Remote Sensing tivities in the UK

UK SPACE AGENCY

Simon Agass

10th September 2018

Remote Sensing and Space Activities in the UK

UK Space Agency

Chief Executive: Graham Turnock

An Executive Agency of the Department of Business Energy and Industrial Strategy (BEIS)

- ✓ Civil Space Policy
- ✓ Funding e.g. €1.4 billion committed to ESA over the next 4 years
- ✓ Strategic Leadership of the sector

From world-leading science to innovative satellite technology and services, space is a fundamental part of Britain's future.

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

We create jobs and help our economy grow

- £13.7 billion to the UK economy each year
- Average of 8% growth per year over the last decade - three times faster than the average sector
- Employs 38,500+
- 6.5% share of global space economy
- Critical national infrastructure
- Underpins all other key industrial sectors

Satellite Launch Programme

Transforming the UK's space economy by enabling commercial small satellite launch services and sub-orbital spaceflights from UK spaceports

Recent Developments

- The Space Industry Bill receives royal assent and becomes UK law
- Regulation is now being developed under the Space Industry Act 2018
- Call for evidence **now open** on charging, liabilities and insurance policy
- We are preparing a business case for investment, after considering 26 proposals for funding, and will make further announcements shortly

Solving a demand problem

low cost access to space:

for small satellites,

micro-gravity science & space experiences

enabling big opportunity

>£10bn

the global opportunity for small satellite launch over the next decade

> *"There are currently some **160** commercial satellite constellations being proposed worldwide that, all together, would comprise over **25,000** satellites"*
>
> **Sir Martin Sweeting | SSTL**

with many benefits

Launch value-chains

UK spaceports

Local opportunities

Research facilities

Up-skilled workforce

STEM Outreach

by taking swift action

- £50m Industrial Strategy Satellite Launch Programme
- Develop a modern, safe and attractive regulatory regime
- Build a user-friendly digital licencing platform
- Secure international interest in & agreement for UK launch

in order to enable

LAUNCH UK

Remote Sensing and Space Activities in the UK

The UKSA EO Vision 2017-2040

To ensure that the UK's participation in Earth observation is as strong as possible and that it is recognised for the role it can play in delivering a sustainable service based economy.

By 2040 satellite Earth Observations will provide the data underpinning mass market and business applications, global cutting edge science and policy and operational decision making.

Therefore ..we should exploit the fact the UK is the lead funder of EO in the European Space Agency to develop a broad and deep ecosystem of companies big and small dealing in the entire spectrum of earth observation issues from early research and technology development, through manufacture and launch, through the infrastructure and services needed to move, validate -share and interpret the data into a format suitable for use.

We should export EO skills and technologies worldwide, negotiate a new relationship with Copernicus and plug the emerging EO skills gap to fill the jobs that will be created in the UK.

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

Thematic (Cross Cutting) Areas

Markets
- Climate
- Polar and Artic
- Sustainable Development Goals
- Marine

Technologies and innovation
- EO Technology Strategy published in December 2017.
- Quality control / Trusted/ Cal /Val activities

Data Access and Use
- Creating a sustainable supply via
  - Policy and regulations (CEOS and GEO data groups, ESA and Commission relationships)
  - Bilateral and commercial suppliers relationship,
- Enabling infrastructure

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

UK Space Gateway

European Centre for Satellite Applications and Telecommunications (ECSAT)

SSGP Space for Smarter Government Programme

We connect the economy of the future

Government

Emergency Services

Energy

Finance

Food

Water

Health

Transportation

Telecomms

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

We build partnerships

Space is the best example of cooperation among European countries and beyond.

We work with partners across Europe and around the world to achieve together what couldn't be done alone.

- Working with countries as diverse as Kazakhstan and Algeria, Tanzania and the UAE
- Encouraging foreign direct investment from global space companies like Thales Alenia Space, Lockheed Martin, Deimos and ComDev.
- International Partnership Programme (IPP): a 5 year, £152 million programme using sector's research and innovation strengths to deliver a sustainable, economic or societal benefit to undeveloped nations

UK SPACE AGENCY

IPP works in 30 countries in Americas, Africa, Asia & Pacific

70 different UK organizations (industrial and academic) 100+ overseas partners!

Remote Sensing and Space Activities in the UK

Space for Smarter Government Programme

Led and funded by the UK Space Agency

Established in 2014

Delivered in close collaboration with the Satellite Applications Catapult.

Working on cross-cutting initiatives centred around Disaster Risk Management, the Emergency Services and Infrastructure

Enabler for wider export

Aims to increase the uptake of space data and services within the UK public sector to enable efficiencies

- Facilitate
- Investigate
- Demonstrate

www.spaceforsmartergovernment.uk

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

Data: The digital age's natural resource

In 2012 IBM identified that the digital universe would consisted of eight zetabytes in 2015

Sentinel 1 mission between 2015-2030 alone will produce in excess of 13 PB of RAW data

Sentinel 1 A&B captures and downlinks ~2.4Tb of raw data a day

Average PC from 2000

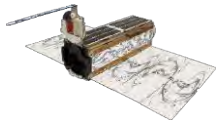
UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

We live in the age of Big Data

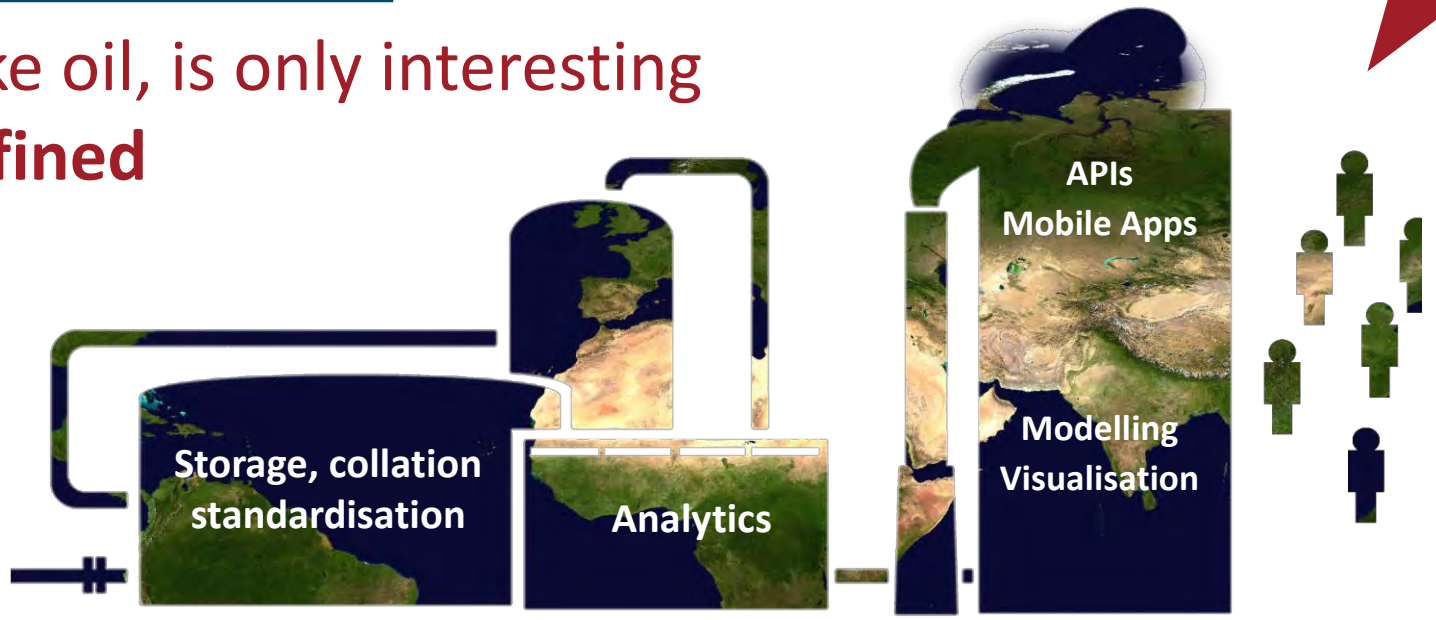
Free access to space

State of the art space



Commoditisation of space

but data, like oil, is only interesting when its **refined**



Data accessibility

Mass Market

the **innovation** comes in with new techniques and tools

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

Globalisation

We are seeing a step change of how geospatial data is interacted with on the web.

