Mapping the Future

Overview

Corporate Vision

SkyMap Global Introduction and Strategy

SkyMap Solutions for Applications on Earth Observation

Corporate Vision

SkyMap aims to be the **Trusted Advisor** to users of

Imagery & geospatial data analytics to support

sustainability of natural resources and environment

of our planet with efficient technology and cost

effective **Platform** using open standards.

SkyMap Global

SkyMap Analytics Centre (SAC) India
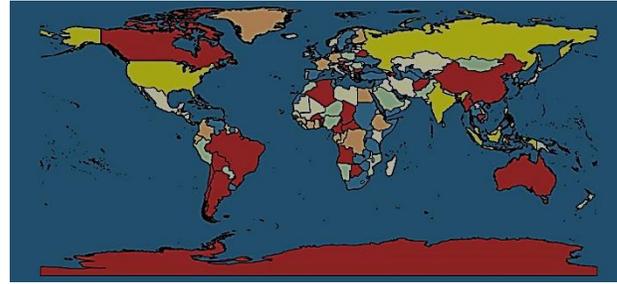
SkyMap Global Indonesia (Indonesia)	SkyMap Global (India) Pte Ltd
SkyMap Global Malaysia Sdn Bhd (Malaysia)	SkyMap Analytics Centre (SAC), India
	SkyMap Training Centre (STC), Malaysia
SkyMap Global Americas LLC (USA)	SkyMap Global Pte Ltd (Singapore)

Source	**Data**	**Applications**	**Business Value**
• **Satellite Partners :** THEOS (Thailand), TH-1, TH-2 (China) Satrec Initiative (South Korea), Blackbridge Rapideye • GF • Triplesat • Planet	• **Satellite Imagery :** High resolution optical imagery, SAR, Hyperspectral • **Terrain Data:** DSM, DTM	• Defense • Government • Infrastructure • Mining • Insurance • Energy & Utilities • Water Resources • Plantation & Agriculture • Forestry & Environment	• Cost Savings • Increased Efficiency • Improved Results • Enhanced Security Levels • New Opportunities

SkyMap Global: Our Clientele
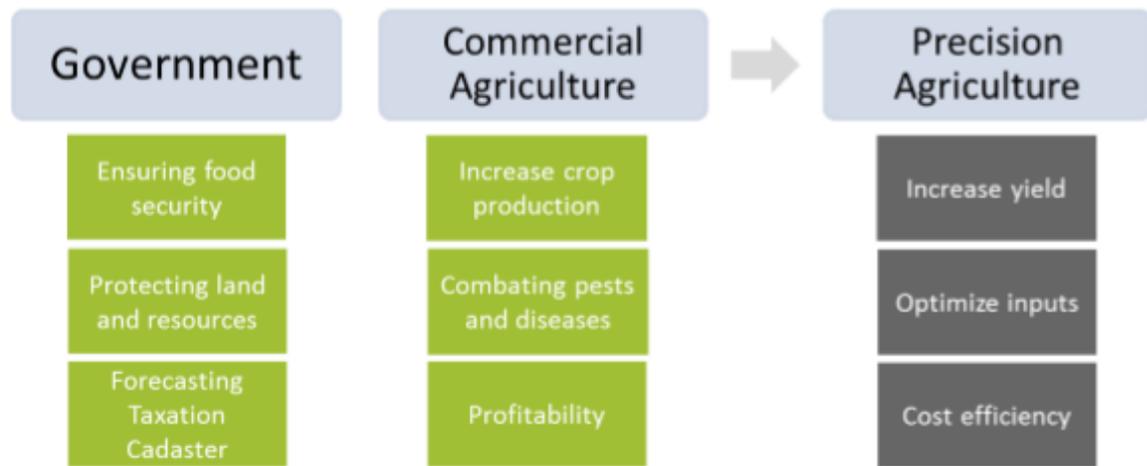

SKYMAP GLOBAL
www.skymapglobal.com

* Partial and exhaustive list

India Context

- Tripartite relationship between NRSC, SI and Skymap for Kompsat data supply.

- Strong foundation built since 2013 based on trust and long term engagement to the Indian customer.

- A platform that fuel the continuous innovation that provides fusion of imagery based product services.

- The key motivation of our innovative product services are make possible by our Indian customers clearly defined demand and expectation.
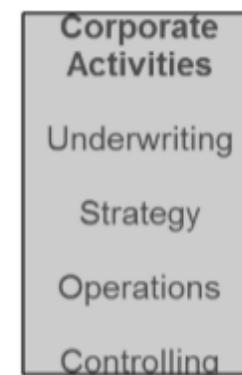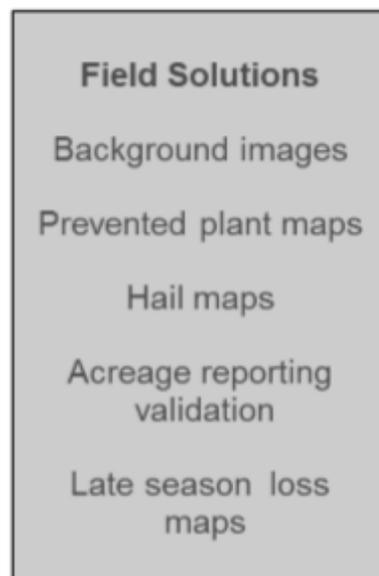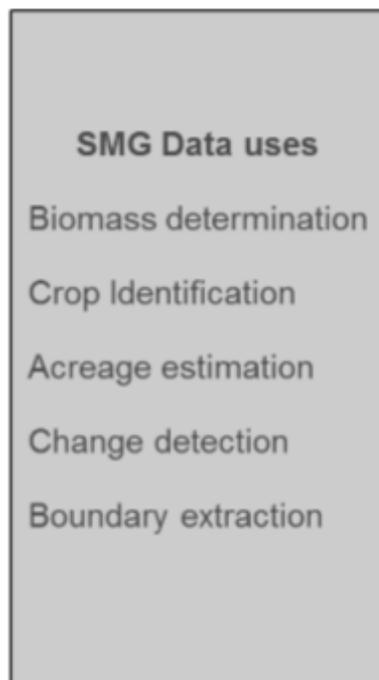
Application Verticals

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Agriculture

Government
- Ensuring food security
- Protecting land and resources
- Forecasting Taxation Cadaster

Commercial Agriculture
- Increase crop production
- Combating pests and diseases
- Profitability

Precision Agriculture
- Increase yield
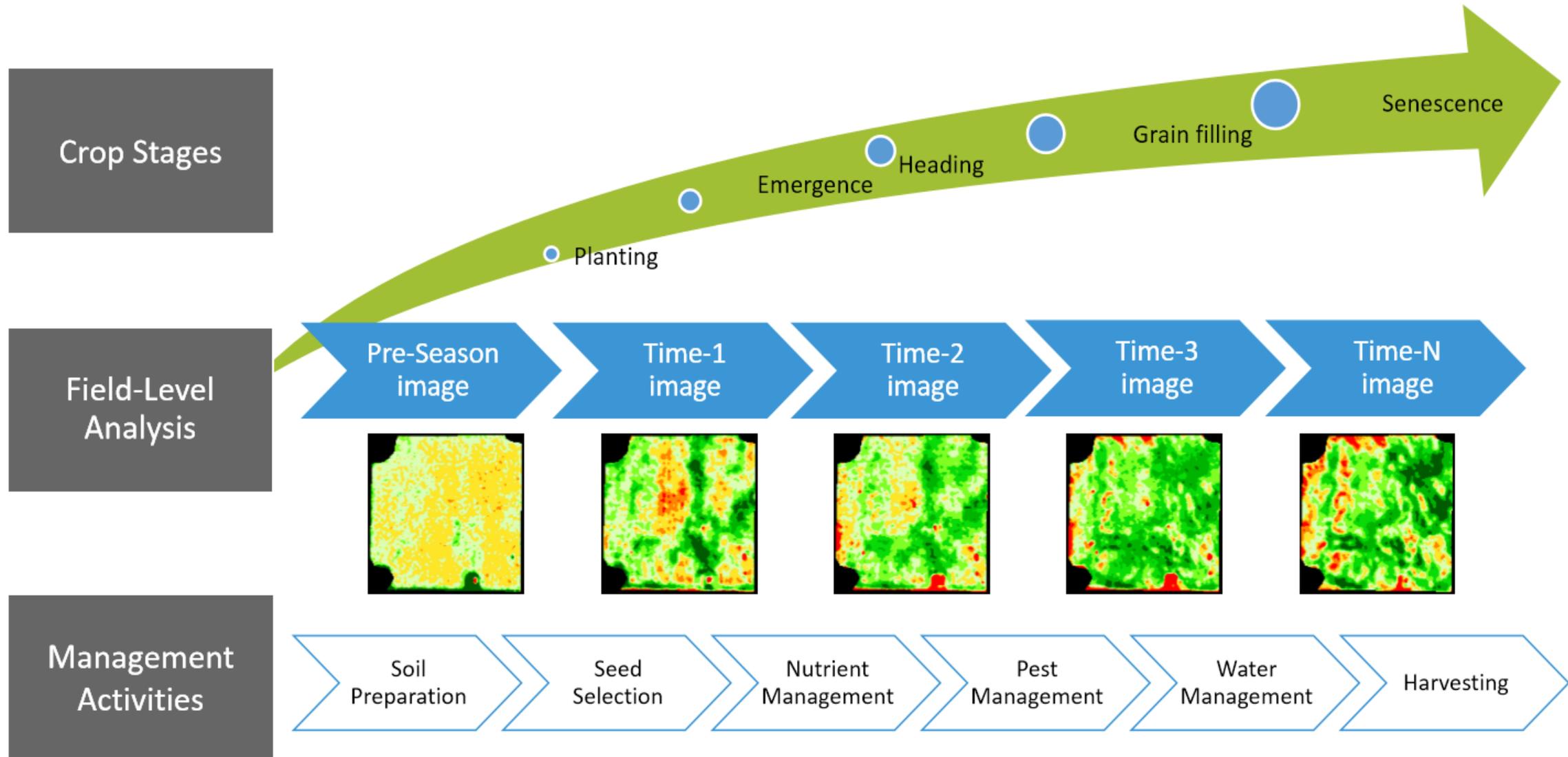- Optimize inputs
- Cost efficiency

Areas of specific applications:

- Crop type classification
- Crop condition assessment
- Crop yield estimation
- Crop Insurance
- Extent of infestation or stress damage
- Mapping of soil characteristics
- Compliance monitoring (farming practices)
- Vegetation/Biomass index

SMG Data uses
Biomass determination
Crop Identification
Acreage estimation
Change detection
Boundary extraction

Field Solutions
Background images
Prevented plant maps
Hail maps
Acreage reporting validation
Late season loss maps

Management Tools
Loss Exposure maps
Market analysis
Production estimates
Fraud monitoring

Corporate Activities
Underwriting
Strategy
Operations
Controlling

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Forestry

Near-real time understanding of effects of human degradation and deforestation

Real-time reaction to mining and illegal logging.

National asset management: forest types and cover maps, Participation in REDD programs, etc.

Strong need to manage well

Activities Monitoring
- Deforestation
- Encroachment
- Illegal Logging
- Plantation
- Forest Asset
- Forest Fire etc.

