



A New Alaska, US, and Global Capability: Near-real-time, Multi-satellite, Optical, Radar, and Elevation Products

JACIE | March 28, 2014 | Louisville, Kentucky

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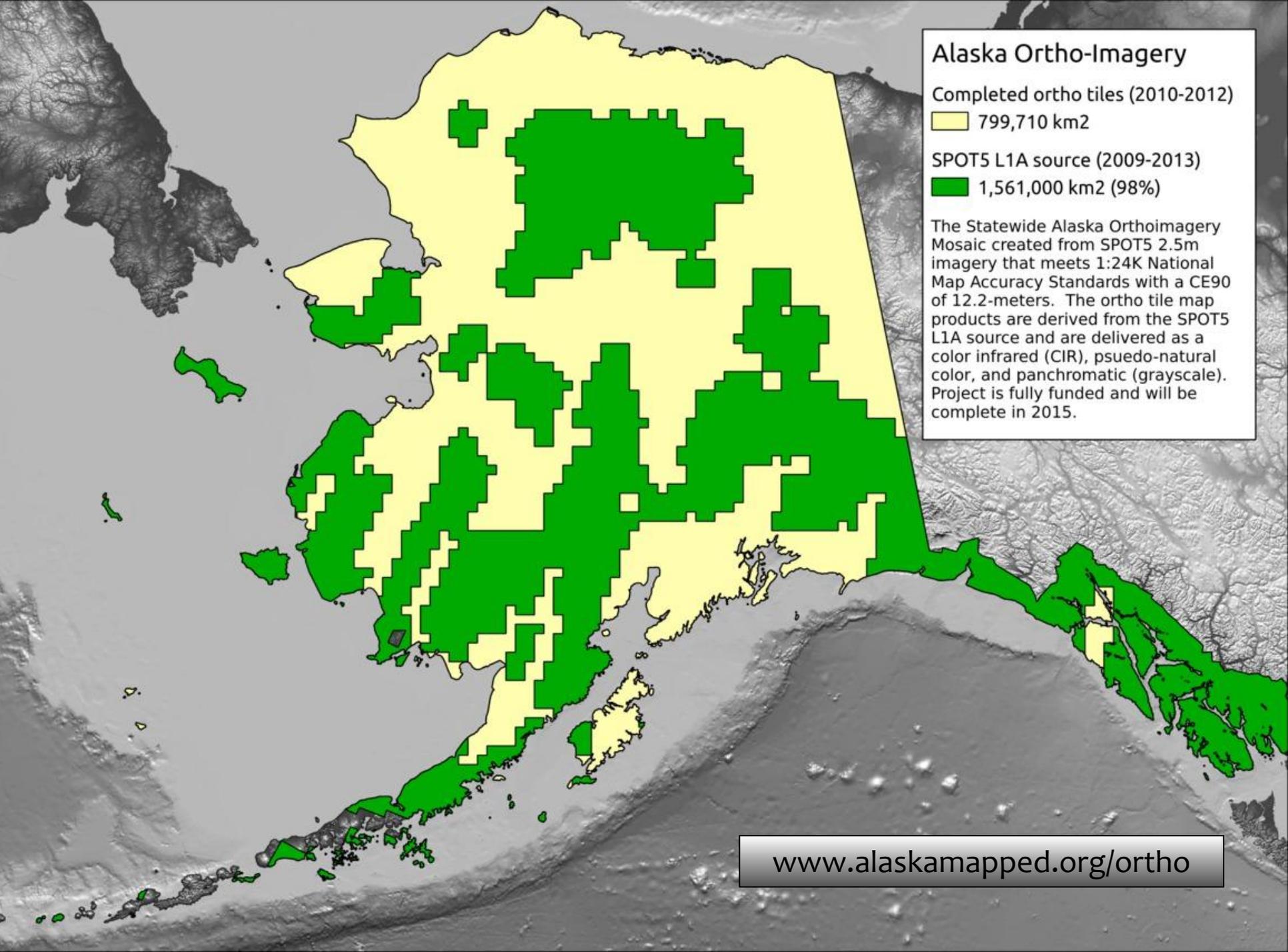


- * Brief status of Alaska statewide mapping
- * New real-time downlink capability in Fairbanks
 - * University of Alaska Fairbanks reception capabilities
 - * UAF-GINA real-time satellite data deliver expertise
- * Partnership with Anchorage-based GeoNorth to receive Airbus constellation in Fairbanks: near-real-time TerraSAR-X & TanDEM-X radar, Pleiades 1a & 1b, and SPOT 5, 6, & 7
 - * Live May 1, 2014



Alaska Orthoimagery Specifications

- Delivery: Pseudo natural color, CIR, panchromatic orthoimagery
- 2.5-m spatial resolution
- 1:24,000 NMAS
- 12.2-m CE90 accuracy
- Alaska Albers
- NAD83, NAVD88
- FGDC metadata, AT solutions, ground control data, quality masks, and less than 10% cloud cover.
- Fully funded with statewide map coverage complete by 2015.



Alaska Ortho-Imagery

Completed ortho tiles (2010-2012)

799,710 km²

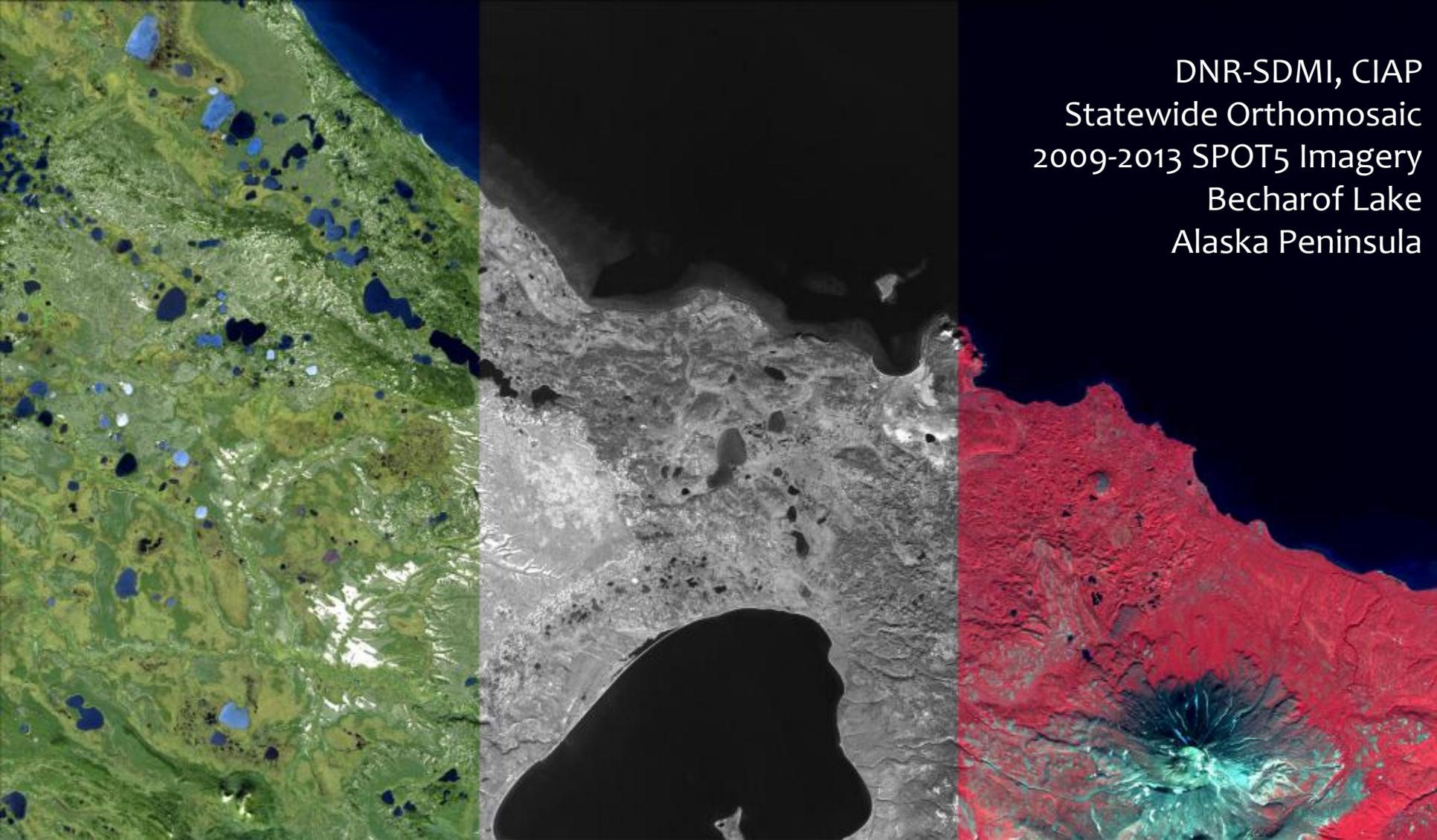
SPOT5 L1A source (2009-2013)

1,561,000 km² (98%)

The Statewide Alaska Orthoimagery Mosaic created from SPOT5 2.5m imagery that meets 1:24K National Map Accuracy Standards with a CE90 of 12.2-meters. The ortho tile map products are derived from the SPOT5 L1A source and are delivered as a color infrared (CIR), psuedo-natural color, and panchromatic (grayscale). Project is fully funded and will be complete in 2015.

www.alaskamapped.org/ortho

DNR-SDMI, CIAP
Statewide Orthomosaic
2009-2013 SPOT5 Imagery
Becharof Lake
Alaska Peninsula



Natural Color

Greyscale

Color-infrared

Alaska IfSAR Specifications

- Delivery: DTM, DSM, & ORI
- 5-m post spacing
- 3-m LE90 vertical accuracy for slopes <10-deg
- 12.2-m CE90 horizontal
- Alaska Albers
- NAD83, NAVD88
- Hydro enforced, FGDC metadata, quality masks, and less than 3% void fill.



