A Geospatial Revolution and E&P (Powered by AI) for Energy

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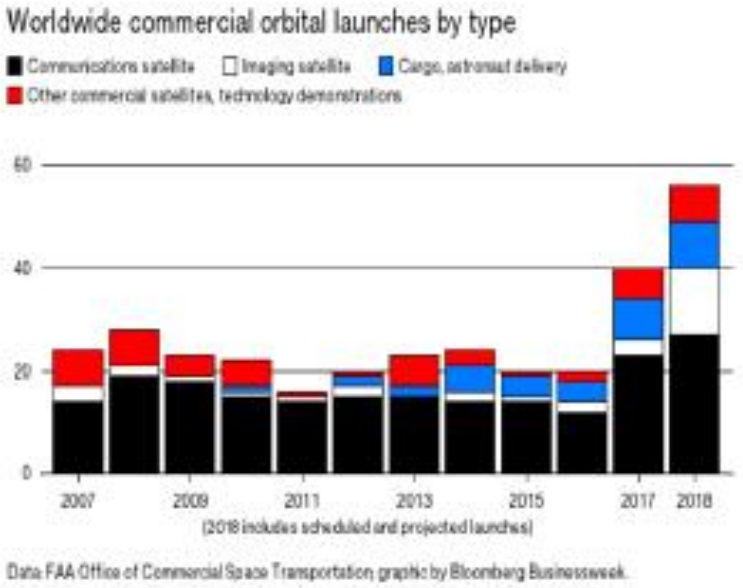
See a better world.™

The Tools

More Earth Observation Satellites

Increased frequency of observations



More Low-Earth Orbit Satellites

With Greater availability of high resolution Images (E.g. WorldView 3, 4)

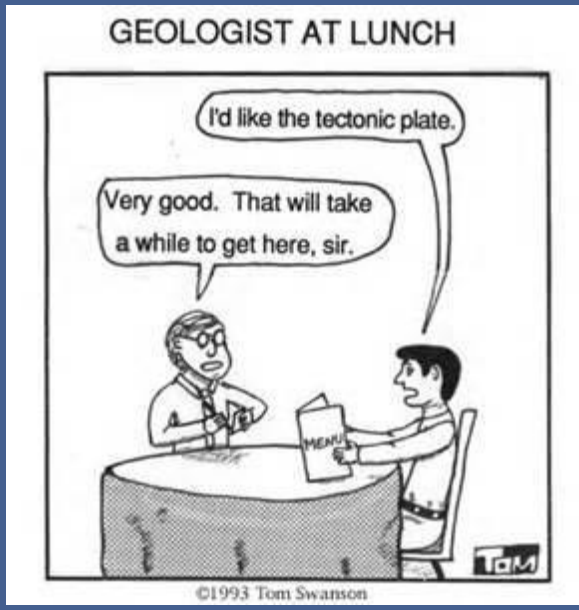
Synthetic-aperture radar (SAR)

More quality observations (2+ years)

What Can be Done from Space

Change Detection, Locations and 'Where'

- Environmental analysis- land use land cover
- Lease Acquisitions and Divestitures Analysis
- Structural mapping ,Lease Mapping
- Seismic Planning
- Structure Extraction
- Subsidence Analysis
- Well Site Planning
- Flood Analysis
- Pipeline Monitoring and Routing
- Land Disturbance Detection
- Emergency Response
- Greenhouse Gas Detection

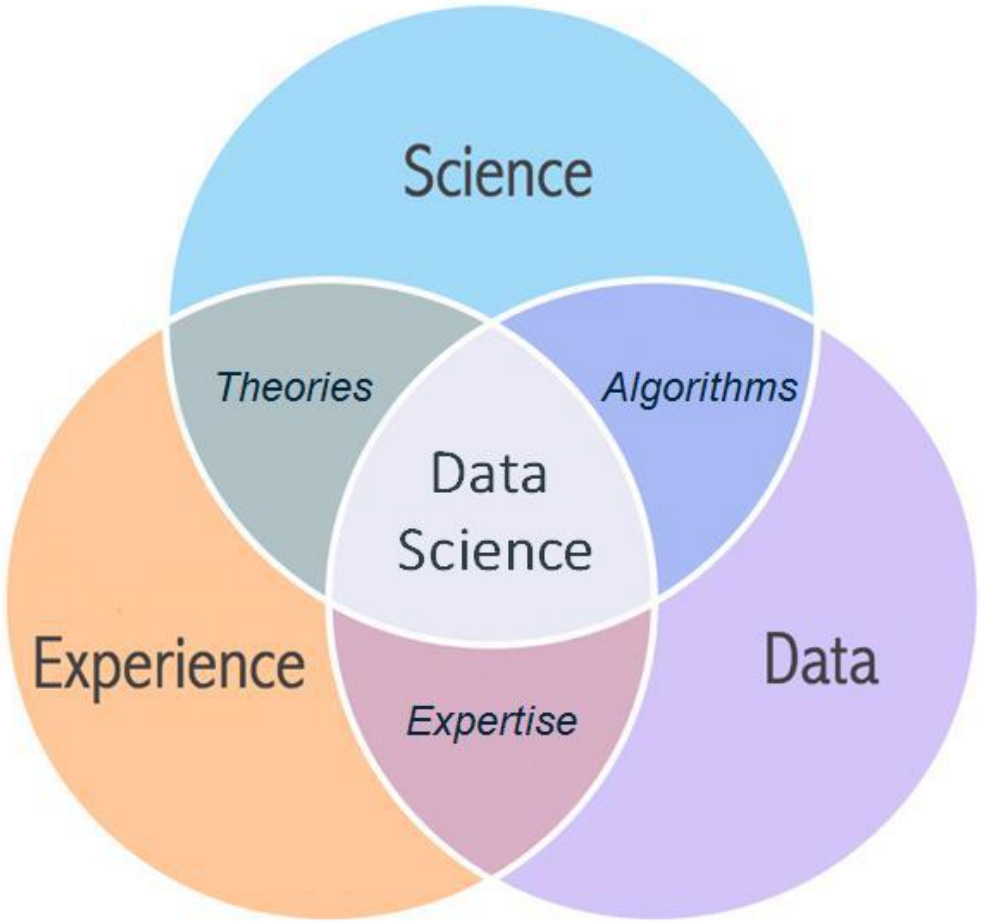


Benefits

- 'Imagery has saved 4x in cost in Seismic planning'
- 'By using imagery I can link the surface to the sub surface'
- 'I can evaluate the lease I am considering remotely'
- 'I was able to deploy my staff efficiently and safely to a remote location'
- 'The ability to monitor the assets that are hard to reach and deploy staff on an add needed basis'
- 'The ability to use archive to develop future analogs'
- 'Competitive analysis world wide fit for purpose'

Where Does Geospatial Data Provide Operational Efficiencies

Goal



Benefits

- Cost Savings
- Decrease downtime
- Higher efficiencies, safety and costs
- Better handle of Inventories
- Predict transport & travel logistics
- Optimize energy consumption
- Reduce carbon emission
- Detecting unusual Patterns through Analytics