Urban Development

- Urban Zonation
- Urban Sprawl Monitoring
- Asset Mapping / Monitoring
- Planning for New Urbanization
- Creation of Land Bank
- Land Use Change Monitoring
- Many More

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Environment

- Water Monitoring
- Urban Hotspot Mapping
- Water Management / Pollutant Monitoring
- Soil Erosion Estimation
- Social Forest Monitoring / Green Watch
- Environmental Impact Assessment (EIA)
- Policy Making etc.

Turbidity and Total Suspended Matter
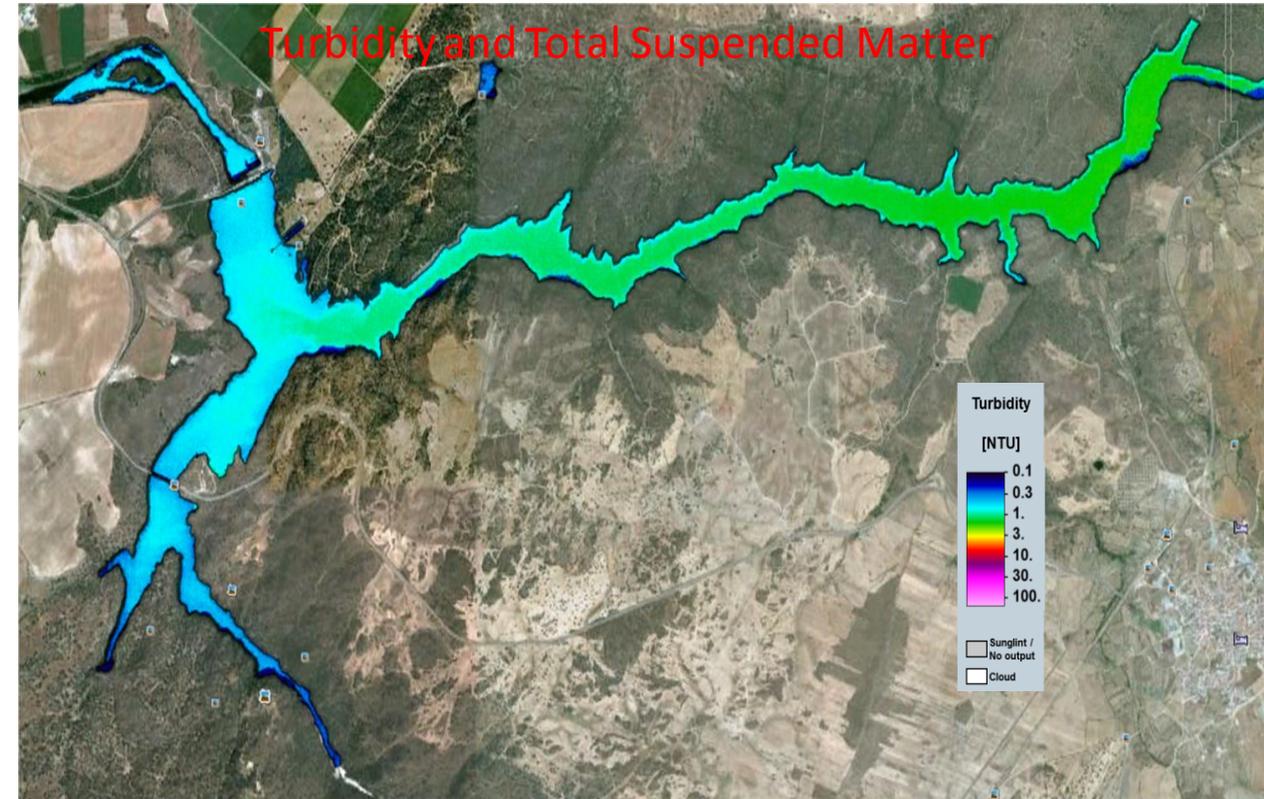
Law & Enforcement

- Imagery Supported Taxation Policy
- Illegal Construction Monitoring
- 2D and 3D Construction Monitoring
- Automated Actionable Scheme for Policy Violation
- Illegal Dumping of Garbage
- Quick Decision for New Construction Planning
- Simulation for High Rising Buildings for Airway Obstruction
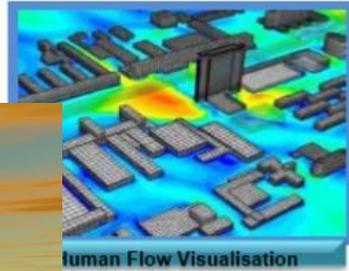

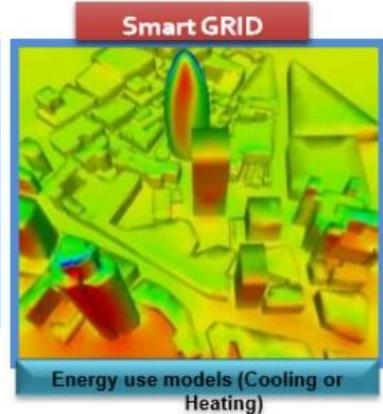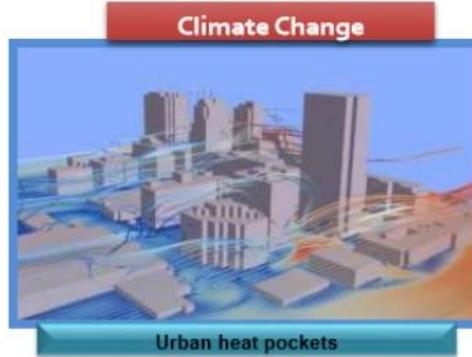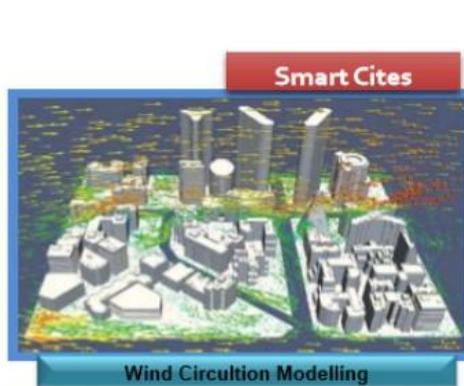SKYMAP GLOBAL

Disaster Management

- Disaster Preparedness
- Real Time Analysis of Disaster Situation with Recent Images
- Usage of Elevation Models for Flood Modelling
- Evacuation Mapping
- Event Loss Estimation
- Scope for Usage of RADAR Data during Cloudy / Rainy Season
- Planning for Rehabilitation

Image Source: TOI

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3D City / BIM

- Capturing of city models using satellite stereo imaging technology
- Search mechanisms based on database attributes in both 3D and 2D environment for quick access
- Real time 3D visualization technology across different platforms
- Usage of City GML for Application Independent Modelling and Visualisation

Mumbai

Smart Cites
Wind Circultion Modelling

Climate Change
Urban heat pockets

Smart GRID
Energy use models (Cooling or Heating)

Human Flow Visualisation

Safe Cities
Fligh Restriction Zones / Detonation Analyis

Sustainable Development
Urban Green Spaces

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Intelligent 3D Platform

Our Satellite Portfolio

Kompsat: An eye in the sky

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From Korea, to the world!!

- Kompsat-3 Data Bundle Product **0.5m PAN & 2 M** Colour

- Kompsat-2 Data Bundle Product **1m PAN & 4M** Colour

- Kompsat-5 is **X-Band SAR** data available in 1 / 3/ 20 m

- Kompsat-3A is **0.4 m PAN & 1.6 m** Colour

- Kompsat and RE data together used for Target Monitoring

- Tremendous Tasking Capability, **low in Cost**
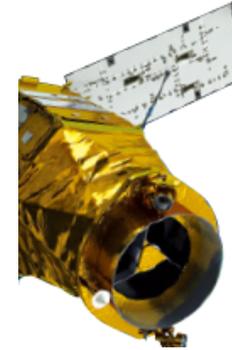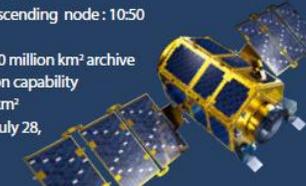
KOMPSAT - 3

Sub-meter in the afternoon
- 0.7 m PAN & 2.8 m MS
- 16 km swath @ nadir
- Local time at ascending node : 13:30
- Key features :
  - Unique local time increases visibility
  - More information per pixel : 14 bits/pixel
- Launched on May 17, 2012 (UTC)

KOMPSAT - 2

Alternate 1m solution
- 1 m PAN & 4 m MS
- 15 km swath @ nadir
- Local time at ascending node : 10:50
- Key features :
  - More than 600 million km² archive
  - Daily collection capability
    of 1,700,000 km²
- Launched on July 28,
  2006 (UTC)

KOMPSAT-5

- SAR (Synthetic Aperture Radar)
- Resolution : 1/3/20m
- Launch : Aug. 22, 2013

KOMPSAT-3A

- Multi-Spectral + IR Camera

All Kompsat Series are Stereo Capable

Kompsat-3A for Land Records Management

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- **14 Bit Depth**
- **12km Swath**
- **IR Band**
- **Stereo Capable**

PAN: 40 cm
MSS: 1.6m
IR: 5.5m

### Role of Kompsat 3A Satellite into Land Records

- K3A Stereo Compilation
- High accuracy GCP's with on ground Monumentation
  - 60 cm x 60 cm structure constructed
  - White reflective surface
  - 4 Km x 4 Km grid
  - Would help in accurately post pointing
- Create high definition DEM & Orthorectify the imagery
- Use Hybrid methodology for LR update
- Collection to progress simultaneously

Cost Effective Solution!

Fits Perfectly into Indian Land Records System

GaoFen-2: An eye in the sky

- GF-2 Data Bundle Product **0.8m PAN & 3.2M** Colour

- Swath Width: 22.5km

- Orbital altitude: 631 km

- Local time at ascending node: 10:30

- Revisit frequency: 5 days

- Launched on August 19, 2014

- GF-2 and RE data can be used for detailed Forest Monitoring

- Tremendous Tasking Capability, **low in Cost**
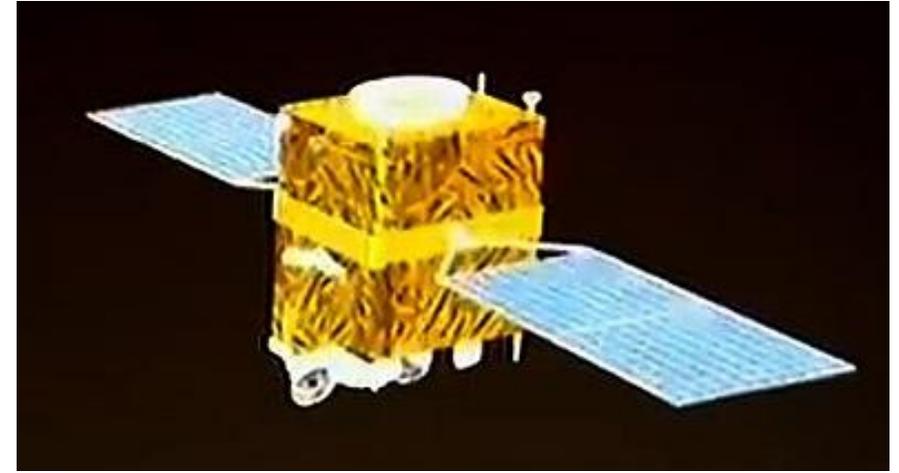
RapidEye: An unique Constellation

