



# **OGC and the Relevance of Standards for Environmental Matters**

Scott Simmons

Executive Director, Standards Program, OGC

1 December 2017

# So what brings so many standards geeks to Wellington?



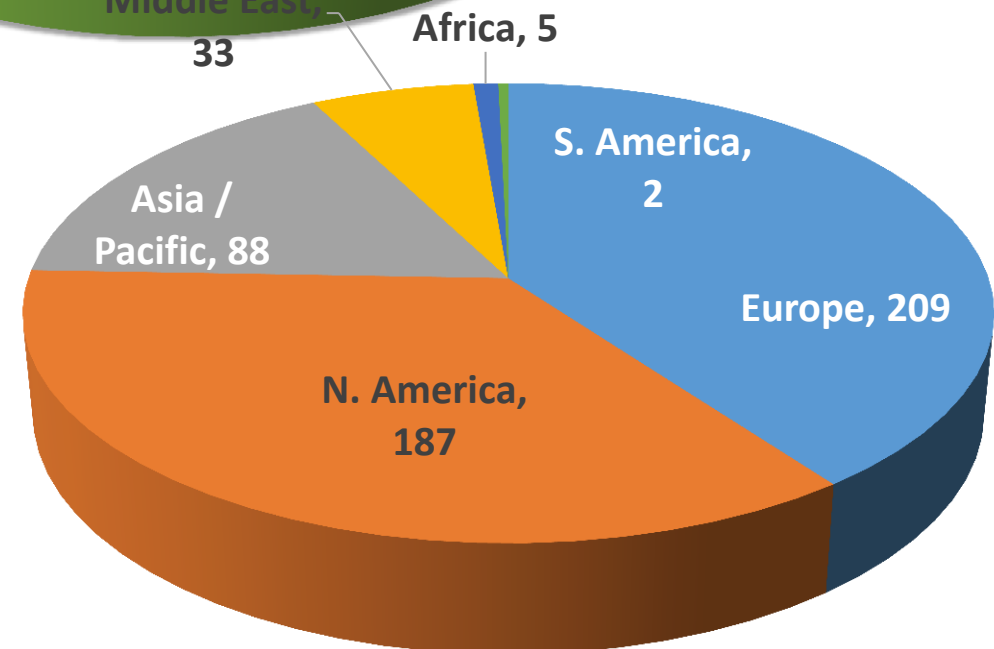
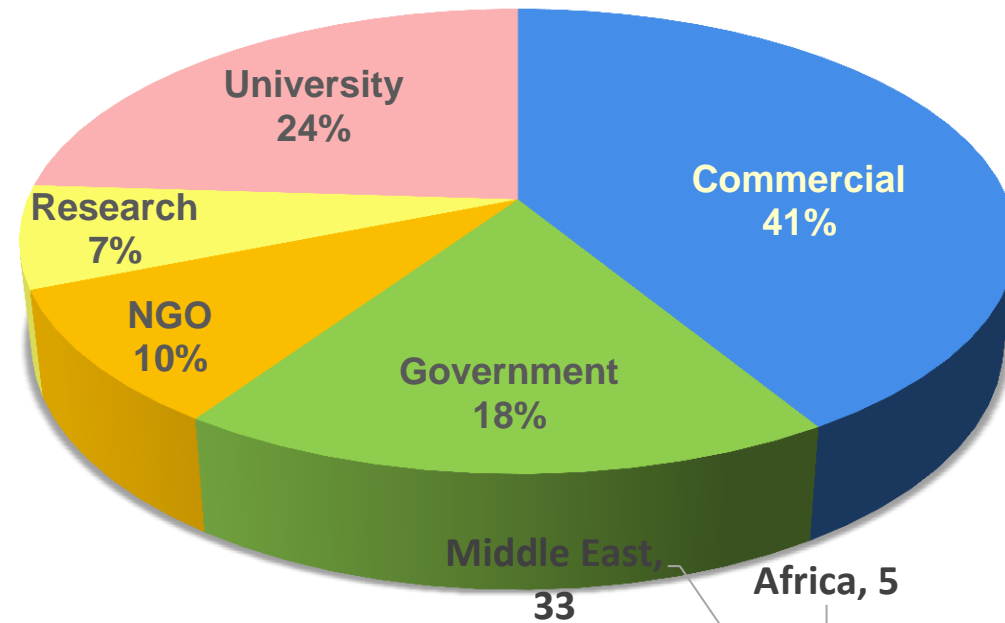
- This week: ISO / TC 211 (Geographic Information / Geomatics) meeting occurred in Wellington
- Next week: OGC Technical Committee Meeting to be held in Palmerston North
  - Hosted by Manaaki Whenua – Landcare Research, MfE is a sponsor
  - Agenda can be found at [ogcmeet.org](http://ogcmeet.org)
  - ANZ Forum - Monday afternoon
  - Environmental Data Summit – Wednesday
  - Location Powers – Data, Interoperability and Agritech - Friday

# The Open Geospatial Consortium



**Not-for-profit, international voluntary consensus standards organization; leading development of geospatial standards**

- Founded in 1994.
- 520+ members and growing
- 50+ standards
- Thousands of implementations
- Broad user community implementation worldwide
- Alliances and collaborative activities with ISO and many other SDO's



# Why Open Standards?

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- Provide fair and equal access to data by all stakeholders
- Improve decision making through consistent delivery of data and repeatable analysis
- Facilitate collaboration through publication of discoverable data

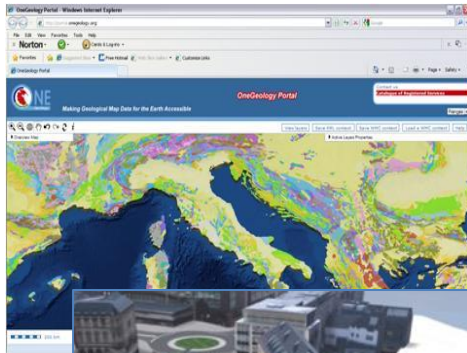


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# THE STANDARDS

# Basic Geospatial Interoperability Challenge Solved

100Ks maps & datasets accessible - 10Ks OGC Web Services

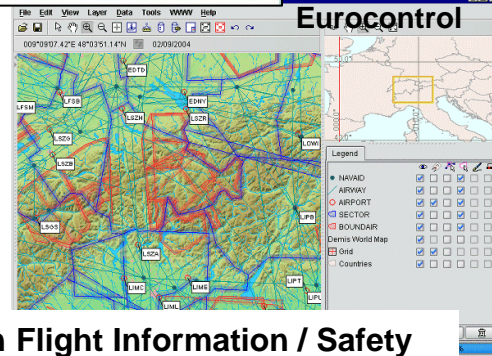


OneGeology.Org

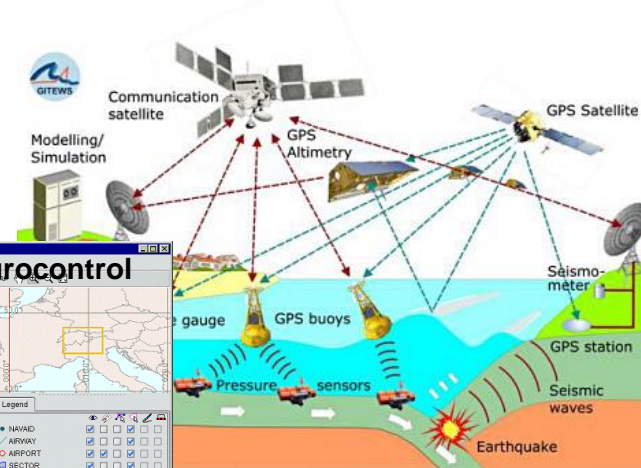


CityGML

Emergency /  
Disaster  
Management



Aviation Flight Information / Safety



Meteorology, Hydrology,  
Ocean Monitoring



# OGC's Geospatial Interoperability Standards Framework



- **OGC Web Service Standards**

- Integrate and share all types of geospatial and remote sensing data

- **OGC Sensor Web Enablement and SensorThings Standards**

- Discover, task, access and process observations from *fixed & mobile sensors*
- Access and integration of Internet of Things

- **Support Analysis and Processing**

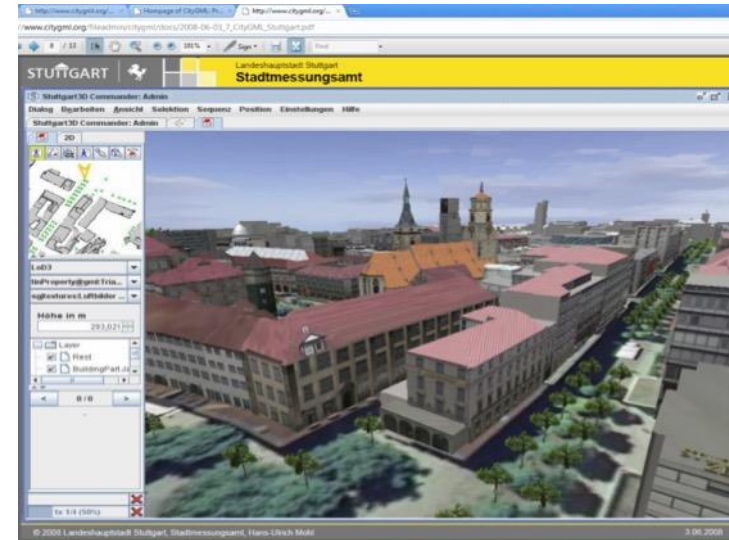
- Environmental modeling
- Urban models
- Geospatial Big Data / Analytics

