Geospatial Big Data

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United Nations Statistics Division

UN-GGIM | United Nations Committee of Experts on Global Geospatial Information Management

Positioning geospatial information to address global challenges

ggim.un.org

UN-GGIM: A global geospatial initiative

Formal inter-governmental UN Committee of Experts to:

- Discuss, enhance and coordinate Global Geospatial Information Management activities by **involving Member States** at the highest level. Reports to ECOSOC
- Make joint decisions and set directions on the use of geospatial information within national and global policy frameworks
- Work with Governments to improve policy, institutional arrangements, and legal frameworks
- Address global issues and contribute collective knowledge as a community with shared interests and concerns
- Develop effective strategies to build geospatial capacity in developing countries

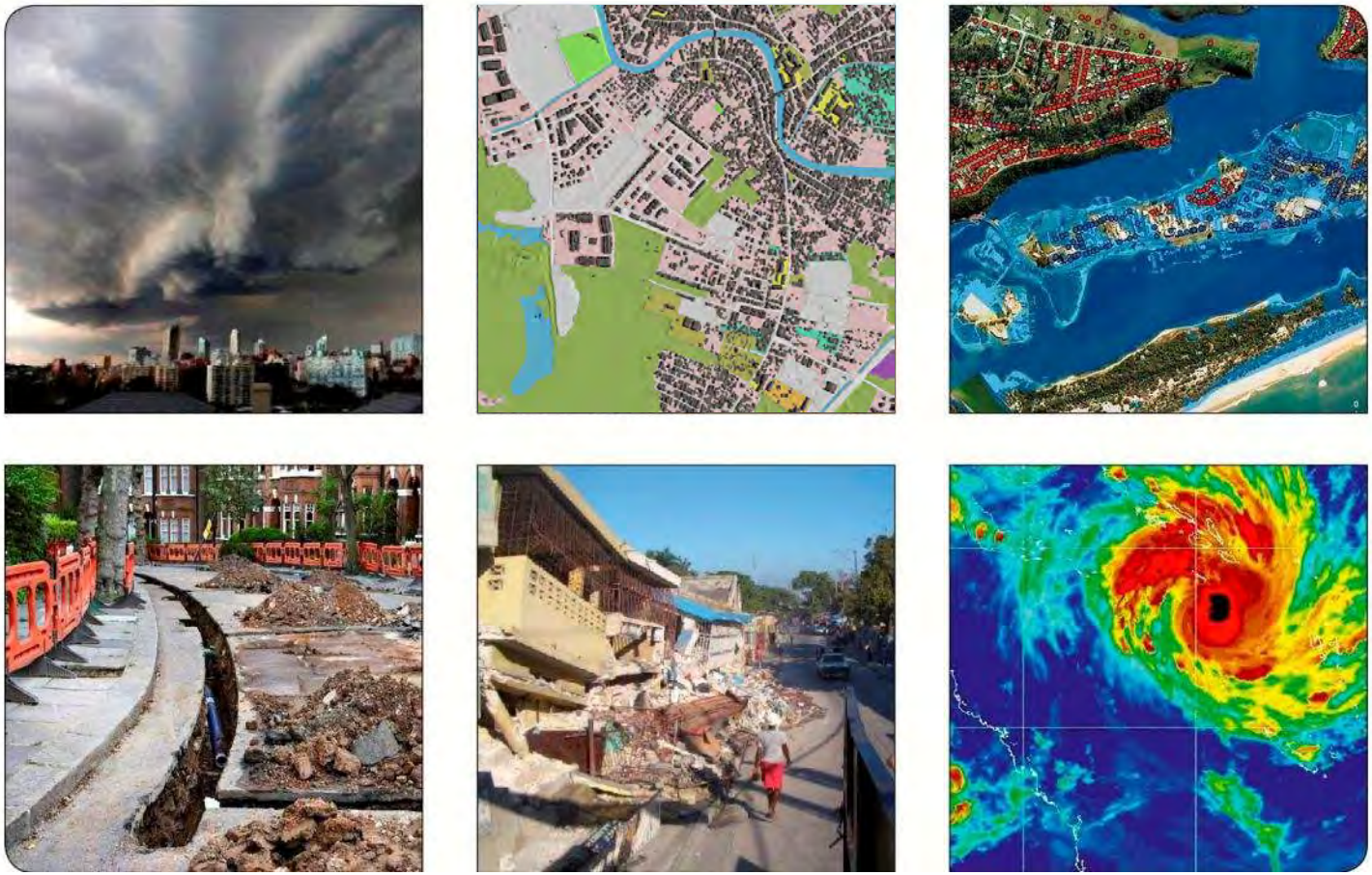
Positioning geospatial information to address global challenges

UN-GGIM | United Nations Committee of Experts on Global Geospatial Information Management

ggim.un.org

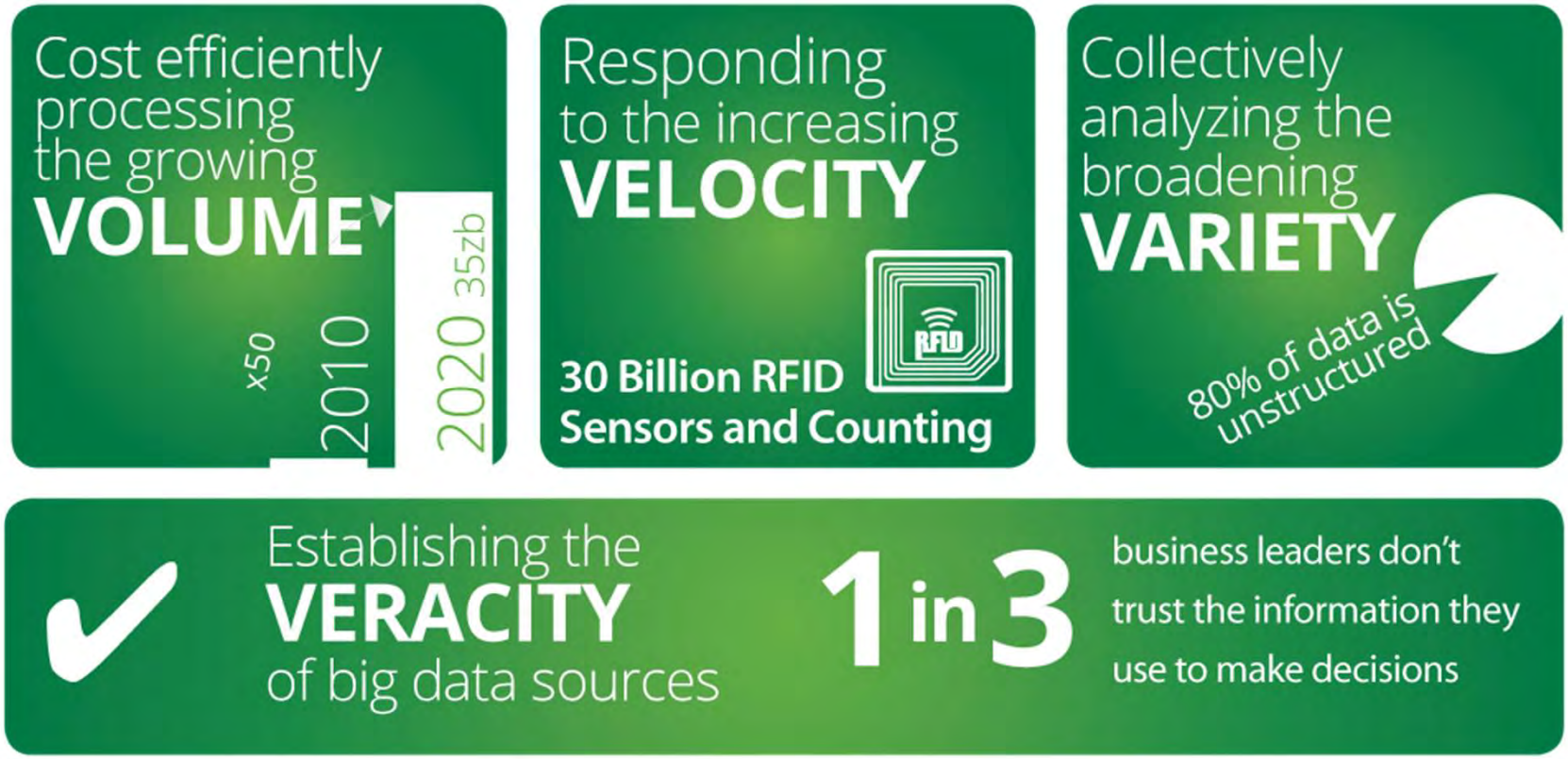
You cannot measure, monitor and manage sustainable development…

THE WORLD WE WANT



…without geography, place and location

Big Data



Data whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it…

What Happens in an **Internet Minute?**

And **Future Growth** is **Staggering**

intel

Data Volume & Variety Explosion Continues - Terabytes, Petabyes, Exabytes, Zettabytes

- Sensors, RFID, LIDAR, Raster, 3D, Crowdsourcing, SDIs
- Terrain Models and 3D city models for planning, maintenance, emergency response, tourism
- New data products for consumers, mobility, defense, intelligence, land and water mgmt, transportation, environment, agriculture, and constituent services
- Tagged Data , Semantics , Ontologies -- Location is a Powerful Organizing Principle
- Integrate Social Media (Video, Audio, Text, Wikis, Facebook, Twitter, Imagery) with Spatial; HADOOP Support
- 2020 = 35 Zettabytes Generated by Us

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Sustainable Development: Geospatial at Core

External Data Sources

Transactional &
Operational Systems
Contents Repository
Databases
Web resources
Blogs, Mails, news
Crowdsource

Real-time Data Streams

Filter, Cleanse, Search, Query, Report, Visualization, Presentation

Enterprise Data Management Infrastructure

Automatic Responses and Publishing

SMS Console Alerts

EV Grid Management

Workflow Initiation

Real-time Dashboards

ORACLE

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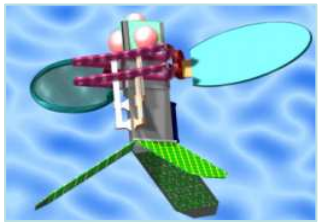
Geospatial Big Data

7,000 Billion Sensors by 2020!

