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Real-Time Geospatial Data Viewer (RETIGO): Web-Based Tool for Researchers and Citizen Scientists to Explore their Air Measurements

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Introduction

The collection of air measurements in real-time on moving platforms, such as wearable, bicycle-mounted, or vehicle-mounted air sensors, is becoming an increasingly common method to investigate local air quality. However, visualizing and analyzing geospatial air monitoring data requires advanced data analysis skillsets that limit participation in data analysis. EPA's Real-Time Geospatial (RETIGO) Data Viewer web-based tool is a new program that reduces the technical barriers to visualize and understand geospatial air data time series.

RETIGO: Webtool Design

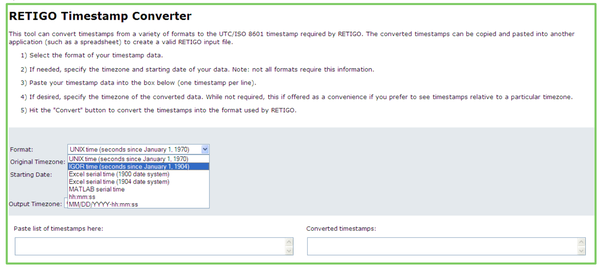
- RETIGO is a Javascript-based end user tool, built using several APIs, including Google Maps API, Flot API, and JQuery API.
- Designed for the user to import their stationary or mobile field monitoring data and explore the data within their browser (e.g., Google Chrome) – the data does not leave the user's computer, unless the user decides to publish their data to the RETIGO open access data repository.
- Data import format designed to be simple and flexible:

Data import:
Standardized and flexible data input format that supports many columns of air monitoring variables, multiple monitoring packages, disordered time

Tool to convert many timestamp options to the UTC/ISO 8601 international standard

Required columns / Flexible number of numeric data columns

Timestamp(UTC)	EAST_LONGITUDE(deg)	NORTH_LATITUDE(deg)	ID(-)	ozone(ppb)	pm2.5(ug/m^3)
2012-07-18T15:44:00-00:00	-78.9979	35.9508	route1	49.0491	32.6768
2012-07-18T15:44:19-00:00	-78.9947	35.9470	route1	43.2706	26.7231
2012-07-18T15:44:57-00:00	-78.9896	35.9361	route1	42.3130	34.1504
2012-07-18T15:45:58-00:00	-78.9846	35.9172	route1	47.7046	33.2918
[etc...]					



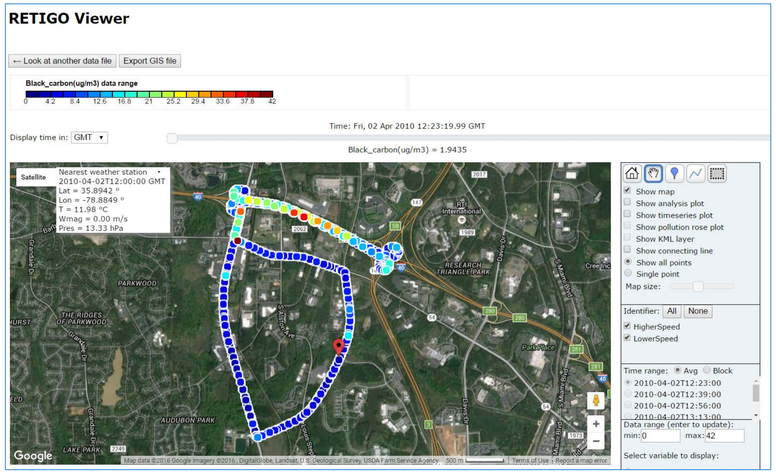
Open access data repository option:
Supports posting of data to the RETIGO data repository, where the file can later be retrieved for interactive exploration with the data viewer.

The open access data repository is enabled by back-end support of Carnegie Mellon University's Environmental Sensor Data Repository (ESDR).

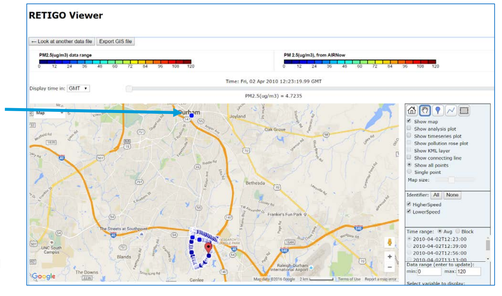
How does RETIGO help me explore my data?

