Assignment 4

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Excecutive summary

#1.1 Project Outline #In this universe one of the basic things that is required for living is water. MWC is given the responsibilty make sure water is availbe in the city of Melbourne, Australia. The main motivation behind this project is to understand the relationship between evaporation rate in a day , amount of sunlight hours and the maximum speed of wind(gust of wind) in kmph, the minimum temperature as well as the maximum temperature and the relative humidity at 9 am. This report analysis will help the Melbourne Water Corporation(MWC) to have some insights on estimating the rate of evaporation at their reservoirs and help them understand is there any factors affecting the evaporation rate at any given day.

1.2 Approach

#We have done the analysis on the obtained dataset , which conisisted some data on random samples of Melbourne's weather observations and evaporation for the financial year of 2018-2019. This report also includes the the relation which will answer the queries asked by the MWC. Multiple statistical modles were developed in order to understand whether the rate of evaporation is affected by some factors or not.

1.3 Findings

Month: After evaluation we were able to find that the aamount of evaporation which we have termed as evaporation rate is comparetively higher in the months of January, March, April , November and December . And because of this we were able to conclude that there is a significant relationship observed between the evaporation rate and the months.

Day Of Week: We were able to observe the fact that the day of the week didn't have much influence on the rate of evaporation significantly and hence no relationship can be seen .

Number of hours of bright sunlight:

#Even in the case of number of hours of sunlight we are unable any effects caused by the number of hours of bright sunlight as they form no relationship.

Speed of the maximum wind gust in kilometer per hour. We can see the speed of gust of wind is a significant factor while predicting the rate of evaporation. We can see a moderate positive linear relationship. For every 1km/h increase in speed of maximum wind gust will increase in 0.522 mm increase in rate of evaporation.

Minimum temperature in degree Celsius : It was observed that minimum temperature is significantly important for the purpose of prediction of amount of evaporation. The coreresponding figure also displays postive linear relationship.For every 1 C increase in the minimum temperature will cause a 0.329 mm increase in the evaporation amount.

Relative humidity (measured at 9am): This is a unique case as we can see a significant negative relationship is developed between humidity and rate of evaporation . for every increase in humidity will cause decrease in 0.084 mm in amount of evaporation

Recommendations

Based on my analyis , we can say with 95% confidence that on december 26th 2024 and January 11 2024 , Cardinia Reservoir will have more than 9mm of evaporation , which should motivate the MWC to make temproray measures to ensure continuous supply of water which also means they should consider transferring the water from the Silvan Reservoir upstream.

METHODS

#2.1 Software used #In this section, I'll be analyzing a random sampled dataset of Melbourne's weather observations devleoped by the Melbourne Water Corporation("MWC") in order to understand the evaporation rate from the reservoir called Cardina Reservoir . The analysis was successfull with the help of Rstudio.

2.2 Dataset used

#In this particular section we will be able to observe and understand how varaibles such as (a) Month, (b) Day of the week, (c)Number of hours of bright sunlight, (d) Speed of the maximum wind gust in kilometers per hour (e) Minimum temperature in degree Celsius (f) Relative humidity , as measured at 9am. #After the information is obtained from the bivariate analysis , we can say that the prediction model is built and tested for all the assumptions

#2 .3 Bivarite Summary

Month : In the figure 1: which tell us relation of rate of evaporation against month , we can see spread of few months March , April , September and November to be wider and the location higher than 9. In the case of January,February,March April , and November and December we can see few outliers, which tells us there is a significant relationship

Day of the week: In the figure 2 the boxplot tells us the spread with is quite same with all the days of the week and location not showing varaince among the days and there is no significant relationship observed.

Sunlight hours: Figure 3 is a scatterplot which shows us no significant relationship due to random scattering of points

Maximum speed of wind gust(kmph): Even though the name of this varaible was slighlty changed for better presentation , we can still observe that there is a moderate linear positive relationship betwwen rate or amount of evaporation against the maximum speed of wind.

Minimum Temperature (in c): The figure 5 which is a scatterplot which tells us a postive relationship betwwen the rate of evaporation agaoinst minimum temperature.

Relative humidity: The figure number 6 displays a sytong positive relationship between evaporation and humidity when measuread at 9 am

Model selection

#We will begin with a model which has all the possible predictor for the response variable . We also used the Anova() function from the "car" package and calculated the p-value for predictor and found out that the varaible sunlight hours didnt had enough significance was removed.

After exculding sunlight hours , second model was created and we realise that the Sunlight hours didnt have enough significance and hence it was removed

In our third model after excluding sunlight hours temperature we got to know the varaible maximum temperature had highest p value , therefore it was removed as well

In our fourth model after excluding maximum temperature we got to know the varaible weekday had highest p value , therefore it was removed as well

Model Diagnostics

Linearity

when we go from left to right, we cannot see any trend in the residuals vs fitted plot. Hence we can conclude the fact that Linearity is justified

Homoscedasticity

On observing the plot we can see there is an increase in spread as we go from left to right, which tells us the assumption of Homoscedasticity is not justified.

Normality

It is very easy for us to conclude from the above figure that the assumption of normality is justified as points on the normal q-q plot follow the reference line even after there are some points not on the right-upper tail.

Independence

Independence in this case is not justified since the samples were taken in the year 2018-19. Which means , subjects can be or cannot be dependent since one day's weather will affect the next one.

Results

#In our analysis with the the help of statistical model, we found that the intercept is 6.358 mm and the amount of evaporation is manipulated such a way that the 1% increase in the relative humidity will decrease

by 0.084 mm. While in the case of minimum temperature, rate of evaporation will increase by 0.329 if temperature increases by 1c. And in the case of maximum gust of speed of wind there is a increase rate of evaporation by 0.0522

Discussion

With the help of our statistical model we predicted that on feburary 21, 2024 on given weather observations, the rate of evaporation is 5.2 mm an the interval is between 0.8mm to 9.5mm.on december 12, 2024 on given weather observations, the rate of evaporation is 14.4 mm an the interval is between 9.7mm to 19.2mm.on january 1, 2024 on given weather observations, the rate of evaporation is 14.4 mm an the interval is between 9.7mm to 19.2mm.on july 07, 2024 on given weather observations, the rate of evaporation is 5.2 mm an the interval is between 0.8mm to 9.5mm.

Hence we poredict that with confidence of 95% that on december and january the rate of evaporation will be more than 9mm and the Cadinia Reservior will require the corporation to take temporary meeasures for continuous supply of water throgh Silvan Reservoir. While the other months have low amount of evaporation and hence no measures required.

#Conclusion:Finally we can conclude that that the report is focused on developing a model which can predict the amount of evaporation on any day of the week using weather observation. We are successfull in determing the fact that varaibles variable month,speed of maximum wind gust, minimum temperature and the relative humidity are significant factors. LAST but not the least we predicted that on feburary 21, 2024 on given weather observations, the rate of evaporation is 5.2 mm an the interval is between 0.8mm to 9.5mm.on december 12, 2024 on given weather observations, the rate of evaporation is 14.4 mm an the interval is between 9.7mm to 19.2mm.on january 1, 2024 on given weather observations, the rate of evaporation is 14.4 mm an the interval is between 9.7mm to 19.2mm.on july 07, 2024 on given weather observations, the rate of evaporation is 5.2 mm an the interval is between 0.8mm to 9.5mm. And hence we poredict that with confidence of 95% that on december and january the rate of evaporation will be more than 9mm and the Cadinia Reservior will require the corporation to take temporary meeasures for continuous supply of water throgh Silvan Reservoir. While the other months have low amount of evaporation and hence no measures required.

#Appendix

```
#Loading the required libraries
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.3     v readr     2.1.4
```

```
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.4.4     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ---------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(tidyr)
library(dplyr)
library(ggplot2)
library(inspectdf)
library(stringr)
library(readr)
library(forcats)
library(ggthemes)
library(caret)
```

```
## Loading required package: lattice
##
## Attaching package: 'caret'
##
## The following object is masked from 'package:purrr':
##
##     lift
```

```
library(lubridate)
library(car)
```

```
## Loading required package: carData
##
## Attaching package: 'car'
##
## The following object is masked from 'package:dplyr':
##
##     recode
##
## The following object is masked from 'package:purrr':
##
##     some
```

```
#importing the dataset on which we will perform analysis
melbourne <- read.csv("melbourne.csv")
head(melbourne)
```

```
##        Date Minimum.temperature..Deg.C. Maximum.Temperature..Deg.C.
## 1 2019-01-1                       15.5                       26.2
## 2 2019-01-2                       18.4                       22.2
## 3 2019-01-3                       15.9                       29.5
## 4 2019-01-4                       18.0                       42.6
## 5 2019-01-5                       17.4                       21.2
```

```
## 6 2019-01-6                        14.6                        22.1
##   Rainfall..mm. Evaporation..mm. Sunshine..hours.
## 1           0.0              7.0             11.0
## 2           0.0              7.0              7.5
## 3           0.0              6.6              9.3
## 4           0.0              7.8             12.2
## 5           0.4             15.4              5.8
## 6           1.4              6.4             13.3
##   Direction.of.maximum.wind.gust Speed.of.maximum.wind.gust..km.h.
## 1                              S                                35
## 2                            SSW                                39
## 3                            SSW                                26
## 4                             NW                                54
## 5                            SSW                                39
## 6                            SSW                                33
##   Time.of.maximum.wind.gust X9am.Temperature..Deg.C. X9am.relative.humidity....
## 1                  17:44:00                     19.8                         74
## 2                  15:23:00                     19.5                         64
## 3                  14:53:00                     18.1                         75
## 4                  12:03:00                     29.5                         31
## 5                  08:24:00                     18.0                         63
## 6                  11:12:00                     17.7                         55
##   X9am.cloud.amount..oktas. X9am.wind.direction X9am.wind.speed..km.h.
## 1                         7                   S                      6
## 2                         8                 SSE                      7
## 3                         8                   S                      2
## 4                         0                 NNE                      9
## 5                         7                   S                     13
## 6                         1                  SW                      9
##   X9am.MSL.pressure..hPa. X3pm.Temperature..Deg.C. X3pm.relative.humidity....
## 1                  1013.0                     24.4                        45
## 2                  1013.9                     21.4                        62
## 3                  1012.6                     24.6                        60
## 4                  1005.5                     42.0                        16
## 5                  1013.5                     19.1                        58
## 6                  1020.4                     20.6                        48
##   X3pm.cloud.amount..oktas. X3pm.wind.direction X3pm.wind.speed..km.h.
## 1                         1                 SSW                     11
## 2                         1                 SSW                     19
## 3                         0                 SSW                     13
## 4                         1                  NW                     15
## 5                         7                   S                     11
## 6                         1                 SSW                     13
##   X3pm.MSL.pressure..hPa.
## 1                  1011.5
## 2                  1012.9
## 3                  1009.9
## 4                  1001.0
## 5                  1013.4
## 6                  1019.5
```

```r
# Here i will try to eliminate or remove some data which are irrelevant and not required for anlayis
melbourne <- melbourne %>%
  mutate(Date = ymd(Date)) %>%
```

```
  mutate(month = as_factor(month(Date)),
         `X9am.wind.speed..km.h.` = as.integer(str_replace(`X9am.wind.speed..km.h.`, "Calm", "0")),
         weekday = as_factor(wday(Date)))
melbourne <- melbourne %>%
rename(minimum_temperature = 'Minimum.temperature..Deg.C.',
maximum_temperature = 'Maximum.Temperature..Deg.C.',
humidity_9am = 'X9am.relative.humidity....',
evaporation_rate = 'Evaporation..mm.',
Sunlight_hours = "Sunshine..hours.",
Maximum_speed_gust_of_wind= "Speed.of.maximum.wind.gust..km.h.")

head(melbourne)
```

```
##         Date minimum_temperature maximum_temperature Rainfall..mm.
## 1 2019-01-01                15.5                26.2           0.0
## 2 2019-01-02                18.4                22.2           0.0
## 3 2019-01-03                15.9                29.5           0.0
## 4 2019-01-04                18.0                42.6           0.0
## 5 2019-01-05                17.4                21.2           0.4
## 6 2019-01-06                14.6                22.1           1.4
##   evaporation_rate Sunlight_hours Direction.of.maximum.wind.gust
## 1              7.0           11.0                              S
## 2              7.0            7.5                            SSW
## 3              6.6            9.3                            SSW
## 4              7.8           12.2                             NW
## 5             15.4            5.8                            SSW
## 6              6.4           13.3                            SSW
##   Maximum_speed_gust_of_wind Time.of.maximum.wind.gust X9am.Temperature..Deg.C.
## 1                         35                 17:44:00                      19.8
## 2                         39                 15:23:00                      19.5
## 3                         26                 14:53:00                      18.1
## 4                         54                 12:03:00                      29.5
## 5                         39                 08:24:00                      18.0
## 6                         33                 11:12:00                      17.7
##   humidity_9am X9am.cloud.amount..oktas. X9am.wind.direction
## 1           74                         7                  S
## 2           64                         8                SSE
## 3           75                         8                  S
## 4           31                         0                NNE
## 5           63                         7                  S
## 6           55                         1                 SW
##   X9am.wind.speed..km.h. X9am.MSL.pressure..hPa. X3pm.Temperature..Deg.C.
## 1                      6                 1013.0                     24.4
## 2                      7                 1013.9                     21.4
## 3                      2                 1012.6                     24.6
## 4                      9                 1005.5                     42.0
## 5                     13                 1013.5                     19.1
## 6                      9                 1020.4                     20.6
##   X3pm.relative.humidity.... X3pm.cloud.amount..oktas. X3pm.wind.direction
## 1                         45                         1                SSW
## 2                         62                         1                SSW
## 3                         60                         0                SSW
## 4                         16                         1                 NW
```

```
## 5                         58                         7                  S
## 6                         48                         1                SSW
##   X3pm.wind.speed..km.h. X3pm.MSL.pressure..hPa. month weekday
## 1                     11                  1011.5     1       3
## 2                     19                  1012.9     1       4
## 3                     13                  1009.9     1       5
## 4                     15                  1001.0     1       6
## 5                     11                  1013.4     1       7
## 6                     13                  1019.5     1       1
```

```
#continuing the cleaning of data. Now i'll remove the missing data but first i would love to show how m
inspect_na(melbourne)
```

```
## # A tibble: 23 x 3
##    col_name                       cnt  pcnt
##    <chr>                        <int> <dbl>
##  1 X9am.wind.direction             17 4.66
##  2 evaporation_rate                 8 2.19
##  3 Rainfall..mm.                    2 0.548
##  4 Date                             0 0
##  5 minimum_temperature              0 0
##  6 maximum_temperature              0 0
##  7 Sunlight_hours                   0 0
##  8 Direction.of.maximum.wind.gust   0 0
##  9 Maximum_speed_gust_of_wind       0 0
## 10 Time.of.maximum.wind.gust        0 0
## # i 13 more rows
```

```
#As mentioned earlier i will not hesitate to remove the values or data which will might cause some trou
melbourne <- na.omit(melbourne)
melbourne
```

```
##           Date minimum_temperature maximum_temperature Rainfall..mm.
## 1   2019-01-01                15.5                26.2           0.0
## 2   2019-01-02                18.4                22.2           0.0
## 3   2019-01-03                15.9                29.5           0.0
## 4   2019-01-04                18.0                42.6           0.0
## 5   2019-01-05                17.4                21.2           0.4
## 6   2019-01-06                14.6                22.1           1.4
## 7   2019-01-07                17.1                23.1           0.0
## 8   2019-01-08                16.7                24.1           0.0
## 9   2019-01-09                16.1                20.5           0.6
## 10  2019-01-10                13.5                21.4           0.0
## 11  2019-01-11                12.9                30.4           0.0
## 12  2019-01-12                17.7                24.7           0.0
## 13  2019-01-13                14.4                30.5           0.0
## 14  2019-01-14                18.7                32.3           0.0
## 15  2019-01-15                19.4                30.4           0.0
## 16  2019-01-16                19.8                26.7           0.0
## 17  2019-01-17                20.7                32.5           0.0
## 18  2019-01-18                22.3                28.7           0.2
## 19  2019-01-19                16.5                23.5           2.0
## 20  2019-01-20                15.2                22.9           0.0
```

```
## 21  2019-01-21              18.4              25.1            0.0
## 22  2019-01-22              19.0              26.8            0.0
## 23  2019-01-23              18.7              23.9            0.0
## 24  2019-01-24              17.3              40.8            0.0
## 25  2019-01-25              21.1              42.8            0.0
## 26  2019-01-26              19.9              26.1            0.0
## 27  2019-01-27              18.4              27.8            0.0
## 28  2019-01-28              15.5              34.5            0.0
## 29  2019-01-29              17.5              36.8            0.0
## 30  2019-01-30              18.0              38.1            0.0
## 31  2019-01-31              17.2              21.5            6.6
## 32  2019-02-01              12.6              24.2            0.0
## 33  2019-02-02              15.0              34.4            0.0
## 34  2019-02-03              19.1              38.2            0.0
## 35  2019-02-04              20.0              22.7            0.0
## 36  2019-02-05              17.7              26.9            0.0
## 37  2019-02-06              18.5              34.7            0.0
## 38  2019-02-07              20.7              28.3           11.0
## 39  2019-02-08              18.1              23.1            0.0
## 40  2019-02-09              14.6              19.7            0.0
## 41  2019-02-10              13.0              23.3            4.8
## 43  2019-02-12              18.4              21.5            0.0
## 44  2019-02-13              11.8              19.2            2.8
## 45  2019-02-14              12.3              23.2            0.0
## 46  2019-02-15              14.8              22.8            0.0
## 47  2019-02-16              16.1              23.2            0.0
## 48  2019-02-17              15.0              29.0            0.0
## 49  2019-02-18              18.0              23.6            0.0
## 50  2019-02-19              13.7              20.2            0.0
## 51  2019-02-20              13.5              23.2            0.0
## 52  2019-02-21              14.0              20.4            0.0
## 53  2019-02-22              15.5              21.2            0.0
## 54  2019-02-23              16.4              25.8            0.0
## 55  2019-02-24              13.8              32.9            0.0
## 56  2019-02-25              18.0              34.2            0.0
## 57  2019-02-26              17.9              22.3            0.0
## 58  2019-02-27              12.9              25.7            0.0
## 59  2019-02-28              16.3              36.8            0.0
## 60  2019-03-01              22.6              38.1            0.0
## 61  2019-03-02              22.3              36.3            0.0
## 62  2019-03-03              25.1              36.0            0.0
## 63  2019-03-04              19.0              24.6            0.0
## 64  2019-03-05              18.0              24.3            0.0
## 65  2019-03-06              13.2              17.2            1.6
## 66  2019-03-07               9.7              22.1            2.0
## 67  2019-03-08              11.3              26.8            0.0
## 68  2019-03-09              13.9              24.7            0.0
## 69  2019-03-10              14.3              23.7            0.0
## 70  2019-03-11              15.9              21.8            0.2
## 71  2019-03-12              15.8              19.2            0.0
## 72  2019-03-13              11.9              18.6            0.0
## 73  2019-03-14              12.1              20.8            0.2
## 74  2019-03-15              11.7              22.2            0.0
## 75  2019-03-16              12.2              25.6            0.0
```

```
## 76  2019-03-17              14.2              25.6          0.0
## 77  2019-03-18              16.5              28.2          0.0
## 81  2019-03-22              18.7              28.6          0.0
## 82  2019-03-23              19.9              31.3          1.8
## 83  2019-03-24              16.5              29.3          2.0
## 84  2019-03-25              14.8              19.0          0.2
## 85  2019-03-26              12.3              20.3          0.0
## 87  2019-03-28              11.6              27.9          0.0
## 88  2019-03-29              14.6              28.5          0.0
## 89  2019-03-30               9.1              15.6          1.8
## 90  2019-03-31               9.4              18.5          2.2
## 91  2019-04-01              13.0              17.1          0.2
## 92  2019-04-02               7.4              25.9          0.0
## 93  2019-04-03               9.4              24.7          0.0
## 94  2019-04-04              13.3              21.9          0.0
## 95  2019-04-05              14.4              28.5          0.0
## 96  2019-04-06              16.5              20.1          0.0
## 97  2019-04-07               9.5              26.5          0.0
## 98  2019-04-08              12.5              23.1          0.0
## 99  2019-04-09              11.1              16.3          1.6
## 100 2019-04-10              10.7              15.8          1.4
## 101 2019-04-11              11.3              17.3          0.0
## 102 2019-04-12               6.7              24.9          0.2
## 103 2019-04-13              10.5              20.7          0.0
## 104 2019-04-14              11.8              22.5          0.0
## 105 2019-04-15              12.9              27.4          0.0
## 106 2019-04-16              17.1              30.3          0.0
## 107 2019-04-17              22.1              30.0          0.0
## 108 2019-04-18              13.2              17.7          0.0
## 109 2019-04-19               8.6              22.1          0.0
## 110 2019-04-20              10.2              30.2          0.0
## 111 2019-04-21              14.8              27.0          0.0
## 112 2019-04-22              13.7              17.6          0.8
## 113 2019-04-23              11.1              18.5          0.0
## 115 2019-04-25              10.2              21.5          0.0
## 116 2019-04-26              11.9              15.8          3.0
## 117 2019-04-27               8.7              16.2          0.0
## 118 2019-04-28              12.4              17.4          0.0
## 119 2019-04-29              11.5              18.1          0.0
## 120 2019-04-30               7.9              23.1          0.0
## 121 2019-05-01              15.6              22.8          0.0
## 122 2019-05-02              17.1              20.2          3.6
## 123 2019-05-03              11.8              20.7          0.2
## 124 2019-05-04              13.0              16.4          0.2
## 125 2019-05-05              11.3              16.3          2.0
## 126 2019-05-06              11.7              16.7          0.2
## 127 2019-05-07               7.4              18.7          0.0
## 128 2019-05-08              10.3              17.4          5.2
## 129 2019-05-09               9.7              16.2          0.6
## 131 2019-05-11              10.2              16.4          8.2
## 132 2019-05-12              12.2              17.7          0.0
## 133 2019-05-13              12.7              18.1          0.0
## 134 2019-05-14              11.3              20.2          0.0
## 135 2019-05-15              12.0              15.8          0.0
```

```
## 136 2019-05-16  10.5  16.1  0.0
## 137 2019-05-17   6.5  18.6  0.0
## 138 2019-05-18   6.2  21.5  0.0
## 139 2019-05-19   8.9  21.8  0.2
## 140 2019-05-20  12.0  19.6  0.4
## 141 2019-05-21  11.1  20.4  0.4
## 142 2019-05-22  10.7  22.3  0.0
## 143 2019-05-23   9.9  21.3  0.0
## 144 2019-05-24  13.8  20.2  0.0
## 145 2019-05-25  13.7  19.8  1.6
## 146 2019-05-26   9.5  15.1  6.6
## 147 2019-05-27   7.8  14.0  8.2
## 148 2019-05-28   8.2  15.7  0.2
## 149 2019-05-29   8.7  10.6  1.2
## 150 2019-05-30   6.7  13.3  5.8
## 151 2019-05-31   8.5  14.3  1.4
## 152 2019-06-01  11.7  14.6  2.4
## 153 2019-06-02  11.0  14.5  0.0
## 154 2019-06-03   8.2  12.0 15.4
## 155 2019-06-04   8.4  12.9  3.2
## 156 2019-06-05   8.6  13.0  0.0
## 157 2019-06-06  10.2  14.8  0.0
## 160 2019-06-09   7.8  18.0  0.0
## 161 2019-06-10  12.0  19.2  3.0
## 162 2019-06-11   9.6  17.9  0.0
## 163 2019-06-12  11.9  16.5  0.6
## 164 2019-06-13   8.8  17.4  2.6
## 165 2019-06-14  10.0  17.3  2.2
## 166 2019-06-15   9.0  15.2  2.6
## 167 2019-06-16   8.6  16.7  0.0
## 168 2019-06-17   6.3  17.9  3.4
## 169 2019-06-18   8.0  13.7  0.0
## 170 2019-06-19   6.6  11.9  0.8
## 171 2019-06-20   6.4  11.3  1.6
## 172 2019-06-21   6.5  12.6  3.0
## 173 2019-06-22   6.8  11.8  0.4
## 174 2019-06-23   3.6   9.6  1.2
## 175 2019-06-24   4.2  16.0  0.0
## 176 2019-06-25   3.5  17.0  0.0
## 177 2019-06-26   4.6  18.0  0.2
## 178 2019-06-27   5.9  17.5  0.0
## 179 2019-06-28  10.7  19.5  0.0
## 180 2019-06-29  13.0  17.6  0.8
## 181 2019-06-30   8.1  14.5  6.4
## 182 2018-07-01   3.5  14.7  0.4
## 183 2018-07-02   2.4  14.6  0.0
## 190 2018-07-09  10.1  13.8  1.2
## 191 2018-07-10   9.3  11.5  0.0
## 192 2018-07-11   6.6  11.6  0.0
## 194 2018-07-13   5.8  13.9  0.2
## 195 2018-07-14   4.4  15.5  0.0
## 196 2018-07-15   6.0  13.8  0.0
## 197 2018-07-16   7.9  12.6  0.0
## 198 2018-07-17   9.1  17.5  0.0
```

```
## 199 2018-07-18              6.2              15.2          1.2
## 200 2018-07-19              8.7              17.6          0.0
## 201 2018-07-20              7.2              12.1          4.4
## 202 2018-07-21              6.7              14.0          0.2
## 203 2018-07-22              8.0              14.8          0.0
## 204 2018-07-23              8.4              15.4          0.2
## 205 2018-07-24              8.6              15.6          0.6
## 206 2018-07-25              8.3              15.7          6.2
## 207 2018-07-26              7.7              15.1          0.0
## 208 2018-07-27              9.2              19.5          0.0
## 209 2018-07-28              8.4              18.6          0.0
## 210 2018-07-29             10.8              14.6          2.0
## 211 2018-07-30              8.2              12.6          0.4
## 212 2018-07-31              8.3              16.2          0.0
## 213 2018-08-01              9.9              14.8          1.6
## 214 2018-08-02              4.9              16.1          0.0
## 215 2018-08-03              7.8              18.4          0.0
## 216 2018-08-04              8.0              15.3          1.6
## 217 2018-08-05             10.6              17.6          0.0
## 218 2018-08-06              9.4              13.8          0.0
## 219 2018-08-07              7.3              14.8          0.0
## 220 2018-08-08              9.6              16.0          1.0
## 221 2018-08-09              5.6              15.4          2.2
## 222 2018-08-10              9.4              20.0          0.0
## 223 2018-08-11              8.1              14.7         10.4
## 224 2018-08-12              5.4              14.8          4.6
## 225 2018-08-13              7.9              14.9          0.0
## 226 2018-08-14              9.4              16.7          0.2
## 227 2018-08-15             11.5              18.4          0.0
## 228 2018-08-16              8.7              14.7          0.2
## 229 2018-08-17              7.7              15.9          0.0
## 230 2018-08-18              8.9              13.8          2.2
## 231 2018-08-19              6.7              11.9          9.2
## 232 2018-08-20              5.5              12.4          2.0
## 233 2018-08-21              8.6              12.4          1.2
## 234 2018-08-22              8.7              14.0          1.0
## 235 2018-08-23              5.6              16.0          0.0
## 236 2018-08-24              4.8              15.4          0.0
## 237 2018-08-25              3.9              15.2          0.0
## 239 2018-08-27              6.8              12.9          3.6
## 240 2018-08-28              1.9              11.2          0.2
## 241 2018-08-29              0.8              12.5          0.0
## 242 2018-08-30              4.8              16.7          0.0
## 243 2018-08-31              8.9              16.0          1.6
## 244 2018-09-01             10.5              13.4          2.2
## 245 2018-09-02              5.0              12.3          3.0
## 246 2018-09-03              5.0              13.1          0.0
## 247 2018-09-04              3.4              19.5          0.0
## 248 2018-09-05              8.1              20.2          0.0
## 249 2018-09-06             13.8              20.6          0.0
## 250 2018-09-07              8.7              15.1          3.4
## 251 2018-09-08              4.2              17.5          0.2
## 252 2018-09-09              8.6              18.1          0.0
## 253 2018-09-10             13.4              18.0          0.0
```