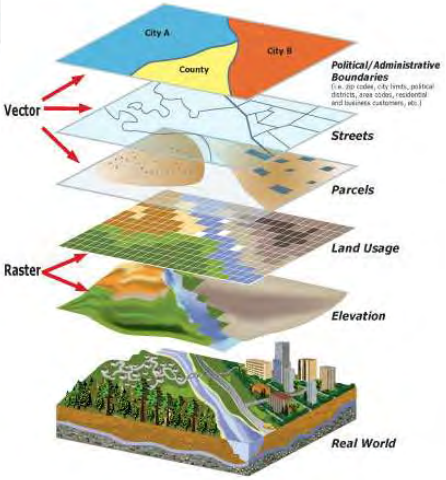


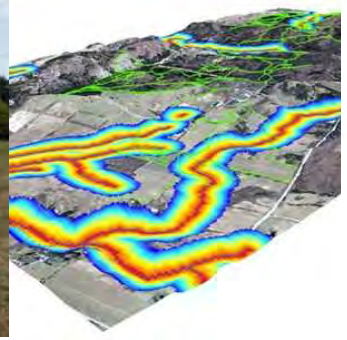
Location!!

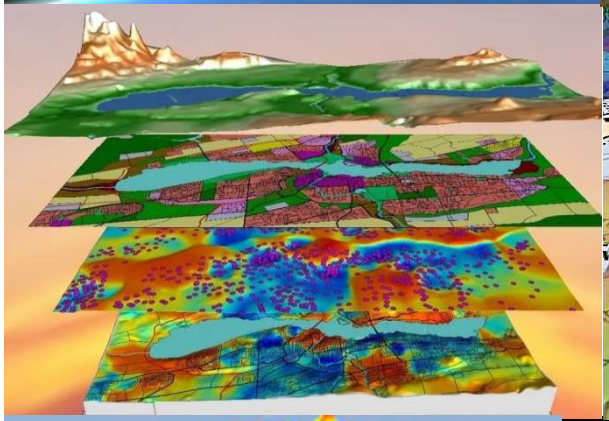
Information Technology
Data Analysis
Ecological Modeling
Environmental Informatics
Natural Resources
Geospatial Science
People

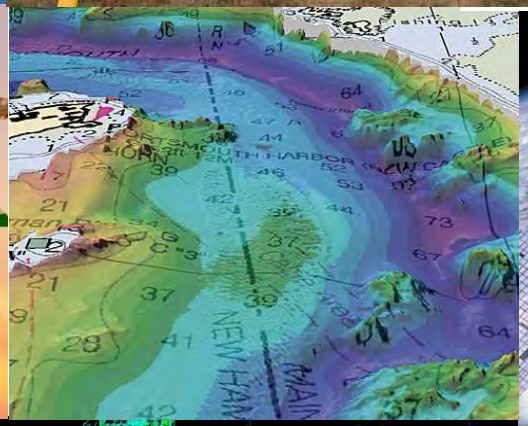
Depth (m)
< 0.1 m
0.1 - 0.5 m
0.5 - 1.0 m
1.0 - 2.0 m
> 2.0 m

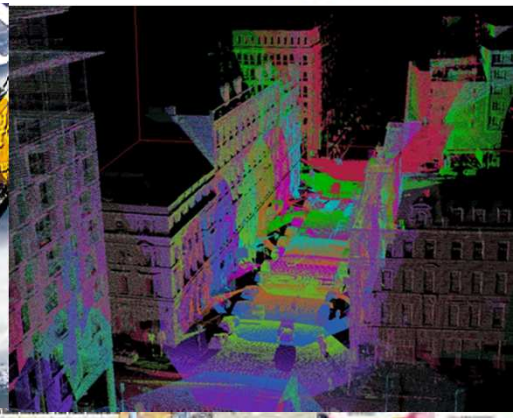
BUILDING EUROPEAN
Spatial Data Infrastructures
Second Edition
Ian Masser

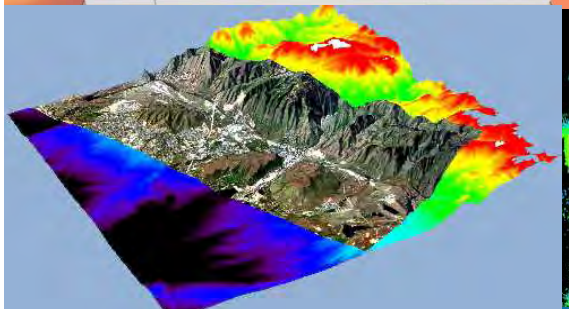

City A
City B
County
Political/Administrative Boundaries
Vector
Streets
Parcels
Land Usage
Raster
Elevation
Real World