Statewide Digital Mapping Initiative's Elevation Products:
Orthorectified Radar Imagery, Hillshaded Surface Model, Hillshaded Bare Earth

ALASKA IFSAR STATUS

Updated February 24, 2014

- Acquired FY11 - Downloadable
- Acquired FY12 - Downloadable
- Acquired FY13 - Available Summer 2014
- Overcollect
- Legacy - Downloadable

ifsar.gina.alaska.edu

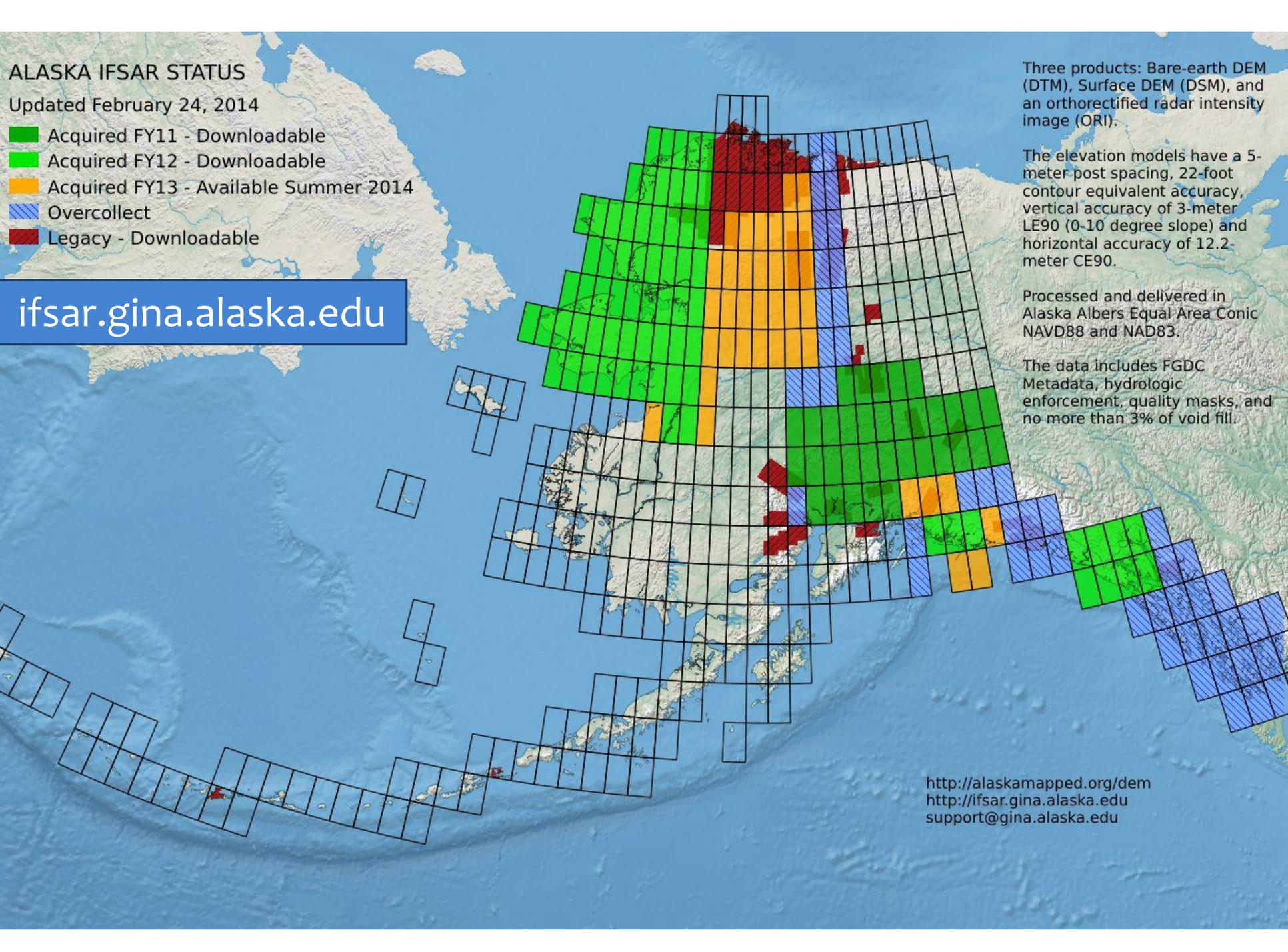
Three products: Bare-earth DEM (DTM), Surface DEM (DSM), and an orthorectified radar intensity image (ORI).

The elevation models have a 5-meter post spacing, 22-foot contour equivalent accuracy, vertical accuracy of 3-meter LE90 (0-10 degree slope) and horizontal accuracy of 12.2-meter CE90.

Processed and delivered in Alaska Albers Equal Area Conic NAVD88 and NAD83.

The data includes FGDC Metadata, hydrologic enforcement, quality masks, and no more than 3% of void fill.

<http://alaskamapped.org/dem>
<http://ifsar.gina.alaska.edu>
support@gina.alaska.edu





NSF EPSCoR-ACE
Northern Test Case
2013 Aerial LiDAR and Imagery
Crea Creek
North Slope - Nuiqsut

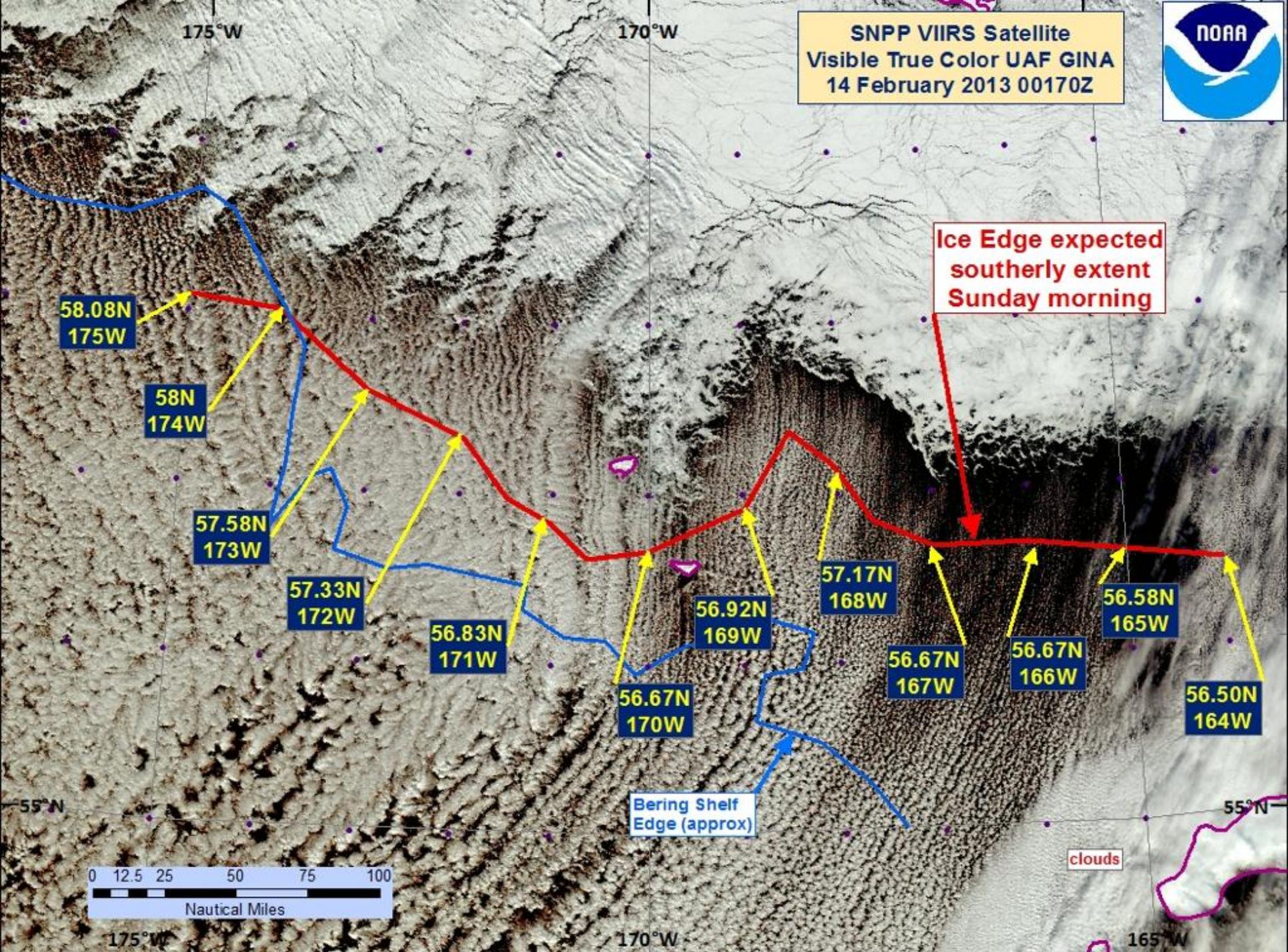
Remote Sensing Partnership Overview





UAF Alaska Satellite Facility – on campus
Two 11-meter X- and S-band antennas
10-meter dish not shown



