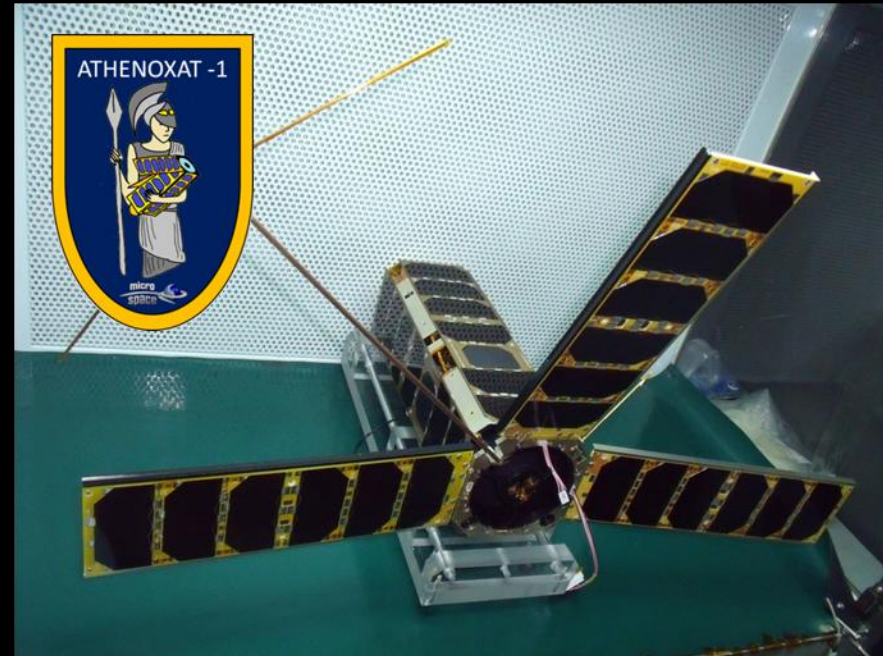


Athenoxat-1, Night Vision Experiments in LEO



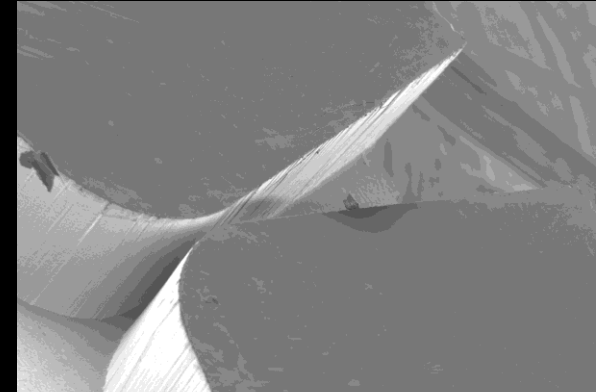
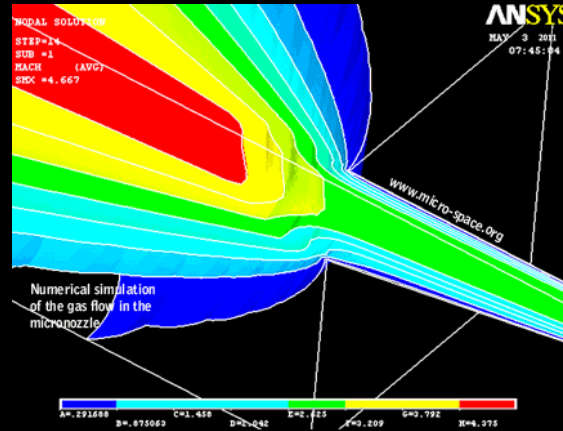
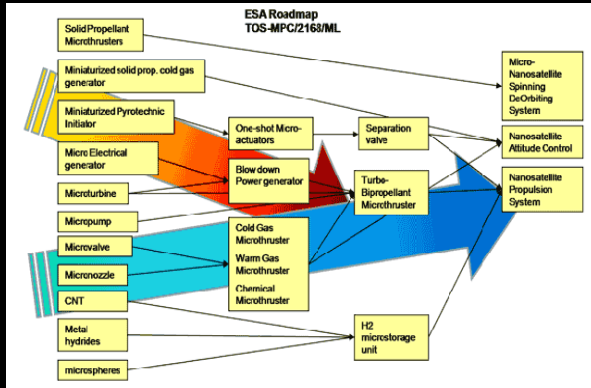
POPSAT-HIP1: Russia 19th June 2014
first 3 axis micropropulsion Cubesat

