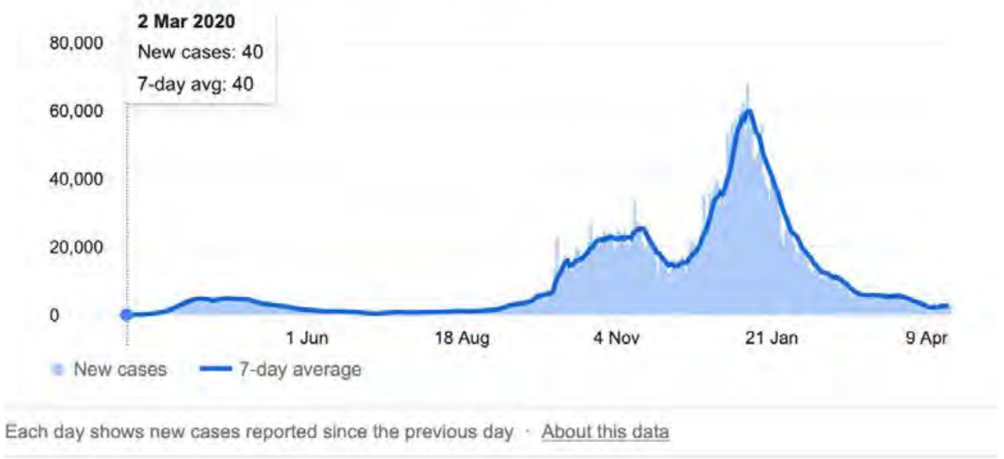
Downloading data using APIs

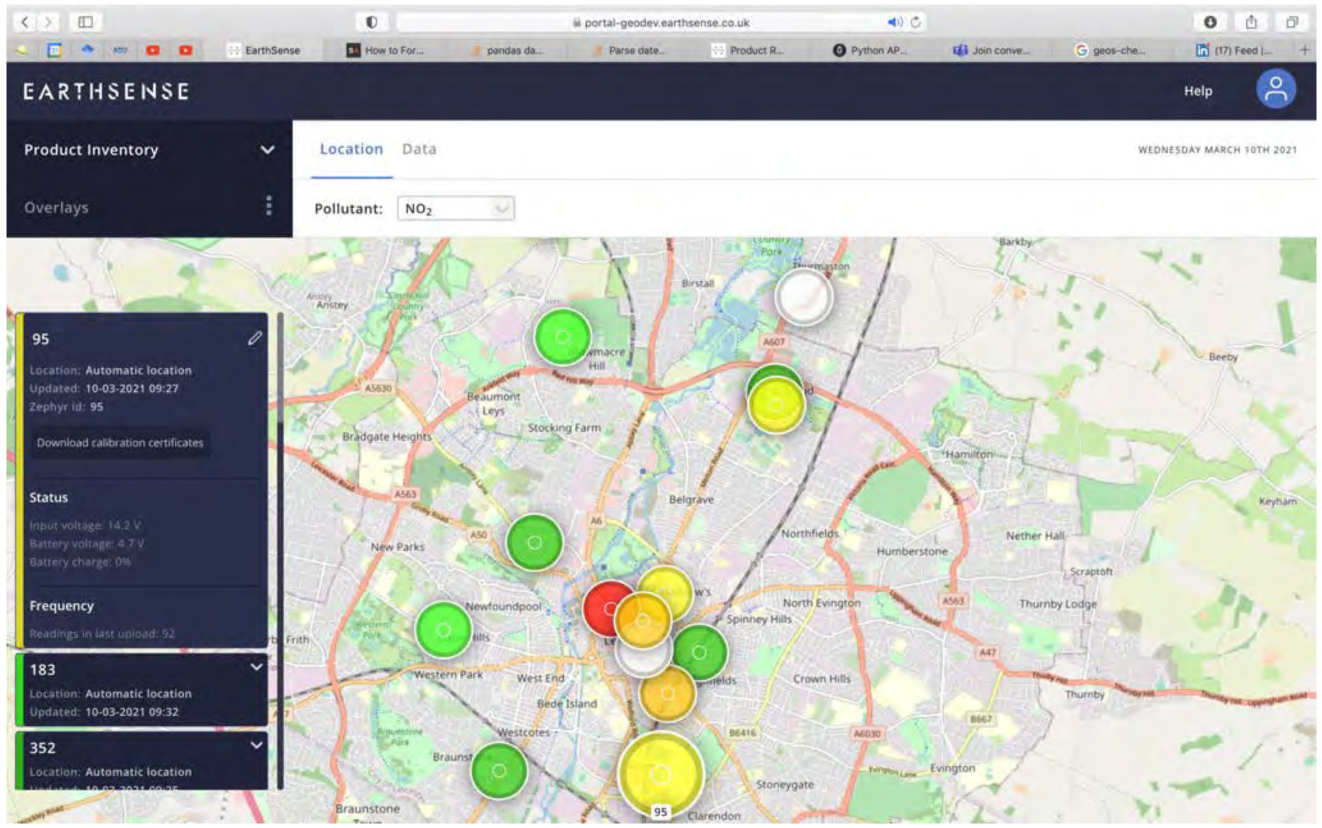
APIs provide access to data

Greater control of what portion of the data you are retrieving

The data to too large to download from the website

To use live information (a database that is constantly be updated)