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## 254 2018-09-11              9.1              24.2          0.0
## 255 2018-09-12             11.7              18.5          0.0
## 256 2018-09-13              7.1              19.7          0.0
## 257 2018-09-14             10.9              22.7          0.0
## 258 2018-09-15             10.2              13.7          0.2
## 259 2018-09-16              5.5              14.0          2.0
## 260 2018-09-17              6.7              18.1          0.0
## 261 2018-09-18             11.0              20.3          0.0
## 262 2018-09-19              8.5              14.7          3.0
## 263 2018-09-20              3.8              17.4          0.8
## 264 2018-09-21              8.3              18.9          0.0
## 265 2018-09-22              6.8              17.3          0.0
## 266 2018-09-23             10.4              13.7          0.2
## 267 2018-09-24              4.6              14.9          0.0
## 268 2018-09-25              8.6              13.6          0.0
## 269 2018-09-26              6.4              17.6          0.0
## 270 2018-09-27              9.2              24.2          0.0
## 271 2018-09-28             10.7              15.2          0.0
## 272 2018-09-29              5.5              14.0          1.2
## 273 2018-09-30              6.8              16.5          0.2
## 274 2018-10-01              4.7              23.3          0.0
## 275 2018-10-02             11.4              25.8          0.0
## 276 2018-10-03             14.7              18.1          0.0
## 277 2018-10-04             10.9              14.6          0.0
## 278 2018-10-05              9.1              20.5          0.0
## 279 2018-10-06              8.3              23.8          0.0
## 280 2018-10-07             10.3              24.7          0.0
## 281 2018-10-08             13.5              28.2          0.0
## 285 2018-10-12              8.7              22.7          0.0
## 286 2018-10-13             10.5              24.9          0.0
## 287 2018-10-14             12.4              27.3          0.0
## 288 2018-10-15             19.5              27.5          0.0
## 289 2018-10-16             20.0              23.1          0.2
## 290 2018-10-17             16.1              22.6          5.2
## 291 2018-10-18             14.7              20.7          2.0
## 292 2018-10-19             12.8              27.4          0.0
## 293 2018-10-20             11.7              16.1          5.0
## 294 2018-10-21              7.6              19.2          5.6
## 295 2018-10-22              8.9              27.0          0.0
## 296 2018-10-23             13.0              18.8          0.0
## 297 2018-10-24              9.2              15.5          0.0
## 298 2018-10-25              6.4              19.5          0.0
## 299 2018-10-26              9.6              18.3          0.0
## 300 2018-10-27             11.3              19.6          0.0
## 301 2018-10-28              9.3              15.9          0.0
## 302 2018-10-29              9.1              17.0          0.0
## 304 2018-10-31             13.0              19.5          0.0
## 305 2018-11-01             12.8              34.3          0.0
## 306 2018-11-02             16.3              31.6          0.0
## 307 2018-11-03             12.6              20.9          0.2
## 308 2018-11-04              9.2              20.9          0.0
## 309 2018-11-05             14.5              28.6          2.8
## 310 2018-11-06             16.3              21.4          4.4
## 311 2018-11-07             11.1              17.2         35.8
```

```
## 312 2018-11-08                7.7                17.0           3.0
## 313 2018-11-09                8.0                20.0           0.0
## 315 2018-11-11                9.3                19.6           0.2
## 316 2018-11-12               10.9                30.2           0.0
## 317 2018-11-13               16.9                30.5           0.0
## 318 2018-11-14               14.8                17.3           6.2
## 319 2018-11-15               13.7                18.1           0.2
## 320 2018-11-16                8.3                19.0           0.0
## 321 2018-11-17                9.6                18.1           0.0
## 322 2018-11-18                9.8                26.6           0.0
## 323 2018-11-19               15.4                30.9           0.0
## 324 2018-11-20               22.5                27.6           0.0
## 325 2018-11-21               12.3                23.2          24.2
## 326 2018-11-22                9.7                16.4           6.2
## 327 2018-11-23               11.0                14.5           6.0
## 328 2018-11-24               11.1                16.9           7.0
## 329 2018-11-25               12.7                18.8           0.8
## 330 2018-11-26               11.9                18.6           0.0
## 331 2018-11-27               14.4                20.0           0.2
## 332 2018-11-28               14.4                20.8           0.0
## 333 2018-11-29               13.9                18.7           0.6
## 334 2018-11-30               14.7                20.8           0.0
## 335 2018-12-01               10.3                31.7           0.0
## 336 2018-12-02               12.2                19.5          10.4
## 337 2018-12-03               13.3                23.6           0.0
## 338 2018-12-04               13.4                20.5           0.0
## 339 2018-12-05               13.4                25.2           0.0
## 340 2018-12-06               14.5                35.5           0.0
## 341 2018-12-07               25.1                38.0           0.0
## 343 2018-12-09               16.0                20.1           1.2
## 344 2018-12-10               15.8                20.6           0.0
## 345 2018-12-11               13.0                23.6           0.0
## 346 2018-12-12               16.0                33.6           0.0
## 347 2018-12-13               16.9                21.1          16.2
## 348 2018-12-14               16.4                22.7          16.6
## 349 2018-12-15               17.2                24.8          41.2
## 350 2018-12-16               15.8                23.5           3.8
## 351 2018-12-17               15.6                21.8           2.0
## 352 2018-12-18               16.7                20.8           0.0
## 354 2018-12-20               16.9                21.2           0.0
## 355 2018-12-21               15.4                20.9           1.0
## 356 2018-12-22               14.1                19.1           9.8
## 357 2018-12-23               11.5                26.9           0.0
## 358 2018-12-24               14.3                34.2           0.0
## 359 2018-12-25               15.8                23.9           0.0
## 360 2018-12-26               13.3                23.8           0.0
## 363 2018-12-29               21.0                23.9           1.2
## 365 2018-12-31               17.3                23.5           0.8
##     evaporation_rate Sunlight_hours Direction.of.maximum.wind.gust
## 1                7.0           11.0                              S
## 2                7.0            7.5                            SSW
## 3                6.6            9.3                            SSW
## 4                7.8           12.2                             NW
## 5               15.4            5.8                            SSW
```

```
## 6              6.4          13.3          SSW
## 7              9.0          11.1          SSW
## 8              7.2          10.7          SSW
## 9              7.4          12.5          SSE
## 10             8.2          11.2          SSW
## 11             4.6          13.4          SSW
## 12            10.2          11.2          SSW
## 13             9.2          13.4          WSW
## 14             9.6          13.2          SSW
## 15             8.6           7.0          SSW
## 16             6.8           5.3          SSW
## 17             4.6           1.5          SSW
## 18             7.8           2.0          SSW
## 19             4.0          13.2          SSW
## 20             7.4          10.2          SSW
## 21             6.0          10.7          SSW
## 22             7.2          12.1            S
## 23             8.8           9.5          SSW
## 24             8.2          12.9           SE
## 25            18.0          11.1            N
## 26            15.8          10.3          SSW
## 27             9.0           8.8            S
## 28             6.0          12.5          SSW
## 29            10.0          12.0            S
## 30            12.0           9.0            N
## 31            12.0          11.2            S
## 32             8.4          13.1          SSW
## 33             8.0          12.9           NW
## 34            11.4          11.5            S
## 35            14.0           0.3          SSW
## 36             4.6           3.9          SSE
## 37             2.0           8.7           SW
## 38             5.4           7.9            S
## 39             5.8           7.8            S
## 40             6.8           7.6          SSW
## 41             6.0          10.9          NNW
## 43            10.6           6.5           SW
## 44             6.2          11.3            S
## 45             6.0          12.4            S
## 46             5.8           6.5            S
## 47             5.4           8.9          SSW
## 48             6.0           8.8            S
## 49             9.4           6.1          SSW
## 50             5.4           9.6          SSW
## 51             6.2           9.1            S
## 52             5.8           7.4          SSW
## 53             4.8          10.4            S
## 54             8.0          10.5          ESE
## 55             5.2          12.4          NNE
## 56            15.6          11.4          NNW
## 57            12.8          11.4          SSW
## 58             6.0          12.0            S
## 59             8.4          10.1            N
## 60            20.0           8.5           NE
```