Traditionally the world of Earth Observation Data has been somewhat isolated from the rest of the data landscape.

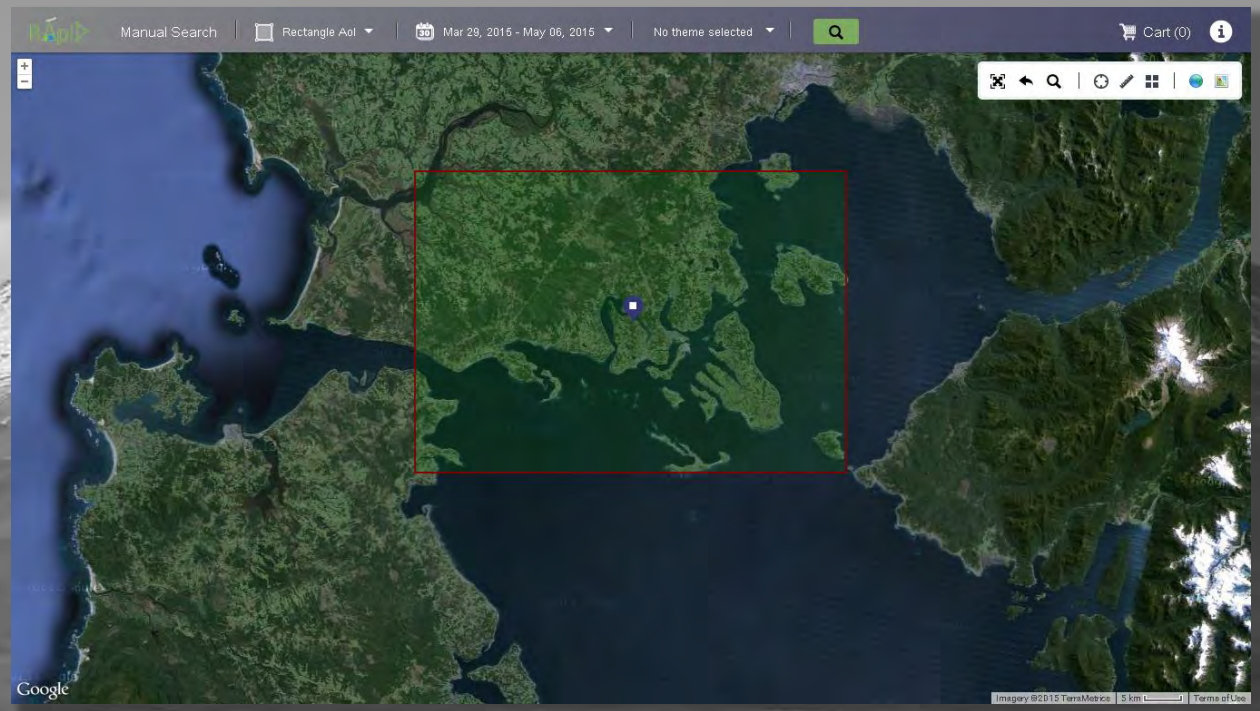
We are more connected now than ever before

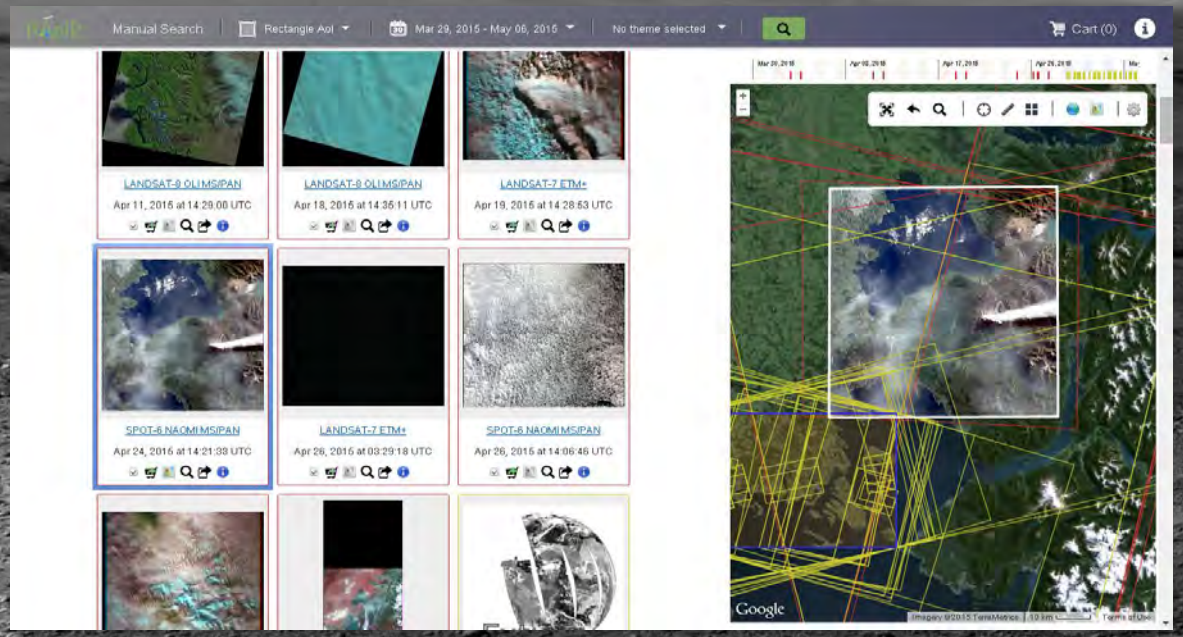
UK SPACE AGENCY

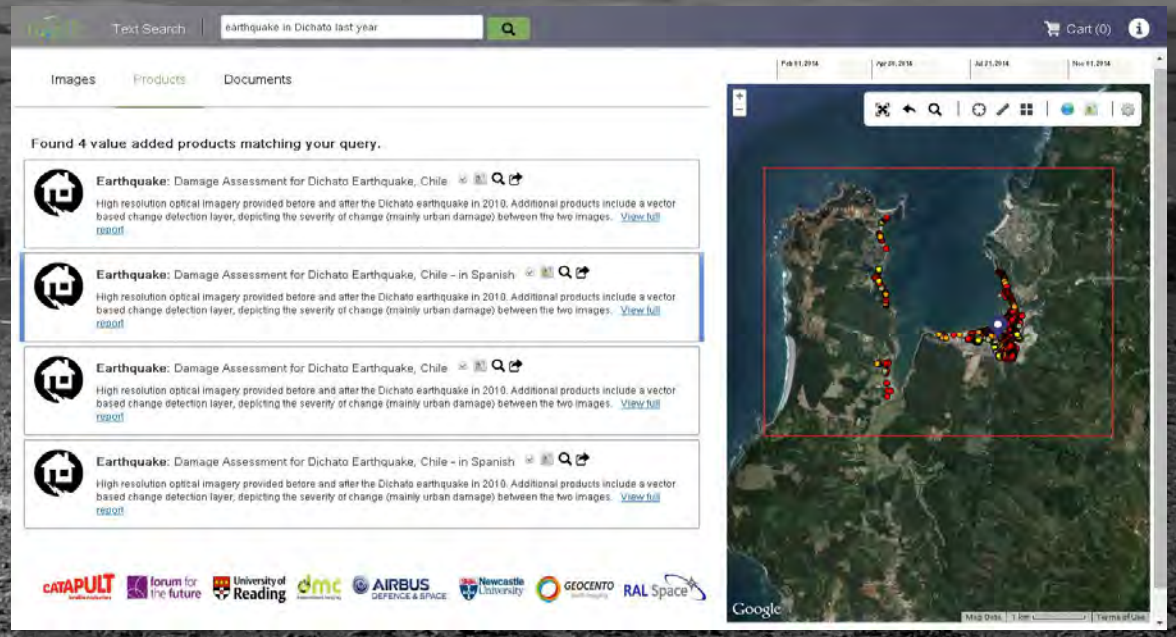
SAFE-D

Linked data application to support disaster management

Enabling rapid data acquisition, analysis and dissemination using Web 3.0 technologies.

