AirU Sensors

Sensor Registration

Sensor ID (using MAC Address), Sensor Model, Sensor Version

POSTed csv data... as one line or many


```
Time (UTC),                   Temp (*C),     Humidity (%),  Pressure (Pa), Altitude (m),   pm1 (ug/m^3), pm2.5 (ug/m^3), pm10 (ug/m^3)
2016-08-31 16:47:04.645526,   23.3999996185, 35.0999984741, 85286,         1430.10073254, 3,            8,              11
2016-08-31 16:47:06.237403,   23.2000007629, 34.9000015259, 85287,         1430.19645369, 3,            8,              11
```


Mesowest sensors

~202 sensors have PM2.5 measurements,
but we think many of these are duplicates of PurpleAir sensors

Lots of query settings available! Documentation:
https://synopticlabs.org/api/mesonet/

Other sensors may have other measurements; this will get a list of all
Mesowest sensors and what measurements they have available:
https://api.mesowest.net/v2/stations/metadata?&token=demotoken&sensorvars=1

List of our pre-selected sensors
http://api.mesowest.net/v2/stations/timeseries
?recent=10&token=demotoken
&stid=mtmet,wbb,NAA,MSI01,UFD10,UFD11
&vars=wind_speed,air_temp,solar_radiation,wind_gust,
relative_humidity,wind_direction,volt,pressure,
precip_accum_fifteen_minute,precip_accum_five_minute,
ozone_concentration,altimeter,PM_25_concentration,
soil_temp,sensor_error_code,
photosynthetically_active_radiation,
clear_sky_solar_radiation,flow_rate,
internal_relative_humidity,air_flow_temperature,
evapotranspiration


```
{
    STATUS: "ACTIVE",
    MNET_ID: "34",
    PERIOD_OF_RECORD: {
        start: "2000-10-24T00:00:00Z",
        end: "2017-03-27T21:55:00Z"
    },
    ELEVATION: "4960",
    NAME: "Olympus Hills - MSI",
    STID: "MSI01",
    SENSOR_VARIABLES: {...},
    LONGITUDE: "-111.80220",
    STATE: "UT",
    OBSERVATIONS: {
        date_time: [
            "2017-03-27T21:15:00Z",
            "2017-03-27T21:20:00Z",
            "2017-03-27T21:25:00Z",
            "2017-03-27T21:30:00Z",
            "2017-03-27T21:35:00Z",
            "2017-03-27T21:40:00Z",
            "2017-03-27T21:45:00Z",
            "2017-03-27T21:50:00Z",
            "2017-03-27T21:55:00Z",
            "2017-03-27T22:00:00Z",
            "2017-03-27T22:05:00Z"
        ],
        precip_accum_five_minute_set_1: [
            0.254, 0, 0.254, 0, 0, 0.254, 0, 0, 0, 0, 0
        ],
        relative_humidity_set_1: [
            88.5, 89.5, 90, 90.2, 90, 89.6, 89.3, 89.7, 90, 90.3, 90.2
        ],
        ozone_concentration_set_1: [
            46.73, 40.11, 40.54, 44.26, 48.22, 44.92, 46.93, 52.1, 44.53, 44.98, 46.09
        ],
        pressure_set_1: [
            84358, 84358, 84358, 84357, 84357, 84357, 84353, 84351, 84348, 84346, 84346
        ],
        wind_speed_set_1: [
            1.59, 1.34, 0.98, 0.45, 0.15, 1.21, 0.69, 0.45, 0.9, 0.54, 0.63
        ],
        wind_gust_set_1: [
            2.97, 2.76, 2.36, 1.54, 0.92, 2.15, 1.54, 1.02, 1.54, 1.44, 1.23
        ],
        altimeter_set_1d: [
            101243.67, 101243.67, 101243.67, 101242.47, 101242.47, 101242.47, 101237.67, 101235.27, 101231.67, 101229.27, 101229.27
        ],
        air_temp_set_1: [
            4.39, 4.38, 4.33, 4.27, 4.22, 4.14, 4.03, 4.05, 4.16, 4.23, 4.29
        ]
        volt_set_1: [
            13.44, 13.44, 13.44, 13.44, 13.43, 13.43, 13.42, 13.42, 13.41, 13.4, 13.4
        ],
        wind_direction_set_1: [
            336.2, 331, 348.5, 337.4, 39.02, 316.2, 276.5, 220.8, 276.8, 344.8, 297.1
        ],
        solar_radiation_set_1: [
            79.98, 81.9, 78.4, 77.51, 78.69, 83, 106.1, 102.1, 86.2, 90, 98.9
        ],
        PM_25_concentration_set_1: [
            null, null, null, null, null, null, null, null, null, 4, null
        ],
    },
    LATITUDE: "40.67250",
    TIMEZONE: "America/Denver",
    ID: "2552"
}
```


values that Mesowest doesn't supply:
Sensor Model, Sensor Version, pm1, pm10.0

null measurements seem to be pretty common
with these sensors; only store records that
have non-null PM2.5 measurements

~~MongoDB~~ InfluxDB

- time of registration for purple air, time we started storing the data
- ID
- Latitude
- Longitude
- Altitude (m)
- Sensor Model
- Sensor Version
- Start
- Sensor Source

InfluxDB

- time (UTC)
- ID
- Humidity (%)
- Pressure (Pa)
- Temp (*C)
- pm1 (ug/m^3)
- pm2.5 (ug/m^3)
- pm10.0 (ug/m^3)
- CO (ppm)
- NO2 (ppm)
- light (lux)
- wind direction (compass degree)
- wind speed (scalar)
- ozon concentration (ppb)
- sensor error code
- wind gust (??)
- solar radiation (W/m**2)

