3.595228

> wilcox.test(TTN_ws, TTT_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTN_ws and TTT_ws
W = 58819, p-value = 0.006228
alternative hypothesis: true location shift is not equal to 0
```

wind direction

```
> summary(TTN_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  37.64  152.07  202.45  194.05  239.88  331.26
> summary(TTT_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  48.54  160.37  209.09  196.33  241.88  333.79
> t.test(TTN_wd, TTT_wd)

        Welch Two Sample t-test

data:  TTN_wd and TTT_wd
t = -0.48985, df = 727.97, p-value = 0.6244
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -11.408121   6.851979
sample estimates:
mean of x mean of y
 194.0548  196.3329

> wilcox.test(TTN_wd, TTT_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTN_wd and TTT_wd
W = 64189, p-value = 0.3949
alternative hypothesis: true location shift is not equal to 0
```

temperature

```
> summary(TTN_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -2.629   5.517   8.654   9.170  13.400  23.854
> summary(TTT_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -2.638   6.058   9.400   9.634  13.075  23.850
> t.test(TTN_temp, TTT_temp)

        Welch Two Sample t-test

data:  TTN_temp and TTT_temp
t = -1.2848, df = 725.31, p-value = 0.1993
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.1719487  0.2448026
sample estimates:
mean of x mean of y
 9.170491  9.634064

> wilcox.test(TTN_temp, TTT_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTN_temp and TTT_temp
W = 63461, p-value = 0.2686
alternative hypothesis: true location shift is not equal to 0
```

data below are daily data

from whole year of 2018

and from whole year of 2020(does not include data from 29th February 2020, for keeping the total amount of data consistent)

SO_2

```
> summary(TTE_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.083   1.836   2.399   2.555   2.953   6.452
> summary(TTT_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.2492  0.6807  0.9627  1.1638  1.4754  4.7775
> t.test(TTE_so2, TTT_so2)

        Welch Two Sample t-test

data:  TTE_so2 and TTT_so2
t = 23.108, df = 640.95, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 1.272529 1.508891
sample estimates:
mean of x mean of y
 2.554515  1.163805

> wilcox.test(TTE_so2, TTT_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTE_so2 and TTT_so2
W = 120832, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

NO

```
> summary(TTE_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.531   6.345  10.138  14.336  16.752 129.781
> summary(TTT_no)
    Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
  0.6868   3.1403   5.5448  10.0069  10.5052 100.2824
> t.test(TTE_no, TTT_no)

        Welch Two Sample t-test

data:  TTE_no and TTT_no
t = 4.2496, df = 727.58, p-value = 2.42e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 2.329365 6.329729
sample estimates:
mean of x mean of y
 14.33642  10.00688

> wilcox.test(TTE_no, TTT_no)

        Wilcoxon rank sum test with continuity correction

data:  TTE_no and TTT_no
W = 91882, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

NO_2

```
> summary(TTE_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  12.78   26.52   34.13   34.62   41.84   77.81
> summary(TTT_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.298  17.304  25.409  27.073  34.365  67.161
> t.test(TTE_no2, TTT_no2)

        Welch Two Sample t-test

data:  TTE_no2 and TTT_no2
t = 8.5509, df = 715.44, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 5.815979 9.282594
sample estimates:
mean of x mean of y
 34.62219  27.07290

> wilcox.test(TTE_no2, TTT_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTE_no2 and TTT_no2
W = 92102, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

```
> summary(TTE_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.745   6.097   8.562  10.764  13.815  45.075
> summary(TTT_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.778   4.841   6.497   8.101   9.575  38.093
> t.test(TTE_pm2.5, TTT_pm2.5)

        Welch Two Sample t-test

data:  TTE_pm2.5 and TTT_pm2.5
t = 6.1673, df = 690.35, p-value = 1.183e-09
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 1.814641 3.509684
sample estimates:
mean of x mean of y
10.763656  8.101494

> wilcox.test(TTE_pm2.5, TTT_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTE_pm2.5 and TTT_pm2.5
W = 86290, p-value = 4.945e-12
alternative hypothesis: true location shift is not equal to 0
```