5 satellites, 5 m resolution, all work great: New Constellation in design


23:04:53 2007

Equally spaced in one orbital plane

- Up to **5 million km²** collected daily

- **Best High Resolution data** for Rapid Monitoring

- Is **available within 24 hours** for quick Response

- High Locational **Accuracy** (<10 m through India)

- **4 times Data** Availability for whole India

- Unique **PCM (Persistent Change Detection)** program for Updating Map

- **Red Edge**: Extremely Useful identifying Chlorophyll and Nitrogen Change in Vegetation

400 nm   500 nm   600 nm   700 nm   800 nm

B   G   R   RE   NIR
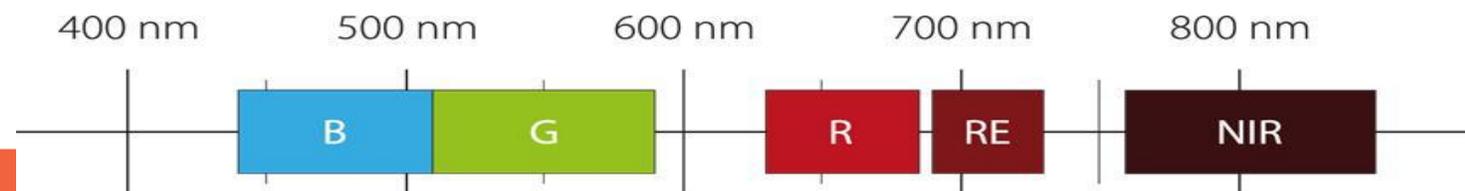
RADARSAT-2

RADARSAT-2 System Capabilities	
Satellite Launch	December 2007
Imaging Modes	17
Spatial Resolution	1 to 100 meters
Swath Width	18 to 500 km
Scene Size	144 km² (Spotlight) to 250,000 km² (ScanSAR Wide)
Polarization	Single, Dual and Quad Polarization Modes
Look Direction	Routine left-and right-looking
On-board Recording	Solid-state recorder
Spacecraft Location	GPS on-board
Imaging Band	C-band
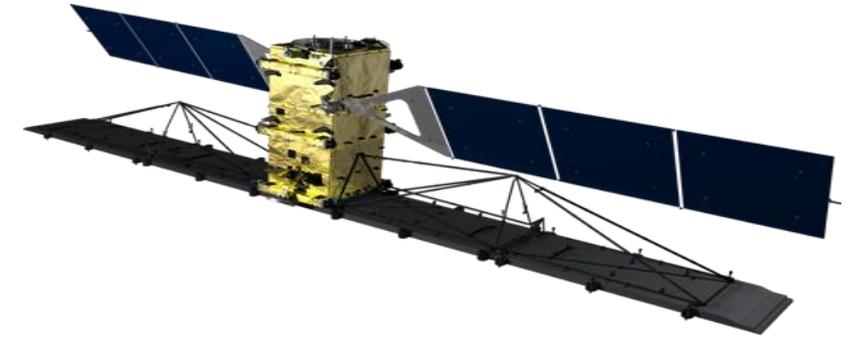
Triplesat 21AT Constellation

3 Satellites

Number of satellites	3
Satellite orbit	Sun-synchronous orbit
	Altitude: 651 km
	LTAN: 10:30am
GSD	<1m PAN
	<4m MS
Bands	PAN: 450nm - 650nm
	Blue: 440nm - 510nm
	Green: 510nm - 590nm
	Red: 600nm - 670nm
	NIR: 760nm - 910nm
Swath width	23.4 km
MTF	PAN: >10% MS: >20%
SNR	>100:1
Pointing accuracy	<500m
Geo-Location	<50m (1-sigma, without GCPs, with no blinding)

Strip length	175 scenes (equivalent to 4000km)
Off-pointing capacity	±45°
Imaging mode	Single scene (23.4 km x 23.4 km)
	Strip map (up to 175 scenes)
	Along track stereo (single pass)
	Across track stereo (two passes)
	Area (40 km x 40 km)
Revisiting	1 Day
Design Lifetime	7 years
Compression	Real-time lossless/near lossless, JPEG-LS
On-board storage	544 GB (equivalent to 550 scenes)
Transmission rate	500Mbps (5/6 TCM encoding)
	400Mbps (2/3 TCM encoding)
Transmitter on time	60 mins/day

Dedicated Each Month Collection for Sensitive Areas in Sub-Meter

Smart Monitoring

Planet Labs Data for Monitoring Solution

Planet Labs helps you detect and act on change by imaging the whole Earth everyday.

Planet Labs Capabilities

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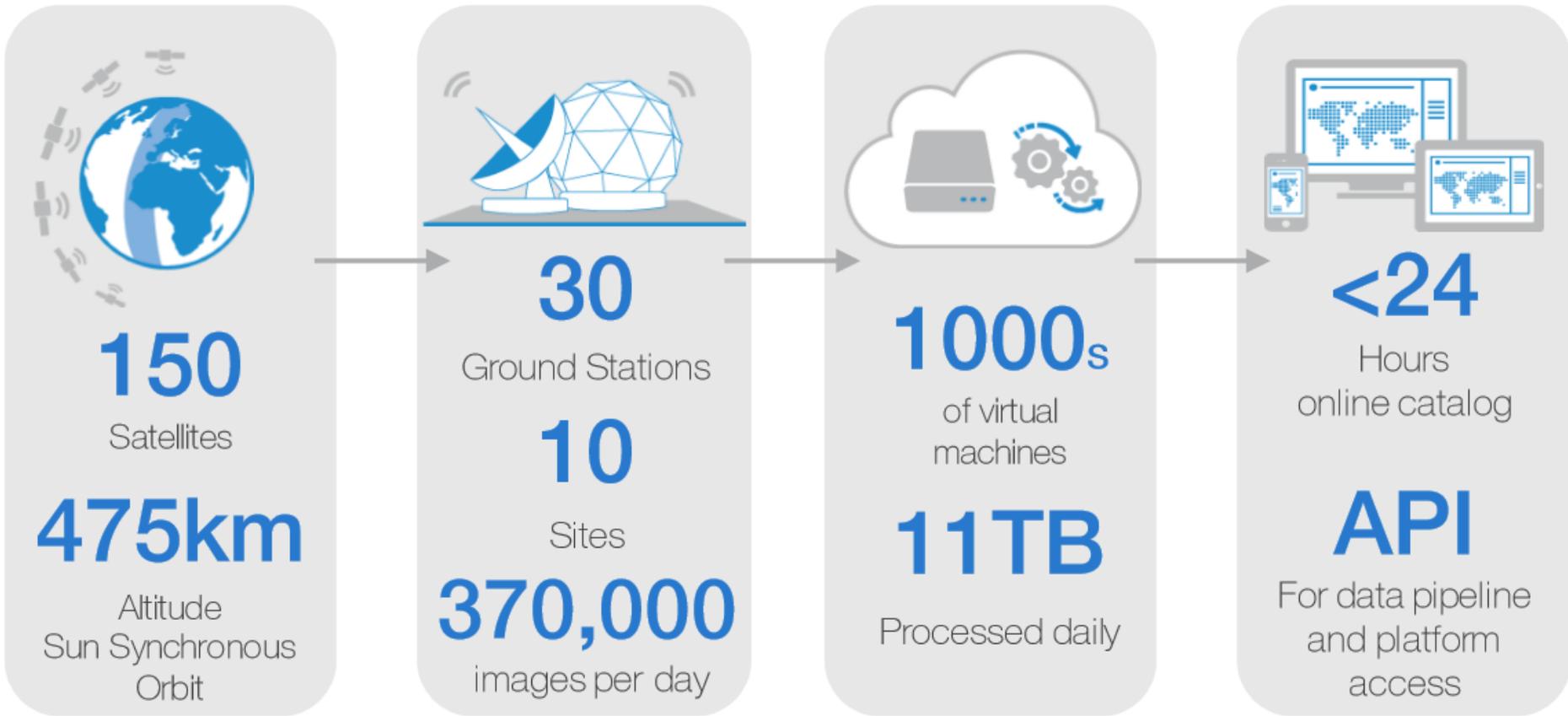www.skymapglobal.com

End-to-end System

150
Satellites

475km
Altitude
Sun Synchronous
Orbit

30
Ground Stations

10
Sites

370,000
images per day

1000s
of virtual
machines

11TB
Processed daily

<24
Hours
online catalog

API
For data pipeline
and platform
access

Image whole Earth everyday

Example: Agriculture Monitoring

Soybean Fields
Plymouth County Iowa
October 12, 2014

Example: Agriculture Monitoring

Soybean Fields
Plymouth County Iowa
October 15, 2014
(3 days later)

Example: Agriculture Monitoring

Soybean Fields
Plymouth County Iowa

Harvest: 1136 Acres

% of Soybean: 15%

Change Surveillance of Interested Features

Legal

legal

Illegal

Compare with government administrative data

Regular remote sensingChange-information extraction data acquisition and processing