portal-geodev.earthsense.co.uk
EARTHSENSE
Help
Product Inventory
Overlays
Location
Data
WEDNESDAY MARCH 10TH 2021
Pollutant:
NO₂
Download calibration certificates
Status
Frequency

95
Location: Automatic location
Updated: 10-03-2021 09:27
Zephyr id: 95

Input voltage: 14.2 V
Battery voltage: 4.7 V
Battery charge: 0%

Readings in last upload: 92

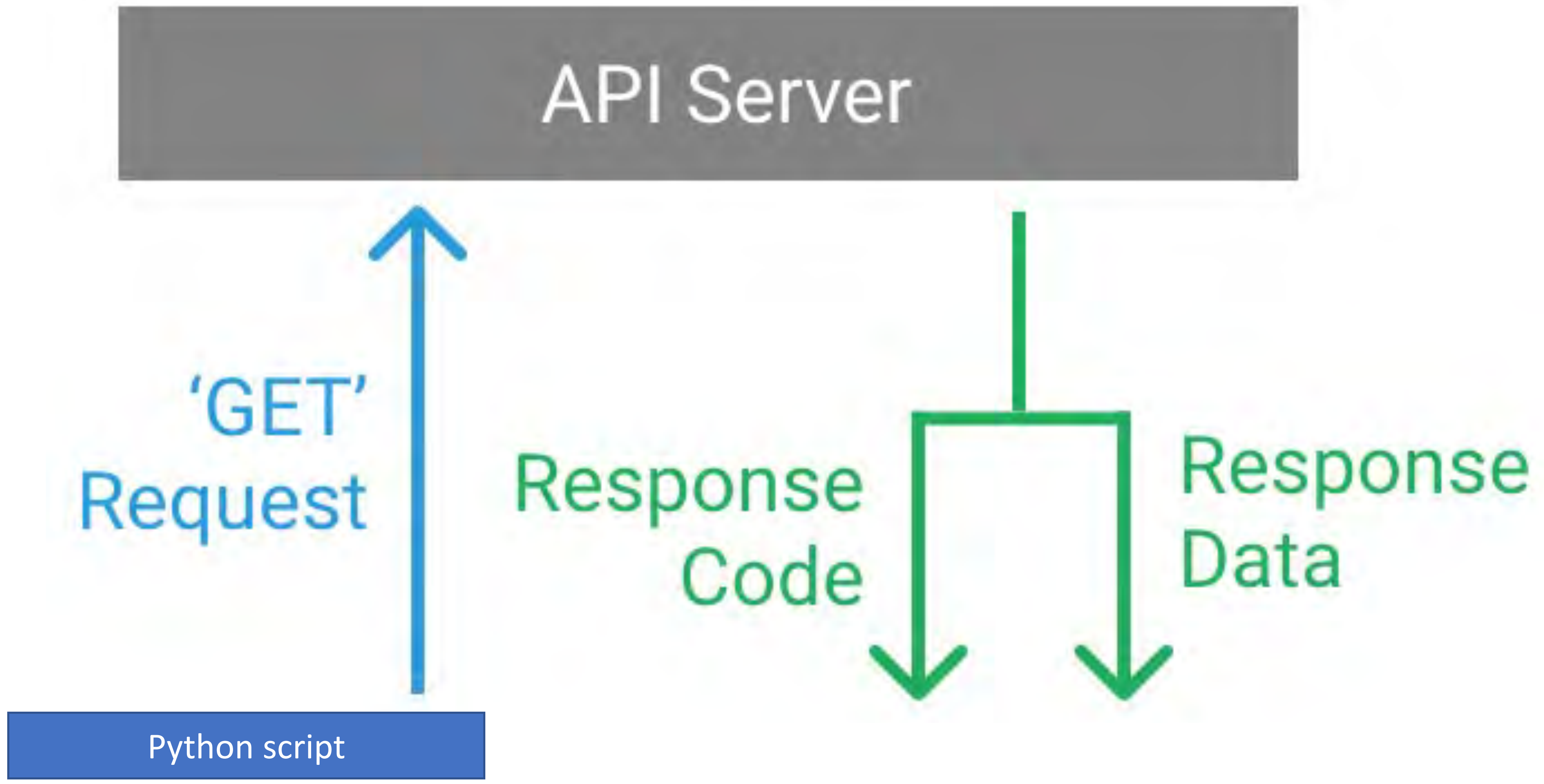
183
Location: Automatic location
Updated: 10-03-2021 09:32

