Machine readable semantic information about observed environments

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@envinf

This years' motto

“Geospatial Sensor Webs - from data to information in the Sensor Web”

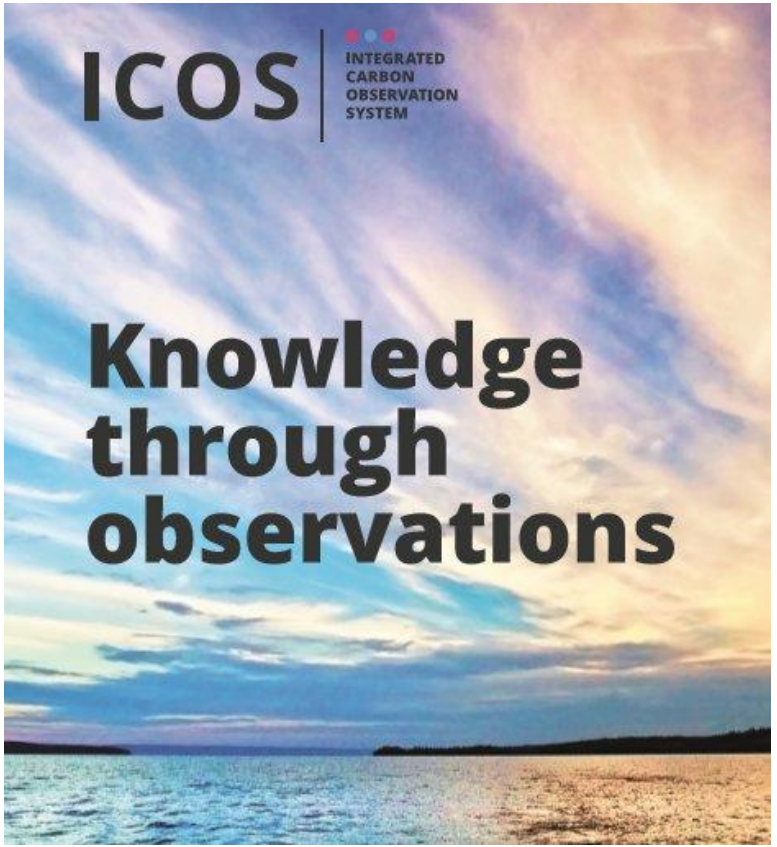
From data to information: A rather common notion ...

FixO3

Provide access to data products as well as derived information

JERICO-NEXT

Delivery of high quality environmental data and information products


ICOS
INTEGRATED
CARBON
OBSERVATION
SYSTEM
Knowledge
through
observations

This years' motto … clarified

… from observational data to information about the observed environment …

In other words

Semantic information
about the observed environment
derived from primary observational data
by research communities