Update the change-information to the spatial database

On-site verification with mobile device

Dismantlement enforcement support

April

June
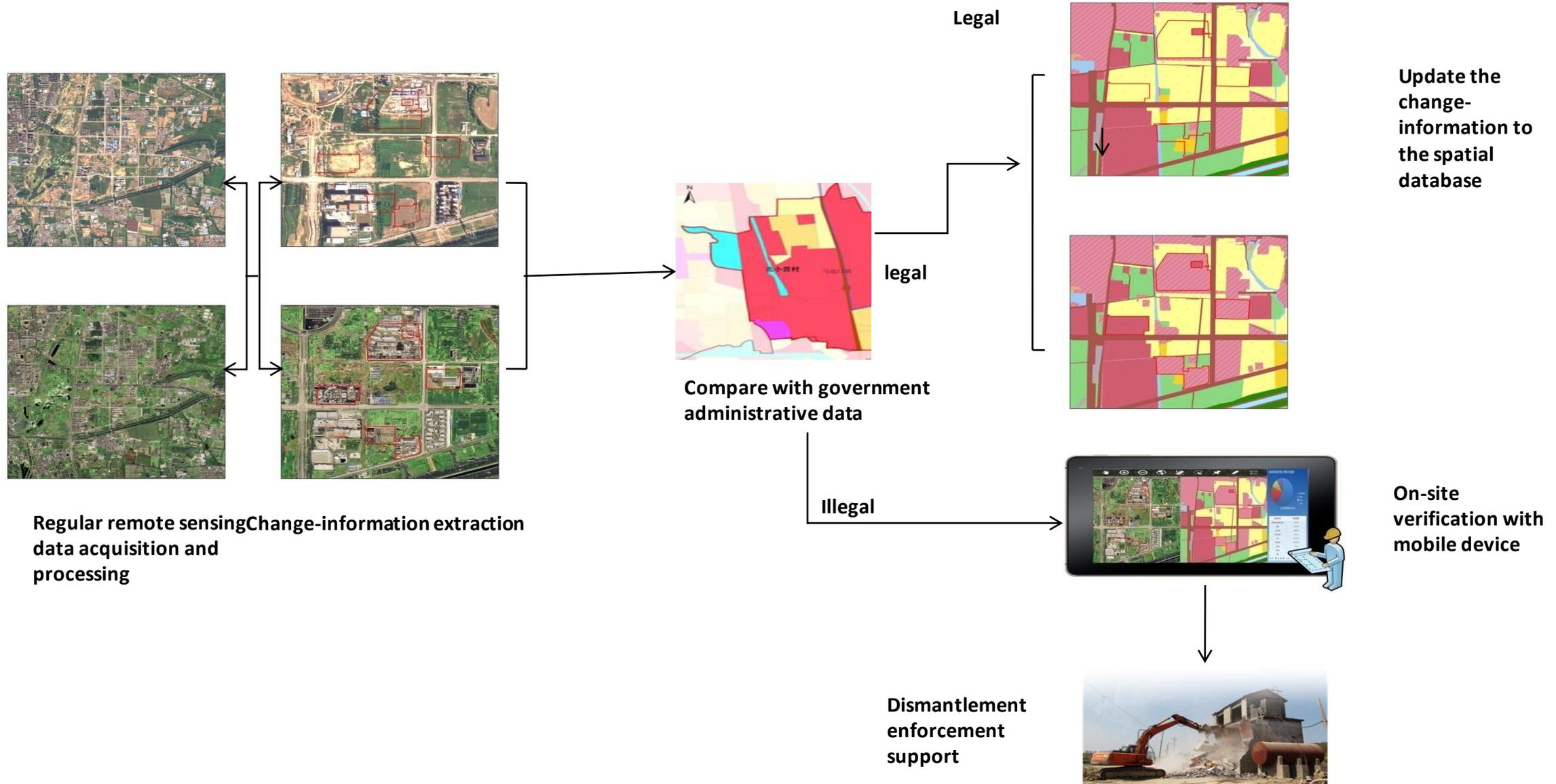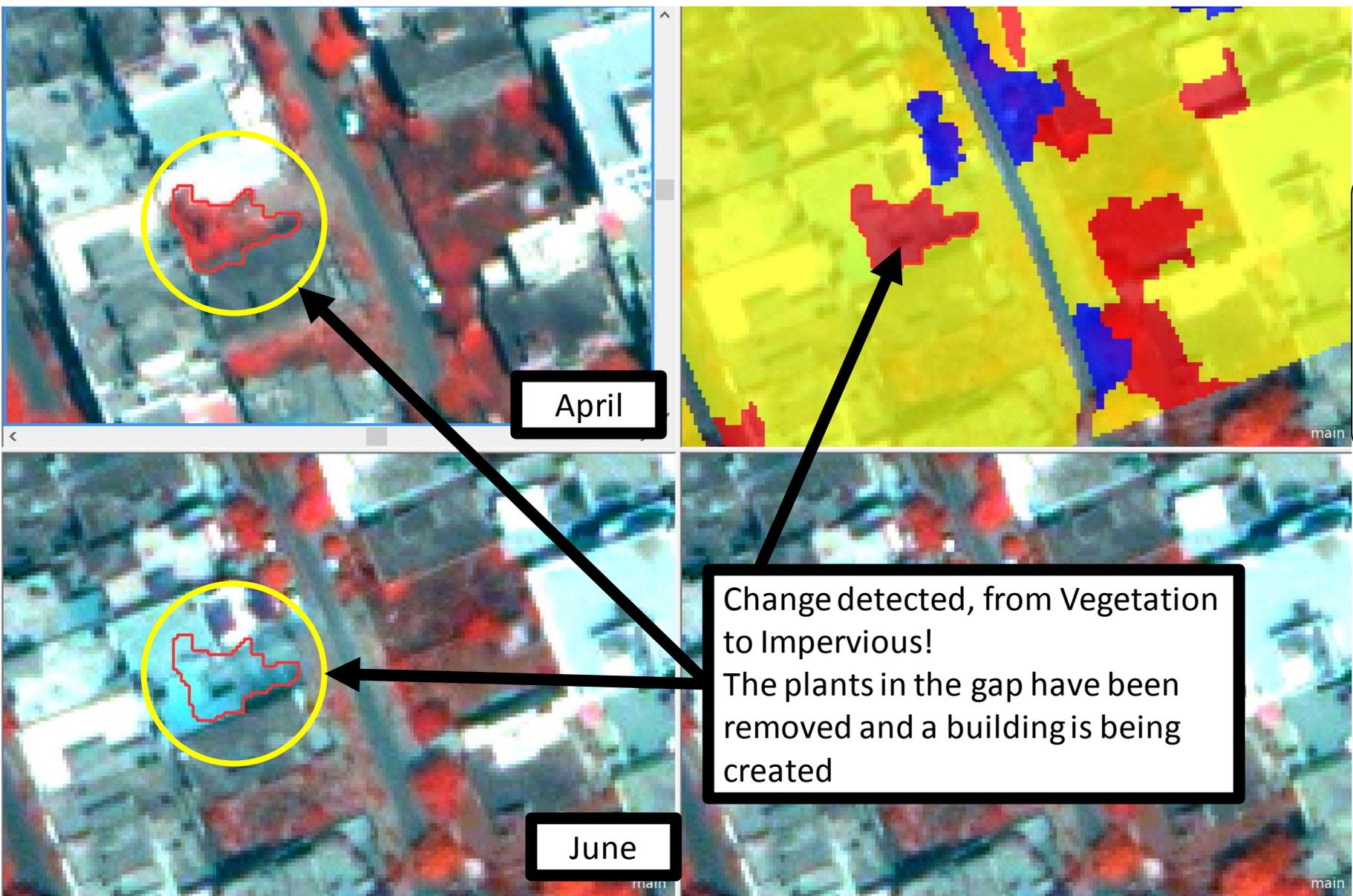
Vegetation to Impervious

Impervious to Vegetation

No Change

Change detected, from Vegetation to Impervious!
The plants in the gap have been removed and a building is being created

The processed workflow/algorithm is working and detects changes well. The figure above shows a real change in the land cover when an area has changed from vegetation to impervious.

Water Quality Monitoring and Assessment

Water Quality Monitoring and Assessment

Turbidity Monitoring and Assessment

Using multispectral imagery, we can assess Total Suspended Matter using the information of backward scattering of light in the visible region.

Water Quality Monitoring and Assessment

Suspended matter

[mg/l]
- 1
- 6
- 24
- 58
- 125
- 358
- 712

Land

Cloud
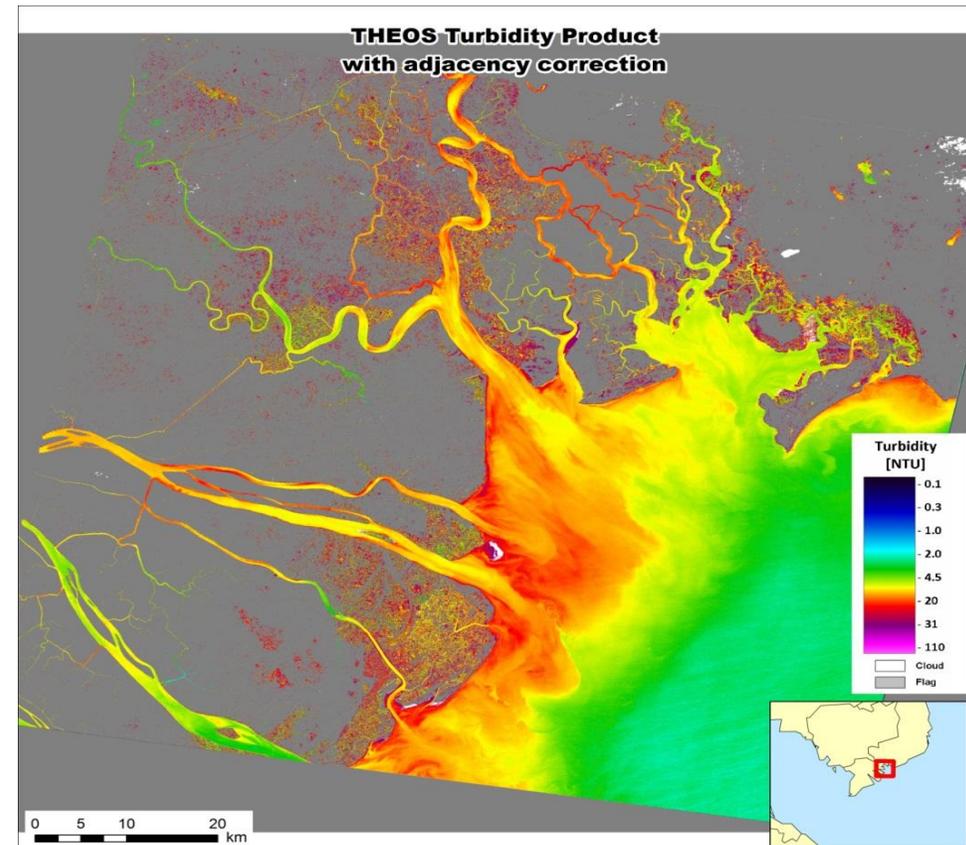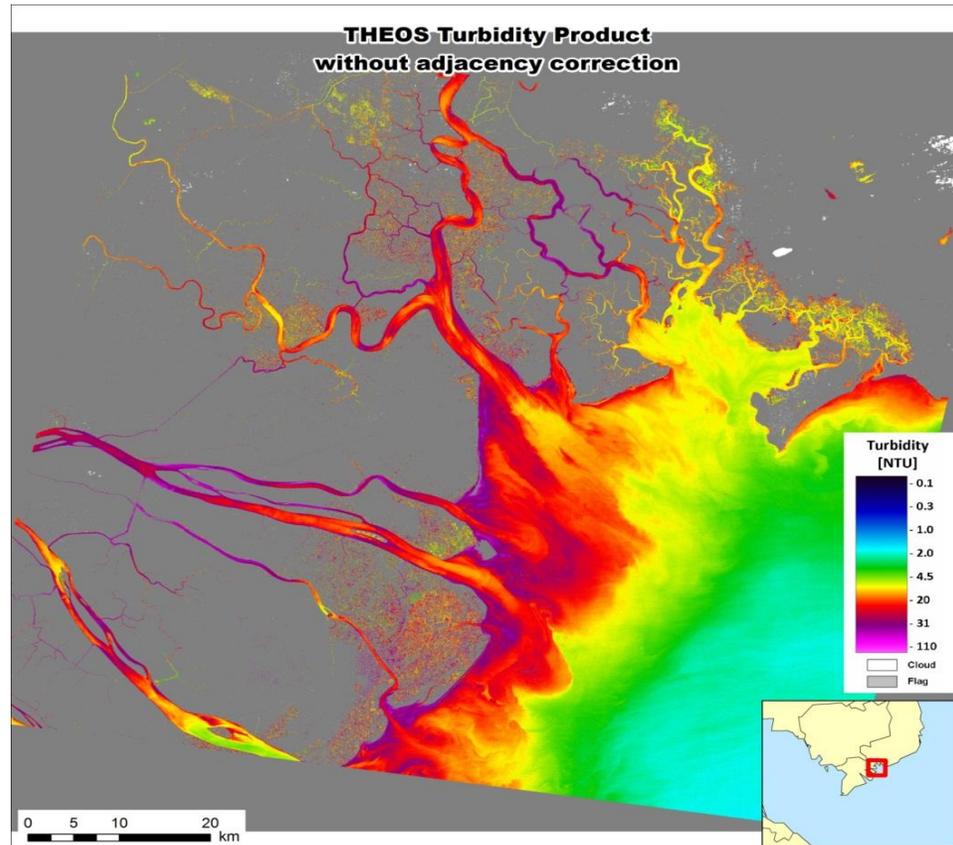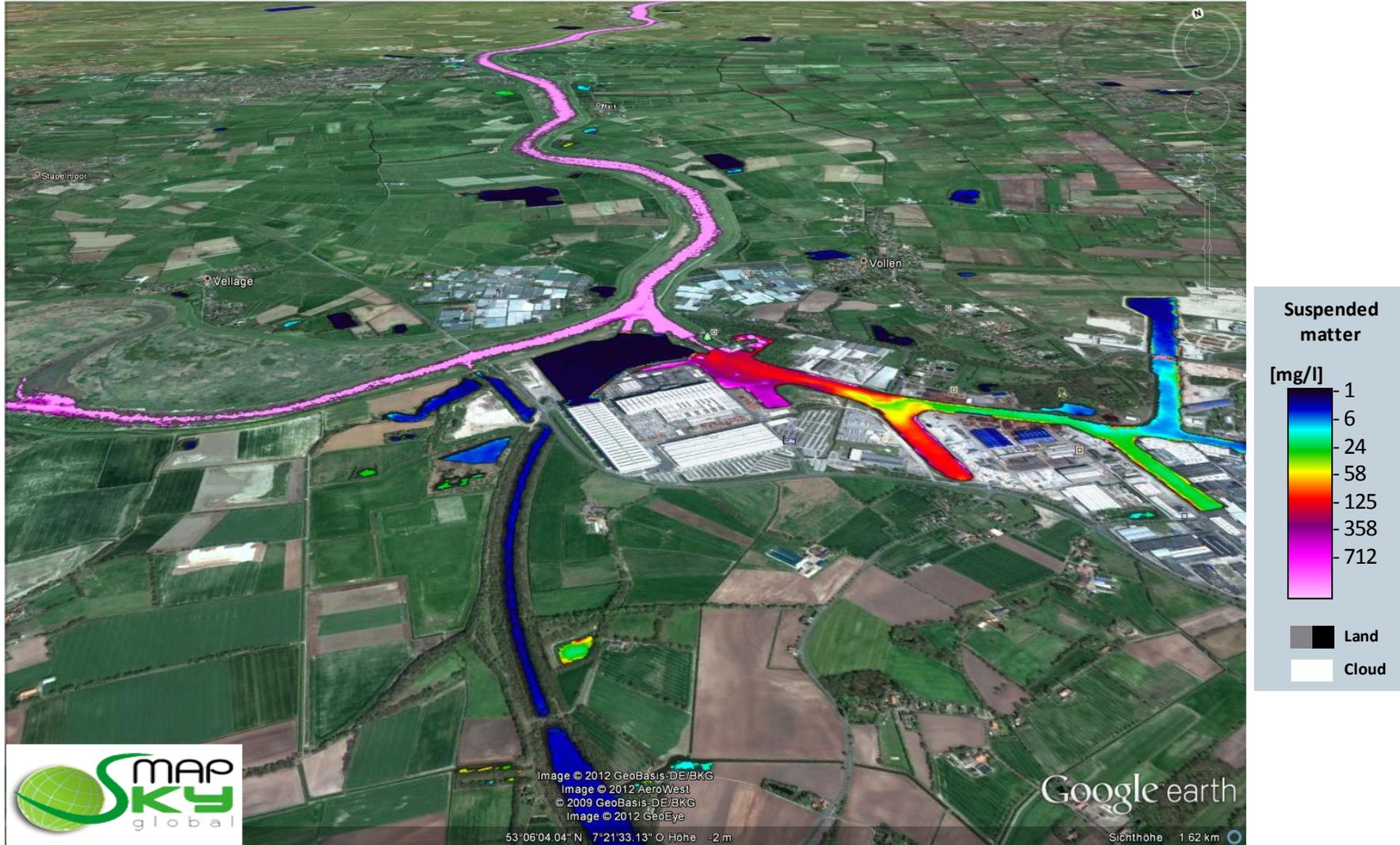
Bathymetry Mapping