352
Location: Automatic location

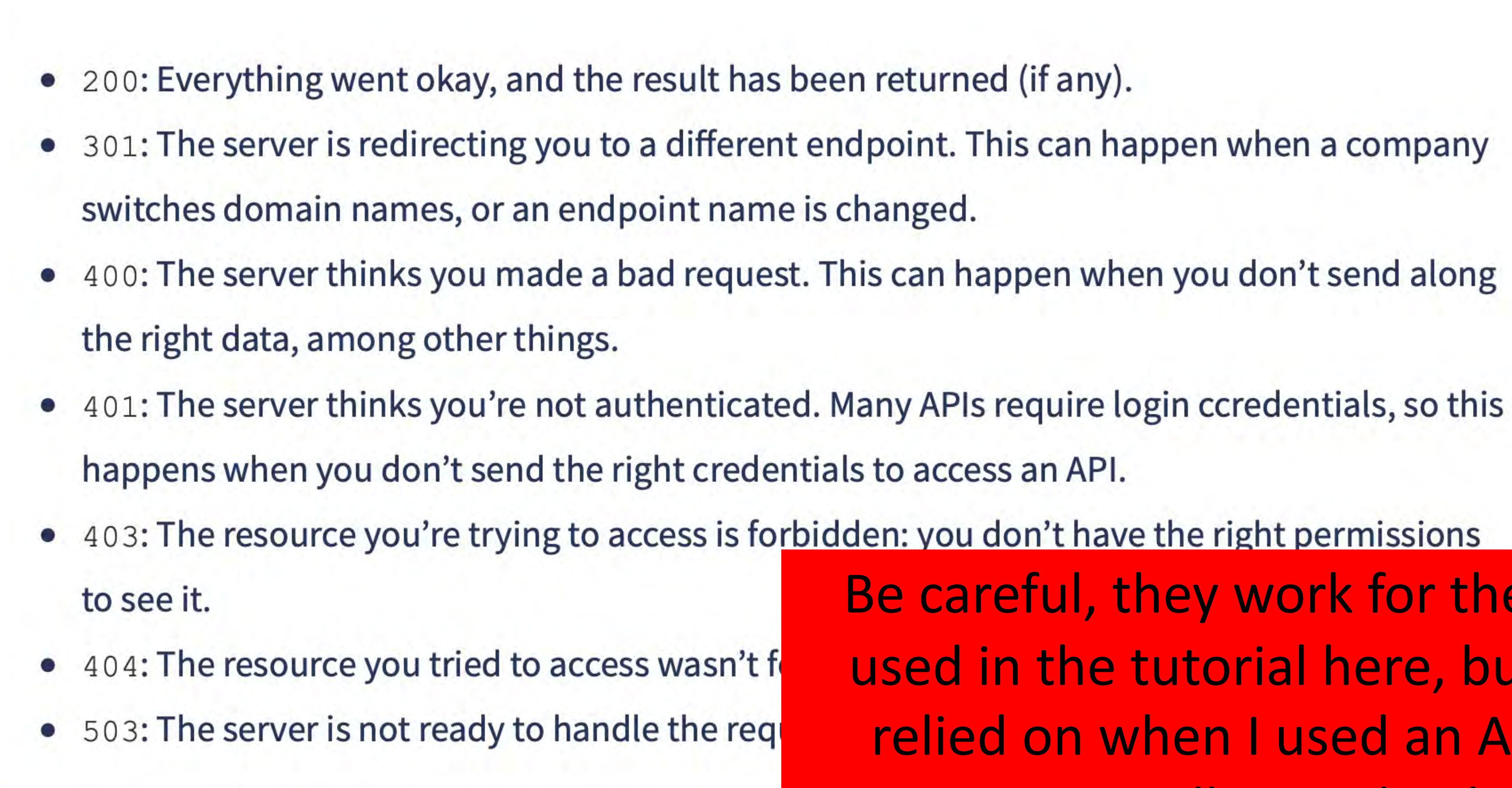
Resources

https://www.dataquest.io/blog/python-api-tutorial/

- Required Python packages and how to install them
- example APIs
- How to manipulate the resulting data (JSON, yuck!)