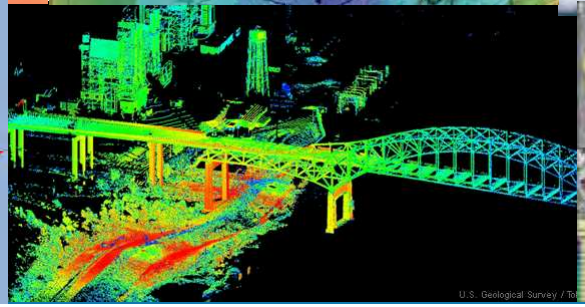


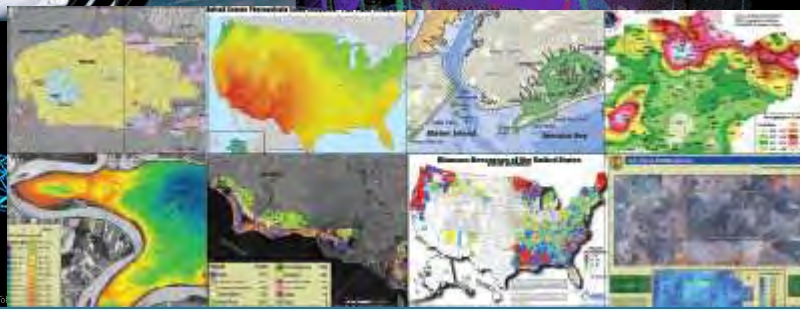






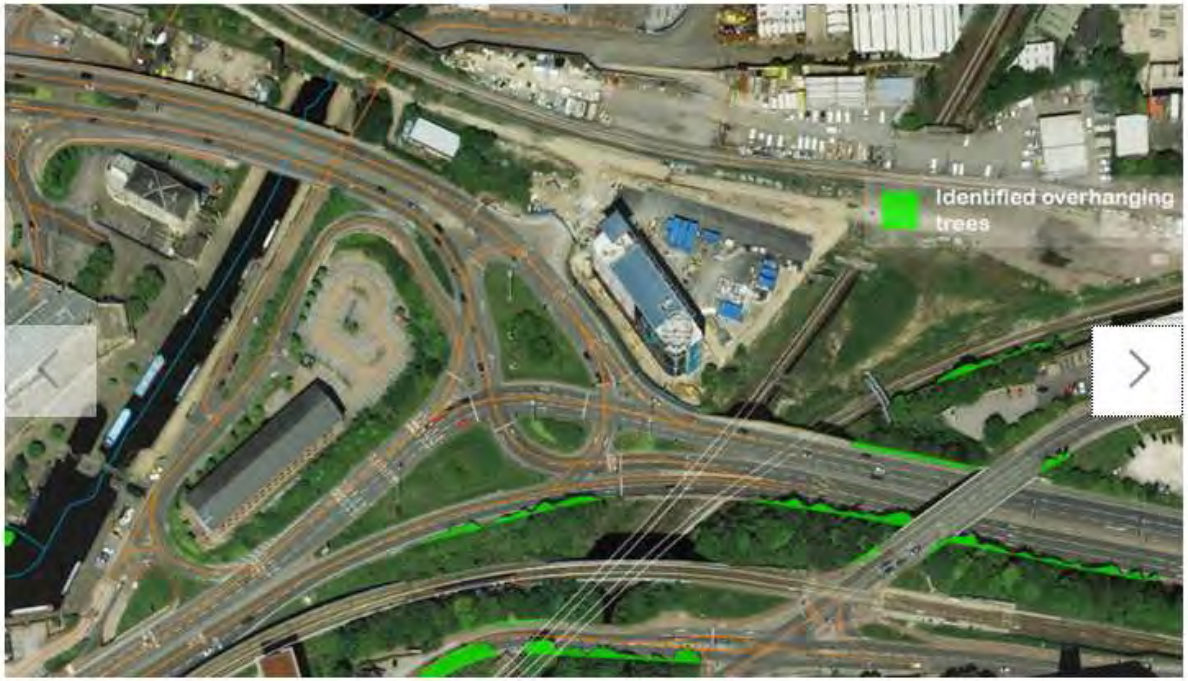






OS MasterMap Imagery Layer

TWEET SHARE SHARE SHARE

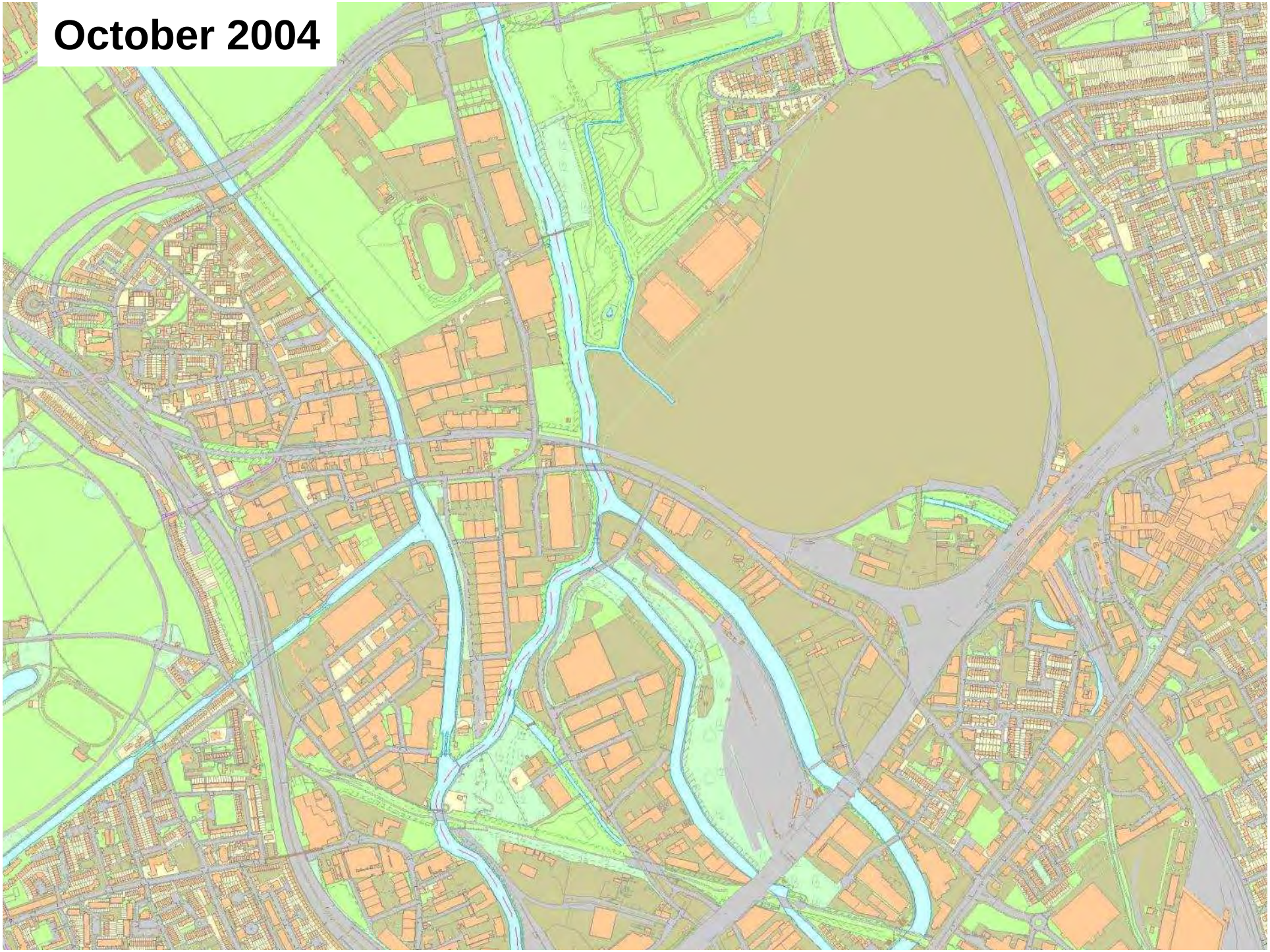


OS MasterMap Imagery and ITN Layers

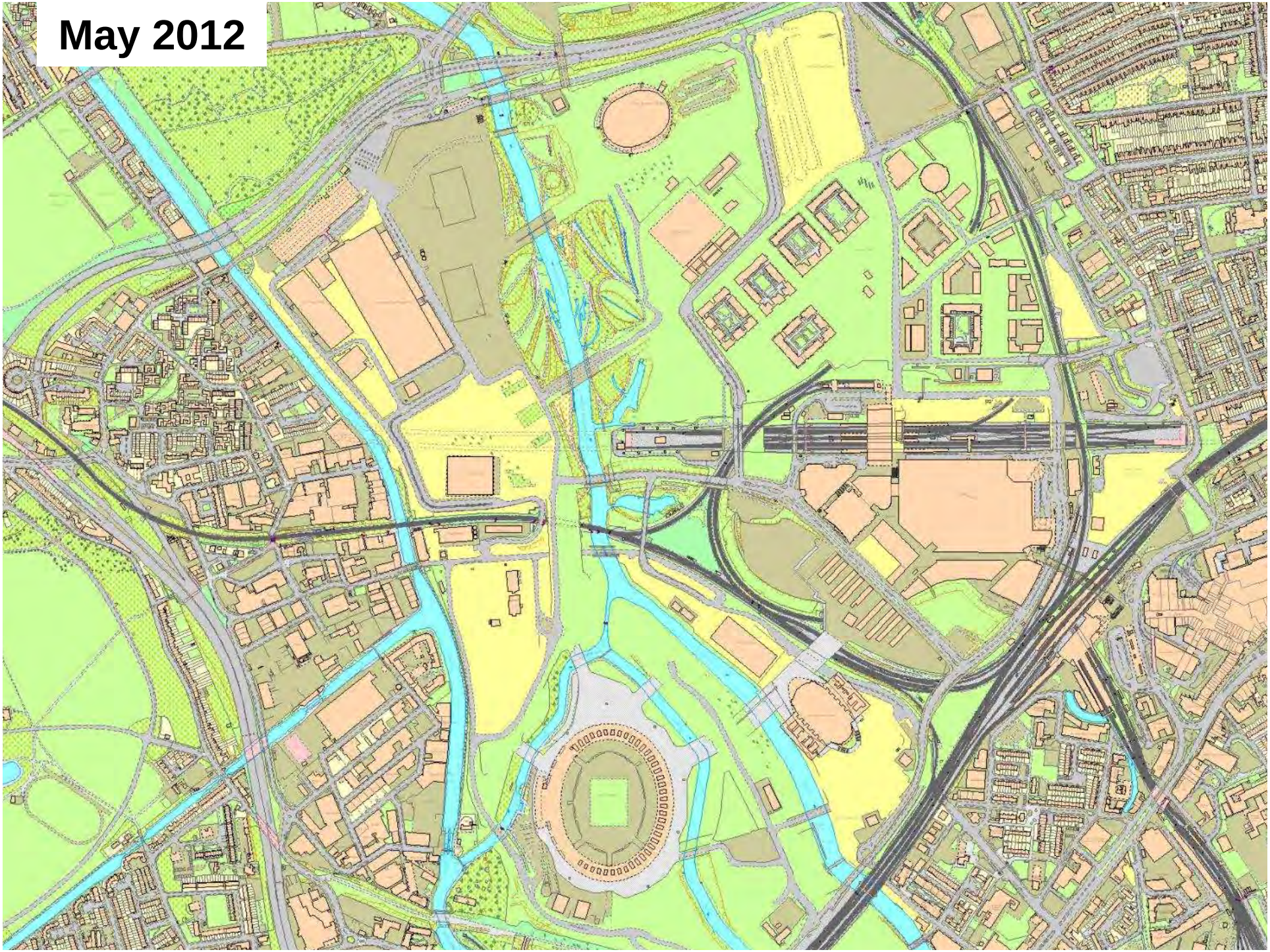
Ordnance Survey (OS) MasterMap Database

- 460 million features
- Over 10,000 changes are made per day

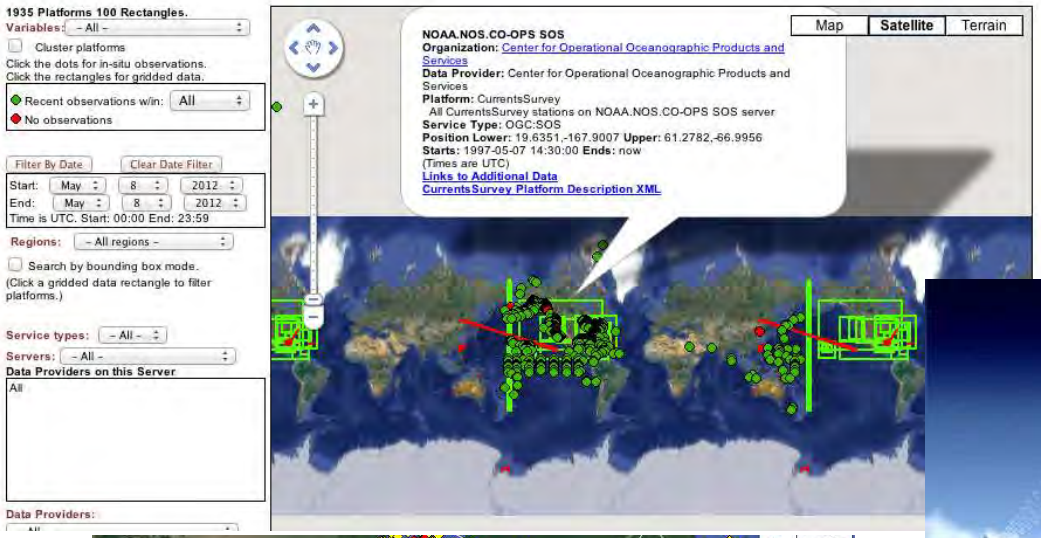
October 2004

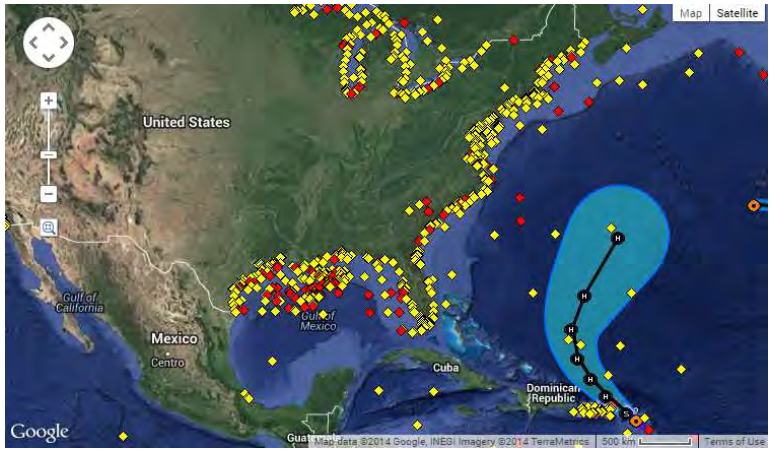


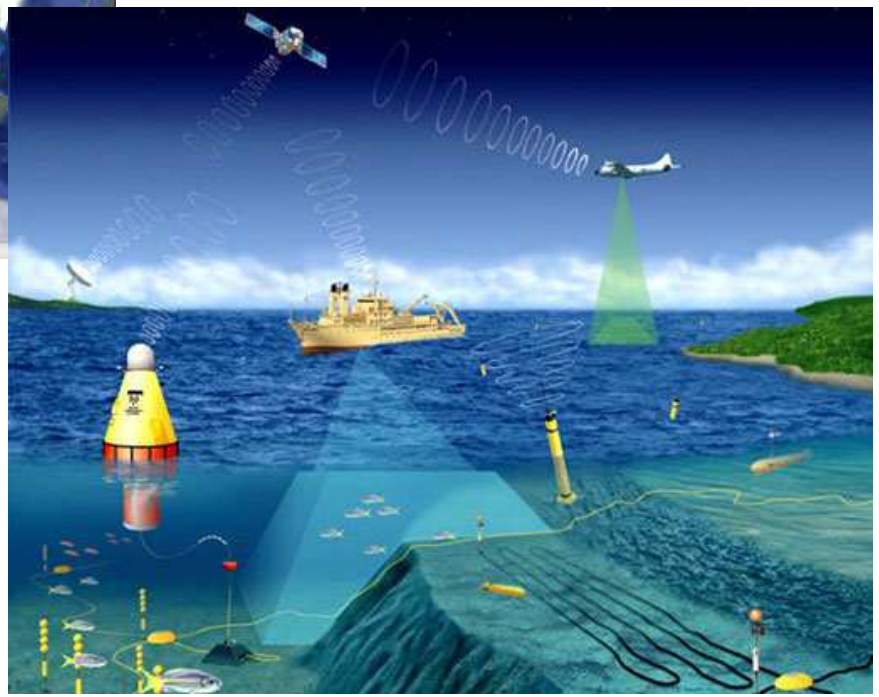
May 2012



NOAA Integrated Ocean Observing System: 2500 online Sensors (OGC SOS), millions of observations