Rottnest Island (West Australia), High Resolution satellite data July 17, 2005

Subsurface reflectance (atmospheric and water surface corrrected)

SkyMap Smart Image Processor

PCI Geomatics Delivers High Volume Production System (GXL) to Skymap Global in Singapore

MARKHAM, Ontario, Canada—May 25, 2016: PCI Geomatics, a world leading developer of remote sensing and photogrammetric software and systems, announced today that SkyMap Global of Singapore has become a key commercial GXL customer in Asia.

SkyMap Global is focused on delivering value added satellite imagery products and solutions to the South Asian market. Skymap has been actively engaged with PCI Geomatics to leverage the capabilities of the GXL to promote and develop solutions to end users. SkyMap is establishing a full support infrastructure in Singapore to work closely with PCI Geomatics to expand its regional base for customized solutions by leveraging the use of GXL technology.

"We selected PCI Geomatics as our technology partner from the day we started our business, and we have received excellent support, allowing us to apply their cutting edge technology for our customers. Now we have also selected PCI Geomatics as our platform for the launch of our *SkyMap Smart Image Processor platform*, powered by PCI's GXL technology, for integrated processing and analytics to our global customer base", said A.S. Mittal, CEO of SkyMap Global in Singapore.

"We are pleased to see that Skymap has selected GXL for its accurate, high-throughput, automated workflows for orthorectification, DEM extraction, color balancing, and mosaicking of satellite image data. We are confident that Skymap will be able to exploit GXL's unique big data handling capabilities to provide excellent value to their customers. We are looking forward to working with Skymap to ensure they are successful in this very dynamic region of the world which is faced with many regional mapping and environmental challenges", said Arnold Hougham, Vice President of Sales and Marketing at PCI Geomatics.

About PCI Geomatics
PCI Geomatics is a world-leading developer of software and systems for remote sensing, imagery processing, and photogrammetry. With more than 30 years of experience in the geospatial industry, PCI is recognized globally for its excellence in providing software for accurately and rapidly processing both satellite and aerial imagery. PCI has installed more than 30 thousand licenses, in over 150 countries worldwide. Find out more about PCI Geomatics at www.pcigeomatics.com.

About SkyMap Global
SkyMap Global specializes in providing information solutions to a range of users on all the different platforms ranging from the web to the mobile devices on both iOS and Android platforms. The company has a highly qualified team of specialists and engineers focusing its efforts on engineering solutions for public and private organizations that include information management, 3D technologies and the latest Remote Sensing methods for deriving valuable information for decision making. The company officially launches its SkyMap Smart Image Processor to create a hub where local companies can benefit from the customized workflows developed to suit the processing requirements. It will enhance the capabilities of local companies to benefit from the power of GXL. Find out more about SkyMap Global at www.skymapglobal.com.

What is the SSIP?

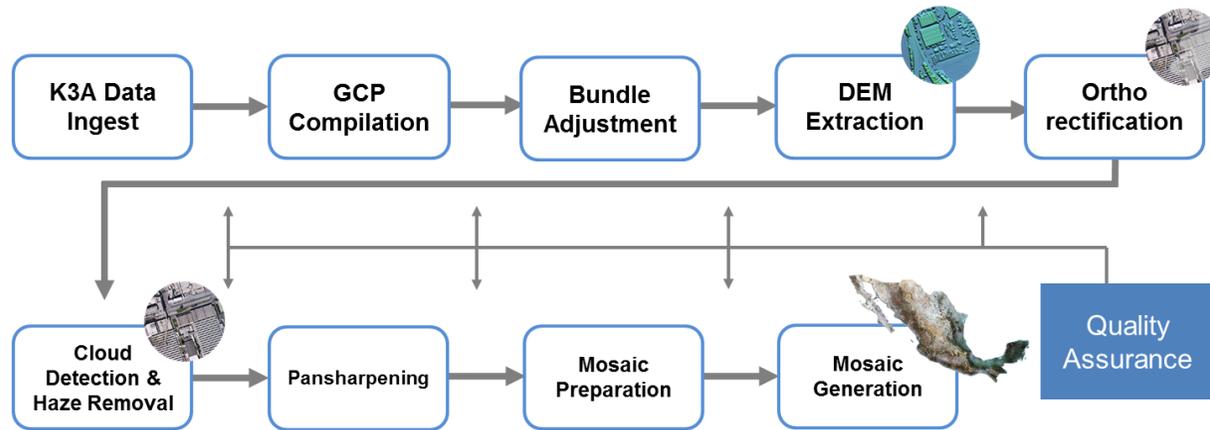**A Hardware-software system for Ortho-Mosaic production**

Optimized for…

- Speed

- Automation

- Quality

Actual SSIP Photograph

Utilization of SSIP for faster Turn Around

Core Strengths of SSIP

Satellite Benchmark

Sensor:	Output:	Area:
Ikonos	120 GB/day	18 000 km²/day (1.0m)
WorldView-2	140 GB/day	8 000 km²/day (0.5m)
QuickBird	144 GB/day	9 000 km²/day (0.6m)
RapidEye	840 GB/day	1 400 000 km²/day (6.5m)
WV-2 (4-node)	1200 GB/day	256 000 km²/day (0.5m)
Ikonos (Cloud)	3 TB/day	600 000 km²/day (1.0m)
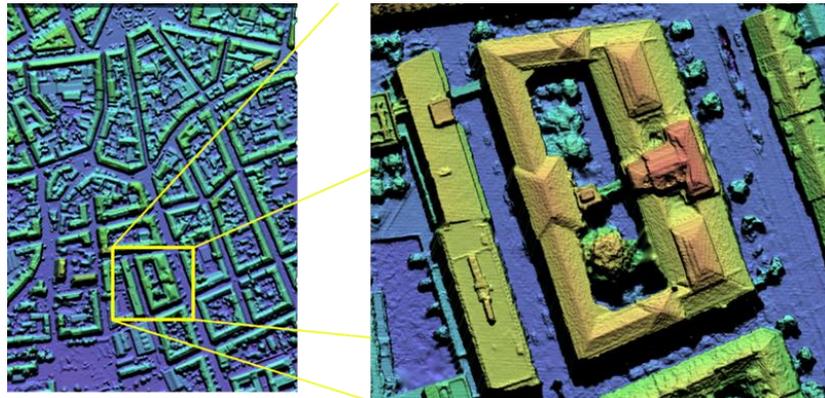
- Fastest solution for Processing Huge Volumetric Data
- SSIP Powered by PCI, Canada
- Increase in efficiency and productivity for land-related Basemap creation
- Highly scalable solution that is able to scale up without increase in technical resources
- Achieve large scale mosaic production with high quality colour balance, bundle adjustments, cloud removal in a single automated process.