API Server
'GET' Request
Response Code
Response Data
Python script

API Status Codes (response codes)

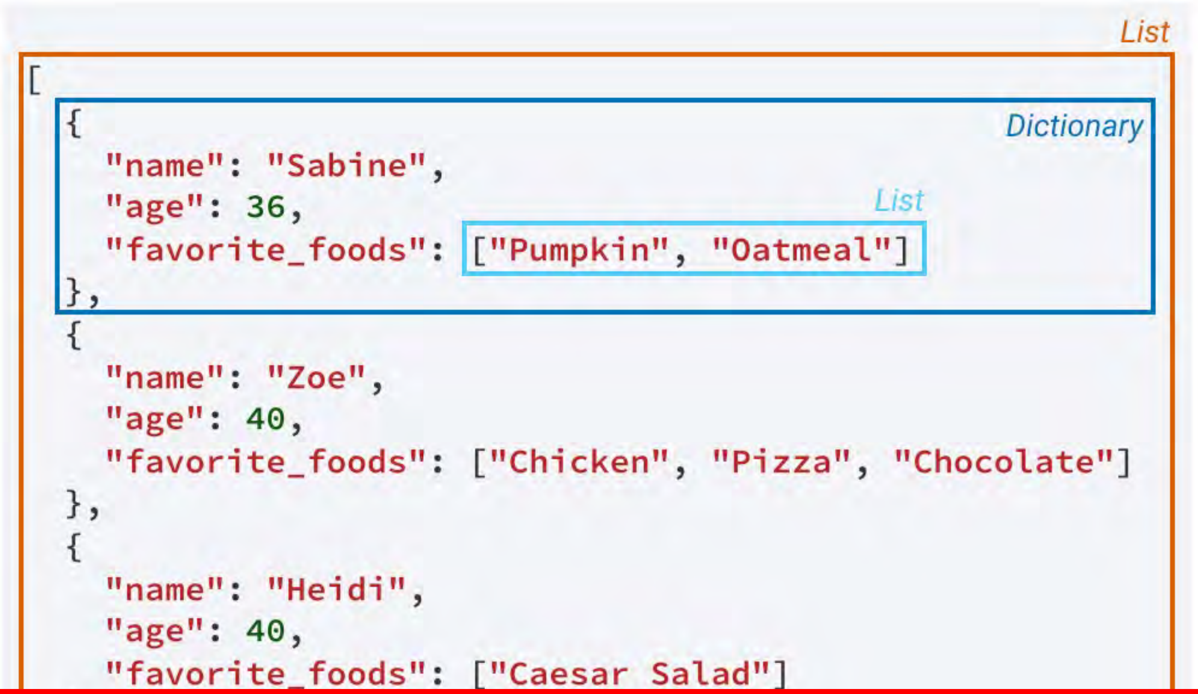


- 200: Everything went okay, and the result has been returned (if any).
- 301: The server is redirecting you to a different endpoint. This can happen when a company switches domain names, or an endpoint name is changed.
- 400: The server thinks you made a bad request. This can happen when you don't send along the right data, among other things.
- 401: The server thinks you're not authenticated. Many APIs require login ccredentials, so this happens when you don't send the right credentials to access an API.
- 403: The resource you're trying to access is forbidden: you don't have the right permissions to see it.
- 404: The resource you tried to access wasn't f
- 503: The server is not ready to handle the req

Be careful, they work for the example APIs used in the tutorial here, but could not be relied on when I used an API from an air pollution database

JavaScript Object Notation (JSON) data (response data)

- JSON is the language of the API (a requests for data returns the data in this format/labguage)
- JASON is a way to encode data structures that ensures that they are easily readable by machines.
  - But difficult to work with (for me!)
- Use the Python package, ‘json’, to convert the JSON to a more familiar object