O_3

```
> summary(TTE_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.969  19.213  27.482  29.934  40.415  78.724
> summary(TTT_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   1.28   24.31   34.82   36.08   46.40   89.78
> t.test(TTE_o3, TTT_o3)

        Welch Two Sample t-test

data:  TTE_o3 and TTT_o3
t = -5.064, df = 712.13, p-value = 5.234e-07
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -8.534501 -3.765742
sample estimates:
mean of x mean of y
 29.93392  36.08404

> wilcox.test(TTE_o3, TTT_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTE_o3 and TTT_o3
W = 52529, p-value = 7.673e-07
alternative hypothesis: true location shift is not equal to 0
```

Wind speed

```
> summary(TTE_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.021   2.225   3.071   3.342   4.162   8.083
> summary(TTT_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.100   2.454   3.212   3.595   4.717  10.338
> t.test(TTE_ws, TTT_ws)

        Welch Two Sample t-test

data:  TTE_ws and TTT_ws
t = -2.2226, df = 716.33, p-value = 0.02656
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.47763020 -0.02958441
sample estimates:
mean of x mean of y
 3.341621  3.595228

> wilcox.test(TTE_ws, TTT_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTE_ws and TTT_ws
W = 60959, p-value = 0.04722
alternative hypothesis: true location shift is not equal to 0
```

Wind direction

```
> summary(TTE_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  34.65  147.33  200.51  188.95  234.11  337.89
> summary(TTT_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  48.54  160.37  209.09  196.33  241.88  333.79
> t.test(TTE_wd, TTT_wd)

        Welch Two Sample t-test

data:  TTE_wd and TTT_wd
t = -1.5658, df = 727.66, p-value = 0.1178
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -16.647071   1.874674
sample estimates:
mean of x mean of y
 188.9467  196.3329

> wilcox.test(TTE_wd, TTT_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTE_wd and TTT_wd
W = 61847, p-value = 0.0944
alternative hypothesis: true location shift is not equal to 0
```

Temperature

```
> summary(TTE_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -4.600   5.112   9.171   9.412  14.121  20.500
> summary(TTT_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -2.638   6.058   9.400   9.634  13.075  23.850
> t.test(TTE_temp, TTT_temp)

        Welch Two Sample t-test

data:  TTE_temp and TTT_temp
t = -0.5887, df = 714, p-value = 0.5562
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.9622529  0.5183031
sample estimates:
mean of x mean of y
 9.412089  9.634064

> wilcox.test(TTE_temp, TTT_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTE_temp and TTT_temp
W = 65793, p-value = 0.7737
alternative hypothesis: true location shift is not equal to 0
```

data below are daily data

from 23th March to 31st May 2018

and from 23th March to 31st May 2020

SO_2

```
> summary(TTE_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.169   1.542   1.848   2.045   2.482   4.077
> summary(TTT_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.4481  0.8187  1.1630  1.2523  1.5745  2.8586
> t.test(TTE_m_m_so2, TTT_m_m_so2)

        Welch Two Sample t-test

data:  TTE_m_m_so2 and TTT_m_m_so2
t = 7.8119, df = 132.51, p-value = 1.528e-12
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.5918401 0.9931805
sample estimates:
mean of x mean of y
 2.044827  1.252316

> wilcox.test(TTE_m_m_so2, TTT_m_m_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_so2 and TTT_m_m_so2
W = 4125, p-value = 2.981e-12
alternative hypothesis: true location shift is not equal to 0
```

NO

```
> summary(TTE_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.618   5.284   7.981   9.012  11.344  39.686
> summary(TTT_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.6868  1.3306  1.8775  3.2304  3.2051 16.4891
> t.test(TTE_m_m_no, TTT_m_m_no)

        Welch Two Sample t-test

data:  TTE_m_m_no and TTT_m_m_no
t = 6.9762, df = 111.09, p-value = 2.311e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 4.139511 7.424095
sample estimates:
mean of x mean of y
 9.012224  3.230421

> wilcox.test(TTE_m_m_no, TTT_m_m_no)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_no and TTT_m_m_no
W = 4282, p-value = 2.295e-14
alternative hypothesis: true location shift is not equal to 0
```