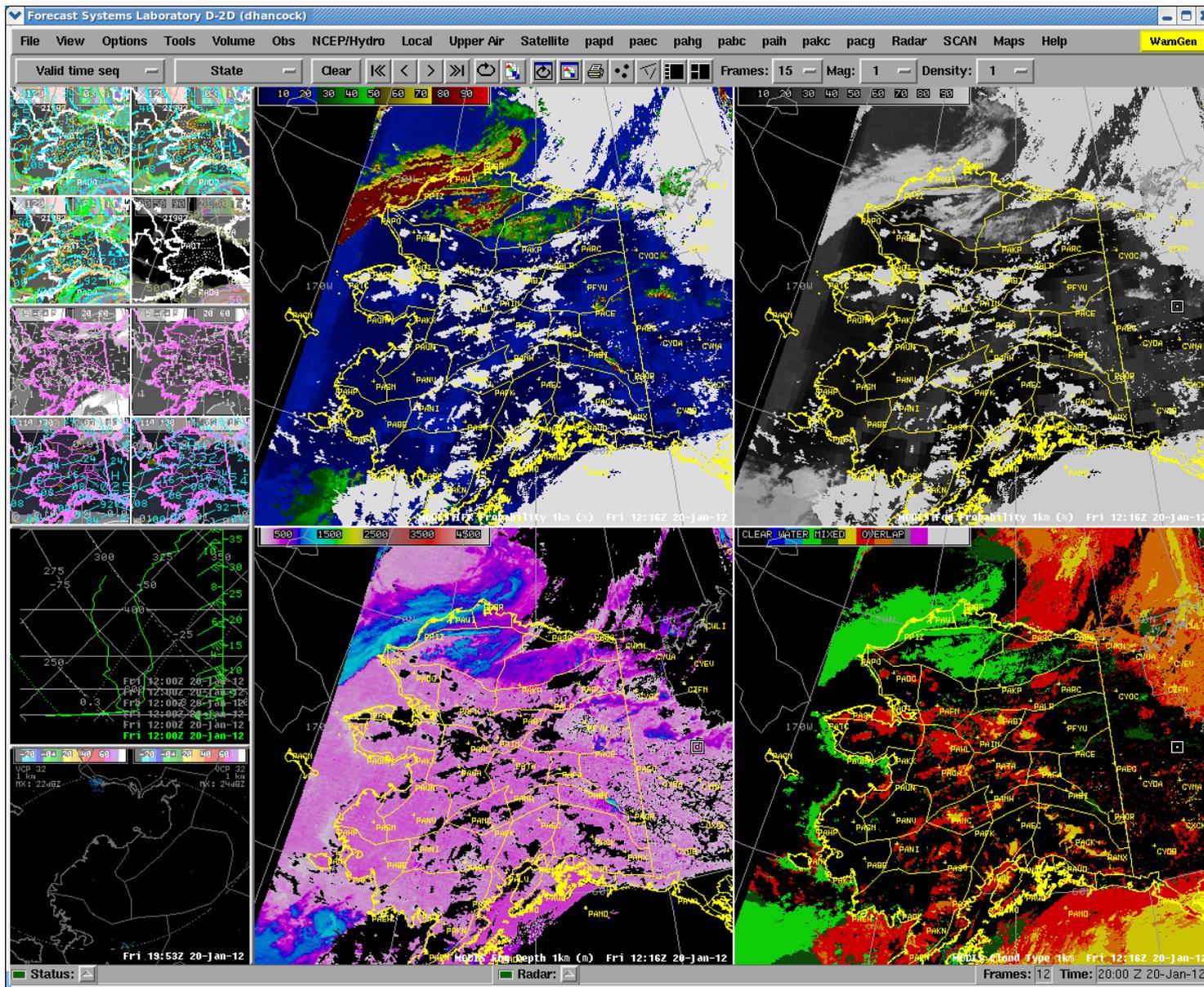


Ice Edge expected
southerly extent
Sunday morning

Bering Shelf
Edge (approx)



clouds



MODIS IFR, fog, depth, cloud

"The combined product performs well as a detector of low stratus and/or fog" - Dan Hancock, NWS Fairbanks



GeoNorth

- Founded in 1994
- Headquartered in Anchorage
- Robust Geospatial & Application development capabilities
- Employee-focused with excellent staff retention
- GeoNorth's Federal clients include Indian Health Service, IRS, Marines, Navy, and NOAA.
- Alaska Native-Owned Corporation
- 8(a) Certified
- Whole owned subsidiary of The Tatitlek Corporation

GeoNorth Remote Sensing

- Access to 7 Airbus Defense & Space satellites
 - 10 year agreement
 - Direct reception of satellite imagery
 - Pleiades 1A & 1B, SPOT5, 6 & 7, TerraSAR-X, and TanDEM-X
- Partnership with the University of Alaska Fairbanks and the Alaska Satellite Facility to manage data reception
- Various value added services



Direct Reception Services

An all-Alaskan Partnership

World Class Team and Facilities

- UAF & ASF have 20 years of experience in satellite imagery acquisition and processing.
- 24/7 Staffing
- Multiple on-site backup systems
- Onsite Airbus Defense and Space multisat processing terminal
- Secure site
 - SCIF Capable



Multi-Mission Terminal

- New Generation of Image Processor
- Both Radar and Optical on a single platform
- First Multi-Mission Terminal in production worldwide
- Automatically Processed from the terminal:
 - ✓ Level 1 (Radiometrically Corrected)
 - ✓ Level 2 (Geo-Corrected) – Spot 5 Only
 - ✓ Level 3 (Ortho-rectified)
 - ✓ SRTM and GLOBE (GTOPO30)
 - ✓ IFSAR/NET for Alaska and Lower 48
- Multiple formats and delivery options
- Automated work flow
- Fast processing times!

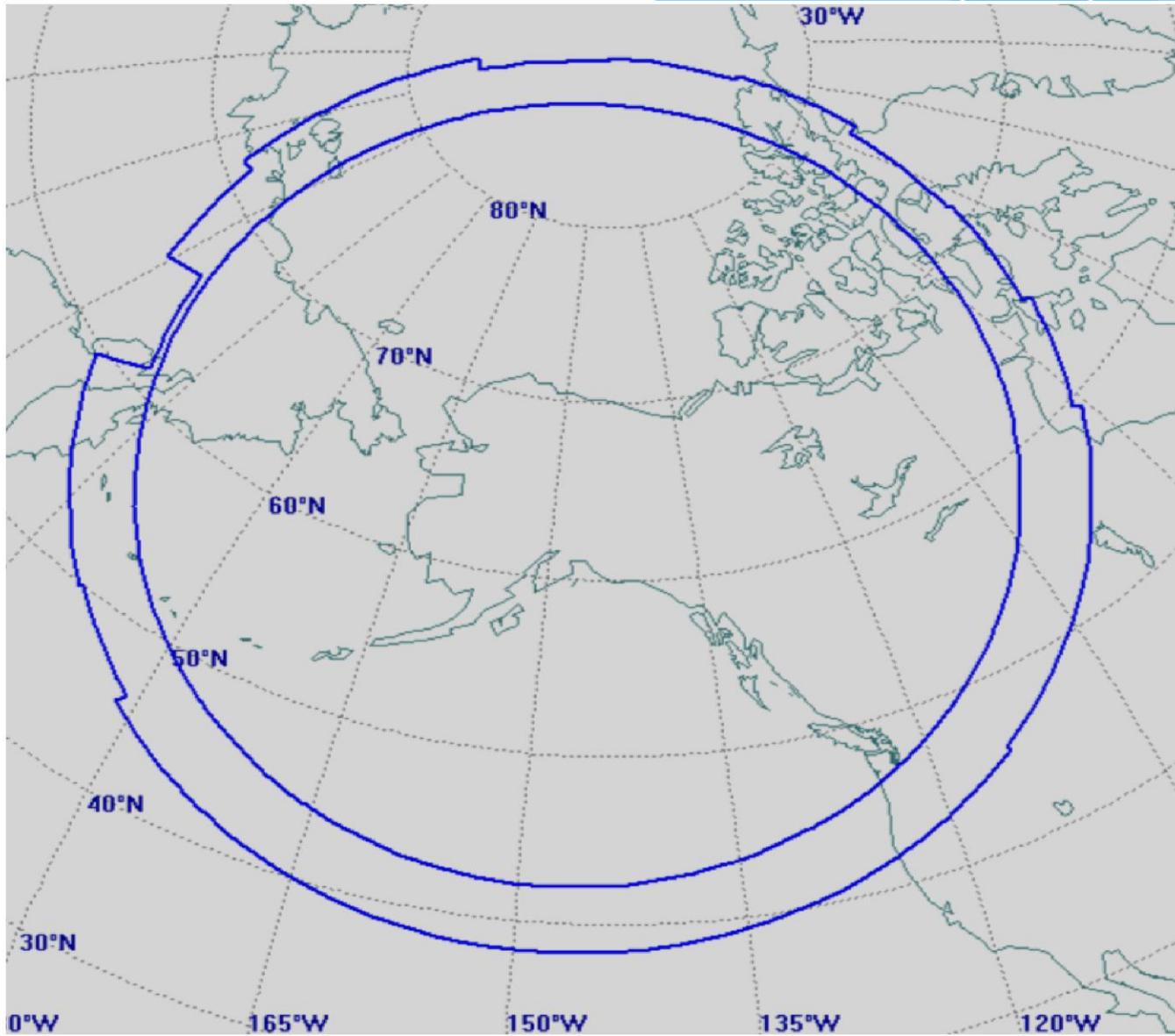


Direct Reception Advantages

- Near real time access to imagery
 - Archive and New Collections
- Rapid collection capabilities
 - Ability to task Satellite
- Responsiveness
 - Preferential tasking abilities over the State of Alaska and Coastal Waters
 - Store and Forward Capability – Collect data anywhere in the World
 - Capability to download imagery to a Sensitive Compartmented Information Facility (SCIF)
- Increased imagery collection
- Development of Innovative business models

