

Title:

# Evolution of Remote Sensing : What's Next ?

Speaker:

**Abhineet Jain (AJ)**  
**Global Industry Business Development**  
**Maxar**

Date:

**18 & 19 November 2019**



# Maxar Technologies is at the nexus of the new space economy



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## Innovative Spacecraft Systems

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Communication and Earth observation satellites  
Space exploration missions  
On-orbit satellite servicing  
Robotics for next-gen space

## Space and Ground Infrastructure & Systems

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Surveillance and intelligence systems  
Defense and maritime systems  
Robotics, Sensors and Automation  
Satellite antennas, electronics and payloads  
Ground systems  
Radar satellites and data

## Satellite Imagery and Geospatial Information

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Electro-optical, high-resolution satellite imagery  
Geodata layers and information products  
Mission ready geospatial intelligence (GEOINT)  
Big data platform and tools

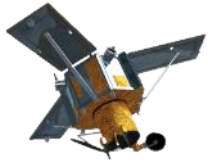
## Agile Geospatial Intelligence, Analytics & Services

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Sensor and ground system optimization for near real-time geospatial insight  
Multisource data enrichment and analysis  
Machine learning and analytics at scale



# Not Just Maxar Content... and Growing



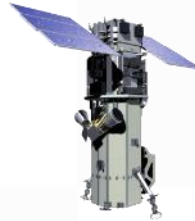
IKONOS®



WorldView-1®



GeoEye-1®



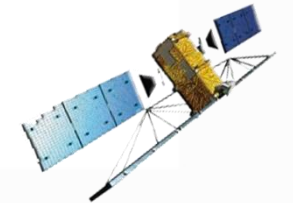
WorldView-2®



WorldView-3®



WorldView-4®



RadarSat-2®



QuickBird®



Sentinel-2



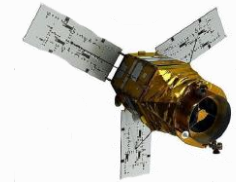
LandSat-8



Sentinel-1



Coming

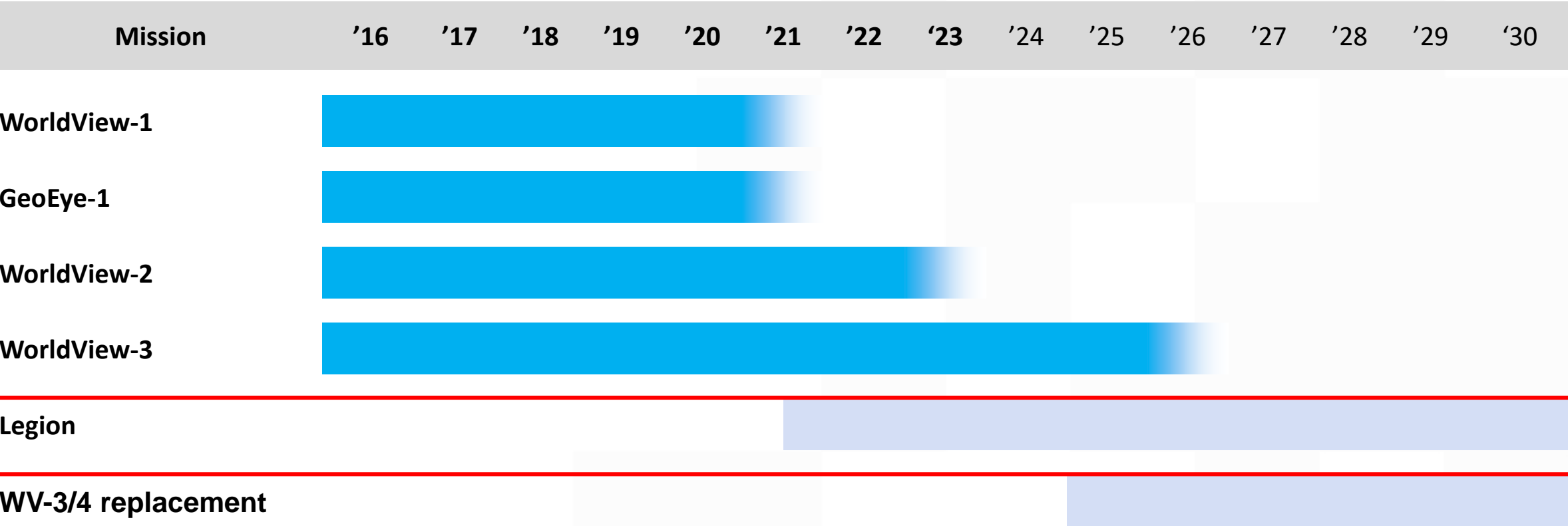


In Orbit



# Legion is designed to achieve three strategic objectives

Capacity, revisit, and mission continuity





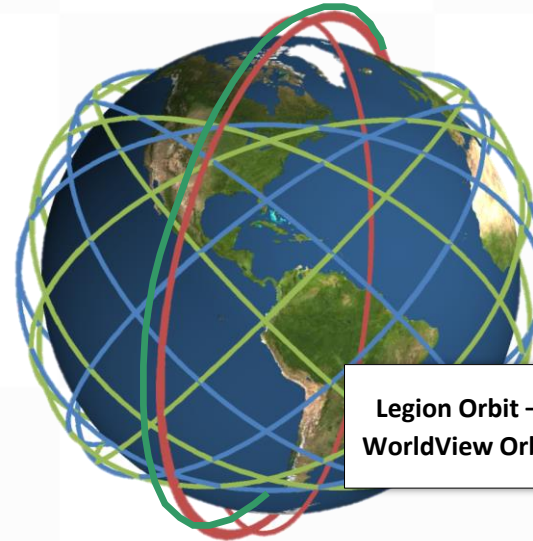
# Legion will improve revisit vs. WorldView

Current WorldView constellation is in sun-sync orbits



WorldView Orbit – red

Future constellation mixes sun-sync and mid-latitude orbits for greater revisit



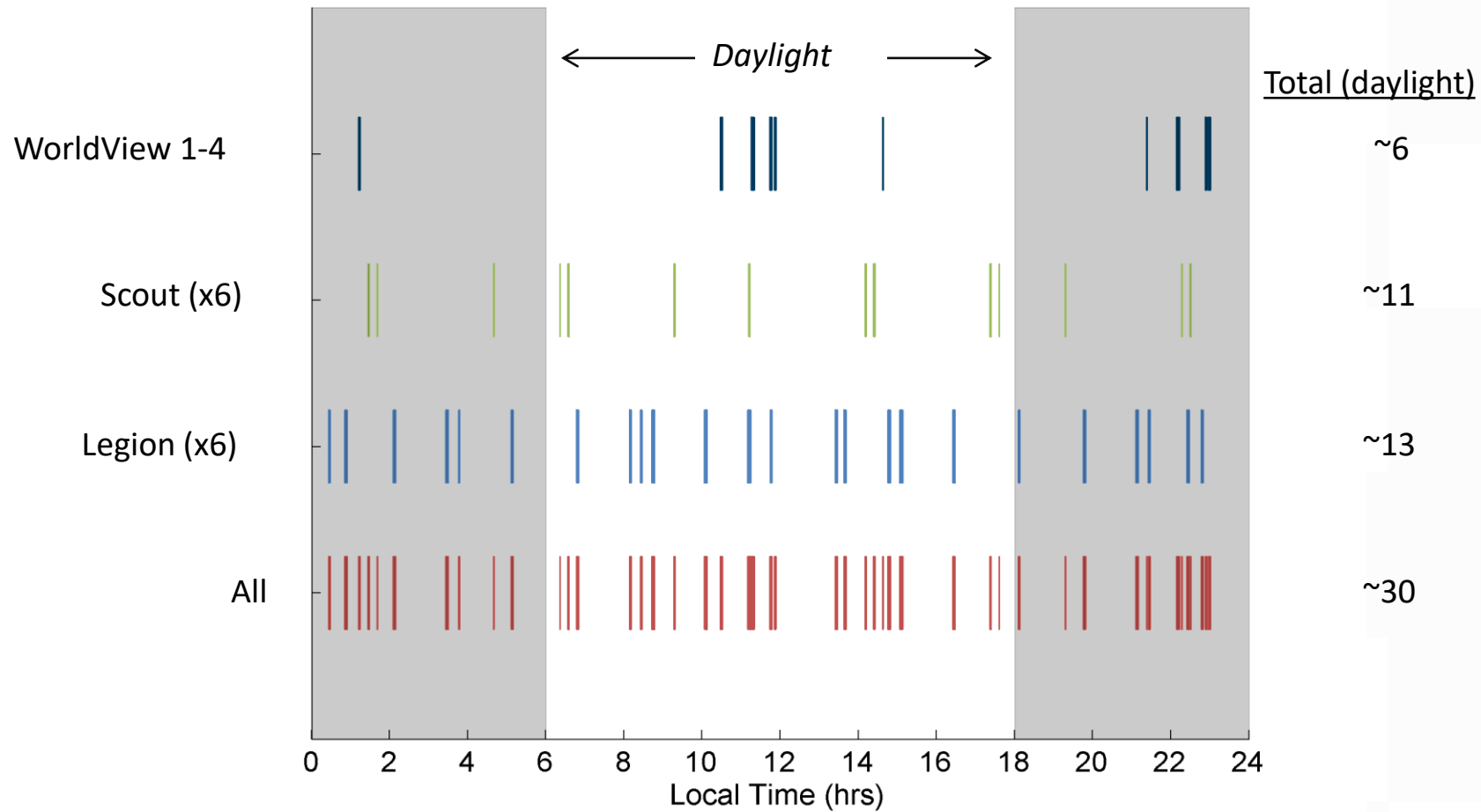
Legion Orbit – green  
WorldView Orbit – red