```
## 61              18.4           11.5                    NNW
## 62              18.2            7.9                      N
## 63               9.8            8.5                    SSW
## 64               6.0            8.6                    SSE
## 65               6.4            9.5                      W
## 66               5.4           11.6                     SW
## 67               7.6            1.4                    NNE
## 68               7.0            9.6                    SSW
## 69               6.4            2.8                    NNW
## 70               4.4            8.2                     SW
## 71               4.2            3.1                    WSW
## 72               7.2            3.7                    SSW
## 73               2.6           11.3                    SSW
## 74               5.2            8.6                    SSW
## 75               5.2           10.9                    SSW
## 76               5.0            9.0                    SSW
## 77               5.2           10.3                     SE
## 81               2.8            6.4                    NNW
## 82               6.6            5.8                    SSW
## 83               6.6            7.4                    NNW
## 84              12.0            8.9                      W
## 85               8.8           10.2                      S
## 87               3.8           10.3                    NNE
## 88              13.4            2.9                      N
## 89               9.0            2.8                    WNW
## 90               3.0            3.7                    SSW
## 91               1.6            2.8                    WSW
## 92               2.4           10.8                    NNE
## 93               8.0            4.5                    WSW
## 94               5.0            3.8                    SSE
## 95               4.0            7.9                      N
## 96              11.8            8.1                      N
## 97               6.4            9.9                    NNW
## 98               6.5            5.7                    NNW
## 99               6.0            7.8                    SSW
## 100              3.6            0.5                     SW
## 101              2.6           11.4                      S
## 102              4.0           10.8                      N
## 103              6.0            3.4                    SSW
## 104              2.8            7.9                      S
## 105              4.4            5.4                    NNW
## 106             10.8            9.2                      N
## 107             15.0            6.6                      N
## 108              9.8            7.5                      S
## 109              4.8            9.6                    SSE
## 110              3.4            9.9                    NNE
## 111              9.4            0.5                      N
## 112              6.6            0.0                    SSW
## 113              2.4            2.1                    SSW
## 115              1.2            9.8                    NNW
## 116              5.2            5.1                    WSW
## 117              3.2            0.9                      W
## 118              3.6            1.3                    WNW
## 119              2.4            5.9                    WSW
```

```
## 120              2.0            7.0                    NNW
## 121              8.0            4.2                      N
## 122              4.8            0.4                      N
## 123              2.6           10.0                    NNW
## 124              4.6            4.3                      S
## 125              2.0            3.1                    SSW
## 126              2.4            5.2                    SSW
## 127              2.4            9.7                    NNW
## 128              4.8            5.3                      W
## 129              3.6            1.4                      N
## 131              2.4            2.4                      W
## 132              1.2            1.9                      N
## 133              1.8            7.4                      N
## 134              4.0            7.0                     NW
## 135              2.8            4.4                     SW
## 136              1.8            5.8                      S
## 137              1.4            9.5                    NNW
## 138              2.0            9.6                      W
## 139              3.2            8.4                      N
## 140              5.4            3.9                      N
## 141              2.6            4.4                    NNW
## 142              2.6            9.8                    NNW
## 143              3.6            8.8                      N
## 144              8.0            2.0                      N
## 145              4.0            6.8                     NW
## 146              4.6            6.5                    WSW
## 147              4.8            5.4                    WNW
## 148              2.2            0.2                     NW
## 149              3.8            6.8                     NW
## 150              1.8            4.7                     SW
## 151              2.4            1.1                    SSW
## 152              0.6            0.5                    SSW
## 153              1.0            2.3                    WNW
## 154              2.4            0.0                      S
## 155              2.4            4.9                      S
## 156              0.8            0.7                     SW
## 157              1.2            1.7                    SSW
## 160              2.6            6.2                      N
## 161              2.4            6.9                      N
## 162              3.2            9.0                    NNW
## 163              3.8            0.0                    NNW
## 164              1.4            8.0                    NNW
## 165              2.4            5.4                     NW
## 166              2.8            0.8                    NNW
## 167              0.8            5.4                    NNE
## 168              1.0            8.8                      N
## 169              2.2            0.9                      N
## 170              1.0            3.1                    SSW
## 171              0.4            0.0                     SW
## 172              0.2            6.5                    SSW
## 173              1.4            2.3                    WSW
## 174              0.8            9.2                     NE
## 175              1.4            8.1                      N
## 176              2.8            8.0                      N
```

```
## 177          1.6          9.3            N
## 178          2.6          9.2            N
## 179          4.0          8.2            N
## 180          4.2          1.1            N
## 181          3.2          8.1            N
## 182          2.0          8.3          NNW
## 183          0.6          8.9            N
## 190          2.8          2.9           SW
## 191          1.2          1.7            N
## 192          3.0          0.3          NNW
## 194          0.8          5.9           SW
## 195          1.2          9.5            N
## 196          3.2          9.0            N
## 197          5.0          3.6            N
## 198          5.2          7.6            N
## 199          4.0          9.1            N
## 200          6.6          6.4            N
## 201          0.0          5.4            W
## 202          2.2          1.7            N
## 203          2.2          9.2            N
## 204          3.4          3.7            N
## 205          2.2          5.6            N
## 206          4.4          7.5           NW
## 207          1.8          4.8          NNW
## 208          2.6          8.5          NNW
## 209          4.4          2.9            N
## 210          1.6          6.1           NW
## 211          3.2          0.7            N
## 212          3.2          8.0            N
## 213          4.0          8.5            W
## 214          1.4          9.1          NNE
## 215          6.2          2.9          NNW
## 216          3.2          5.2            N
## 217          2.0          8.4            N
## 218          7.6          5.1          NNW
## 219          2.0          5.7           NW
## 220          4.6          3.6          NNW
## 221          1.8          3.6            N
## 222          4.0          9.3            N
## 223          7.8          2.9          NNW
## 224          3.0          7.4           NW
## 225          3.6          2.5            W
## 226          1.4         10.2          NNW
## 227          8.0          6.7            N
## 228          4.8          7.5           NW
## 229          3.4          7.9            N
## 230          4.0          7.3          WNW
## 231          4.2          4.8            S
## 232          1.8          0.5           NW
## 233          2.0          1.3           NW
## 234          1.2          1.6            N
## 235          2.2          7.8          NNE
## 236          1.5         10.5          SSW
## 237          3.0         10.5          SSW
```

```
## 239              3.0           10.3                    S
## 240              3.0            9.5                   SW
## 241              1.2           10.8                  SSW
## 242              4.0            0.0                    N
## 243              3.2            1.2                    N
## 244              2.0            4.4                    W
## 245              2.2            9.0                  SSE
## 246              2.6            9.2                   SW
## 247              2.2           10.7                  NNE
## 248              4.4           10.4                  NNE
## 249              6.4            5.9                  NNE
## 250              0.4            6.5                    W
## 251              2.0           10.6                  NNW
## 252              3.0            3.4                   NW
## 253              3.8            3.2                   SW
## 254              3.0           10.7                    N
## 255              9.4            9.2                    W
## 256              6.8           10.9                    N
## 257              4.8           10.2                  NNW
## 258              8.2            4.8                  WNW
## 259              5.6            8.4                   NW
## 260              3.0           10.4                    N
## 261             10.4            6.3                    N
## 262              4.6            8.6                  SSW
## 263              3.8            9.6                  SSW
## 264              3.4            7.6                  SSW
## 265              2.6           10.8                  SSW
## 266              3.8            1.5                    S
## 267              3.4           11.0                  SSW
## 268              4.6            4.7                    S
## 269              2.2           11.4                  SSW
## 270              8.0           10.9                    N
## 271              5.6            2.9                    S
## 272              3.0            5.1                    W
## 273              3.4            6.7                  SSW
## 274              2.4           10.9                    N
## 275              5.2            4.0                    N
## 276              8.8            1.5                  SSW
## 277              4.8            1.0                    S
## 278              3.0           11.7                   SE
## 279              6.2           11.1                    N
## 280              5.0            6.2                   SW
## 281              4.8            7.1                  WNW
## 285              5.8           12.1                   SE
## 286              6.4           12.1                  NNW
## 287              8.4           10.4                  NNE
## 288             10.4            5.2                  NNE
## 289             12.4            0.2                  NNE
## 290              3.4            6.2                  NNW
## 291              6.2            3.4                  NNW
## 292              3.6            9.0                    N
## 293              9.8            3.0                  WSW
## 294              5.4            8.6                  WNW
## 295              4.0           12.4                  NNW
```

```
## 296  10.6  5.3  SSW
## 297   3.8 10.4  SSW
## 298   4.6 12.1  SSW
## 299   6.0  8.2    S
## 300   3.4  6.7  SSW
## 301   5.8  9.4  SSW
## 302   6.2 10.3  SSW
## 304   7.6  4.1  SSW
## 305   2.8  3.4  NNW
## 306  11.2  6.4  WNW
## 307  11.2 10.4  WSW
## 308   7.8  6.8  WSW
## 309   5.0  6.0  NNW
## 310   4.8  2.2  SSW
## 311   7.2  9.8  SSW
## 312   3.4  8.2  SSW
## 313   4.8  1.8  SSW
## 315   4.8 12.8  SSW
## 316   6.6  4.6  NNW
## 317  11.8  2.6    N
## 318  11.0  0.0  SSW
## 319   2.0 11.0   SW
## 320   6.6 13.2  SSW
## 321   6.2 12.8  SSW
## 322   7.0 12.8  SSW
## 323  10.6 11.0  NNW
## 324  14.4  0.2    W
## 325   7.4 11.0   NW
## 326   7.2  7.0  SSW
## 327   4.6  0.0  WSW
## 328   2.0  1.7  SSW
## 329   2.4  5.6  SSW
## 330   4.8  9.4  SSW
## 331   4.8  4.2    S
## 332   5.2 10.5    S
## 333   5.4  5.7   SW
## 334   4.6 11.5  SSW
## 335   7.0 12.5    N
## 336  14.6  7.8  WNW
## 337   7.2  5.4  NNW
## 338   5.6  7.9    W
## 339   5.4 13.8  SSW
## 340   7.8 12.8  NNW
## 341  15.6  8.2    N
## 343   4.8  0.2    S
## 344   2.4 11.4    S
## 345   7.4 13.0  SSW
## 346   7.4  9.8   SW
## 347  14.2  0.4  SSW
## 348   4.4  3.7    N
## 349   3.0  4.7  NNW
## 350   3.8  3.0  NNW
## 351   4.0  4.5  SSW
## 352   5.2  5.0   SW
```

```
## 354              2.8           1.9                            S
## 355              4.8           2.8                            S
## 356             10.8          10.5                          SSW
## 357              4.0          13.9                          SSW
## 358              7.0          13.7                            N
## 359             10.4          13.3                          SSW
## 360              8.2          13.6                          SSW
## 363              7.8           0.1                           SW
## 365              3.2          11.8                          SSW
##     Maximum_speed_gust_of_wind Time.of.maximum.wind.gust
## 1                           35                  17:44:00
## 2                           39                  15:23:00
## 3                           26                  14:53:00
## 4                           54                  12:03:00
## 5                           39                  08:24:00
## 6                           33                  11:12:00
## 7                           39                  16:20:00
## 8                           43                  15:36:00
## 9                           37                  13:02:00
## 10                          31                  14:21:00
## 11                          30                  15:21:00
## 12                          44                  15:06:00
## 13                          35                  13:44:00
## 14                          31                  15:40:00
## 15                          31                  13:48:00
## 16                          41                  13:35:00
## 17                          35                  07:24:00
## 18                          33                  21:11:00
## 19                          31                  15:17:00
## 20                          33                  12:42:00
## 21                          37                  17:26:00
## 22                          31                  17:43:00
## 23                          41                  16:26:00
## 24                          26                  18:03:00
## 25                          57                  09:12:00
## 26                          37                  21:44:00
## 27                          30                  17:04:00
## 28                          35                  16:27:00
## 29                          41                  15:17:00
## 30                          54                  15:51:00
## 31                          48                  16:45:00
## 32                          41                  15:08:00
## 33                          39                  12:30:00
## 34                          37                  18:36:00
## 35                          39                  15:11:00
## 36                          30                  04:32:00
## 37                          41                  18:23:00
## 38                          28                  11:32:00
## 39                          33                  16:20:00
## 40                          46                  13:57:00
## 41                          28                  11:06:00
## 43                          46                  09:49:00
## 44                          39                  10:54:00
## 45                          26                  11:34:00
```

```
## 46                31              13:21:00
## 47                31              13:20:00
## 48                20              12:36:00
## 49                37              15:32:00
## 50                33              13:56:00
## 51                30              15:14:00
## 52                31              13:41:00
## 53                39              16:06:00
## 54                37              19:23:00
## 55                35              10:25:00
## 56                43              09:59:00
## 57                35              15:45:00
## 58                24              16:48:00
## 59                46              09:23:00
## 60                39              17:29:00
## 61                41              09:32:00
## 62                46              12:56:00
## 63                30              15:34:00
## 64                28              17:17:00
## 65                54              12:46:00
## 66                24              14:18:00
## 67                31              12:10:00
## 68                28              16:24:00
## 69                39              13:52:00
## 70                37              14:52:00
## 71                39              09:17:00
## 72                28              14:17:00
## 73                33              14:26:00
## 74                35              14:10:00
## 75                22              14:03:00
## 76                24              15:59:00
## 77                33              17:54:00
## 81                31              16:37:00
## 82                46              16:41:00
## 83                57              20:01:00
## 84                50              07:54:00
## 85                33              11:08:00
## 87                39              15:15:00
## 88                56              15:33:00
## 89                39              13:39:00
## 90                30              13:14:00
## 91                17              23:33:00
## 92                35              11:29:00
## 93                35              10:14:00
## 94                24              00:06:00
## 95                54              13:42:00
## 96                63              00:19:00
## 97                48              15:14:00
## 98                48              14:07:00
## 99                37              18:11:00
## 100               22              03:16:00
## 101               28              15:51:00
## 102               33              14:36:00
## 103               20              14:07:00
```

```
## 104                17              16:00:00
## 105                30              15:03:00
## 106                46              11:16:00
## 107                50              10:41:00
## 108                30              12:51:00
## 109                17              02:48:00
## 110                24              12:21:00
## 111                35              11:10:00
## 112                22              12:29:00
## 113                22              15:11:00
## 115                24              12:21:00
## 116                41              17:01:00
## 117                30              12:56:00
## 118                33              11:38:00
## 119                19              06:05:00
## 120                48              12:45:00
## 121                46              09:34:00
## 122                39              13:01:00
## 123                30              13:46:00
## 124                37              17:19:00
## 125                28              14:40:00
## 126                24              13:25:00
## 127                57              21:26:00
## 128                35              11:49:00
## 129                57              12:39:00
## 131                26              09:41:00
## 132                22              17:56:00
## 133                46              15:42:00
## 134                33              13:09:00
## 135                20              12:40:00
## 136                17              13:32:00
## 137                22              11:55:00
## 138                17              14:01:00
## 139                33              11:32:00
## 140                52              13:35:00
## 141                33              15:46:00
## 142                24              12:23:00
## 143                46              14:10:00
## 144                50              15:58:00
## 145                44              13:47:00
## 146                50              21:02:00
## 147                46              03:44:00
## 148                44              21:11:00
## 149                50              10:09:00
## 150                31              14:50:00
## 151                31              11:58:00
## 152                28              00:28:00
## 153                41              16:03:00
## 154                35              20:21:00
## 155                30              00:14:00
## 156                24              13:54:00
## 157                26              12:01:00
## 160                39              11:54:00
## 161                57              04:04:00
```

```
## 162                41                13:21:00
## 163                44                10:08:00
## 164                35                11:50:00
## 165                39                14:52:00
## 166                17                10:34:00
## 167                20                00:33:00
## 168                26                15:45:00
## 169                37                02:51:00
## 170                24                13:40:00
## 171                22                15:09:00
## 172                31                14:21:00
## 173                20                13:02:00
## 174                13                04:30:00
## 175                17                06:35:00
## 176                28                13:56:00
## 177                26                13:26:00
## 178                41                14:29:00
## 179                41                12:29:00
## 180                52                12:45:00
## 181                39                13:08:00
## 182                19                00:57:00
## 183                33                16:10:00
## 190                31                12:43:00
## 191                24                13:42:00
## 192                37                11:26:00
## 194                20                13:18:00
## 195                26                15:18:00
## 196                50                13:38:00
## 197                46                12:22:00
## 198                69                10:06:00
## 199                57                14:32:00
## 200                52                07:32:00
## 201                43                13:11:00
## 202                31                13:46:00
## 203                41                13:16:00
## 204                80                19:05:00
## 205                57                10:24:00
## 206                33                11:52:00
## 207                28                13:39:00
## 208                31                10:32:00
## 209                33                14:20:00
## 210                52                11:04:00
## 211                57                23:59:00
## 212                57                01:17:00
## 213                28                00:52:00
## 214                44                12:25:00
## 215                61                11:54:00
## 216                41                10:35:00
## 217                57                11:29:00
## 218                54                15:32:00
## 219                46                14:33:00
## 220                48                02:59:00
## 221                41                14:33:00
## 222                70                10:14:00
```

```
## 223                39              00:15:00
## 224                41              15:36:00
## 225                35              18:17:00
## 226                56              14:48:00
## 227                54              00:55:00
## 228                30              09:27:00
## 229                52              23:58:00
## 230                52              18:34:00
## 231                48              13:54:00
## 232                30              13:11:00
## 233                24              06:41:00
## 234                24              11:21:00
## 235                19              04:33:00
## 236                20              14:46:00
## 237                20              14:26:00
## 239                33              14:12:00
## 240                26              15:19:00
## 241                22              12:37:00
## 242                37              09:19:00
## 243                56              03:20:00
## 244                30              09:30:00
## 245                28              16:07:00
## 246                26              14:35:00
## 247                19              15:28:00
## 248                46              10:58:00
## 249                54              13:34:00
## 250                24              02:30:00
## 251                28              15:09:00
## 252                39              12:29:00
## 253                20              09:12:00
## 254                61              15:14:00
## 255                41              00:05:00
## 256                37              16:51:00
## 257                46              09:41:00
## 258                50              08:23:00
## 259                33              00:38:00
## 260                48              15:11:00
## 261                59              11:59:00
## 262                31              15:48:00
## 263                20              10:16:00
## 264                31              13:03:00
## 265                35              15:51:00
## 266                39              14:45:00
## 267                37              16:05:00
## 268                35              16:00:00
## 269                20              13:34:00
## 270                48              08:27:00
## 271                44              12:38:00
## 272                28              09:35:00
## 273                22              15:44:00
## 274                35              10:51:00
## 275                39              15:07:00
## 276                33              09:01:00
## 277                33              13:48:00
```