- **3D Visualization & Augmented Reality**

- Outdoor location, routing
- Indoor location

- **Social Media / Crowdsourcing**

- Geo-enabled Social Media



Source: Thomas Kolbe, Berlin TU



OGC Augmented Reality Markup Language 2.0

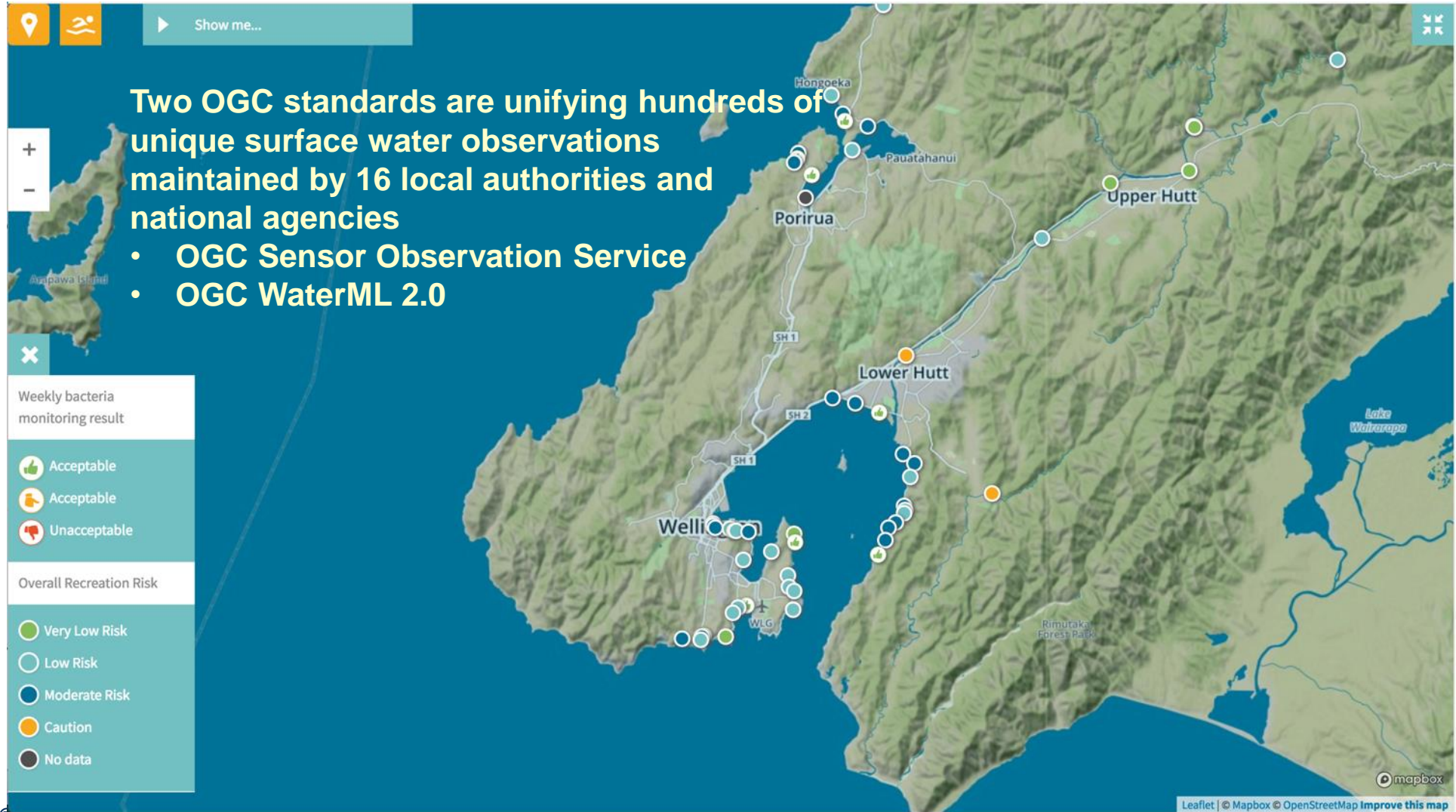


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# EXAMPLES



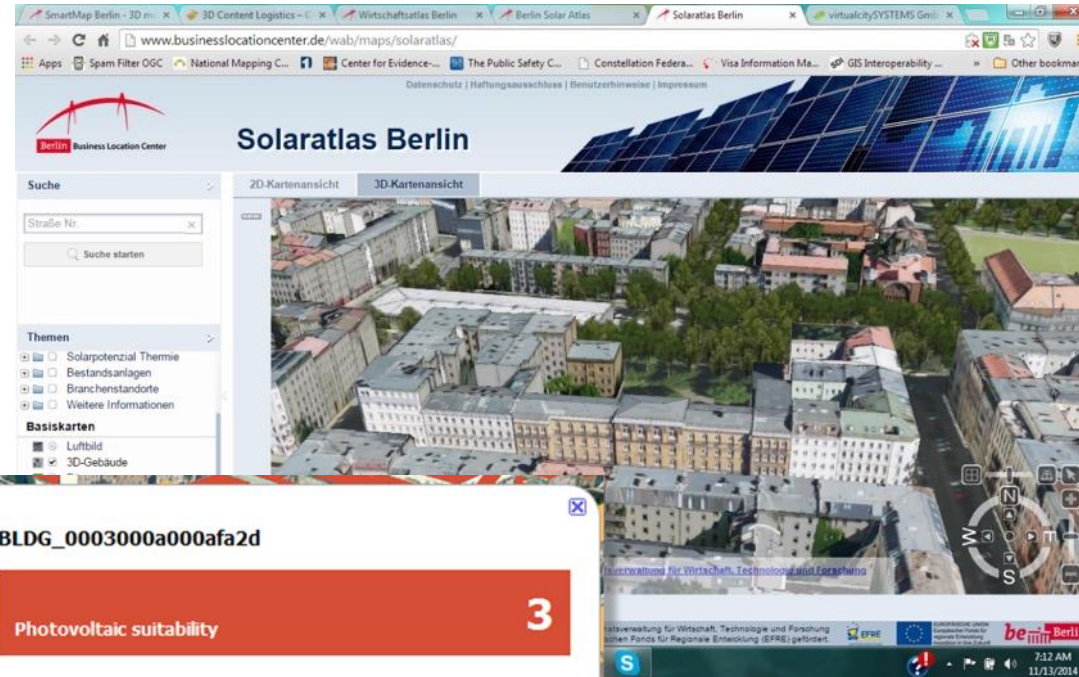
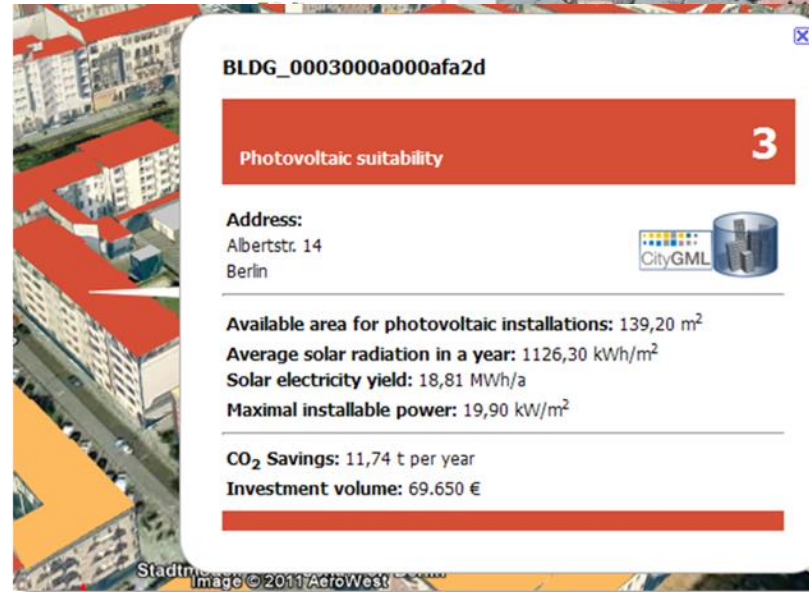
# LAWA – Land Air Water Aotearoa



# OGC CityGML Standard: Solar Energy Production Potential Analysis




- Solar power potential and CO<sub>2</sub> offset potential computed for the 550,000 buildings in the Berlin 3D city model.
- City Model is based on OGC CityGML Standard







# Citizen Science






## COBWEB Dyfi Biosphere Reserve Portal (Beta)


This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308513.