# Legion will improve revisit vs. WorldView

Wuzhai, China

Markings show sample of local times of accesses



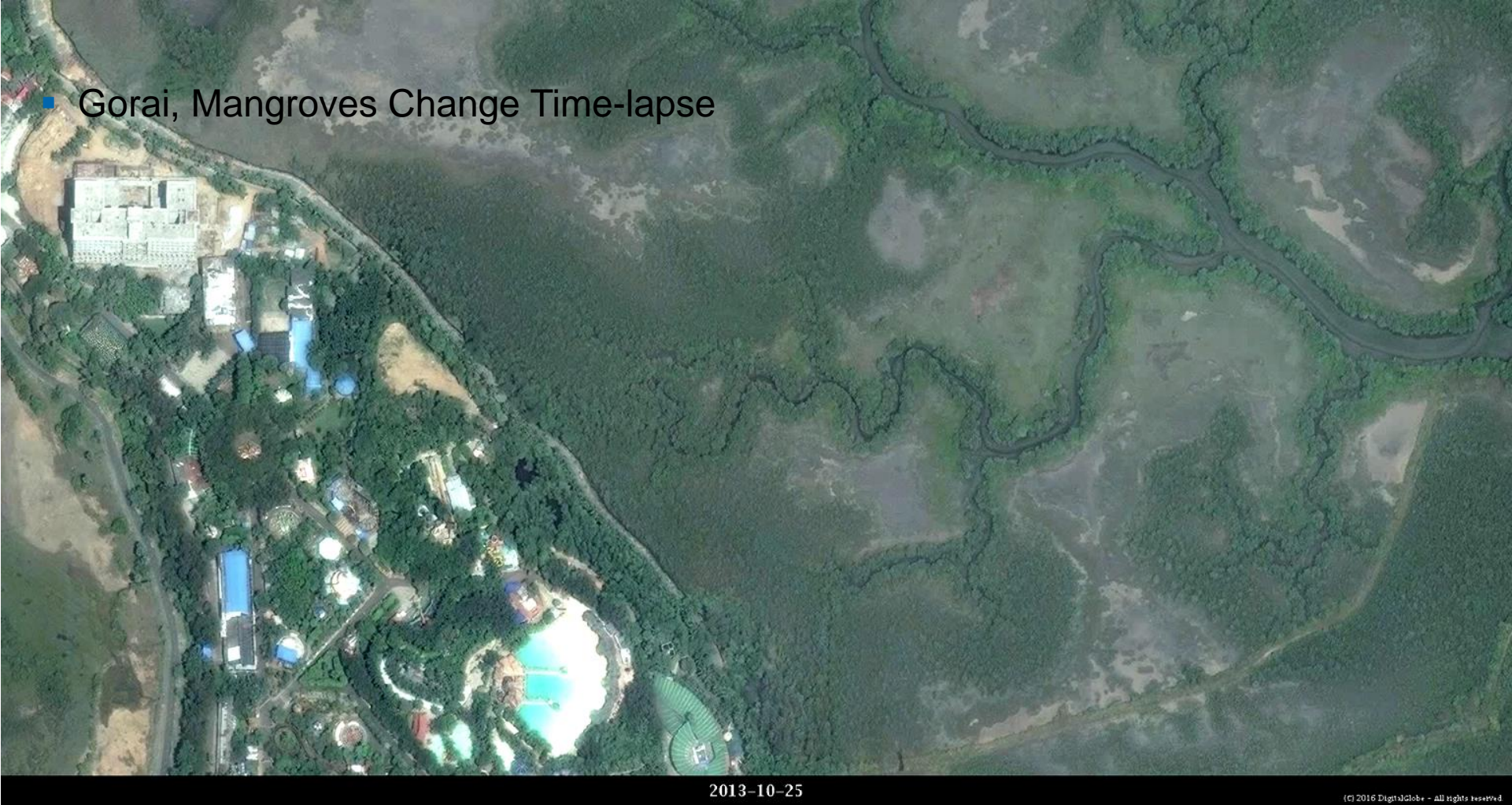












■ Gorai, Mangroves Change Time-lapse

# Increasing Spectral Resolution

## 8 BANDS (VNIR)

WorldView-2

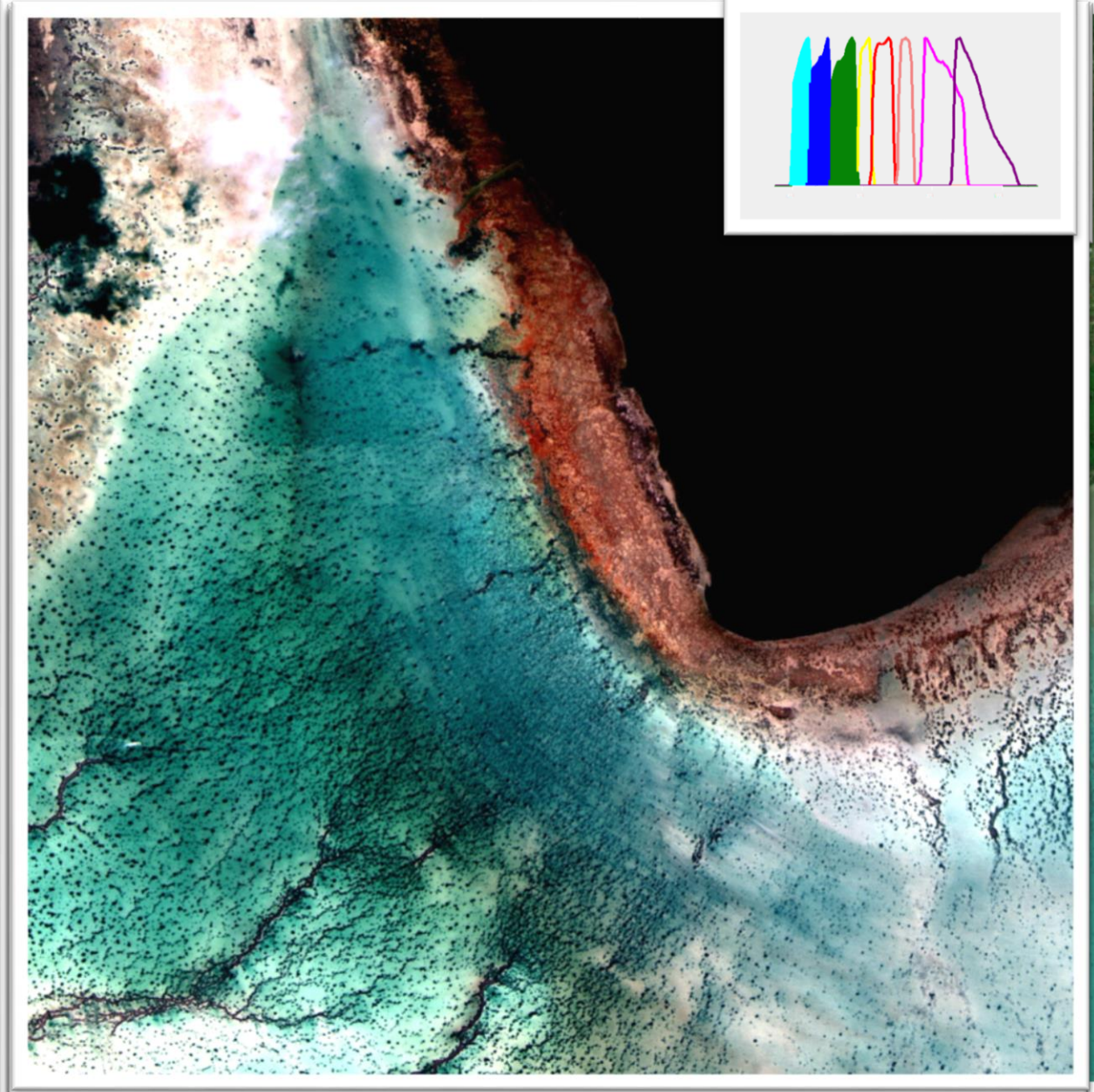
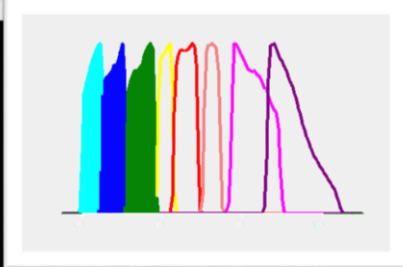
First Images