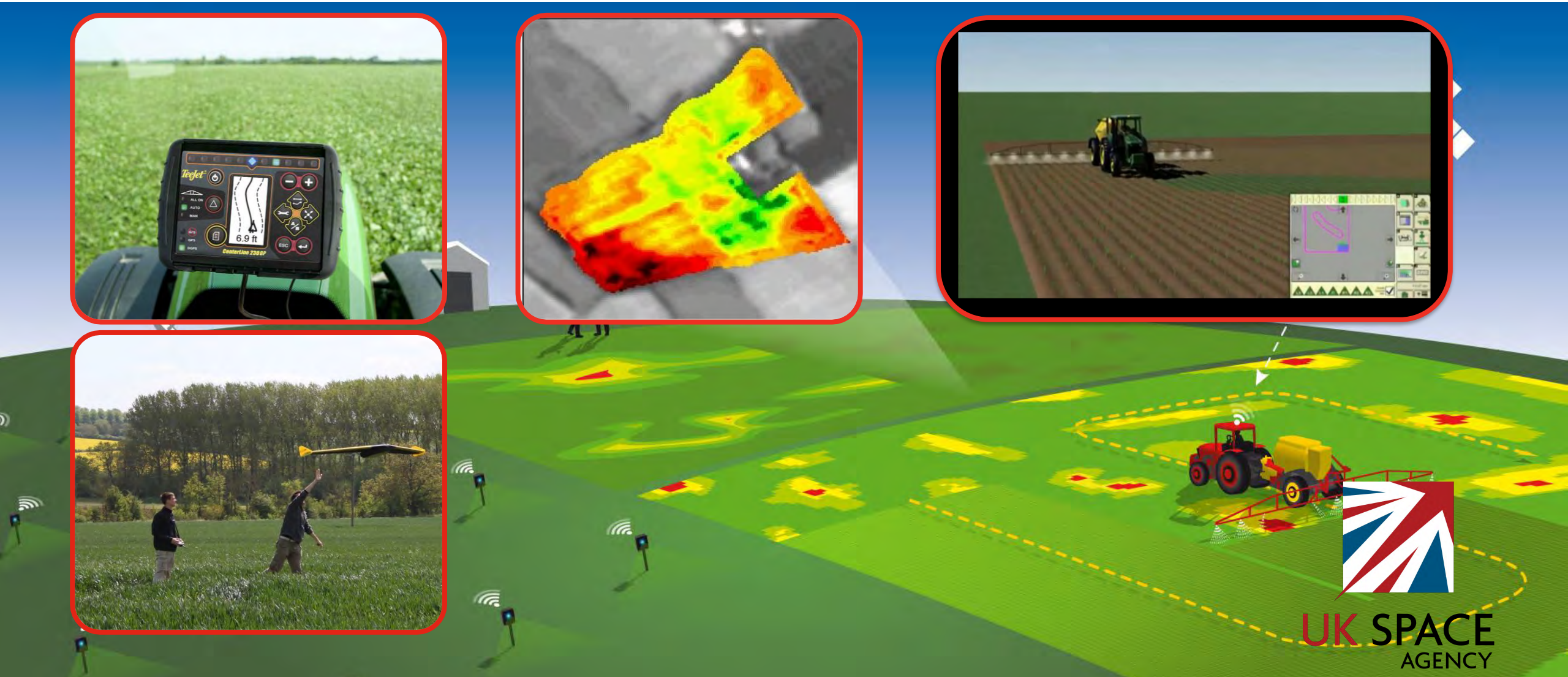






Remote Sensing and Space Activities in the UK

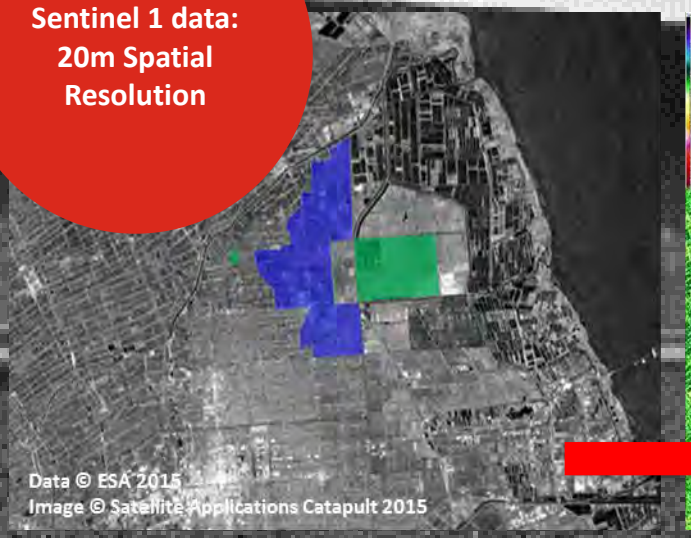
Agricultural applications



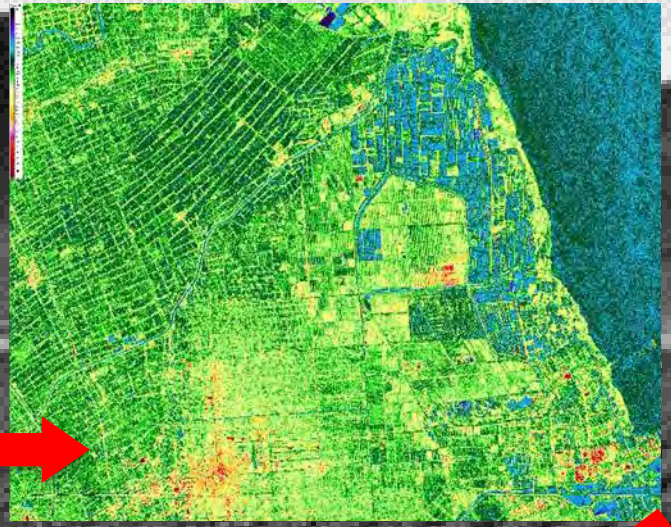
UK SPACE AGENCY

Demonstrating C-band Radar Backscatter as a Function of Crop Phenology

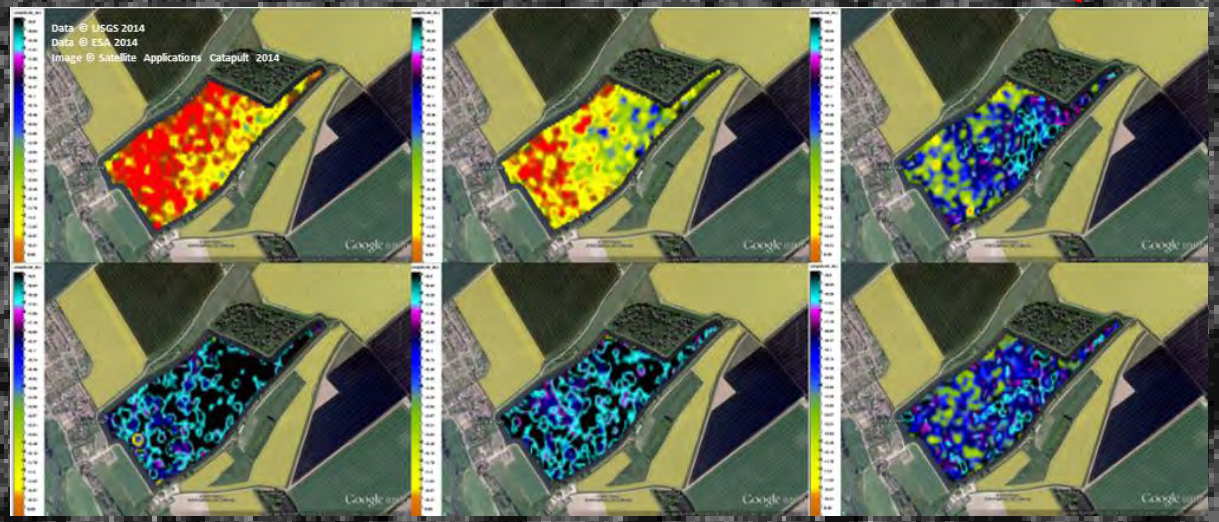
Copernicus Sentinel 1 data: 20m Spatial Resolution



A geocoded, speckle filtered Sigma0 VV product derived from Sentinel-1 data and overlaid with a shape file of the farm.