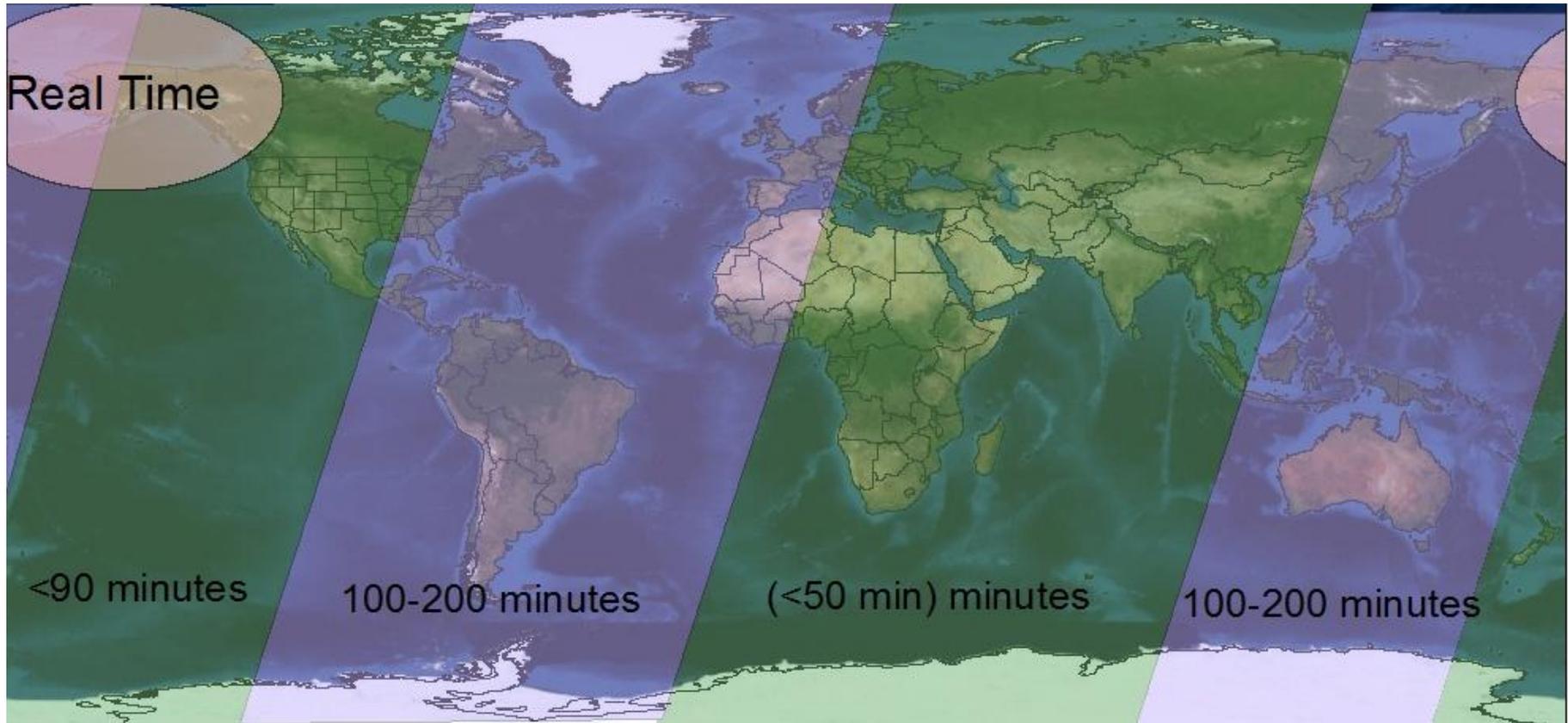


North Pole Ground Station



Store and Forward – Global, Low-latency Recorder downlinks to Fairbanks

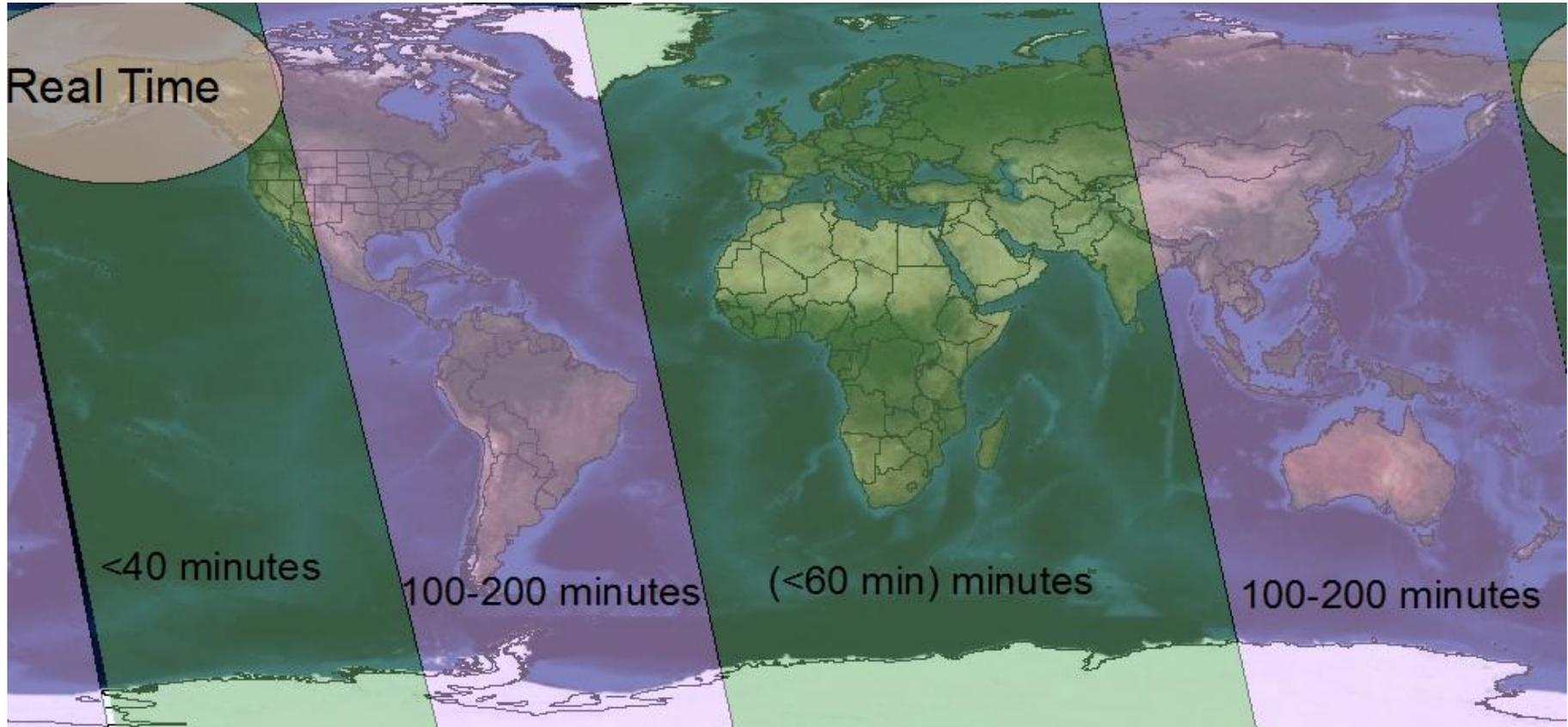
Delay between Collection and Downlink for images collected on **descending** (morning) passes and received at the station in Fairbanks*



* Estimated (using TSX Orbits)

Store and Forward – Global, Low-latency Recorder downlinks to Fairbanks

Delay between Collection and Downlink for images collected on **ascending** (evening) passes and received at the station in Fairbanks*

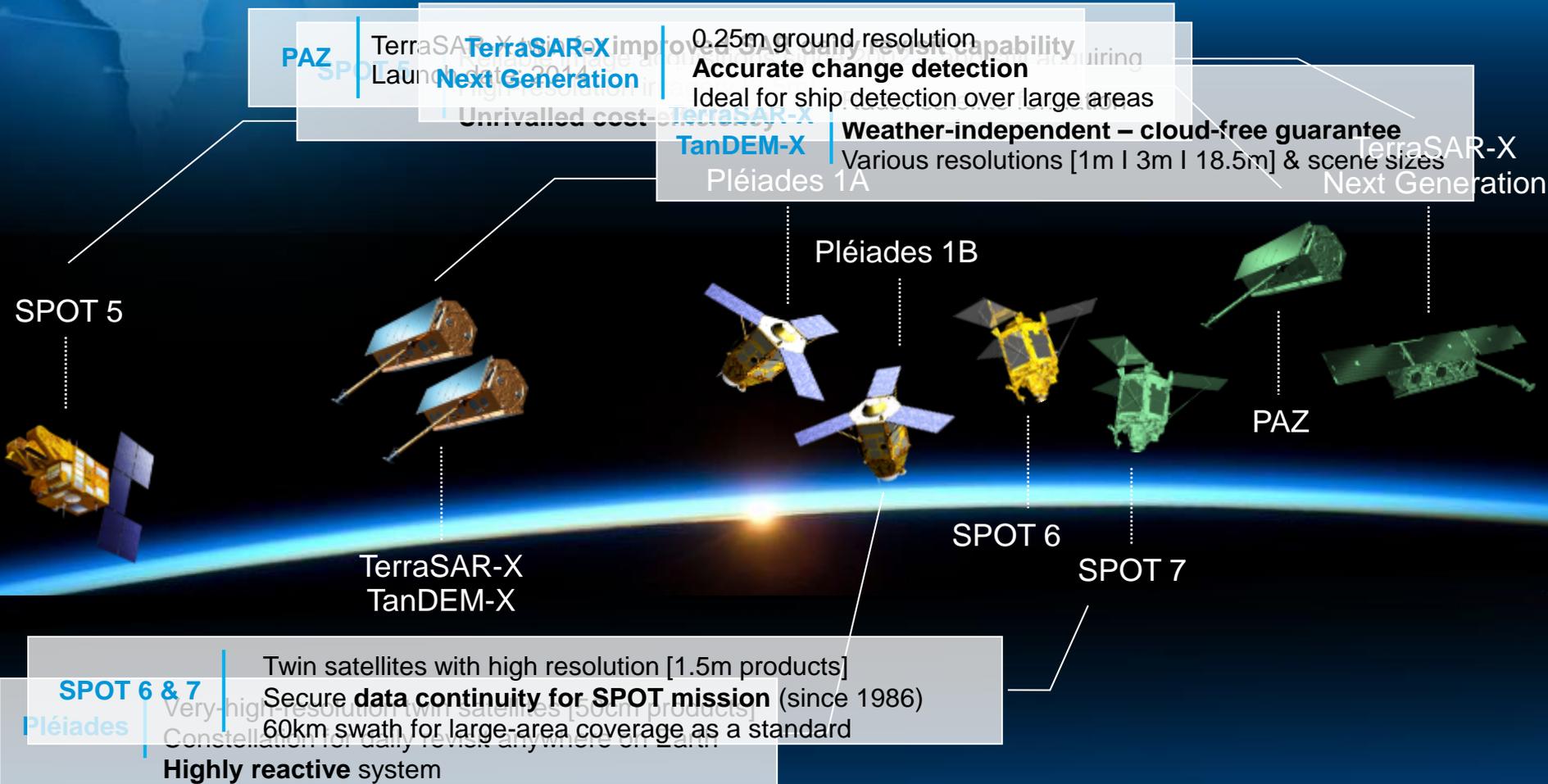


* Estimated (using TSX Orbits)

Multi-Sensor Approach

- Remote sensed imagery
 - Optical and SAR
- Multi-Sat (Multi-Sat) Direct Receiving Station (ground-based DRS)
 - First Multi-Sat facility on in the world.
 - Located at the University of Fairbanks, Alaska (US Soil)
- Multi-Sensor product offerings
- Supported by a financially strong parent company, Airbus partnership, existing GeoNorth Management team, and industry professionals.