8 band 2m Image

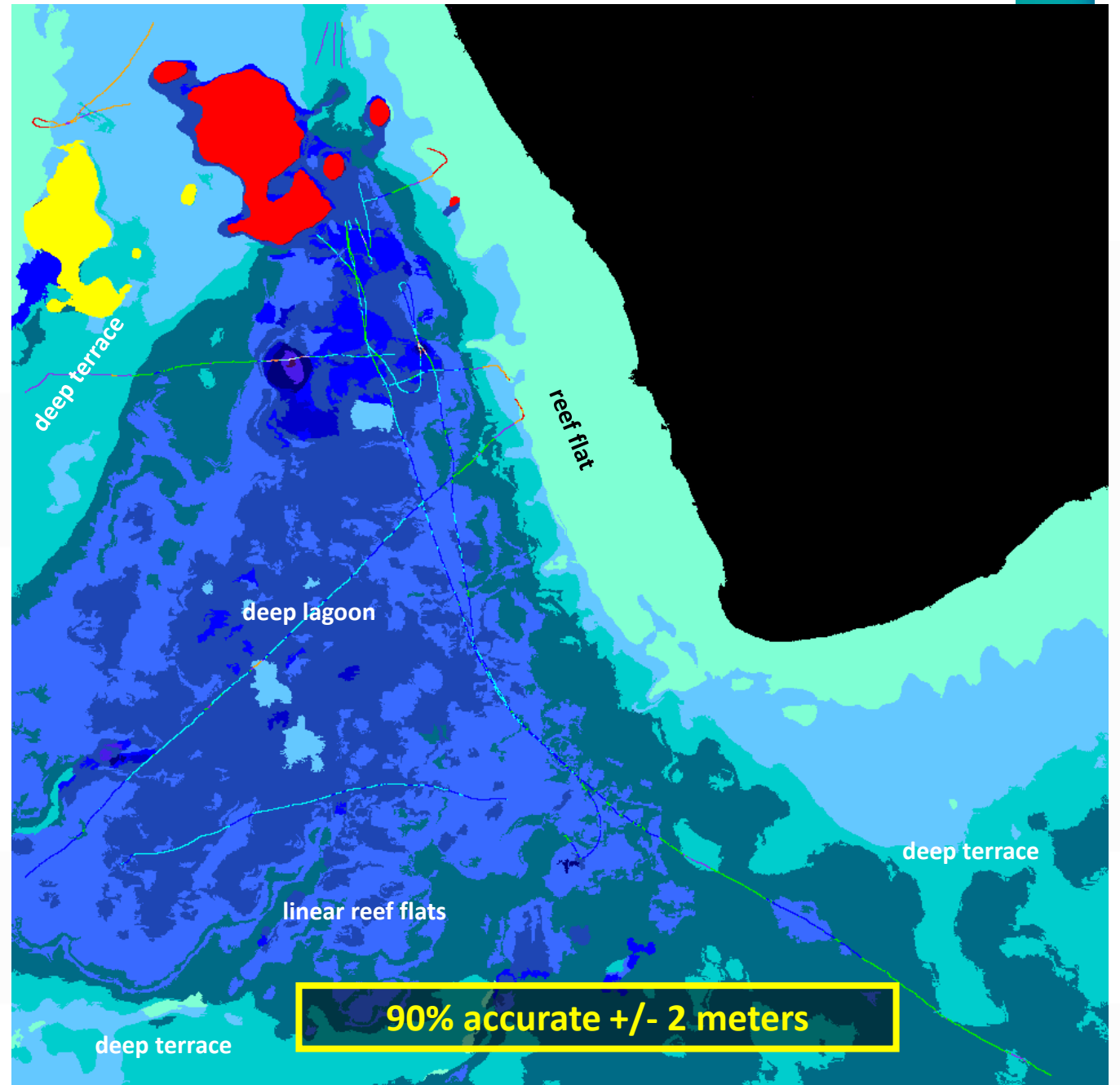
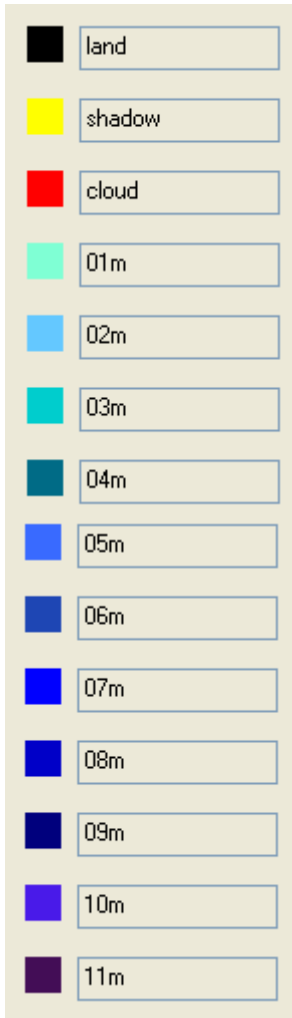
November 23, 2009

Aitutaki

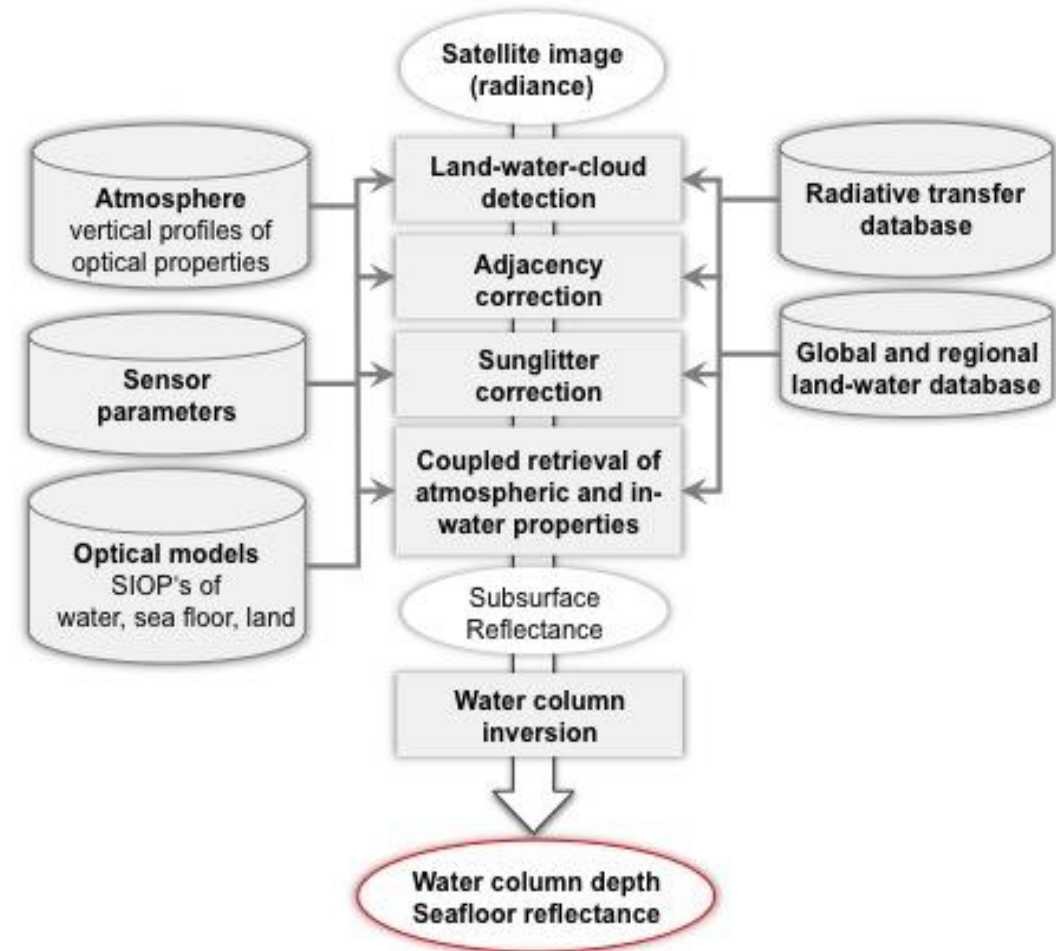
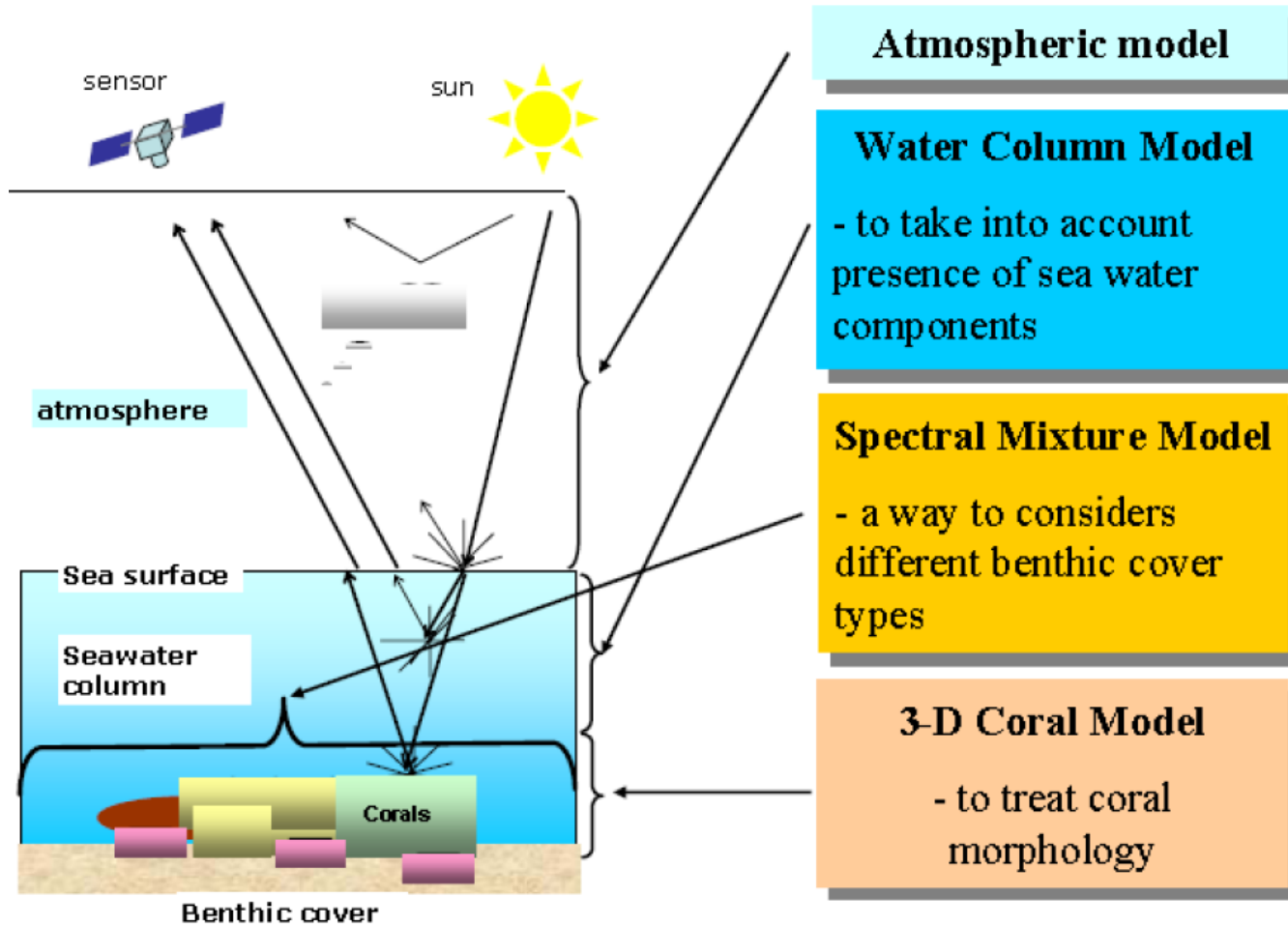
Lagoon