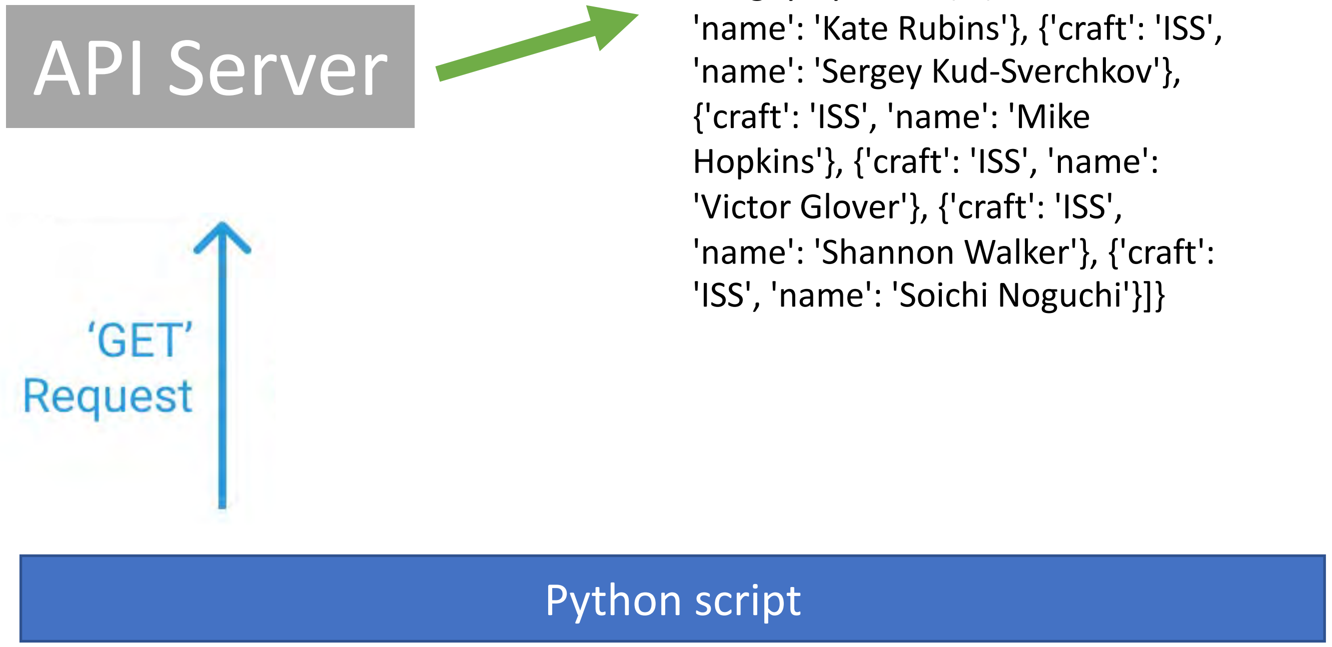


```
[
  {
    "name": "Sabine",
    "age": 36,
    "favorite_foods": ["Pumpkin", "Oatmeal"]
  },
  {
    "name": "Zoe",
    "age": 40,
    "favorite_foods": ["Chicken", "Pizza", "Chocolate"]
  },
  {
    "name": "Heidi",
    "age": 40,
    "favorite_foods": ["Caesar Salad"]
```

```
def jprint(obj):
    # create a formatted string of the Python JSON object
    text = json.dumps(obj, sort_keys=True, indent=4)
    print(text)
```

Working with JSON was difficult for me, and the structure of the data was not consistent – across different APIs, as well as within the same API (but for different time periods)