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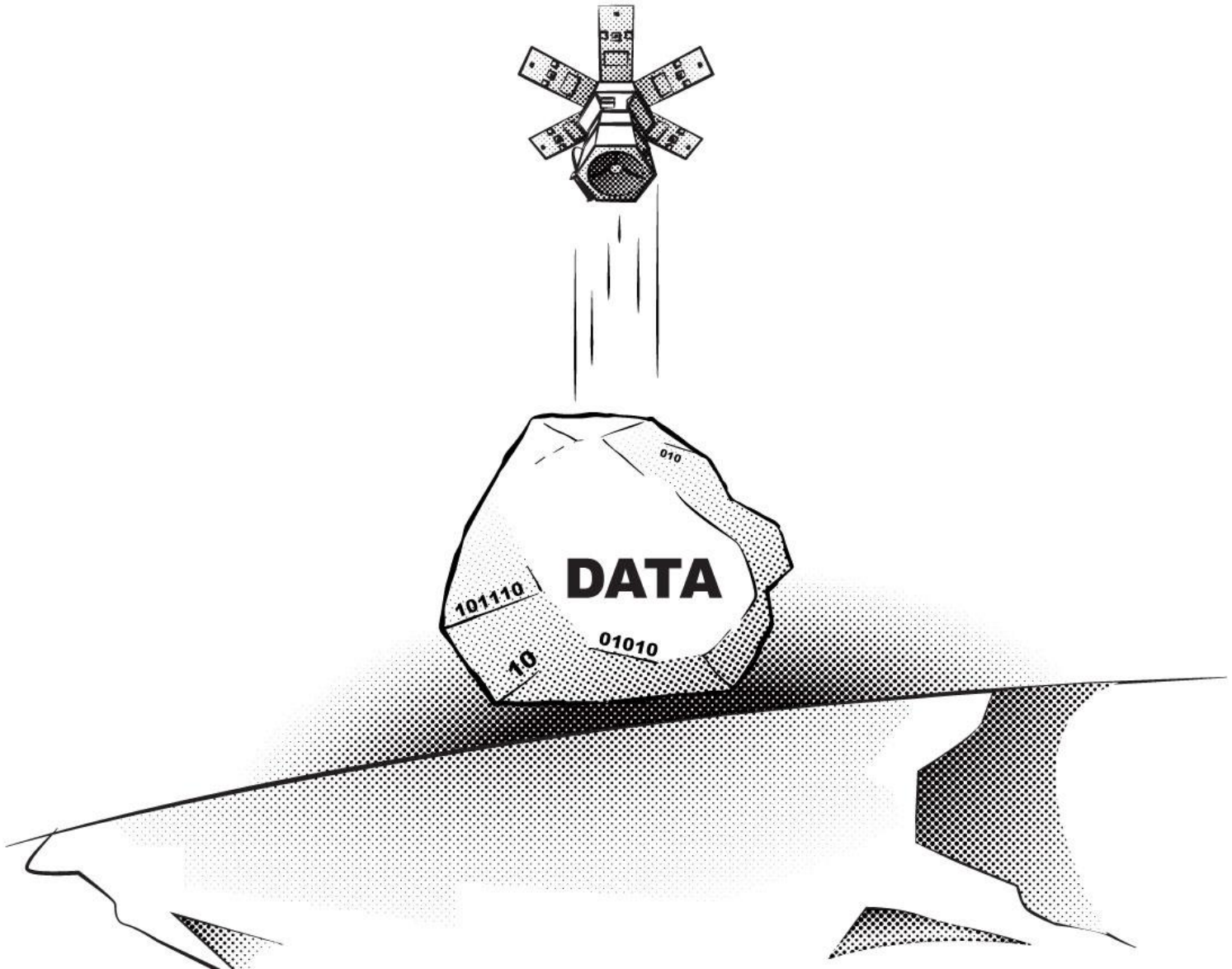
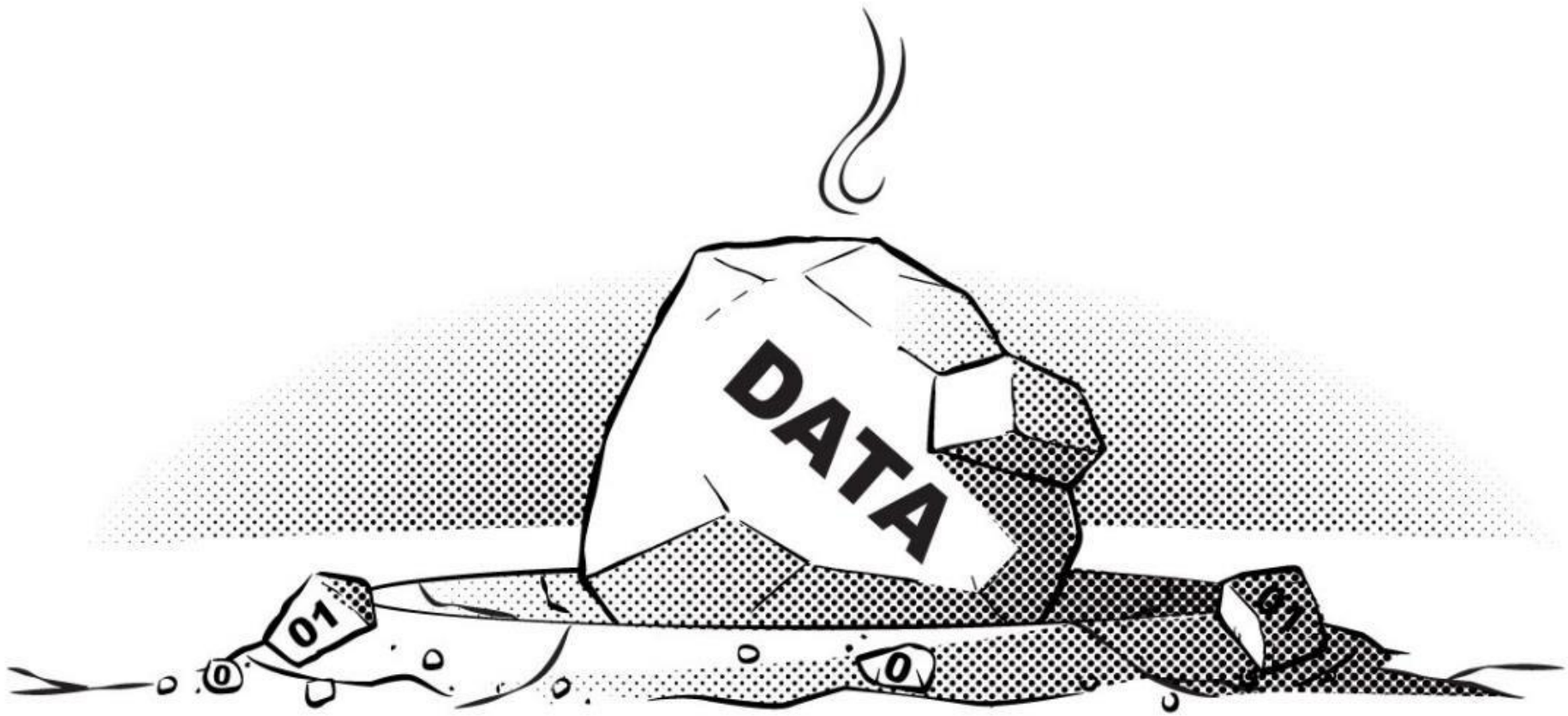
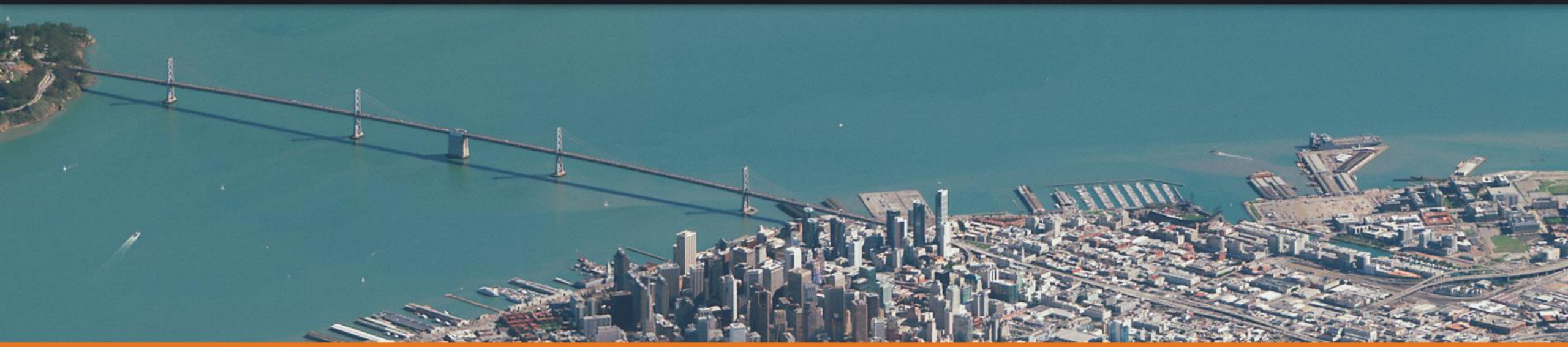
How