```
## 278    31    13:55:00
## 279    37    09:04:00
## 280    24    12:52:00
## 281    30    18:28:00
## 285    31    17:26:00
## 286    35    09:02:00
## 287    43    10:41:00
## 288    46    12:16:00
## 289    54    05:09:00
## 290    39    13:18:00
## 291    39    09:01:00
## 292    46    08:54:00
## 293    41    02:21:00
## 294    20    09:00:00
## 295    44    13:44:00
## 296    41    15:55:00
## 297    39    14:36:00
## 298    35    15:06:00
## 299    30    15:43:00
## 300    41    19:05:00
## 301    35    16:16:00
## 302    33    12:09:00
## 304    28    13:26:00
## 305    39    13:36:00
## 306    57    15:50:00
## 307    46    23:38:00
## 308    26    09:46:00
## 309    43    13:32:00
## 310    35    17:25:00
## 311    44    14:02:00
## 312    28    16:02:00
## 313    31    17:25:00
## 315    31    15:25:00
## 316    30    11:44:00
## 317    50    15:36:00
## 318    28    15:21:00
## 319    35    12:55:00
## 320    37    16:15:00
## 321    43    12:52:00
## 322    30    15:36:00
## 323    41    10:48:00
## 324    46    15:10:00
## 325    41    18:13:00
## 326    46    22:21:00
## 327    48    03:28:00
## 328    35    03:50:00
## 329    33    15:49:00
## 330    30    13:41:00
## 331    35    13:31:00
## 332    41    15:42:00
## 333    35    13:11:00
## 334    37    13:50:00
## 335    52    16:48:00
## 336    70    02:28:00
```

```
## 337                        46                 12:58:00
## 338                        28                 23:34:00
## 339                        30                 14:44:00
## 340                        43                 11:47:00
## 341                        61                 13:05:00
## 343                        26                 23:32:00
## 344                        35                 11:49:00
## 345                        33                 16:30:00
## 346                        44                 18:54:00
## 347                        39                 09:28:00
## 348                        28                 10:43:00
## 349                        41                 12:56:00
## 350                        43                 12:04:00
## 351                        31                 14:15:00
## 352                        31                 14:46:00
## 354                        43                 16:41:00
## 355                        44                 16:46:00
## 356                        35                 12:14:00
## 357                        28                 17:44:00
## 358                        43                 13:26:00
## 359                        39                 15:25:00
## 360                        28                 14:35:00
## 363                        33                 23:42:00
## 365                        35                 17:06:00
##     X9am.Temperature..Deg.C. humidity_9am X9am.cloud.amount..oktas.
## 1                       19.8          74                         7
## 2                       19.5          64                         8
## 3                       18.1          75                         8
## 4                       29.5          31                         0
## 5                       18.0          63                         7
## 6                       17.7          55                         1
## 7                       19.1          55                         6
## 8                       20.2          72                         7
## 9                       17.8          62                         5
## 10                      16.9          53                         7
## 11                      17.9          64                         1
## 12                      24.1          46                         4
## 13                      19.2          60                         3
## 14                      22.8          72                         0
## 15                      25.2          66                         2
## 16                      21.9          76                         4
## 17                      22.7          83                         7
## 18                      27.1          50                         7
## 19                      18.4          66                         1
## 20                      19.9          67                         7
## 21                      20.0          76                         7
## 22                      21.0          80                         1
## 23                      20.1          75                         8
## 24                      21.2          73                         1
## 25                      35.5          32                         5
## 26                      21.6          63                         7
## 27                      18.6          59                         7
## 28                      19.3          68                         1
## 29                      19.9          79                         3
```

```
## 30          21.3          68          2
## 31          18.6          61          1
## 32          16.4          49          1
## 33          19.2          66          1
## 34          25.0          66          1
## 35          20.4          72          7
## 36          18.5          72          7
## 37          22.3          75          5
## 38          23.7          76          5
## 39          18.1          83          8
## 40          16.7          55          7
## 41          15.7          58          3
## 43          20.7          55          7
## 44          13.7          56          1
## 45          14.9          61          7
## 46          18.6          68          7
## 47          18.7          77          8
## 48          18.1          80          7
## 49          20.2          64          6
## 50          17.0          59          2
## 51          15.9          60          7
## 52          17.4          57          7
## 53          17.3          64          7
## 54          17.5          65          7
## 55          18.1          69          0
## 56          23.6          36          0
## 57          20.6          81          2
## 58          16.3          71          1
## 59          24.5          50          1
## 60          28.5          35          7
## 61          26.8          38          0
## 62          27.9          33          2
## 63          20.7          69          6
## 64          20.4          72          7
## 65          13.8          66          3
## 66          11.4          63          1
## 67          15.7          43          7
## 68          16.0          62          3
## 69          16.0          87          7
## 70          19.9          70          5
## 71          17.5          59          7
## 72          13.4          71          7
## 73          16.0          66          1
## 74          15.5          77          3
## 75          14.2          84          1
## 76          18.4          91          8
## 77          18.7          75          4
## 81          20.1          88          8
## 82          22.3          61          8
## 83          19.0          79          4
## 84          15.0          53          5
## 85          13.5          56          1
## 87          14.6          61          1
## 88          21.5          35          7
```

```
## 89   9.5  80  7
## 90  14.1  79  7
## 91  13.4  78  7
## 92   9.4  82  6
## 93  18.6  56  7
## 94  14.6  68  6
## 95  16.9  73  4
## 96  16.7  71  2
## 97  16.5  65  0
## 98  17.2  60  7
## 99  12.9  58  1
## 100 11.9  76  7
## 101 14.1  61  5
## 102 11.5  75  0
## 103 12.8  65  7
## 104 14.9  87  7
## 105 17.1  66  7
## 106 22.8  44  2
## 107 25.8  32  7
## 108 15.3  59  3
## 109 12.7  68  1
## 110 15.0  54  1
## 111 22.3  48  7
## 112 15.7  68  7
## 113 15.8  72  7
## 115 14.0  75  4
## 116 12.4  73  7
## 117 12.7  60  5
## 118 13.6  79  7
## 119 12.9  75  7
## 120 15.6  54  2
## 121 20.2  46  7
## 122 17.6  78  7
## 123 15.4  75  1
## 124 14.1  72  2
## 125 13.0  84  7
## 126 12.2  85  4
## 127 10.6  80  1
## 128 13.0  75  6
## 129 13.4  62  6
## 131 12.2  76  3
## 132 14.3  68  7
## 133 14.5  74  2
## 134 14.4  64  3
## 135 13.6  74  7
## 136 11.3  77  7
## 137  9.1  84  1
## 138  8.9  83  1
## 139 11.9  76  7
## 140 17.8  60  7
## 141 14.0  77  7
## 142 14.4  72  1
## 143 13.8  72  0
## 144 16.1  47  7
```

```
## 145  15.6  69  7
## 146  11.2  64  1
## 147   8.7  67  7
## 148   9.7  76  7
## 149   8.9  62  3
## 150   8.5  71  3
## 151  11.8  99  7
## 152  13.3  78  7
## 153  11.3  79  7
## 154   9.3  97  8
## 155  10.1  68  7
## 156  10.3  84  7
## 157  12.1  84  7
## 160  12.1  76  3
## 161  15.6  73  7
## 162  11.9  76  0
## 163  15.6  76  8
## 164  11.5  72  3
## 165  13.0  72  7
## 166  10.9  83  7
## 167  10.4  86  7
## 168   8.0  91  3
## 169  11.0  77  7
## 170   7.6  78  5
## 171   7.9  95  7
## 172   7.7  90  5
## 173   7.8  93  7
## 174   5.8 100  1
## 175   4.5  96  2
## 176   5.3  77  6
## 177   6.6  84  0
## 178  10.7  69  3
## 179  13.0  65  1
## 180  14.1  86  7
## 181  10.3  61  1
## 182   5.7  84  5
## 183   4.1  92  1
## 190  10.5  77  6
## 191   9.5  64  7
## 192   8.6  62  7
## 194   7.2 100  3
## 195   6.0  86  1
## 196   7.9  66  1
## 197  10.1  55  7
## 198  10.7  58  1
## 199   8.8  77  1
## 200  10.6  53  7
## 201   8.8  66  1
## 202   8.1  79  7
## 203   9.0  66  1
## 204   9.7  61  8
## 205  10.9  74  1
## 206  10.6  69  3
## 207   9.2  79  7
```

```
## 208  11.6  69  4
## 209  12.3  71  4
## 210  11.8  62  1
## 211  10.1  69  7
## 212  10.6  66  1
## 213  11.1  69  3
## 214   7.8  79  2
## 215  15.6  37  7
## 216  10.6  75  1
## 217  11.3  57  7
## 218  10.1  68  6
## 219   9.7  63  5
## 220  11.9  71  4
## 221   9.4  67  7
## 222  15.3  44  5
## 223   8.5  94  7
## 224   7.9  68  1
## 225  12.7  71  7
## 226  11.6  72  1
## 227  13.8  51  4
## 228  10.8  63  1
## 229  10.6  64  4
## 230  10.6  65  1
## 231   7.1  76  7
## 232   8.9  67  7
## 233   9.8  73  4
## 234  10.7  73  7
## 235   8.8  79  1
## 236   8.5  77  1
## 237   8.0  74  0
## 239   8.6  78  6
## 240   6.3  81  1
## 241   5.3  70  1
## 242   8.9  59  7
## 243  12.3  65  8
## 244  12.4  68  2
## 245   9.1  77  3
## 246  10.2  75  6
## 247   8.4  77  1
## 248  15.4  55  2
## 249  15.8  56  6
## 250  10.7  73  7
## 251   8.6  77  1
## 252  14.4  57  7
## 253  15.1  67  7
## 254  16.8  64  0
## 255  12.5  50  3
## 256  13.8  54  1
## 257  15.7  45  0
## 258  10.2  77  8
## 259   9.8  64  1
## 260  12.3  52  5
## 261  14.6  31  5
## 262  10.4  63  3
```

```
## 263  11.1  66  1
## 264  13.0  67  7
## 265  13.4  69  1
## 266  11.7  67  8
## 267  12.3  49  5
## 268  11.3  68  7
## 269  10.2  68  1
## 270  16.9  46  4
## 271  13.1  66  7
## 272  10.3  60  6
## 273  11.7  73  7
## 274  13.2  62  6
## 275  14.7  54  7
## 276  17.9  56  7
## 277  12.1  66  8
## 278  14.2  62  1
## 279  17.9  44  1
## 280  14.4  65  1
## 281  16.6  61  4
## 285  13.3  73  0
## 286  16.3  51  1
## 287  20.3  47  3
## 288  21.4  45  7
## 289  21.0  61  7
## 290  17.7  81  6
## 291  15.7  82  6
## 292  17.8  64  6
## 293  11.8  90  7
## 294  12.8  76  7
## 295  16.2  59  4
## 296  14.8  81  7
## 297  12.9  55  5
## 298  12.0  66  1
## 299  13.0  67  7
## 300  13.1  72  7
## 301  11.7  55  7
## 302  12.7  54  7
## 304  15.9  77  7
## 305  16.4  81  7
## 306  22.7  62  8
## 307  15.0  52  7
## 308  14.5  59  8
## 309  17.3  79  8
## 310  18.5  98  8
## 311  13.4  55  1
## 312  12.0  61  1
## 313  12.4  72  7
## 315  16.5  50  1
## 316  17.1  69  7
## 317  22.3  50  7
## 318  15.2  100  8
## 319  15.0  53  7
## 320  13.7  68  6
## 321  14.9  55  5
```

```
## 322                    15.6          71                      1
## 323                    22.6          38                      3
## 324                    26.8          35                      7
## 325                    14.1          68                      5
## 326                    12.6          57                      7
## 327                    11.2          86                      7
## 328                    12.7          84                      8
## 329                    13.6          84                      7
## 330                    15.3          79                      7
## 331                    16.6          70                      7
## 332                    18.6          67                      6
## 333                    15.5          79                      8
## 334                    16.7          75                      7
## 335                    17.3          57                      1
## 336                    15.4          62                      5
## 337                    16.3          58                      7
## 338                    15.4          71                      7
## 339                    17.1          63                      7
## 340                    25.1          47                      5
## 341                    30.8          30                      3
## 343                    16.9          82                      8
## 344                    16.7          76                      7
## 345                    17.0          68                      2
## 346                    22.0          67                      5
## 347                    17.0         100                      8
## 348                    17.4          85                      7
## 349                    19.3          98                      7
## 350                    18.6          72                      7
## 351                    18.9          80                      7
## 352                    17.6          70                      8
## 354                    19.2          89                      7
## 355                    17.8          86                      7
## 356                    16.9          62                      7
## 357                    16.2          64                      1
## 358                    21.8          61                      0
## 359                    22.4          53                      1
## 360                    18.3          63                      1
## 363                    21.4          81                      7
## 365                    19.1          66                      5
##     X9am.wind.direction X9am.wind.speed..km.h. X9am.MSL.pressure..hPa.
## 1                     S                      6                  1013.0
## 2                   SSE                      7                  1013.9
## 3                     S                      2                  1012.6
## 4                   NNE                      9                  1005.5
## 5                     S                     13                  1013.5
## 6                    SW                      9                  1020.4
## 7                    SE                     11                  1019.8
## 8                   WSW                      2                  1011.8
## 9                    SW                     11                  1015.7
## 10                  SSW                      6                  1020.1
## 11                    N                      9                  1016.4
## 12                    S                      9                  1015.4
## 13                  SSE                     15                  1020.2
## 14                   SW                      4                  1013.2
```

```
## 15          NNE           2          1009.1
## 16           SW           7          1011.2
## 17          SSW          13          1009.9
## 18          NNW          11          1008.2
## 19          WSW           7          1020.8
## 20            S           9          1021.7
## 21          SSE           4          1018.1
## 22           NE           7          1013.4
## 23          SSE          11          1016.4
## 24          NNE           7          1013.8
## 25            N          31          1004.7
## 26          SSE           9          1009.9
## 27            W           9          1011.3
## 28          NNE           6          1015.6
## 29          NNE          11          1011.2
## 30          NNE           9          1008.6
## 31           SW          11          1012.5
## 32           SE          15          1022.6
## 33           NE           4          1015.6
## 34          SSW           7          1009.7
## 35            S          11          1014.5
## 36          SSE          13          1017.7
## 37            N           7          1014.1
## 38          NNW          11          1011.6
## 39            S           9          1009.4
## 40          NNW          15           999.4
## 41           NW           7          1010.8
## 43          NNW          19           993.2
## 44            W          15          1010.2
## 45           NW           9          1020.2
## 46          SSE           7          1024.0
## 47           SW           6          1019.2
## 48          NNE           6          1012.8
## 49          WSW          11          1007.3
## 50           SW           9          1012.0
## 51          WNW           4          1015.3
## 52          SSW          11          1020.0
## 53          SSE           9          1024.1
## 54          SSE           9          1025.9
## 55          ENE           4          1026.4
## 56            N          19          1025.2
## 57          SSW           9          1021.9
## 58          WSW           4          1022.4
## 59          NNE           9          1018.8
## 60            N           9          1020.2
## 61            N          20          1019.7
## 62            N          13          1018.3
## 63          SSW           4          1019.6
## 64          SSW           4          1013.2
## 65          WNW          13          1014.1
## 66           NE           9          1025.1
## 67           NE           9          1018.0
## 68           NE           6          1018.6
## 69          NNE           9          1012.0
```

```
## 70          NNW          4          1011.0
## 71          WNW         11          1009.4
## 72          WSW          9          1018.9
## 73            S          7          1017.0
## 74          NNE          4          1019.8
## 75           NE          7          1021.0
## 76            W          4          1019.4
## 77           SE          7          1017.9
## 81          NNE          6          1015.4
## 82            N         13          1009.5
## 83          NNE          9          1011.0
## 84          WNW         17          1005.5
## 85           NW         15          1018.2
## 87            N          7          1018.3
## 88            N         20          1006.1
## 89            W         15          1009.9
## 90          WNW          9          1015.2
## 91          NNE          6          1025.5
## 92          NNE         11          1027.0
## 93            N         11          1024.2
## 94           SW          2          1030.4
## 95            N          9          1024.5
## 96          WSW          7          1019.5
## 97          NNE          9          1017.6
## 98            N          9          1014.1
## 99            W         13          1018.1
## 100           W          6          1027.4
## 101         NNE          6          1027.7
## 102         NNE          7          1024.9
## 103         NNE          6          1025.6
## 104          NE          4          1025.2
## 105          NE          2          1021.7
## 106           N          7          1021.3
## 107           N         20          1018.3
## 108         SSW          4          1027.7
## 109          NE          9          1027.8
## 110         NNE         11          1023.9
## 111         NNW          9          1017.9
## 112           S          9          1025.4
## 113         SSE          6          1028.2
## 115           N          9          1022.4
## 116           W         11          1017.7
## 117          NW          9          1026.5
## 118           W         11          1025.4
## 119         WNW          4          1027.2
## 120           N         11          1017.2
## 121           N         20          1012.0
## 122           N         13          1018.2
## 123         NNW         11          1017.0
## 124         WSW          9          1019.4
## 125           W          6          1025.4
## 126           S          6          1023.5
## 127         NNE          9          1014.6
## 128         WNW         11          1011.3
```

```
## 129                N                22               1013.2
## 131              WNW                 7               1025.4
## 132              NNW                 9               1028.3
## 133                N                13               1027.8
## 134                N                13               1028.4
## 135                W                 2               1031.9
## 136               NE                 7               1029.7
## 137               NE                11               1028.4
## 138               NE                 9               1031.1
## 139                N                 9               1028.9
## 140                N                17               1021.4
## 141              NNW                11               1023.8
## 142                N                 7               1028.3
## 143                N                11               1026.5
## 144              NNW                22               1019.7
## 145              NNW                 7               1014.0
## 146                N                11               1014.5
## 147              WNW                13               1008.2
## 148                N                19               1010.3
## 149              WNW                13               1002.9
## 150              WSW                 9               1021.3
## 151               SW                 9               1027.1
## 152                S                 9               1032.5
## 153              WNW                 6               1028.3
## 154              SSE                 7               1020.0
## 155              SSE                 9               1027.4
## 156              WSW                 7               1032.8
## 157                W                 7               1034.7
## 160                N                17               1022.0
## 161                N                17               1011.2
## 162              NNE                 9               1022.5
## 163              NNW                19               1013.8
## 164              NNW                17               1015.9
## 165              NNW                13               1018.3
## 166              NNE                 7               1021.5
## 167               NE                 7               1023.2
## 168              NNE                11               1023.8
## 169                N                13               1017.3
## 170                W                 7               1026.2
## 171                W                 2               1026.6
## 172              WSW                 7               1029.2
## 173              WNW                 2               1031.4
## 174                N                 6               1032.3
## 175              NNE                13               1034.0
## 176              NNE                11               1034.8
## 177              NNE                 9               1036.2
## 178                N                17               1032.6
## 179                N                13               1027.6
## 180               NE                13               1014.6
## 181              NNW                13               1018.0
## 182              NNE                 9               1032.5
## 183              NNE                 9               1032.3
## 190              SSW                 6               1027.5
## 191              WNW                 7               1029.4
```