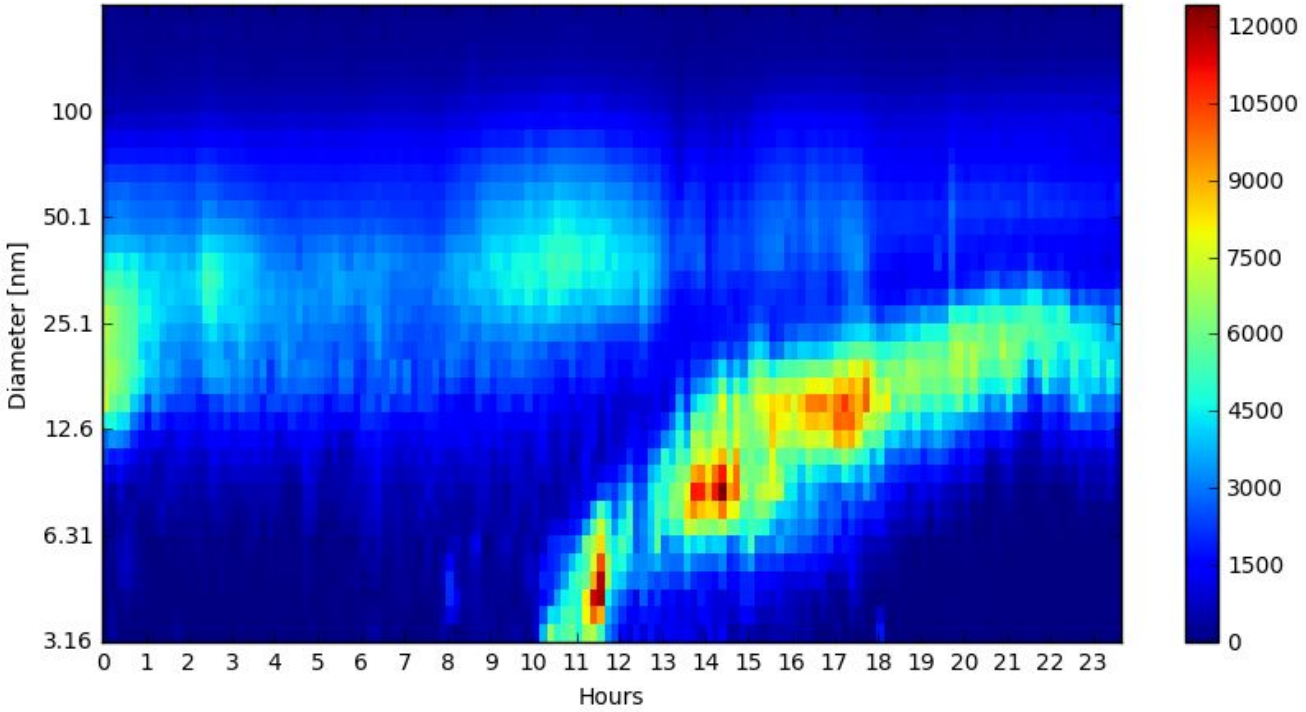
Semantic information

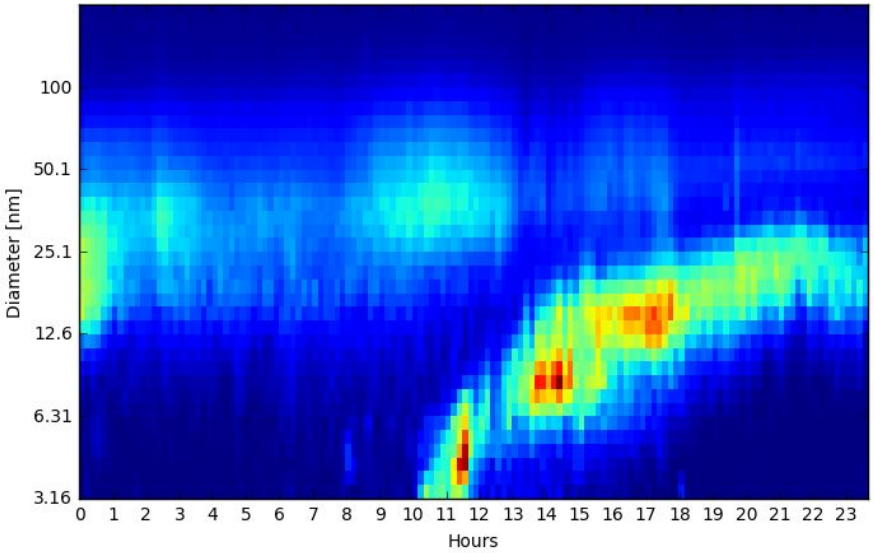
- Consists of data
- Data must be well-formed
- The well-formed data must be meaningful
- Meaningful well-formed data must be truthful
- *False information is not a kind of information*

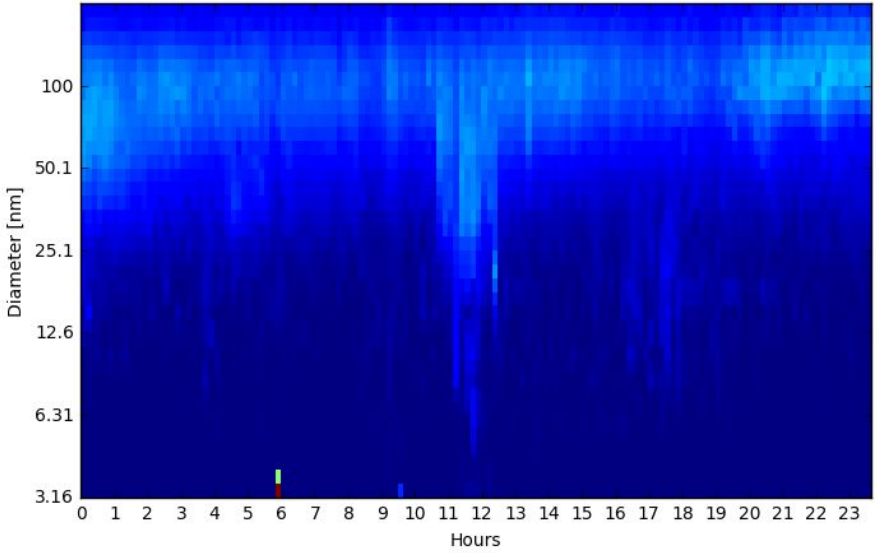
Floridi, L. (2011). The Philosophy of Information. Oxford University Press.