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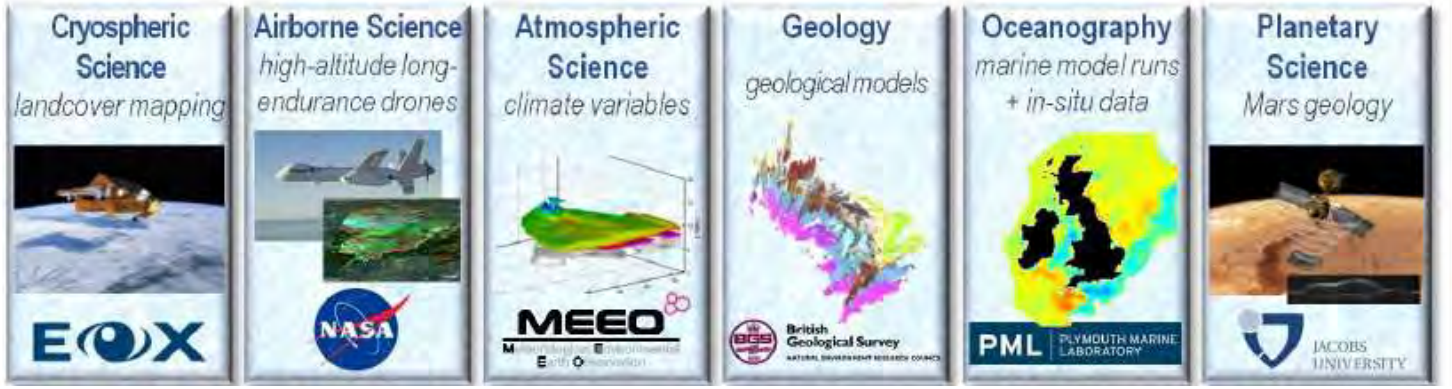
Example: EarthServer

EarthServer: *Big Earth Data Analytics*

- Scalable On-Demand Processing for the Earth Sciences
  - EU funded, 3 years, 5.85 mEUR

www.earthserver.eu

- 6 * 100+ TB databases for all Earth sciences + planetary science
- Platform: rasdaman Array Analytics Server
  - Distributed query processing, integrated data/metadata search, 3D clients
  - Strictly open standards: WMS + WCS + WCPS



Baumann, 2013

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The World Takes Shape with Global Daily Acquisitions
1 Aug 2013 – 31 Jan 2014

Digital Globe captures 3.2 million square km of imagery a day
and delivers it to the customer hours after collection

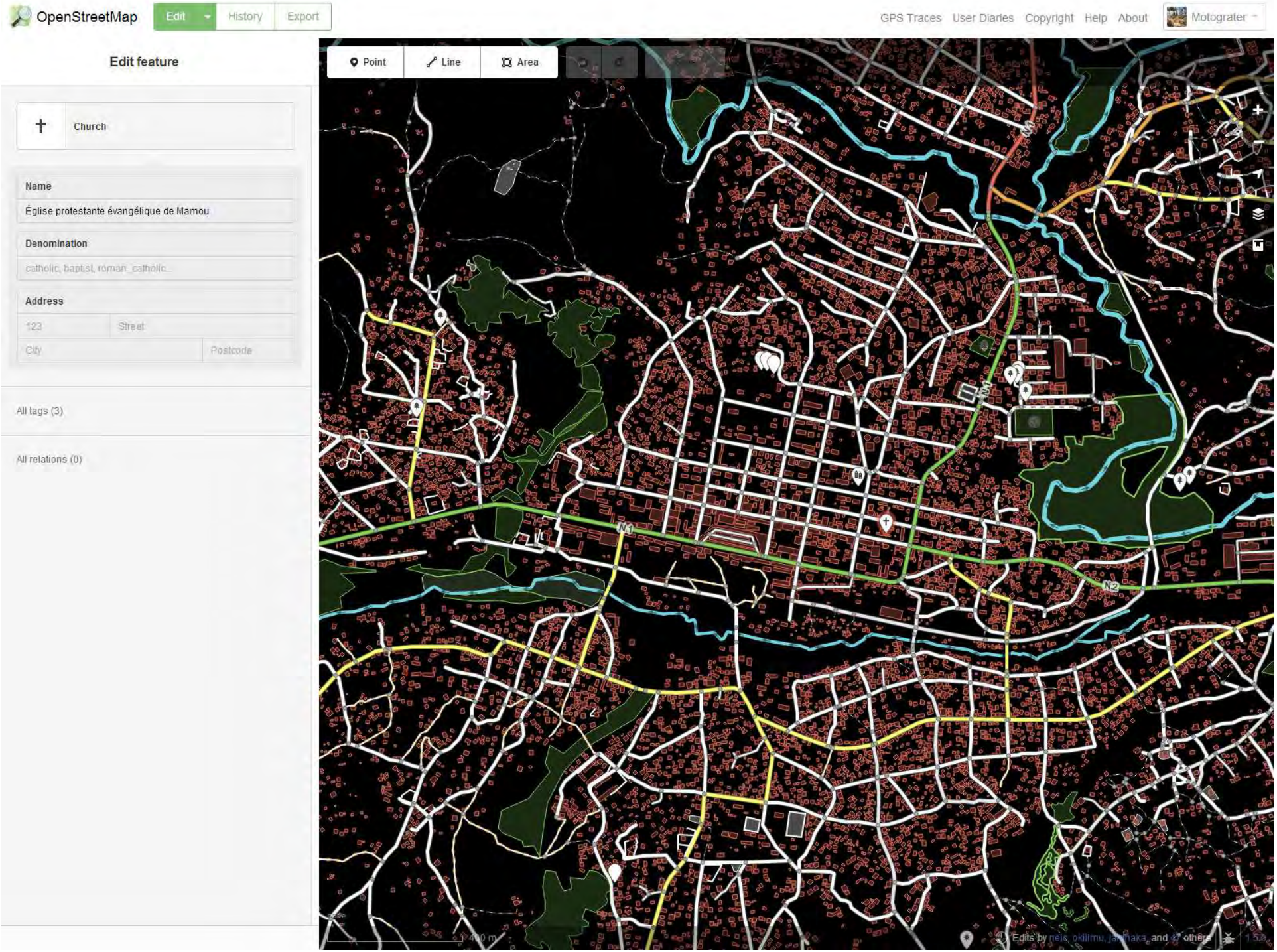
Creating 3D Models …

Saab Proprietary and Company Confidential

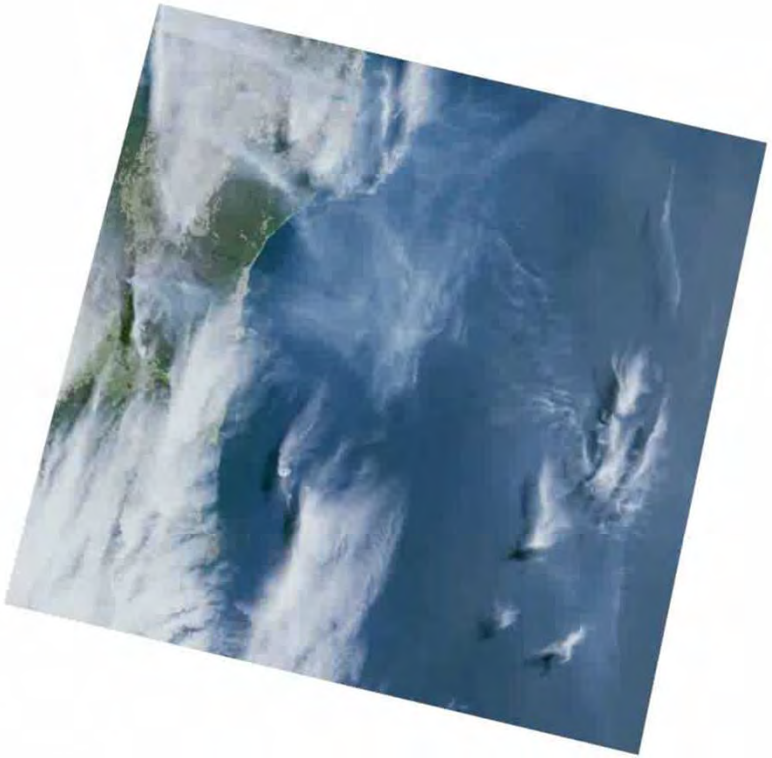
Location in Guinea

Coordinates: 10°23'N 12°05'W

Country	Guinea
Region	Mamou Region
Prefecture	Mamou Prefecture
Population (2008)	
• **Total**	76,269


OpenStreetMap
Edit
History
Export
GPS Traces
User Diaries
Copyright
Help
About
Motograter
Edit feature
Point
Line
Area
Church
Name
Église protestante évangélique de Mamou
Denomination
catholic, baptist, roman_catholic
Address
123
Street
City
Postcode
All tags (3)
All relations (0)
N1
N2
Edits by neis, okilimu, jamhaka, and 47 others

Satellite Images: Not just ‘photos’



Satellite Image

© Commonwealth of Australia (Geoscience Australia) 2014

Satellite Images: Not just ‘photos’

