RapidEye
Delivering the World

LARGE AREA IMAGING CAPABILITIES AND NEW COUNTRYWIDE MOSAIC PRODUCT

JACIE 2013, April 16, St. Louis, MO

Michael Oxfort

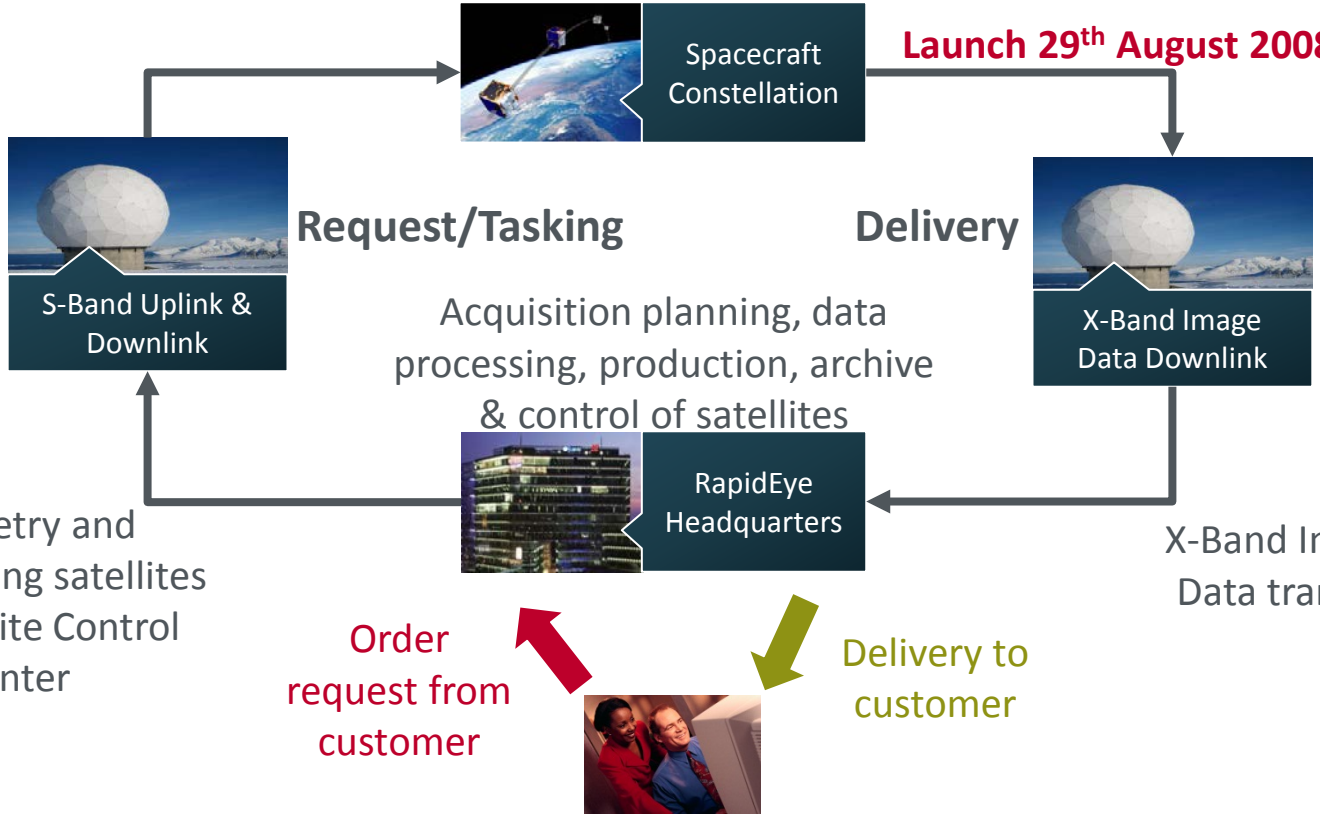
CONTENT

- The System
- The Planning
- The Coverage Performance
- The New Product – RapidEye Mosaics™

THE SYSTEM

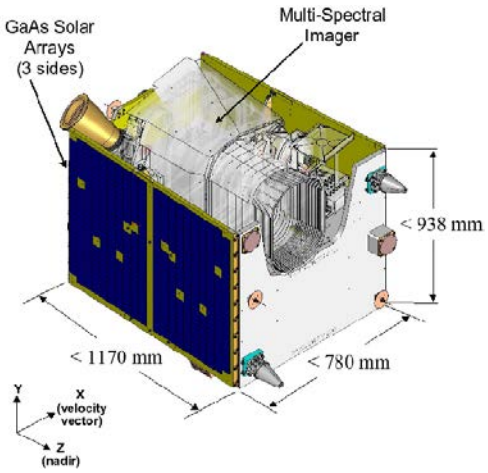
…. only a brief refresher!

THE SYSTEM


Spacecraft Constellation
Launch 29th August 2008
S-Band Uplink & Downlink
Request/Tasking
Delivery
X-Band Image Data Downlink
Acquisition planning, data processing, production, archive & control of satellites
RapidEye Headquarters
Telemetry and commanding satellites via Satellite Control Center
X-Band Image Data transfer
Order request from customer
Delivery to customer

THE CONSTELLATION

- Constellation of five “interchangeable” small satellites positioned – equally phased – in the same sun-synchronous orbit.