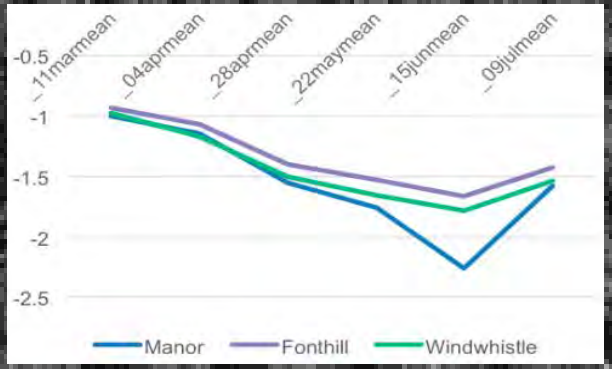


A colour coding image derived from the geocoded speckle filtered Sigma0 VV product.



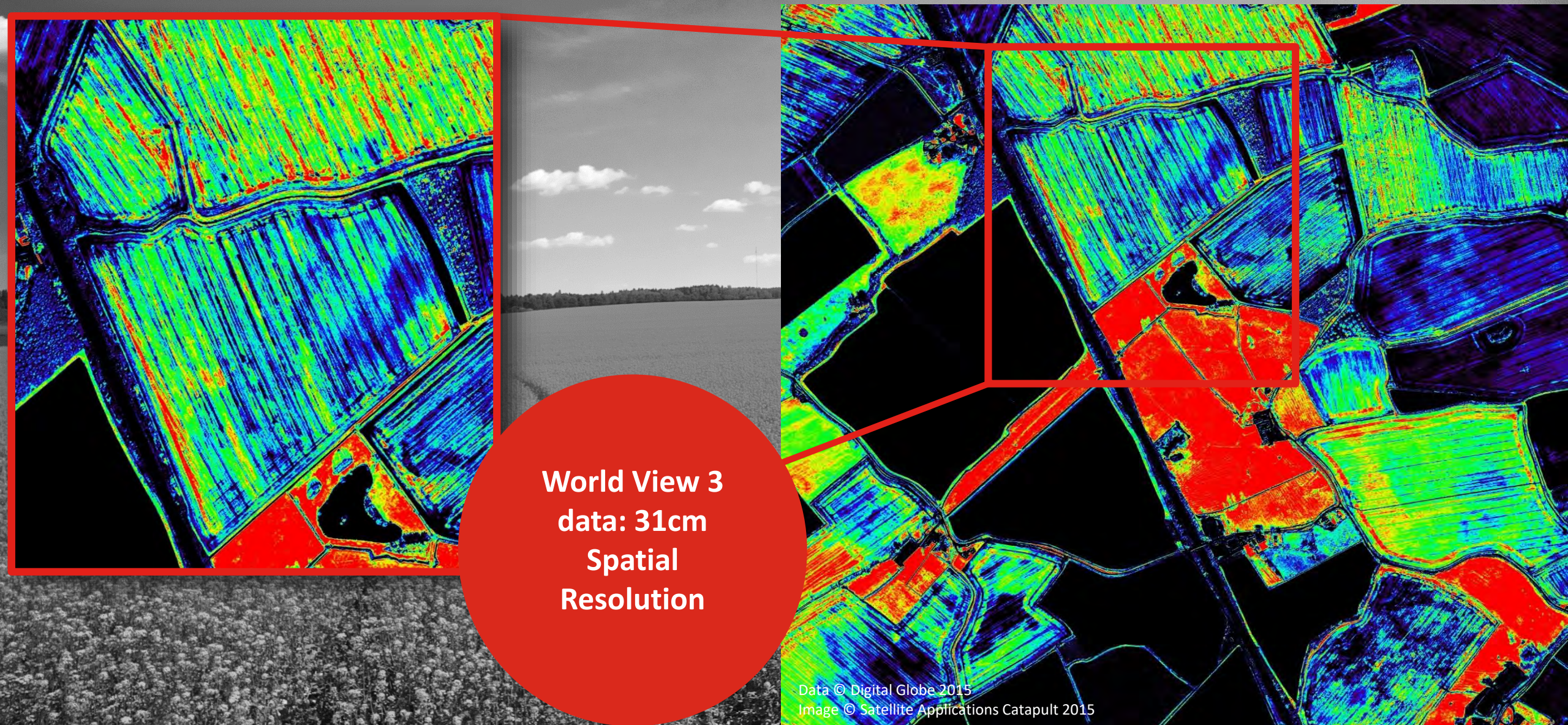
The amplitude of backscatter derived from polarization VV for a wheat field in time (left to right).

Research has clearly demonstrated the possibility of monitoring the **growth stage** of cereal and oilseed rape crops, by linking data from the **Copernicus Sentinel 1 satellite** with phenological state.



