# Creating Actionable Air Quality Data using RDF (Resource Description Framework)

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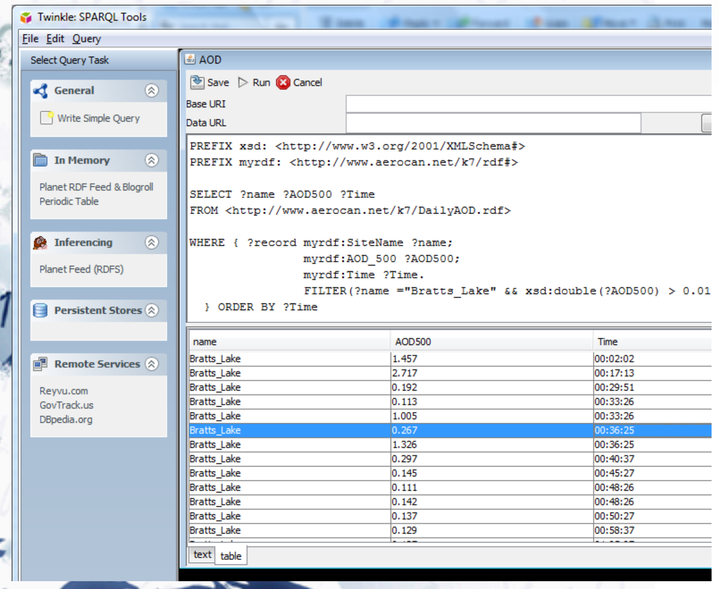
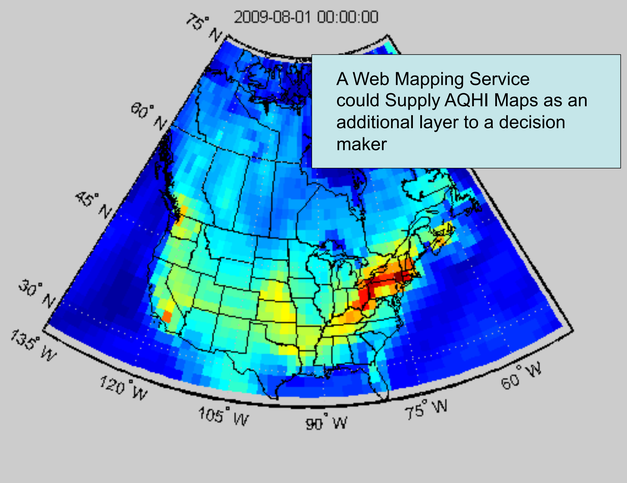
The AEROCAN sunphotometery network generates optical indicators of aerosol concentration and size on a regional and national scale from over a dozen sites Across Canada. These aerosol column measurements (along with other types of Aerosol observations) and gaseous pollution measurements can be employed to constrain air quality assimilation models and subsequently extrapolate the aerosol and gaseous properties in time and space. The resulting 4D grid of physical properties can then be transformed into surface maps of air quality and health indicators such as the AQHI (Air Quality Health Index). As part of the AEROCAN operational quality assurance (QA) methodology we have written automatic procedures to make some of the AEROCAN data more accessible or "actionable" using RDF (Resource Description Framework). In addition encoding the observations and associated sensor metadata using the Sensor Web Enablement (SWE) Common Data Model allows sensor related data to be shared across applications. Efforts have been made to enable the dataset to become "Linked Data" further enhancing its value.

AEROCAN CIMEL Sunphotometer located at PEARL Eureka. AEROCAN is a subnet of AERONET

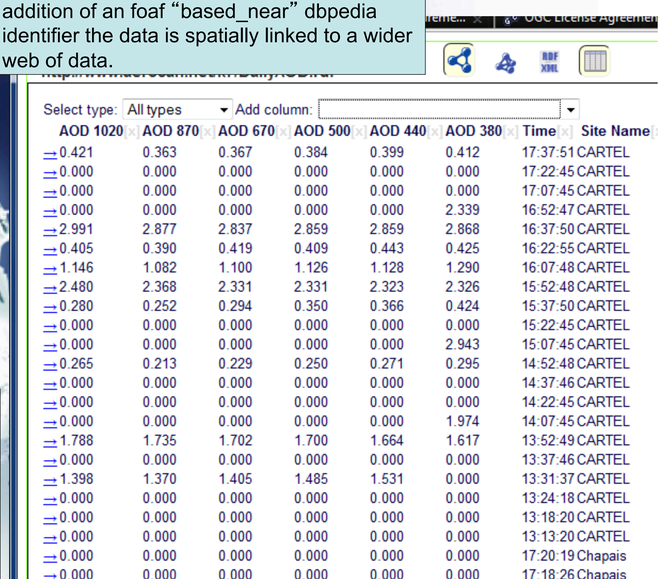



A Web Mapping Service could Supply AQHI Maps as an additional layer to a decision maker

Using a RDF Schema a RDF representation of the daily aerosol optical depth (AOD) is produced.