DATA
01
0
0
01

We captured these data boulders ...
But they were stuck “in jail”



DeepCore Machine Learning Abstraction Framework

DeepCore is a utility toolkit, written in modern C++ (C++11) by DigitalGlobe

It allows a user to download, perform either image classification or object detection, and manipulate geospatial vector files. DeepCore is intended to be a machine learning framework agnostic toolkit, allowing for a simple, clean, consistent programmatic interface. It also provides easy access to the DigitalGlobe imagery archive. As new machine learning techniques and frameworks emerge, they can easily be integrated into DeepCore. This allows developers using DeepCore to easily extend their applications with the latest technology, without having to worry about the complexities of each framework or

DeepCore's machine learning features can also be accelerated by the use of Nvidia Graphics Processing Units (GPUs) using CUDA technology. By enabling GPU mode, the process of object detection becomes very quick, allowing for faster and more efficient processing of large geographic areas. The use of GPUs to accelerate machine learning and object detection processes is highly recommended.

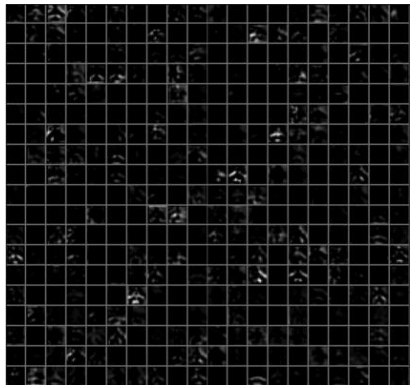
THE CHALLENGE for Exploration and Production…..

HOW DO WE ANALYSE ALL SENSOR DATA INTO SOMETHING RELEVANT ?

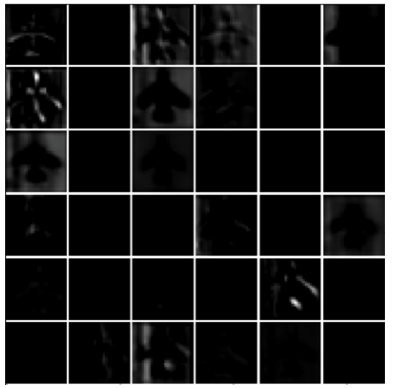
It’s all about the **information**

Data	Customer data such as sensor data, your data and access to imagery archives plus 3rd party data including RADAR
Compute	Highly scalable compute architecture for parallel processing of analytics
Ecosystem	Access to third party, partners and developer and proprietary ecosystem of algorithms
Analytics	Any algorithms that can be ported to the platform, such as ENVI, CrowdAI, ThinkTopic, Simularity, Exogenesis, SAP Hanna
Information	Asset monitoring, Specialized Change Detection, Building Footprints, etc.

