

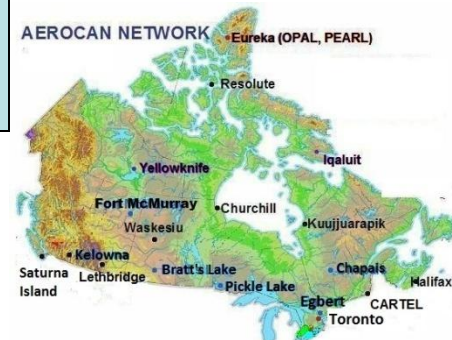
# Creating Actionable Data from an Optical Depth Measurement Network using RDF

J. Freemantle, N. T. O'Neill, A. Mileevsky<sup>1</sup>, I. Lumb, J. McConnell<sup>2</sup>, B. McArthur, I. Abboud<sup>3</sup>



Environnement  
Canada

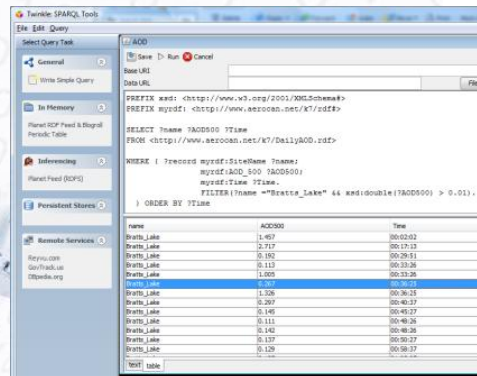
Environment  
Canada



The AEROCAN sunphotometry network has generated optical indicators of aerosol concentration and size on a regional and national scale. We believe this information can be made more useful by making it "actionable" using an information-sharing geospatial strategy.

## Structure (RDF Schema)

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE rdf:RDF [
  <ENTITY rdf:"http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  <ENTITY rdf:"http://prolog.stanford.edu/rdf"
  <ENTITY rdfs:"http://www.w3.org/2000/01/rdf-schema#"
  <rdf:RDF xmlns:rdf="&rdf;" xmlns:rdfs="&rdfs;"
  <rdfs:Class rdf:about="&rdfs:_DataRecord" rdfs:label="DataRecord">
  <rdfs:subClassOf rdf:resource="&rdfs:Resource"/>
  <rdfs:Class>
  <rdf:Property rdf:about="&rdfs:_AOD_1020"
  rdfs:comment="Aerosol Optical Depth at 1020 nm" rdfs:label="AOD_1020">
  <rdfs:domain rdf:resource="&rdfs:_DataRecord"/>
  <rdfs:range rdf:resource="&rdfs:Literal"/>
  <rdf:Property>
  <rdf:Property rdf:about="&rdfs:_AOD_500"
  rdfs:comment="Aerosol optical depth at 500 nm"
  <rdfs:domain rdf:resource="&rdfs:_DataRecord"/>
  <rdfs:range rdf:resource="&rdfs:Literal"/>
  <rdf:Property>
  <rdf:Property rdf:about="&rdfs:_Date" rdfs:label="Date">
  <rdf:Property rdf:about="&rdfs:_InstrumentNumber">
```



## RDF file

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xml" href="rdf.xsl"?>
<!DOCTYPE rdf:RDF [
  <ENTITY rdf:"http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  <ENTITY rdf:"http://www.aerocan.net/k7/rdf/"
  <ENTITY rdfs:"http://www.w3.org/2000/01/rdf-schema#"
  <rdf:RDF xmlns:rdf="&rdf;" xmlns:rdfs="&rdfs;"
  xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  <rdf:_DataRecord rdf:about="&rdfs:_CARTEL_2010-12-05_20:01:09">
  <rdf:_AOD_1020>0.035</rdf:_AOD_1020>
  <rdf:_AOD_870>0.070</rdf:_AOD_870>
  <rdf:_AOD_670>0.170</rdf:_AOD_670>
  <rdf:_AOD_500>0.185</rdf:_AOD_500>
  <rdf:_AOD_440>0.205</rdf:_AOD_440>
  <rdf:_AOD_380>0.300</rdf:_AOD_380>
  <rdf:_AirMass>6.736</rdf:_AirMass>
  <rdf:_Date>2010-12-05</rdf:_Date>
  <rdf:_Time>20:01:09</rdf:_Time>
  <rdf:_InstrumentNumber>333</rdf:_InstrumentNumber>
  <geo:lat>45.3667</geo:lat>
  <geo:long>-71.9292</geo:long>
  <rdf:_SiteName>CARTEL</rdf:_SiteName>
  <foaf:based_near rdf:resource="http://DBpedia.org/resource/Sherbrooke/"
  <rdfs:label>CARTEL 2010-12-05 20:01:09</rdfs:label>
  </rdf:_DataRecord>
```

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.



In this study we are attempting to reach out to the health care community that are interested in the health effects of poor air quality. Recent work (Van Donkelaar et al 2010) has correlated satellite-derived total-column AOD to PM<sub>2.5</sub> concentrations. In a similar manner ground based total-column AOD should be able to be used to derive PM<sub>2.5</sub> concentrations. The addition of NO<sub>2</sub> and O<sub>3</sub> values from other sources would allow the AQHI to be reported instead of the less familiar, at least to the health care community, AOD values.

Van Donkelaar et al "Global Estimates of Ambient Fine Particulate Matter Concentrations from Satellite-Based Aerosol 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 a 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

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	0.000	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

<sup>1</sup> CARTEL, Université de Sherbrooke, Sherbrooke, Quebec, Canada J1K 2R1  
<sup>2</sup> York University, 4700 Keele Street, Toronto, Ontario, Canada, M3J 1P3  
<sup>3</sup> Environment Canada, 4905 Dufferin Street, Toronto, Ontario, Canada, M3H 5T4

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