Viewing of complex data over time and space

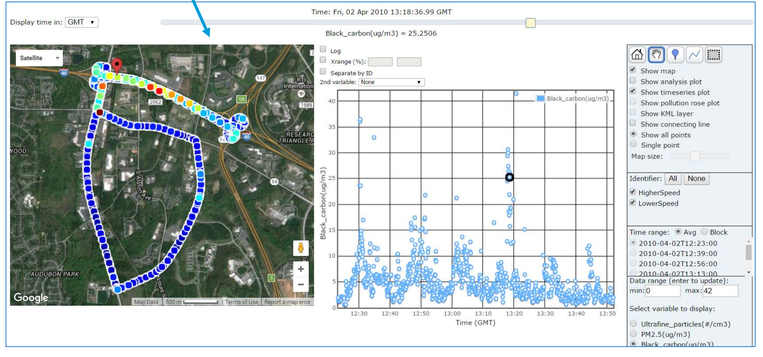
You can chose to simply overlay on a map and use all the functions you are used to with Google Maps (satellite view, streetview). You can slide along a time control bar to highlight specific points along the route. You can toggle between multiple pollutants measured. You can also select to obtain a summary of meteorological conditions (source: World Meteorological Organization) retrieved from the nearest weather station, automatically set to match your sampling period.



Zooming out, you can also see the nearest station reporting $PM_{2.5}$ or ozone, retrieved through the AirNow web service. The concentration value shown automatically aligns with the user-provided sampling data timeframe.

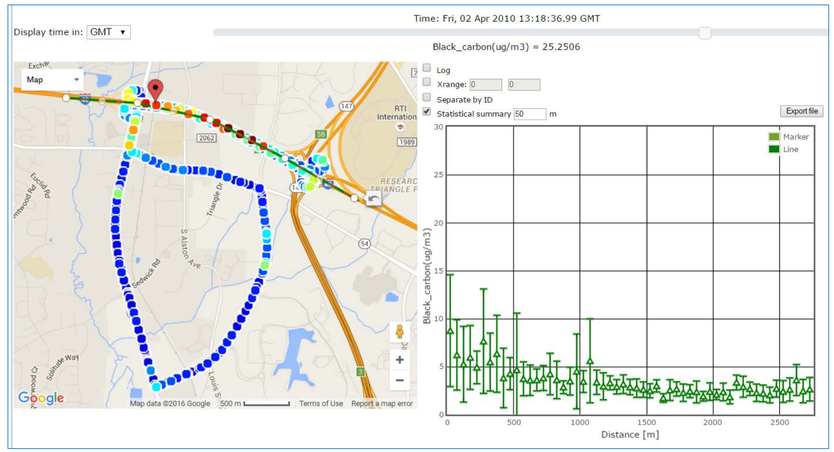


View data simultaneously on map and time series. Can simultaneously highlight point on map and time series using time slider.

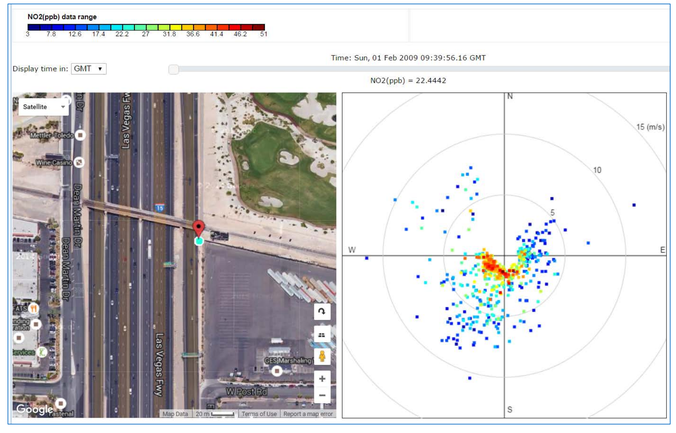


Exploring spatial gradients and hypothesized source impacts

You can manually draw a line or place a marker to represent a nearby point or line source, then create a plot of concentration versus distance. The data can be shown either as individual markers or spatial averages of concentrations as a function of distance to the line or marker. The graph does live updates while the user moves the marker or line around on the map.



For imported data that incorporates wind measurements, RETIGO activates a wind-directional pollution plot option. For example, below shows nitrogen dioxide (NO_2) concentrations at a roadside monitoring station.



Wind-directional pollution plot:
Each marker is colored by the observed NO_2 concentration. The location from the center of the plot is set by the wind speed. The angular position of the marker is set by the wind direction. For example, a marker placed in the SW quadrant represents winds coming from the SW.

Where can I access RETIGO? Is training available?

RETIGO is freely available at www.epa.gov/retigo. Tutorial information is provided on the web page and live training sessions are also offered periodically. Email the team at retigo@epa.gov to learn more.

Acknowledgements

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