PM2.5 Delhi, data sources

Maëlle Salmon

23 janvier 2016

Maybe it's nicer to have a readable document with the analysis!

So, the goal is to compare historic PM2.5 values for Delhi as found on the CPCB website by Eric Dodge to values queried from OpenAQ.

Load packages

```
library("readr")
library("lubridate")
library("dplyr")
library("Ropenaq")
library("ggplot2")
```

Check available locations for Delhi on OpenAQ

```
Ropenaq::locations(city="Delhi", parameter="pm25")
```

```
## Source: local data frame [5 x 12]
##
##                        location                      locationURL   city
##                          (fctr)                            (chr) (fctr)
## 1                   Anand Vihar                      Anand+Vihar  Delhi
## 2                   Mandir Marg                      Mandir+Marg  Delhi
## 3                  Punjabi Bagh                     Punjabi+Bagh  Delhi
## 4                      RK Puram                         RK+Puram  Delhi
## 5 US Diplomatic Post: New Delhi US+Diplomatic+Post%3A+New+Delhi  Delhi
## Variables not shown: cityURL (chr), country (fctr), count (int),
##   sourceName (fctr), firstUpdated (time), lastUpdated (time), parameters
##   (fctr), latitude (dbl), longitude (dbl).
```

```
# we'll use only the 4 first ones since the first one
# is US embassy data
locationsDelhi <- Ropenaq::locations(city="Delhi",
                                     parameter="pm25")[1:4,]
```

Load the CPCB historic data

```
dataCPCB <- readr::read_csv("cpcb_ambient_panel.csv")
# change this name for compatibility with Open AQ name
dataCPCB$station[dataCPCB$station=="R K Puram"] <- "RK Puram"
# filter the locations we have with OpenAQ
dataCPCB <- dplyr::filter(dataCPCB,
                          station %in% locationsDelhi$location)
# now off to translating date
# I am too lazy for finding something more elegant
dataCPCB$dt_clean <- gsub("apr", "-04-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("may", "-05-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("jun", "-06-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("jul", "-07-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("aug", "-08-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("sep", "-09-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("oct", "-10-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("nov", "-11-", dataCPCB$dt_clean)
dataCPCB$dt_clean <- gsub("dec", "-12-", dataCPCB$dt_clean)
dataCPCB <- dplyr::mutate(dataCPCB,
                          dateLocal=lubridate::dmy_hms(dt_clean))
# name the column differently
dataCPCB <- dplyr::mutate(dataCPCB,
                          historicValue=reading_value)
# drop useless columns
dataCPCB <- dplyr::select(dataCPCB,
                          - dt_clean,
                          - date_r,
                          - monitor_read,
                          - reading_value)
```

Get Open AQ data

It is not a rapid query but it does not take months. ;-)

```
# dataOpenAQ <- NULL
# for (i in 1:length(locationsDelhi)){
#   firstUpdated <- locationsDelhi[i,]$firstUpdated
#   locationURL <- locationsDelhi[i,]$locationURL
#
#   seqDays <- seq(from=lubridate::ymd(format(firstUpdated, "%Y-%m-%d")),
#                  to=lubridate::ymd("2015-12-31"),
#                  by="1 day")
#   seqDays <- format(seqDays, "%Y-%m-%d")
#   for(i in 1:(length(seqDays)-1)){
#     dataOpenAQTemp <- try(Ropenaq::measurements(location=locationURL,
#                                                      parameter="pm25",
#                                                      limit=1000,
#                                                      date_from=seqDays[i],
#                                                      date_to=seqDays[i+1]), silent=TRUE)
#     print(seqDays[i])
#
#     if(class(dataOpenAQTemp)[1]!="try-error"){
```

```r
#       dataOpenAQ <- rbind(dataOpenAQ,
#                                dataOpenAQTemp)
#     }
#
#   }
#
#
# }
# # might be useful later
# dataOpenAQ <- unique(dataOpenAQ)
# save(dataOpenAQ, file="dataOpenAQ.RData")
# write.table(dataOpenAQ, row.names=FALSE, file="dataOpenAQ.csv",
#             sep=",")
load("dataOpenAQ.RData")
```

Put these data in shape.