Filter:
Latitude and Longitude are defined, and within
Utah (Latitude [36.999090, 41.993882]; Longitude[-114.041498, -109.045215])

Purple Air sensors

List of all sensors
https://map.purpleair.org/json


```
{
    ID: 649,
    ParentID: null,
    THINGSPEAK_PRIMARY_ID: "198241",
    THINGSPEAK_PRIMARY_ID_READ_KEY: "48ZPHGK7WBPVLNQ2",
    Label: "Rowland Hall 2",
    Lat: "40.751036433894456",
    Lon: "-111.86373710632324",
    PM2_5Value: "0.33",
    State: null,
    Type: "PMS5003+BME280+PUB",
    Hidden: "false",
    Flag: 1,
    DEVICE_BRIGHTNESS: "15",
    isOwner: 0,
    A_H: null,
    temp_f: "52",
    humidity: "67",
    pressure: "864.50",
    AGE: 0,
    THINGSPEAK_SECONDARY_ID: "198242",
    THINGSPEAK_SECONDARY_ID_READ_KEY: "8OJ27474V6WYU5NC",
    LastSeen: 1490640835,
    Version: "2.47c",
    LastUpdateCheck: 1490638385,
    Uptime: "1172469",
    RSSI: "-58",
    Stats:
    "{"v":0.33,"v1":0.7649148515564815,"v2":1.423589445142715,"
    v3":1.5899388543305246,"v4":1.3443167326394843,"v5":2.21178
    67664101363,"v6":2.8938586977010923,"pm":0.33,"lastModified
    ":1490640835773,"timeSinceModified":69195}"
},
```


Primary feed for a single sensor
https://api.thingspeak.com/channels/198241/feed.json?results=100&api_key=48ZPHGK7WBPVLNQ2


```
channel: {
    id: 198241,
    name: "AirMonitor_5c:cf:7f:cf:6b:e8",
    latitude: "0.0",
    longitude: "0.0",
    field1: "PM1.0 (ATM)",
    field2: "PM2.5 (ATM)",
    field3: "PM10.0 (ATM)",
    field4: "Uptime",
    field5: "RSSI",
    field6: "Temperature",
    field7: "Humidity",
    field8: "PM2.5 (CF=1)",
    created_at: "2016-12-03T01:07:47Z",
    updated_at: "2017-03-27T19:58:15Z",
    last_entry_id: 242641
},
feeds: [
    {
        created_at: "2017-03-27T18:02:45Z",
        entry_id: 242542,
        field1: "1.34",
        field2: "2.41",
        field3: "2.76",
        field4: "19489",
        field5: "-59",
        field6: "51",
        field7: "71",
        field8: "2.41"
    },
```


no time conversion needed, timezone used is UTC

Lots of query / averaging settings available! Documentation:
https://www.mathworks.com/help/thingspeak/get-a-channel-feed.html

values that Purple Air doesn't supply:
Pressure*, Altitude
* (pressure IS in the all-sensor list, but AFAIK it's not
available in the time series feeds)

Secondary feed for a single sensor
https://api.thingspeak.com/channels/198242/feed.json?results=100&api_key=8OJ27474V6WYU5NC


```
channel: {
    id: 198242,
    name: "AirMonitor_5c:cf:7f:cf:6b:e8 Counters",
    latitude: "0.0",
    longitude: "0.0",
    field1: "0.3um",
    field2: "0.5um",
    field3: "1.0um",
    field4: "2.5um",
    field5: "5.0um",
    field6: "10.0um",
    field7: "PM1.0 (CF=1)",
    field8: "PM10.0 (CF=1)",
    created_at: "2016-12-03T01:07:48Z",
    updated_at: "2017-03-27T20:00:45Z",
    last_entry_id: 243044
},
feeds: [
    {
        created_at: "2017-03-27T18:02:45Z",
        entry_id: 242945,
        field1: "341.90",
        field2: "93.35",
        field3: "11.32",
        field4: "1.55",
        field5: "0.58",
        field6: "0.06",
        field7: "1.00",
        field8: "2.00"
    },
```


DAQ sensors

List of all sensors, hourly measurements for the last 10 days
http://air.utah.gov/xmlFeed.php


```
<site>
    <name>Salt Lake County</name>
    <data>
        <date>03/27/2017 12:00:00</date>
        <ozone>0.034</ozone>
        <ozone_8hr_avg>0.031</ozone_8hr_avg>
        <pm25>2.3</pm25>
        <pm25_24hr_avg>2.5</pm25_24hr_avg>
        <nox>0.018</nox>
        <no2>0.013</no2>
        <temperature>41.99</temperature>
        <relative_humidity>83</relative_humidity>
        <wind_speed>4.4</wind_speed>
        <wind_direction>127</wind_direction>
        <co>0.24</co>
        <solar_radiation>112</solar_radiation>
        <so2/>
        <noy>15.272</noy>
        <bp/>
        <pm10>1.6</pm10>
    </data>
```


they use Mountain Standard Time,
does not change with Daylight Savings Time (Kerry)

values that DAQ doesn't supply:
Sensor Model, Sensor Version, Start,
Pressure, pm1

also grab RH, PRMC coarse PM, SWD, WSW, and temp
(scalar wind direction, scalar wind speed, and temp, respectively) (Kerry)

for each sensor, look up / hard code (Kerry provided this information):
- latitude
- longitude
- altitude