# WV2 Bathymetry



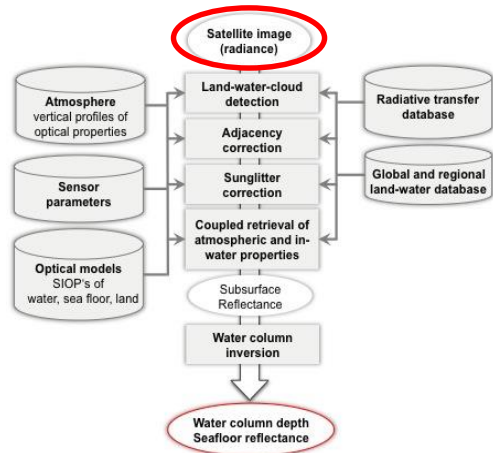
# Methods and Workflows





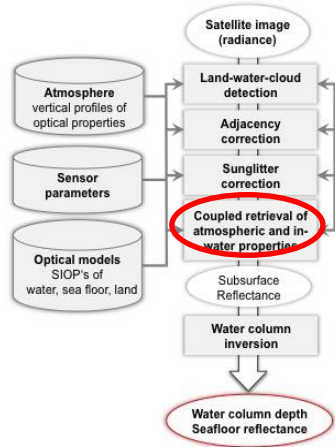
# Raw satellite imagery: View from sensor

## Heron Island, WorldView-2 Radiances (RGB: ch4, 3, 2)





# Atmospheric effects removed: View of the sea's surface Heron Island, WorldView-2 Reflectance (RGB: ch4, 3, 2)



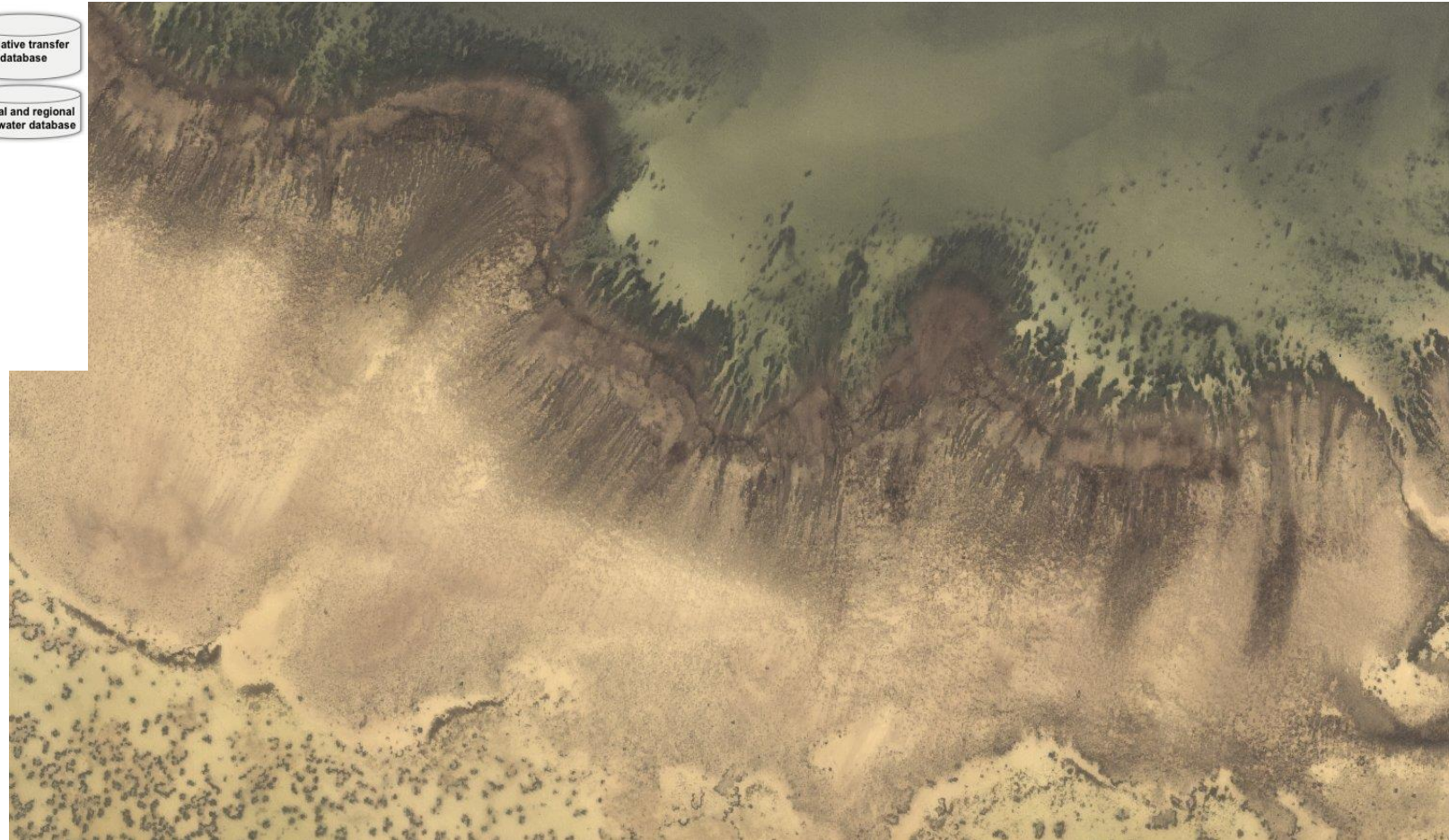
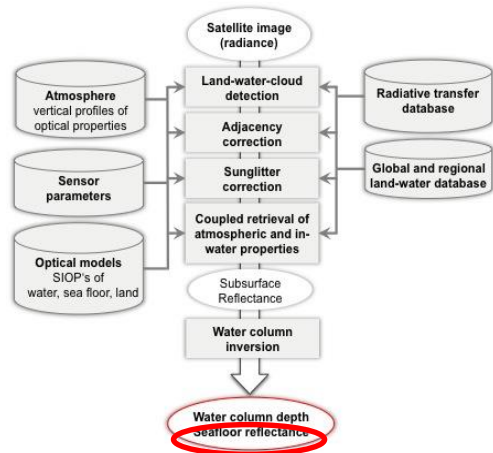
Include copyrighted material of DigitalGlobe. WorldView-2, acquisition date: 2011-10-30





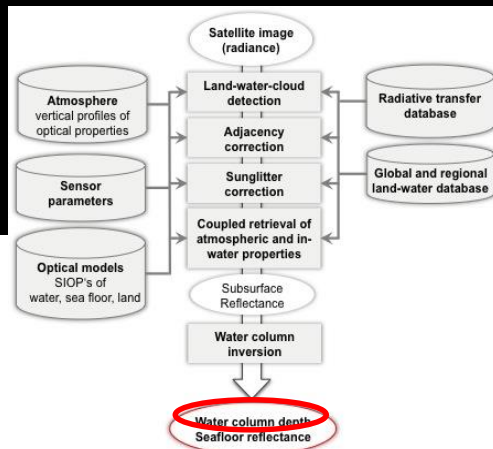
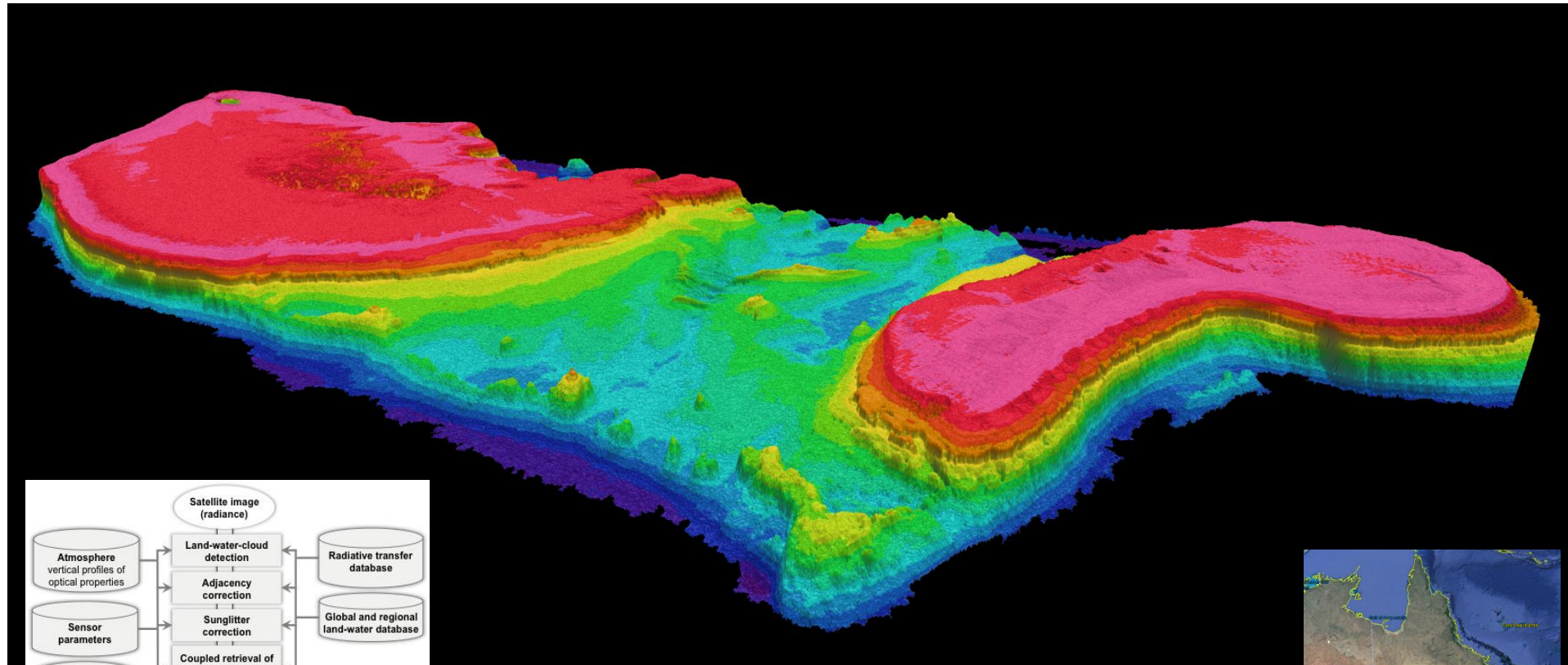
# Water column removed: View of the seafloor