11.50-12.51 - TIRS 2
10.60-11.19 - TIRS 1
1.36-1.38 - Cirrus
0.5 - 0.68 - Panchromatic
2.11-2.29 - SWIR 2
1.11-2.29 - SWIR 1
0.85-0.88 - Near Infrared
0.64-0.67 - Red
0.53-0.59 - Green
0.45-0.51 - Blue
0.43-0.45 - New Deep Blue

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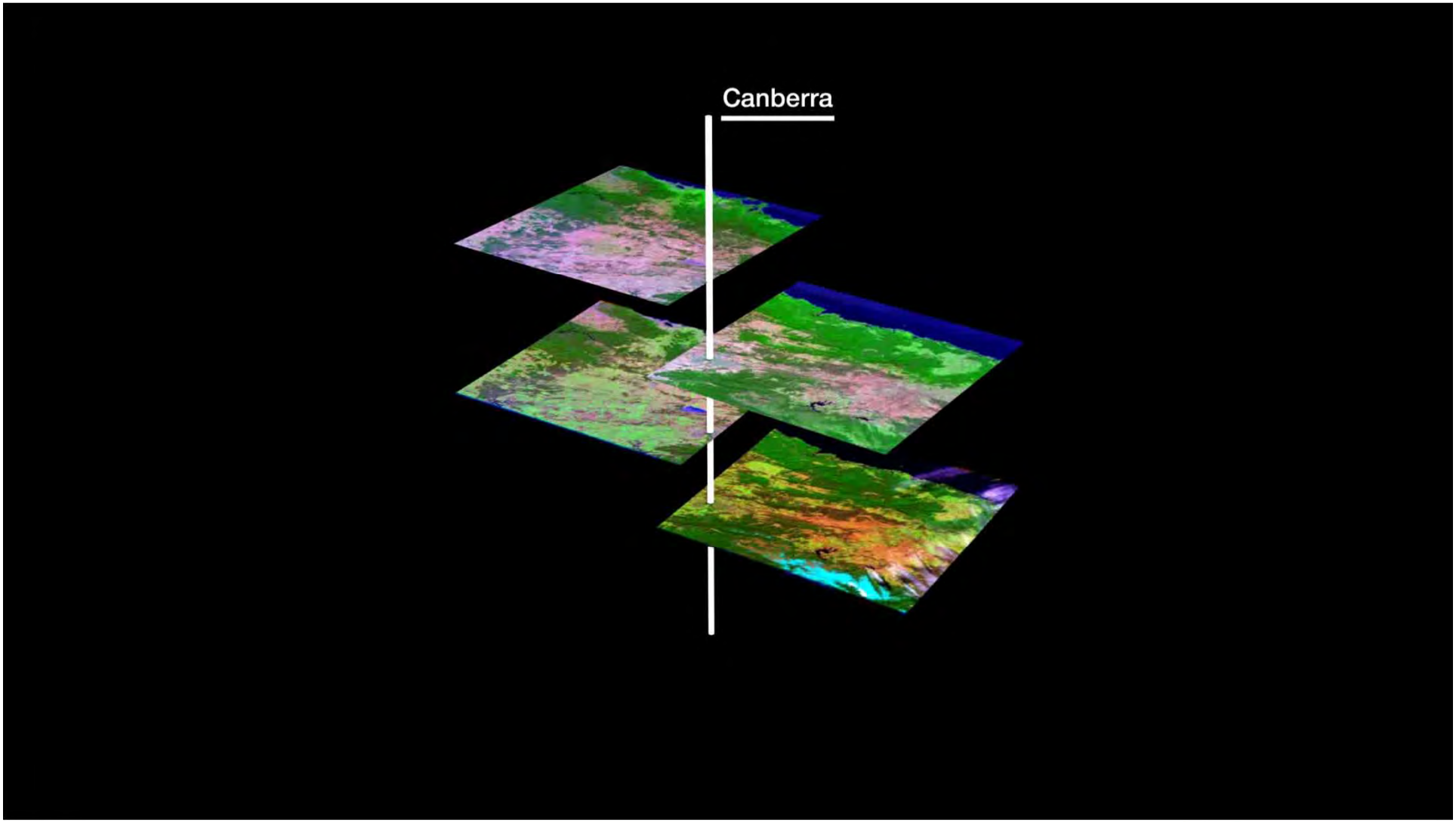

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Application
National Flood Risk Information Portal – Water Observations from Space - GA

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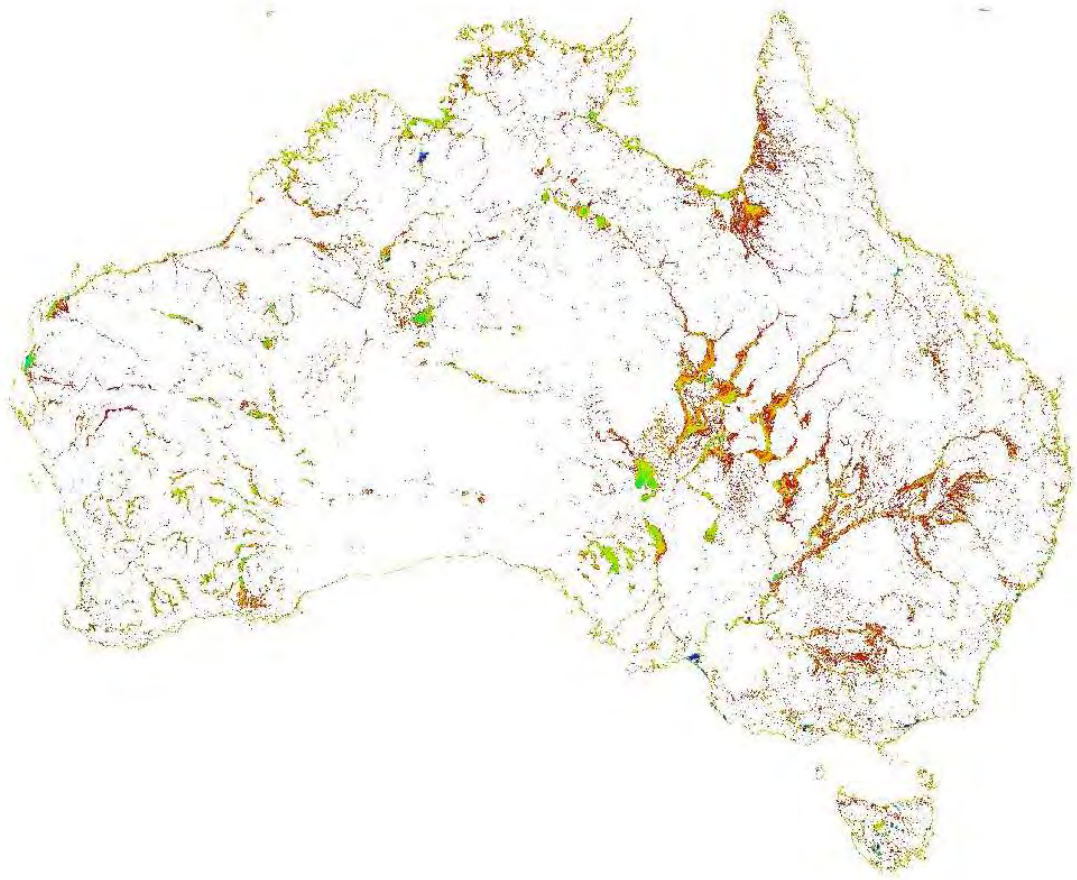
Continental Scale NFRIP results



NFRIP water detection

- **15 Years** of data from LS5 & LS7(1998-2012)
- **25m** Nominal Pixel Resolution
- Approx. 133,000 individual source ARG-25 scenes in approx. 12,400 passes
- Entire archive of 1,312,087 ARG25 tiles => **$21x10^{12}$ pixels** visited
- **3 hrs** at NCI (elapsed time) to compute.

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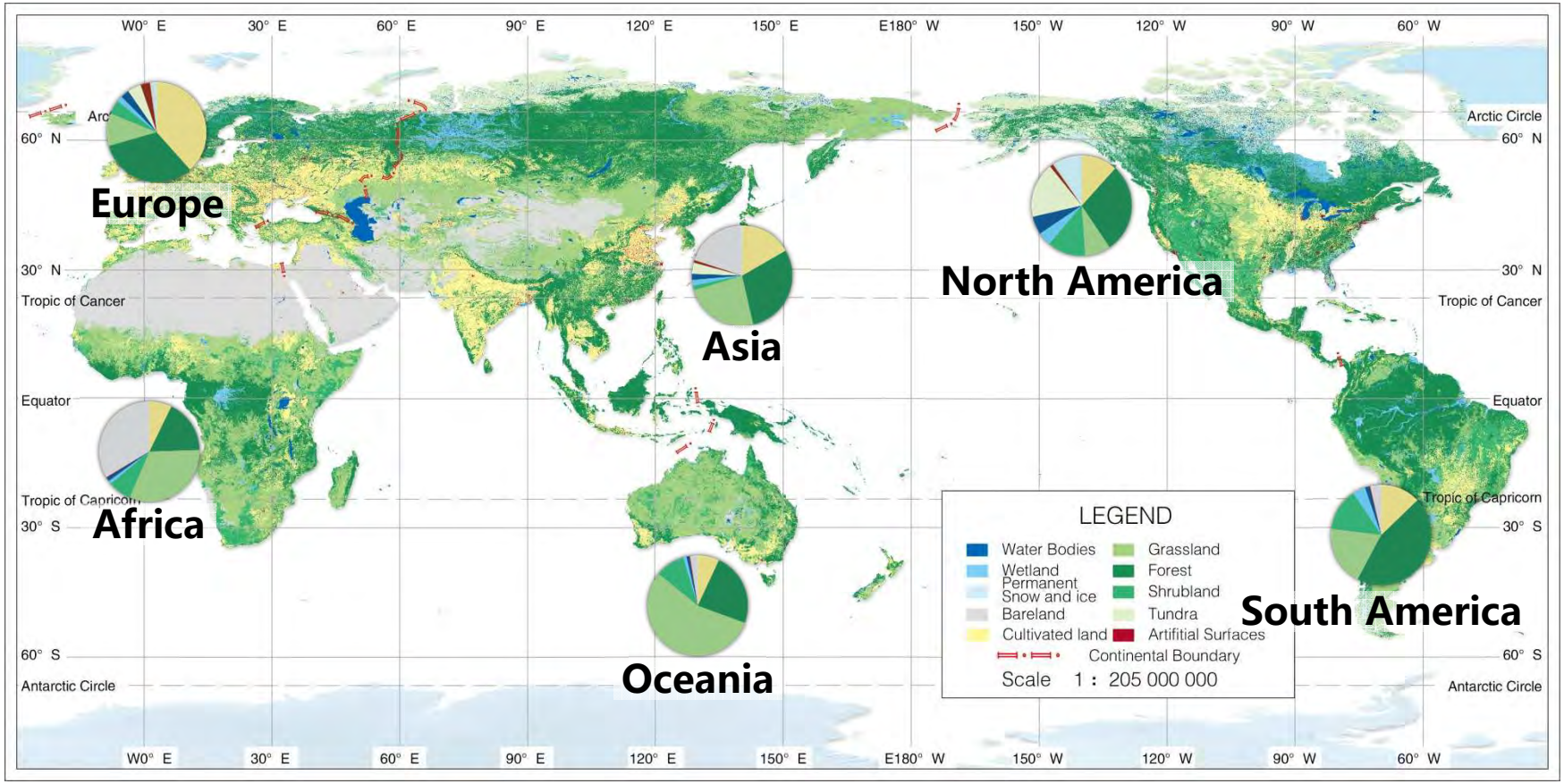
GlobeLand30 - Statistics