Satellite Access



Pleiades Overview

Sensors

One camera	1 panchromatic 4 multispectral
12 bits	Dynamic range per pixel at acquisition
PAN Color	Simultaneous acquisition
20km	Imaging swath

Products

50cm	Panchromatic Pan-sharpened
2m	Multispectral
Ortho rectified	As a standard Fully automatic processing, incl monopass mosaics
Per sq.km.	Pricing model







GeoNorth, LLC acquired 1/29/14 Pleiades 50cm
(© CNES 2013, distribution Astrium Services/SPOT Image)

Valdez, Alaska: Keystone Canyon avalanche
Pleiades 50-cm – February 2014 – 6 hour turnaround

SPOT 6 & 7 Overview

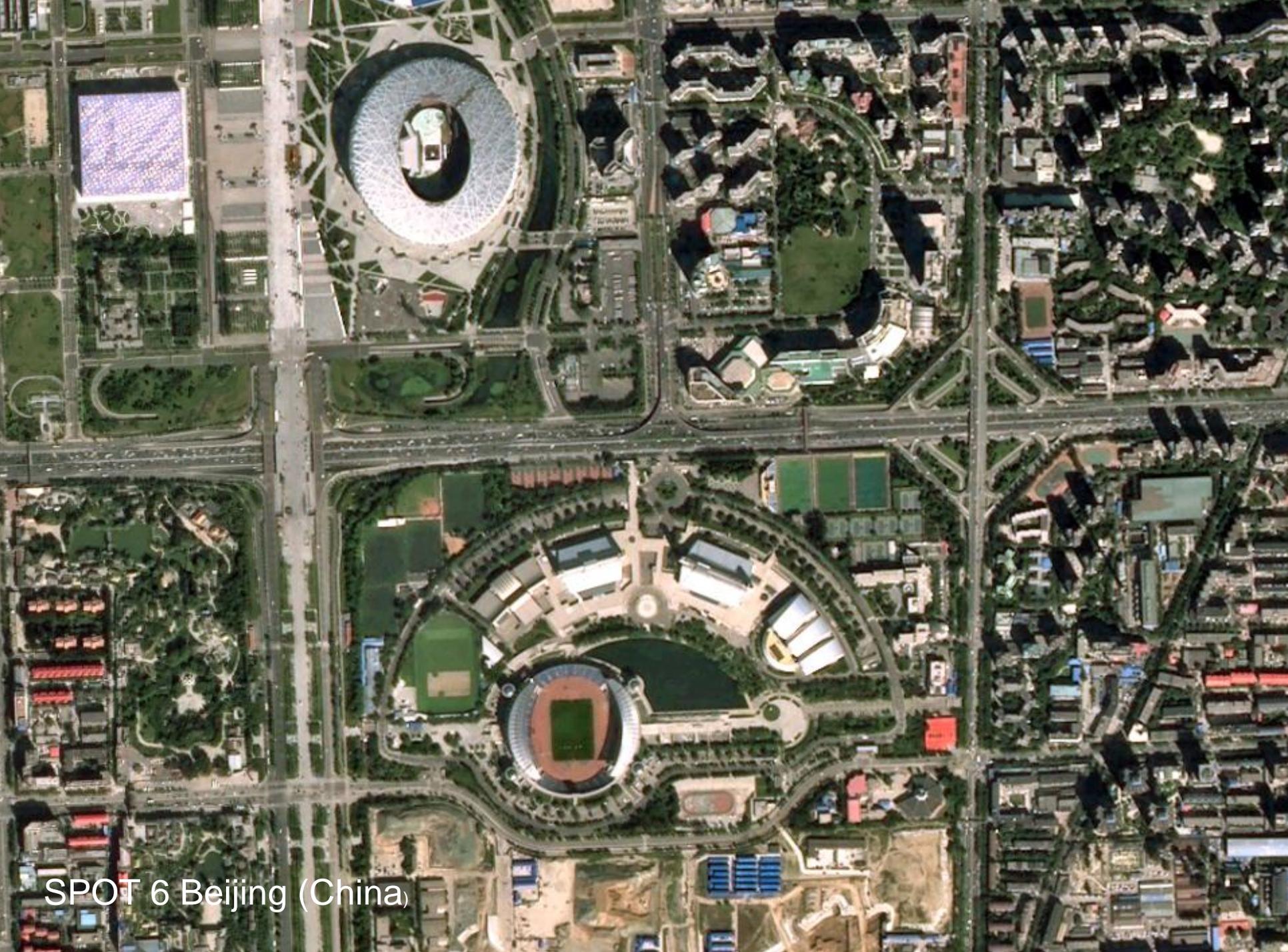
Sensors

One camera	1 panchromatic 4 multispectral
12 bits	Dynamic range per pixel at acquisition
PAN Color	Simultaneous acquisition
60km	Imaging swath

Products

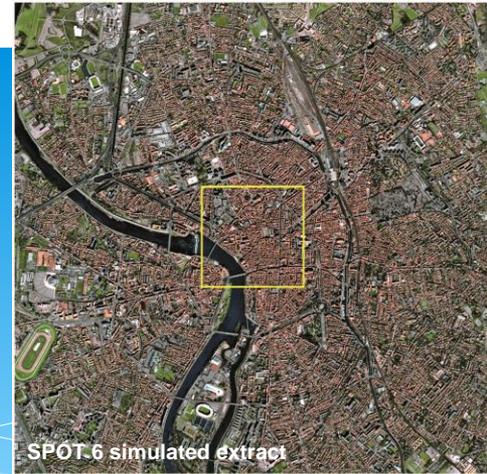
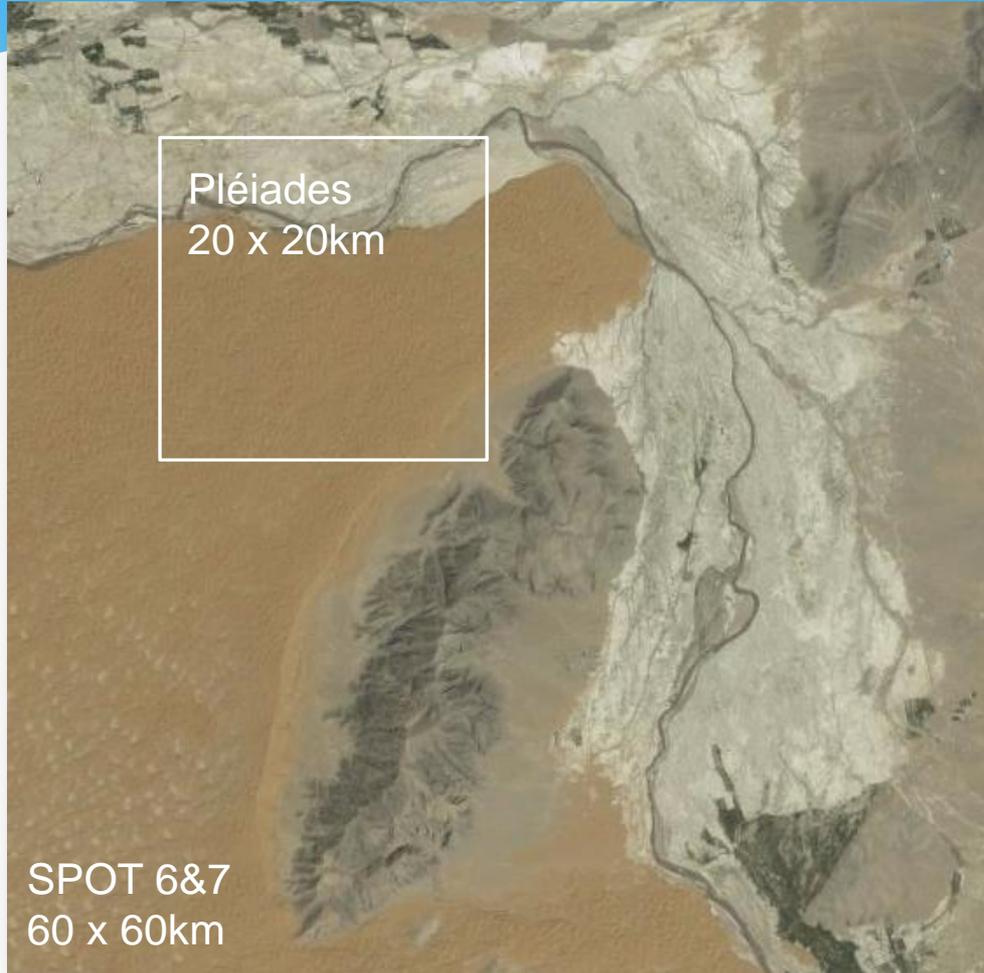
1.5m	Panchromatic Pan-sharpened
6m	Multispectral
Ortho rectified	As a standard Fully automatic processing, incl monopass mosaics
Per sq.km.	Pricing model





SPOT 6 Beijing (China)