Deep Learning



hidden layer 1



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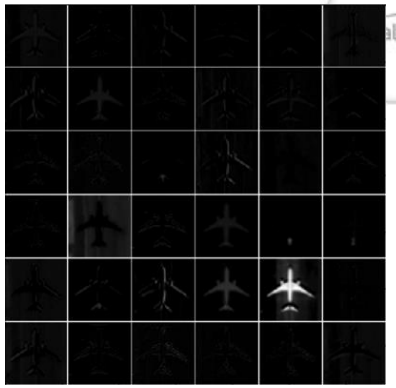
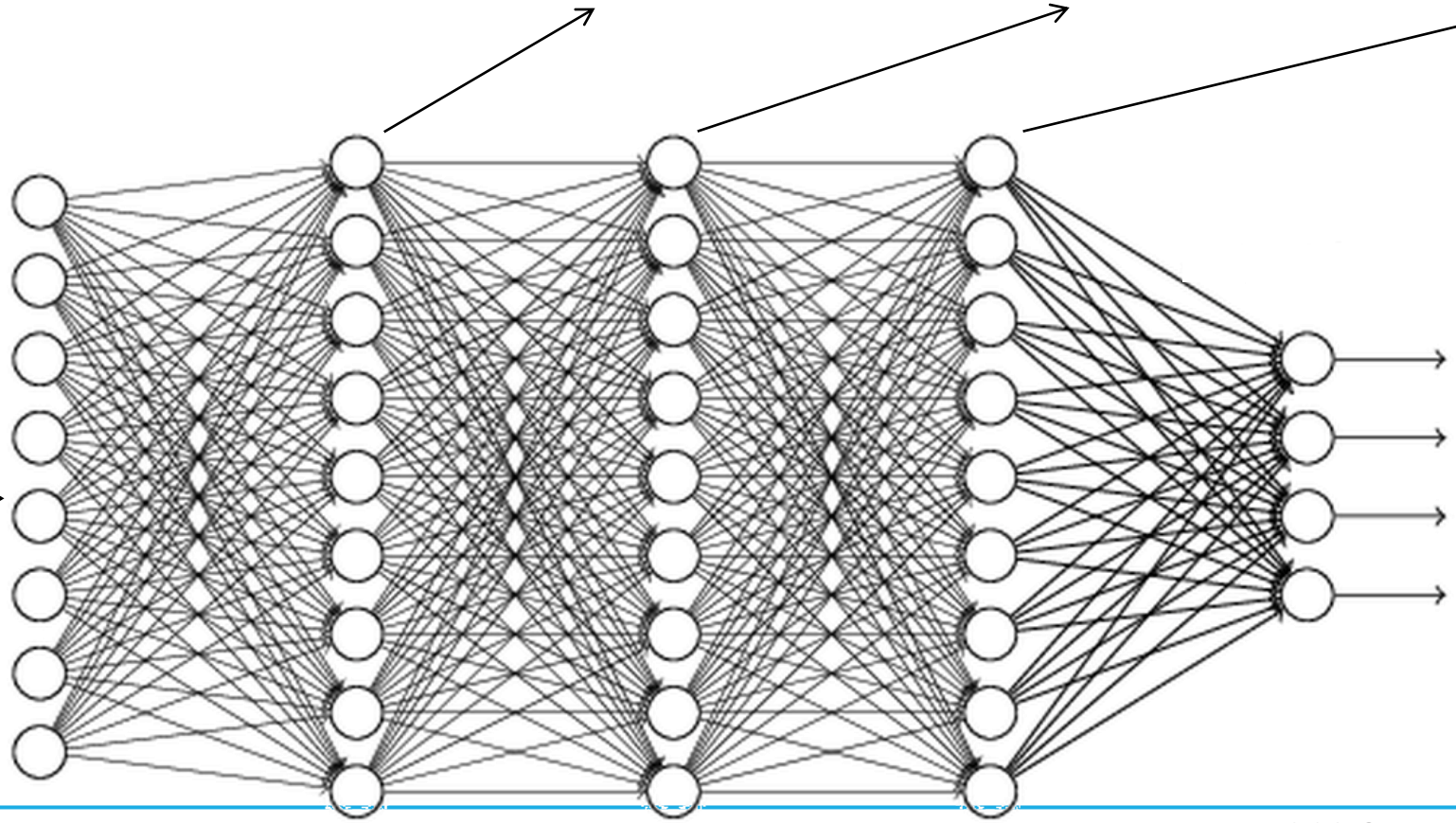


hidden layer 3



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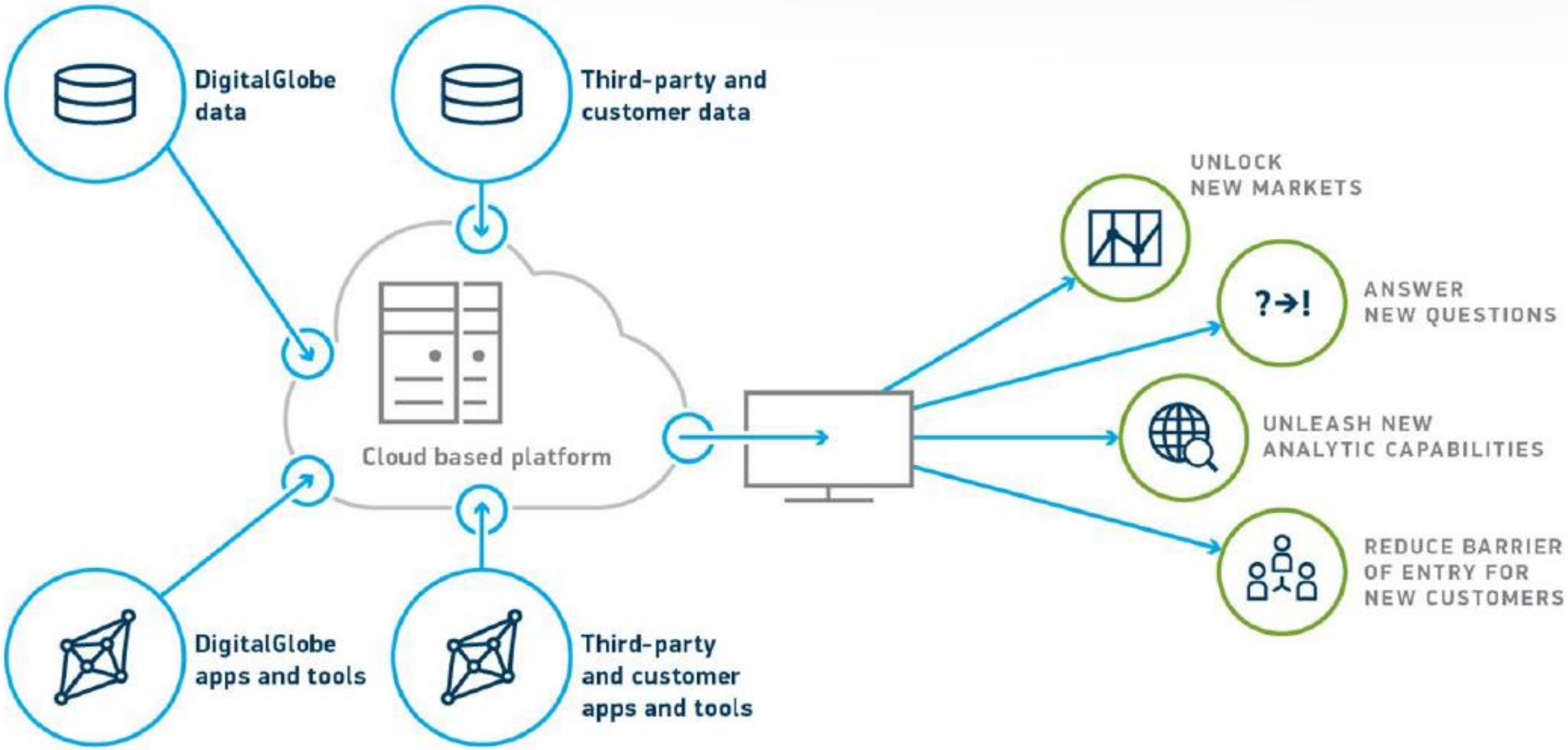
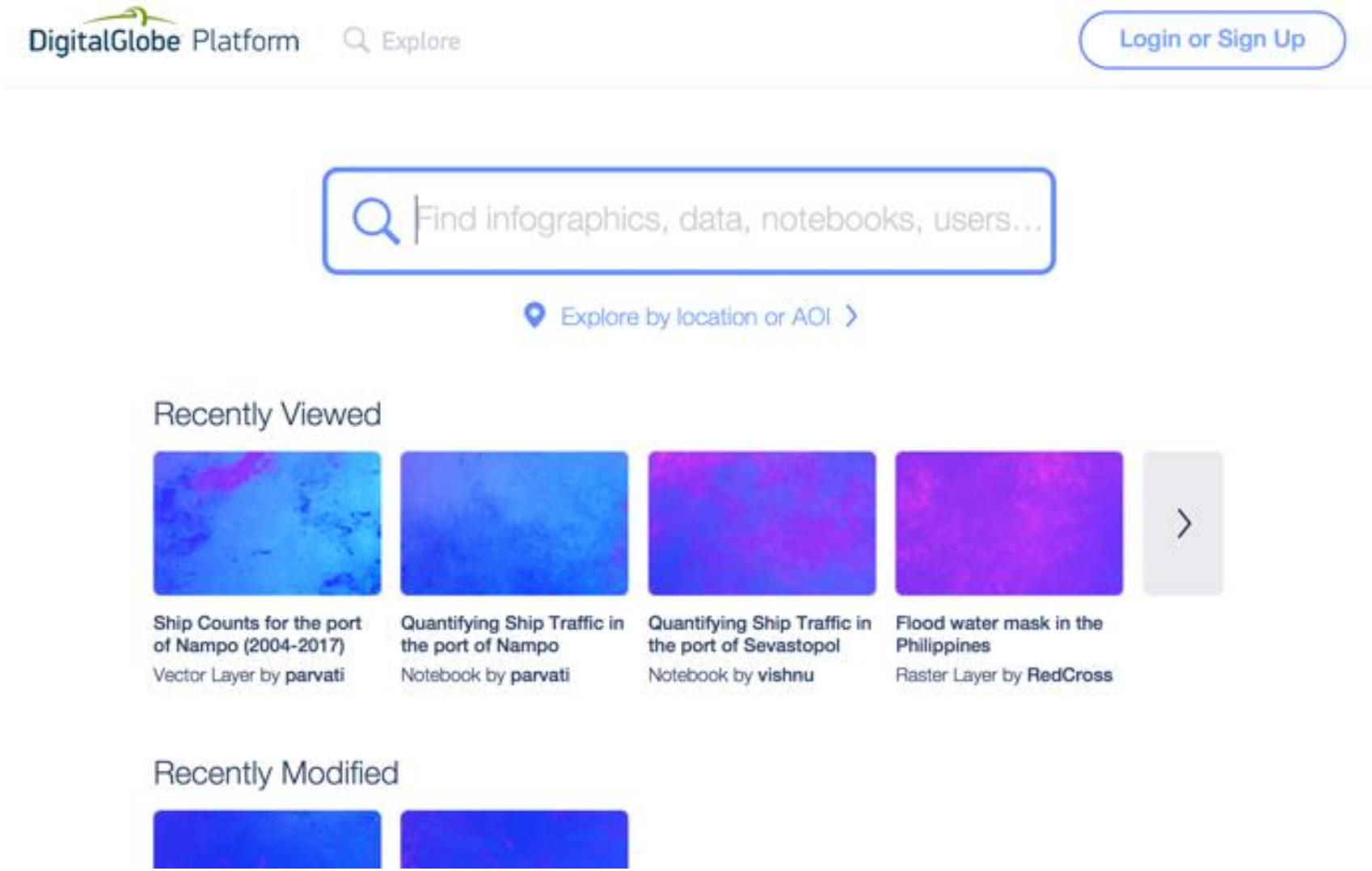
Simple


