NW-AIRQUEST

Air Sensor Working Group

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Timeline of Air Sensor Working Group

2019

- February – Discussing of possible formation of Air Sensor Working Group

- April – Organizational telecon meeting with 15-20 people
  - Lots of interest
  - But not sure what our "mission" should be

- ??…

2020

- Institute either quarterly or bi-annual telecons, before NW-AIRQUEST "general meetings"

Personal Research Activities

2017

- Avista Streetlight project through Urbanova
  - Low-cost AQ sensors
  - Established a reference site in Spokane
  - Monitored urban air through 2017 and 2018 wildfire seasons
    - High PM2.5 values (peak of 250 ug m-3 in Spokane)
  - Used social media (Twitter) to correlate AQ with public reactions

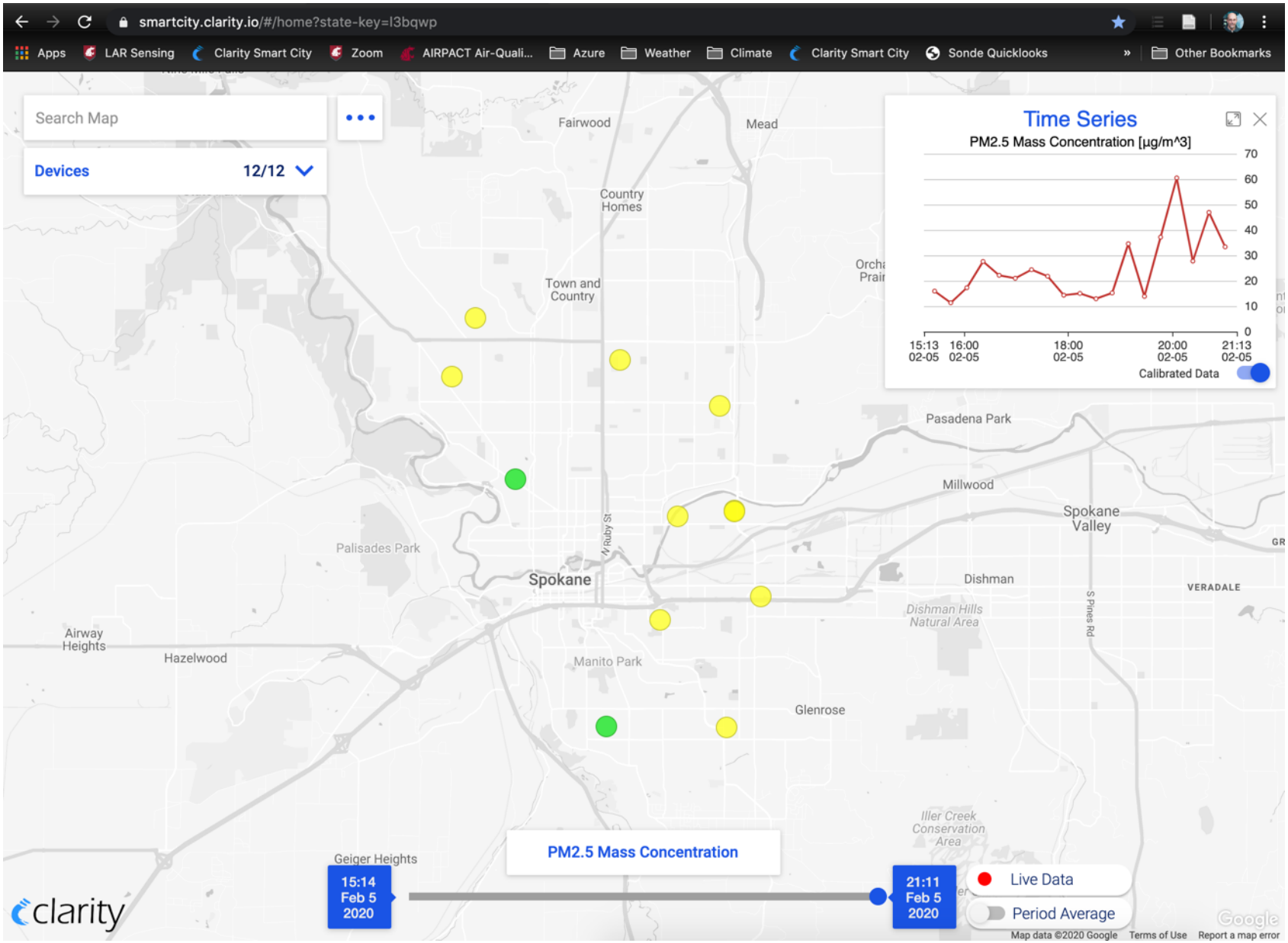
2018

- Formation of Wildfire and Health group for proposals

2019

- Creation of the Urbanova Cloud
- Spokane School Project funded by Ramboll
  - June 2019-May 2020
  - Installation of 10 outdoor (Clarity) and 10 indoor (WSU) PM2.5 sensors
- Submission of NIH R21 proposal
  - Use Spokane AQ network
  - Outfit university students with GPS trackers and spirometers