[Home](#) [Search](#) [Map](#) [About](#) [Sign in](#) [Register](#)



### Find a survey and start contributing




[Featured surveys](#) [Take a tour](#) [Calendar](#)



#### Snowdonia National Park Japanese Knotweed Survey - poly

Survey to record the distribution of Japanese Knotweed within the boundaries of the Snowdonia


[Read more](#)



#### Gemmas Tutorial

Describe your survey here

[Read more](#)



#### APCE-ymlledol

Mae prosiect Awdurdod Parc Cenedlaethol Eryri i gasglu gwybodaeth am rywogaethau ymlledol fel Llysiau'r Dial, Jac y Neidwr a Rhododendron...

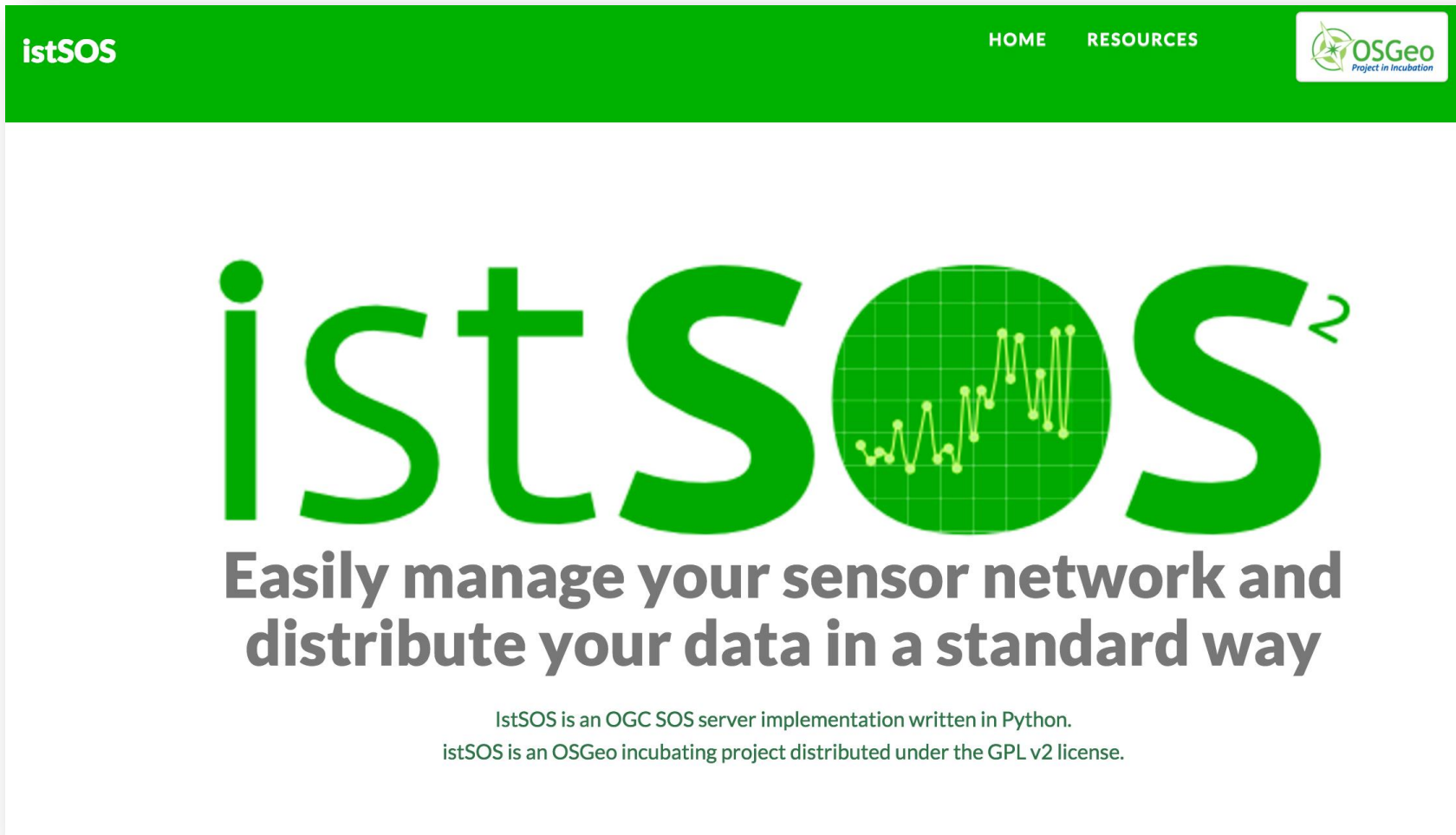
[Read more](#)

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# Play with sensor networks now!



istsos.org



The screenshot shows the istSOS website homepage. At the top is a green navigation bar with the text 'istSOS' on the left, 'HOME' and 'RESOURCES' in the center, and the OSGeo Project in Incubation logo on the right. The main content area features the 'istSOS' logo in large green letters, where the 'O' is a circle containing a line graph. Below the logo is the tagline 'Easily manage your sensor network and distribute your data in a standard way'. At the bottom of the page, there are two lines of text: 'IstSOS is an OGC SOS server implementation written in Python.' and 'istSOS is an OSGeo incubating project distributed under the GPL v2 license.'



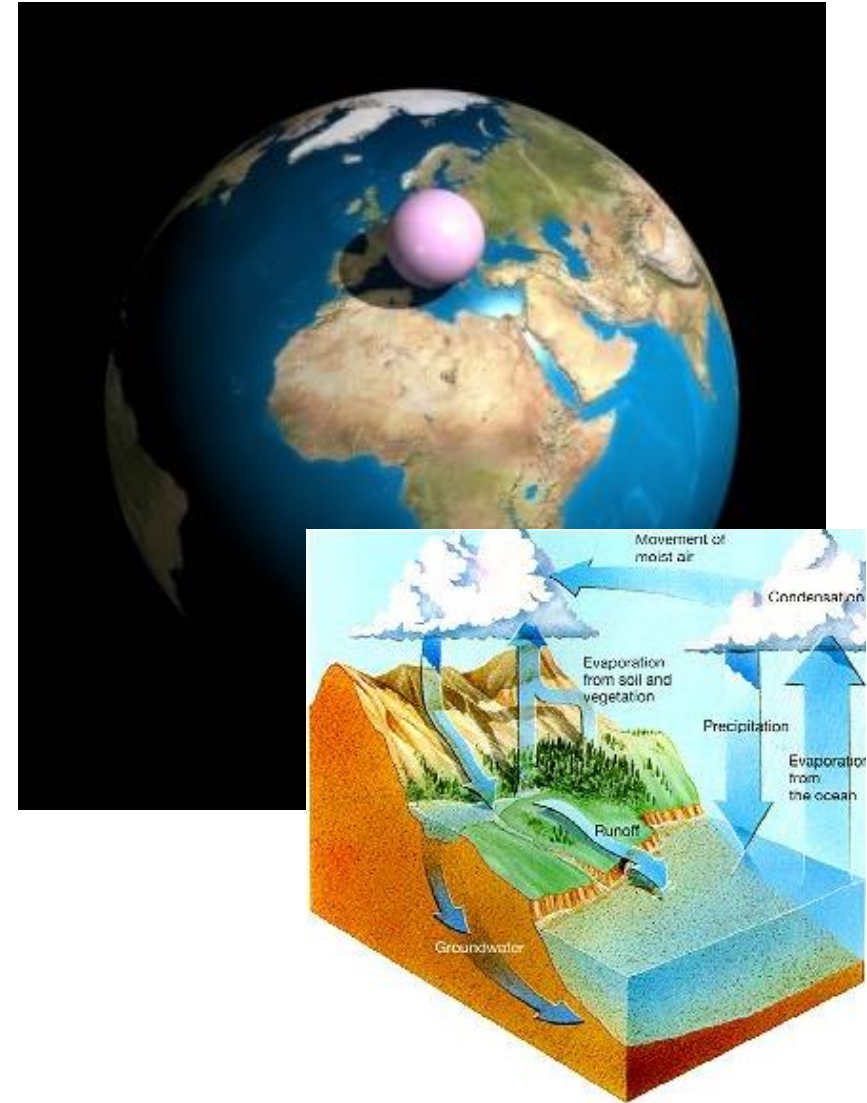
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# HOW TO PARTICIPATE

# Earth System Science (ESS) DWG



- Coordination point for multiple DWGs working geosciences, environmental, and other activities related to the use of OGC standards
- Very recent: GeoSciML Discussions



# Hydrology Domain Working Group



- Provide a venue and mechanism for seeking technical and institutional solutions to the challenge of describing and exchanging data describing the state and location of water resources, both above and below the ground surface. Coordination with WMO.