DigitalGlobe data
Third-party and customer data
Cloud based platform
DigitalGlobe apps and tools
Third-party and customer apps and tools
UNLOCK NEW MARKETS
ANSWER NEW QUESTIONS
UNLEASH NEW ANALYTIC CAPABILITIES
REDUCE BARRIER OF ENTRY FOR NEW CUSTOMERS

ASK



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Use Case

7.6 million square km

24 million people

13 million structures

spatial analysis at

CONTINENTAL SCALE

Geoscape - Turning data into information layers

Spatial database w/ building attributes

Roof material extraction

Digital Surface Model—Elevation map

High-resolution land cover map

Building footprint extraction

High-resolution satellite imagery

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Analytics

- Machine Learning
  - Object Detection
  - Feature Extraction
- Generalized Change Detection
- Anomaly Detection
- In House Analytics
- ESRI Raster Analytics
- ENVI Algorithms

Key Drivers

- Explosion of new algorithms/methods not integrated with existing work streams
- Procurement activities protracted and complex
- All require large volumes of data access to be relevant
- Accelerate ecosystem growth to drive solutions for niche/unique demands

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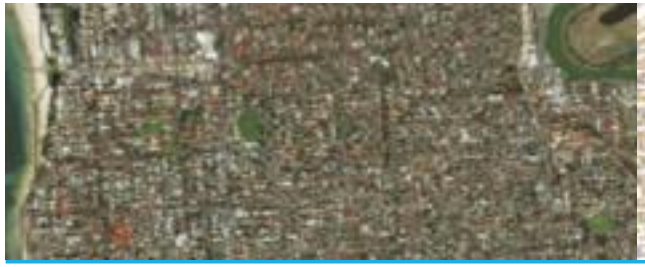
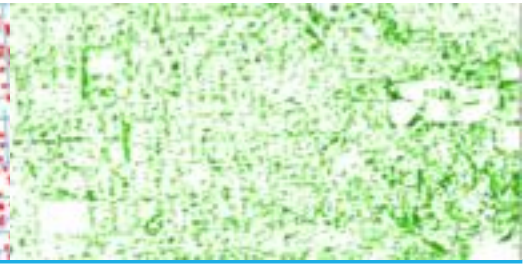
Information Layers for E&P

- Unconventional Asset Monitoring
- Pipeline Monitoring
- Land based Asset Monitoring
- Infrastructure Monitoring
- Building Extraction
- Oil Seep Mapping
- Road Extraction
- Competitive intelligence
- Refinery and Tank Farm Monitoring

Key Drivers

- “Best available” data sets derived from most current content
- Customers indicate they have analysis needs but don’t want to create every Information Layer themselves.
- Support a larger market