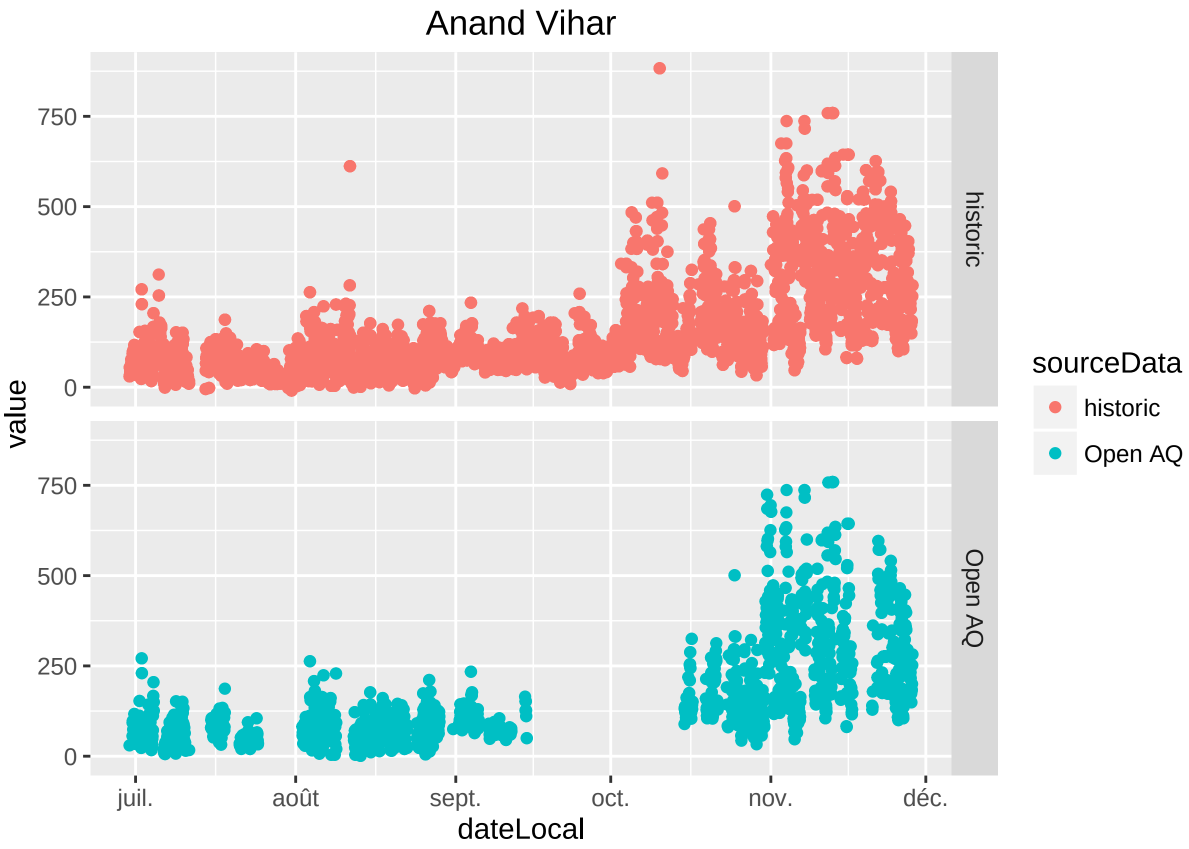
```r
dataOpenAQ <- dplyr::mutate(dataOpenAQ,
                            openAQValue=value,
                            station=location)
dataOpenAQ <- dplyr::select(dataOpenAQ,
                            dateLocal,
                            station,
                            openAQValue)
```

