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Description of Air Quality Data

China National Environmental Monitoring Center (CNEMC) has developed an online platform [3] to publish the real-time primary pollutants and Air Quality Index (AQI) data of 367 cities in China. As the new ambient air quality standards [1], basic air pollutants include PM2.5, PM10, SO_2, NO_2, O_3, and CO (see Table 1 for details), and the AQI level is calculated by the Chinese Standard [2] using the above six atmospheric pollutants, measured at monitoring stations in each city.

For the convenience of future research, as to how we dealt with other COVID-19 related data, we match the data from CNEMC to our base map by city names. (See Table 4 in Appendix A for the detailed mapping list) Firstly, we create a mapping list between cities in CNEMC and our base map. Then we calculated the daily average, minimum, maximum, and standard deviation in each city from the original data recorded by hours. The mean value indicates the city air quality average by days. The standard deviation value expresses the fluctuation within each day. The minimum and maximum value show the two extreme conditions each day. The primary pollutants can be used as the single variable and AQI is a composite index. The data can reflect the change of the air quality by day, and the user could further process the data according to their specific needs. The current data contains the records from 1st January 2020 to 11th April 2020 by the time we finish the article, and we plan to update the data weekly. (See Table 3 in Appendix A for details)

However, due to a few mismatches between the city names in CNEMC data and our base map, there are some missing values, which account for 3% (10 out of 377 cities in our base map are not found in the CNEMC data, See Table 4 in Appendix A for details) of the final processed air quality data. We plan to solve these issues by updating our base map according to the latest administrative division in our future work.

Table 1: Meta-Data Table for Air Quality Data

English Variable Name	Description	Unit
CO	content of carbon monoxide in the air	mg/m^3
SO_2	content of sulfur dioxide in the air	$\mu g/m^3$
NO_2	content of nitrogen dioxide in the air	$\mu g/m^3$
O_3	content of ozone in the air	$\mu g/m^3$
PM2.5	suspended particulates smaller than 2.5μm	$\mu g/m^3$
PM10	suspended particulates smaller than 10 μm	$\mu g/m^3$

Future work for meteorological data

The meteorological data is from the National Climatic Data Center (NCDC) [4], US, including variables of air temperature, dew point temperature, sea level pressure, wind direction, wind speed rate, sky condition, and liquid precipitation depth. The original data is collected by monitoring stations, distributed in cities all over the world, as shown in Table 2. In our future work, we plan to match the meteorological data to our base map by using the geographic variables of longitude and latitude. We plan to calculate the average, minimum, maximum, and standard deviation of all monitor stations with longitude and latitude within a city and use it as the four statistic indicators for each variable in each city included in our base map.

Table 2: Meta-Data Table for Meteorological Data

English Variable Name	Description	Unit
air temperature	The temperature of the air.	Degrees celsius
dew point temperature	The temperature to which a given parcel of air must be cooled at constant pressure and water vapor content for saturation to occur.	Degrees celsius
sea-level pressure	The air pressure relative to Mean Sea Level.	Hectopascals
wind direction	The angle, measured in a clockwise direction, between true north and the direction from which the wind is blowing.	Angular degrees
wind speed rate	The rate of horizontal travel of air past a fixed point.	Meters per second
sky condition	The code that denotes the fraction of the total celestial dome covered by clouds or other obscuring phenomena.	
Liquid precipitation depth	The depth of liquid precipitation that is measured over a one-hour accumulation period.	Millimeters

Appendix A

Table 3: Meta Data Description for Our Air Quality Data.

Table Notes: The first column shows all air quality variables. We have one sheet for each air quality variable. The second column is the standard format column name in each sheet, where 'statistics' contains 'Mean', 'Max', 'Min', and 'Std' representing the average, minimum, maximum, and standard deviation of the daily data. The 'date' means the date of month and day. The third column is an example of column names when the statistics is 'Mean" and the date is "April 11th".

Air Quality Variables	Column names	Example
CO	CO_ [statistics]_[date]	CO_Mean_0411
SO_2	SO2_ [statistics]_[date]	SO2_Mean_0411
NO_2	NO2_ [statistics]_[date]	NO2_Mean_0411
O_3	O3_ [statistics]_[date]	O3_Mean_0411
PM2.5	PM2.5_ [statistics]_[date]	PM2.5_Mean_0411
PM10	PM10_ [statistics]_[date]	PM10_Mean_0411
AQI	AQI_ [statistics]_[date]	AQI_Mean_0411

WReference:

[1] "环境空气质量标准" [Ambient Air Quality Standards] (PDF). Ministry of Environmental Protection of the People's Republic of China (in Chinese). 2012-03-02. Retrieved 2018-02-02.

[2] "环境空气质量指数(AQI) 技术规定(试行)" [Technical Regulation on Ambient Air Quality Index (on trial)] (PDF). Ministry of Environmental Protection of the People's Republic of China (in Chinese). 2012-03-02. Retrieved 2018-02-02.

[3] 罗海江, 史宇. 全国空气质量移动发布平台[J]. 中国科技成果, 2016, 17(18).

[4] National Climatic Data Center. (2020, March 4) Retrieved from https://www.ncdc.noaa.gov/