Use case

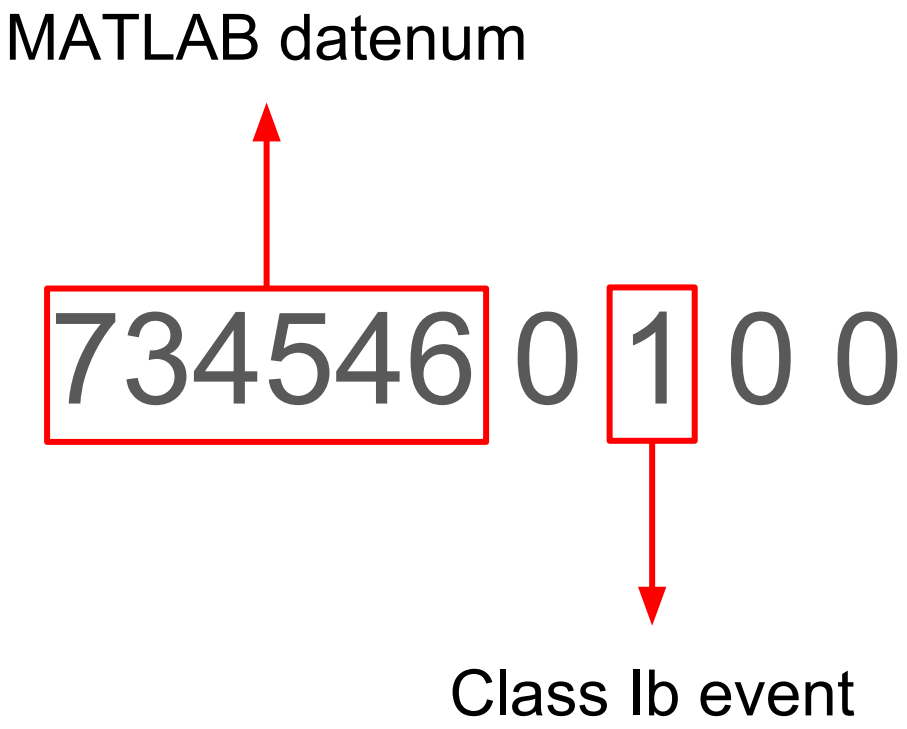
Aerosol science for the study of atmospheric new particle formation


Diameter [nm]
100
50.1
25.1
12.6
6.31
3.16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours
12000
10500
9000
7500
6000
4500
3000
1500
0


Diameter [nm]
100
50.1
25.1
12.6
6.31
3.16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours