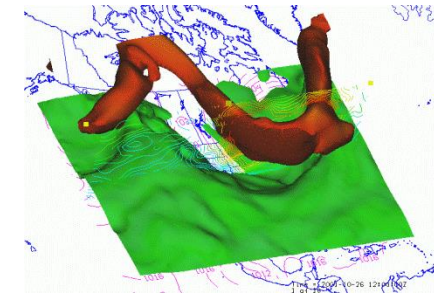
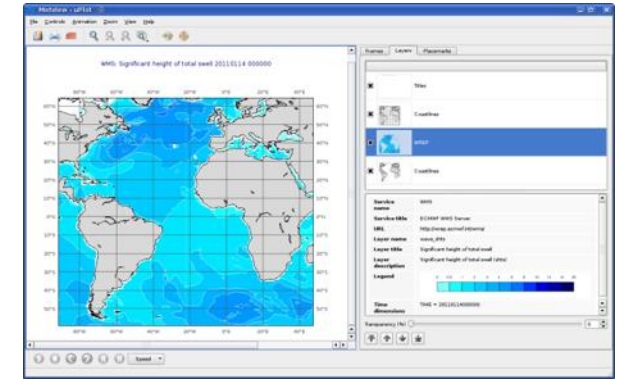


# MetOcean DWG



- Enables collaboration and communication between groups with meteorological and oceanographic interests. Maintains a list of topics of interest to the meteorological and oceanographic communities for discussion, defining feedback to the OGC SWGs, and performing interoperability experiments.

– [http://external.opengeospatial.org/twiki\\_public/MetOceanDWG](http://external.opengeospatial.org/twiki_public/MetOceanDWG)



## Aviation:

- ICAO WXCM / WXXM



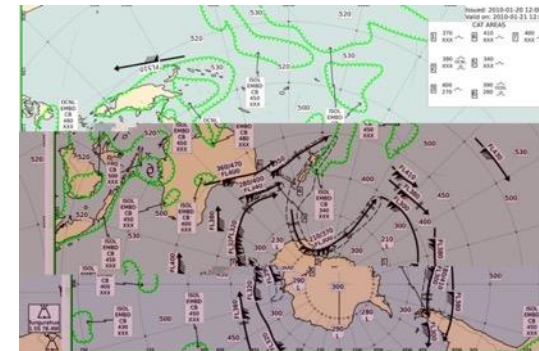
## Hydrology:

- OGC Hydro DWG
- *Surface Water IE*



## Climate:

- Surface Temperatures
- CMIP5 etc.



# Many more Domain Working Groups – all open



Name	Lead **
<b>3DIM DWG</b> (3DIM DWG)	Carsten Roensdorf, Ordnance Survey
<b>Agriculture DWG</b> (Agriculture DWG)	Joshua Lieberman, Harvard University
<b>Architecture DWG</b> (Arch DWG)	Carl Reed III, Reed, Carl
<b>Aviation DWG</b> (Aviation DWG)	Hubert Lepori, European Organisation for the Safety of Air Navigation (EUROCONTROL)
<b>Big Data DWG</b> (BigData DWG)	Peter Baumann, Jacobs University Bremen GmbH
<b>Catalog DWG</b> (Cat DWG)	Uwe Voges, con terra GmbH
<b>Citizen Science DWG</b> (Citizen Science)	Chris Higgins, EDINA, University of Edinburgh
<b>Coordinate Reference System DWG</b> (CRS DWG)	Keith Ryden, Esri
<b>Coverages DWG</b> (Coverages DWG)	Peter Baumann, Jacobs University Bremen GmbH
<b>Data Preservation DWG</b> (PreservDWG)	Steve Morris, North Carolina State University
<b>Data Quality DWG</b> (DQ DWG)	Matt Beare, Beare, Matthew
<b>Defense and Intelligence DWG</b> (D and I DWG)	Lucio Colaiacono, European Union Satellite Cent
<b>Earth Systems Science DWG</b> (ESS WG)	Stefano Nativi, CNR Institute for Atmospheric Pol
<b>Electromagnetic Spectrum DWG</b> (EM Spectrum DWG)	Lance McKee, McKee, Lance
<b>Emergency &amp; Disaster Management DWG</b> (EDM DWG)	Jacqueline (Jaci) Knudson, US Dept. of Defense/D
<b>Energy and Utilities DWG</b> (EnergyUtilities)	Renee Bogle Hughes, Hughes, Renee Bogle
<b>Geography Markup Language (GML) DWG</b> (GML DWG)	Ron Lake, Galdos Systems Inc.
<b>Geosemantics DWG</b> (Semantics)	Joshua Lieberman, Harvard University
<b>Health DWG</b> (Health DWG)	Eddie Oldfield, Oldfield, Eddie
<b>Hydrology DWG</b> (Hydrology DWG)	Tony Boston, Australian Bureau of Meteorology
<b>Land Administration DWG</b> (LandAdmin)	Peter van Oosterom, Delft University of Technology
<b>Land and Infrastructure DWG</b> (LandInfraDWG)	Paul Scarponcini, Bentley Systems, Inc.
<b>Law Enforcement And Public Safety DWG</b> (LEAPS DWG)	Mohammed Saleh Al Mansoori, GIS Center for Security
<b>Marine DWG</b> (Marine DWG)	Trevor Taylor, Open Geospatial Consortium, Inc.
<b>Metadata DWG</b> (Metadata DWG)	David Danko, Esri
<b>Meteorology &amp; Oceanography DWG</b> (Met Ocean DWG)	Chris Little, UK Met Office
<b>Mobile Location Services DWG</b> (MLSDWG)	Giuseppe Conti, Trilogis Srl
<b>Point Cloud DWG</b> (Point Cloud DWG)	Stan Tillman, Intergraph Corporation
<b>Quality of Service and Experience DWG</b> (QoSE DWG)	Ilkka Rinne, Spatineo Oy
<b>Security DWG</b> (SecurityDWG)	Andreas Matheus, University of the Bundeswehr - ITIS
<b>Sensor Web Enablement DWG</b> (SensorWeb DWG)	Mike Botts, Botts Innovative Research
<b>Smart Cities DWG</b> (SmartCities DWG)	John Herring, Oracle USA
<b>Temporal DWG</b> (Temporal DWG)	Chris Little, UK Met Office
<b>University DWG</b> (Univ DWG)	Chris Higgins, Open Grid Forum
<b>Web Feature Service DWG</b> (WFS DWG)	Martin Daly, cadcorp (Computer Aided Development Corp.) Ltd.
<b>Workflow DWG</b> (Workflow DWG)	Stan Tillman, Intergraph Corporation

\*\* - There may be Co-Chairs or Vice-Chairs that are not listed in this table

# FRAMEWORKS AND STANDARDS FOR DECISION MAKING

Jari Reini





# INSPIRE

The European Union spatial data infrastructure (SDI)

The sharing of environmental spatial information among public sector organisations, facilitate public access to spatial information across Europe and assist in policy-making across boundaries.

The Directive addresses 34 spatial data themes needed for environmental applications.

The Directive came into force on 15 May 2007 and will be implemented in various stages, with full implementation required by 2021.

## Data Specifications > Themes

### ANNEX: 1



Addresses



Cadastral parcels



Geographical grid systems



Hydrography



Transport networks



Administrative units



Coordinate reference systems



Geographical names



Protected sites

## ANNEX: 2



Elevation



Land cover

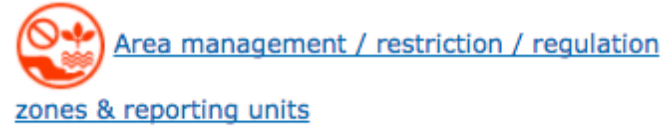
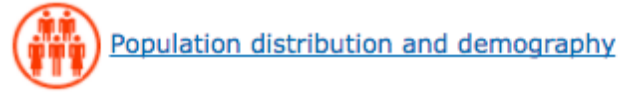
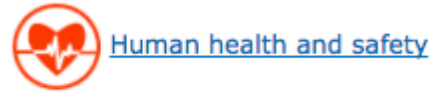
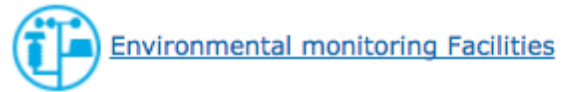
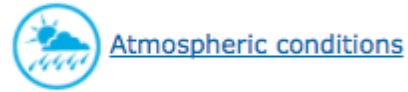
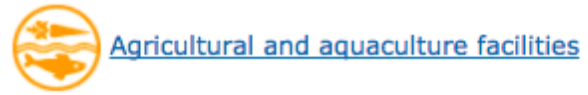


Geology



Orthoimagery





**1** NO POVERTY



**2** NO HUNGER



**3** GOOD HEALTH



**4** QUALITY EDUCATION




**5** GENDER EQUALITY




**6** CLEAN WATER AND SANITATION




**7** RENEWABLE ENERGY



**8** GOOD JOBS AND ECONOMIC GROWTH



**9** INNOVATION AND INFRASTRUCTURE



**10** REDUCED INEQUALITIES



**11** SUSTAINABLE CITIES AND COMMUNITIES



**12** RESPONSIBLE CONSUMPTION



**13** CLIMATE ACTION



**14** LIFE BELOW WATER



**15** LIFE ON LAND



**16** PEACE AND JUSTICE



**17** PARTNERSHIPS FOR THE GOALS



**THE GLOBAL GOALS**  
For Sustainable Development

# OUR CURRENT WORK

- INSPIRE-directive
  - Statistical Units (SU), Administrative Units (AU)
  - Statistical data, environmental data, ...
- Reporting needs
- Duplicating data is not desirable
- Finnish Geospatial Platform (2017-2019)
  
- Thematic Maps
- OGC TJS (Table Joining Service)

Timo Aa  
[Sign Out](#)

SEARCH

MAP LAYERS

SELECTED LAYERS 2

MAP LEGENDS

MAP PUBLISHING

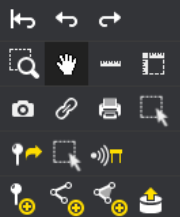
THEMATIC MAPS

ANALYSIS (BETA)

ROUTE SEARCH

USER GUIDE

MY DATA



### Thematic maps

Region  
Municipalities 2017 (1:4,5 ...)