Example API in the tutorial…

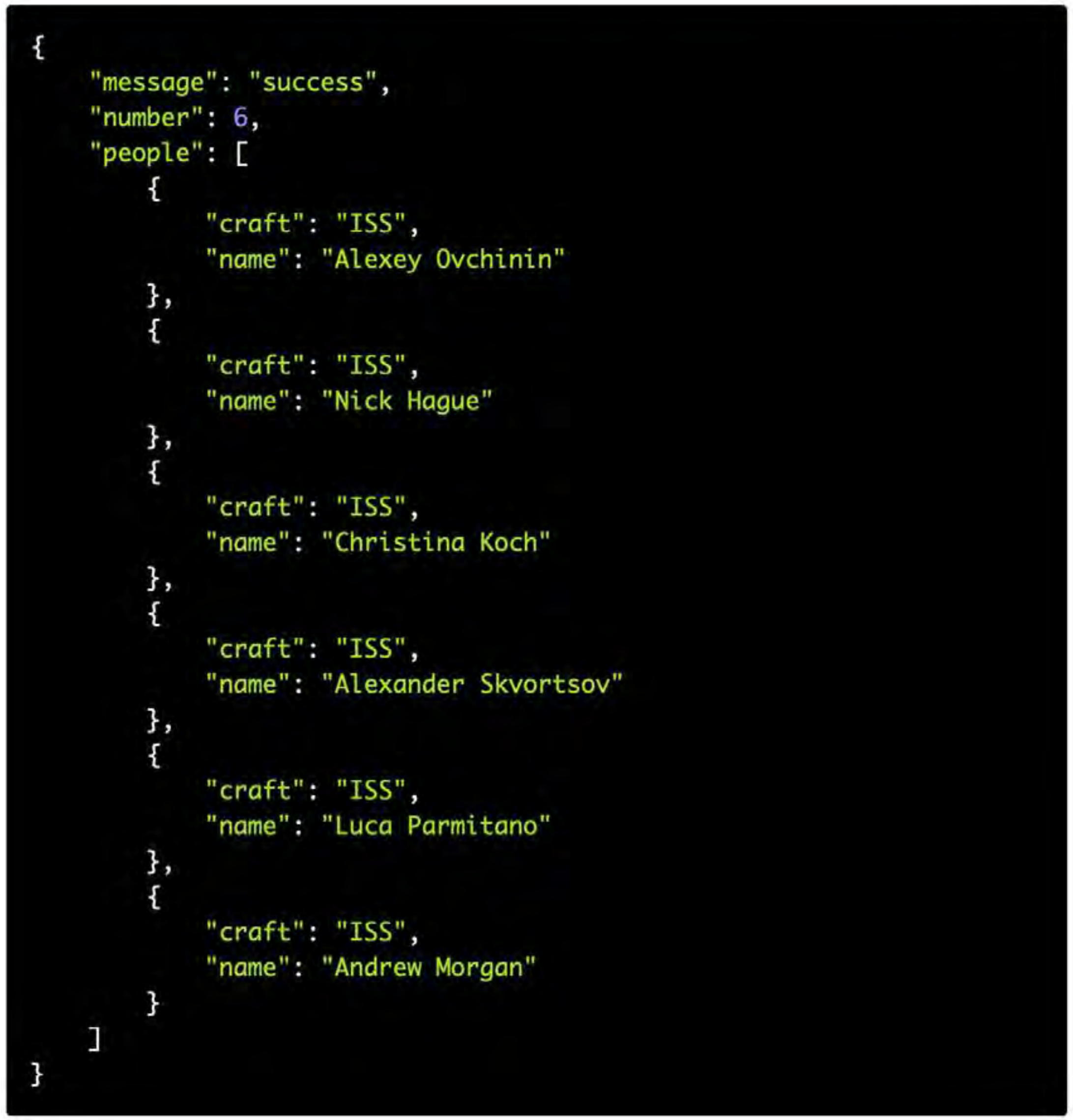


Response data (JSON format)

'message': 'success', 'number': 7, 'people': [{'craft': 'ISS', 'name': 'Sergey Ryzhikov'}, {'craft': 'ISS', 'name': 'Kate Rubins'}, {'craft': 'ISS', 'name': 'Sergey Kud-Sverchkov'}, {'craft': 'ISS', 'name': 'Mike Hopkins'}, {'craft': 'ISS', 'name': 'Victor Glover'}, {'craft': 'ISS', 'name': 'Shannon Walker'}, {'craft': 'ISS', 'name': 'Soichi Noguchi'}]}

jprint(respone)

Response data (in the form of a string)



```
{
    "message": "success",
    "number": 6,
    "people": [
        {
            "craft": "ISS",
            "name": "Alexey Ovchinin"
        },
        {
            "craft": "ISS",
            "name": "Nick Hague"
        },
        {
            "craft": "ISS",
            "name": "Christina Koch"
        },
        {
            "craft": "ISS",
            "name": "Alexander Skvortsov"
        },
        {
            "craft": "ISS",
            "name": "Luca Parmitano"
        },
        {
            "craft": "ISS",
            "name": "Andrew Morgan"
        }
    ]
}
```

Retrieve data

endpoint

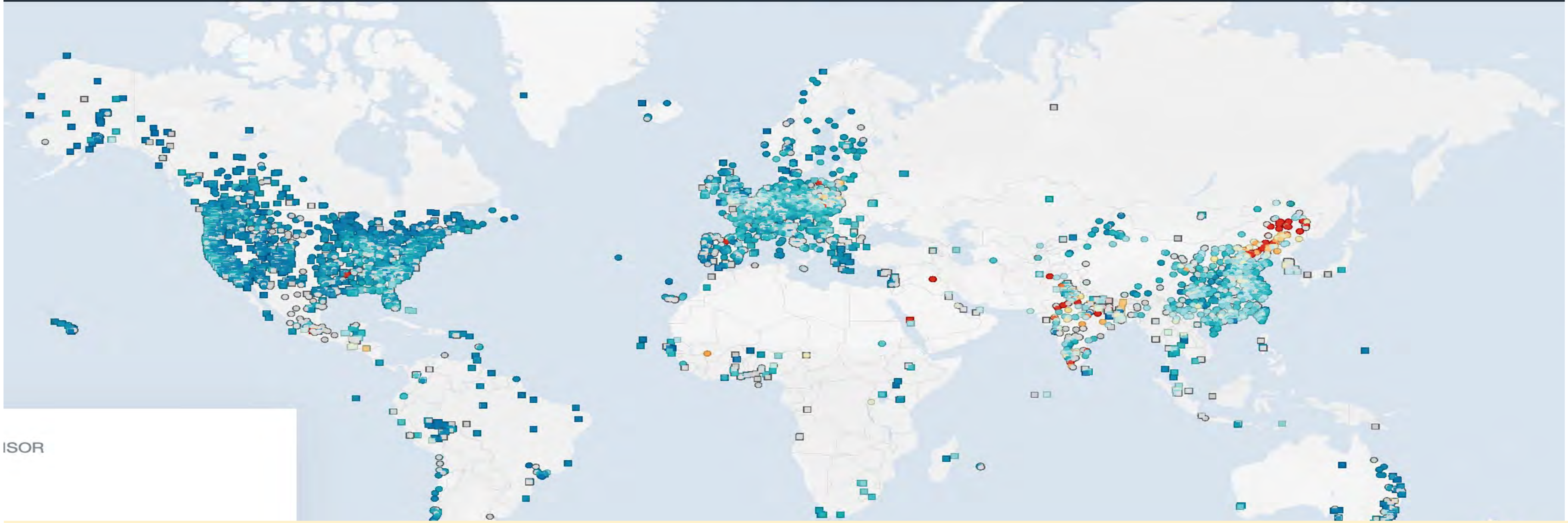
JavaScript Object Notation

```
response = requests.get("http://api.opennotify.org/astros.json")
```