```
## 192                N                11              1023.0
## 194              NNE                 6              1022.8
## 195               NE                 9              1022.2
## 196                N                24              1015.3
## 197                N                13              1008.3
## 198                N                22              1006.1
## 199              NNE                11              1015.4
## 200                N                26              1008.1
## 201               NW                11              1008.9
## 202              NNE                 9              1022.4
## 203                N                17              1023.1
## 204                N                26              1013.3
## 205                N                19              1008.6
## 206                N                15              1016.1
## 207                N                11              1018.9
## 208                N                15              1014.1
## 209               NE                 9              1013.0
## 210              WNW                17              1002.7
## 211              NNW                11              1016.2
## 212                N                15              1011.9
## 213               NW                 7              1019.2
## 214              NNE                 9              1022.1
## 215                N                 9              1006.0
## 216                N                17              1011.6
## 217                N                22              1010.0
## 218                N                13               999.5
## 219              NNW                13              1007.0
## 220                N                17              1008.3
## 221                N                11              1022.2
## 222                N                26              1012.3
## 223              WNW                 7              1006.6
## 224               NW                11              1019.2
## 225              WNW                13              1023.6
## 226                N                15              1021.8
## 227              NNW                15              1006.2
## 228               NW                15              1013.0
## 229                N                11              1014.0
## 230              NNW                15              1008.5
## 231                W                15              1018.6
## 232              WNW                 9              1024.3
## 233               NW                13              1017.6
## 234                W                 4              1017.5
## 235               NE                 7              1020.5
## 236               NE                 7              1025.0
## 237               NE                 6              1022.8
## 239              SSE                 7              1026.6
## 240               NE                 6              1025.8
## 241              NNE                 7              1023.0
## 242              NNE                 9              1017.3
## 243                N                15               999.8
## 244                W                11              1010.8
## 245              SSW                11              1022.0
## 246                S                 2              1029.9
## 247                N                 7              1029.6
```

```
## 248    NNE    13    1022.9
## 249    NNE    22    1011.6
## 250    WSW     7    1017.1
## 251     NE     9    1018.7
## 252     NW    13    1019.0
## 253     NW     6    1025.8
## 254      N    19    1017.0
## 255    NNW    19    1015.0
## 256      N     9    1020.2
## 257      N    22    1015.9
## 258      W    24    1003.1
## 259    WNW    11    1021.8
## 260      N    15    1021.9
## 261      N    30    1010.6
## 262    WSW    15    1013.3
## 263    NNW     9    1021.1
## 264    NNW     9    1027.3
## 265     SE     4    1027.5
## 266      S    11    1030.9
## 267      S    11    1032.2
## 268    SSE     9    1029.2
## 269     NE     6    1024.4
## 270      N    20    1016.0
## 271     NW    11    1015.7
## 272     SW     9    1025.9
## 273     SW     7    1031.7
## 274    NNE     9    1027.2
## 275    NNE     9    1024.6
## 276    SSW    13    1016.8
## 277      S    13    1022.9
## 278    SSE    13    1025.9
## 279    NNW    20    1023.9
## 280    NNE     9    1022.8
## 281    NNE     7    1019.2
## 285     NE    11    1026.6
## 286    NNE    13    1023.9
## 287    NNE    20    1020.9
## 288    NNE    22    1018.2
## 289    NNE    15    1013.2
## 290    NNE     9    1013.5
## 291      N    15    1013.9
## 292    NNW    20    1015.0
## 293    WSW     6    1014.7
## 294    WSW     9    1020.4
## 295    NNE    13    1014.2
## 296     SW     9    1013.3
## 297    SSE    13    1023.7
## 298      W     6    1019.6
## 299    WNW     4    1020.7
## 300    WSW     6    1017.8
## 301    SSW     9    1020.4
## 302      S    13    1020.6
## 304    ESE     4    1020.2
## 305      E     6    1017.7
```

## 306	N	22	1008.2
## 307	NW	13	1016.6
## 308	NNW	4	1014.7
## 309	NNE	9	1005.9
## 310	NNW	9	1001.9
## 311	WSW	11	1009.9
## 312	WSW	11	1019.8
## 313	NNE	7	1020.3
## 315	ESE	7	1022.0
## 316	NE	7	1018.6
## 317	NNW	2	1011.1
## 318	SSE	9	1014.8
## 319	S	15	1023.5
## 320	WSW	7	1021.5
## 321	SSE	17	1024.6
## 322	E	4	1022.8
## 323	N	22	1017.0
## 324	NE	7	1006.4
## 325	W	6	1002.5
## 326	N	22	996.2
## 327	W	13	1005.1
## 328	W	9	1008.3
## 329	WSW	7	1007.3
## 330	S	11	1009.6
## 331	ESE	9	1007.1
## 332	SSE	13	1008.7
## 333	SSE	9	1015.1
## 334	SSW	7	1012.5
## 335	NNE	11	1009.9
## 336	WSW	13	1004.3
## 337	NW	13	1009.2
## 338	SSW	7	1018.0
## 339	S	7	1021.3
## 340	N	26	1017.3
## 341	N	24	1014.2
## 343	SSE	6	1018.6
## 344	SW	11	1019.1
## 345	SSW	9	1018.2
## 346	NNE	11	1009.9
## 347	W	9	998.5
## 348	NW	7	1003.1
## 349	N	4	1005.0
## 350	N	15	1005.7
## 351	SW	9	1011.7
## 352	SE	9	1016.6
## 354	SSW	9	1010.5
## 355	SE	7	1010.2
## 356	SSE	13	1018.1
## 357	NNE	2	1021.9
## 358	N	11	1017.8
## 359	SSW	6	1016.5
## 360	NE	4	1016.4
## 363	NNW	6	1011.8
## 365	SE	6	1013.2

```
##     X3pm.Temperature..Deg.C. X3pm.relative.humidity....
## 1                       24.4                         45
## 2                       21.4                         62
## 3                       24.6                         60
## 4                       42.0                         16
## 5                       19.1                         58
## 6                       20.6                         48
## 7                       22.2                         60
## 8                       23.5                         60
## 9                       19.3                         46
## 10                      20.6                         50
## 11                      28.0                         32
## 12                      22.4                         67
## 13                      25.2                         60
## 14                      28.8                         57
## 15                      25.1                         73
## 16                      22.1                         75
## 17                      31.2                         51
## 18                      22.1                         89
## 19                      22.9                         42
## 20                      22.4                         68
## 21                      24.8                         66
## 22                      24.9                         72
## 23                      23.1                         66
## 24                      38.4                         27
## 25                      28.5                         50
## 26                      24.3                         54
## 27                      25.8                         34
## 28                      29.3                         42
## 29                      35.0                         26
## 30                      35.6                         25
## 31                      20.8                         51
## 32                      22.4                         45
## 33                      33.4                         37
## 34                      37.0                         24
## 35                      21.3                         71
## 36                      23.5                         64
## 37                      33.5                         37
## 38                      27.5                         58
## 39                      22.3                         49
## 40                      18.7                         45
## 41                      21.9                         45
## 43                      18.4                         41
## 44                      17.4                         47
## 45                      21.0                         45
## 46                      21.1                         66
## 47                      21.9                         70
## 48                      27.8                         30
## 49                      23.3                         59
## 50                      18.7                         60
## 51                      22.0                         46
## 52                      18.9                         60
## 53                      20.2                         62
## 54                      21.2                         64
```

```
## 55                31.8                25
## 56                32.2                21
## 57                21.6                66
## 58                24.3                52
## 59                35.3                26
## 60                36.9                18
## 61                34.6                26
## 62                35.8                21
## 63                24.2                60
## 64                21.6                66
## 65                15.9                53
## 66                20.4                38
## 67                26.4                23
## 68                23.3                44
## 69                20.1                56
## 70                20.7                71
## 71                17.0                54
## 72                17.7                48
## 73                20.1                55
## 74                21.1                53
## 75                24.4                51
## 76                24.7                62
## 77                27.8                50
## 81                25.5                66
## 82                29.8                37
## 83                29.0                35
## 84                15.8                44
## 85                19.2                43
## 87                27.1                24
## 88                27.2                21
## 89                14.5                50
## 90                16.6                81
## 91                16.9                57
## 92                24.8                32
## 93                20.2                70
## 94                20.8                55
## 95                27.2                37
## 96                18.8                58
## 97                26.1                30
## 98                22.5                40
## 99                14.6                53
## 100               15.5                54
## 101               16.3                55
## 102               24.3                27
## 103               19.7                54
## 104               21.6                50
## 105               27.2                29
## 106               30.1                22
## 107               29.3                27
## 108               16.8                52
## 109               20.1                51
## 110               29.7                24
## 111               26.8                39
## 112               17.0                61
```

```
## 113                17.9                66
## 115                21.0                41
## 116                13.9                55
## 117                15.4                49
## 118                16.6                62
## 119                17.6                51
## 120                22.3                33
## 121                22.5                58
## 122                19.9                72
## 123                19.4                39
## 124                16.1                66
## 125                15.5                71
## 126                16.0                61
## 127                18.6                46
## 128                15.6                61
## 129                16.1                47
## 131                15.2                70
## 132                17.0                56
## 133                17.4                50
## 134                19.6                46
## 135                15.1                57
## 136                15.3                58
## 137                16.6                58
## 138                20.3                49
## 139                20.4                43
## 140                18.6                64
## 141                19.3                56
## 142                20.9                38
## 143                20.8                43
## 144                19.3                50
## 145                18.5                53
## 146                14.5                54
## 147                13.1                60
## 148                14.9                61
## 149                 9.6                63
## 150                12.4                63
## 151                13.3                80
## 152                13.8                71
## 153                13.6                67
## 154                10.2                91
## 155                12.5                59
## 156                12.8                57
## 157                14.1                77
## 160                17.2                48
## 161                17.6                45
## 162                17.1                57
## 163                16.1                83
## 164                16.6                50
## 165                16.5                56
## 166                14.2                67
## 167                14.3                67
## 168                16.9                54
## 169                10.0                76
## 170                11.2                70
```

```
## 171  10.1  75
## 172  12.2  71
## 173  10.8  78
## 174   9.0  84
## 175  15.8  47
## 176  16.9  46
## 177  17.1  49
## 178  17.3  48
## 179  19.1  50
## 180  13.9  85
## 181  13.3  51
## 182  12.4  63
## 183  13.9  48
## 190  13.1  65
## 191  10.6  63
## 192  11.4  54
## 194  13.1  63
## 195  14.8  43
## 196  13.5  45
## 197  12.3  55
## 198  16.2  45
## 199  14.7  49
## 200  16.7  42
## 201  11.2  66
## 202  12.4  51
## 203  14.1  43
## 204  13.9  37
## 205  15.5  60
## 206  14.5  47
## 207  13.8  63
## 208  19.0  45
## 209  17.5  47
## 210  12.1  56
## 211  11.7  56
## 212  15.2  51
## 213  13.7  56
## 214  15.7  46
## 215  15.9  43
## 216  13.1  67
## 217  17.0  37
## 218  12.8  52
## 219  13.9  45
## 220  12.8  80
## 221  12.7  57
## 222  19.2  38
## 223  13.7  45
## 224  14.2  46
## 225  14.1  63
## 226  16.1  53
## 227  17.0  36
## 228  13.7  48
## 229  15.1  41
## 230   9.6  59
## 231  10.9  64
```

```
## 232  10.3  77
## 233  11.2  75
## 234  13.2  55
## 235  14.9  50
## 236  14.2  54
## 237  14.2  54
## 239  11.5  55
## 240  10.0  64
## 241  11.1  58
## 242   9.8  72
## 243  14.1  67
## 244  10.6  81
## 245  11.9  61
## 246  12.3  57
## 247  18.9  37
## 248  20.0  37
## 249  19.1  54
## 250  14.1  51
## 251  16.5  33
## 252  16.9  60
## 253  17.3  60
## 254  23.1  39
## 255  17.6  32
## 256  19.2  37
## 257  22.5  32
## 258  11.2  52
## 259  12.6  53
## 260  17.1  35
## 261  19.1  28
## 262  12.7  57
## 263  16.3  43
## 264  17.6  46
## 265  15.2  61
## 266  12.9  52
## 267  14.5  57
## 268  12.6  59
## 269  17.0  47
## 270  23.8  28
## 271  12.6  73
## 272  12.8  51
## 273  15.6  47
## 274  20.9  33
## 275  25.1  29
## 276  15.5  73
## 277  13.8  70
## 278  20.1  40
## 279  23.0  36
## 280  23.8  33
## 281  26.7  28
## 285  20.8  42
## 286  23.7  30
## 287  26.6  34
## 288  26.8  36
## 289  22.2  60
```

```
## 290                21.3                48
## 291                19.7                54
## 292                26.5                31
## 293                13.9                74
## 294                17.9                42
## 295                25.8                30
## 296                18.4                55
## 297                14.5                49
## 298                18.9                38
## 299                17.9                53
## 300                16.9                64
## 301                15.5                50
## 302                15.7                56
## 304                18.0                72
## 305                32.3                22
## 306                29.1                46
## 307                20.0                37
## 308                19.4                53
## 309                26.5                44
## 310                20.3                73
## 311                13.9                58
## 312                15.9                45
## 313                19.0                37
## 315                18.4                63
## 316                28.8                24
## 317                30.3                29
## 318                16.0                82
## 319                16.5                55
## 320                17.6                56
## 321                17.3                54
## 322                24.3                48
## 323                29.7                25
## 324                27.4                40
## 325                20.8                44
## 326                14.0                67
## 327                12.9                91
## 328                16.1                72
## 329                18.5                63
## 330                17.8                63
## 331                19.3                73
## 332                19.2                64
## 333                17.9                68
## 334                18.7                64
## 335                30.6                27
## 336                18.5                43
## 337                22.5                44
## 338                19.7                52
## 339                22.2                62
## 340                33.8                30
## 341                36.5                22
## 343                19.2                71
## 344                19.2                62
## 345                20.3                68
## 346                32.7                27
```

```
## 347                    20.0                    74
## 348                    21.3                    76
## 349                    21.5                    61
## 350                    21.3                    58
## 351                    20.6                    75
## 352                    19.1                    70
## 354                    19.9                    75
## 355                    19.6                    77
## 356                    18.1                    57
## 357                    24.4                    44
## 358                    32.4                    20
## 359                    22.3                    71
## 360                    21.5                    65
## 363                    21.1                    71
## 365                    21.9                    64
##     X3pm.cloud.amount..oktas. X3pm.wind.direction X3pm.wind.speed..km.h.
## 1                           1                 SSW                    11
## 2                           1                 SSW                    19
## 3                           0                 SSW                    13
## 4                           1                  NW                    15
## 5                           7                   S                    11
## 6                           1                 SSW                    13
## 7                           5                   S                    15
## 8                           3                 SSW                    13
## 9                           3                   S                    15
## 10                          5                 SSW                    17
## 11                          2                 SSW                    13
## 12                          5                 SSW                    20
## 13                          1                  SW                    15
## 14                          0                 SSW                    11
## 15                          7                 SSW                    17
## 16                          7                 SSW                    20
## 17                          8                   S                     6
## 18                          7                 SSW                    13
## 19                          1                   S                    11
## 20                          1                 SSW                    11
## 21                          1                 SSW                    13
## 22                          1                 SSW                    17
## 23                          1                 SSW                    19
## 24                          1                  NE                     9
## 25                          5                   S                    15
## 26                          1                   S                    15
## 27                          7                 SSW                     7
## 28                          1                  SW                    13
## 29                          3                   N                    13
## 30                          6                   W                     7
## 31                          6                 SSW                    17
## 32                          1                   S                    20
## 33                          2                 SSE                     7
## 34                          5                  SW                     7
## 35                          7                 SSW                    17
## 36                          7                 SSW                     9
## 37                          6                 SSE                     9
## 38                          3                   S                     9
```

```
## 39   5  SSW 13
## 40   7  SSW 20
## 41   1    S 13
## 43   7  WNW 17
## 44   6    S 15
## 45   1    S  9
## 46   6  SSW 17
## 47   3    S 15
## 48   7    S 13
## 49   2  SSW 15
## 50   7    S 19
## 51   5  ENE  6
## 52   7  SSW 15
## 53   1  SSW 17
## 54   0  SSW 19
## 55   0    N 11
## 56   2   NW 13
## 57   2  SSW 17
## 58   1   SW 11
## 59   1    N 19
## 60   2    N 13
## 61   1    N 20
## 62   7    N 17
## 63   1  SSW 11
## 64   7    S 15
## 65   5  SSW 13
## 66   6  SSW  6
## 67   8   NW  7
## 68   1  SSW 15
## 69   7  NNW 24
## 70   3  SSW 13
## 71   7  SSW 13
## 72   7    S 15
## 73   7  SSW 13
## 74   1  SSW 20
## 75   1  SSW 13
## 76   1  SSW 11
## 77   3   SE 13
## 81   2   SW  9
## 82   1    N 26
## 83   5  NNW 26
## 84   3    W 17
## 85   3    S 13
## 87   4  NNE 19
## 88   7   NW 13
## 89   3   SW 15
## 90   7    S 13
## 91   7  SSW  7
## 92   2  NNW 17
## 93   7  SSW 11
## 94   7  SSW  9
## 95   7    N 28
## 96   7    S 13
## 97   2  NNW 19
```

```
## 98    4  NNW 15
## 99    7  SSW 15
## 100   7  SSW 11
## 101   7  SSW 13
## 102   0    N 15
## 103   7  SSW  9
## 104   3  SSW  7
## 105   7  NNW 13
## 106   1    N 19
## 107   7    N 26
## 108   7  SSW 17
## 109   1  SSW  9
## 110   2    N 11
## 111   7    N 15
## 112   7    S 11
## 113   6  SSW 11
## 115   1  WSW  7
## 116   6  WSW 17
## 117   7    W  9
## 118   7  SSW  9
## 119   1  ESE  6
## 120   7    N 26
## 121   4    N 19
## 122   7    N 17
## 123   5   NW 13
## 124   4  SSW 15
## 125   7  SSW 15
## 126   5    S  9
## 127   2    N 20
## 128   6    W 11
## 129   7    N 20
## 131   7  SSW  7
## 132   7    W  7
## 133   6    N 19
## 134   4    W  9
## 135   2    S  9
## 136   1  SSW  9
## 137   1  SSW  7
## 138   1   SW  4
## 139   3    N 17
## 140   3  NNW 19
## 141   7    N 15
## 142   1  SSW 11
## 143   5    N 22
## 144   5    N 22
## 145   7  NNW 20
## 146   7  NNW 22
## 147   3  WSW 15
## 148   7    N  9
## 149   3    W 15
## 150   7   SW 13
## 151   7  SSW  9
## 152   7  SSW  9
## 153   7   NW  7
```