Comparison

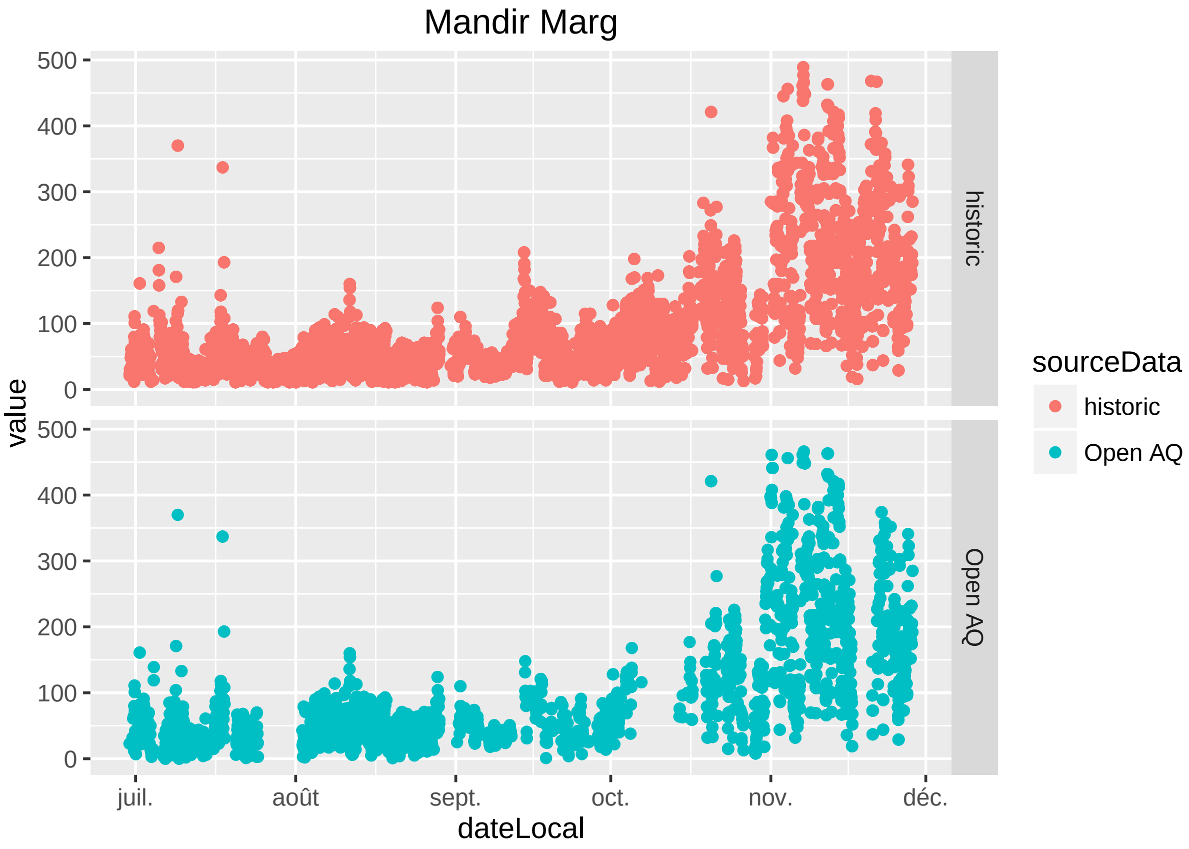
This is the really interesting part I guess.

```r
for (stationNow in levels(as.factor(dataOpenAQ$station))){
  print(stationNow)

  # filter only data for the station
  dataTempCPCB <- dataCPCB[dataCPCB$station==stationNow,]
  dataTempOpenAQ <- dataOpenAQ[dataOpenAQ$station==stationNow,]

  # now filter only dates with data from both sources
  minDate <- min(dataTempOpenAQ$dateLocal)
  maxDate <- max(dataCPCB$dateLocal)

  dataTempCPCB <- dplyr::filter(dataTempCPCB,
                                dateLocal>=minDate)

  dataTempOpenAQ <- dplyr::filter(dataTempOpenAQ,
                                  dateLocal<=maxDate)

  # now combine both data sets
  dataTempCPCB <- dplyr::mutate(dataTempCPCB,
                                sourceData="historic",
                                value=historicValue)%>%
    dplyr::select(dateLocal,
                  value,
                  sourceData)
  dataTempOpenAQ <- dplyr::mutate(dataTempOpenAQ,
                                  sourceData="Open AQ",
                                  value=openAQValue)%>%
    dplyr::select(dateLocal,
                  value,
                  sourceData)
  dataForPlot <- rbind(dataTempCPCB, dataTempOpenAQ)

  p <- ggplot() +
    geom_point(data=dataForPlot,
              aes(x=dateLocal, y=value, col=sourceData))+
    ggtitle(stationNow)+ facet_grid(sourceData ~ .)
  print(p)
}
```