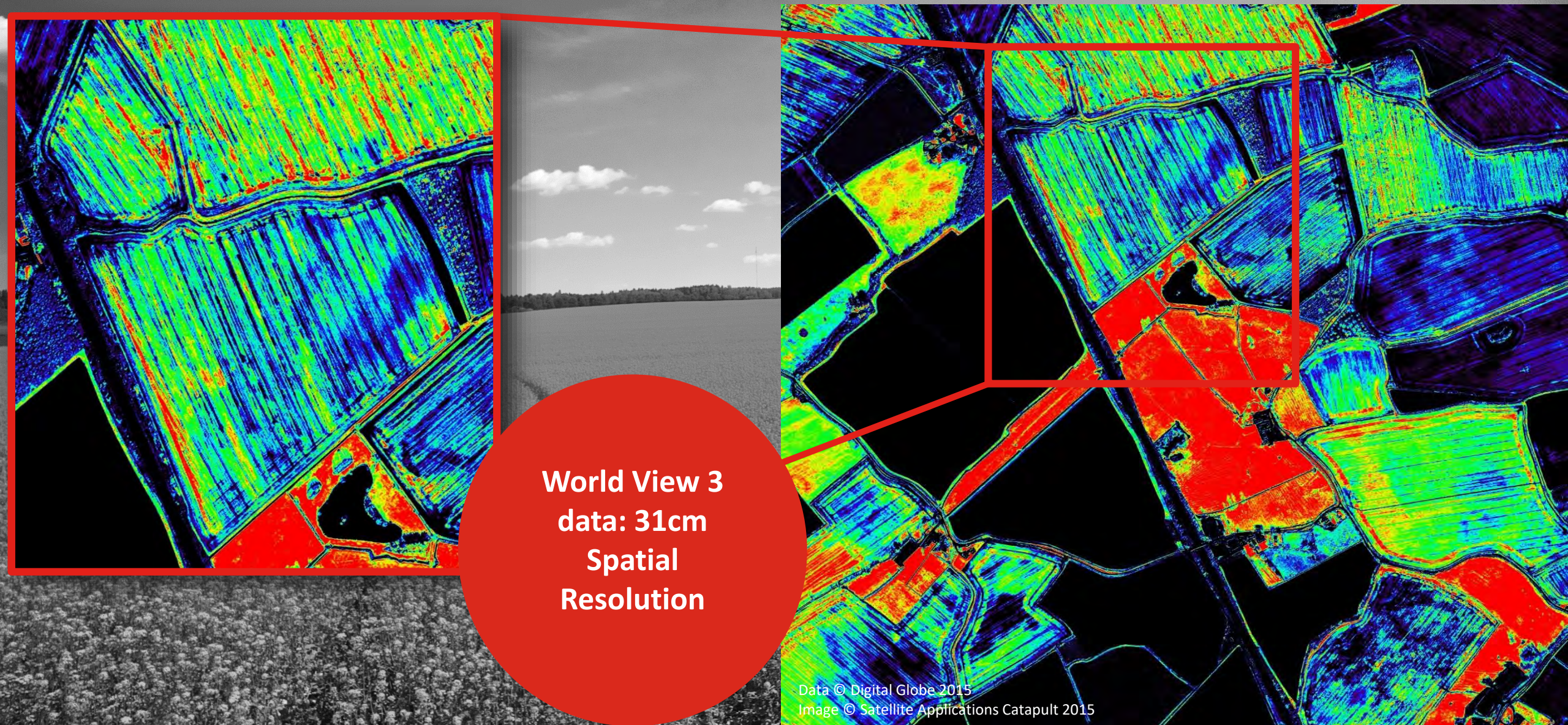
Logarithmic time series plot of average backscatter values from wheat fields.

Demonstrating the use of high resolution optical data for farm management



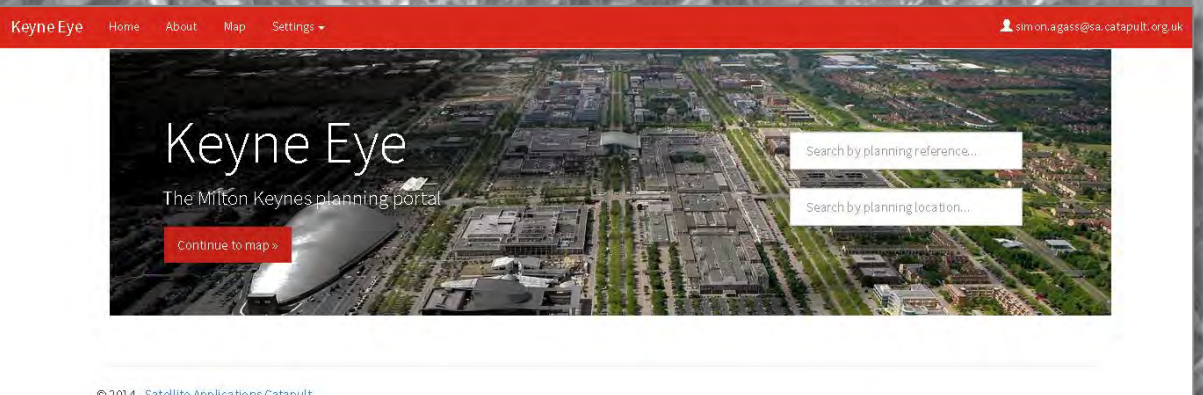
World View 3 data: 31cm Spatial Resolution

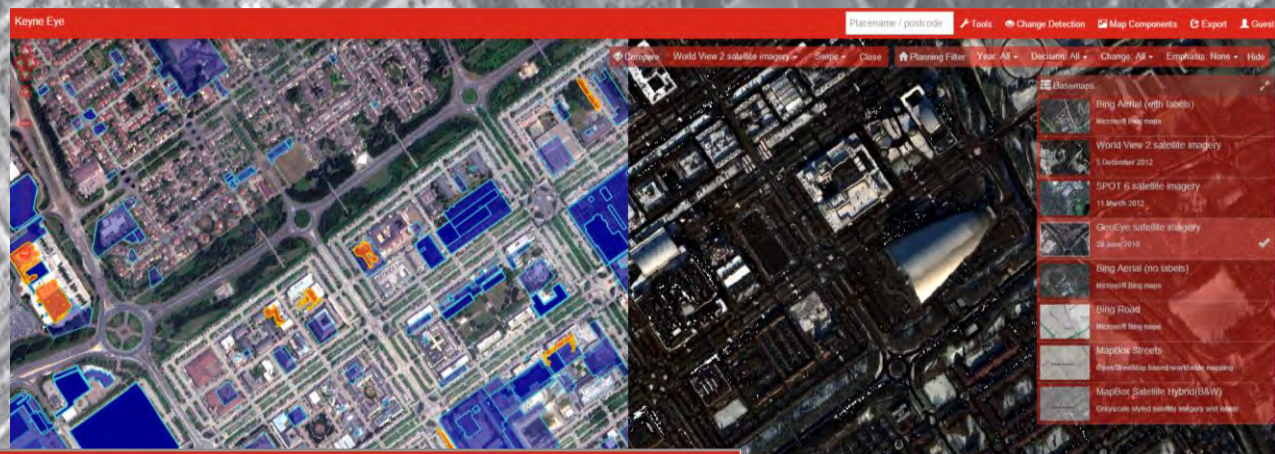
Demonstrating the use of high resolution optical data for farm management