NO_2

```
> summary(TTE_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  16.82   27.96   35.08   34.49   39.13   50.20
> summary(TTT_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.442  12.172  15.717  18.273  21.366  46.450
> t.test(TTE_m_m_no2, TTT_m_m_no2)

        Welch Two Sample t-test

data:  TTE_m_m_no2 and TTT_m_m_no2
t = 11.22, df = 135.68, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 13.36196 19.08026
sample estimates:
mean of x mean of y
 34.49380  18.27269

> wilcox.test(TTE_m_m_no2, TTT_m_m_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_no2 and TTT_m_m_no2
W = 4424, p-value < 2.2e-16
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

```
> summary(TTE_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.402   6.534  11.338  11.736  15.745  25.842
> summary(TTT_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.144   5.803   7.833   9.652  12.249  28.856
> t.test(TTE_m_m_pm2.5, TTT_m_m_pm2.5)

        Welch Two Sample t-test

data:  TTE_m_m_pm2.5 and TTT_m_m_pm2.5
t = 2.0975, df = 137.61, p-value = 0.03778
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.119410 4.049611
sample estimates:
mean of x mean of y
11.736103  9.651592

> wilcox.test(TTE_m_m_pm2.5, TTT_m_m_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_pm2.5 and TTT_m_m_pm2.5
W = 2974, p-value = 0.02913
alternative hypothesis: true location shift is not equal to 0
```

O_3

```
> summary(TTE_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  21.63   35.78   42.28   44.42   52.34   78.72
> summary(TTT_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  31.33   48.45   57.42   57.34   65.59   83.22
> t.test(TTE_m_m_o3, TTT_m_m_o3)

        Welch Two Sample t-test

data:  TTE_m_m_o3 and TTT_m_m_o3
t = -6.639, df = 136.7, p-value = 6.834e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -16.776163  -9.075927
sample estimates:
mean of x mean of y
 44.41553  57.34157

> wilcox.test(TTE_m_m_o3, TTT_m_m_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_o3 and TTT_m_m_o3
W = 1025, p-value = 2.908e-09
alternative hypothesis: true location shift is not equal to 0
```

wind speed

```
> summary(TTE_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.117   2.118   3.077   3.213   4.042   6.275
> summary(TTT_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.300   2.254   2.685   3.056   3.658   6.842
> t.test(TTE_m_m_ws, TTT_m_m_ws)

        Welch Two Sample t-test

data:  TTE_m_m_ws and TTT_m_m_ws
t = 0.76183, df = 137.91, p-value = 0.4475
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.2504327  0.5643612
sample estimates:
mean of x mean of y
 3.213274  3.056310

> wilcox.test(TTE_m_m_ws, TTT_m_m_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_ws and TTT_m_m_ws
W = 2624.5, p-value = 0.4684
alternative hypothesis: true location shift is not equal to 0
```

wind direction

```
> summary(TTE_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  54.66  108.90  186.18  171.80  224.14  274.48
> summary(TTT_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  48.54   99.73  173.85  169.03  226.52  301.70
> t.test(TTE_m_m_wd, TTT_m_m_wd)

        Welch Two Sample t-test

data:  TTE_m_m_wd and TTT_m_m_wd
t = 0.24035, df = 137.19, p-value = 0.8104
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -20.07044  25.62449
sample estimates:
mean of x mean of y
 171.8048  169.0278

> wilcox.test(TTE_m_m_wd, TTT_m_m_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_wd and TTT_m_m_wd
W = 2487, p-value = 0.8791
alternative hypothesis: true location shift is not equal to 0
```

temperature

```
> summary(TTE_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.550   7.109   9.433   9.829  12.922  17.400
> summary(TTT_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.087   7.222   9.483   9.581  11.757  16.312
> t.test(TTE_m_m_temp, TTT_m_m_temp)