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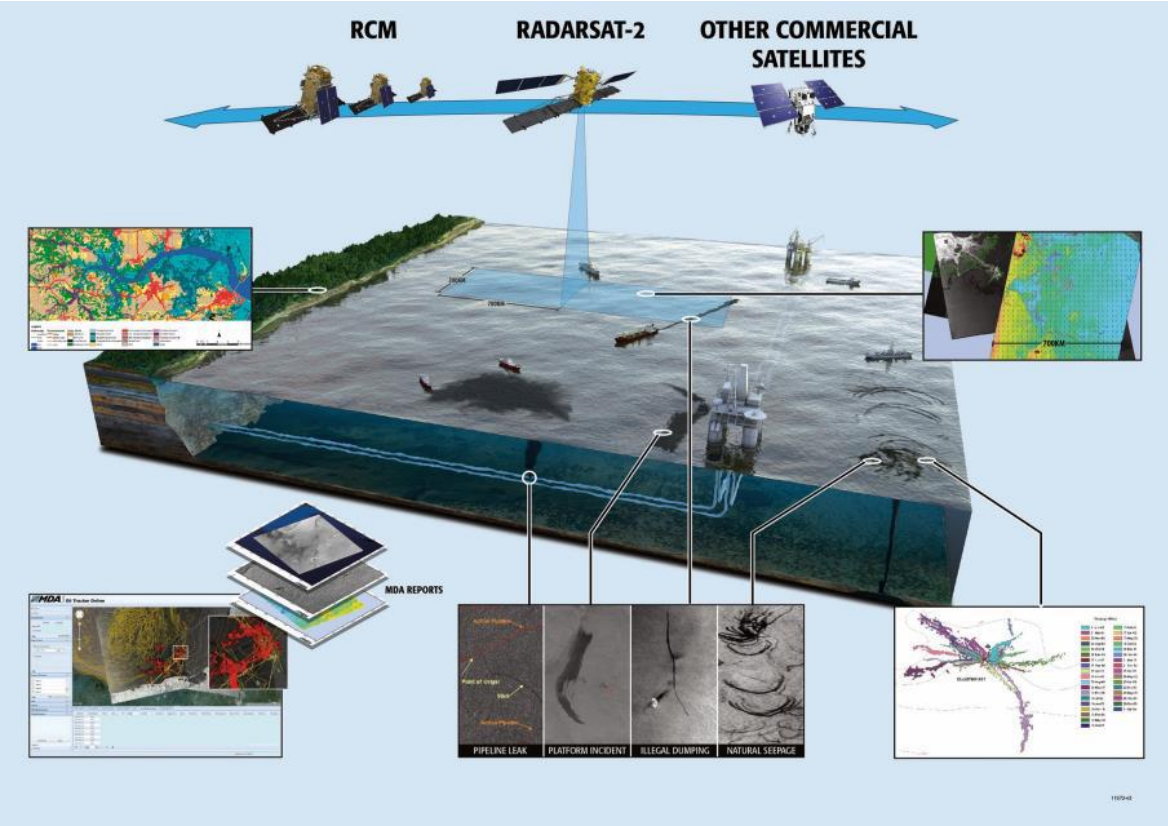
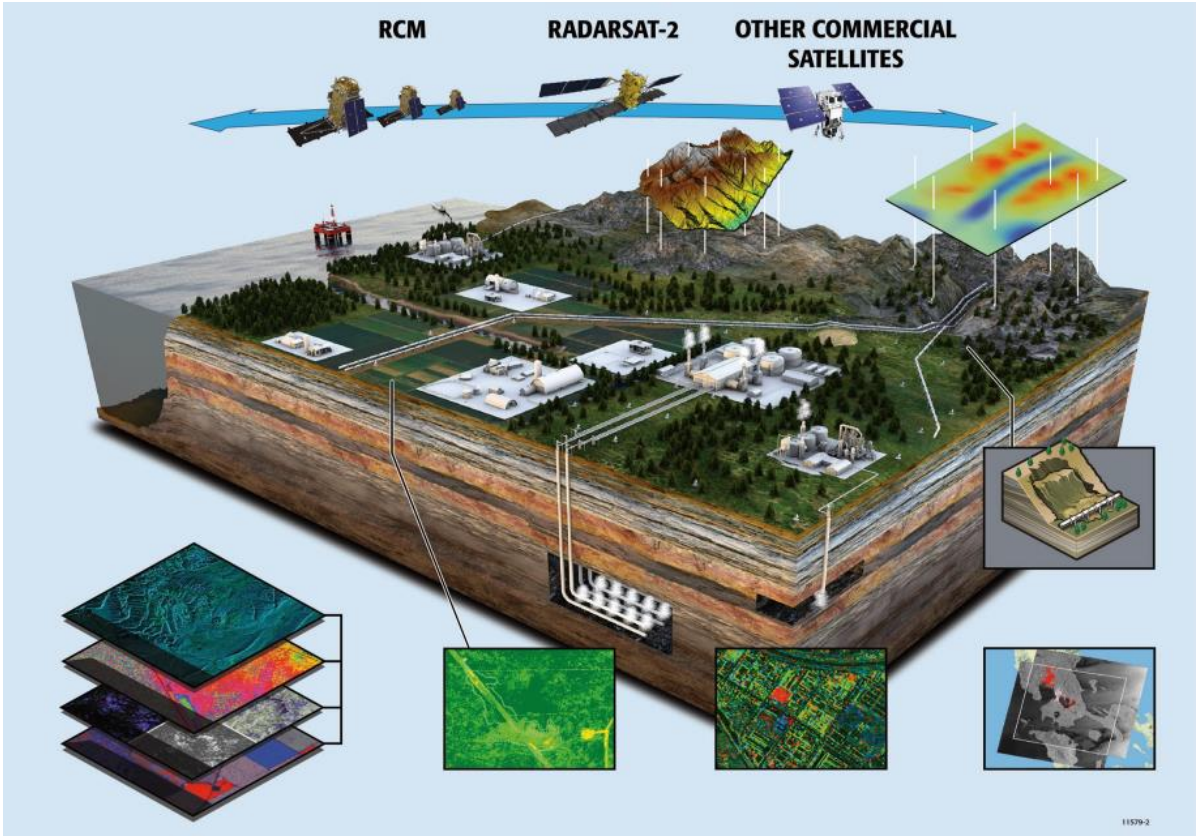
Operations Analytics





- Oil on water detection from all source
- Natural Seep Studies
- •Incident response support
- •Vessel/platform monitoring
- •Metocean information
- •Shoreline sensitivity mapping

- •Enhanced Oil Recovery Monitoring
- •Pipeline monitoring
- •Change Detection
- •Historical Movement Analysis
- •Digital Elevation Models
- •Map Products