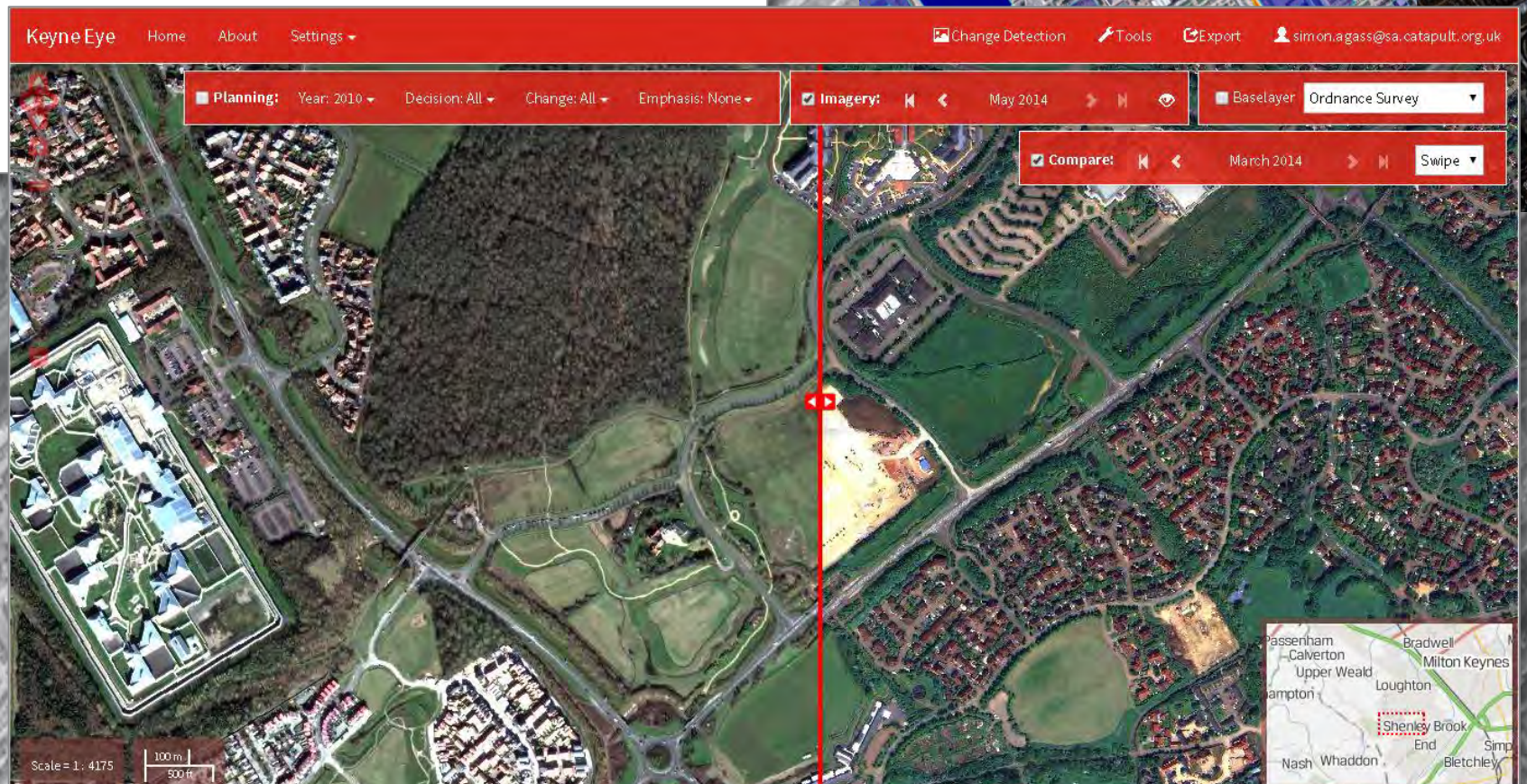


World View 3 data: 31cm Spatial Resolution

Working With Local Authorities





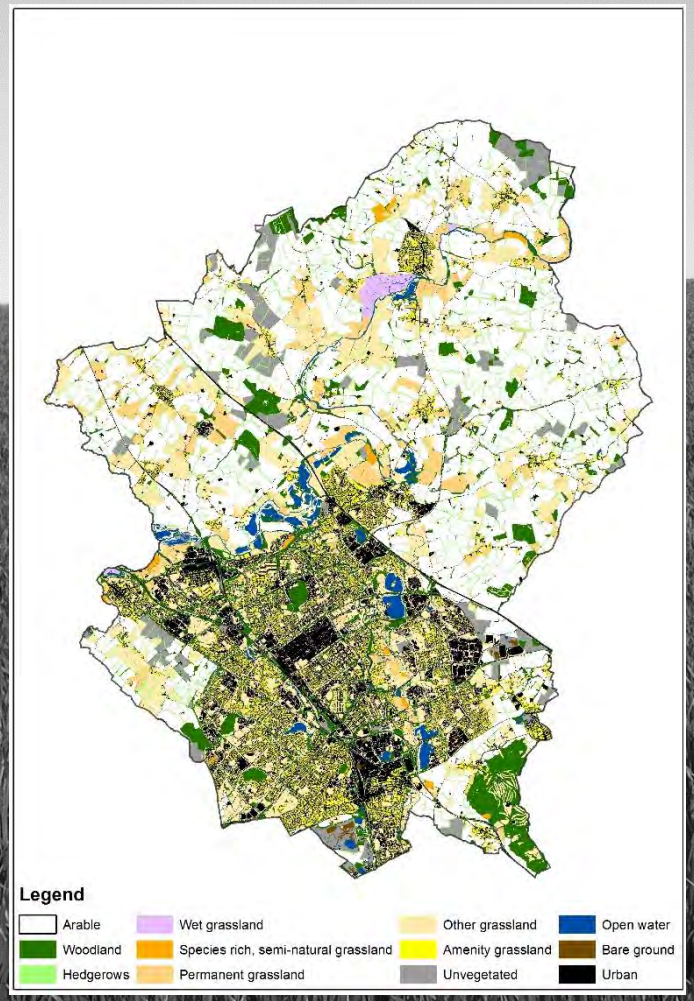


Milton Keynes Ecosystem Services

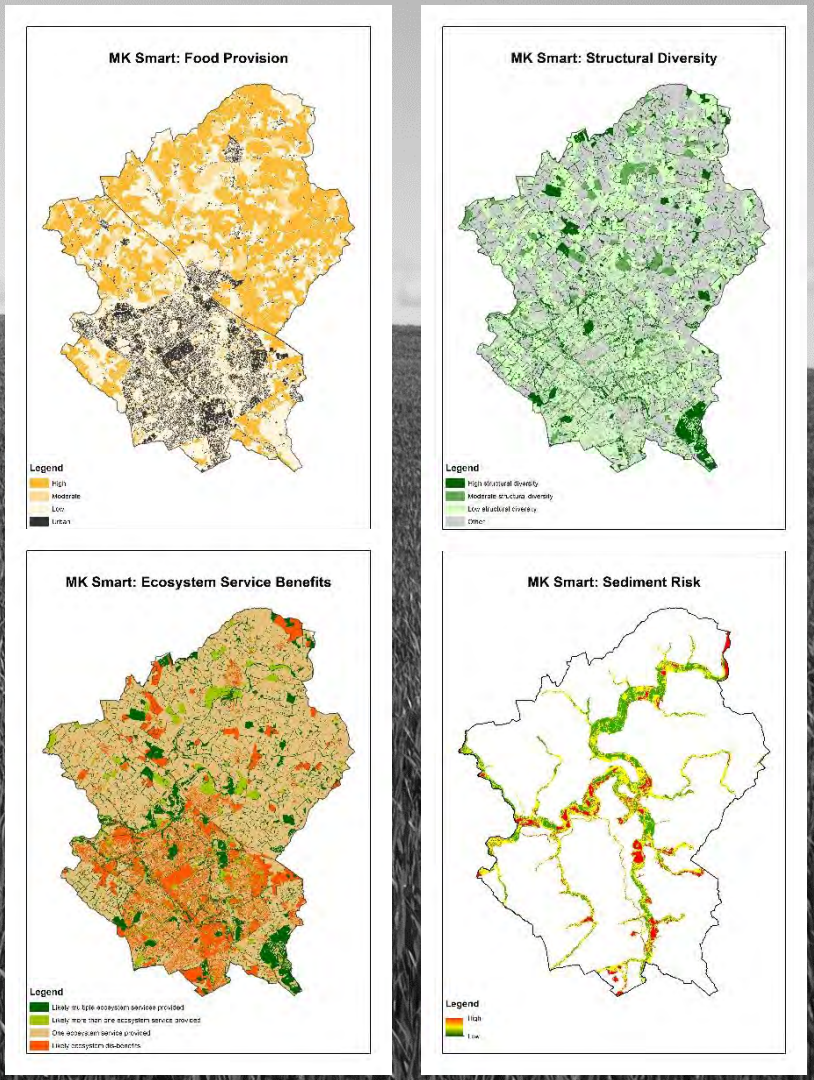
Ecosystem Service Assessments are valuable tools for local authorities, as they provide a framework for looking at whole ecosystems in decision making.

Object-based image analysis, on multiple satellite datasets, is used to classify the county borough.

Each delineated habitat is given a score of importance, from low to high, for each ecosystem service layer.