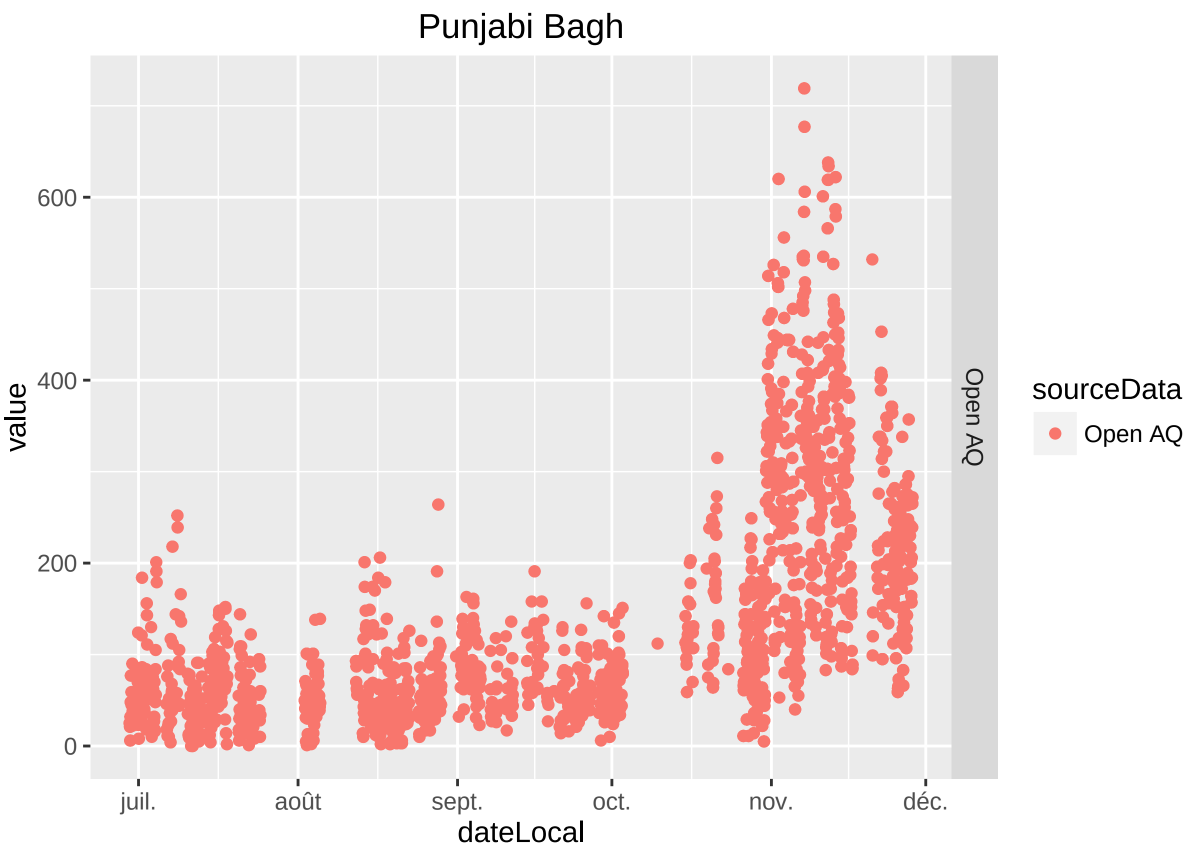
```
## [1] "Anand Vihar"
```



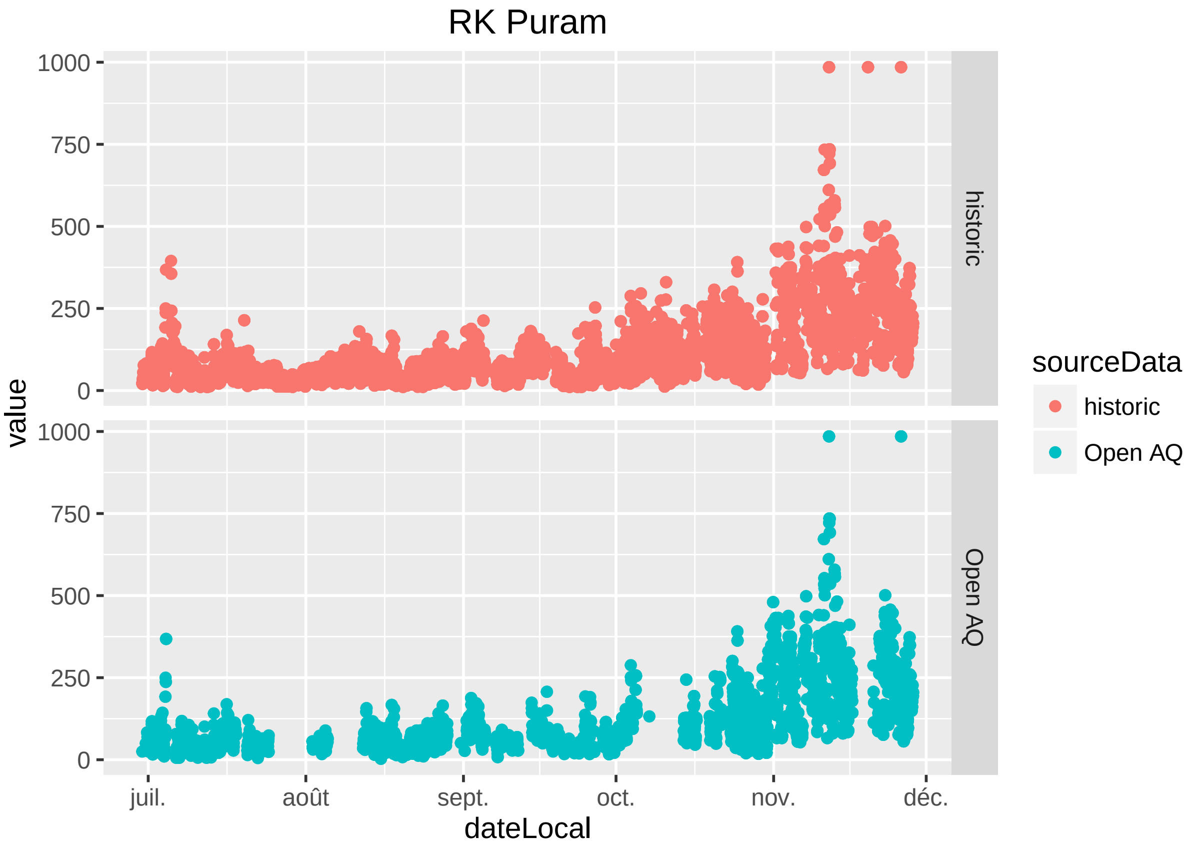
```
## [1] "Mandir Marg"
```



```
## [1] "Punjabi Bagh"
```


Punjabi Bagh
value
600
400
200
0
juil.
août
sept.
oct.
nov.
déc.
dateLocal
Open AQ
sourceData
● Open AQ

```
## [1] "RK Puram"
```


RK Puram
value
1000
750
500
250
0
historic
Open AQ
juil.
août
sept.
oct.
nov.
déc.
dateLocal
sourceData
● historic
● Open AQ