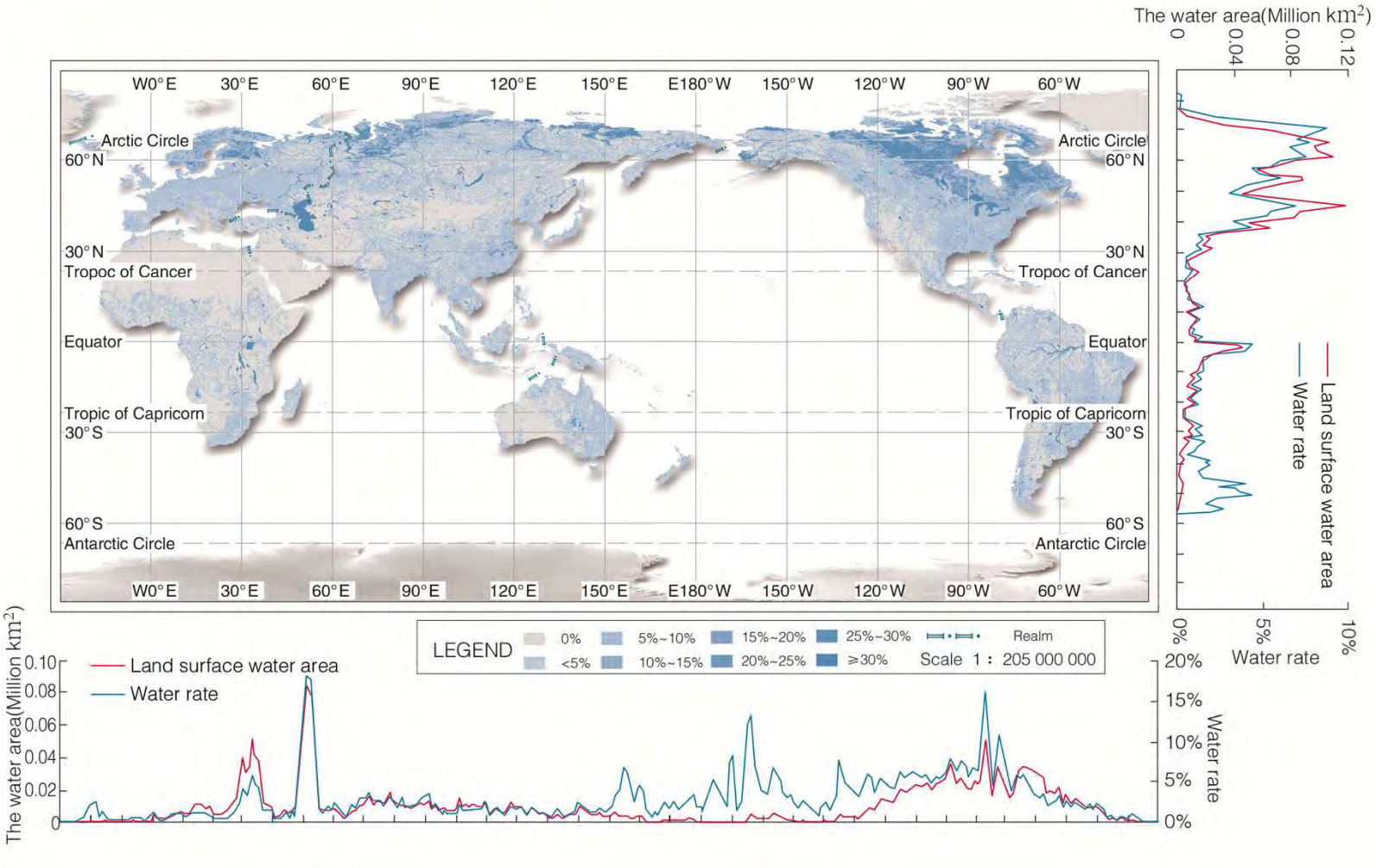
Statistics of 2010 Global land cover types