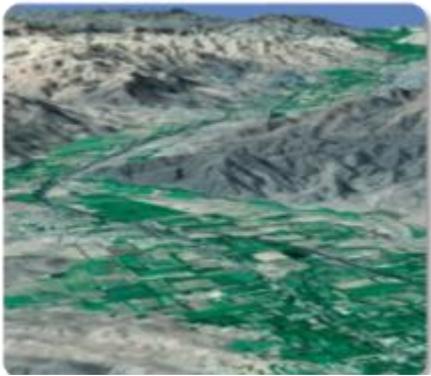
Ideal Balance



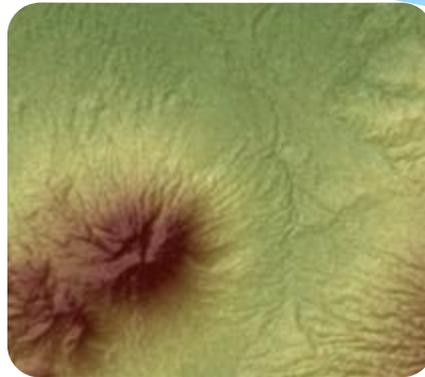
Coverage vs. Resolution

Digital Elevation Models

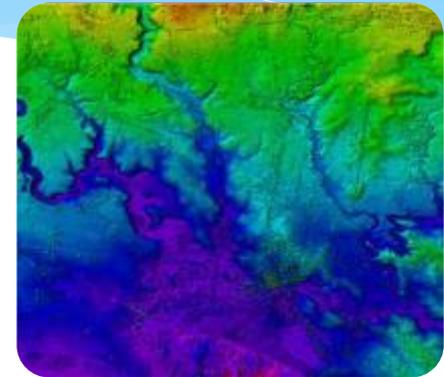
Elevation30



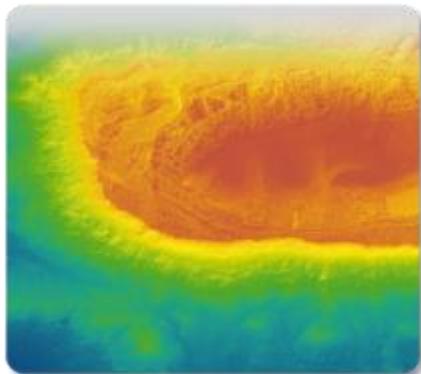
Elevation10



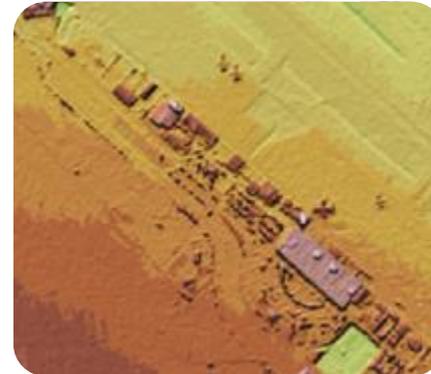
Elevation8



Elevation4



Elevation1



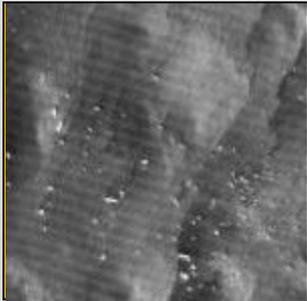
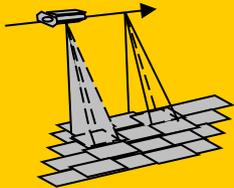
TerraSAR-X & TanDEM-X

Overview

- Twin X-Band Synthetic Aperture Radar (SAR) satellites
- Weather & daylight independent collection
 - Ideal for monitoring applications or imager needs in cloud prone regions of the world
- Variable spatial resolution, polarization, swath width & collection length benefiting a broad applications portfolio:
 - Staring Spotlight: 25cm
 - SpotLight: 1 m
 - StripMap: 3 m
 - ScanSAR: 18 m
 - Wide ScanSAR: 40 m
- TerraSAR-X - PAZ Constellation (2014): Global mean revisit time improved from 43 h to ~ 21 h
 - Providing multiple visits per day over Alaska

TerraSAR-X & TanDEM-X Collection Modes

WSC

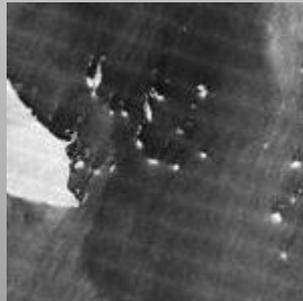
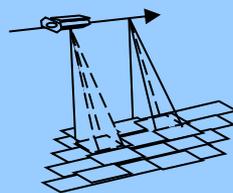


res. 40 m

200 – 270 x 200 km²

Large area maritime monitoring of traffic, oil spills, sea ice,..

ScanSAR

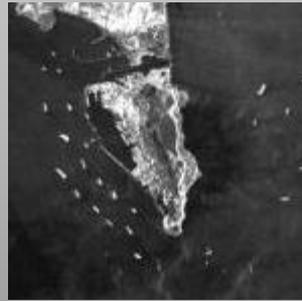
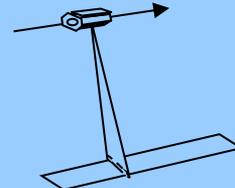


res. 18 m

100 x 150 km²

Detailed maritime monitoring & detection

StripMap

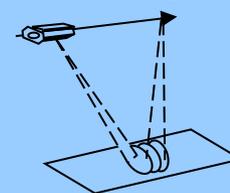


res. 3 m

30 x 50 km²

Detection & classification of vessels, infrastructure, etc.

SpotLight

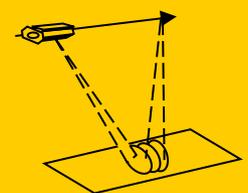


res. 1 m

10 x 5 km²

Recognition of objects (airplanes, hangars, vessels,..)