THE STATUS

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All five satellites are **fully-operational.**

The constellation is **intact**.

Engineers and Operators monitor systems trends and performance routinely.

System improvements continuously developed and implemented to minimize the downtime.

Improved calibration techniques developed to ensure image quality uniformity and stability.

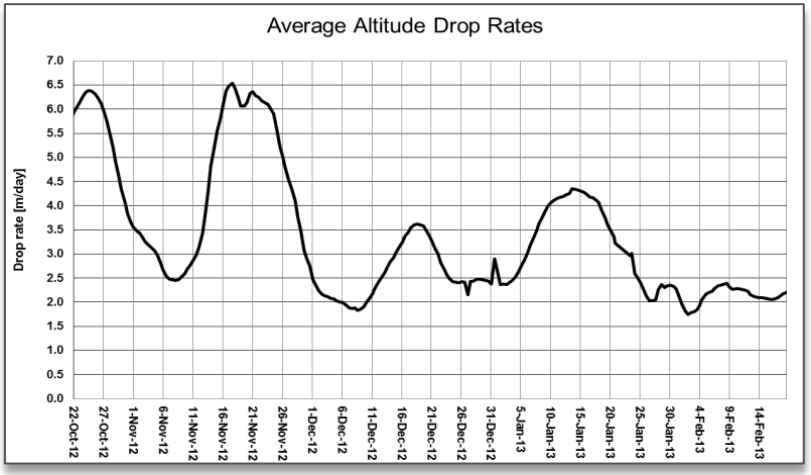
Space segment is utilized beyond initial design capacity. Creative solutions being developed to push the limits further.

THE LIFETIME

Two aspects to consider for constellation lifetime:

1. Propellant Consumption
   - Highly precise injection at launch
   - Drop rates lower than expected

➡ Propellant margin for constellation extends use to 2019 (instead of anticipated 2016)

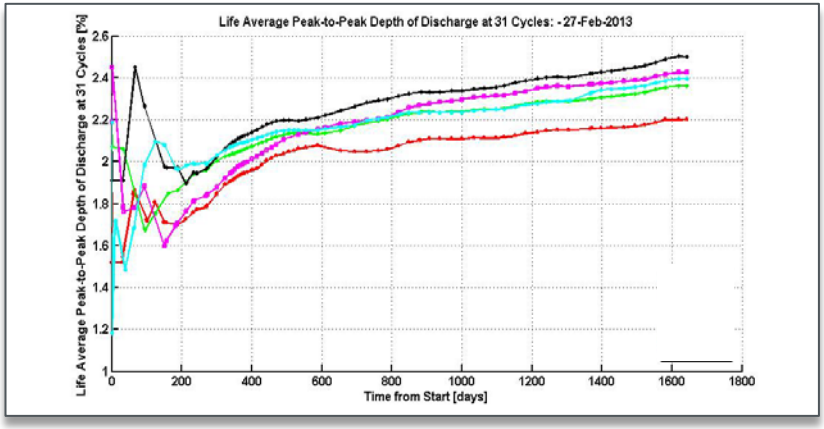


Example of progression of the drop rates of RapidEye satellites over a period of five months

THE LIFETIME – CONT'D

Two aspects to consider for constellation lifetime:

2. Power subsystem degradations
   - Ageing effects less than anticipated
   - Performance above specifications
   - Capacity for extension



Evolution of Battery Depth of Discharge with stable behaviour since satellites launch

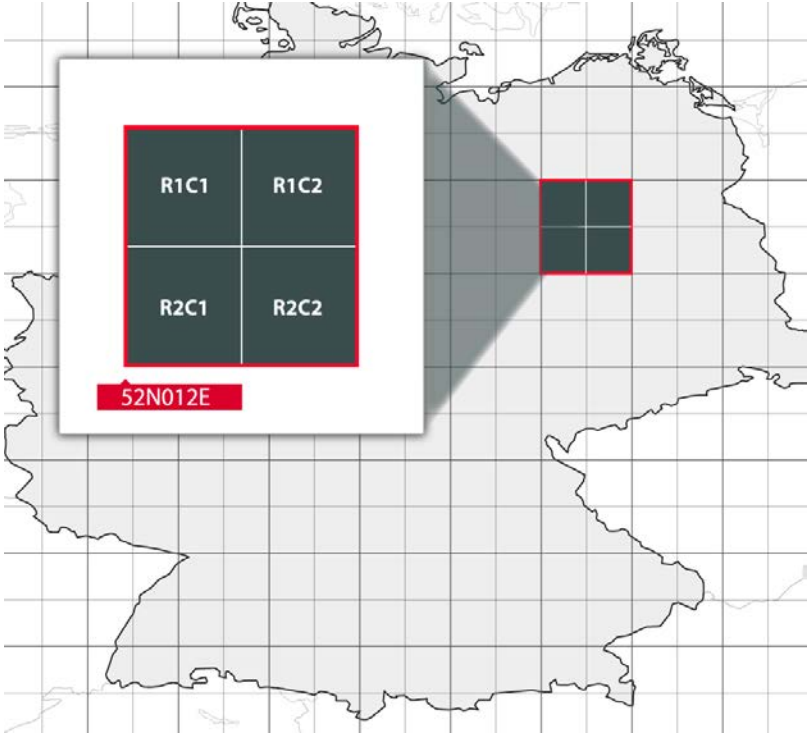
➡ Constellation operational until at least 2019