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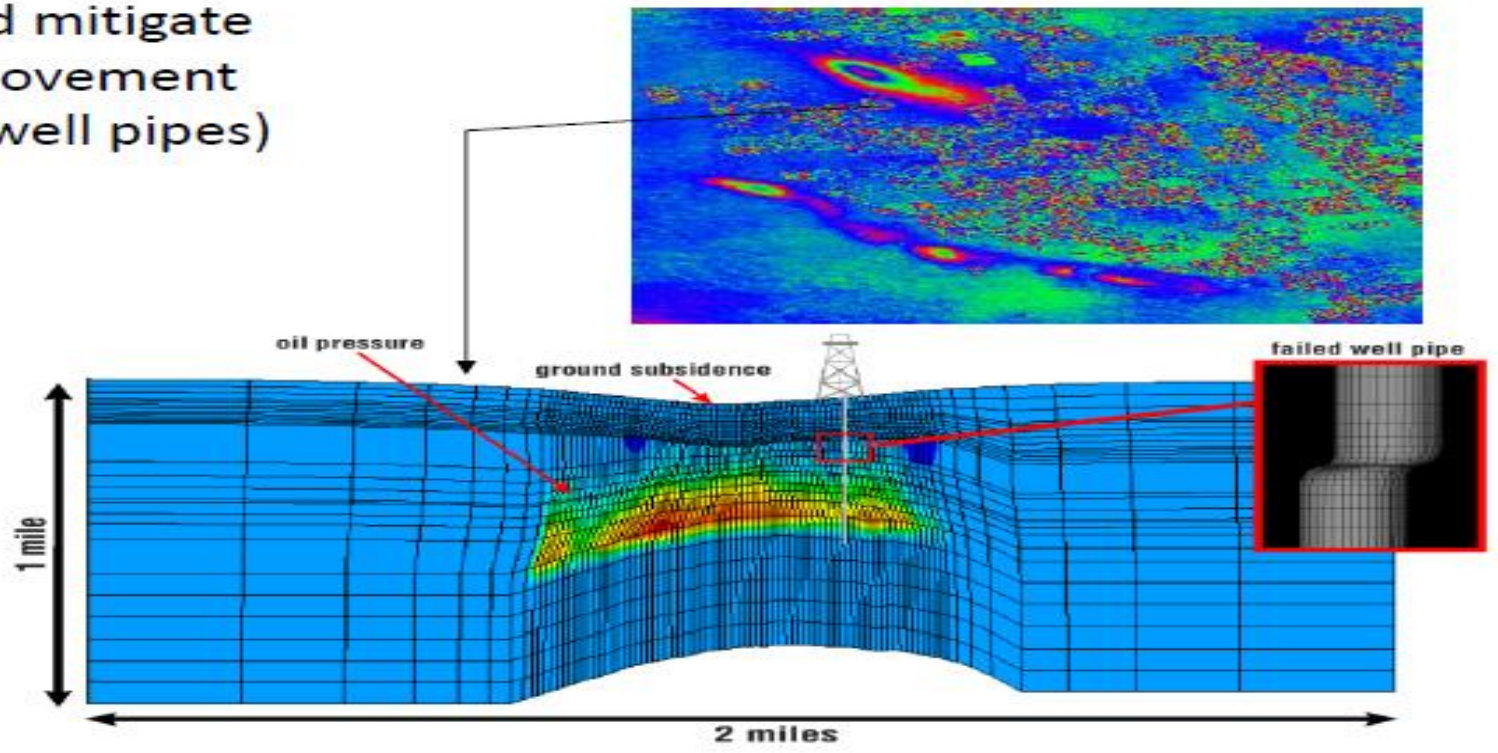
What if you could predict damage to wells ?

Production Monitoring

- Ground movement data can be used to optimize operations and mitigate the impact of ground movement on infrastructure (e.g., well pipes)



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From Production to Storage

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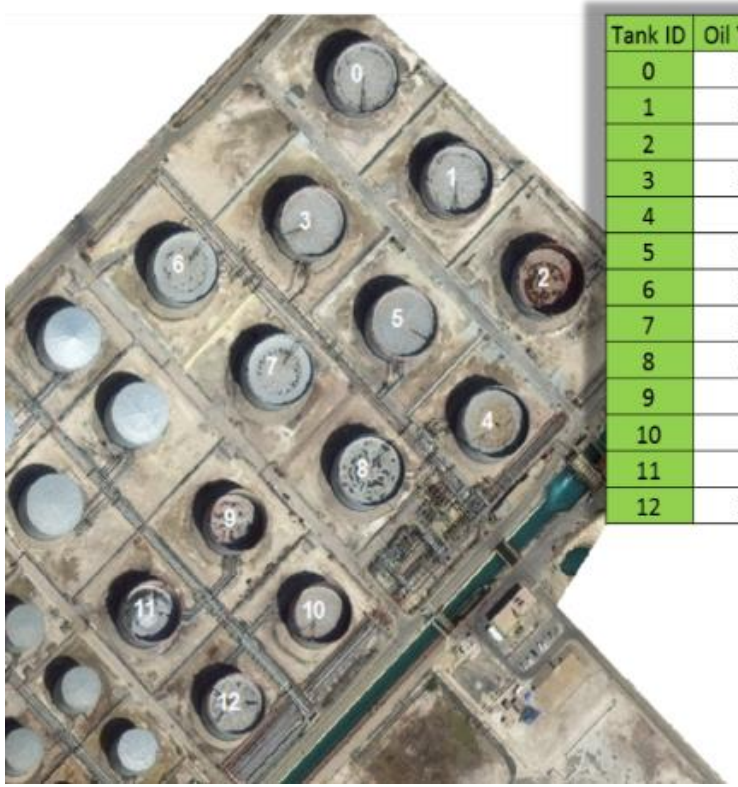
Floating Tank Lid Monitoring



Tank ID	Oil Volume (m^3)	Oil Volume (bbl)	% Full
0	16100.74	101270.60	80.50
1	12201.48	76744.99	61.01
2	2046.45	12871.81	10.23
3	13712.63	86249.85	68.56
4	7425.26	46703.49	37.13
5	14485.61	91111.76	72.43
6	16100.74	101270.60	80.50
7	16100.74	101270.60	80.50
8	16100.74	101270.60	80.50
9	1701.37	10701.32	10.01
10	6423.56	40402.95	37.79
11	9350.69	58814.05	55.00
12	12851.58	80833.99	75.60

Customer Requirement

Monitoring of floating tank lids to add critical information to trading algorithms

Challenge

How to determine information on oil inventories that are not publically reported on a regular basis

Solution

Two measurement methodologies to calculate oil tank volume levels from high resolution imagery. Calculations Include volume capacity, temporal monitoring, historical Trends

Benefit

Timely, accurate, reliable, measurements on a global basis to fit the customers needs

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Pipeline and Asset Detection

Customer Requirement

Rapid assessment pipeline locations , well pads and assets from space

Challenge

How to detect and monitor pipelines and assets in a cost efficient manner

Solution

Large scale automated asset detection combined with optical, radar, and other source of surveillance