        Welch Two Sample t-test

data:  TTE_m_m_temp and TTT_m_m_temp
t = 0.43248, df = 135.67, p-value = 0.6661
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.8838239  1.3785858
sample estimates:
mean of x mean of y
 9.828571  9.581190

> wilcox.test(TTE_m_m_temp, TTT_m_m_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTE_m_m_temp and TTT_m_m_temp
W = 2498.5, p-value = 0.8414
alternative hypothesis: true location shift is not equal to 0
```

data below are daily data

from whole year of 2018

and from whole year of 2019

SO_2

```
> summary(TTN_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.6924  1.8427  2.3459  2.4895  3.0676  5.2660
> summary(TTE_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.083   1.836   2.399   2.555   2.953   6.452
> t.test(TTN_so2, TTE_so2)

        Welch Two Sample t-test

data:  TTN_so2 and TTE_so2
t = -0.94402, df = 726.57, p-value = 0.3455
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.20029116  0.07021751
sample estimates:
mean of x mean of y
 2.489478  2.554515

> wilcox.test(TTN_so2, TTE_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_so2 and TTE_so2
W = 65816, p-value = 0.7799
alternative hypothesis: true location shift is not equal to 0
```

NO

```
> summary(TTN_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.471   6.162  10.890  17.080  19.051 134.522
> summary(TTE_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.531   6.345  10.138  14.336  16.752 129.781
> t.test(TTN_no, TTE_no)

        Welch Two Sample t-test

data:  TTN_no and TTE_no
t = 2.2648, df = 676.51, p-value = 0.02384
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.3650953 5.1227941
sample estimates:
mean of x mean of y
 17.08037  14.33642

> wilcox.test(TTN_no, TTE_no)

        Wilcoxon rank sum test with continuity correction

data:  TTN_no and TTE_no
W = 69761, p-value = 0.2691
alternative hypothesis: true location shift is not equal to 0
```

NO_2

```
> summary(TTN_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  10.90   27.12   34.87   36.40   43.72   80.29
> summary(TTE_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  12.78   26.52   34.13   34.62   41.84   77.81
> t.test(TTN_no2, TTE_no2)

        Welch Two Sample t-test

data:  TTN_no2 and TTE_no2
t = 1.9685, df = 707.99, p-value = 0.0494
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.004705976 3.544805951
sample estimates:
mean of x mean of y
 36.39694  34.62219

> wilcox.test(TTN_no2, TTE_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_no2 and TTE_no2
W = 70803, p-value = 0.1413
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

```
> summary(TTN_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.962   6.104   8.979  11.329  13.317  54.467
> summary(TTE_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.745   6.097   8.562  10.764  13.815  45.075
> t.test(TTN_pm2.5, TTE_pm2.5)

        Welch Two Sample t-test

data:  TTN_pm2.5 and TTE_pm2.5
t = 1.0503, df = 697.86, p-value = 0.2939
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.4917995  1.6233380
sample estimates:
mean of x mean of y
 11.32943  10.76366

> wilcox.test(TTN_pm2.5, TTE_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTN_pm2.5 and TTE_pm2.5
W = 67768, p-value = 0.6853
alternative hypothesis: true location shift is not equal to 0
```

O_3

```
> summary(TTN_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.217  16.605  26.282  28.502  38.821  97.161
> summary(TTE_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.969  19.213  27.482  29.934  40.415  78.724
> t.test(TTN_o3, TTE_o3)

        Welch Two Sample t-test

data:  TTN_o3 and TTE_o3
t = -1.2684, df = 727.83, p-value = 0.2051
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.6479643  0.7843202
sample estimates:
mean of x mean of y
 28.50209  29.93392

> wilcox.test(TTN_o3, TTE_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTN_o3 and TTE_o3
W = 62825, p-value = 0.1837
alternative hypothesis: true location shift is not equal to 0
```