THE PLANNING

Concept Description

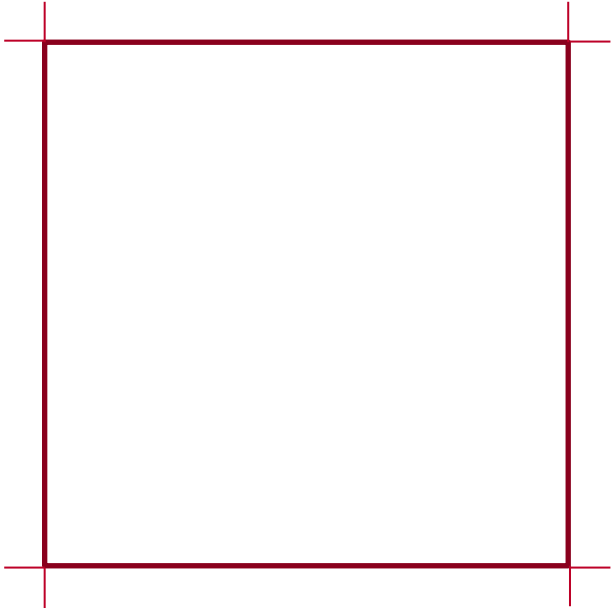
THE TILE GRID

- The surface of earth (±84°) is divided into image tiles based on the UTM map grid.
- The grid is defined in 24km by 24km tile centers, with 1km of overlap, resulting in 25km by 25km tiles.



THE TILE SCORE

- Every day, a score is being determined for each of these tiles based on:



THE PLANNING

- The Acquisition Planning System (APS) conducts an automated process:
  - Maps for each spacecraft the predicted payload footprint to the tile grid
  - Defines the image takes to be acquired by determining the highest achievable tile score sum for each orbit and by considering various system constraints, like available on-board memory and downlink opportunities
  - Generates the acquisition schedules for each spacecraft and the reception schedule for the download stations

THE COVERAGE PERFORMANCE

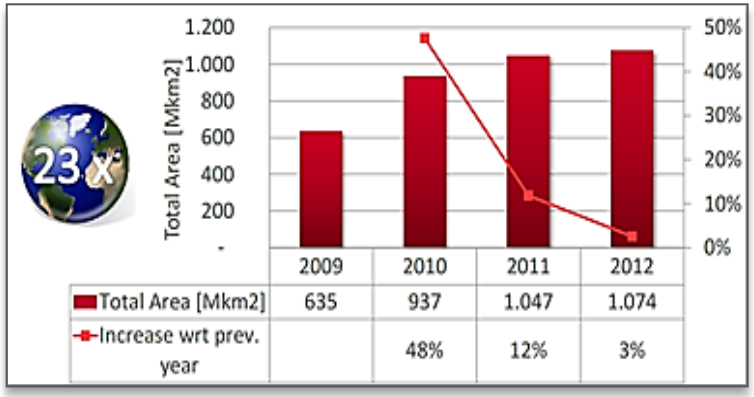
THE COLLECTION PERFORMANCE

Original RapidEye System Design:

- Collect up to 4 million km²/day

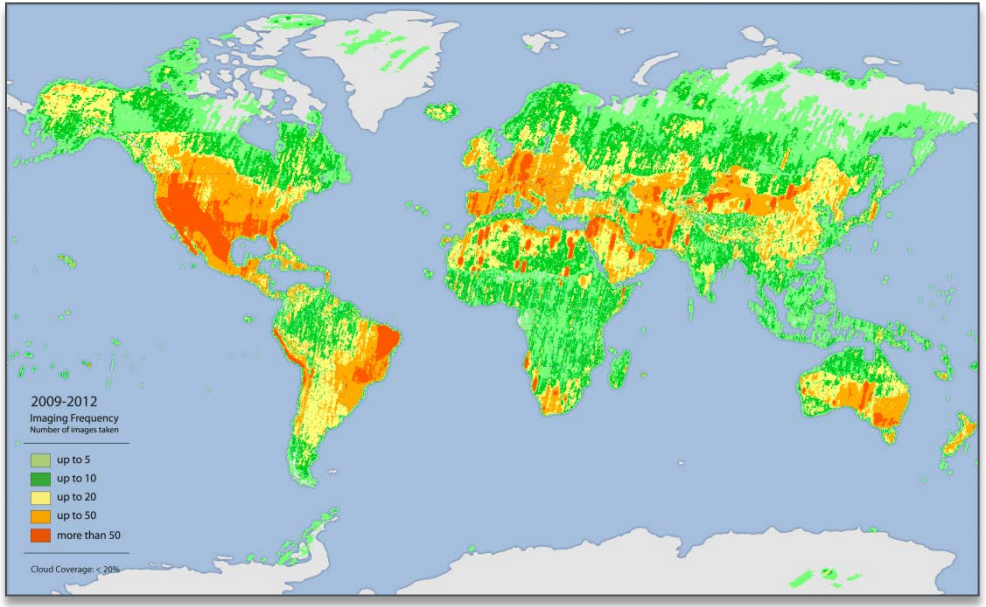
Achieved in 2012:

- Collected up to 5 million km²/day



Close to 4 billion km² imagery in archive

With less than 20% cloud coverage!