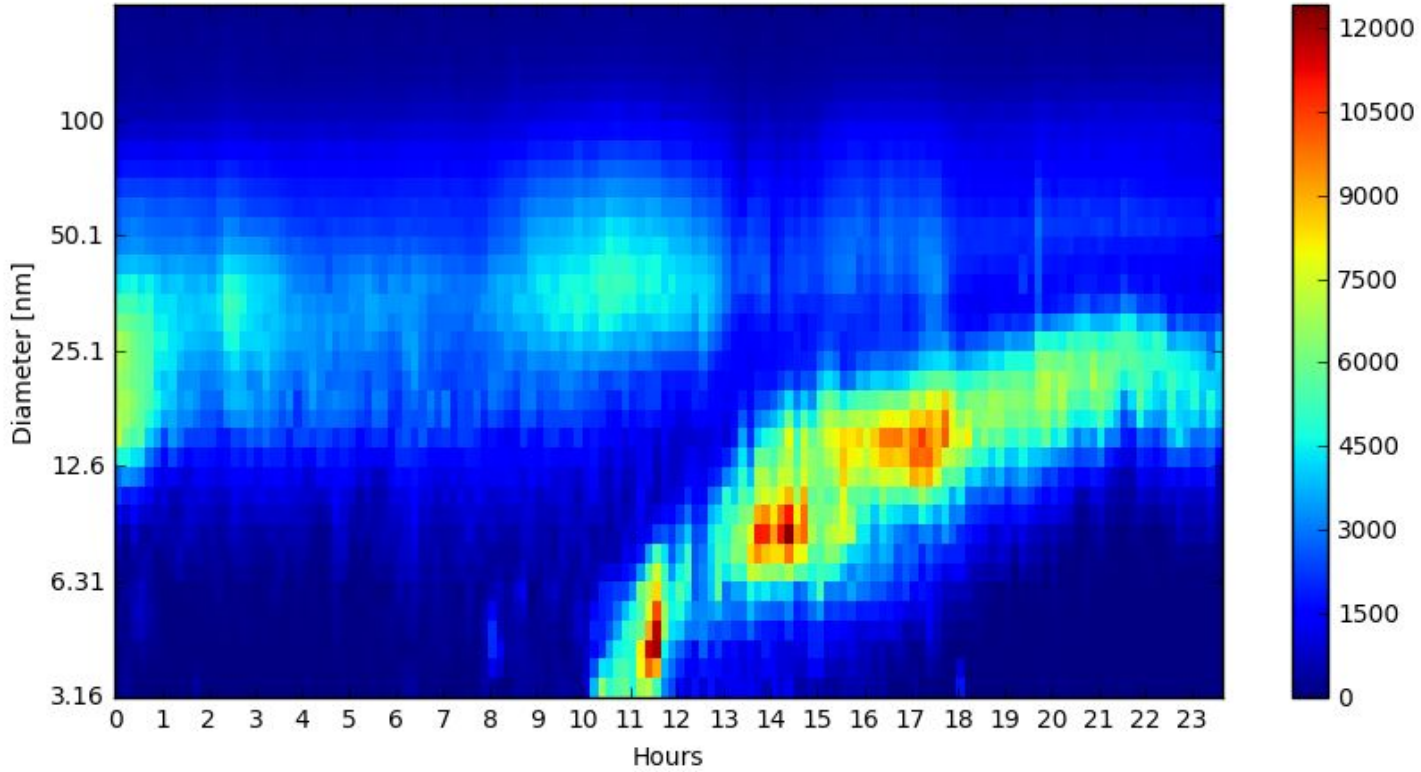

Diameter [nm]
100
50.1
25.1
12.6
6.31
3.16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours

734544 0 0 0 0
734545 0 0 0 1
734546 0 1 0 0
734547 0 0 0 1
734548 0 0 0 1
734549 0 0 0 1
734550 0 0 0 1
734551 0 0 0 1
734552 0 0 1 0


MATLAB datenum
734546 0 1 0 0
Class Ib event

Record data and meaning gained in interpretation

```python
from smear.datafetcher import fetchdata
from smear.dataplotter import plotdata

# Fetch and plot concentration data for the given time and location
# from SmartSMEAR, https://avaa.tdata.fi/web/smart
plotdata(fetchdata('2013-04-04', 'Hyytiälä'))
```