Get data

Additional terms and features

**REGION**

Municipaliti...

Redefine the areas in which you want to view the data, click the drop-down menu

Order by ▲

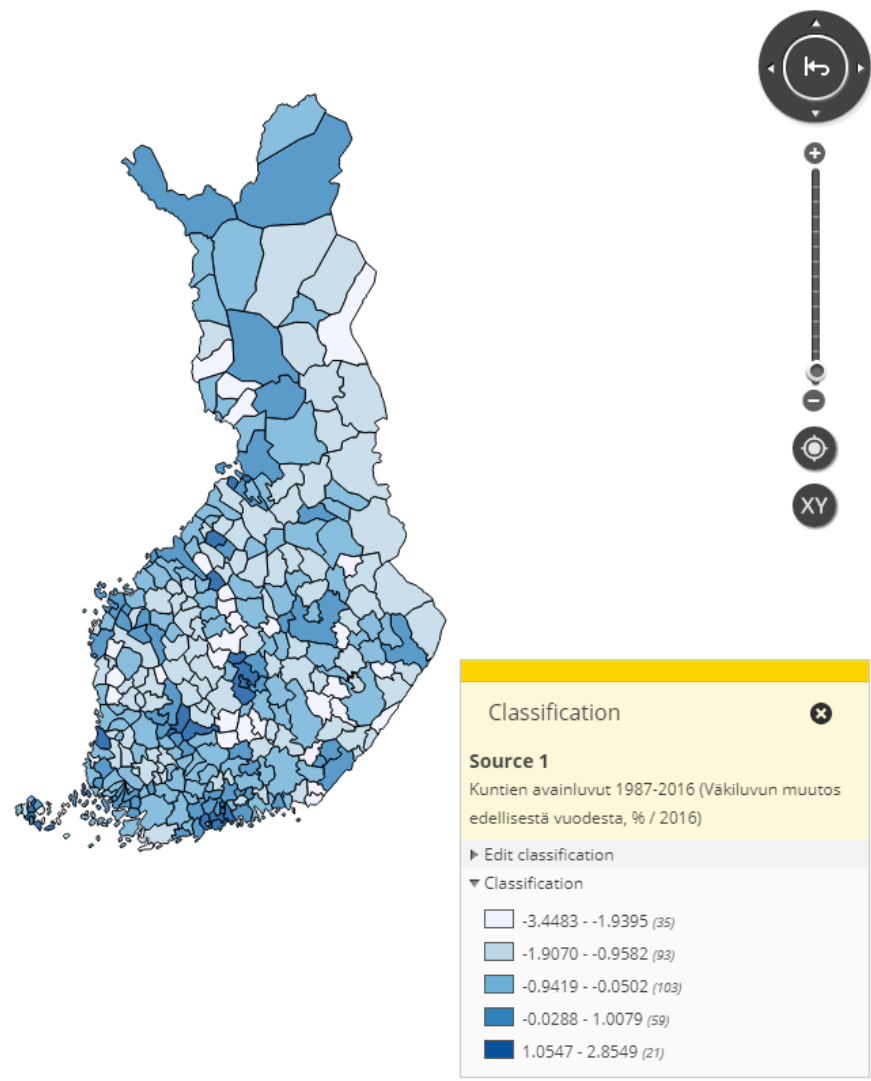
**SEARCHED DATA (1)**

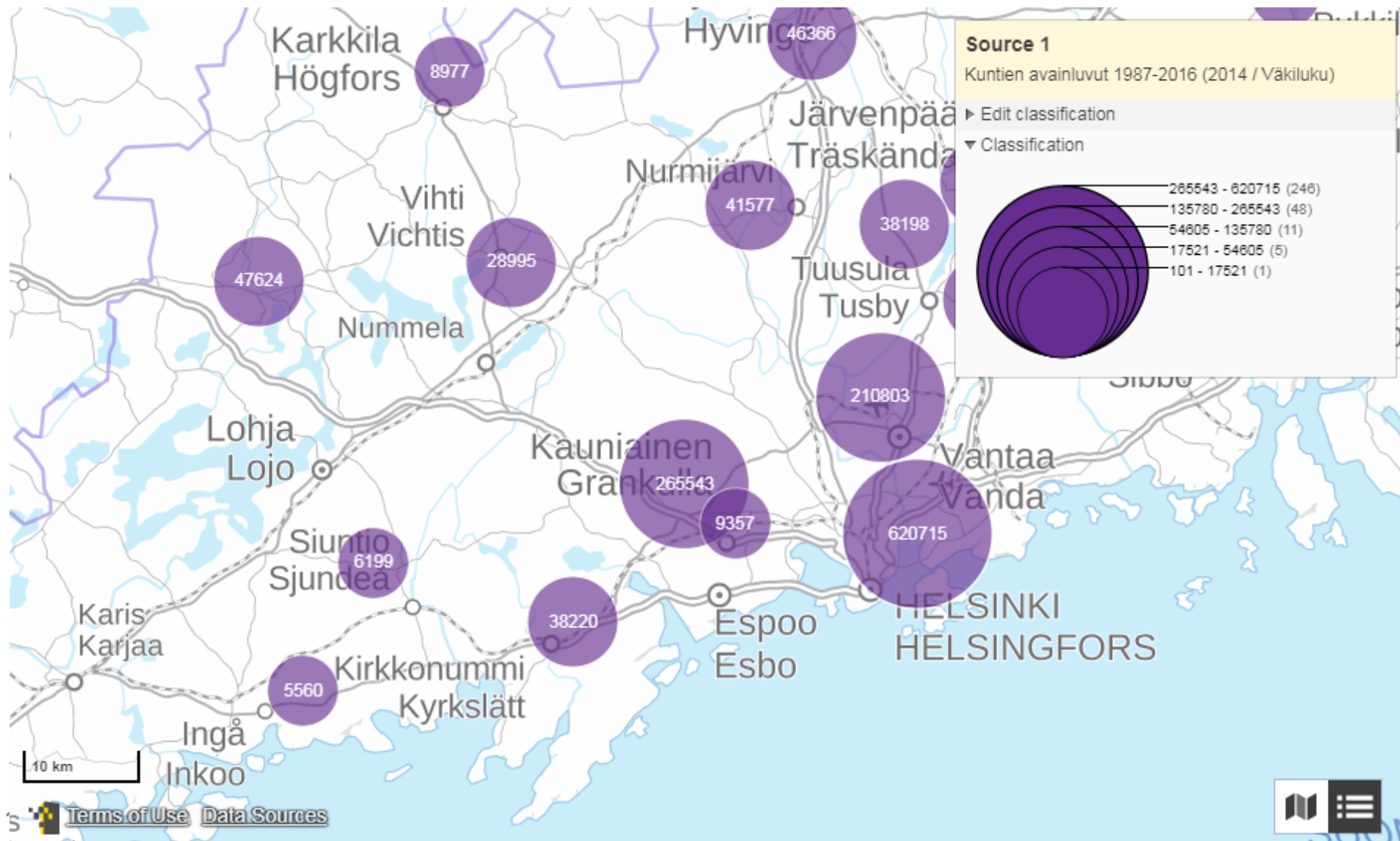
**Source 1:** Kuntien avainluvut 1987-2016 (Väkiluvun muutos edellisestä vuodesta, % / 2016)

Order by ▼

Akaa	-0.7041
Alajärvi	-1.0694
Alavieska	-1.7864
Alavus	-1.1375
Asikkala	0.4344
Askola	-1.1364
Aura	-0.0502
Brändö	0.2128
Eckerö	-0.7487
Enonkoski	-1.3578
Enontekiö	0.5911
Espoo	1.772
Eura	-1.0224
Eurajoki	1.4106
Evijärvi	-1.5916
Finström	2.8549