Imaging frequency of the RapidEye Archive (2009 to 2012)

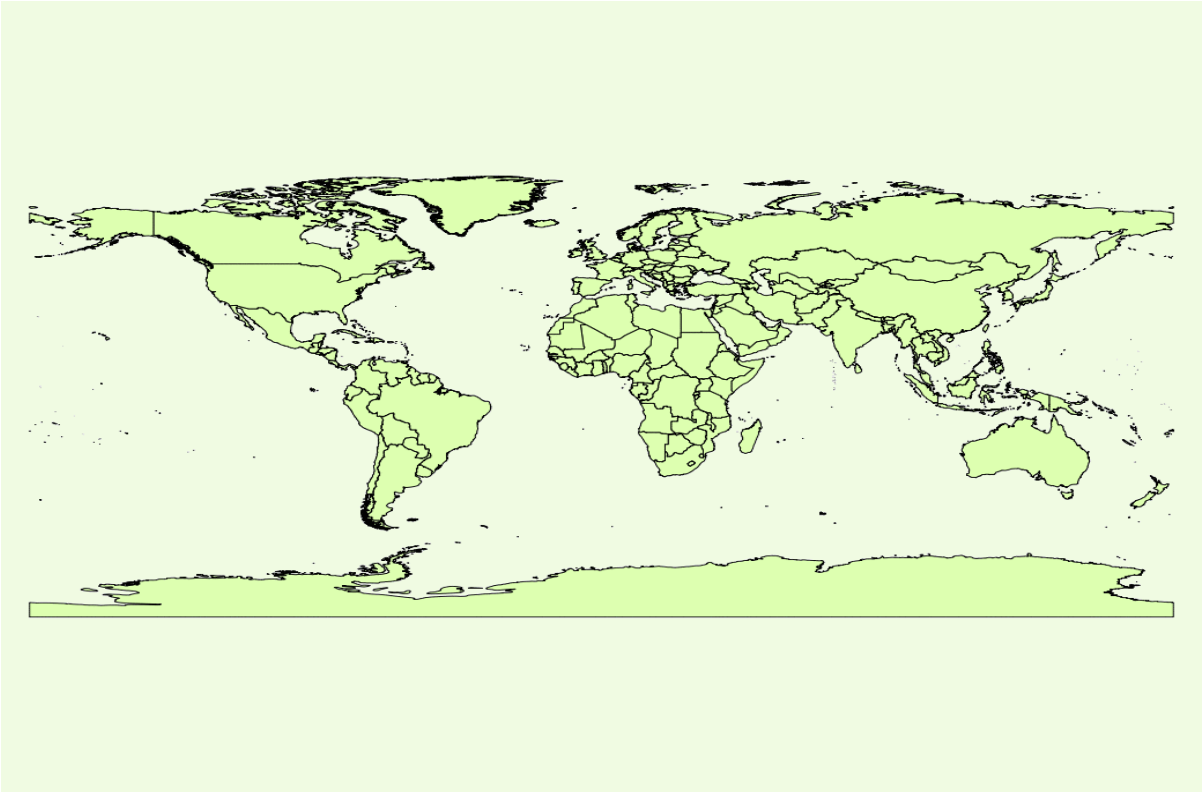
MEXICO CAMPAIGN

- Objective: complete coverage of Mexico

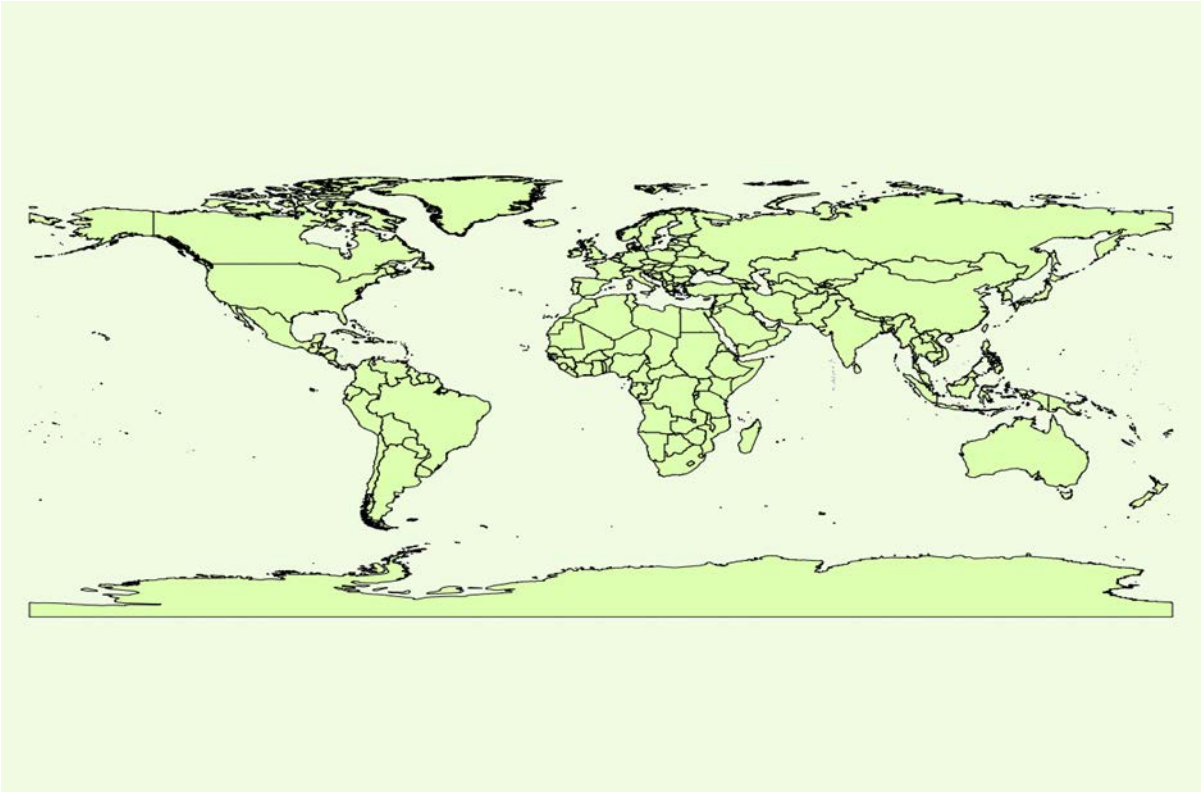
- Area of Interest: 1.972.550 Km^2
- Time of Interest: January 1, 2012 until April 30, 2012