wind speed

```
> summary(TTN_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  0.400   2.275   2.929   3.225   3.946   8.267
> summary(TTE_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.021   2.225   3.071   3.342   4.162   8.083
> t.test(TTN_ws, TTE_ws)

        Welch Two Sample t-test

data:  TTN_ws and TTE_ws
t = -1.1139, df = 726.53, p-value = 0.2657
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.32080991  0.08854964
sample estimates:
mean of x mean of y
 3.225491  3.341621

> wilcox.test(TTN_ws, TTE_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTN_ws and TTE_ws
W = 64622, p-value = 0.4847
alternative hypothesis: true location shift is not equal to 0
```

wind direction

```
> summary(TTN_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  37.64  152.07  202.45  194.05  239.88  331.26
> summary(TTE_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  34.65  147.33  200.51  188.95  234.11  337.89
> t.test(TTN_wd, TTE_wd)

        Welch Two Sample t-test

data:  TTN_wd and TTE_wd
t = 1.0865, df = 727.42, p-value = 0.2776
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -4.12226 14.33852
sample estimates:
mean of x mean of y
 194.0548  188.9467

> wilcox.test(TTN_wd, TTE_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTN_wd and TTE_wd
W = 68952, p-value = 0.4116
alternative hypothesis: true location shift is not equal to 0
```

temperature

```
> summary(TTN_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -2.629   5.517   8.654   9.170  13.400  23.854
> summary(TTE_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -4.600   5.112   9.171   9.412  14.121  20.500
> t.test(TTN_temp, TTE_temp)

        Welch Two Sample t-test

data:  TTN_temp and TTE_temp
t = -0.6236, df = 723.39, p-value = 0.5331
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.0022087  0.5190123
sample estimates:
mean of x mean of y
 9.170491  9.412089

> wilcox.test(TTN_temp, TTE_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTN_temp and TTE_temp
W = 64381, p-value = 0.4335
alternative hypothesis: true location shift is not equal to 0
```

data below are daily data

from 23th March to 31st May 2018

and from 23th March to 31st May 2019

SO_2

```
> summary(TTN_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.423   1.935   2.542   2.644   3.149   4.937
> summary(TTE_m_m_so2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.169   1.542   1.848   2.045   2.482   4.077
> t.test(TTN_m_m_so2, TTE_m_m_so2)

        Welch Two Sample t-test

data:  TTN_m_m_so2 and TTE_m_m_so2
t = 4.5802, df = 128.25, p-value = 1.086e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.3402033 0.8576911
sample estimates:
mean of x mean of y
 2.643774  2.044827

> wilcox.test(TTN_m_m_so2, TTE_m_m_so2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_so2 and TTE_m_m_so2
W = 3495, p-value = 1.343e-05
alternative hypothesis: true location shift is not equal to 0
```

NO

```
> summary(TTN_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.471   4.583   7.935   8.933  11.023  36.125
> summary(TTE_m_m_no)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.618   5.284   7.981   9.012  11.344  39.686
> t.test(TTN_m_m_no, TTE_m_m_no)

        Welch Two Sample t-test

data:  TTN_m_m_no and TTE_m_m_no
t = -0.077075, df = 137.81, p-value = 0.9387
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.119959  1.960890
sample estimates:
mean of x mean of y
 8.932690  9.012224

> wilcox.test(TTN_m_m_no, TTE_m_m_no)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_no and TTE_m_m_no
W = 2394, p-value = 0.8171
alternative hypothesis: true location shift is not equal to 0
```

NO_2

```
> summary(TTN_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  13.68   28.02   35.37   35.15   42.73   72.07
> summary(TTE_m_m_no2)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  16.82   27.96   35.08   34.49   39.13   50.20
> t.test(TTN_m_m_no2, TTE_m_m_no2)

        Welch Two Sample t-test

data:  TTN_m_m_no2 and TTE_m_m_no2
t = 0.39696, df = 123.42, p-value = 0.6921
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.632758  3.953642
sample estimates:
mean of x mean of y
 35.15424  34.49380

> wilcox.test(TTN_m_m_no2, TTE_m_m_no2)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_no2 and TTE_m_m_no2
W = 2540, p-value = 0.7092
alternative hypothesis: true location shift is not equal to 0
```