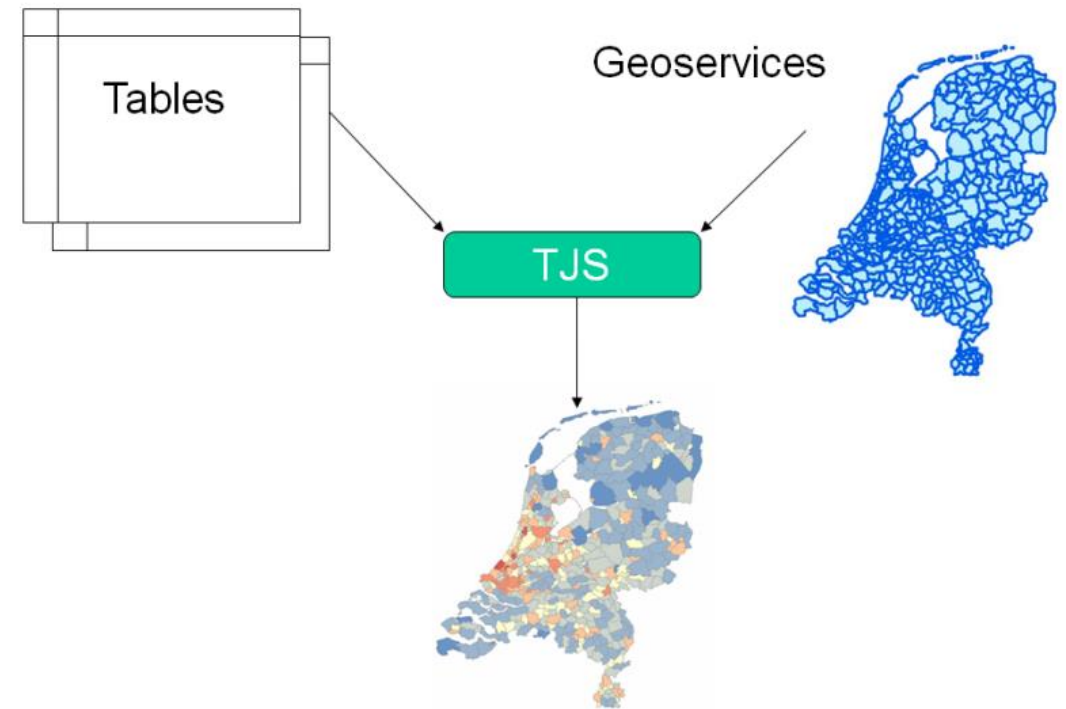
[Terms of Use](#) [Data Sources](#)





# TABLE JOINING SERVICE

- OGC standard from 2010
- Similar to other web service standards
  - GetCapabilities describing the service
  - Data Access Operations for data retrieval
  - Data Joining Operations for performing data joins
- GDAS used for all communication
- To be revised...



# THANK YOU



[jari.reini@maanmittauslaitos.fi](mailto:jari.reini@maanmittauslaitos.fi)

[jari.reini@nls.fi](mailto:jari.reini@nls.fi)

[www.geoportal.fi](http://www.geoportal.fi)





# The Hierarchical Data Format (HDF5)

Ted Habermann, Director of Earth Science, The HDF Group,  
[thabermann@hdfgroup.org](mailto:thabermann@hdfgroup.org)