## Heron Island, WorldView-2 seafloor reflectances (RGB: ch3, 2, 1)





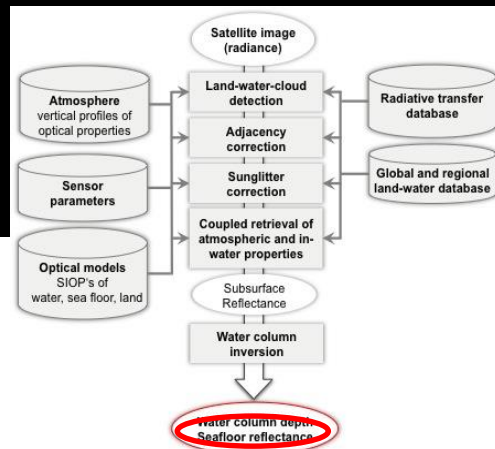
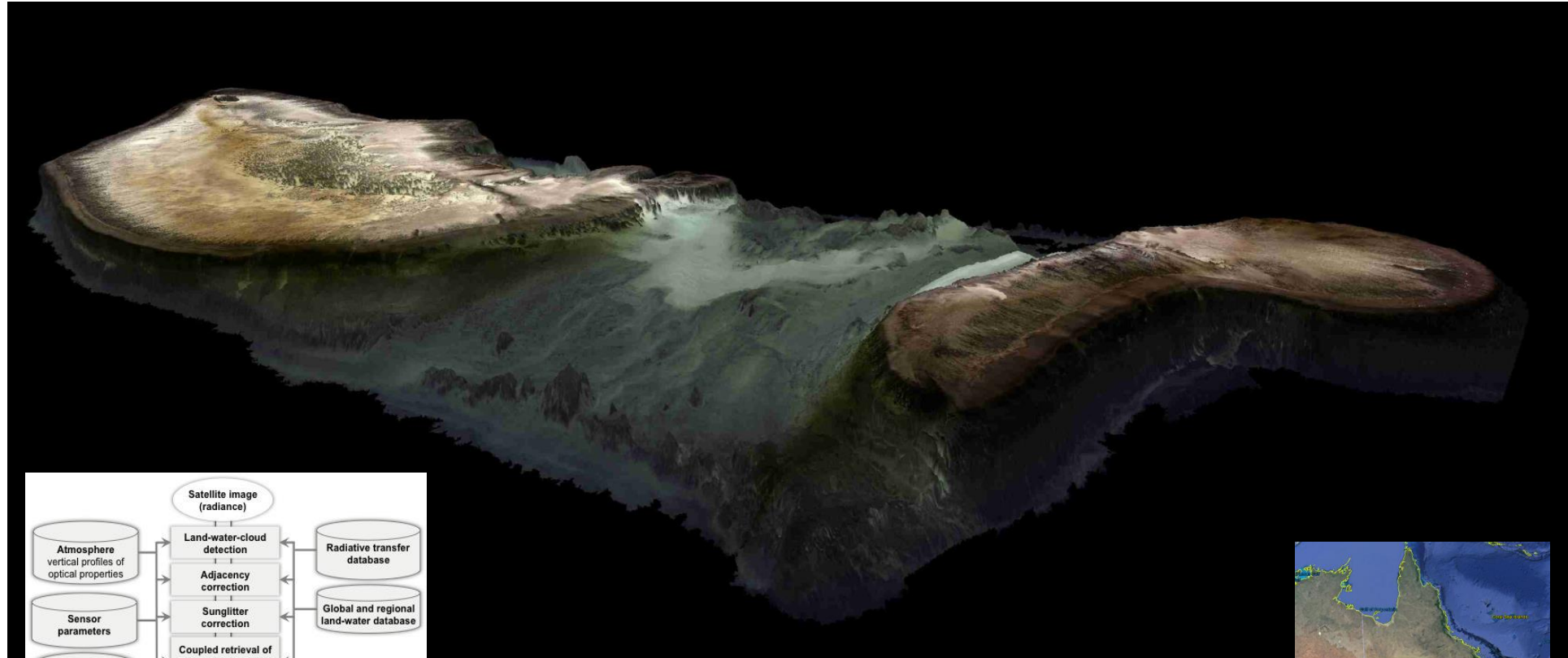
# Satellite-Derived Bathymetry, 2m Heron Island, WorldView-2 (RGB: ch3, 2, 1)



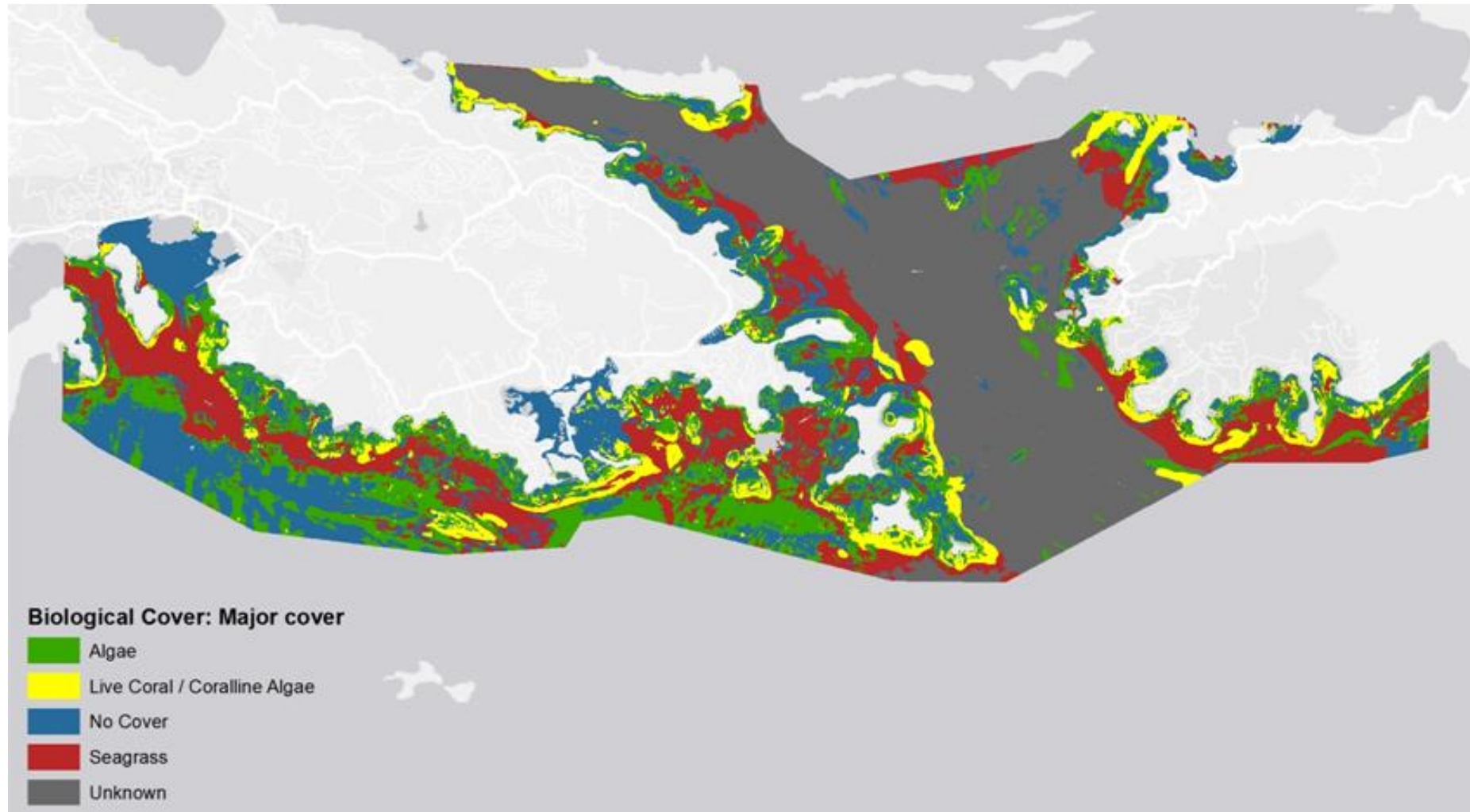
Red to blue = +1m to -25m water depth (LAT)