A Hardware-software system for Ortho-Mosaic production

Mature Math…

- Algorithms based on 30+ years of sound science and innovation
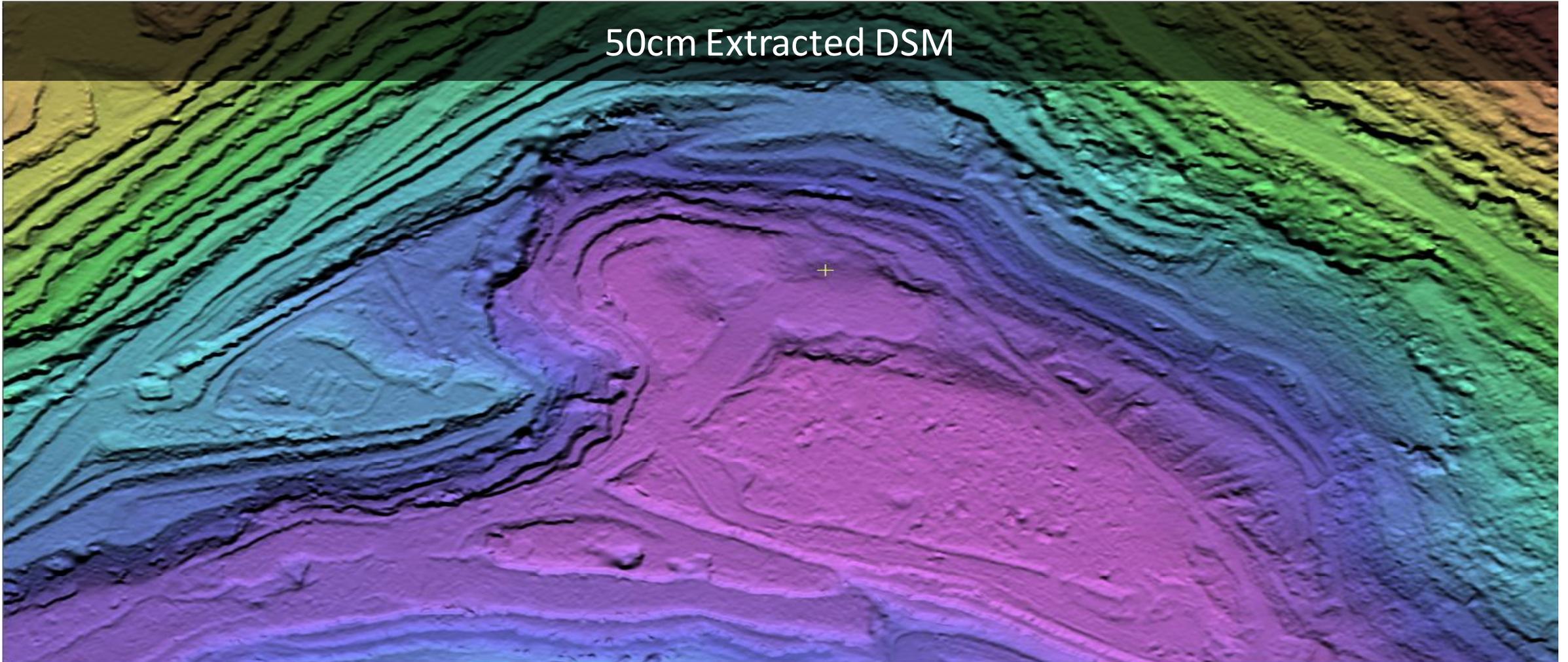
- Award winning algorithms (i.e. Pansharpening)

Quality – DEM Extraction

20cm DSM overview

20cm DSM detail (raw, unedited)
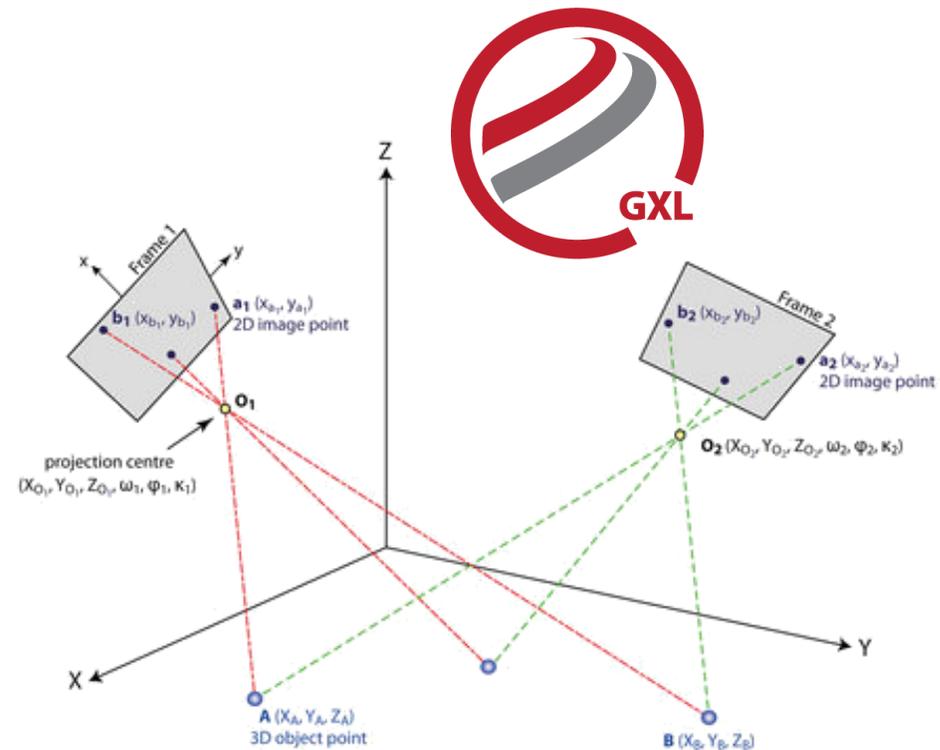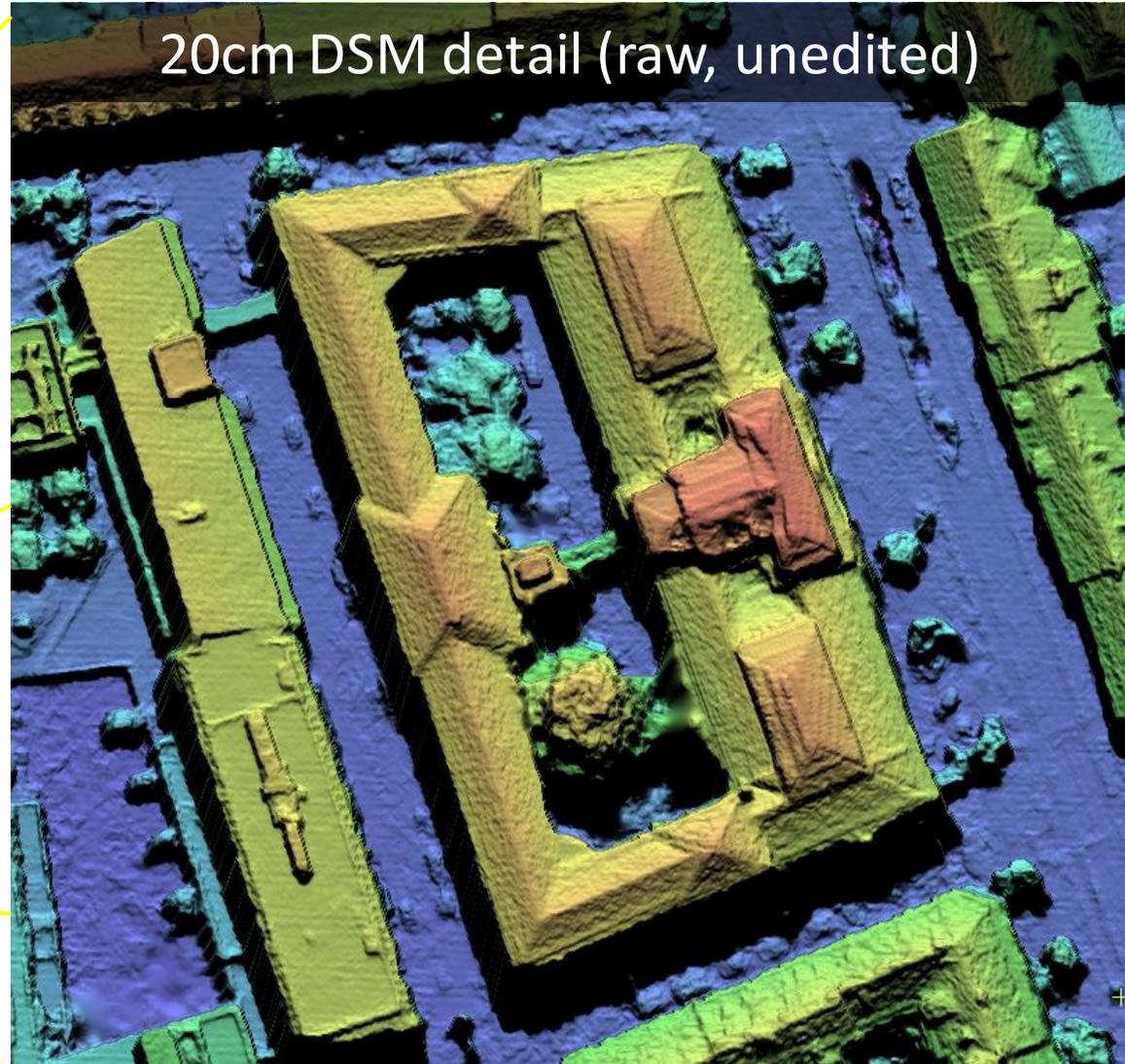
1:1 – DEM Extraction