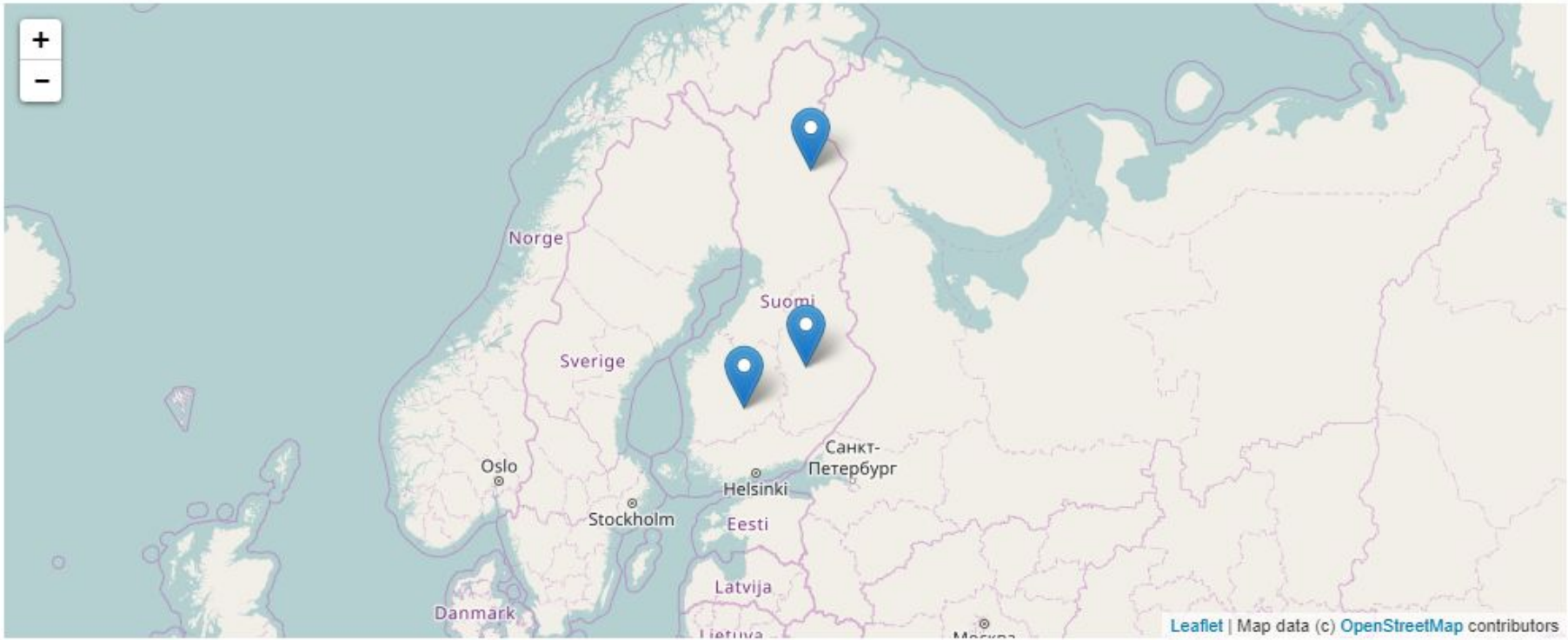


```
from smear.datafetcher import fetchdata
from factory import assess

# Automated assessment for whether or not an event occurred
assess(fetchdata('2013-04-04', 'Hyytiälä'))
```

```
['Event']
```

```
from factory import record, event

# Record information about the new particle formation event
record(event('2013-04-04', 'Hyytiälä', '11:00', '19:00', 'Class Ia'))
```

```python
from processing.visualization import imap
from factory import events

# Visualize event locations on an interactive map
imap(events())
```



```
from processing.statistics import duration
from factory import events

# Compute the average duration of events, possibly at specific locations
duration(events(), fun='avg')
```