ATHENOXAT-1: India 16th Dec. 2015
*first day and night multi-resolution
imaging Cubesat*



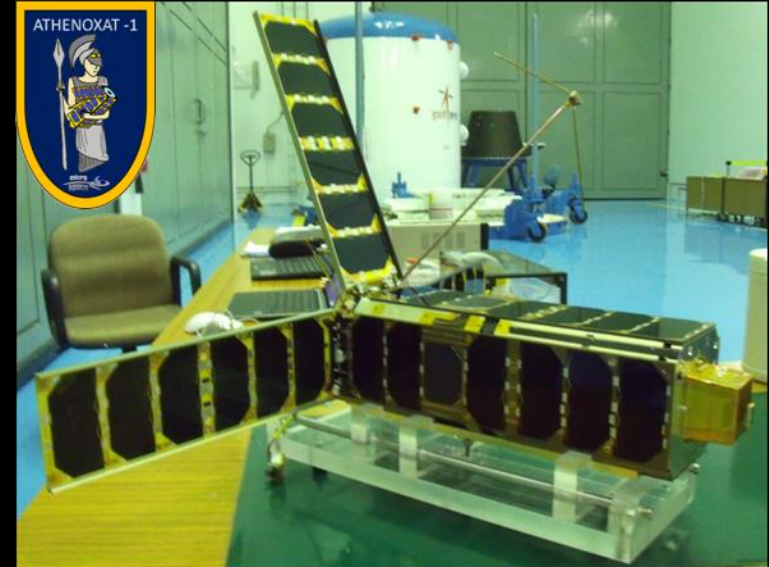
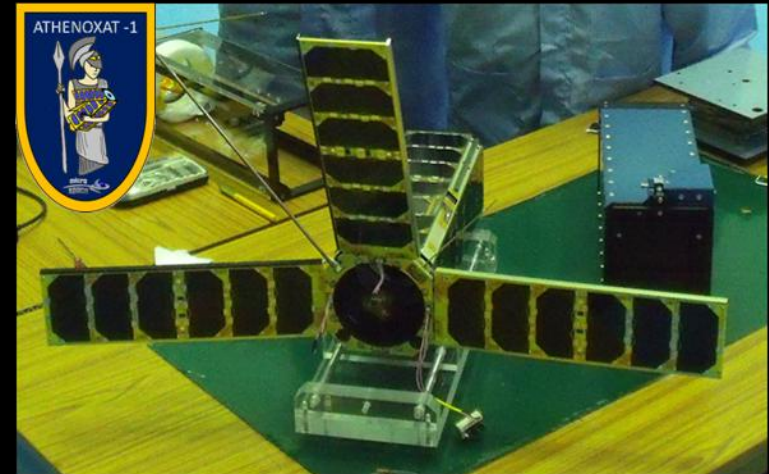
MICROSPACE