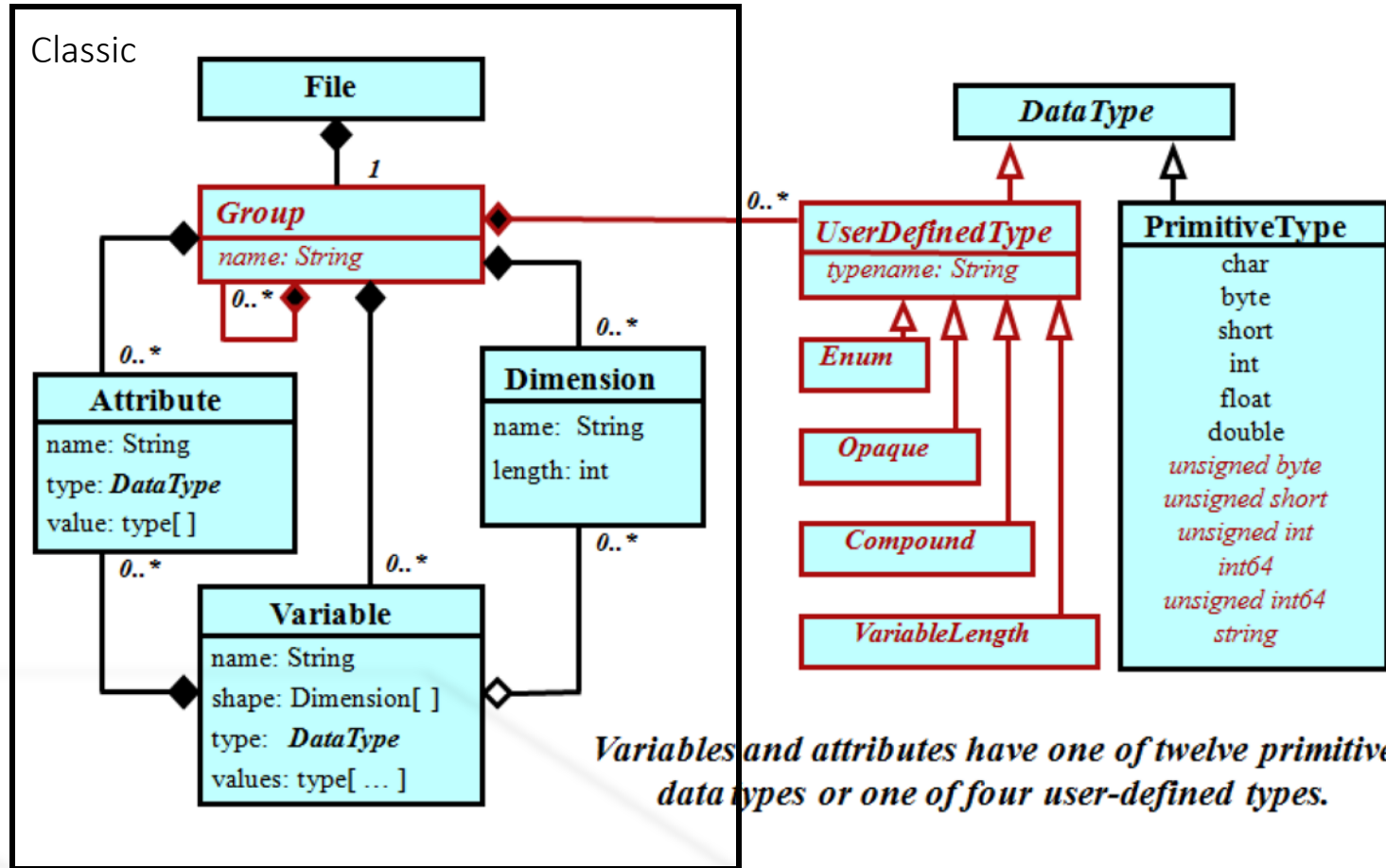
# HDF Domains and Conventions



Conventions – Disciplinary Data Types

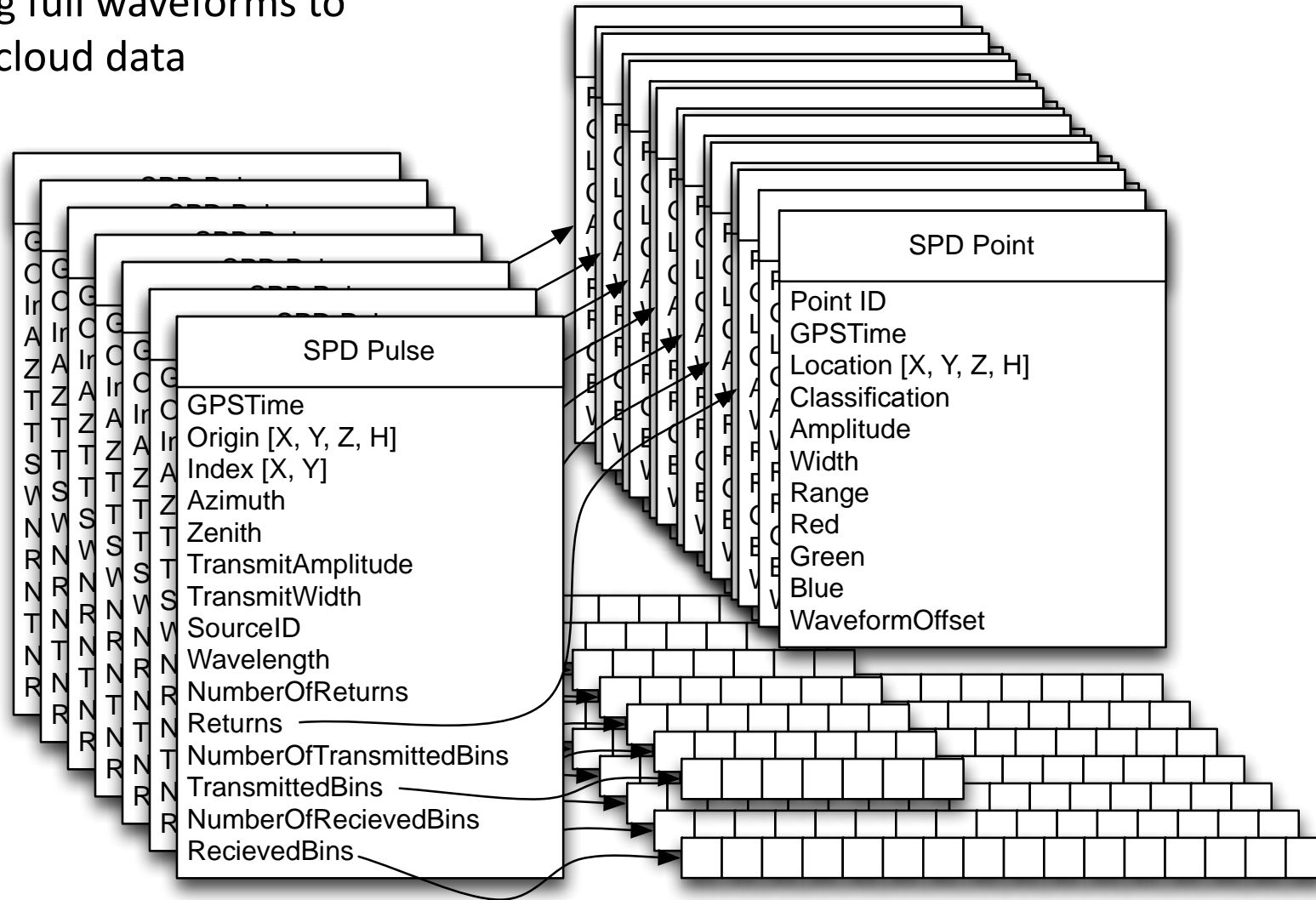
HDF – Computer Science Data Types

# netCDF Data Model



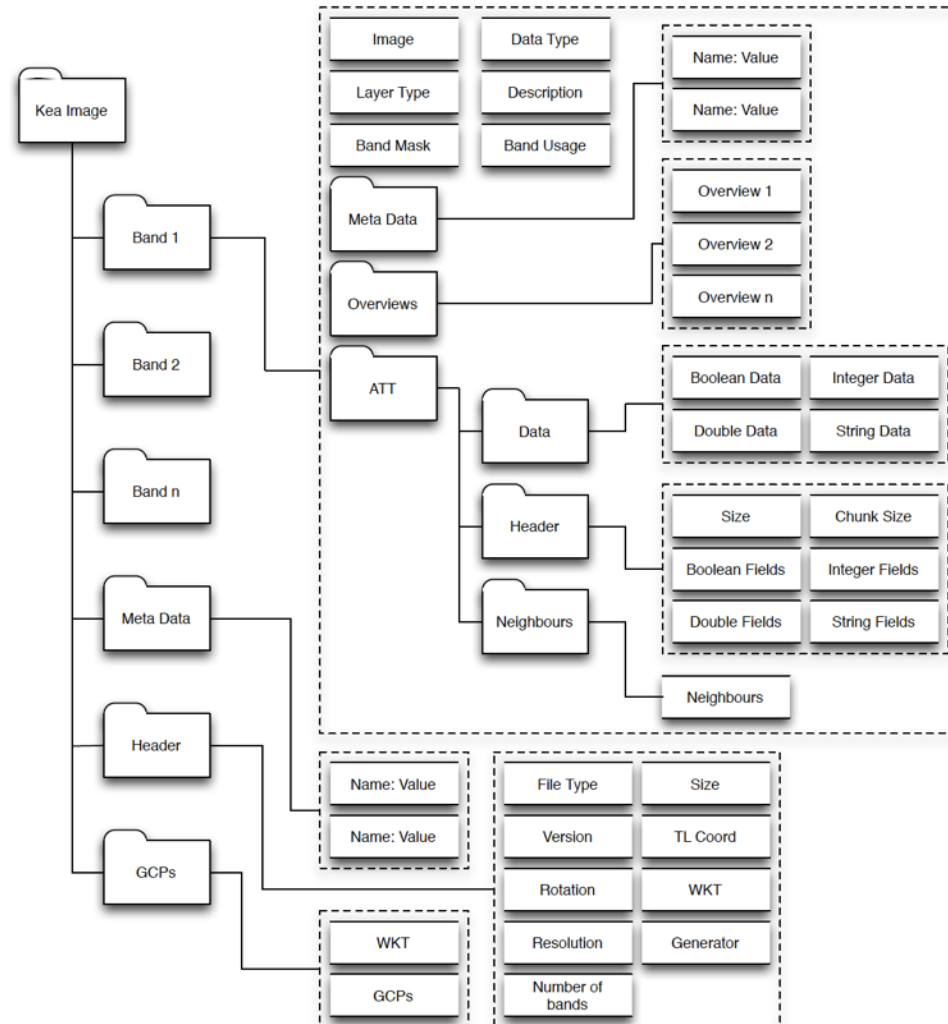
# Sorted Pulse Data Format (Aberystwyth Univ.)

Adding full waveforms to  
point cloud data



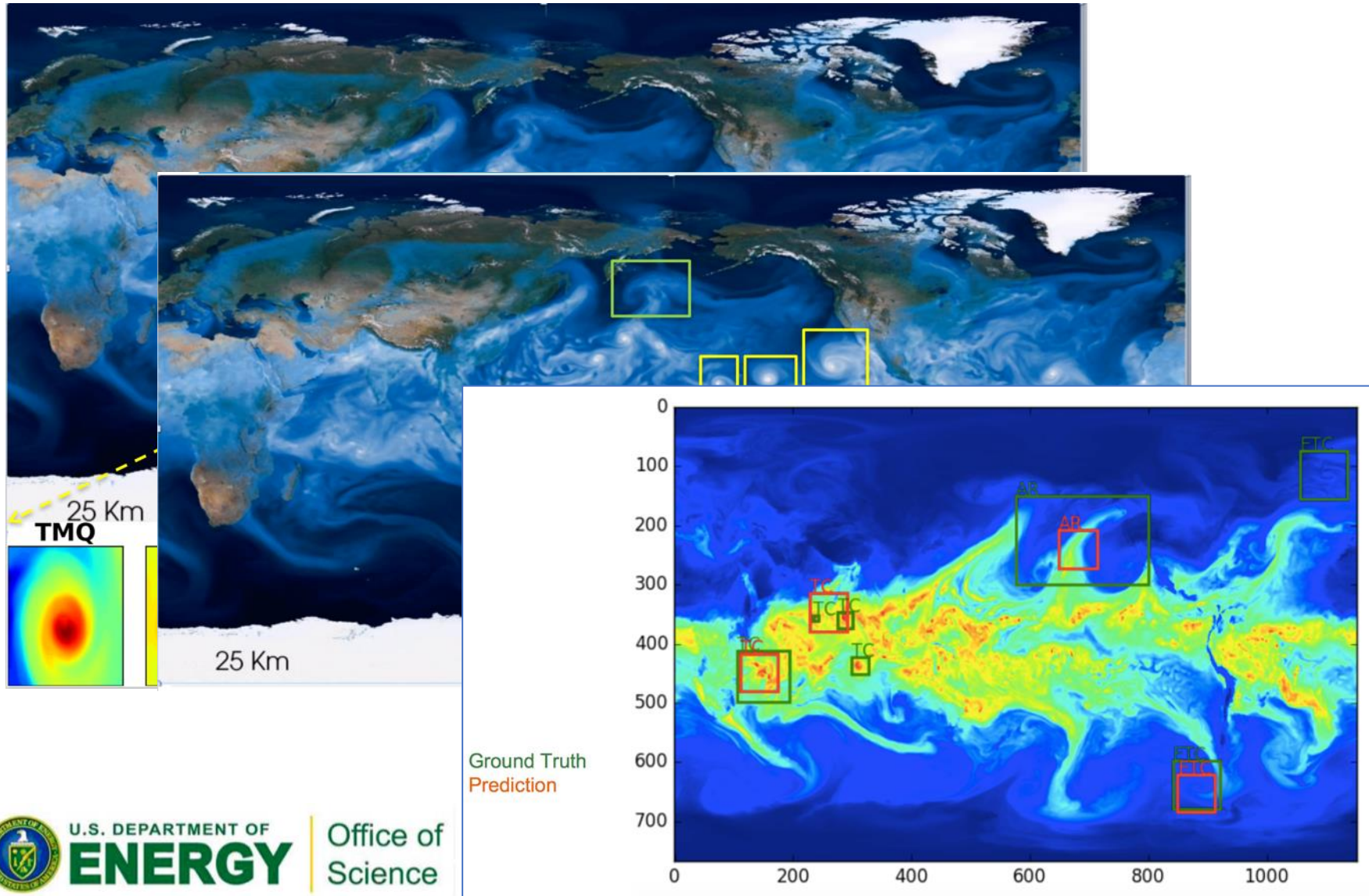
# KEA (GDAL)

There are a large number of image formats already in use within the remote sensing community but currently there is no format that provides the features of: compression, support for large file sizes, ground control points, raster attribute tables and inbuilt image pyramids. Therefore, a new image format, named KEA, after the New Zealand bird, has been proposed. The KEA format provides a full implementation of the GDAL data model and is implemented within a HDF5 file.