```
## 154   7   S  11
## 155   4   S  15
## 156   7  SW  11
## 157   7   S   7
## 160   3   N  20
## 161   5 WNW  13
## 162   1   N  22
## 163   8  NW   9
## 164   1   N  22
## 165   7 NNW  22
## 166   7 SSW   7
## 167   6 WSW   9
## 168   1   N  13
## 169   7 WSW  15
## 170   7 SSW  11
## 171   7 SSW   9
## 172   3 SSW  11
## 173   7  SW   6
## 174   2 ESE   7
## 175   1   N   2
## 176   1 NNE  13
## 177   1 NNW  13
## 178   1   N  20
## 179   4   N  19
## 180   7 NNE  20
## 181   7 NNW  17
## 182   7 SSW   6
## 183   1   N  17
## 190   7  SW  11
## 191   7   N  11
## 192   7 NNE  15
## 194   5  SW   9
## 195   1   N  13
## 196   1 NNW  24
## 197   7   N  17
## 198   6   N  35
## 199   6 NNW  22
## 200   6 NNW  19
## 201   4 WNW  17
## 202   6 NNW  13
## 203   1   N  20
## 204   5   N  30
## 205   4 NNW  28
## 206   6   W   9
## 207   7   N  17
## 208   1 NNW  13
## 209   7   N  20
## 210   7 WNW  20
## 211   7   N  20
## 212   2 NNW  24
## 213   5 SSW   9
## 214   1   N  20
## 215   7 NNW  19
## 216   7   N  19
```

```
## 217   1   N  33
## 218   7 NNW  24
## 219   7  NW  15
## 220   7 WSW  11
## 221   7   N  26
## 222   4   N  30
## 223   7 WNW  13
## 224   5 WNW  13
## 225   7   W  15
## 226   1   N  28
## 227   6 WNW  15
## 228   6   W  13
## 229   3 NNW  19
## 230   6 WNW  20
## 231   6 SSW  13
## 232   7 WNW   7
## 233   7  SW   7
## 234   7  NE   7
## 235   6 SSW   7
## 236   1 SSW  13
## 237   1 SSW  13
## 239   3 SSW  17
## 240   7 SSW  13
## 241   1 SSW  11
## 242   7 NNE  13
## 243   7   N   6
## 244   8 SSW   9
## 245   7 SSE  11
## 246   5 SSW  17
## 247   2 NNW   7
## 248   7   N  22
## 249   7   N  24
## 250   5   S   9
## 251   7 NNW  15
## 252   7   W  13
## 253   7 NNW   2
## 254   2   N  33
## 255   5   W  13
## 256   1   N  17
## 257   2 NNW  20
## 258   5 WSW  17
## 259   7 SSW   7
## 260   4   N  26
## 261   7  NW  17
## 262   5 SSW  13
## 263   4   S   9
## 264   3   S   9
## 265   6   S  17
## 266   5   S  17
## 267   3 SSW  13
## 268   7 SSW  17
## 269   1 SSW  11
## 270   1   N  22
## 271   7 SSW  13
```

## 272	7	S	11
## 273	1	SSW	9
## 274	1	SW	15
## 275	7	NNW	20
## 276	8	S	13
## 277	7	SSW	15
## 278	1	SE	13
## 279	1	SW	9
## 280	7	S	13
## 281	6	S	11
## 285	1	S	17
## 286	4	ESE	7
## 287	7	N	20
## 288	7	N	24
## 289	7	N	15
## 290	6	NNW	20
## 291	7	NW	17
## 292	7	N	22
## 293	7	SSE	13
## 294	5	S	13
## 295	5	N	28
## 296	5	SSE	15
## 297	7	SSW	17
## 298	7	S	9
## 299	7	SSW	11
## 300	7	S	19
## 301	1	SSW	11
## 302	0	SSW	17
## 304	6	SSW	13
## 305	7	N	20
## 306	5	NNW	20
## 307	5	W	13
## 308	7	S	9
## 309	7	NNW	20
## 310	4	SSW	6
## 311	7	SSW	19
## 312	7	S	9
## 313	7	W	9
## 315	1	SSW	17
## 316	6	N	13
## 317	7	N	28
## 318	8	SSW	13
## 319	7	S	19
## 320	1	SSW	13
## 321	1	SSW	20
## 322	1	SSW	9
## 323	3	NNE	11
## 324	8	NE	9
## 325	6	S	7
## 326	7	S	13
## 327	7	W	13
## 328	7	S	15
## 329	7	S	15
## 330	3	S	15

```
## 331                       7               SSW                  19
## 332                       7                 S                  19
## 333                       4               SSW                  19
## 334                       3                 S                  17
## 335                       2                 N                  24
## 336                       6               SSW                  11
## 337                       7                 W                  13
## 338                       5               SSW                  13
## 339                       2               SSW                  13
## 340                       1                 N                  20
## 341                       7                 N                  30
## 343                       8               SSW                   9
## 344                       1                 S                  17
## 345                       1               SSW                  15
## 346                       2                 N                  17
## 347                       7               SSE                  13
## 348                       7               SSW                  11
## 349                       6               NNW                  22
## 350                       7                NW                  20
## 351                       7               SSE                  17
## 352                       7               SSW                  15
## 354                       8               SSW                  22
## 355                       7                 S                  13
## 356                       4                 S                  17
## 357                       1               SSW                   9
## 358                       0               NNW                  15
## 359                       2               SSW                  20
## 360                       0               SSW                  13
## 363                       7                 S                  11
## 365                       1                SW                  11
##     X3pm.MSL.pressure..hPa. month weekday
## 1                    1011.5     1       3
## 2                    1012.9     1       4
## 3                    1009.9     1       5
## 4                    1001.0     1       6
## 5                    1013.4     1       7
## 6                    1019.5     1       1
## 7                    1016.0     1       2
## 8                    1008.7     1       3
## 9                    1016.7     1       4
## 10                   1018.1     1       5
## 11                   1012.2     1       6
## 12                   1016.6     1       7
## 13                   1016.4     1       1
## 14                   1009.0     1       2
## 15                   1009.1     1       3
## 16                   1012.2     1       4
## 17                   1008.5     1       5
## 18                   1008.8     1       6
## 19                   1021.2     1       7
## 20                   1020.5     1       1
## 21                   1013.8     1       2
## 22                   1010.8     1       3
## 23                   1015.3     1       4
```

```
## 24                1008.3     1       5
## 25                1003.9     1       6
## 26                1007.3     1       7
## 27                1010.8     1       1
## 28                1010.5     1       2
## 29                1007.1     1       3
## 30                1001.5     1       4
## 31                1016.2     1       5
## 32                1019.0     2       6
## 33                1010.1     2       7
## 34                1006.2     2       1
## 35                1015.7     2       2
## 36                1014.7     2       3
## 37                1009.2     2       4
## 38                1009.3     2       5
## 39                1006.3     2       6
## 40                1003.0     2       7
## 41                1009.0     2       1
## 43                 997.9     2       3
## 44                1013.1     2       4
## 45                1019.8     2       5
## 46                1022.2     2       6
## 47                1016.1     2       7
## 48                1010.9     2       1
## 49                1005.2     2       2
## 50                1012.8     2       3
## 51                1014.4     2       4
## 52                1021.2     2       5
## 53                1023.4     2       6
## 54                1024.1     2       7
## 55                1023.3     2       1
## 56                1021.8     2       2
## 57                1021.8     2       3
## 58                1019.0     2       4
## 59                1016.8     2       5
## 60                1017.9     3       6
## 61                1016.7     3       7
## 62                1015.5     3       1
## 63                1016.8     3       2
## 64                1008.2     3       3
## 65                1017.4     3       4
## 66                1021.0     3       5
## 67                1016.0     3       6
## 68                1016.7     3       7
## 69                1009.3     3       1
## 70                1009.3     3       2
## 71                1013.2     3       3
## 72                1018.3     3       4
## 73                1015.7     3       5
## 74                1018.8     3       6
## 75                1018.4     3       7
## 76                1016.4     3       1
## 77                1014.7     3       2
## 81                1011.7     3       6
```

```
## 82                  1004.7     3       7
## 83                  1004.1     3       1
## 84                  1009.3     3       2
## 85                  1020.2     3       3
## 87                  1013.0     3       5
## 88                  1000.3     3       6
## 89                  1009.9     3       7
## 90                  1017.4     3       1
## 91                  1025.2     4       2
## 92                  1022.1     4       3
## 93                  1026.2     4       4
## 94                  1027.3     4       5
## 95                  1018.3     4       6
## 96                  1019.4     4       7
## 97                  1011.6     4       1
## 98                  1010.6     4       2
## 99                  1020.3     4       3
## 100                 1026.4     4       4
## 101                 1025.4     4       5
## 102                 1020.2     4       6
## 103                 1023.8     4       7
## 104                 1020.8     4       1
## 105                 1017.7     4       2
## 106                 1018.0     4       3
## 107                 1016.3     4       4
## 108                 1026.9     4       5
## 109                 1024.2     4       6
## 110                 1019.2     4       7
## 111                 1015.9     4       1
## 112                 1025.8     4       2
## 113                 1026.4     4       3
## 115                 1017.6     4       5
## 116                 1018.8     4       6
## 117                 1024.7     4       7
## 118                 1025.0     4       1
## 119                 1022.3     4       2
## 120                 1011.9     4       3
## 121                 1012.6     5       4
## 122                 1015.1     5       5
## 123                 1014.0     5       6
## 124                 1020.5     5       7
## 125                 1024.3     5       1
## 126                 1020.0     5       2
## 127                 1008.7     5       3
## 128                 1013.8     5       4
## 129                 1009.1     5       5
## 131                 1025.0     5       7
## 132                 1026.7     5       1
## 133                 1024.5     5       2
## 134                 1027.2     5       3
## 135                 1030.2     5       4
## 136                 1026.4     5       5
## 137                 1026.2     5       6
## 138                 1027.5     5       7
```

```
## 139                1025.2     5       1
## 140                1018.6     5       2
## 141                1022.2     5       3
## 142                1026.1     5       4
## 143                1021.6     5       5
## 144                1014.0     5       6
## 145                1010.2     5       7
## 146                1009.9     5       1
## 147                1009.7     5       2
## 148                1004.8     5       3
## 149                1005.5     5       4
## 150                1022.2     5       5
## 151                1027.4     5       6
## 152                1031.0     6       7
## 153                1022.7     6       1
## 154                1021.6     6       2
## 155                1028.1     6       3
## 156                1031.2     6       4
## 157                1034.1     6       5
## 160                1018.0     6       1
## 161                1012.8     6       2
## 162                1020.7     6       3
## 163                1009.8     6       4
## 164                1014.3     6       5
## 165                1015.8     6       6
## 166                1020.3     6       7
## 167                1021.5     6       1
## 168                1020.3     6       2
## 169                1019.2     6       3
## 170                1025.9     6       4
## 171                1024.8     6       5
## 172                1029.0     6       6
## 173                1029.9     6       7
## 174                1031.1     6       1
## 175                1031.5     6       2
## 176                1032.6     6       3
## 177                1032.7     6       4
## 178                1028.6     6       5
## 179                1022.1     6       6
## 180                1006.0     6       7
## 181                1018.9     6       1
## 182                1031.2     7       1
## 183                1028.2     7       2
## 190                1027.6     7       2
## 191                1027.0     7       3
## 192                1021.0     7       4
## 194                1021.4     7       6
## 195                1017.6     7       7
## 196                1011.7     7       1
## 197                1006.6     7       2
## 198                 998.8     7       3
## 199                1012.5     7       4
## 200                1004.5     7       5
## 201                1010.4     7       6
```

```
## 202                1021.6     7       7
## 203                1018.4     7       1
## 204                1006.6     7       2
## 205                1004.5     7       3
## 206                1015.3     7       4
## 207                1015.7     7       5
## 208                1011.4     7       6
## 209                1008.8     7       7
## 210                1004.5     7       1
## 211                1013.8     7       2
## 212                1008.4     7       3
## 213                1019.7     8       4
## 214                1016.1     8       5
## 215                 999.9     8       6
## 216                1010.1     8       7
## 217                1003.4     8       1
## 218                 997.3     8       2
## 219                1007.8     8       3
## 220                1010.4     8       4
## 221                1018.9     8       5
## 222                1006.6     8       6
## 223                1005.9     8       7
## 224                1018.6     8       1
## 225                1023.3     8       2
## 226                1015.9     8       3
## 227                1005.2     8       4
## 228                1012.6     8       5
## 229                1010.5     8       6
## 230                1008.8     8       7
## 231                1022.8     8       1
## 232                1020.1     8       2
## 233                1014.4     8       3
## 234                1015.6     8       4
## 235                1019.0     8       5
## 236                1023.1     8       6
## 237                1018.3     8       7
## 239                1026.0     8       2
## 240                1022.6     8       3
## 241                1019.7     8       4
## 242                1013.8     8       5
## 243                 997.7     8       6
## 244                1012.9     9       7
## 245                1022.6     9       1
## 246                1028.3     9       2
## 247                1025.4     9       3
## 248                1018.1     9       4
## 249                1006.2     9       5
## 250                1015.7     9       6
## 251                1015.1     9       7
## 252                1019.0     9       1
## 253                1023.9     9       2
## 254                1008.2     9       3
## 255                1014.2     9       4
## 256                1017.0     9       5
```

```
## 257                1009.8     9       6
## 258                1008.6     9       7
## 259                1021.6     9       1
## 260                1016.8     9       2
## 261                1007.1     9       3
## 262                1014.4     9       4
## 263                1021.1     9       5
## 264                1025.1     9       6
## 265                1025.7     9       7
## 266                1031.1     9       1
## 267                1029.0     9       2
## 268                1026.5     9       3
## 269                1019.2     9       4
## 270                1011.3     9       5
## 271                1015.5     9       6
## 272                1026.3     9       7
## 273                1028.4     9       1
## 274                1023.5    10       2
## 275                1017.9    10       3
## 276                1017.0    10       4
## 277                1021.3    10       5
## 278                1022.7    10       6
## 279                1020.6    10       7
## 280                1019.9    10       1
## 281                1015.7    10       2
## 285                1022.7    10       6
## 286                1019.7    10       7
## 287                1017.5    10       1
## 288                1014.1    10       2
## 289                1012.2    10       3
## 290                1010.9    10       4
## 291                1013.3    10       5
## 292                1009.8    10       6
## 293                1014.8    10       7
## 294                1018.3    10       1
## 295                1010.6    10       2
## 296                1014.2    10       3
## 297                1022.5    10       4
## 298                1017.1    10       5
## 299                1018.8    10       6
## 300                1016.3    10       7
## 301                1018.5    10       1
## 302                1017.4    10       2
## 304                1019.6    10       4
## 305                1009.6    11       5
## 306                1003.1    11       6
## 307                1016.1    11       7
## 308                1011.4    11       1
## 309                1003.4    11       2
## 310                1002.9    11       3
## 311                1010.5    11       4
## 312                1019.2    11       5
## 313                1017.4    11       6
## 315                1020.5    11       1
```

```
## 316                 1015.4    11       2
## 317                 1007.4    11       3
## 318                 1015.2    11       4
## 319                 1023.4    11       5
## 320                 1020.3    11       6
## 321                 1023.5    11       7
## 322                 1018.5    11       1
## 323                 1011.9    11       2
## 324                 1001.0    11       3
## 325                  998.3    11       4
## 326                  997.2    11       5
## 327                 1005.3    11       6
## 328                 1007.9    11       7
## 329                 1006.5    11       1
## 330                 1007.7    11       2
## 331                 1004.9    11       3
## 332                 1010.2    11       4
## 333                 1013.5    11       5
## 334                 1011.4    11       6
## 335                 1002.4    12       7
## 336                 1005.8    12       1
## 337                 1009.0    12       2
## 338                 1019.6    12       3
## 339                 1018.9    12       4
## 340                 1013.4    12       5
## 341                 1010.3    12       6
## 343                 1016.7    12       1
## 344                 1019.2    12       2
## 345                 1015.3    12       3
## 346                 1004.9    12       4
## 347                  997.2    12       5
## 348                 1003.6    12       6
## 349                 1003.4    12       7
## 350                 1005.1    12       1
## 351                 1012.7    12       2
## 352                 1015.5    12       3
## 354                 1010.7    12       5
## 355                 1008.6    12       6
## 356                 1019.5    12       7
## 357                 1019.1    12       1
## 358                 1014.1    12       2
## 359                 1015.8    12       3
## 360                 1014.7    12       4
## 363                 1013.1    12       7
## 365                 1010.1    12       2
```