# Seafloor reflectance draped over bathymetry, 2m Heron Island, WorldView-2 (RGB: ch3, 2, 1)



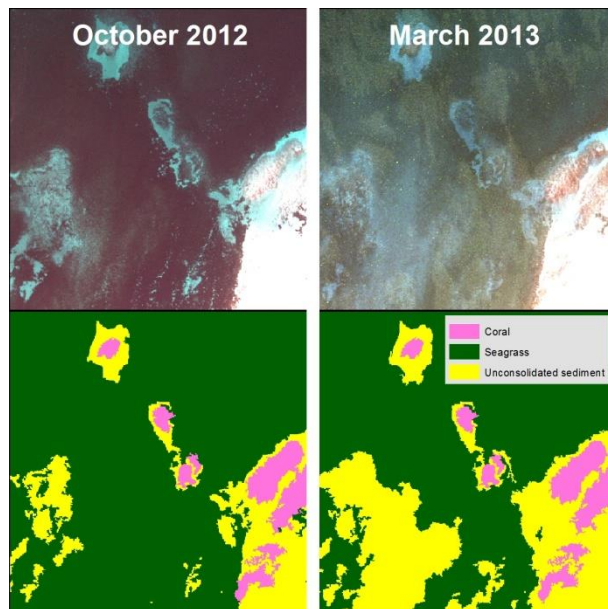
# Example of Benthic Habitat map U.S. Virgin Islands





# Example of EOMAP Benthic Habitat map Arabian Gulf, Abu Dhabi

## Seasonal Change mapping of seagrass



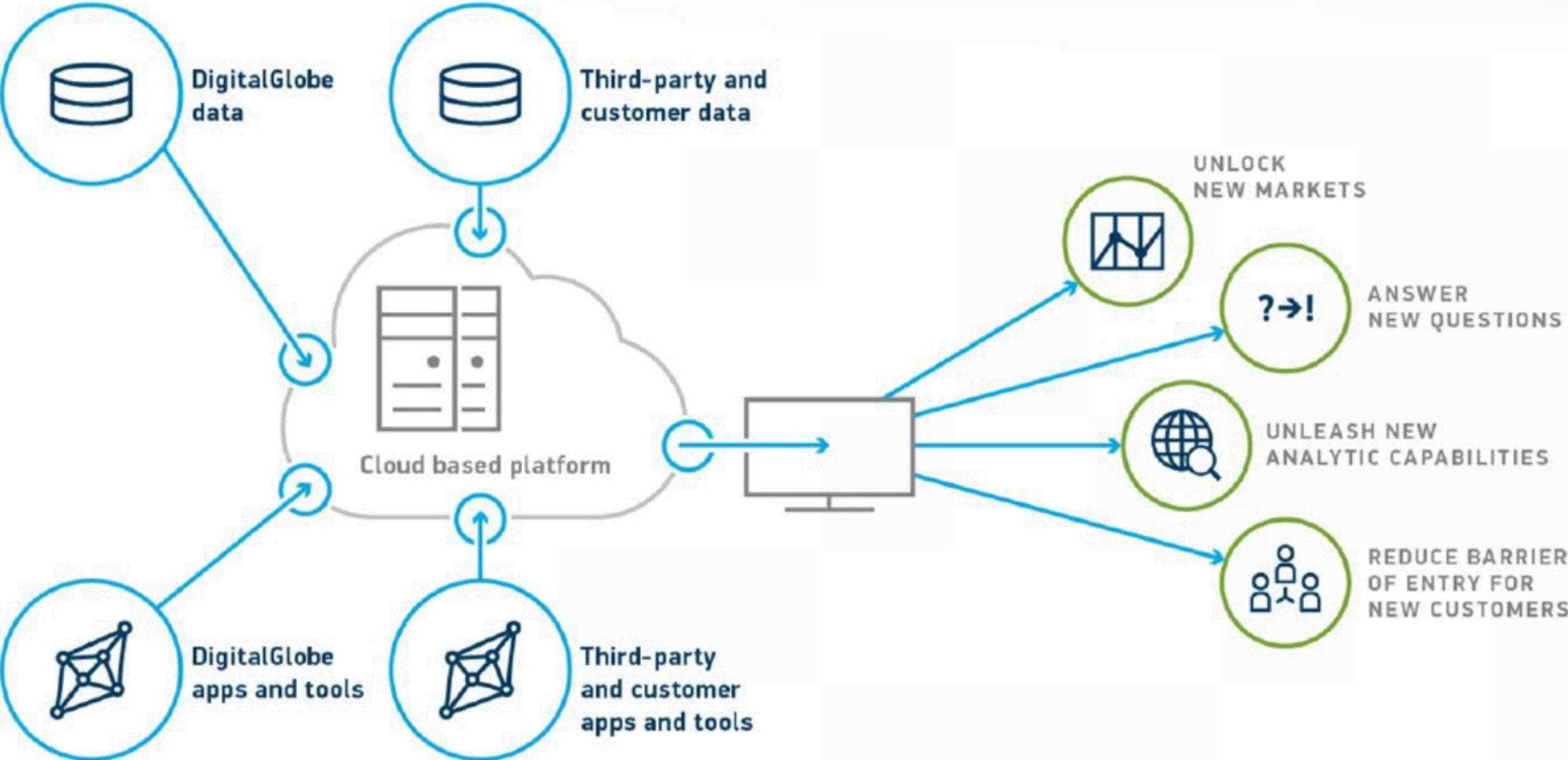
## Seafloor habitat classification



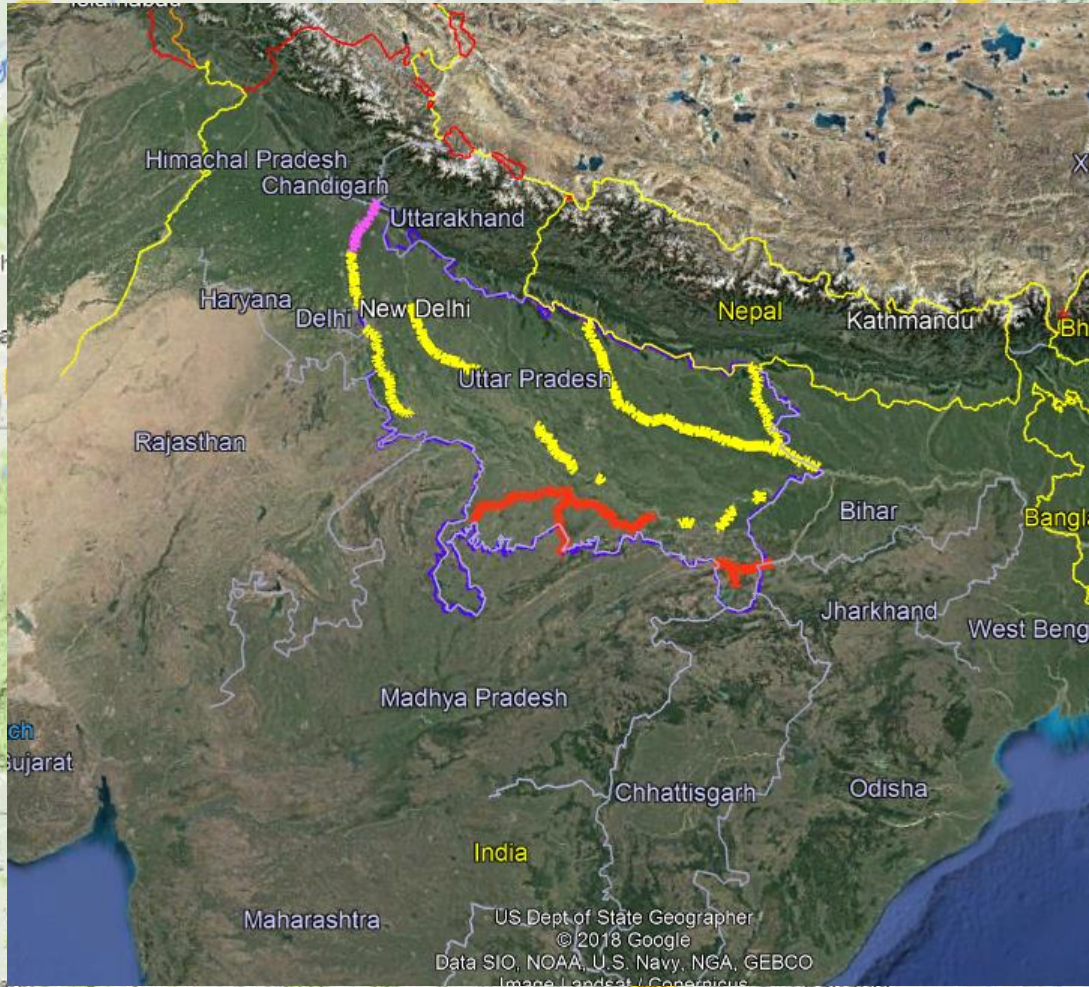
Satellite data used: RapidEye und WorldView-2