ST



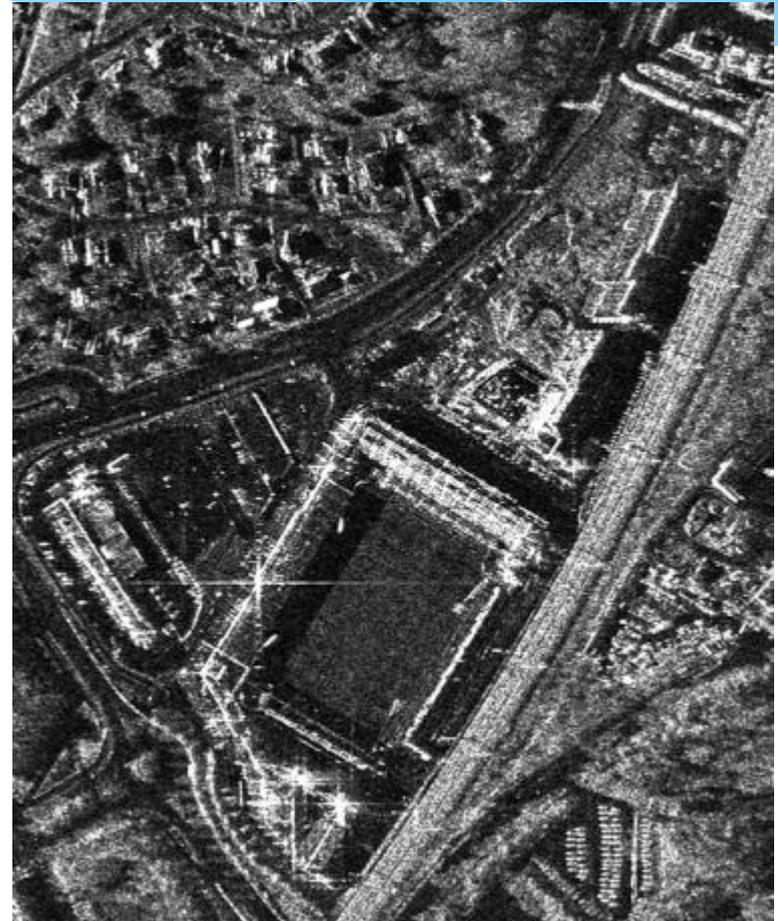
res. 0.25 m

4 x 3.7 km² or
2.5 x 7.5 km²,

Identification of objects

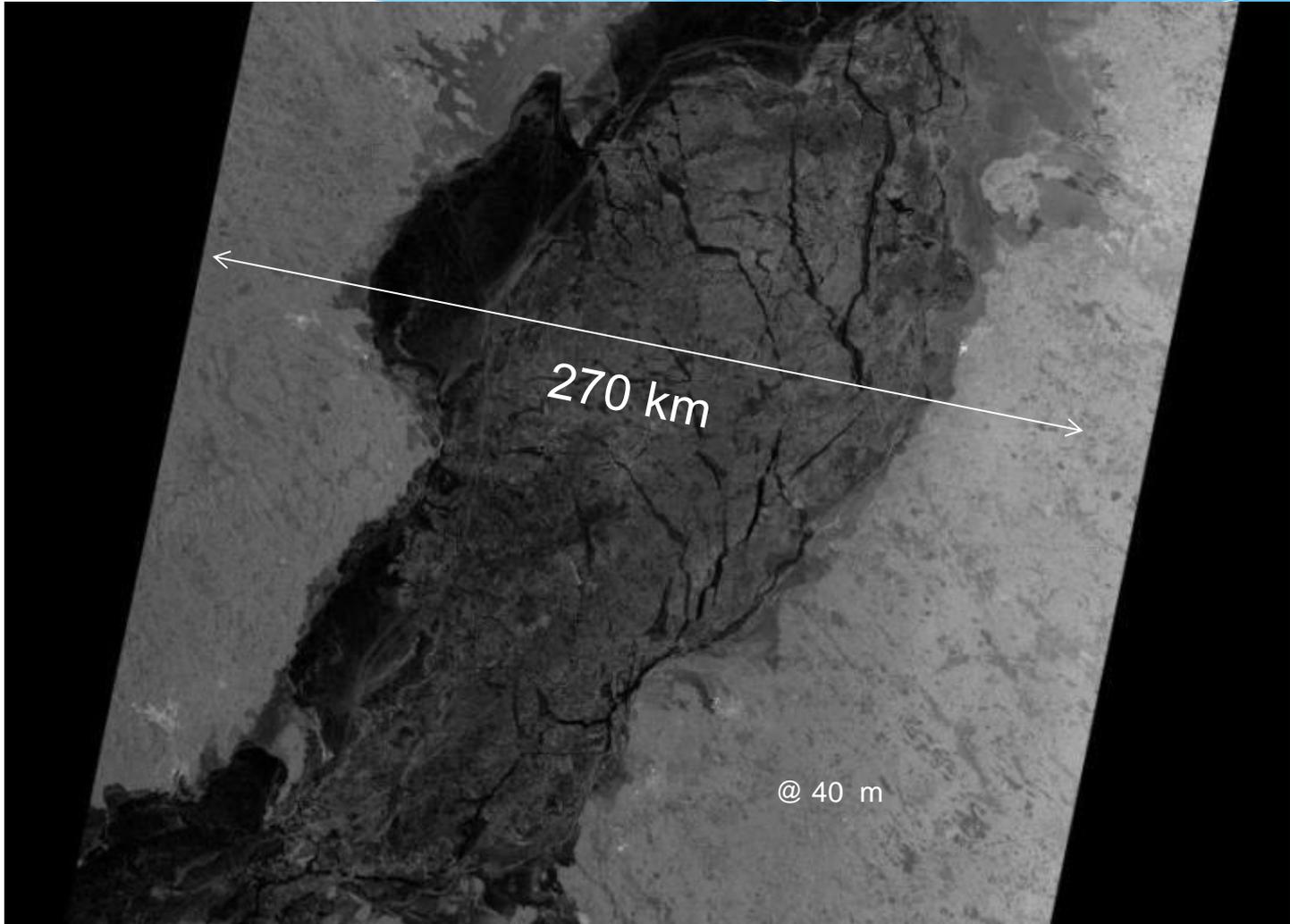
TSX New Modes

Increased resolution with New Staring Spotlight Mode – 25-cm



TSX new modes

- Wider Collection Swath with new Wide ScanSAR mode



University Of Alaska Fairbanks



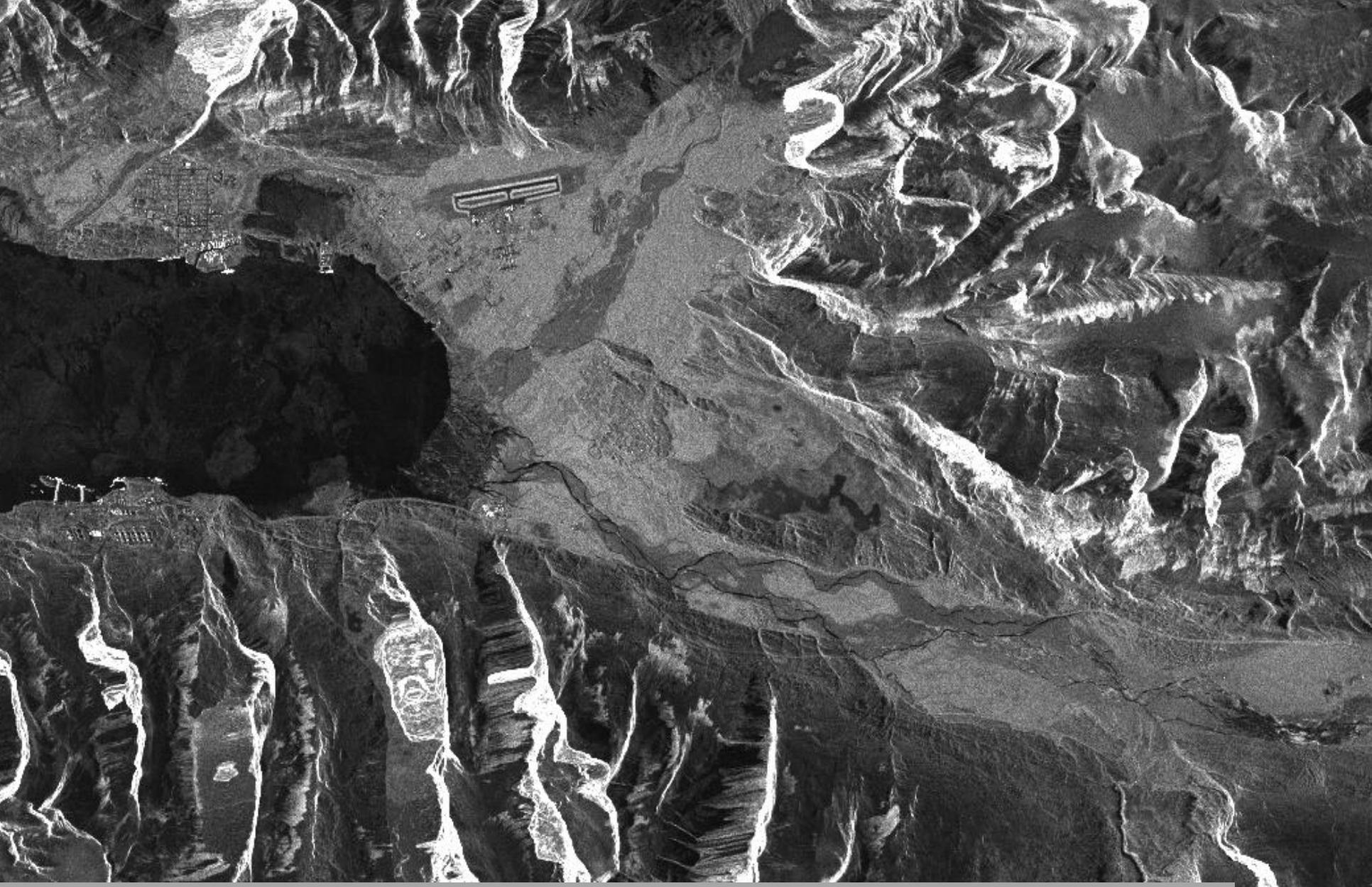
Collection date: 2/27/14

Resolution: ~1.2m

Polarization: HH

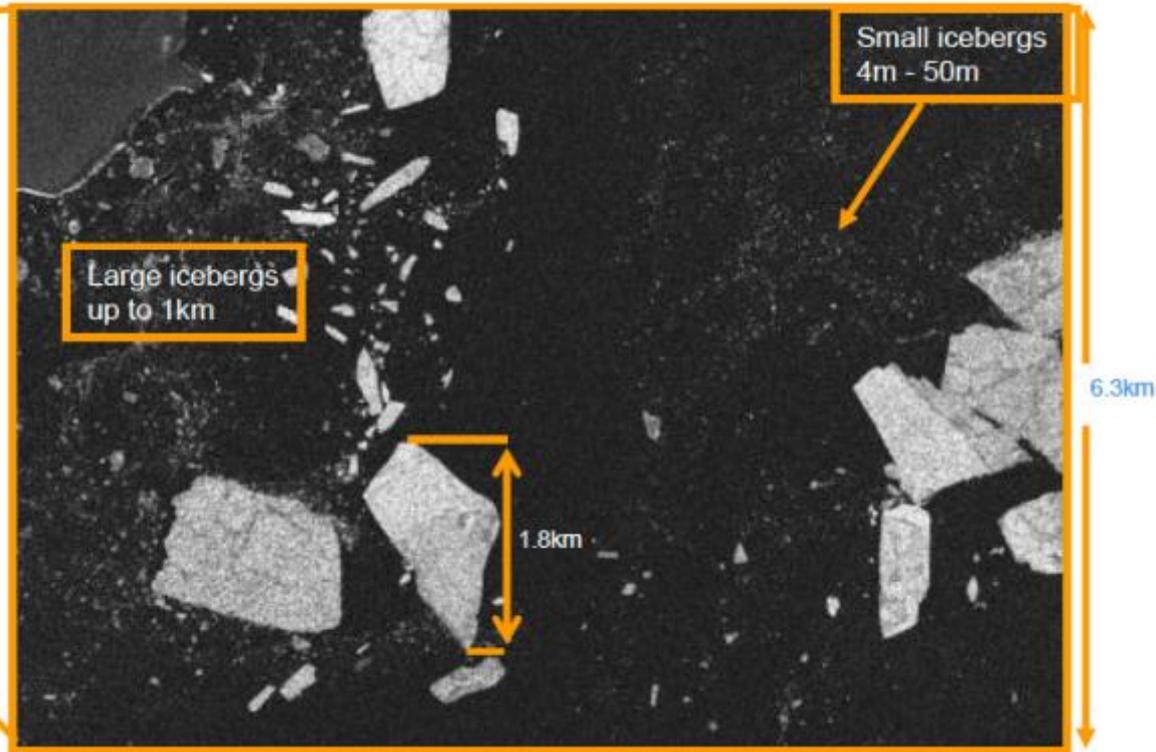
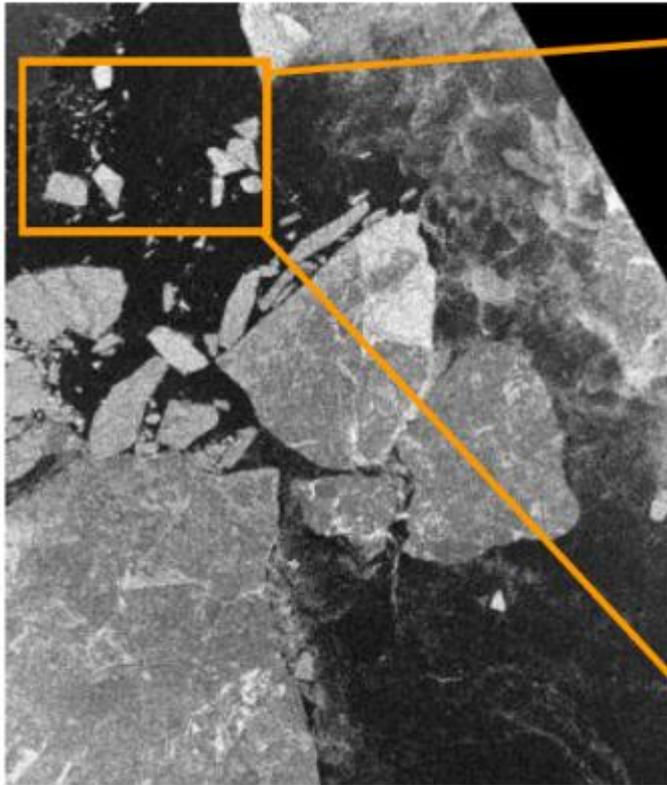