- Additional parameters (deviation from standard):
  - Acceptable cloud coverage: <= 10%
  - View Angle: between -16° and 16°

MEXICO CAMPAIGN – CONT'D



MEXICO CAMPAIGN – CONT'D



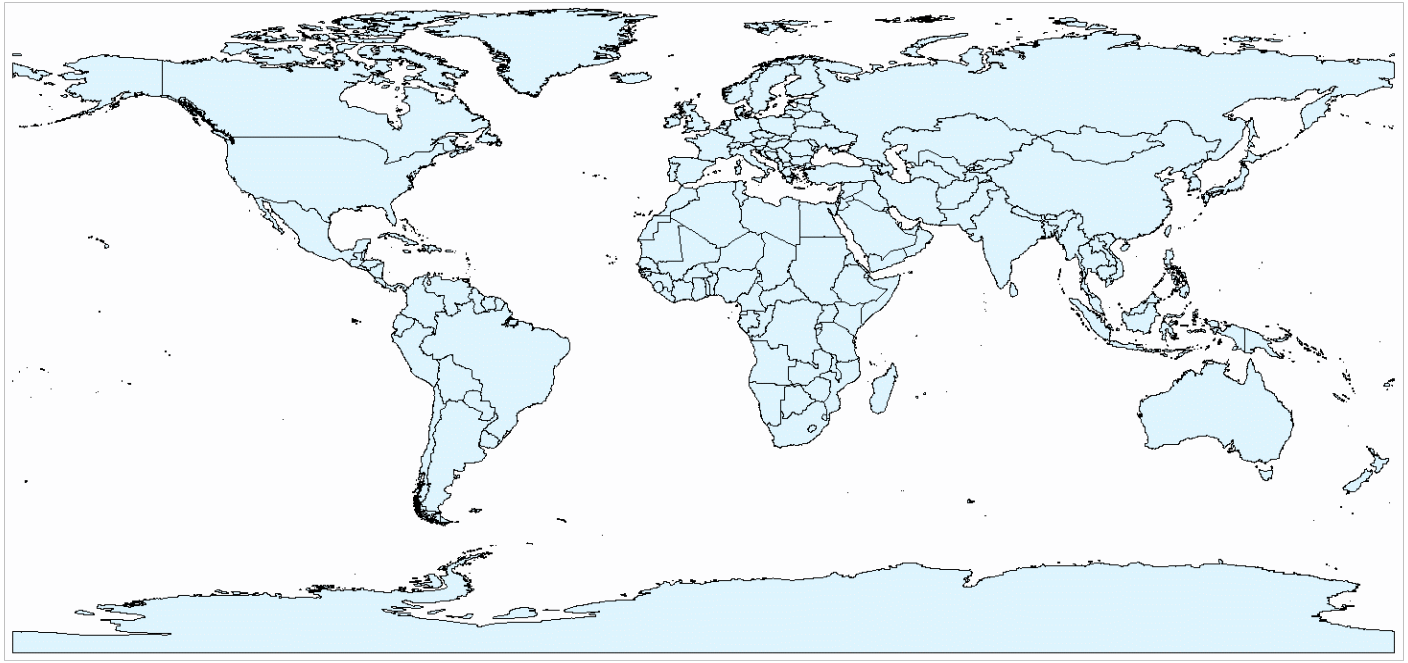
CHINA CAMPAIGN

- Objective: yearly campaign of almost entire China

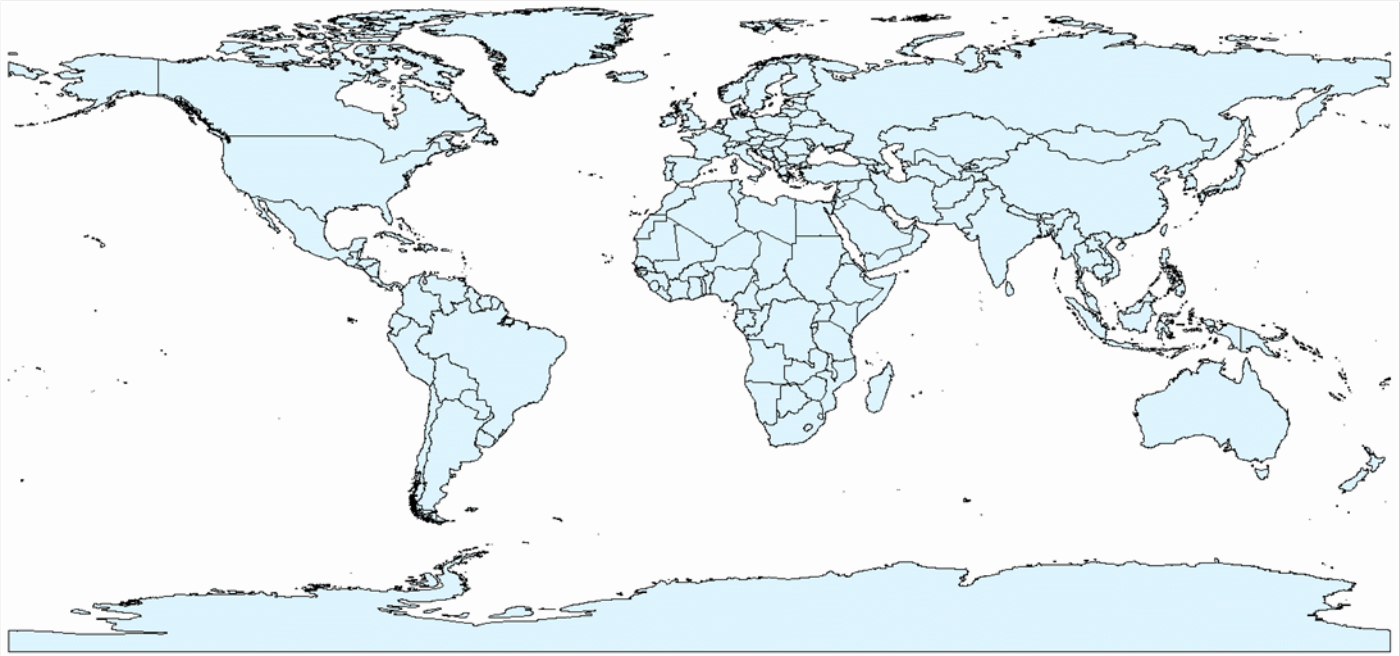
- Area of Interest: approx. 8.000.000 Km^2
- Time of Interest: August 01, 2009 until January 31, 2010

- Additional parameters (deviation from standard):
  - Acceptable cloud coverage: <= 10%

CHINA CAMPAIGN – CONT'D



CHINA CAMPAIGN – CONT'D



THE RAPIDEYE MOSAIC™

…. our latest product!

BASIC PRODUCT SPECIFICATIONS

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- 3 band RGB, 8-bit image
- Five (5) meter pixel spacing
- Top quality color balancing and feature adjustments (i.e. roads, rivers, etc.) are all connected correctly
- Nearly cloud-free (less than 3%)
- Locational accuracy better than 15m RMSE