```
#Since we have extracted variables with their proper names . Its time to start our first analysis , tha
#FIGURE 1
ggplot(melbourne, aes(x= month, y = evaporation_rate)) +
  geom_boxplot(aes(fill = month))+
  theme_bw() +
  labs(caption = "Figure 1: Boxplot showing evaporation rate in relation against month")+
  theme(plot.caption = element_text(hjust = 0.5))
```

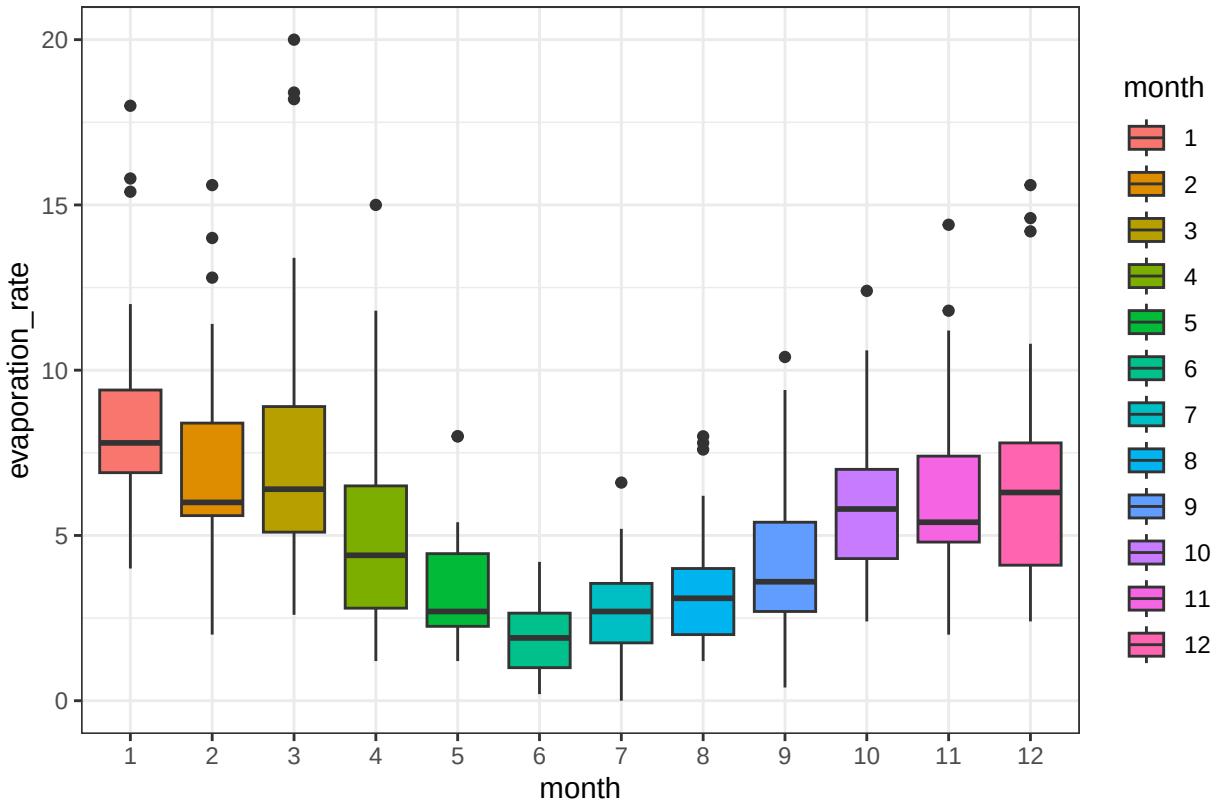


Figure 1: Boxplot showing evaporation rate in relation against month

```
# Figure 2.Now we will have a look how evaporation looks against weekday.
ggplot(melbourne, aes(x= weekday, y = evaporation_rate)) +
  geom_boxplot(aes(fill = weekday))+
  theme_bw() +
  labs(caption = " Figure 2: Boxplot showing evaporation rate in relation against weekday  ")
```

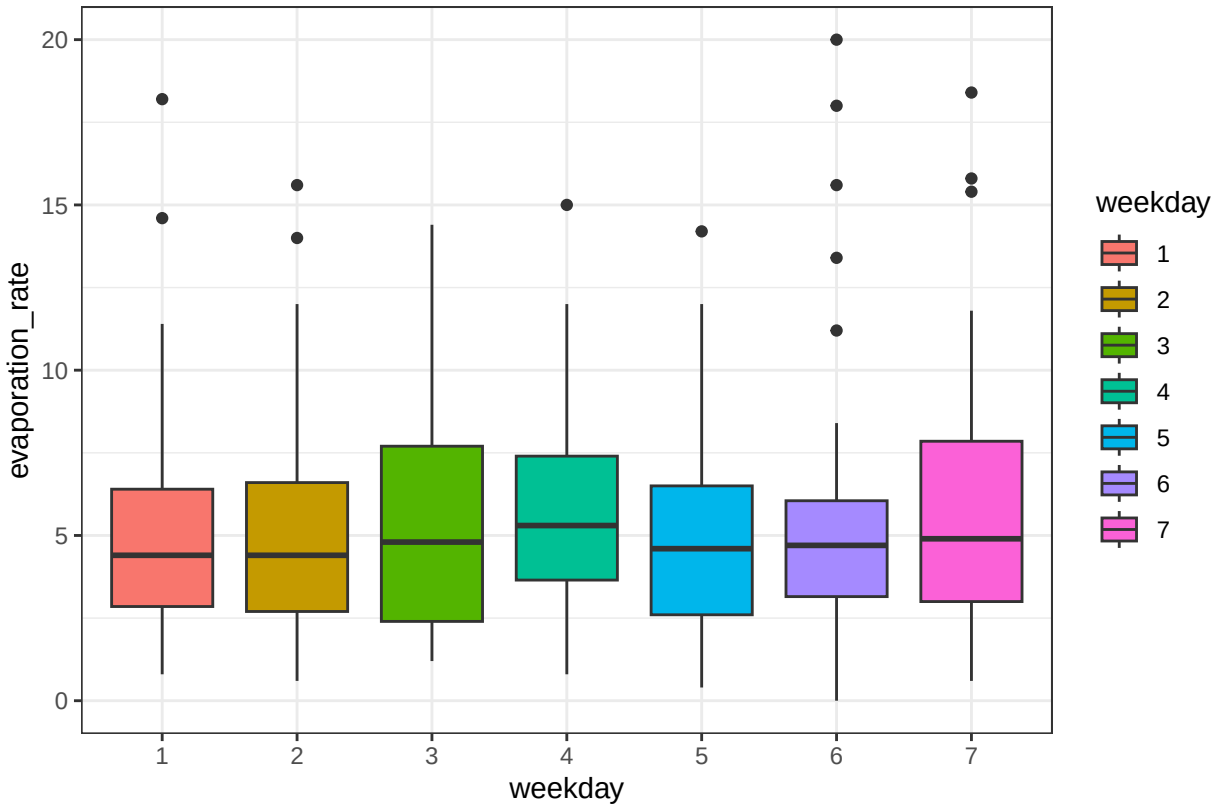


Figure 2: Boxplot showing evaporation rate in relation against weekday

```
#Figure 3. A boxplot which will help us to understand the relation of evaporation rate against Number o
ggplot(melbourne, aes(x= Sunlight_hours, y= evaporation_rate)) +
  geom_point() +
  theme_bw() +
  labs(caption = " Figure 3: A scatterplot showing relation of evaporation rate against Number of hours
  theme(plot.caption = element_text(hjust = 0.5))
```

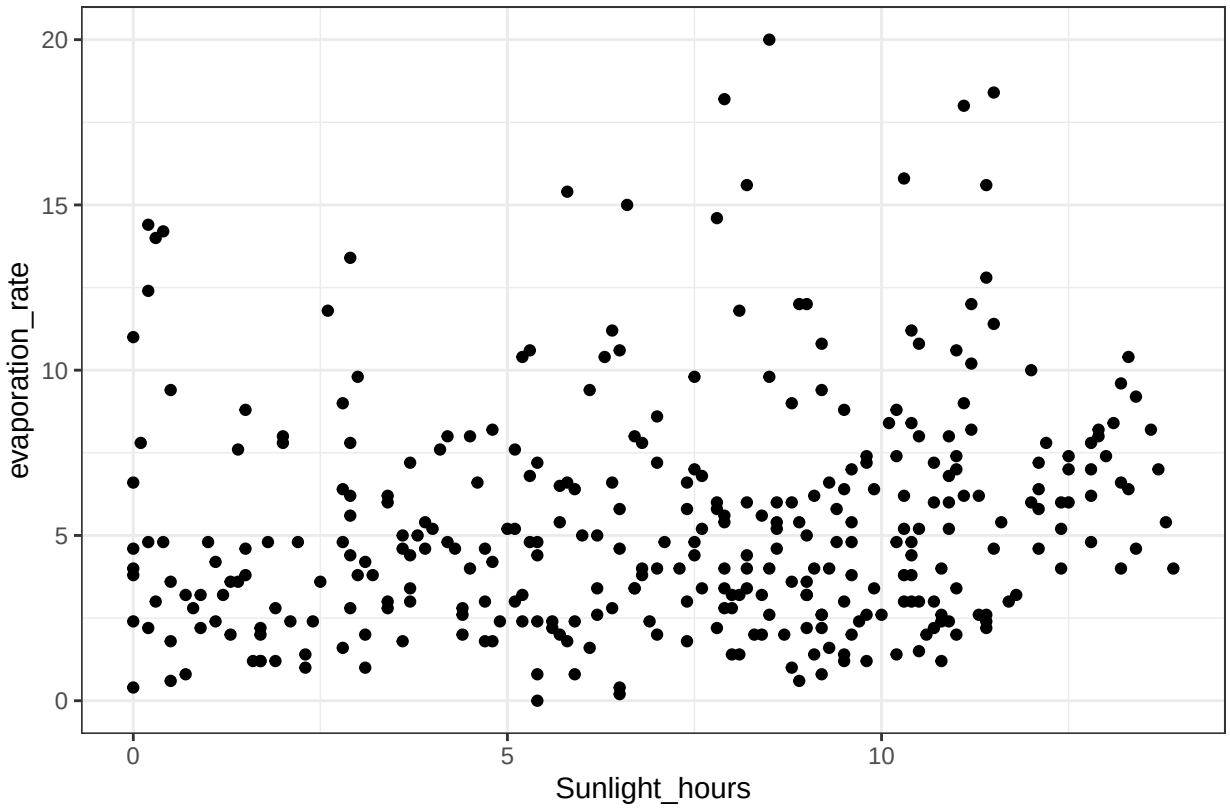


Figure 3: A scatterplot showing relation of evaporation rate against Number of hours of bright sunlight

```
# Figure 4
ggplot(melbourne, aes(x = Maximum_speed_gust_of_wind, y = evaporation_rate)) +
  geom_point() +
  theme_bw() +
  labs(caption = " Figure 4: Scatterplot showing evaporation rate in relation against Speed of the maxi
  theme(plot.caption = element_text(hjust = 0.5))
```

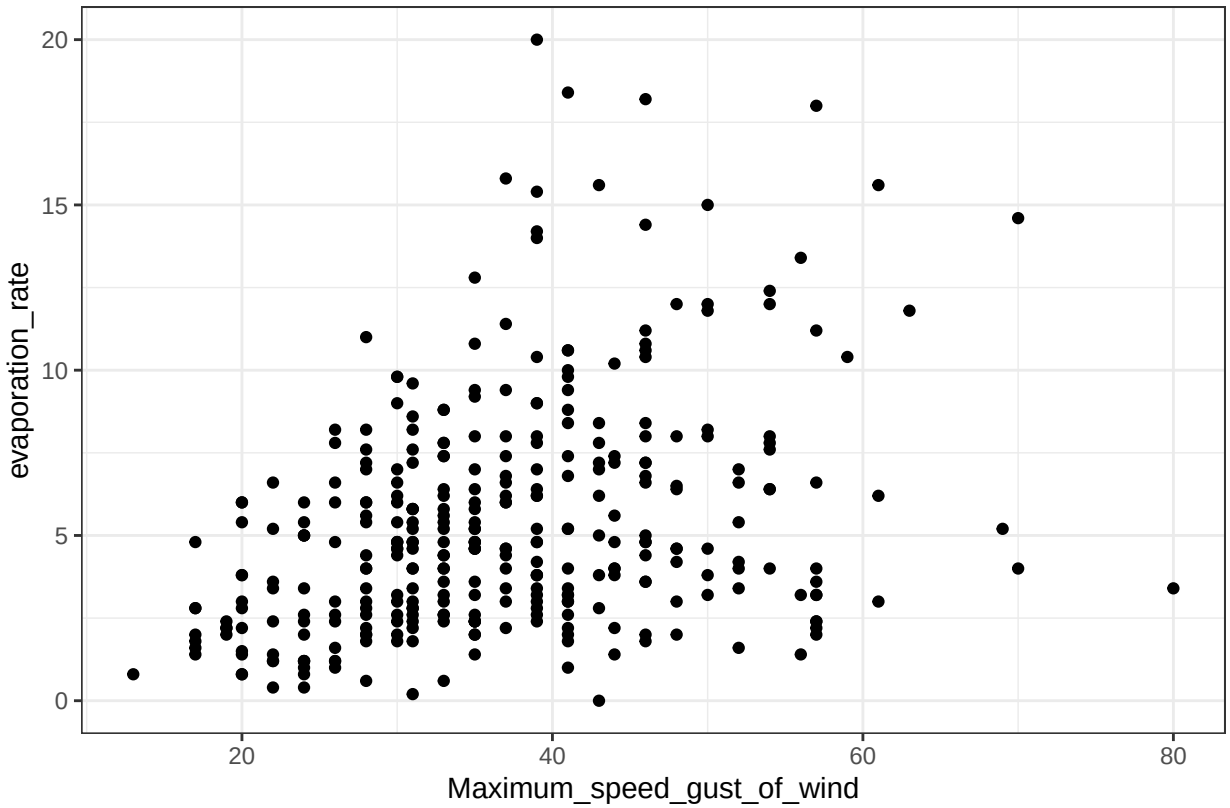


Figure 4: Scatterplot showing evaporation rate in relation against Speed of the maximum wind gust in kilometers per

```
# Figure 5
ggplot(melbourne, aes(x = minimum_temperature, y = evaporation_rate)) +
  geom_point() +
  theme_bw() +
  labs(caption = " Figure 5: Scatterplot showing evaporation rate in relation against Minimum Temperatu
  theme(plot.caption = element_text(hjust = 0.5))
```

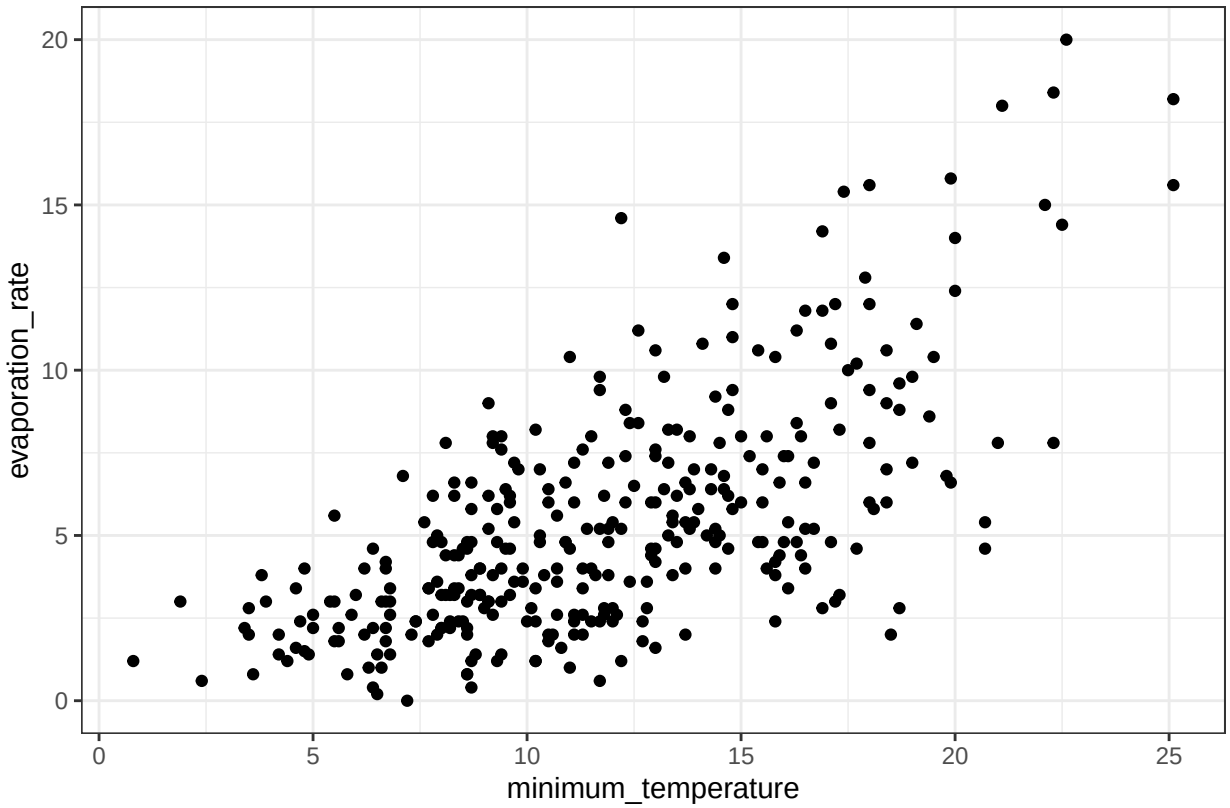


Figure 5: Scatterplot showing evaporation rate in relation against Minimum Temperataure

```
# Figure 6. A scatterplot showing relation of evaporation rate against Relative humidity, as measured a
ggplot(melbourne, aes(x= humidity_9am, y= evaporation_rate)) +
  geom_point() +
  theme_bw() +
  labs(caption = " Figure 6: A scatterplot showing relation of evaporation rate against Relative humidi
  theme(plot.caption = element_text(hjust = 0.5))
```

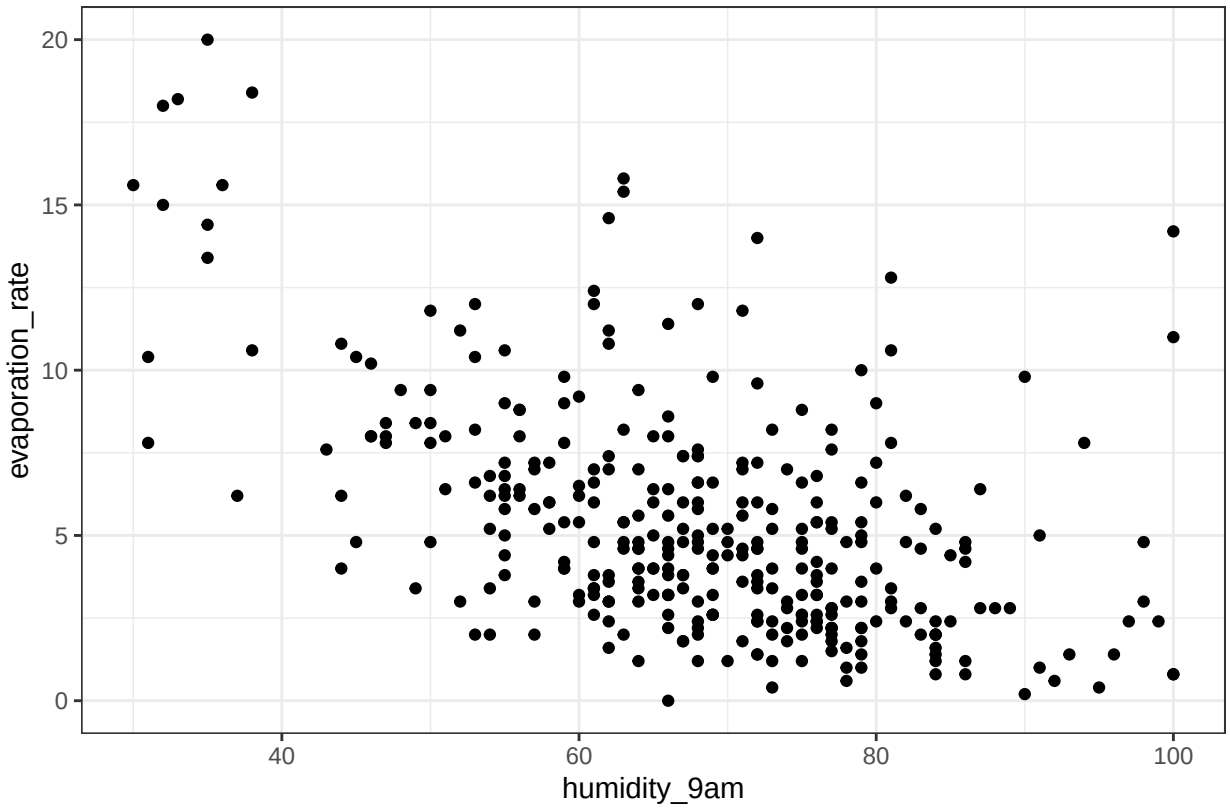


Figure 6: A scatterplot showing relation of evaporation rate against Relative humidity, as measured at 9am