# Access - Geospatial Big Data Platform [GBDX]



# Sustainability & Development : A Story of Sand Mining (India)



Oct 10, 2012 | WV02 | 50cm





March 04, 2013 | WV02 | 50cm



11 Feb 2017 | WV02 | 50cm



Feb 12, 2017 | WV03 | 40cm

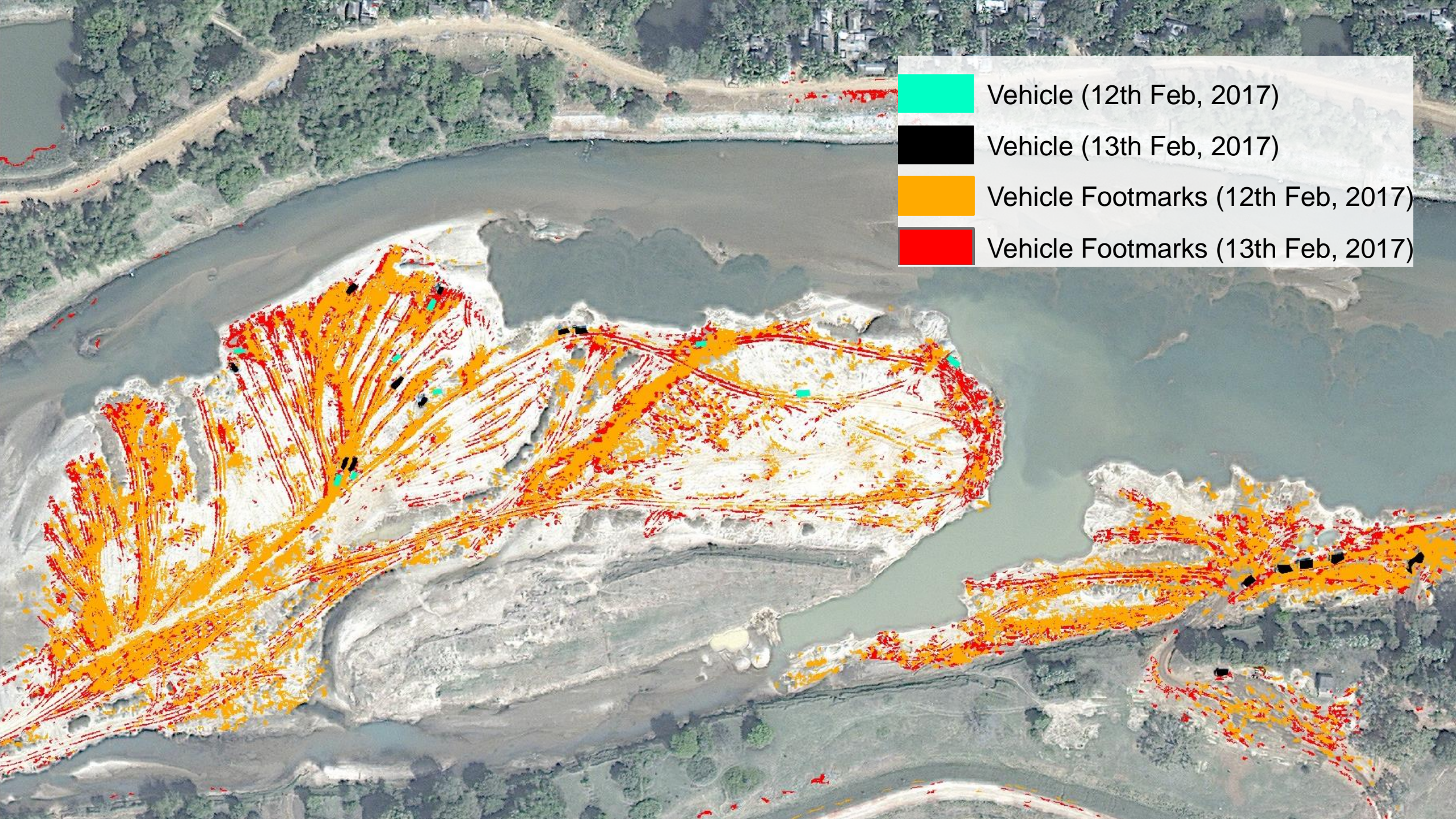





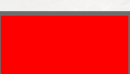
Feb 13, 2017 | WV03 | 30cm



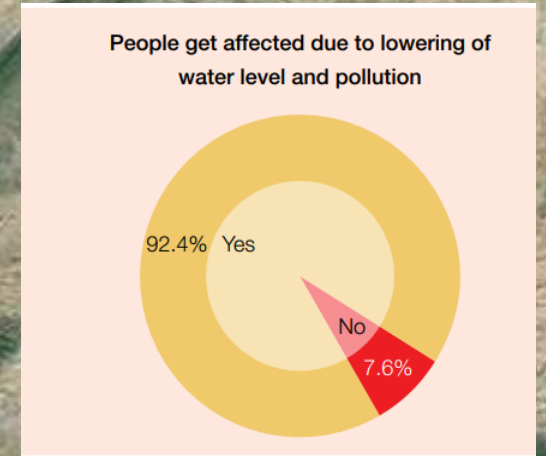
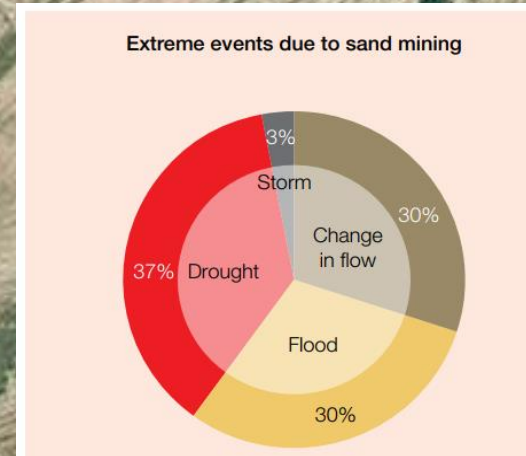
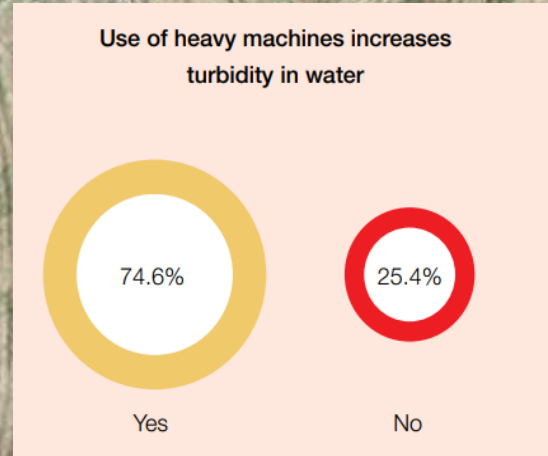
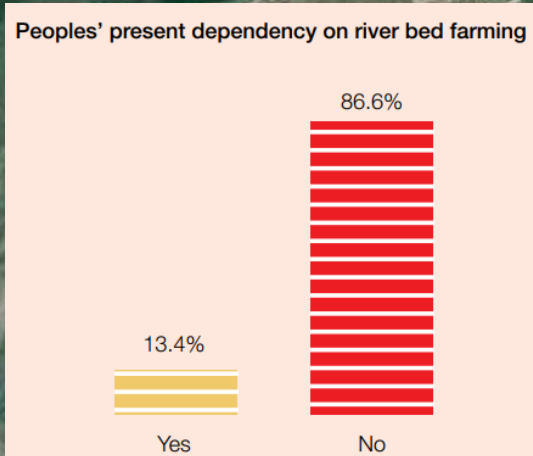
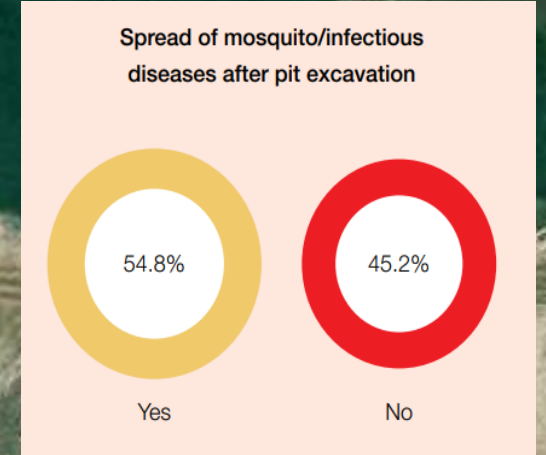
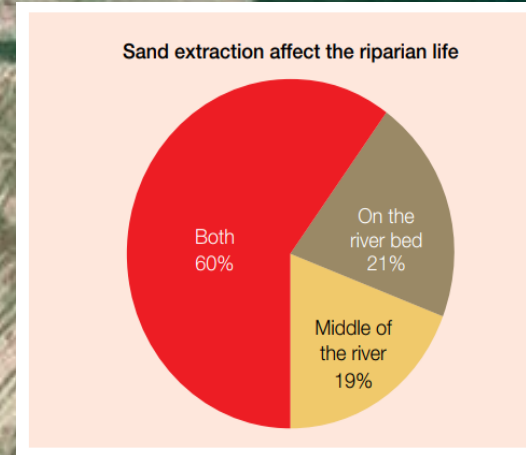
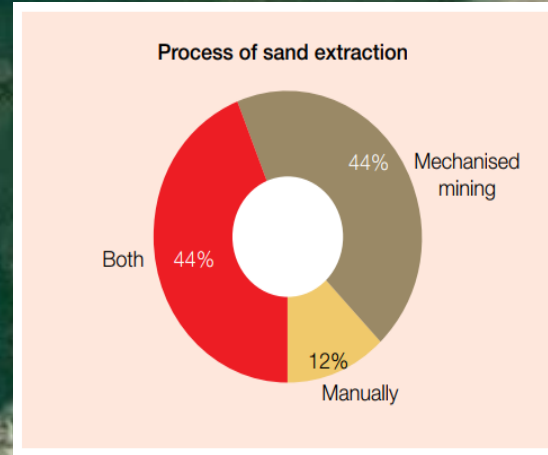
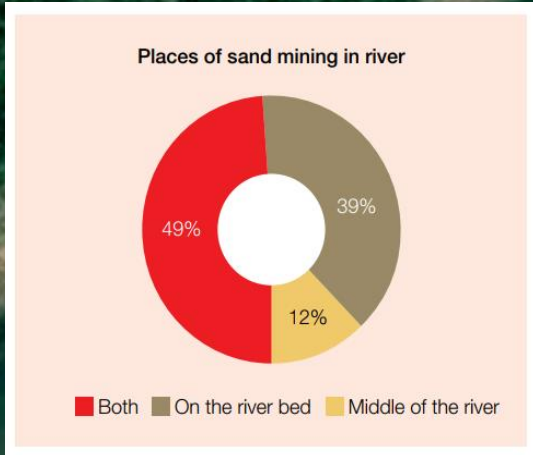
■ Feb 13, 2017: Zoomed | WV03 | 30cm