PM2.5

```
> summary(TTN_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  5.175   8.305  10.997  14.961  15.919  52.312
> summary(TTE_m_m_pm2.5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.402   6.534  11.338  11.736  15.745  25.842
> t.test(TTN_m_m_pm2.5, TTE_m_m_pm2.5)

        Welch Two Sample t-test

data:  TTN_m_m_pm2.5 and TTE_m_m_pm2.5
t = 2.339, df = 114.52, p-value = 0.02107
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.4937433 5.9562271
sample estimates:
mean of x mean of y
 14.96109  11.73610

> wilcox.test(TTN_m_m_pm2.5, TTE_m_m_pm2.5)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_pm2.5 and TTE_m_m_pm2.5
W = 2838, p-value = 0.1063
alternative hypothesis: true location shift is not equal to 0
```

O_3

```
> summary(TTN_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  14.42   38.84   46.52   45.90   53.15   97.16
> summary(TTE_m_m_o3)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  21.63   35.78   42.28   44.42   52.34   78.72
> t.test(TTN_m_m_o3, TTE_m_m_o3)

        Welch Two Sample t-test

data:  TTN_m_m_o3 and TTE_m_m_o3
t = 0.69762, df = 136.98, p-value = 0.4866
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.730900  5.708129
sample estimates:
mean of x mean of y
 45.90414  44.41553

> wilcox.test(TTN_m_m_o3, TTE_m_m_o3)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_o3 and TTE_m_m_o3
W = 2701, p-value = 0.2965
alternative hypothesis: true location shift is not equal to 0
```

wind speed

```
> summary(TTN_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.450   2.281   2.640   2.965   3.630   7.104
> summary(TTE_m_m_ws)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.117   2.118   3.077   3.213   4.042   6.275
> t.test(TTN_m_m_ws, TTE_m_m_ws)

        Welch Two Sample t-test

data:  TTN_m_m_ws and TTE_m_m_ws
t = -1.2766, df = 136.83, p-value = 0.2039
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.6330048  0.1363382
sample estimates:
mean of x mean of y
 2.964940  3.213274

> wilcox.test(TTN_m_m_ws, TTE_m_m_ws)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_ws and TTE_m_m_ws
W = 2196, p-value = 0.2907
alternative hypothesis: true location shift is not equal to 0
```

wind direction

```
> summary(TTN_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  58.48  116.93  176.82  179.65  238.56  324.30
> summary(TTE_m_m_wd)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  54.66  108.90  186.18  171.80  224.14  274.48
> t.test(TTN_m_m_wd, TTE_m_m_wd)

        Welch Two Sample t-test

data:  TTN_m_m_wd and TTE_m_m_wd
t = 0.67142, df = 136.71, p-value = 0.5031
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -15.26167  30.95334
sample estimates:
mean of x mean of y
 179.6507  171.8048

> wilcox.test(TTN_m_m_wd, TTE_m_m_wd)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_wd and TTE_m_m_wd
W = 2591, p-value = 0.5582
alternative hypothesis: true location shift is not equal to 0
```

temperature

```
> summary(TTN_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.112   6.297   8.619   8.879  10.826  15.467
> summary(TTE_m_m_temp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.550   7.109   9.433   9.829  12.922  17.400
> t.test(TTN_m_m_temp, TTE_m_m_temp)

        Welch Two Sample t-test

data:  TTN_m_m_temp and TTE_m_m_temp
t = -1.6846, df = 134.31, p-value = 0.09439
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.0633859  0.1651716
sample estimates:
mean of x mean of y
 8.879464  9.828571

> wilcox.test(TTN_m_m_temp, TTE_m_m_temp)

        Wilcoxon rank sum test with continuity correction

data:  TTN_m_m_temp and TTE_m_m_temp
W = 2099, p-value = 0.1441
alternative hypothesis: true location shift is not equal to 0
```