The RDF file becomes a SPARQL endpoint, data can now be queried. Data can still be viewed as a web page of data and with the addition of an foaf "based_near" dbpedia identifier the data is spatially linked to a wider web of data.

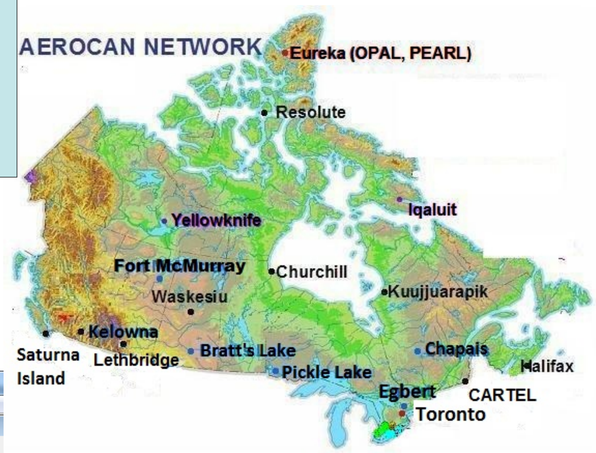


Select type: All types Add column:

| AOD 1020 | AOD 870 | AOD 670 | AOD 500 | AOD 440 | AOD 380 | Time | Site Name |
|---|---|---|---|---|---|---|---|
| 0.421 | 0.363 | 0.367 | 0.384 | 0.399 | 0.412 | 17:37:51 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17:22:45 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17:07:45 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.339 | 16:52:47 | CARTEL |
| 2.991 | 2.877 | 2.837 | 2.859 | 2.859 | 2.868 | 16:37:50 | CARTEL |
| 0.405 | 0.390 | 0.419 | 0.409 | 0.443 | 0.425 | 16:22:55 | CARTEL |
| 1.146 | 1.082 | 1.100 | 1.126 | 1.128 | 1.290 | 16:07:48 | CARTEL |
| 2.480 | 2.368 | 2.331 | 2.331 | 2.323 | 2.326 | 15:52:48 | CARTEL |
| 0.280 | 0.252 | 0.294 | 0.350 | 0.366 | 0.424 | 15:37:50 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 15:22:45 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.943 | 15:07:45 | CARTEL |
| 0.265 | 0.213 | 0.229 | 0.250 | 0.271 | 0.295 | 14:52:48 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14:37:46 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14:22:45 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.974 | 14:07:45 | CARTEL |
| 1.788 | 1.735 | 1.702 | 1.700 | 1.664 | 1.617 | 13:52:49 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13:37:46 | CARTEL |
| 1.398 | 1.370 | 1.405 | 1.485 | 1.531 | 0.000 | 13:31:37 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13:24:18 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13:18:20 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13:13:20 | CARTEL |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17:20:19 | Chapais |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17:18:26 | Chapais |

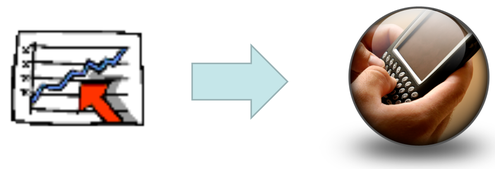
In our work we are attempting to connect to the health care community that are interested in the heath effects of poor air quality. Recent work (Van Donkelaar et al 2010) has correlated satellite-derived total-column AOD to $PM_{2.5}$ concentrations. In a similar manner ground based total-column AOD should be able to be used to derive $PM_{2.5}$ concentrations. The addition of $NO_2$ and $O_3$ values from other sources would allow the AQHI to be reported instead of the less familiar, at least to the heath care community, AOD values.

Van Donkelaar et al "Global Estmates of Ambient Fine Particulate Matter Concentrations from Satellite-Based Aderosol Optical Depth: Development and Application" Environmental Health Perspectives Vol 118 No 6 June 2010 pp 847-855




## Actionable Data

By actionable data we mean information that is presented in manner that can be understood and then used in the decision making process. The decision maker could be a technical professional, a policy analyst or a machine. We have been using RDF (Resource Description Framework); the resulting self-describing representation is structured so that it is machine readable. This allows semantically based queries on our dataset that in the past was viewable only as passive Web tables of data or plots. Now the data can be used as a trigger to send an alert or as part of a "mash up" of other datasets.



Further work linking the aerosol optical depth with air quality indices should allow users to set their own thresholds for alerts. In addition we have published other data streams including a twitter feed, RSS and dynamically updated web pages.

With this approach not only is the data machine encoded but also the metadata, the data about the data, the information about the sensor, encoded with sensor markup language (sml), information about the responsible institutions, the instrument operators and the site.

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