Spokane AQ Network



Purple Air Sensors

- Julie Fox (DOH)
  - Has a set of Purple Air sensors that she is using to engage users at schools and in the general public
  - Protocols for usage
- Air Sensor WG
  - Should share code (like that shown at the right) for general use
  - Establish a GitHub code repository

Obtain and Plot Global PurpleAir Sensor Data

Von P. Walden, Washington State University
5 February 2020

In [1]:
```
import urllib
import json
from datetime import datetime
import pandas as pd
import geoviews as gv
import geoviews.feature as gf

gv.extension('bokeh')
```

...

Download data from global Purple Air sites

Purple REST API

In [2]:
```
url           = 'https://www.purpleair.com/data.json'
response      = urllib.request.urlopen(url)
purpleAirSites = json.loads(response.read())
now           = datetime.now()
```

Prepare data for plotting with Geoviews

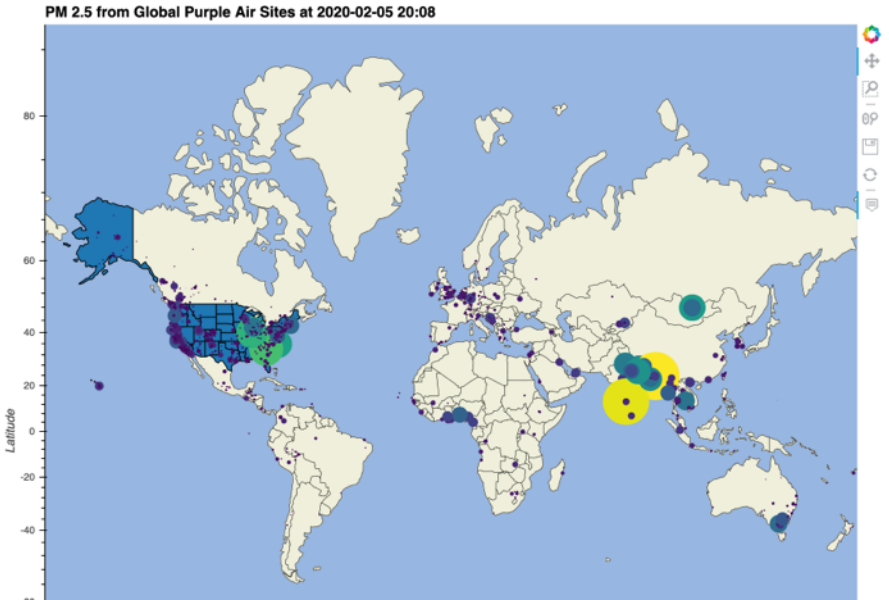
In [3]:
```
pAir  = pd.DataFrame(purpleAirSites['data'], columns=purpleAirSites['fields'])
pAir.dropna(subset=['pm_2', 'Lon', 'Lat'], inplace=True)
pm2_5 = gv.Dataset(pAir, kdims=['pm_2'])
points = pm2_5.to(gv.Points, ['Lon', 'Lat'], ['pm_2'])
```

Plot the data on a global map

In [4]:
```
features = gv.Overlay([gf.ocean, gf.land, gf.borders, gf.coastline, gf.states])

features * points.opts(
    color='pm_2', cmap='viridis', size=gv.dim('pm_2')*0.1,
    tools=['hover'], width=950, height=950, global_extent=True,
    title='PM 2.5 from Global Purple Air Sites at ' + now.strftime('%Y-%m-%d %H:%M')
)
```

Out[4]:



Future Activities that are related to NW-AIRQUEST

2020 - …

- Quarterly meetings of the Air Sensor WG
- Establish a code repository for a wide variety of users
- Use existing networks as testbeds
  - How well do low-cost sensors work?
  - Establish methods for streaming data to users (AWS, Urbanova Cloud)
  - How often do the sensors need to be calibrated?
  - Can machine learning (ML) techniques be used to improve the quality of low-cost sensors?
- Discuss the establishment of sensor networks in mountainous regions with wood burning issues
  - Pinehurst, Idaho (?)
  - Bend, Oregon (?)
  - Wenatchee, WA (?)

Looking forward

- Deploy low-cost mobile sensors
- Continue to operate Reference site
  - Fitted with research grade instruments
  - Co-locate with sensor packages for calibration and validation
- Mobile sampling using new LAR instrumented van for regional field campaigns
  - Meteorology
  - Surface flux measurements
  - PTR-MS
  - Mobile reference site for field projects

Questions?

Urbanova Cloud

- https://alpha.urbanova.cloud/