2010年全球地表覆盖类型统计



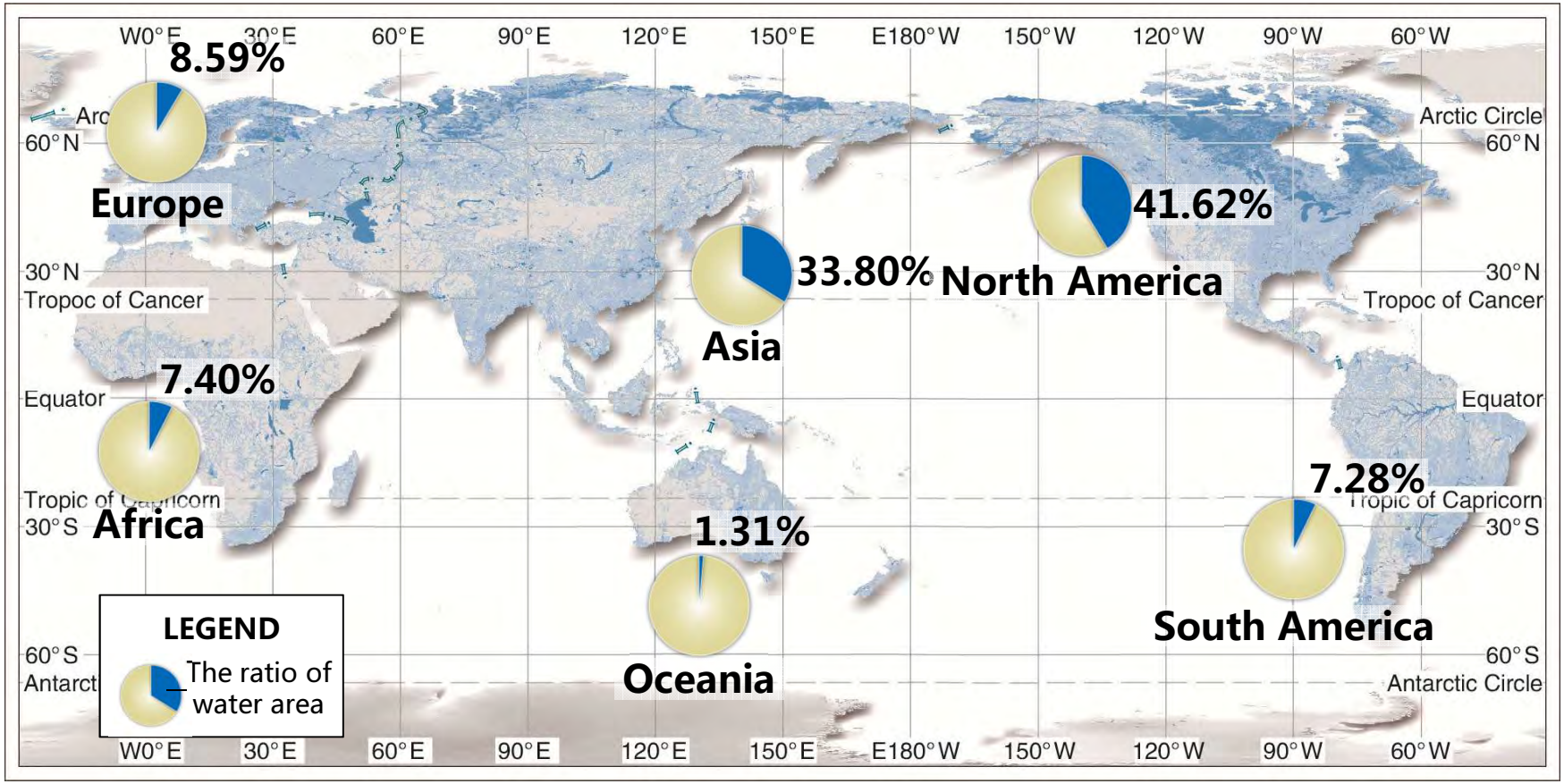
GlobeLand30 - Statistics

Global land water body distribution　全球陆表水体的空间格局



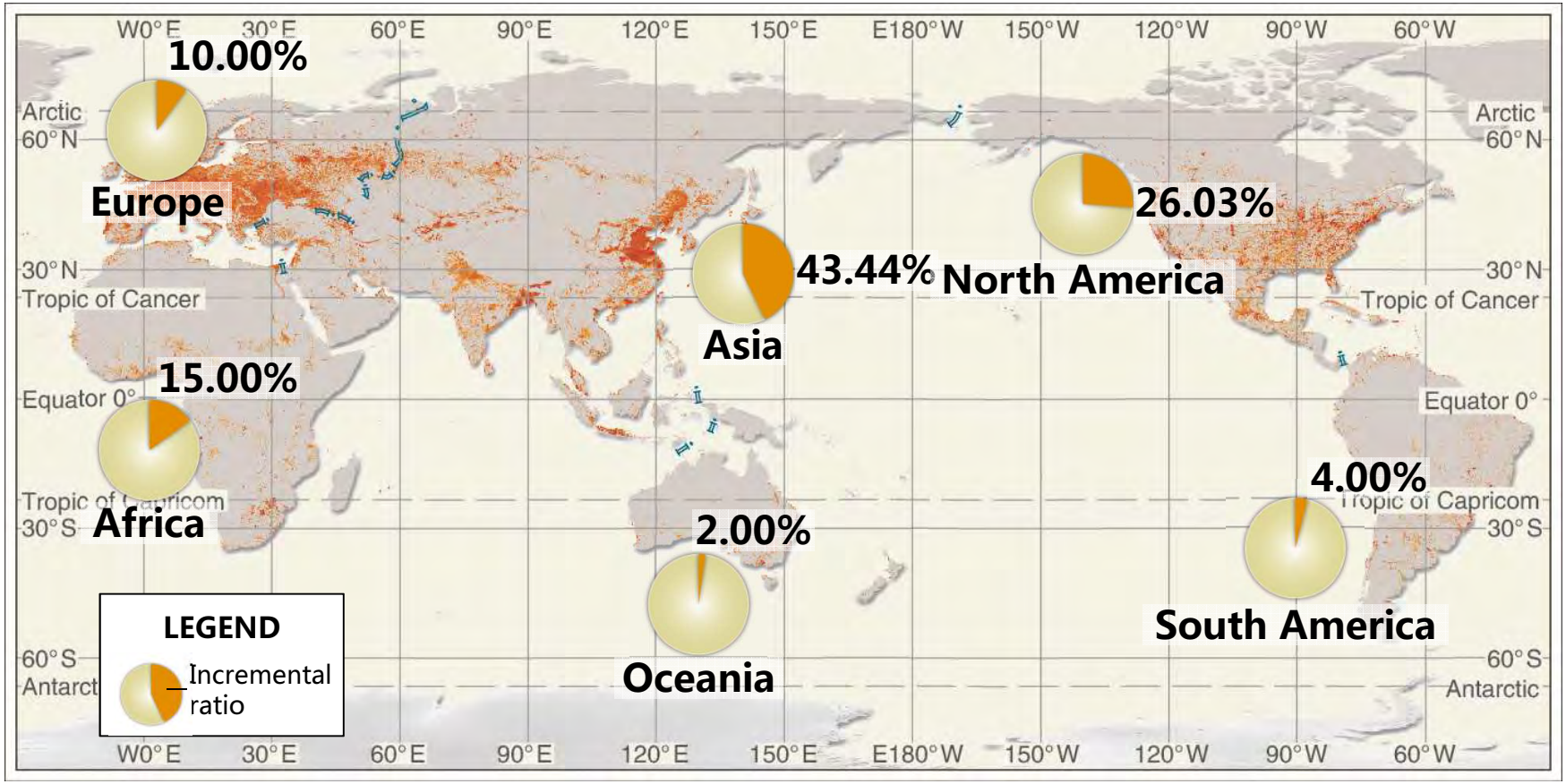
GlobeLand30 - Statistics

Global land water body distribution 全球陆表水体的空间格局

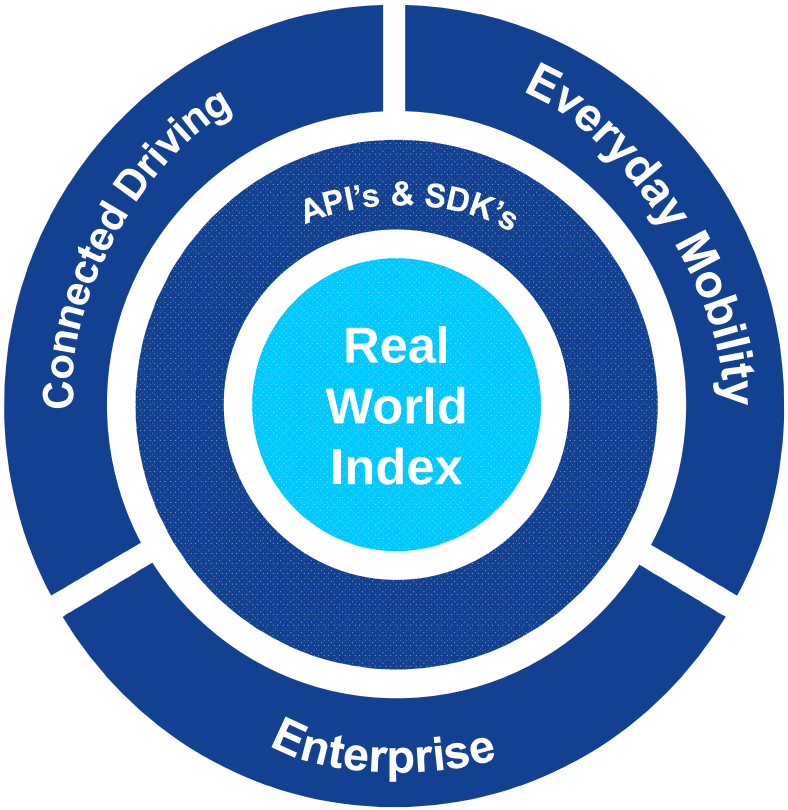


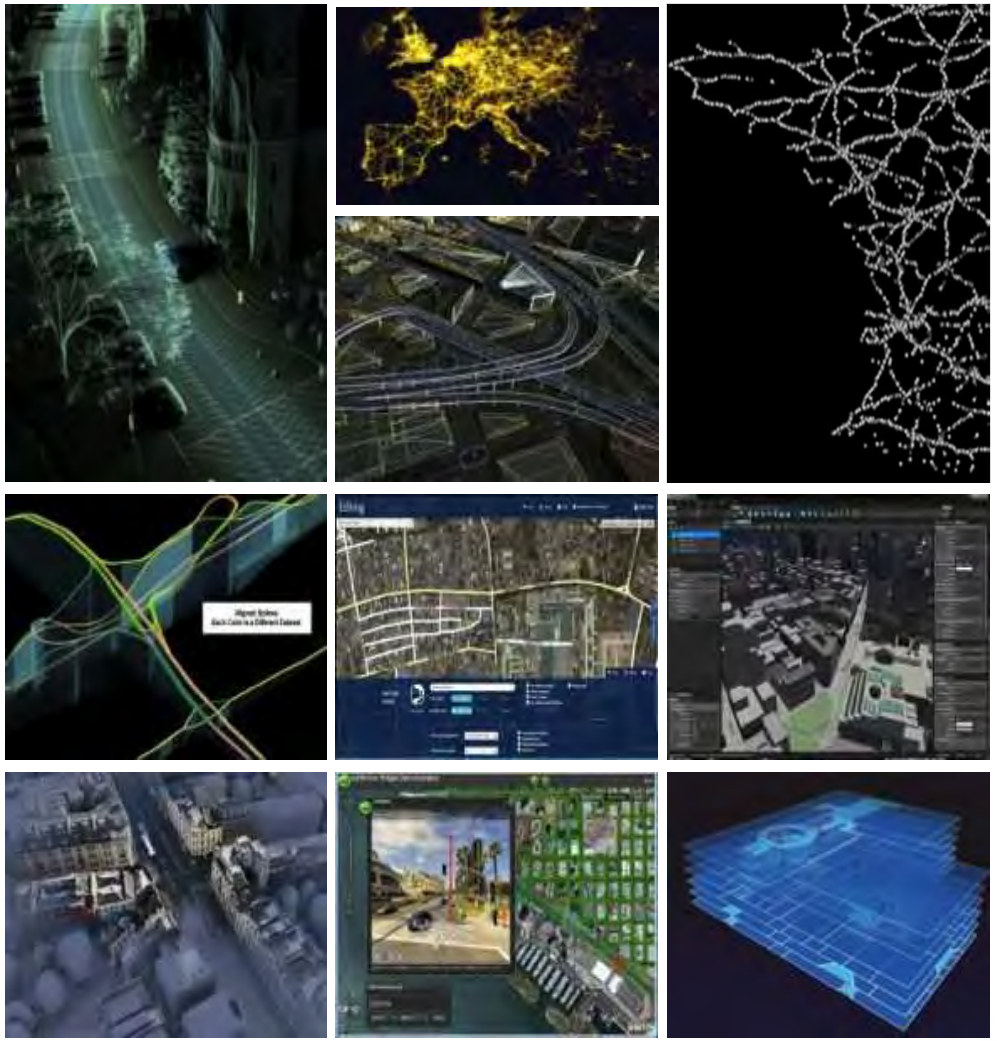
GlobeLand30 - Statistics

The incremental ratio of the global built-up areas from 2000 to 2010　2000年—2010年全球城乡建设用地面积增量占比