Benefit

Cost effective monitoring of assets in urban, and or remote locations

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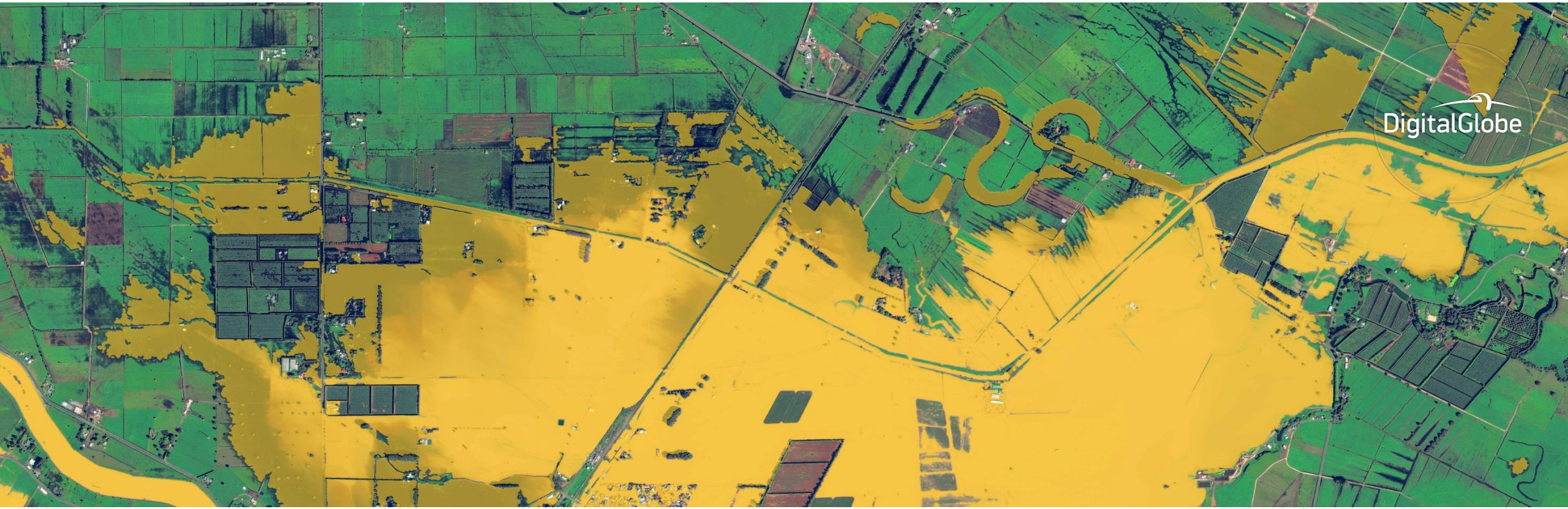
Health, Safety and Environment - locating people to delivering vaccines to protecting assets

…that can have a fundamental impact on business operations

Energy Corridor – Houston 31 August 2017

Flood water classification



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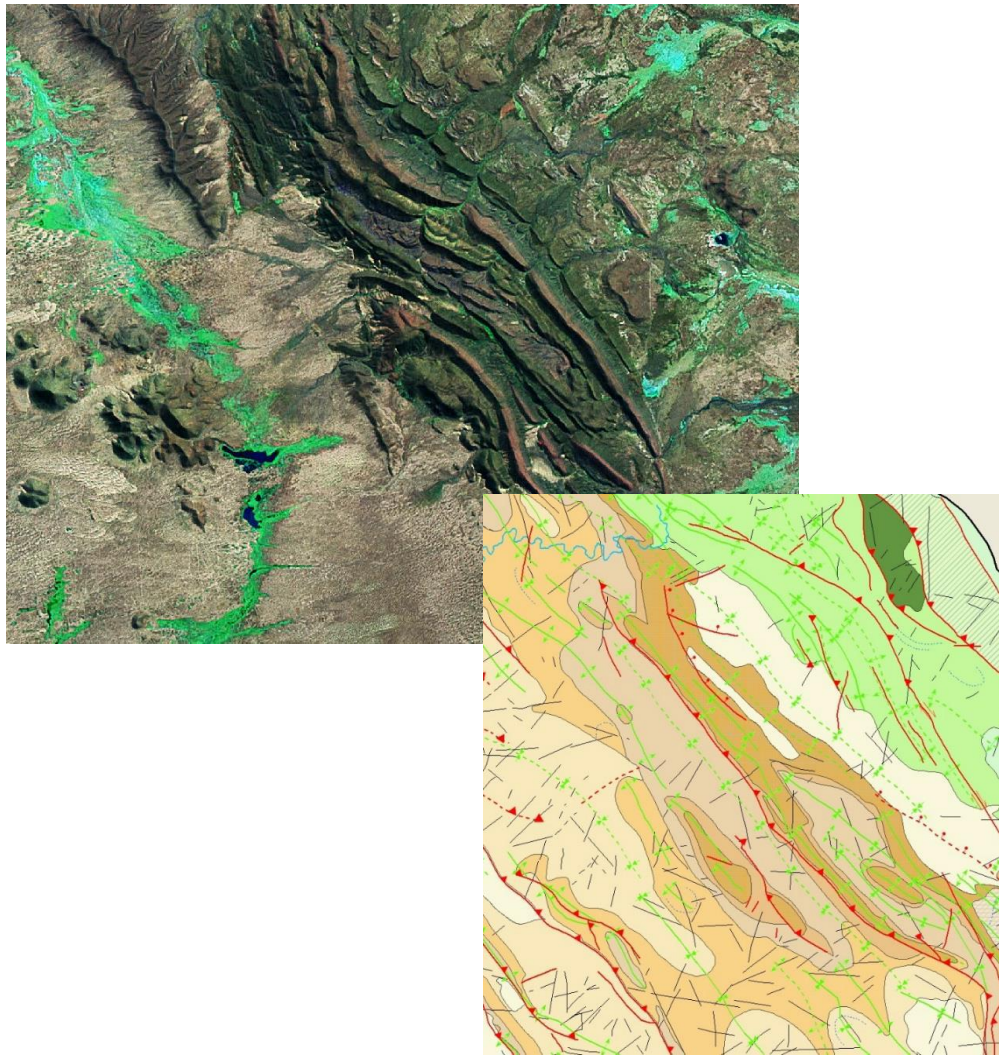
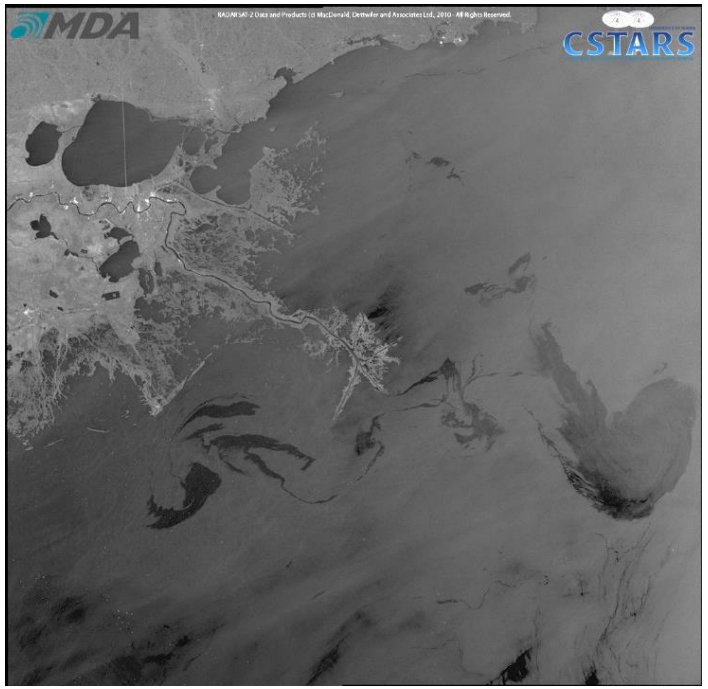
Derived Analysis

Structural Mapping



Natural Oil Seep

Oil Spill



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