PROCESSING OPTIONS

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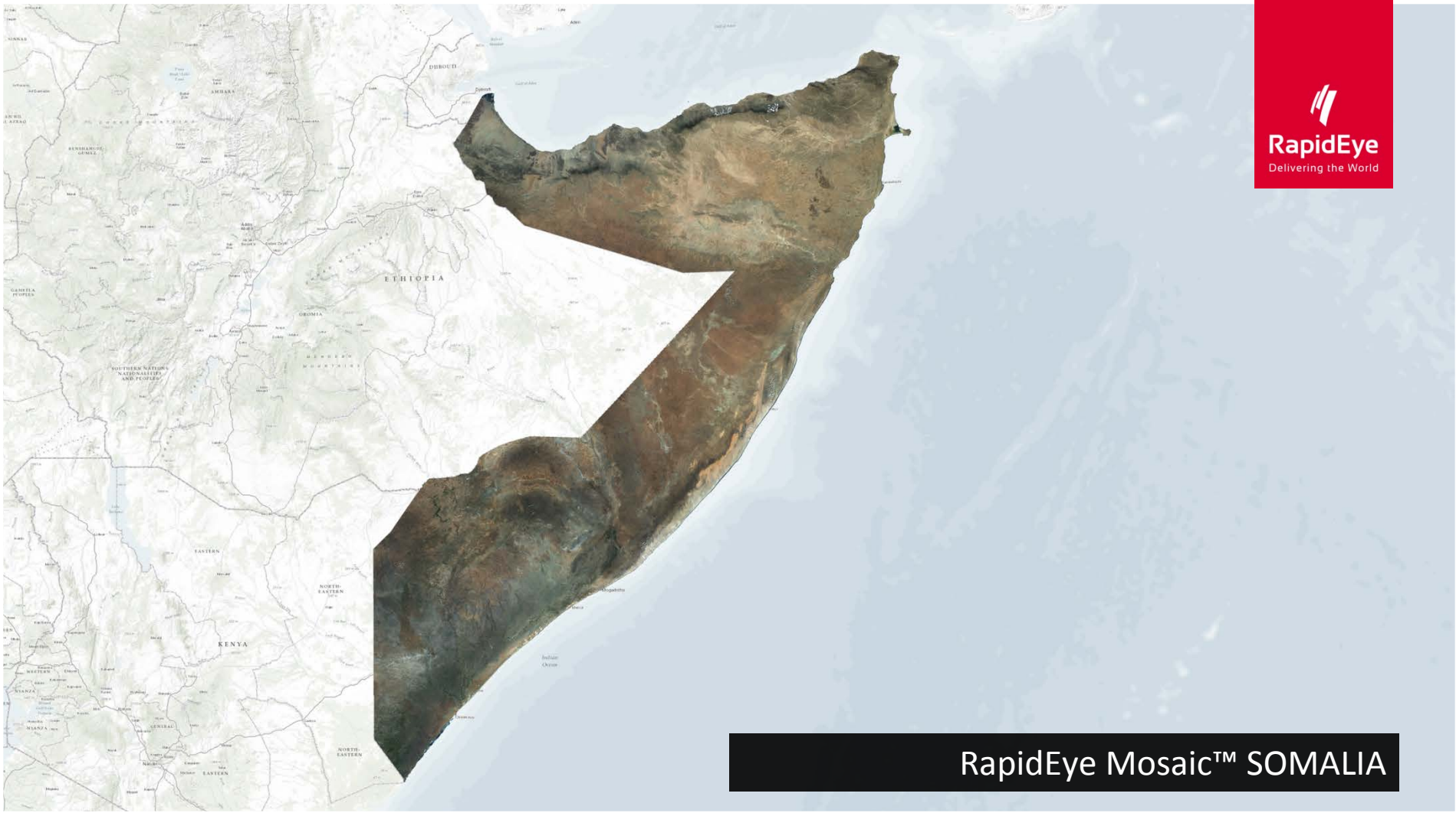
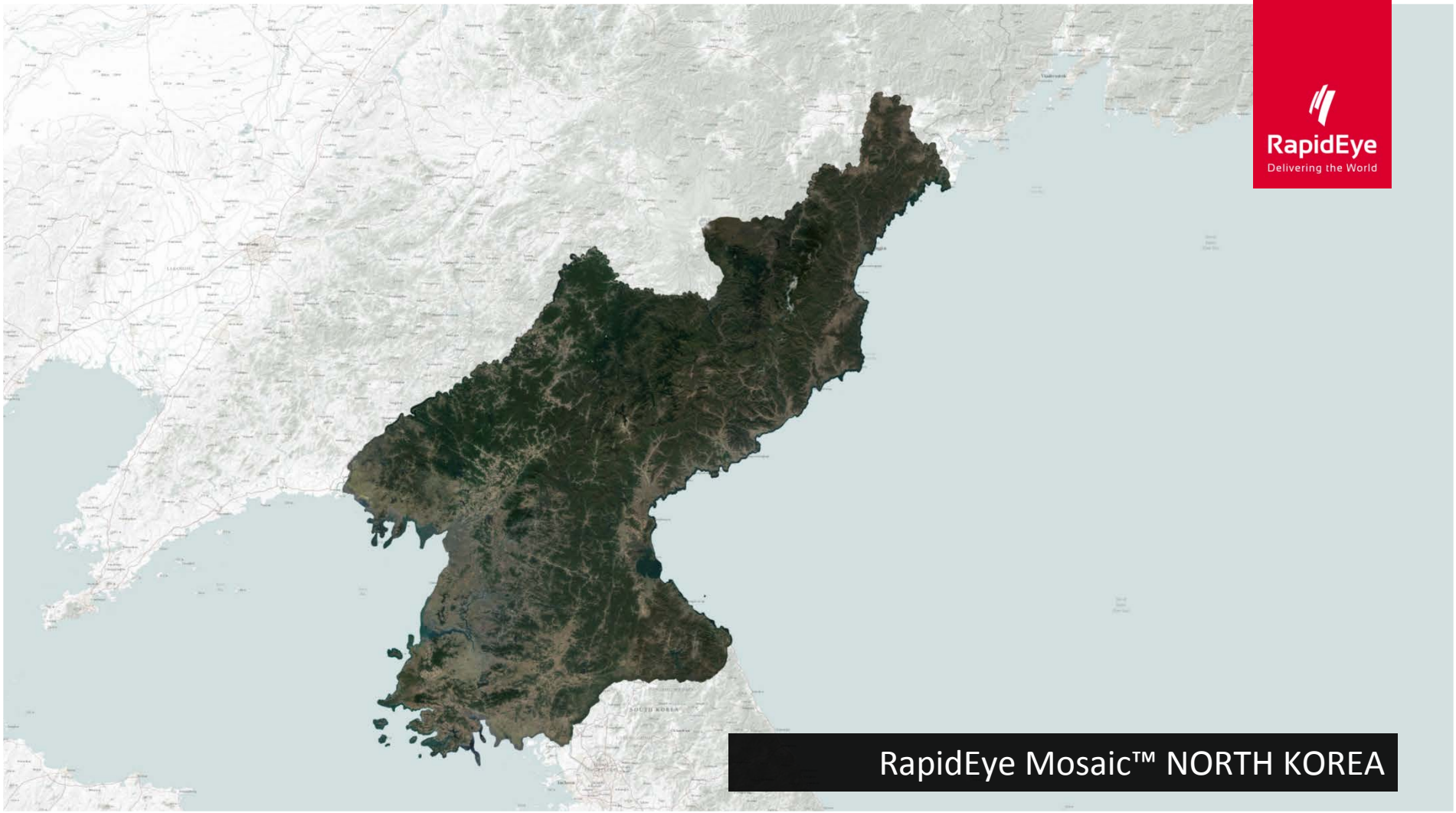
- Standard **Off-the-Shelf** mosaics
- **Custom** mosaic processing
- Custom mosaics will allow the customer to:
  - Define a specific AOI and TOI for their mosaics
  - A custom tiling and naming scheme
  - Different band combinations, bit depth and file formats
  - All subject to feasibility