Next example API in the tutorial introduces an API that uses a query parameter

- With these, you can have more control of what data you are requesting (e.g. time, location, pollutants, etc.)

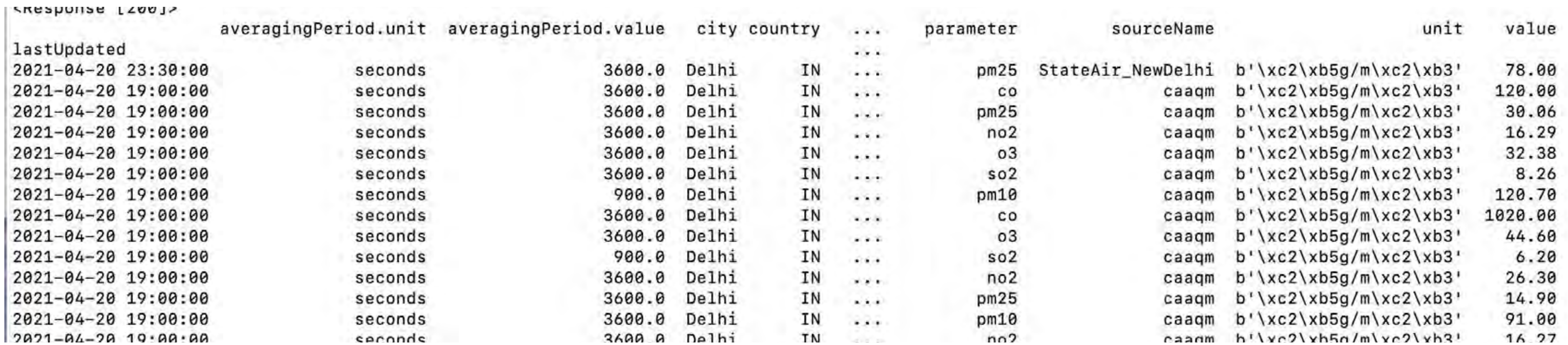
Open AQ – A publicly available database of sensors around the world



- Info on Open AQ website on their own APIs is NOT USEFUL
- I found a nice Python wrapper, developed by David Hagan (w/ tutorial), which was much more useful
- One huge advantage to this package is that it loads in the form of Panda DataFrame, which is much more easier to handle that JSON
- http://dhhagan.github.io/py-openaq/tutorial/api.html
- https://py-openaq.readthedocs.io/en/latest/