50cm Extracted DSM

Automatic Interactive Color Balancing
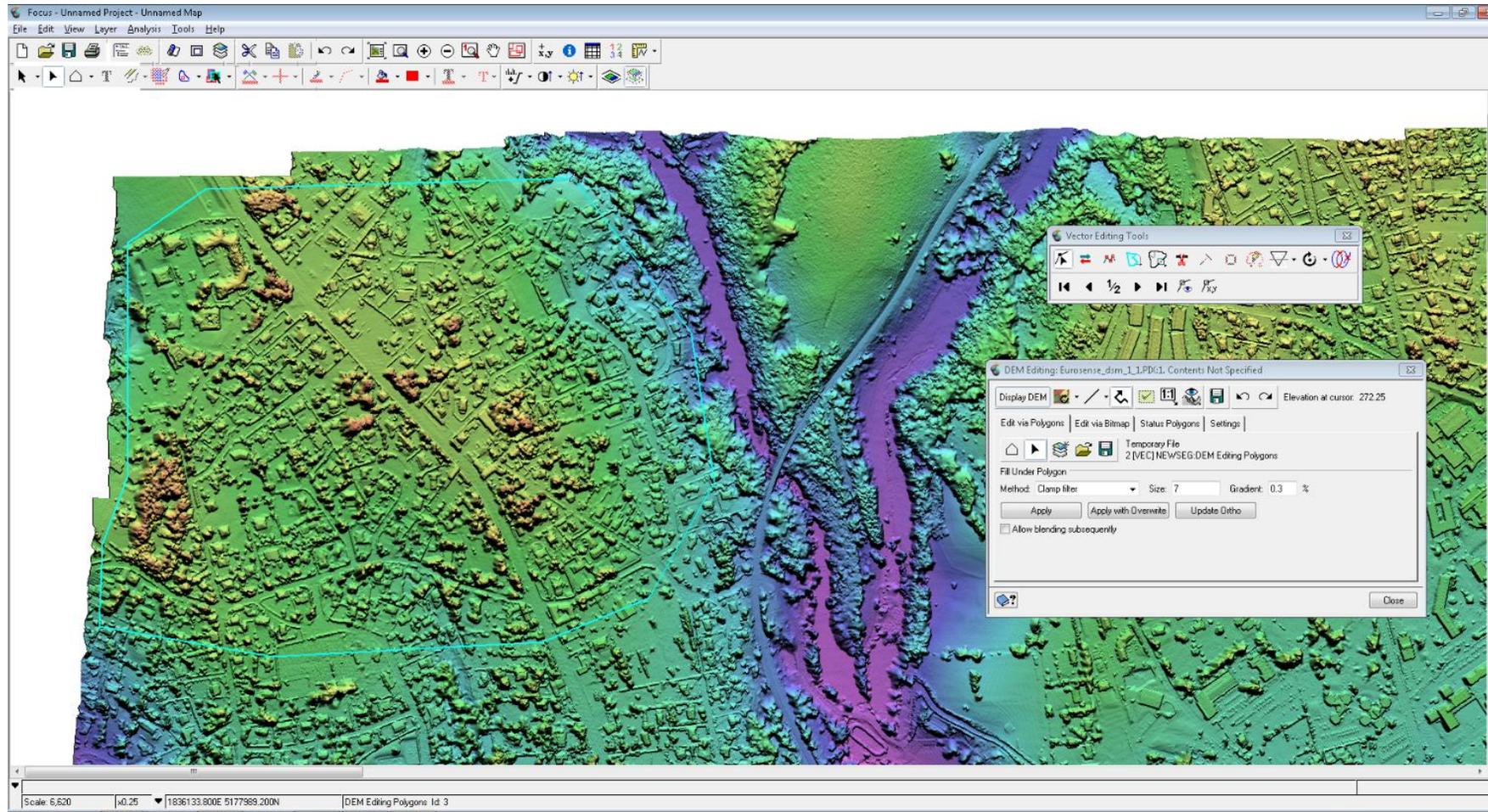

Automatch to both sides

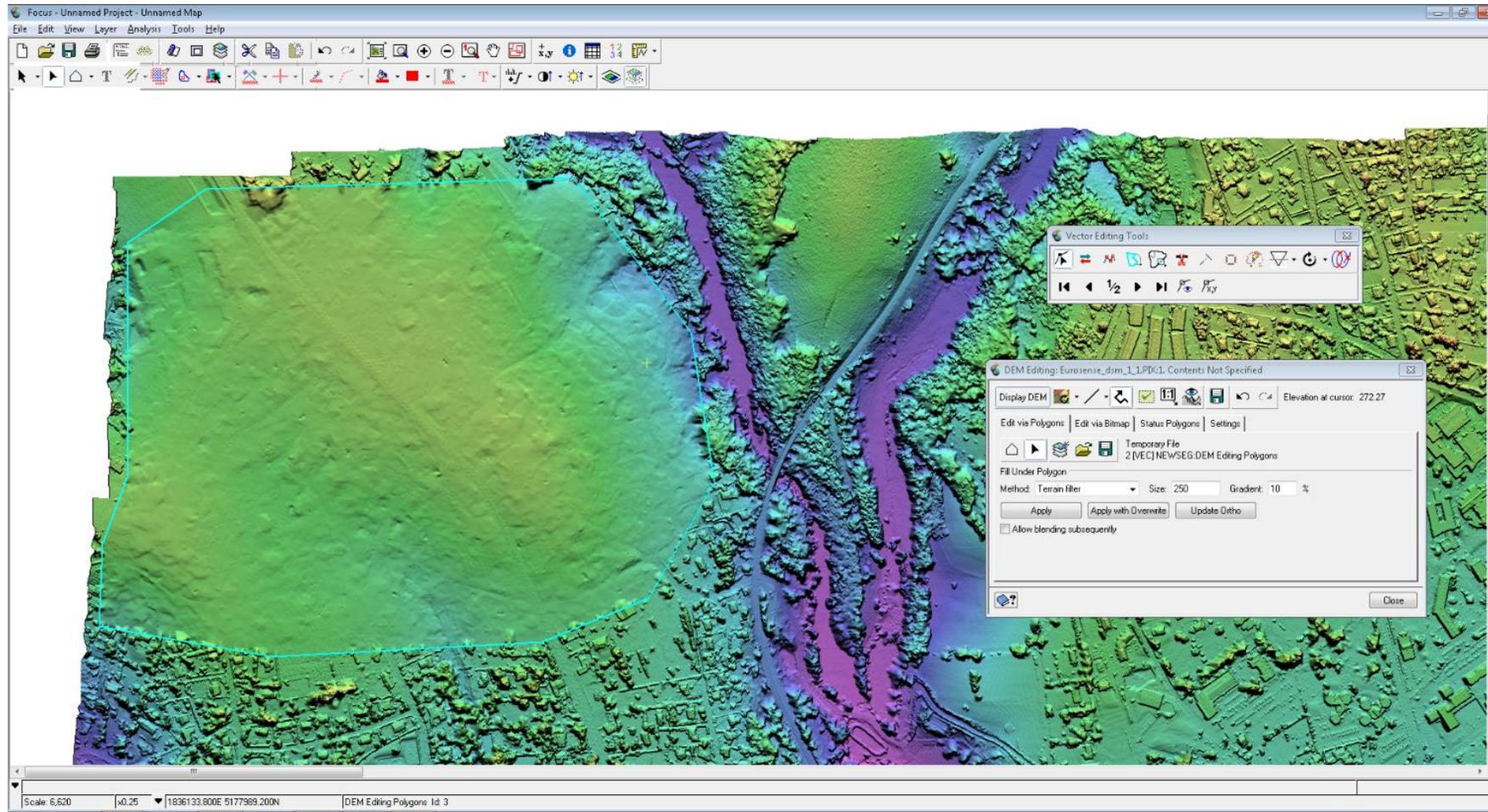Automatch to single side

Smart GeoFill Exposure Correction
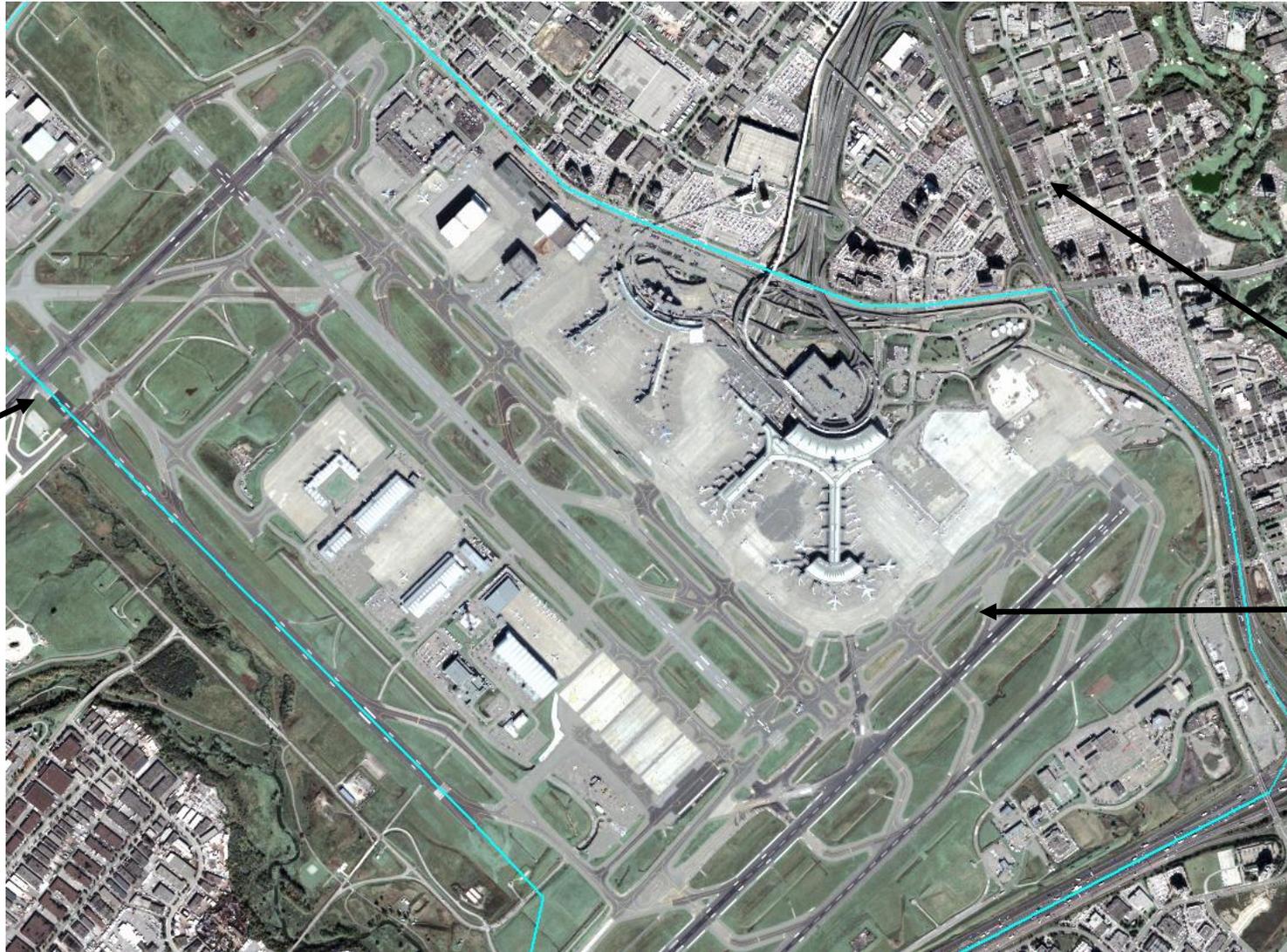
Delineate boundary to perform exposure correction
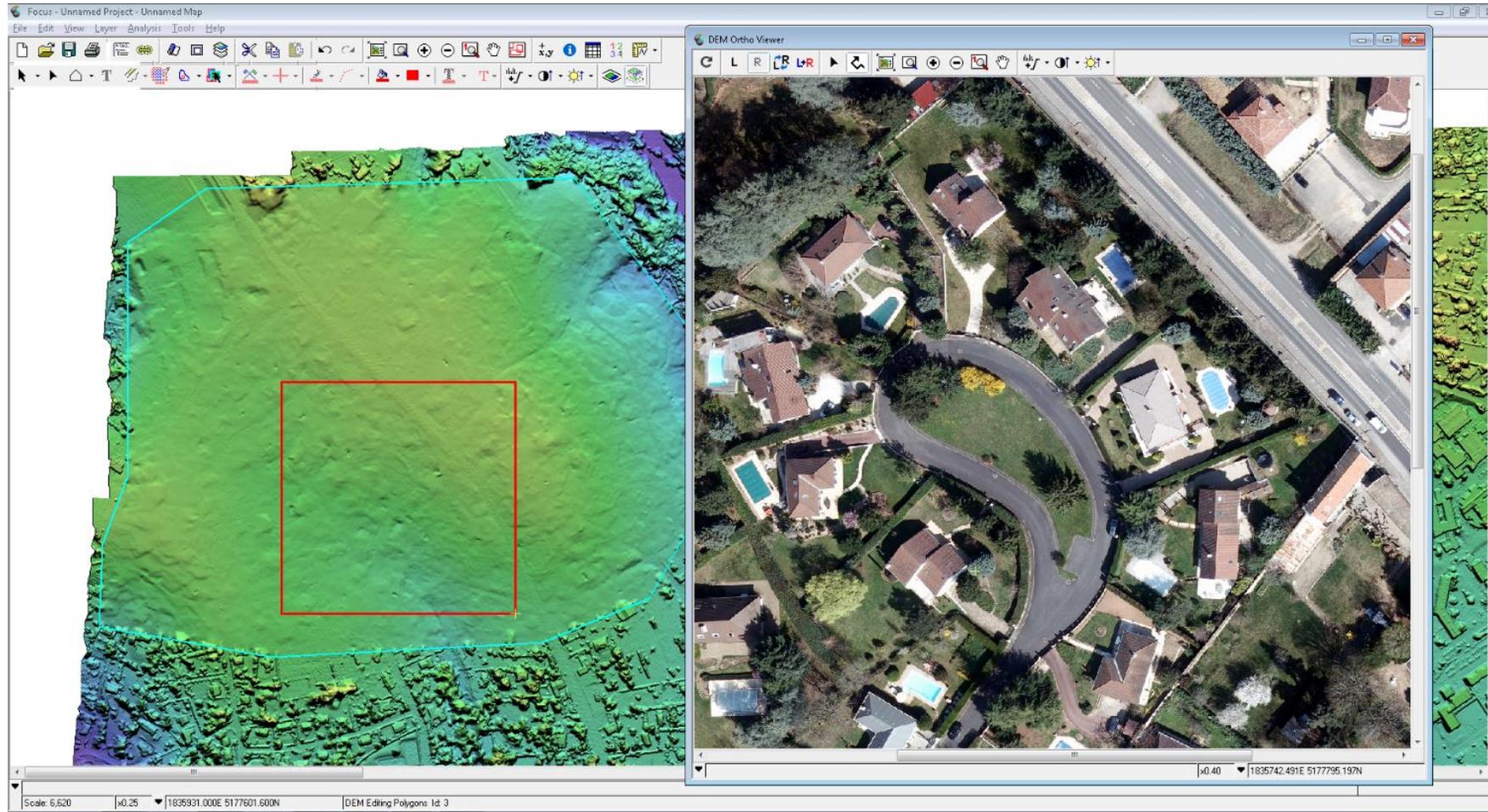
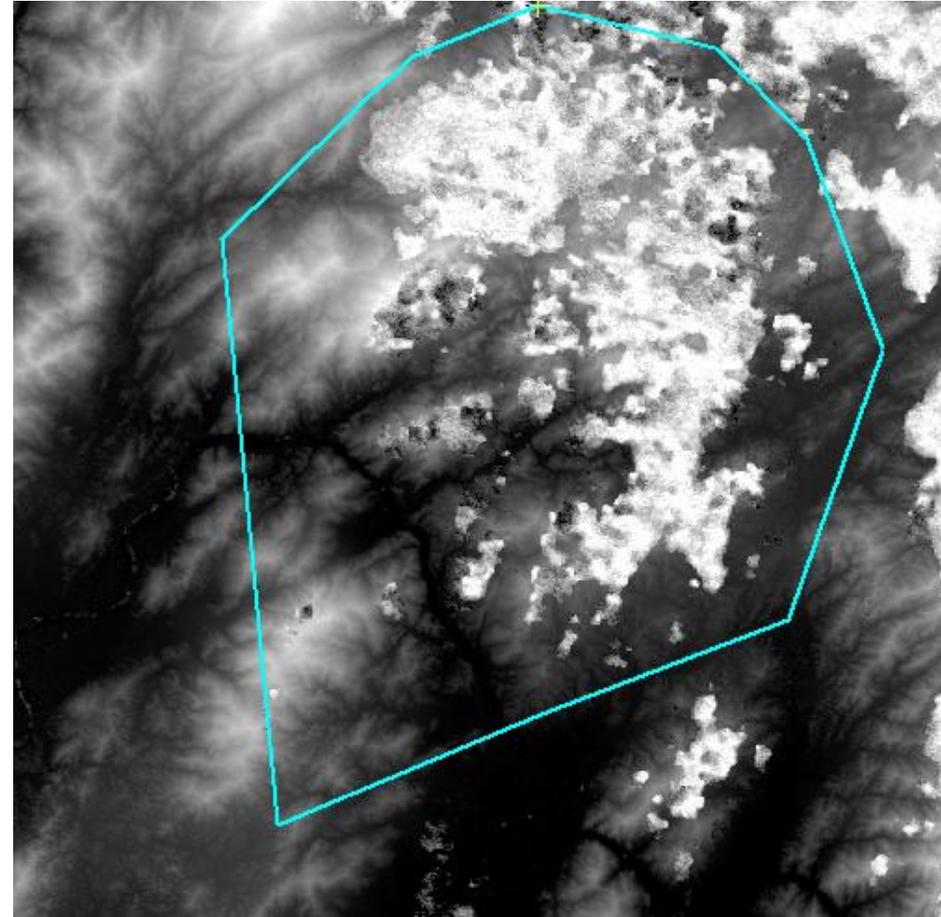Exposure correction contained within boundary