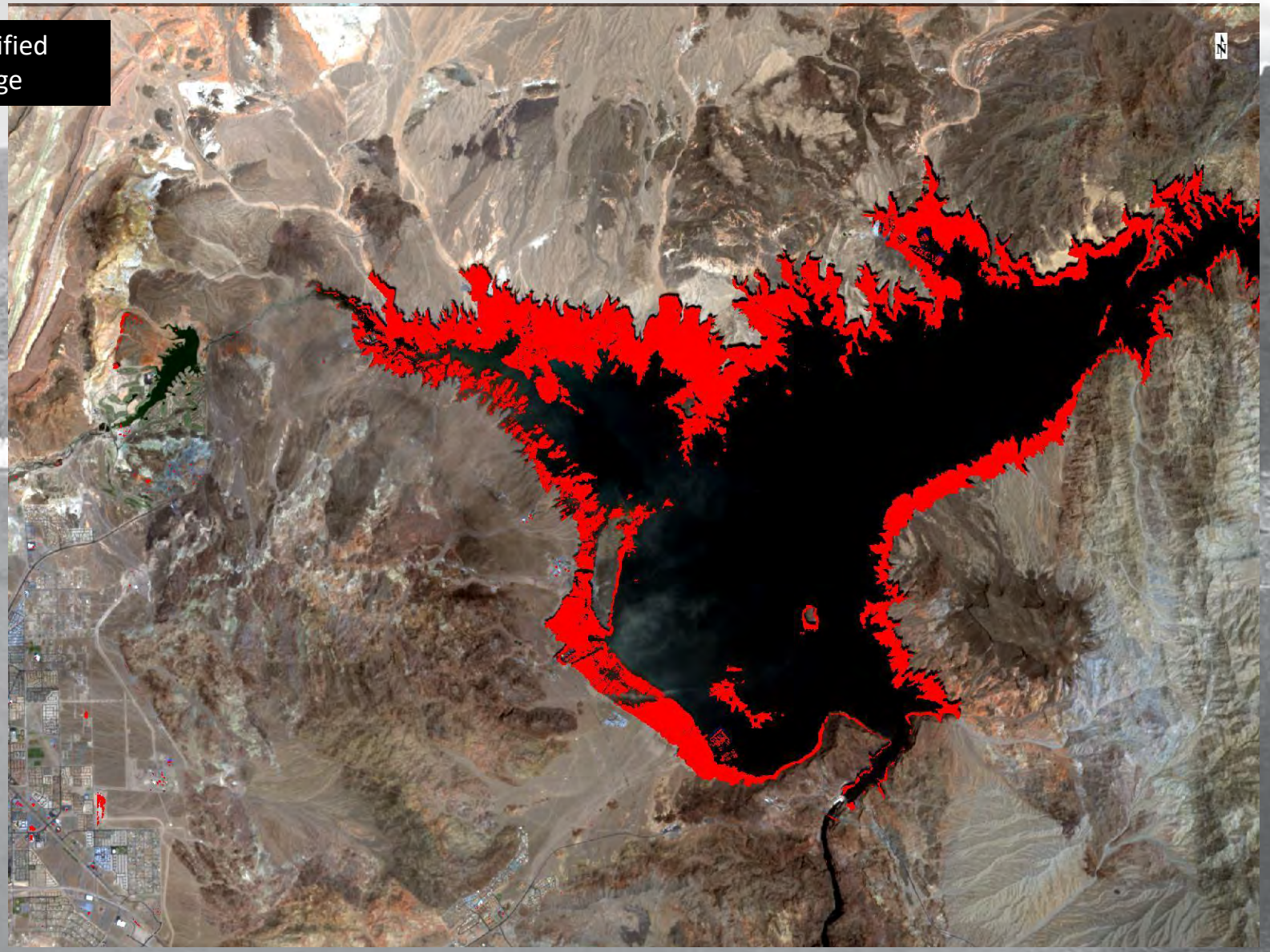
Multi-temporal and sensor classification, using object-based analysis



Derived ecosystem service layers

Natural Resource Change

Identified Change



Lake Mead 2000 to 2015

Remote Sensing and Space Activities in the UK

Earth and Sea Observation System

UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

Earth and Sea Observation System

To provide informed and coordinated decision making capability to 23 Government Agencies in Malaysia through an integrated user-centred dashboard and a scalable platform

To deliver information and analysis on three environmental challenges.

Reduce the degradation to the mangrove coastline in Malaysia by reducing marine pollution in the Malacca Straits.

Reduce the social and environmental impact of illegal logging and increase the economic benefit from legal logging for Malaysia.

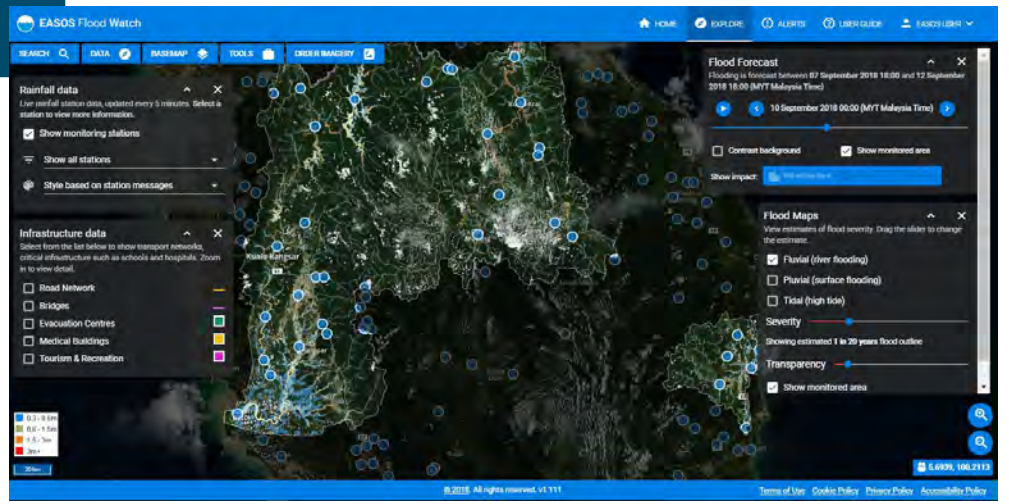
Reduce the economic and social cost of flood events.

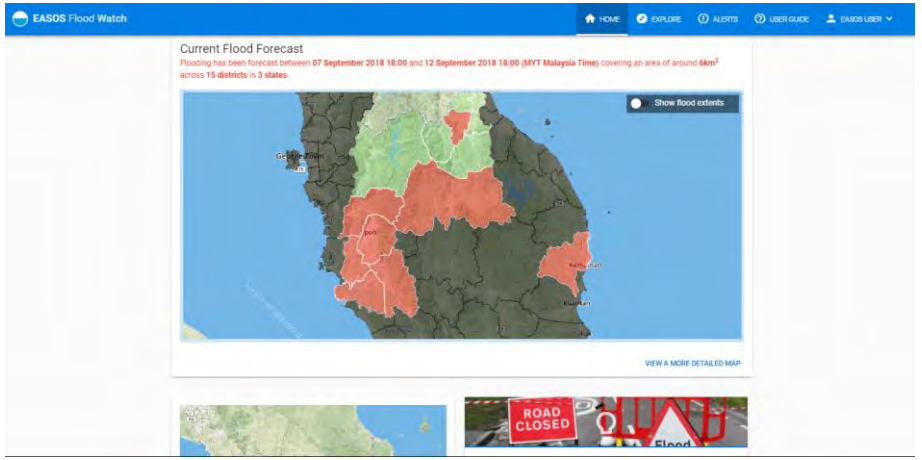
UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