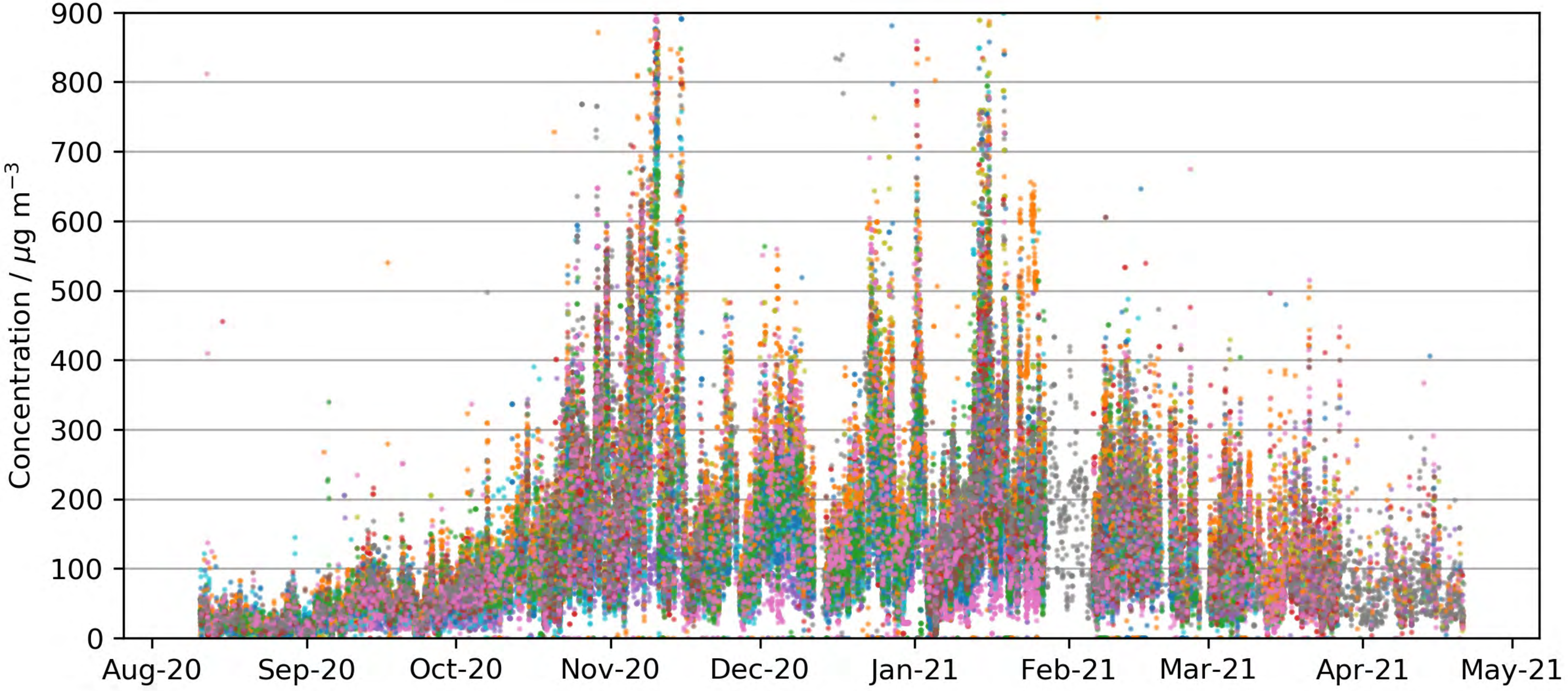
```
data = api.latest(city='Delhi',
parameter='pm25', df=True)

data = api.measurements(city='Delhi',
parameter='pm25', limit=60000, df=True)
```



```
<Response [200]>
                    averagingPeriod.unit  averagingPeriod.value   city country  ...    parameter        sourceName                      unit    value
lastUpdated                                                                     ...
2021-04-20 23:30:00              seconds                 3600.0  Delhi      IN  ...         pm25  StateAir_NewDelhi  b'\xc2\xb5g/m\xc2\xb3'    78.00
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...           co              caaqm  b'\xc2\xb5g/m\xc2\xb3'   120.00
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...         pm25              caaqm  b'\xc2\xb5g/m\xc2\xb3'    30.06
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...          no2              caaqm  b'\xc2\xb5g/m\xc2\xb3'    16.29
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...           o3              caaqm  b'\xc2\xb5g/m\xc2\xb3'    32.38
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...          so2              caaqm  b'\xc2\xb5g/m\xc2\xb3'     8.26
2021-04-20 19:00:00              seconds                  900.0  Delhi      IN  ...         pm10              caaqm  b'\xc2\xb5g/m\xc2\xb3'   120.70
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...           co              caaqm  b'\xc2\xb5g/m\xc2\xb3'  1020.00
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...           o3              caaqm  b'\xc2\xb5g/m\xc2\xb3'    44.60
2021-04-20 19:00:00              seconds                  900.0  Delhi      IN  ...          so2              caaqm  b'\xc2\xb5g/m\xc2\xb3'     6.20
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...          no2              caaqm  b'\xc2\xb5g/m\xc2\xb3'    26.30
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...         pm25              caaqm  b'\xc2\xb5g/m\xc2\xb3'    14.90
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...         pm10              caaqm  b'\xc2\xb5g/m\xc2\xb3'    91.00
2021-04-20 19:00:00              seconds                 3600.0  Delhi      IN  ...          no2              caaqm  b'\xc2\xb5g/m\xc2\xb3'    16.27
```

$PM_{2.5}$ over Delhi from OpenAQ Sensor Network



```
Average conc of 150 (over 104,022 datapoints)
```