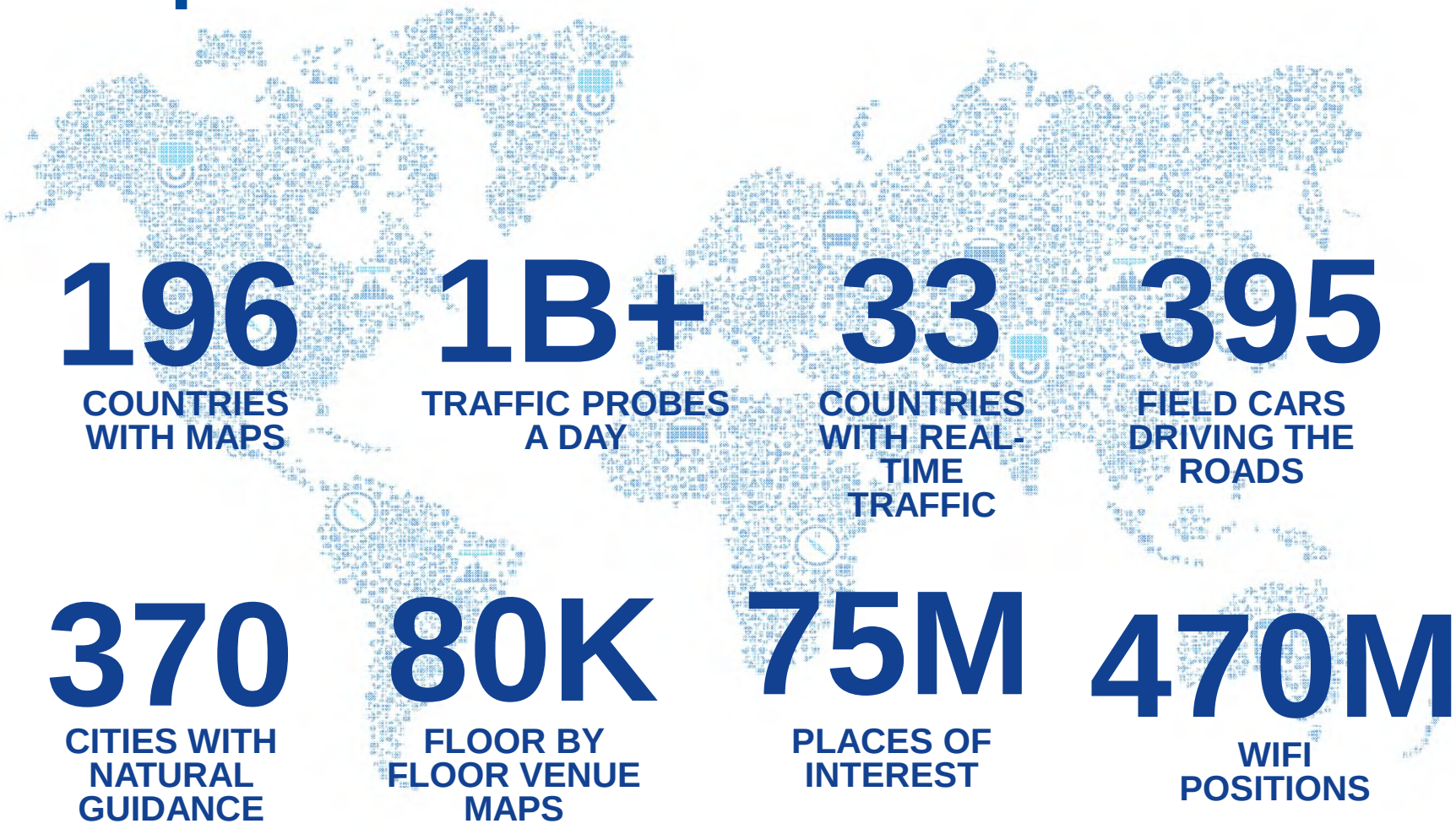
HERE Platform – Delivers Dynamic Digital Maps





rohan.fernando@here.com +61 407 976 385

HERE – Global Digital Mapping Capabilities



196
COUNTRIES WITH MAPS

1B+
TRAFFIC PROBES A DAY

33
COUNTRIES WITH REAL-TIME TRAFFIC

395
FIELD CARS DRIVING THE ROADS

370
CITIES WITH NATURAL GUIDANCE

80K
FLOOR BY FLOOR VENUE MAPS

75M
PLACES OF INTEREST

470M
WIFI POSITIONS

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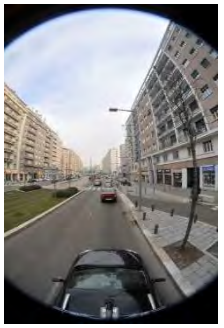
Street Level Imagery + LiDAR = Spatially Accurate 3D

- Capturing high resolution street level imagery.
- Capturing full 3D street level LiDAR.
- Fusing imagery with LiDAR for spatially accurate 3D representations



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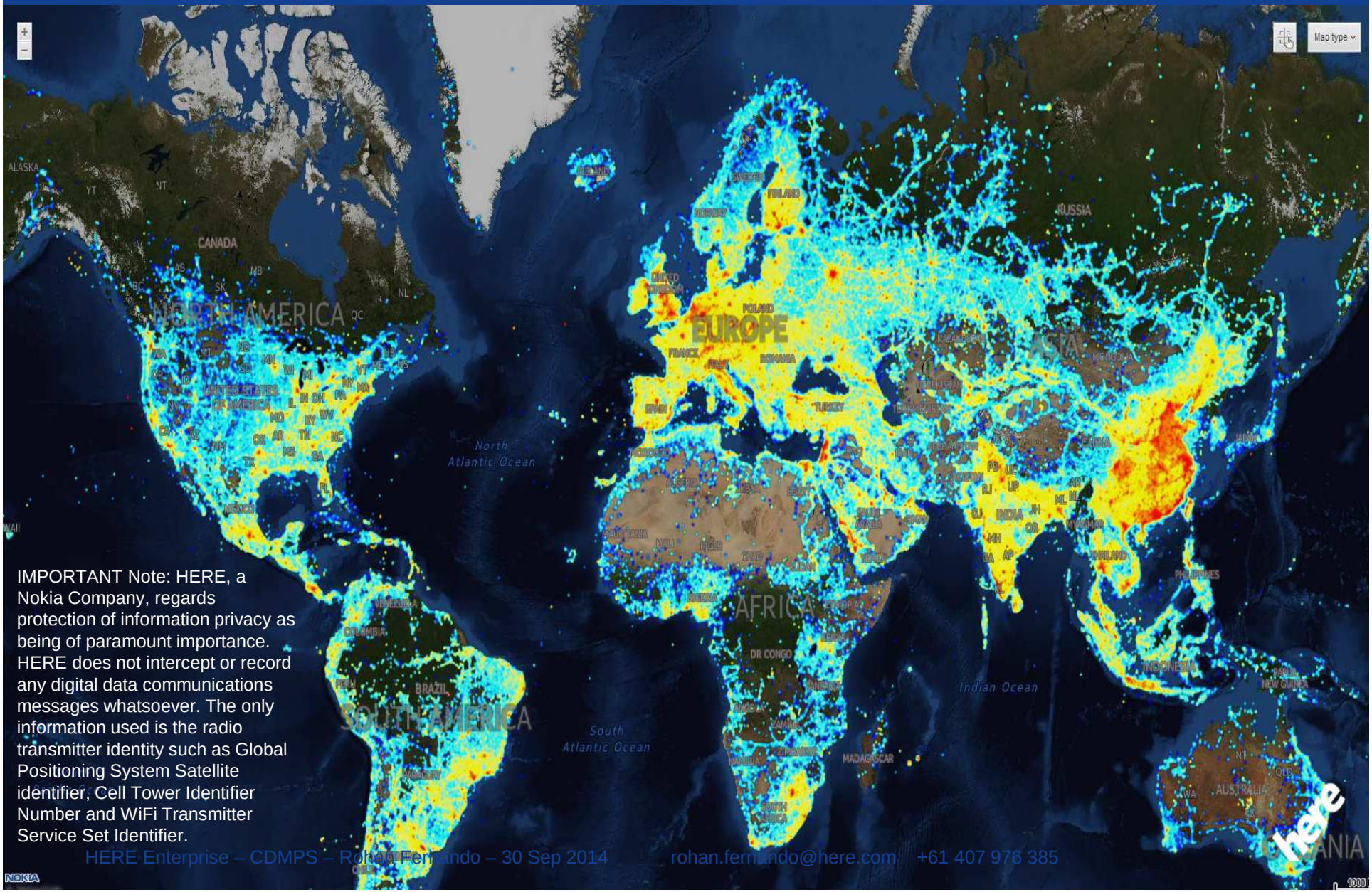
HERE - Capturing Anonymous Cell and WiFi Locations for accurate Positional API Reference



IMPORTANT Note: HERE, a Nokia Company, regards protection of information privacy as being of paramount importance. HERE does not intercept or record any digital data communications messages whatsoever. The only information used is the radio transmitter identity such as Global Positioning System Satellite identifier, Cell Tower Identifier Number and WiFi Transmitter Service Set Identifier.

HERE - Global Traffic in Real-Time

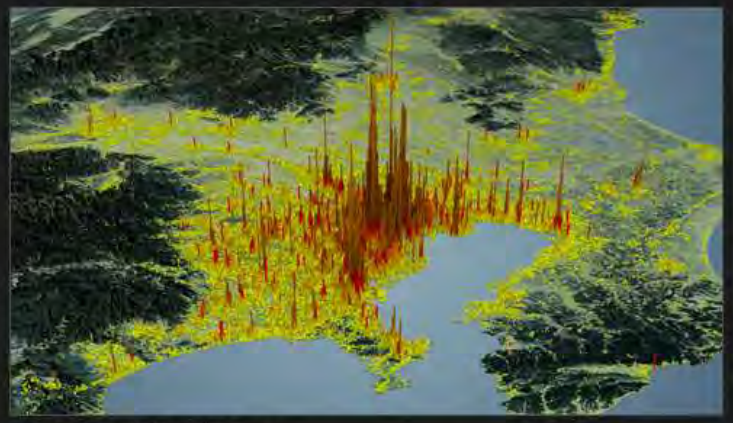
HERE Enterprise – CDMPS – Rohan Fernando – 30 Sep 2014 rohan.fernando@here.com +61 407 976 385

NHK Special

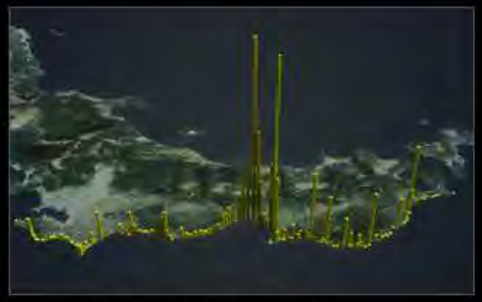
Disaster Big Data

Saving Lives Through Information

Aired Mar 3, 2013 on NHK General TV / NHK World Premium
Aired April 13, 2013 on NHK World TV



Population distribution map



Distribution of people in the area hit by tsunami at the time of earthquake

Traffic congestion map of the disaster area

How did people react to the Magnitude 9.0 earthquake, massive tsunami, and nuclear accident that followed on March 11, 2011?
What determined their fate and what could have been done to save more lives?
Eight companies and organizations including NHK, Google Japan, and Twitter gathered the huge amount of disaster-related data stored from that day to share for analysis. Projects have been launched by government, business, and academia to establish new tools created using Big Data.
How did people react? What did they do? A complete picture of that day cannot be revealed with video footage alone, but by using Big Data it is unveiled in the program. We examine the lives of people as they fought the disaster by investigating the traces of movements made by hundreds of thousands of people in the area, by driving records left on car navigation systems, and 180 million tweets posted in the one week following the disaster.

http://www.nhk.or.jp/datajournalism/about/index_en.html