AVAILABLE MOSAICS

- The following mosaics are currently available:
  - Bangladesh (2010-2012)
  - DR Congo (2009-2012)
  - Eritrea (2010-2012)
  - Hawaii – USA (2010-2012)
  - Malawi (2010-2011)
  - North Korea (2010-2011)
  - Oman (2010-2012)
  - Somalia (2010-2012)
  - Uzbekistan (2010-2012)



RapidEye Mosaic™ SOMALIA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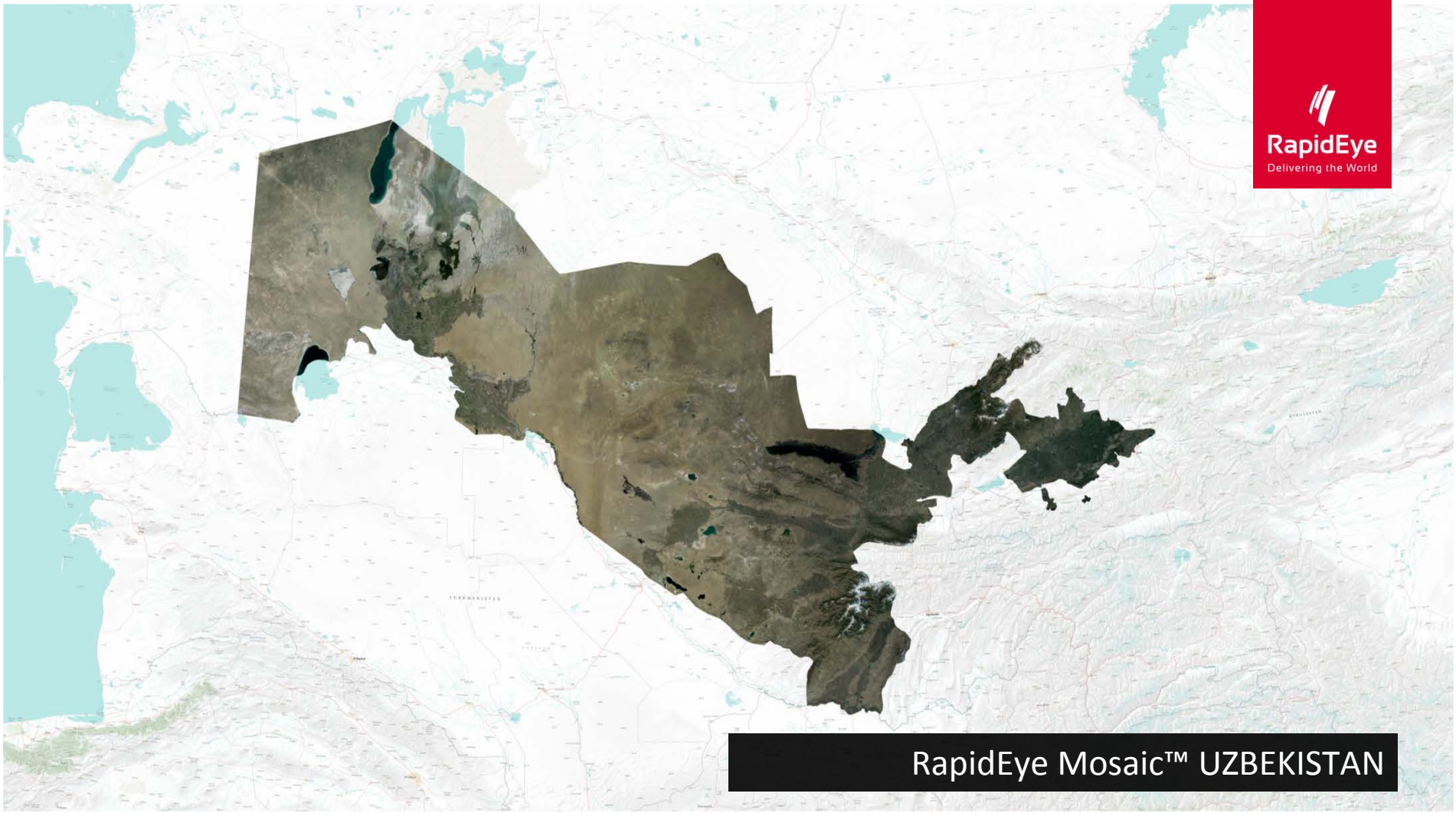
RapidEye Mosaic™ NORTH KOREA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RapidEye Mosaic™ UZBEKISTAN

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