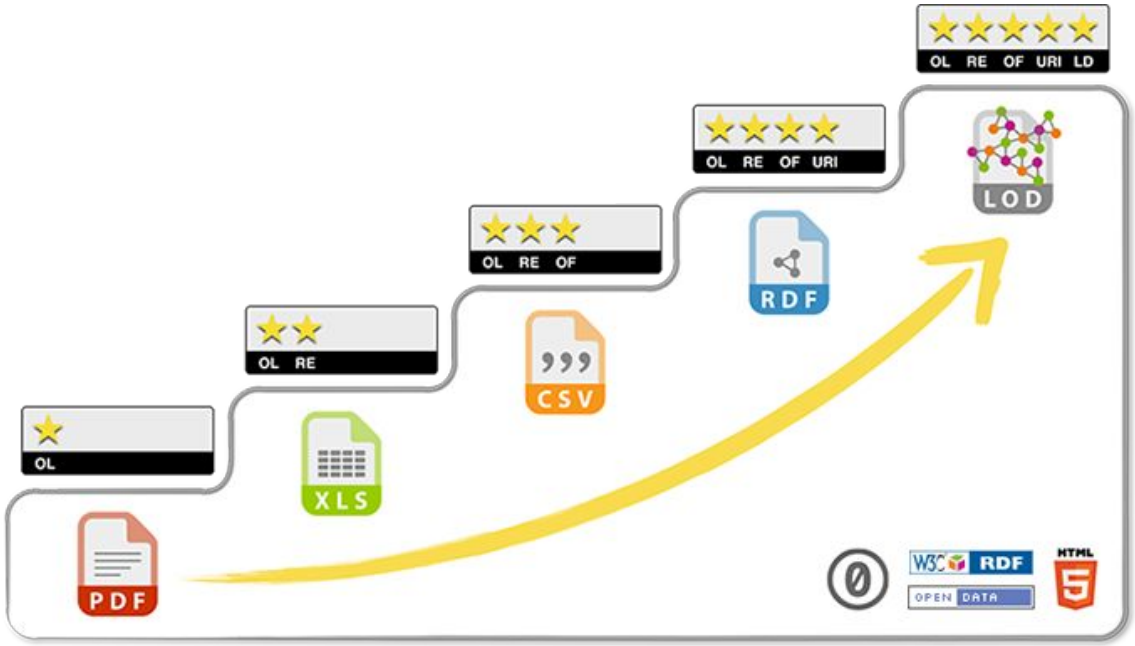
```
7:00:00
```

```
from processing.description import describe
from factory import events

# Describe an event in plain English text
describe(events(place='Hyytiälä'), format='text')
```

```
A Class Ia event occurred at Hyytiälä (FI) [http://www.geonames.org/656888/hyytiaelae.html] on 2013-04-04
 starting at 11:00 and ending at 19:00.
```

```
from factory import events
from processing.description import describe

# Describe an event with information in machine readable format
describe(events('2013-04-04', 'Hyytiälä'), format='rdf')
```

```
<http://pangaea.de/eb1ad69f11aecd2449f6d5741c3b8ac3> a lode:Event ;
    smear:hasClassification smear:ClassIa ;
    lode:atPlace <http://sws.geonames.org/656888/> ;
    lode:atTime <http://pangaea.de/92be5465a05cc56156422d6cdb4603e1> ;
    lode:inSpace <http://pangaea.de/7f885190eb43154e01c97f814b287a4b> .

<http://pangaea.de/3ca2edb9bb13c998a0ea94082aa592dd> a time:Instant ;
    time:inXSDDateTime "2013-04-04T11:00:00+03:00"^^xsd:dateTime .

<http://pangaea.de/7f885190eb43154e01c97f814b287a4b> a sf:Point,
        wgs84:SpatialThing ;
    geosparql:asWKT "POINT (24.29077 61.84562)"^^geosparql:wktLiteral .

<http://pangaea.de/92be5465a05cc56156422d6cdb4603e1> a time:Interval ;
    time:hasBeginning <http://pangaea.de/3ca2edb9bb13c998a0ea94082aa592dd> ;
    time:hasEnd <http://pangaea.de/cc87885836375b64bf023a6bcd5ad814> .

<http://pangaea.de/cc87885836375b64bf023a6bcd5ad814> a time:Instant ;
    time:inXSDDateTime "2013-04-04T19:00:00+03:00"^^xsd:dateTime .

<http://sws.geonames.org/656888/> a gn:Feature,
        DUL:Place ;
    gn:countryCode "FI"^^xsd:string ;
    gn:locationMap <http://www.geonames.org/656888/hyytiaelae.html> ;
    gn:name "Hyytiälä"^^xsd:string ;
    wgs84:lat "61.84562" ;
    wgs84:long "24.29077" .
```



http://5stardata.info/en/

Environment Ontology

- Contributed new concept to recent release
- “formation of particles in an atmosphere”
  - a particle formation process
  - that occurs in an atmosphere
  - with aerosol as output
- Planning to adopt this concept in the use case

Research Data Alliance

- IG “From Observational Data to Information”
- rd-alliance.org/groups/observational-data-information
- Session at Montréal plenary, Breakout 5
- Monthly conference calls

Take aways

- Data interpretation results in semantic information
- Truthful and meaningful well-formed data
- Acquire semantic information in infrastructures
- Integrate with tools researchers use