-  Vehicle (12th Feb, 2017)
-  Vehicle (13th Feb, 2017)
-  Vehicle Footmarks (12th Feb, 2017)
-  Vehicle Footmarks (13th Feb, 2017)

# Feb 13, 2017: Zoomed | WV03 | 30cm





This is Lake Volta in Ghana.





## Eyes in the sky: online mappers track child slavery in Ghana | Reuters

<https://uk.reuters.com/.../eyes-in-the-sky-online-mappers-track-child-slavery-in-ghana-id...>

Oct 27, 2015 - More than 20,000 children are forced into slavery on **Lake Volta**, the ... said Caitlyn Milton at Tomnod, part of the satellite company **DigitalGlobe**.

You visited this page on 4/14/19.

## Creating a Better World | Trajectory Magazine

[trajectorymagazine.com/creating-a-better-world/](http://trajectorymagazine.com/creating-a-better-world/) ▼

Nov 2, 2016 - For example, **DigitalGlobe** imagery helps NGOs in India and Pakistan ... to reveal child slavery on illegal fishing boats at **Lake Volta** in Ghana.

## Help from above: Satellites, crowd sourcing to fight child slavery in ...

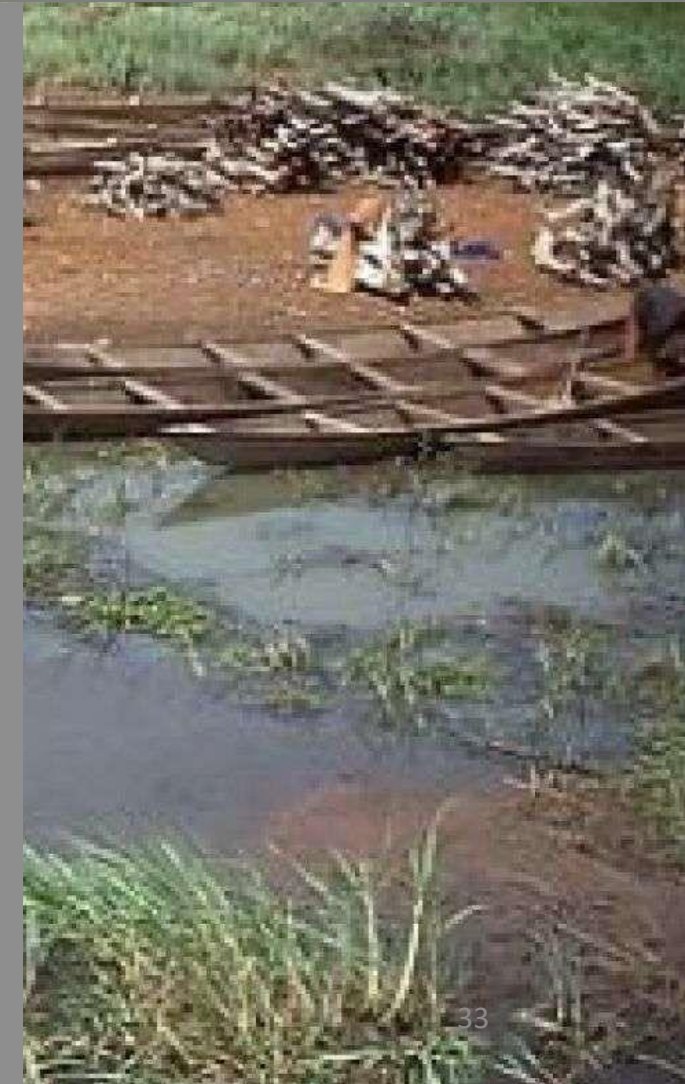
<https://www.foxnews.com/.../help-from-above-satellites-crowd-sourcing-to-fight-child-sl...>

Oct 22, 2015 - Tomnod, the project run by **DigitalGlobe**, has pointed its orbiting cameras at Ghana's **Lake Volta**, an infamous hub for child trafficking. It's been ...

## A crowdsourced satellite image search is helping find child slaves in ...

<https://qz.com/.../a-crowdsourced-satellite-image-search-is-pinpointing-child-slavery-n...> ▼

Oct 23, 2015 - **Lake Volta**, in the eastern part of Ghana, has long been a center of ... satellite company **DigitalGlobe** (of which Tomnod is part) available online.



# Monitoring human trafficking

Assessing the extent of child slavery with high-resolution imagery and crowdsourcing

You've selected... **Boat**

Search the map on the right for this object. If you see one, click the map to drop a tag.

Examples select to zoom

**Boat**

Building

Fish Cage

Examples & Tips

Description

Boats in the center of the lake, anchored by the lakeshore or pulled-up on land.

Area 4lix2vy25

Search and tag these objects:

Boat

Building

Fish Cage

Examples & Tips

Brong-Ahafo Region

Digya National Park

Volta Region

Kpasa

Kitari

Bodomasi

Juansa

Konongo

Mpraeso

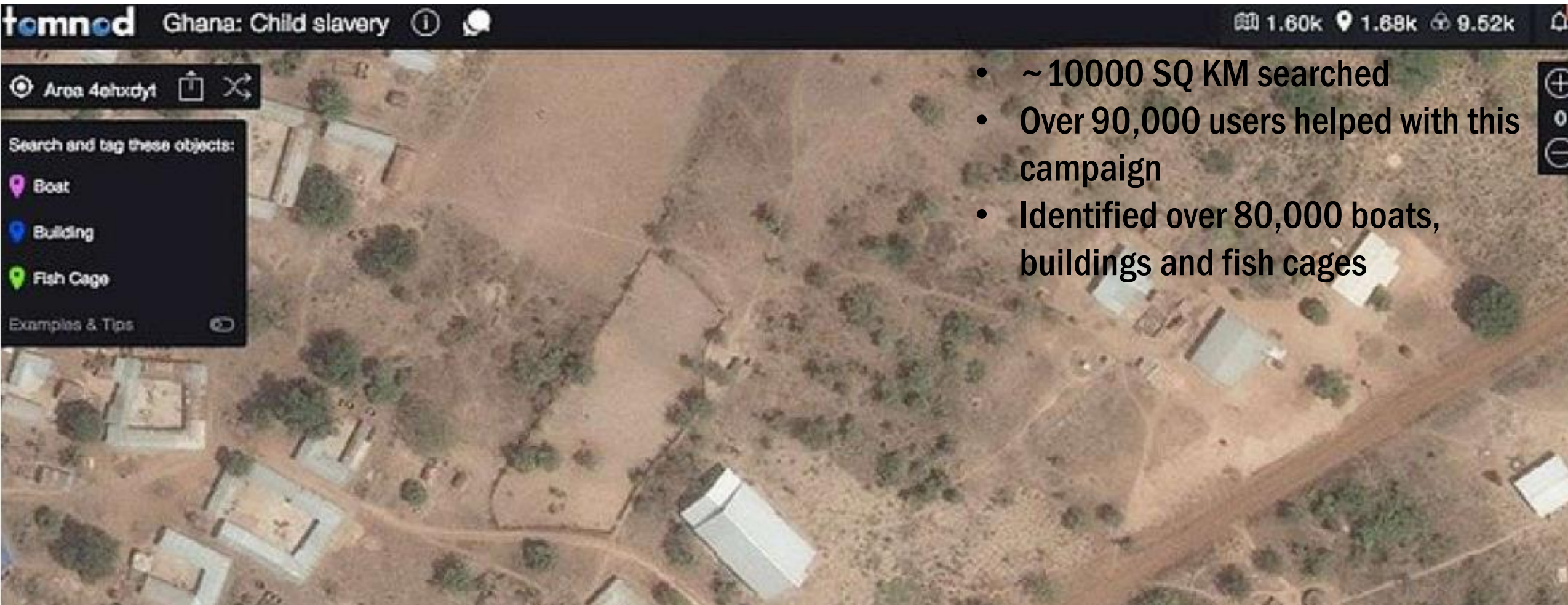
Nkawkaw

Ho

Eastern Region

# Monitoring human trafficking

Assessing the extent of child slavery with high-resolution imagery and crowdsourcing



- ~10000 SQ KM searched
- Over 90,000 users helped with this campaign
- Identified over 80,000 boats, buildings and fish cages

Tomnod started the search campaign with the Global Fund to End Slavery to track and log every boat, fish cage and building along Lake Volta for the first reliable estimate of child slavery in the region. (Image provided by DigitalGlobe © 2015)