```
# I will begin will fitting the full model with all possible predictors
lm_melbourne <- lm(evaporation_rate ~ month +
                     weekday+
                    Sunlight_hours +
                    Maximum_speed_gust_of_wind+
                    maximum_temperature +
                    minimum_temperature +
                    humidity_9am +
                    month: humidity_9am,
                   data=melbourne )
Anova(lm_melbourne)
```

```
## Anova Table (Type II tests)
##
## Response: evaporation_rate
##                              Sum Sq  Df F value    Pr(>F)
## month                         98.99  11  1.9517 0.0328695 *
## weekday                       36.36   6  1.3144 0.2503076
## Sunlight_hours                 1.68   1  0.3636 0.5469549
## Maximum_speed_gust_of_wind    70.24   1 15.2339 0.0001170 ***
## maximum_temperature            1.74   1  0.3767 0.5398587
## minimum_temperature          146.46   1 31.7633 3.974e-08 ***
## humidity_9am                 231.23   1 50.1463 9.940e-12 ***
## month:humidity_9am           158.47  11  3.1243 0.0005192 ***
## Residuals                   1401.76 304
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# from the above observations, we can conclude that "Sunlight_hours " has the highest p-value , therefo

lm_melbourne2 <- lm(evaporation_rate ~ month +
                     weekday+
                    Maximum_speed_gust_of_wind+
                    maximum_temperature +
                    minimum_temperature +
                    humidity_9am +
                    month: humidity_9am,
                   data=melbourne )
Anova(lm_melbourne2)
```

```
## Anova Table (Type II tests)
##
## Response: evaporation_rate
##                              Sum Sq  Df F value    Pr(>F)
## month                         98.59  11  1.9478 0.0332691 *
## weekday                       35.93   6  1.3013 0.2562310
## Maximum_speed_gust_of_wind    69.90   1 15.1901 0.0001195 ***
## maximum_temperature            0.87   1  0.1886 0.6644135
## minimum_temperature          211.93   1 46.0583 5.984e-11 ***
## humidity_9am                 232.75   1 50.5825 8.167e-12 ***
## month:humidity_9am           158.50  11  3.1315 0.0005047 ***
## Residuals                   1403.43 305
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#from the above observations and calculations we can conclude that "maximum_temperature" has highest p
lm_melbourne3 <- lm(evaporation_rate ~ month +
                     weekday+
                    Maximum_speed_gust_of_wind+
                    minimum_temperature +
                    humidity_9am +
                    month: humidity_9am,
                   data=melbourne )
Anova(lm_melbourne3)
```

```
## Anova Table (Type II tests)
##
## Response: evaporation_rate
##                              Sum Sq  Df F value    Pr(>F)
## month                        118.50  11  2.3474 0.0086669 **
## weekday                       35.17   6  1.2774 0.2673598
## Maximum_speed_gust_of_wind    71.27   1 15.5295 0.0001007 ***
## minimum_temperature          241.61   1 52.6464 3.303e-12 ***
## humidity_9am                 262.74   1 57.2513 4.533e-13 ***
## month:humidity_9am           161.08  11  3.1908 0.0004033 ***
## Residuals                   1404.30 306
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
#from the above observations and calculations we can conclude that "weekday" has highest p value, there
```

```r
lm_melbourne4 <- lm(evaporation_rate ~ month +
                     Maximum_speed_gust_of_wind+
                     minimum_temperature +
                     humidity_9am +
                     month: humidity_9am,
                    data=melbourne )
Anova(lm_melbourne4)
```

```
## Anova Table (Type II tests)
##
## Response: evaporation_rate
##                             Sum Sq  Df F value    Pr(>F)
## month                       119.06  11  2.3459 0.0086754 **
## Maximum_speed_gust_of_wind   71.05   1 15.3999 0.0001071 ***
## minimum_temperature         245.37   1 53.1819 2.522e-12 ***
## humidity_9am                253.36   1 54.9155 1.189e-12 ***
## month:humidity_9am          167.05  11  3.2917 0.0002730 ***
## Residuals                  1439.47 312
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
summary(lm_melbourne4)
```

```
##
## Call:
## lm(formula = evaporation_rate ~ month + Maximum_speed_gust_of_wind +
##     minimum_temperature + humidity_9am + month:humidity_9am,
##     data = melbourne)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.8270 -1.1603 -0.0941  1.1352  9.5483
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 6.358170   2.249806   2.826 0.005016 **
## month2                      0.556089   3.259698   0.171 0.864653
## month3                      5.397192   2.651877   2.035 0.042672 *
## month4                      1.534093   3.035119   0.505 0.613601
## month5                     -4.320274   3.410596  -1.267 0.206200
## month6                     -9.303646   3.924989  -2.370 0.018378 *
## month7                     -7.931404   3.518775  -2.254 0.024888 *
## month8                     -9.266054   3.260777  -2.842 0.004783 **
## month9                     -2.484941   3.070197  -0.809 0.418916
## month10                    -6.044544   3.080561  -1.962 0.050633 .
## month11                    -0.648342   2.707044  -0.240 0.810874
## month12                    -0.353236   2.844030  -0.124 0.901235
## Maximum_speed_gust_of_wind  0.052284   0.013323   3.924 0.000107 ***
## minimum_temperature         0.329534   0.045187   7.293 2.52e-12 ***
## humidity_9am               -0.084676   0.031560  -2.683 0.007685 **
```

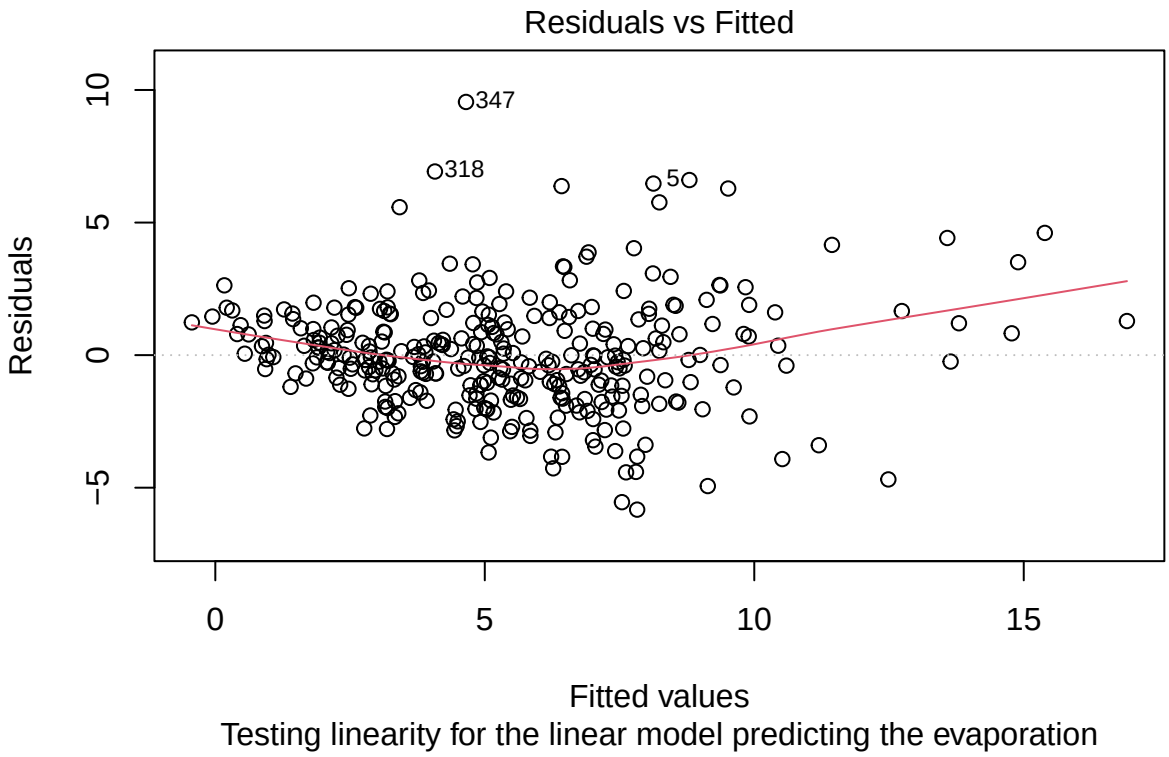
```
## month2:humidity_9am        -0.016776   0.049737  -0.337 0.736121
## month3:humidity_9am        -0.082493   0.040363  -2.044 0.041814 *
## month4:humidity_9am        -0.040056   0.046221  -0.867 0.386815
## month5:humidity_9am         0.028592   0.048794   0.586 0.558321
## month6:humidity_9am         0.091116   0.051724   1.762 0.079119 .
## month7:humidity_9am         0.080370   0.050435   1.594 0.112049
## month8:humidity_9am         0.111816   0.047890   2.335 0.020185 *
## month9:humidity_9am         0.018795   0.047606   0.395 0.693259
## month10:humidity_9am        0.086485   0.047091   1.837 0.067226 .
## month11:humidity_9am        0.004915   0.040430   0.122 0.903316
## month12:humidity_9am       -0.004938   0.041792  -0.118 0.906023
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.148 on 312 degrees of freedom
## Multiple R-squared:  0.6534, Adjusted R-squared:  0.6256
## F-statistic: 23.52 on 25 and 312 DF,  p-value: < 2.2e-16
```

All terms are hence significant.

It can be observed that all varaibles behaved as expected from the relationship observed in Bivariate analysis.

##linearity

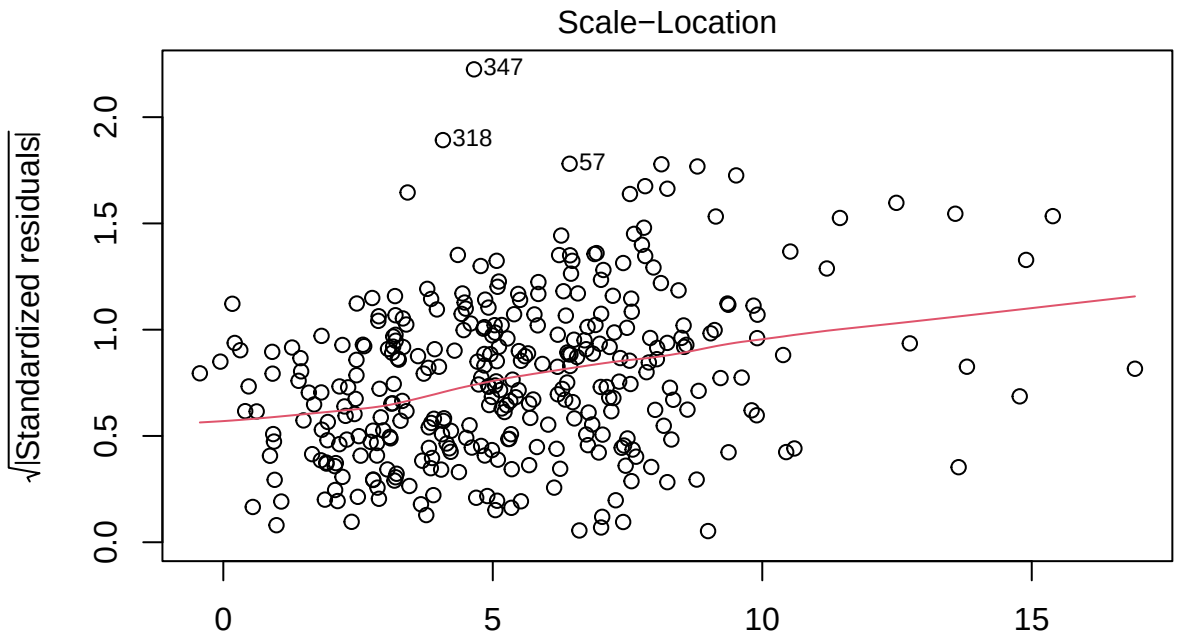
```
plot(lm_melbourne4, which = 1, sub= "Testing linearity for the linear model predicting the evaporation")
```



Testing linearity for the linear model predicting the evaporation

#Homoscedasticity

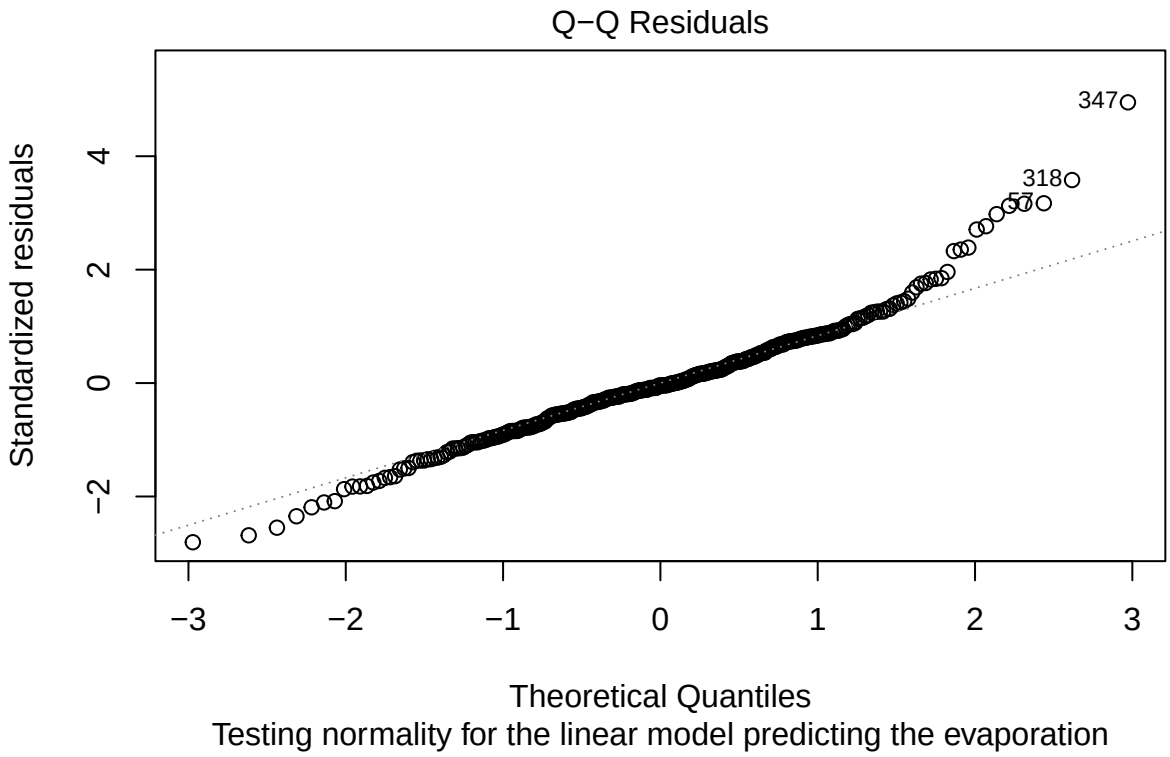
```
plot(lm_melbourne4, which = 3, sub= "Testing homoscedasticity for the linear model predicting the evapo
```



Testing homoscedasticity for the linear model predicting the evaporation

##Normality

```
plot(lm_melbourne4, which=2, sub= "Testing normality for the linear model predicting the evaporation")
```



Testing normality for the linear model predicting the evaporation

Prediction

```
predicted_melbourne = tibble(date=dmy(c("21/2/2024",

"26/12/2024", "11/1/2024","11/7/2024")),

month=as_factor(c(2,12,1,7)),
Maximum_speed_gust_of_wind= c(23.2,76,44.3,10.6),
minimum_temperature= c(13.8, 16.4, 26.5, 6.8),
humidity_9am = c(74,37,35,76),
Sunlight_hours = c(3.4,9,9.6,4),
weekday=wday(dmy(c("21/2/2024", "26/12/2024",
"11/1/2024", "11/7/2024"))))
predicted_melbourne = predicted_melbourne[c(3,1,4,2),]
predicted_melbourne
```

```
## # A tibble: 4 x 7
##   date       month Maximum_speed_gust_of_wind minimum_temperature humidity_9am
##   <date>     <fct>                      <dbl>               <dbl>        <dbl>
## 1 2024-01-11 1                           44.3                26.5           35
## 2 2024-02-21 2                           23.2                13.8           74
## 3 2024-07-11 7                           10.6                 6.8           76
## 4 2024-12-26 12                          76                  16.4           37
```

```
## # i 2 more variables: Sunlight_hours <dbl>, weekday <dbl>
```

```
predicted_interval <- predict(lm_melbourne4, predicted_melbourne, interval = "prediction", level=0.95)
predicted_interval <- tibble(Date = predicted_melbourne$date,
'Lower_Bound' = predicted_interval[,2],
'Expected evaporation Rate' = predicted_interval[,1],
'Upper_Bound' = predicted_interval[,3] )
predicted_interval %>%
knitr::kable(digits = 1,format.args=list(big.mark= ","),
caption = "Table 1: Prediction of intervals of the  evaporation rates in Melbourne on specific dates as
```

Table 1: Table 1: Prediction of intervals of the evaporation rates in Melbourne on specific dates as requested by Melbourne Water Corporation

Date	Lower_Bound	Expected evaporation Rate	Upper_Bound
2024-01-11	9.7	14.4	19.2
2024-02-21	0.8	5.2	9.5
2024-07-11	-3.5	0.9	5.3
2024-12-26	7.4	12.1	16.8