MONITORING PROGRAMS FOR AGRICULTURE

JECAM/GEOGLAM Science Meeting
Ottawa, Canada
21 – 23 July 2014

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Outline:

- RapidEye Constellation
- Commercial Monitoring Program
- Data for JECAM/GEOGLAM
RAPIDEYE CONSTELLATION
SUMMARY OF MISSION

Five-Satellite Constellation
Enables daily revisit capability

Broad Area Collection
77 km wide sensor swath ideal for large area monitoring and mapping

 Superior Revisit
Frequent revisit enables large area change detection and monitoring

High-Resolution Imaging
5 meter resolution imagery

Multispectral Imaging
5 spectral bands for improved vegetation analysis
RAPIDYE SATELLITES

**Spacecraft Mass**
- **Bus:** 112.9 kg
- **Payload:** 43.5 kg
- **Total:** 156.4 kg

**Lifetime:** Beyond year 2020

**Manufacturer**
- **Bus:**
  - Surrey Satellite Technology Limited (SSTL) / England
- **Payload:**
  - Jena-Optronik GmbH / Germany
RAPIDEYE MULTISPECTRAL BANDS

400 nm - 510 nm
520 - 590 nm
630 - 685 nm
690 - 730 nm
760 - 850 nm
RED-EDGE BAND

The Red-Edge band is used to:

- monitor vegetation health
- improve species separation
- measure chlorophyll, protein, and nitrogen content
RESOLUTION

LANDSAT8 30 METER

LANDSAT8 15 METER

RAPIDEYE 5 METER
2013 COLLECTION

Jan 2013  6.85 Million Square Kilometres

JECAM
Joint Experiment for Crop Assessment and Monitoring
NEXT GENERATION

RapidEye+

JECAM
Joint Experiment for Crop Assessment and Monitoring
MONITORING PROGRAMS FOR AGRICULTURE
NEEDS OF 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
CROP GROWTH CYCLE

Crop Stages

Field-Level Analytics Required

Management Activities

Pre-Season image
Time-1 image
Time-2 image
Time-3 image
Time-N image

Soil Preparation
Seed Selection
Nutrient Management
Pest Management
Water Management
Harvesting

Joint Experiment for Crop Assessment and Monitoring (JECAM)

GEO - Group on Earth Observations
MONITORING PROGRAMS FOR AGRICULTURE

IMAGE COLLECTION
+ Target Area (AOI)
+ Critical Times (TOI)
+ Archive Images

ORTHO PRODUCT
+ 5 Spectral Bands
+ 5 m Pixel Size
+ <10 m RMSE

CATALOG & DELIVERY
+ Cloud-based
+ Quick Delivery
+ EyeFind / API
+ 3rd Party Data

BUSINESS MODEL
+ Subscription Options
+ Price Options
+ Sales Model
2013 NORTH AMERICA PROGRAM EXAMPLE

3 million km² AOI

4 TOIs (monthly)

Commitment: 20% clouds or less

TOI-4: RapidEye collections in 30 days (15-Aug to 14-Sep 2013)
2013 NORTH AMERICA PROGRAM EXAMPLE

- ~90% cloud-free
- 72% collected at <10° viewing angle
- Delivery time ~24 hours after acquisition

Coverage: ~100% geometrical coverage
Additional products: ~90%

Cloud-free coverage: ~72%
Collected at <10° viewing angle: ~72%
Delivery time: ~24 hours after acquisition

# OF PRODUCTS

JECAM
Joint Experiment for Crop Assessment and Monitoring
2013 NORTH AMERICA PROGRAM EXAMPLE

Multi-date tile delivery within TOI

RapidEye time series 2013, Gettysburg, South Dakota, USA
DElivery by Web

EyeFind-Ag

Intuitive search and download
Search API

Automated query and retrieval of new imagery

To download a zipped image product directly:
```python
>>> import requests
>>> import cgi
>>> s = requests.Session()
>>> s.auth = ('eyefindag.demo', 'BBdemo14')
>>> r =
    s.get('https://geocloud.blackbridge.com/gcapi/getProduct?im
streaming=True')
>>> if r.status_code == 200:
    ...   if r.headers.get('content-type') == 'application/zip
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
```

Query:
```python
https://eyefind-ag.blackbridge.com/rest/v1?
toiStart=2012-07-01&
toiEnd=2012-08-01&
aoiType=poly&
country=United States&
admin=South Dakota&
cc=5&
imgType=itt
```
SUPPLY CHAIN

Solution to Problem

Application

Derivative Products

API

Image Catalog

Collection Program

End-User

Partner

BlackBridge

JECAM

Joint Experiment for Crop Assessment and Monitoring

GEO

GROUP ON EARTH OBSERVATIONS
PROGRAMS WORLDWIDE

Source: MCD12C1 - MODIS Land Cover Classification Type 2 (UMD)

- Cropland
- Grassland

Running Programs
- In Discussion

JECAM
Joint Experiment for Crop Assessment and Monitoring

GEO
GROUP ON EARTH OBSERVATIONS
DATA FOR JECAM / GEOGLAM
Currently No Direct Support to JECAM

Supported though/by:

- ESA Third Party Mission: CAT-1 Program
- ESA Sent2-Take5 Program
- Agriculture and Agri-Food Canada

Flexible Data Licensing

- Base Single User can include a user group such as JECAM
RAPID EYE SENT2-TAKE5
Within this ESA project we acquired ~12 AOIs (only one tile each) every 5 days.

Amongst them there are 4-5 JECAM sites.

For research purposes:
- Simulate what might be expected from Sentinel 2
- Prepare different kind of applications (e.g. for wetlands, agriculture, etc.)
TEST AREA UKRAINE (CEOS JECAM SITE)

JULY 01, 2013

RapidEye Tile ID: 3662206
TEST AREA MOROCCO

JUNE 26, 2013

RapidEye Tile ID: 2954319
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