# Machine Learning for Climate



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# Environmental Innovations @ OGC

Josh Lieberman  
Chair OGC Agriculture DWG

1 December 2017

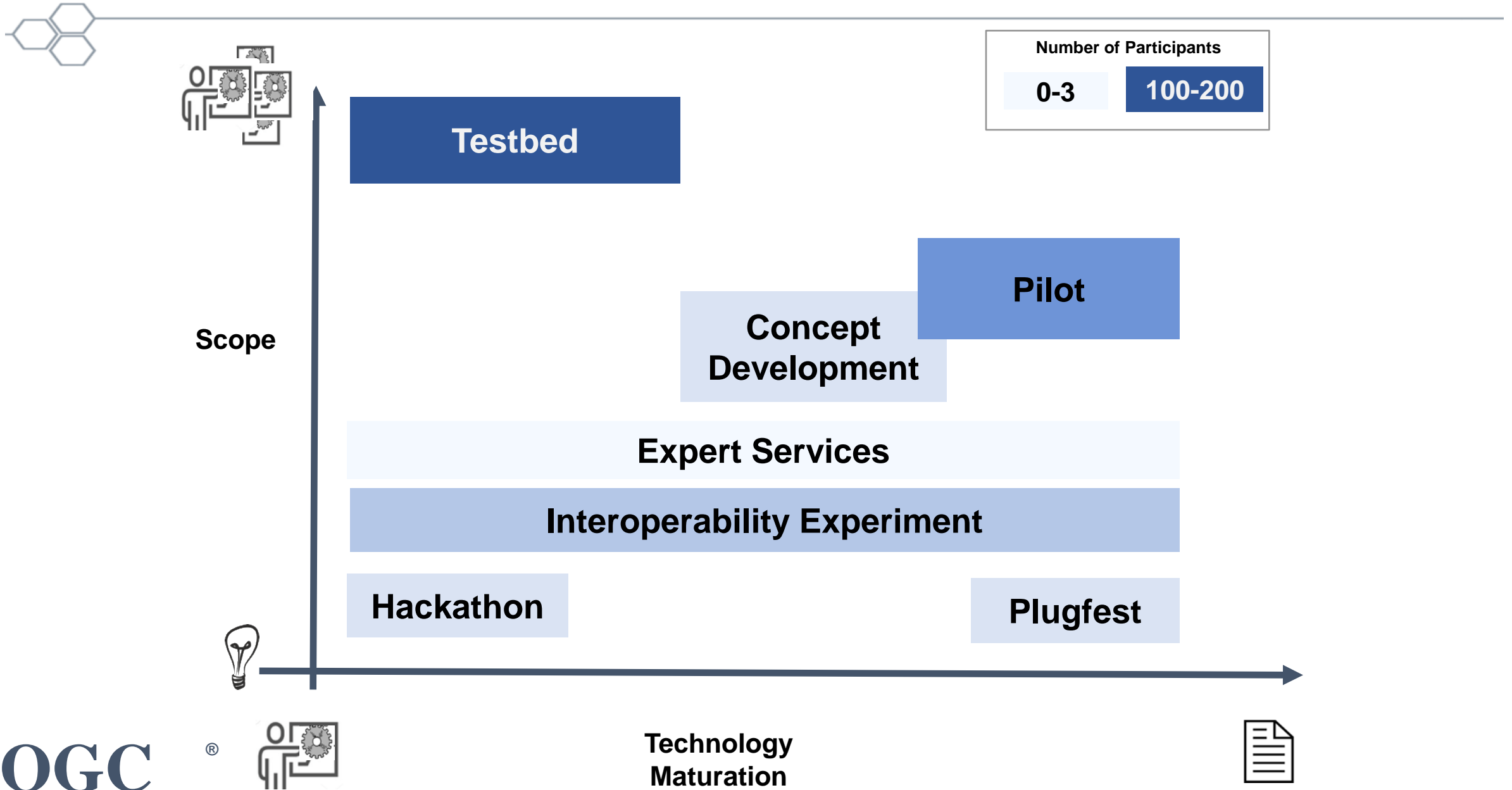


# Role of OGC Innovation Program



- Can one “imagine” if there were a standard...where industry practice does not yet exist”
  - Technical creativity on a solid foundation of theory and practice
- How can one evaluate the potential of a specification in systems that cannot function without it?
  - Collaborative experimentation
- How can market competitors agree on a standard that could create the market they can compete within?
  - “Coopetition”
- How can general solutions be applied to specific users?
  - Testing of domain-specific architectures, best practices, profiles, extensions, vocabularies
- How can standards stay relevant?
  - Accommodate disruption

# Innovation Program initiatives

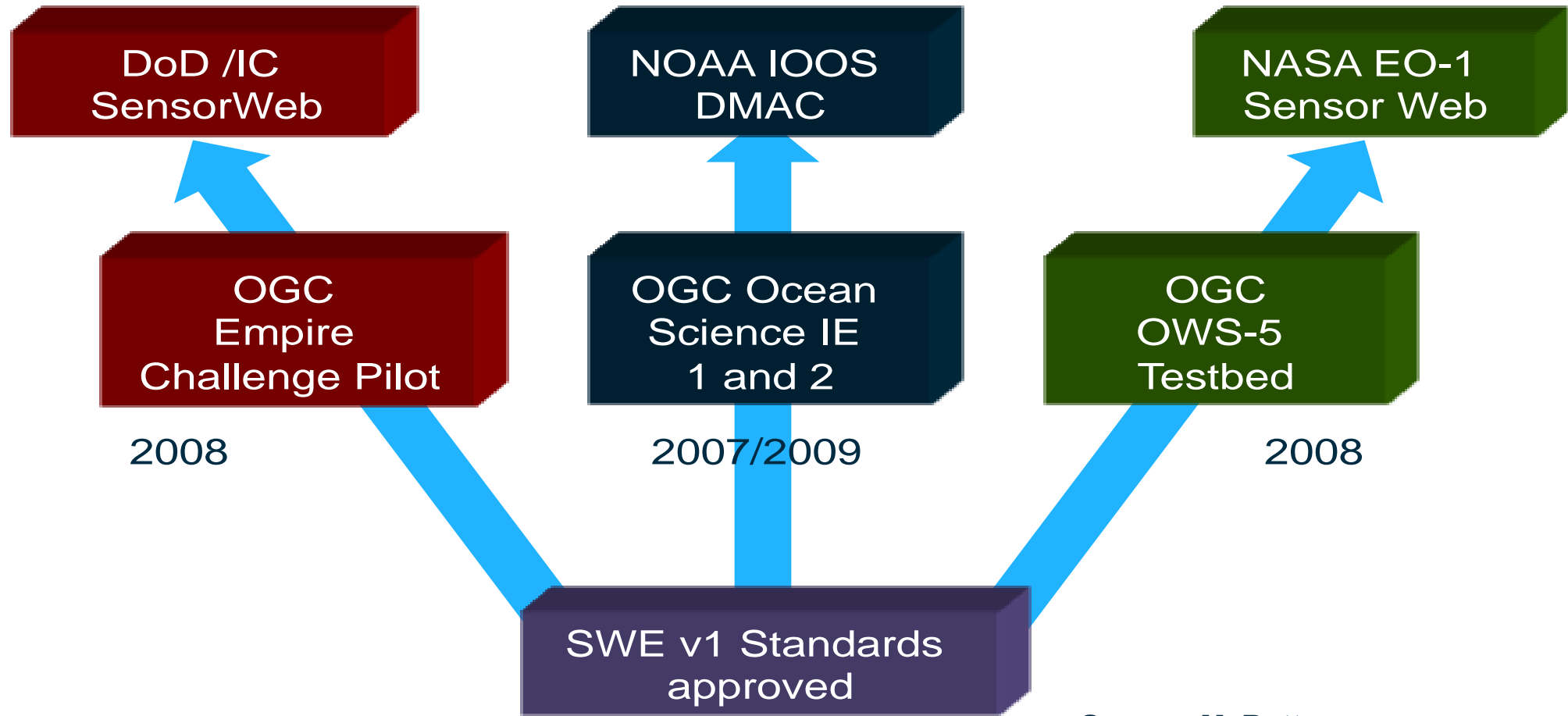


# A History of Initiatives



- Climate Challenge - Integration Plugfest - 2009 (CCIP2009)
- Climatology-Hydrology Information Sharing Pilot, Phase 1 (CHISP-1)
- GALEON IE (Geo-interface for Atmosphere, Land, Earth, and Ocean netCDF)
- HDWG Groundwater 2 IE (GW2IE)
- HDWG Surface Water IE (SW IE)
- Ocean Science Interoperability Experiment II (OceansIE II)
- Soil Data IE (SoilDataIE)

# Innovation -> Standards



Source: M. Botts

# Testbed Threads

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- OWS-8
  - WCS 2.0 Earth Observation Application Profile
  - Advancement of semantic mediation approaches to query and use data based on different heterogeneous data models
- OWS-10
  - Interoperability in the hydrology domain
- TB-11
  - Climate data processing
  - High-resolution flood modeling
  - Social media environmental observations
- TB-12 WCS Earth Observation Application Profile

# Present Initiatives

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- Arctic Spatial Data Pilot (ArcticSDP)
- Environmental Linked Features Interoperability Experiment (ELFIE)
- NextGEOSS – follow on to series of GEOSS Architecture Implementation Pilots

# GEOSS Components



**Figure 8 DAB-Q context.**

- AIP – Architecture Implementation Pilot
- GCI – GEOSS Common Infrastructure
- DAB Data Access Broker





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**ANY QUESTIONS?**