MODIS over Alaska on 2/28/14



Port of Valdez, 3m StripMap (acquired 1/29/14)

Ice Detection & Monitoring



Maritime Services

Iceberg Detection

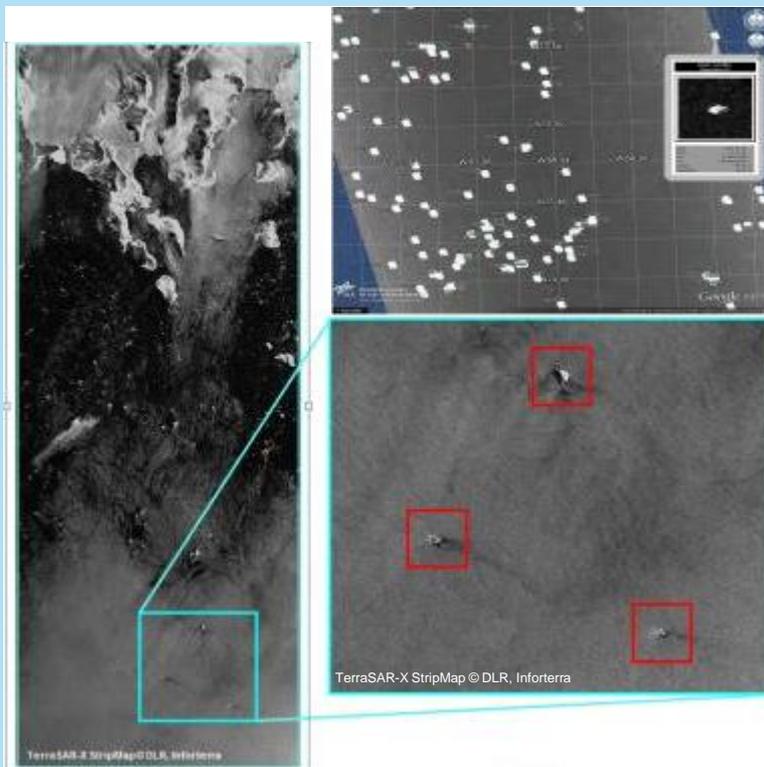
ice berg detection service providing detailed information on drifting ice bergs

- **Tactical ice berg detection** information to support safe ship navigation & oil rig protection in ice infested waters
- Provision of information on **ice berg position & size in NRT**
- Formats: kmz, OGC gml, ASCII, GeoTIFF

Key Benefits

- **Large data volume throughput & NRT information delivery due to automatic processing:**
 - **StripMap: t ~ 15 min** (after data downlink)
 - **ScanSAR: t ~ 25 min** (after data downlink)
- **Short urgent tasking time t < 8 h**
- **Detection of even small scaled ice objects down to a size of l < 8 m**
- Service can be offered in frame of **integrated optical & SAR based maritime service** taking full advantage of **Astrium GEO's complementary satellite fleet & maritime services offer**

Ice Berg Early Warning & Collision Avoidance



Maritime Services

Ship Detection

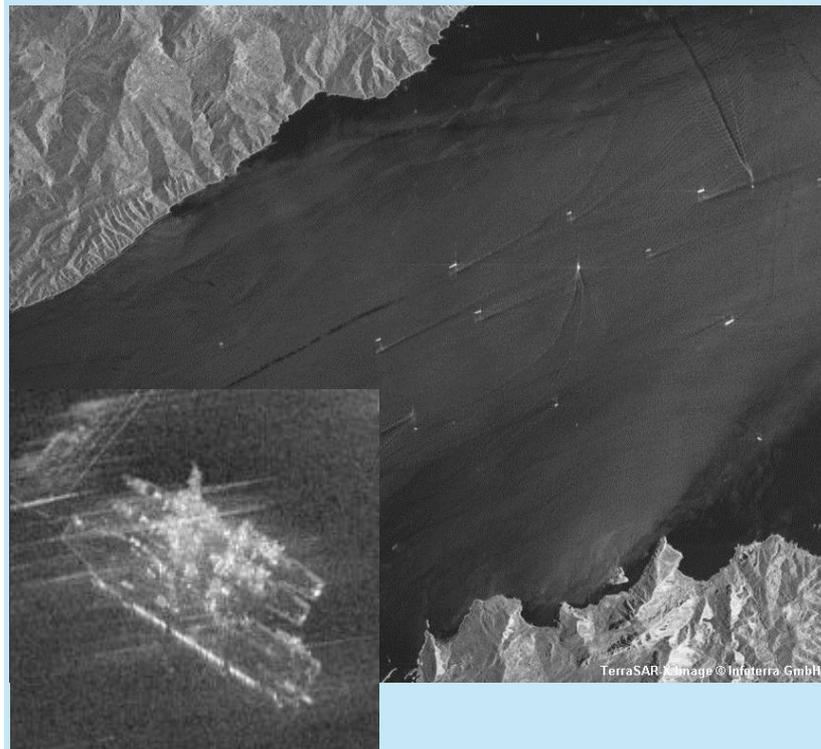
Multi-Mode X-Band SAR Satellite providing

- continuous, weather & daylight independent monitoring
- varying spatial resolution, modes, polarization, swath width & length (up to 1500 km² for SM, SC & WSC) benefiting broad applications portfolio:
 - **Staring Spotlight:** down to 0.25 m @ 4 x 3.7 km² or 2.5 x 7.5 km²
 - **SpotLight:** 1 m @ 10 x 5 km²
 - **StripMap:** 3 m @ 30 x 50 km²
 - **ScanSAR:** 18 m @ 100 x 150 km²
 - **Wide ScanSAR:** 40 m @ 200 – 270 x 200 km²

Key Benefits

- Thanks to sensor specifications and operations performance, suitable monitoring mean for:
 - **Maritime services: Vessels Detection, Sea Ice Monitoring, Oil Spill Detection**
 - **Surface Movement Monitoring**
 - **Image Intelligence**
 - **Change Detection**
 - **Digital Elevation Model (DEM)**
 - **etc.**

SAR - weather & daylight independent Monitoring



Maritime Services

Oil Spill Detection

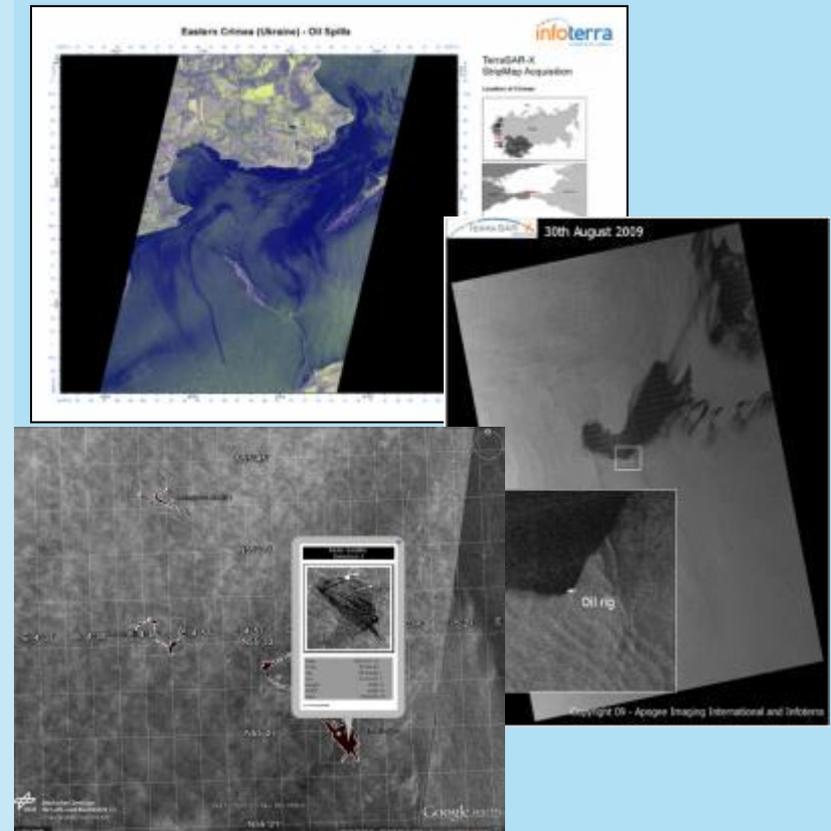
NRT Service providing information on even small scaled oil spills, leakages and natural seeps

- Reliable **oil spill detection** over **large sea areas** down to detailed **oil leakages identification** at **oil rigs**
- **Oil spill analysis** operated by **maritime image analysis experts** guaranteeing **high detection accuracy**
- Service can be enriched with **ship detection information** for **polluter identification & tracking**
- **Natural oil seeps identification** for **hydrocarbon exploration**

Key Benefits

- **NRT information delivery**
- **High detection accuracy** of even small scaled oil leakages and seeps due to **HR data** and **X-band sensitivity** to dampening effect of oil on capillary waves
- Service can be offered as **integrated optical & SAR based maritime service** taking full advantage of **GeoNorth's complementary satellite capability**

Oil Spill Detection and Monitoring



Ship Detection

NRT Maritime Surveillance Service taking full benefit from GeoNorth satellite capabilities

- Continuous, weather & daylight independent monitoring of remote & large sea areas
- **Detection & classification** of suspicious vessels down to a length of ~8 m
- Identification of **AIS non-cooperative ships**
- Provision of high resolution information on **ship position, dimension, heading & AIS cooperativeness**
- Formats: kmz, OGC gml, ASCII, GeoTIFF

Key Benefits

- **Large data volume throughput & NRT information delivery due to automatic processing:**
 - **StripMap: t ~ 15 min** (after data downlink)
 - **ScanSAR: t ~ 25 min** (after data downlink)
- **Short urgent tasking time t < 8 h**
- **High automatic detection accuracy of 92 %** (average for ships l > 15 m in sea state up to 5)
- **Very high location accuracy down to ~20 m**
- Service can be offered as **integrated optical & SAR based maritime service** taking full advantage of Astrium GEO's complementary satellite fleet

Maritime Domain Awareness