Digital Surface Model (DSM)

Live DEM Editor

Area Filters

Live DEM Editor

Quality Assurance: Toggle Stereo Orthos

Quickly correct errors due to clouds in DEMs

Skymap Smart Image Processor (SSIP) Modules

Popular Satellite Modules

- Orthorectification
- Mosaicking
- DSM/DEM Extraction
- Pansharpening
- DEM Generation

- Automatic GCP Collection
- Automatic Bundle Adjustment
- Data Transformation
- Clip Area of Interest
- Image Coregistration

Few Popular Aerial Modules

- Orthorectification
- Mosaicking
- DSM/DEM Extraction

- Clip Area of Interest
- Airphoto Bundle Adjustment
- Pansharpening

SSIP as a Service

- SSIP on-site based services including Hardware
- On Demand State level Ortho-Mosaic
- On-Site Technical Support and Production Support
- Highly trained and experienced Team

These tools are batchable, Linkable and mostly automatic for superior throughput

SSIP Benchmark

- Tens of Gigabytes of imagery can be processed in minutes, instead of the hours and days.

- GPU based processing allows hundreds of GPU processing cores to work on the jobs concurrently.

- SSIP processing architecture also allow multiple nodes

Satellite Sensors

Sensor:	Output:	Area:
Ikonos	120 GB/day	18 000 km²/day (1.0m)
WorldView-2	140 GB/day	8 000 km²/day (0.5m)
QuickBird	144 GB/day	9 000 km²/day (0.6m)
RapidEye	840 GB/day	1 400 000 km²/day (6.5m)
WV-2 (4-node)	1200 GB/day	256 000 km²/day (0.5m)
Ikonos (Cloud)	3 TB/day	600 000 km²/day (1.0m)

Aerial Sensors

Ortho-Mosaic:	UltraCam X	UltraCam Xp
Project:	3300 Images	4500 Images
Total Time:	17.5 Hours	52.5 Hours
Output:	1.8 TB/day	1.1 TB/day
Speed:	4500 Images/day	2000 Images/day

SmartMap Platform
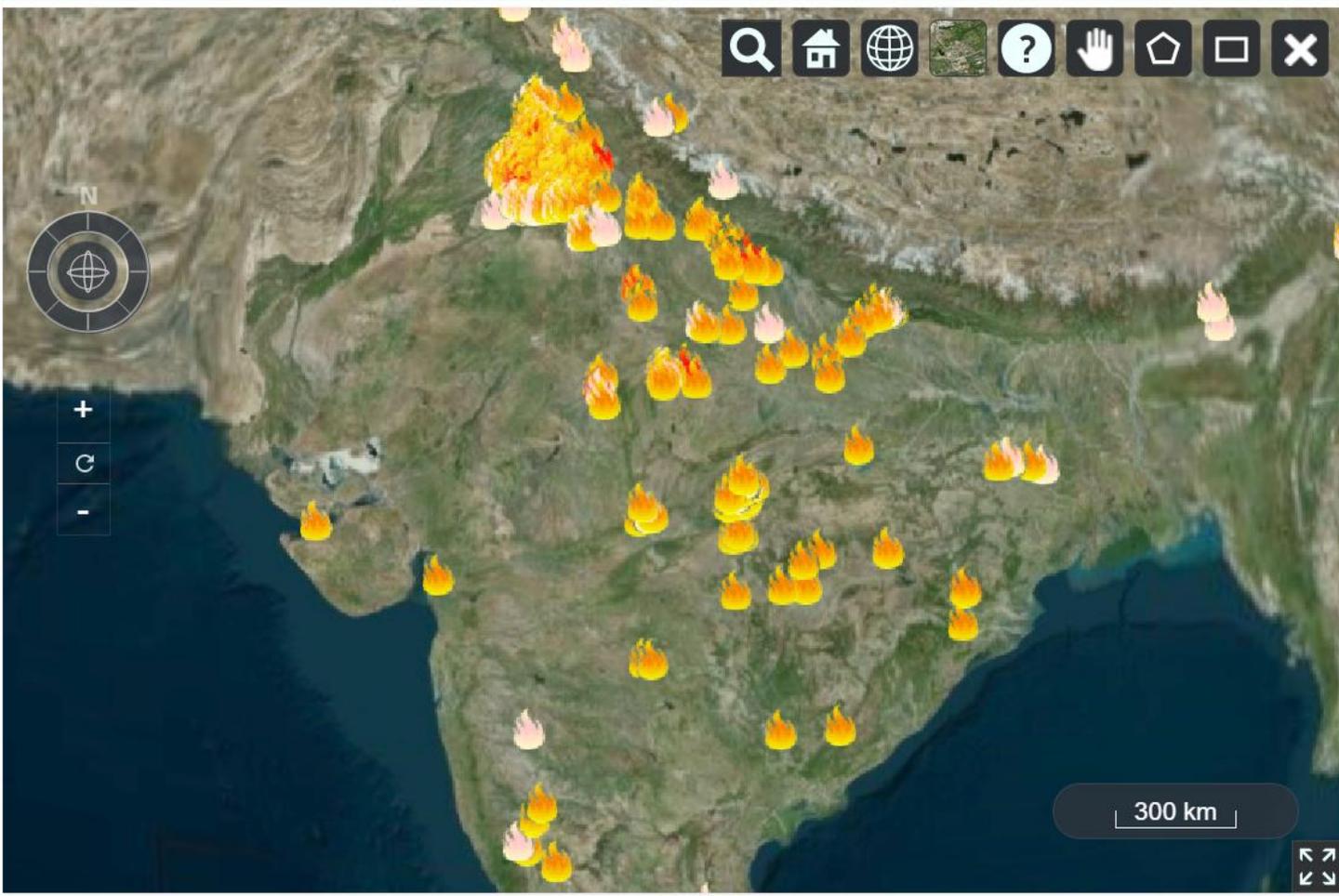
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10, Jalan Besar, #07-10, Sim Lim Tower
Singapore 208787
Phone: +65-62860018

For More Information, visit
www.skymapglobal.com
www.linkedin.com/company/skymap-global