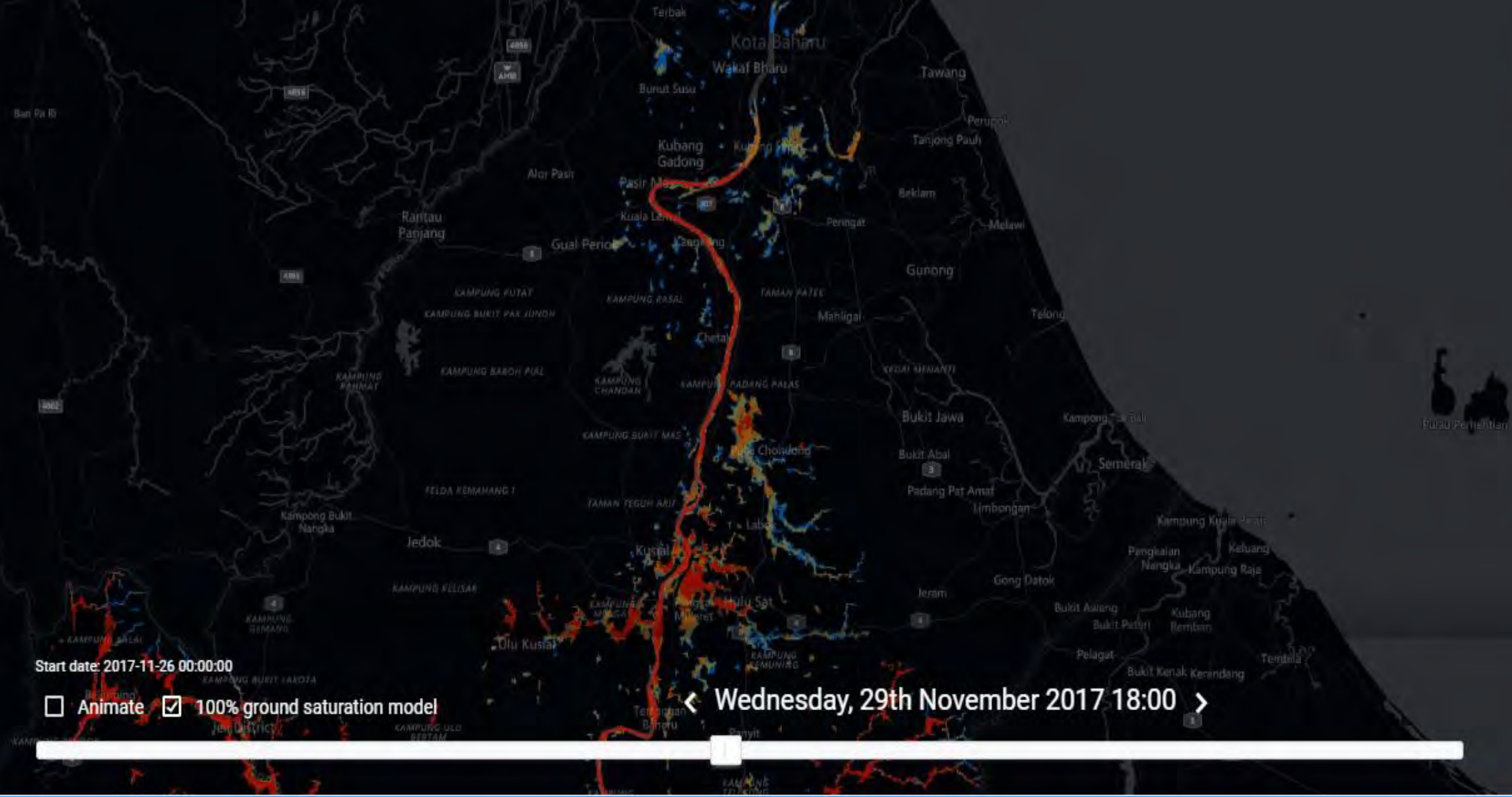
EASOS: Flood Watch

- Reduce human and economic cost from flood disaster
- Achieve over 90% accuracy for flood alerts with a 12 hour lead time
- Enable better handling of flood events
- Enable proper action to be taken prior to a disaster event
- Enable Malaysian Disaster Management committee to coordinate all agencies, and preventative measures using the same source information





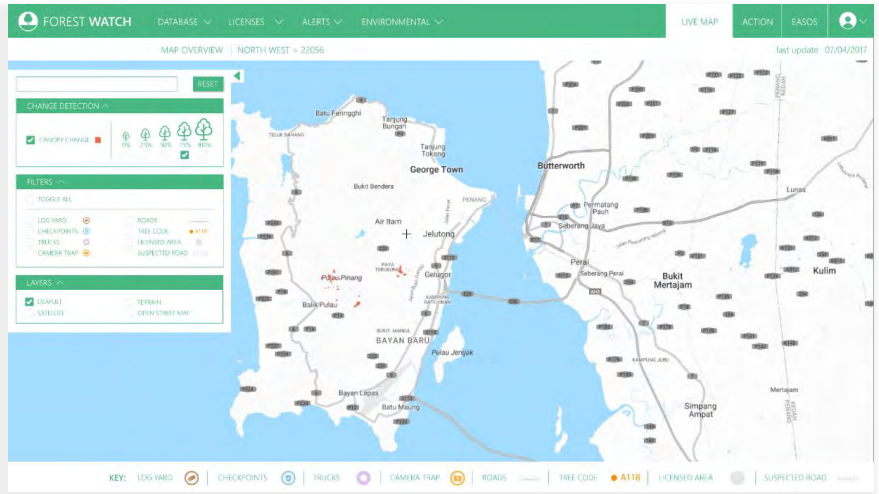
UK SPACE AGENCY

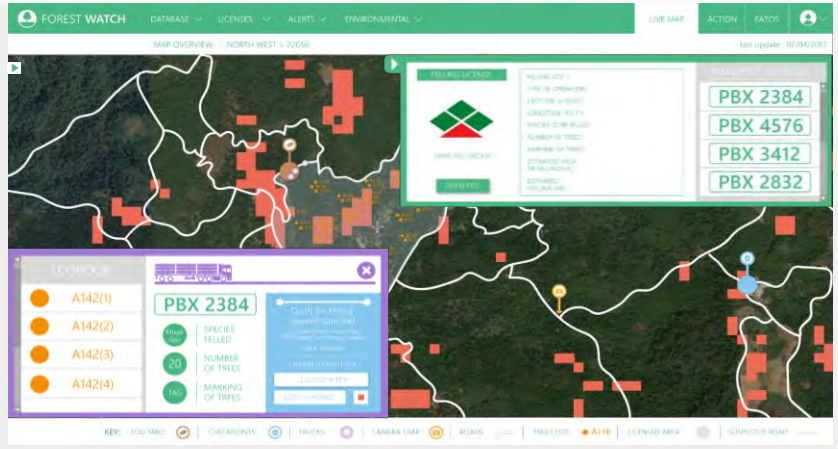


Remote Sensing and Space Activities in the UK

EASOS: Forest Watch

- lead to a 10% decrease of illegal logging activities and enforce forestry legislation and management practices
- help protect the endangered species such as Orangutans, Pygmy Elephants and Sumatran Rhino, threatened by their diminishing habitat
- support the Malaysian's tourist industry who come to see the wildlife and forests
- help identify legally sourced logs and trace how they get into the supply chain





UK SPACE AGENCY

Remote Sensing and Space Activities in the UK

EASOS: Marine Watch

- Reduce the financial impact of marine pollution by at least 10% across regions covered by the project
- Improve the detection rate of marine pollution events
- Help identify vessels that are likely to be responsible
- Forecast pollution dispersal
- Help Coastguard assess and track where oil slicks derive from and predict end points to intercept offenders
- Help relieve loss of habitat, coastal erosion, species extinction and depletion of fish stocks by deterring ships from pumping their bilges in the Malacca Straits

UK SPACE AGENCY

Geological surveying & monitoring

Normal RGB composite ASTER image 30x37km Atacama Desert in Chile, Copper, Gold, Silver mine

Short Wave Infra Red bands 4-6-8 showing lithology (physical characteristics) of surface rock

Rapid Deployment hybrid-comms platform – courtesy of DataSat

Persistent surveillance from space


DigitalGlobe


UK SPACE
AGENCY