Nanosatellites R&D

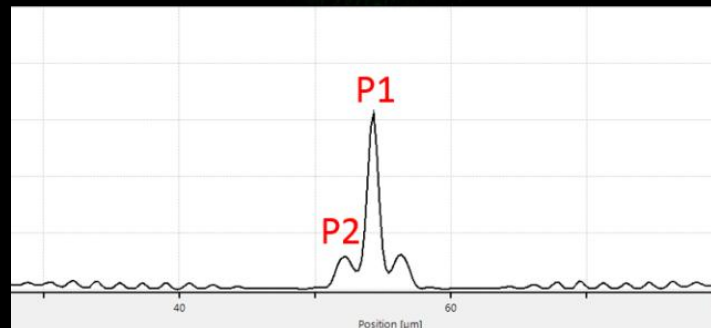
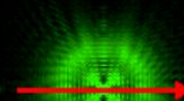
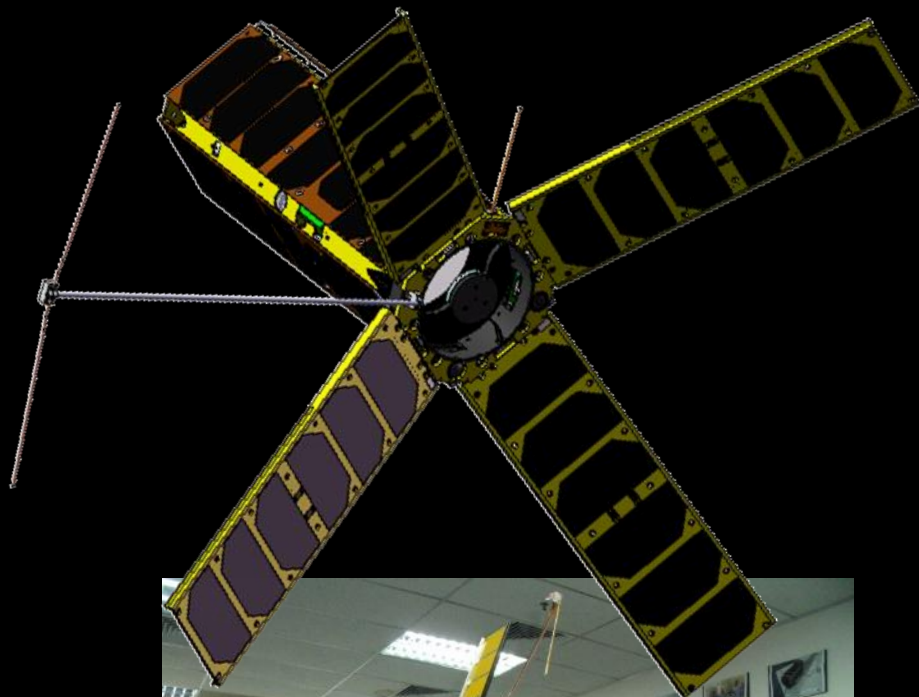


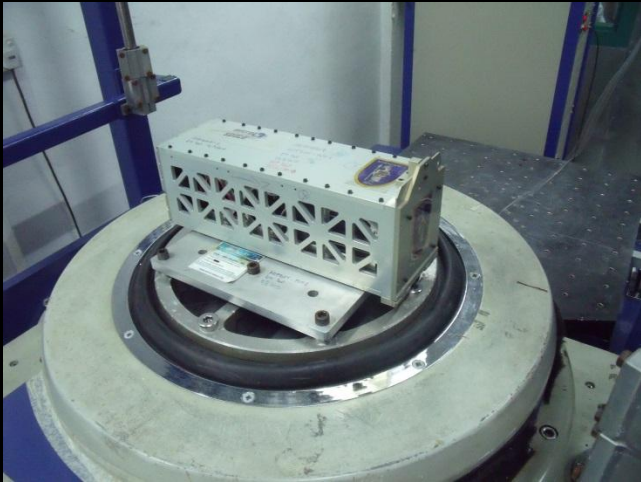
Athenoxat-1

- 3U cubesat of 4.8kg
- ADS sensors: coarse sun sensors, magnetometer & gyroscopes
- ACS air-coil magnetorquers primarily for stabilization
- Made in-house ACS reaction wheels for imaging pointing
- Made in-house main payload optics
- Main in-house payloads boost converters
- Made in-house deployable solar panels
- Made in-house deployable antennas
- Made in-house frame structure including deployment system for solar panels & antennas
- Made in-house payloads interfaces
- Made in-house CDH & ADCS software including Nadir vector determination & payloads drivers



Developing Athenoxat...





Ready to launch





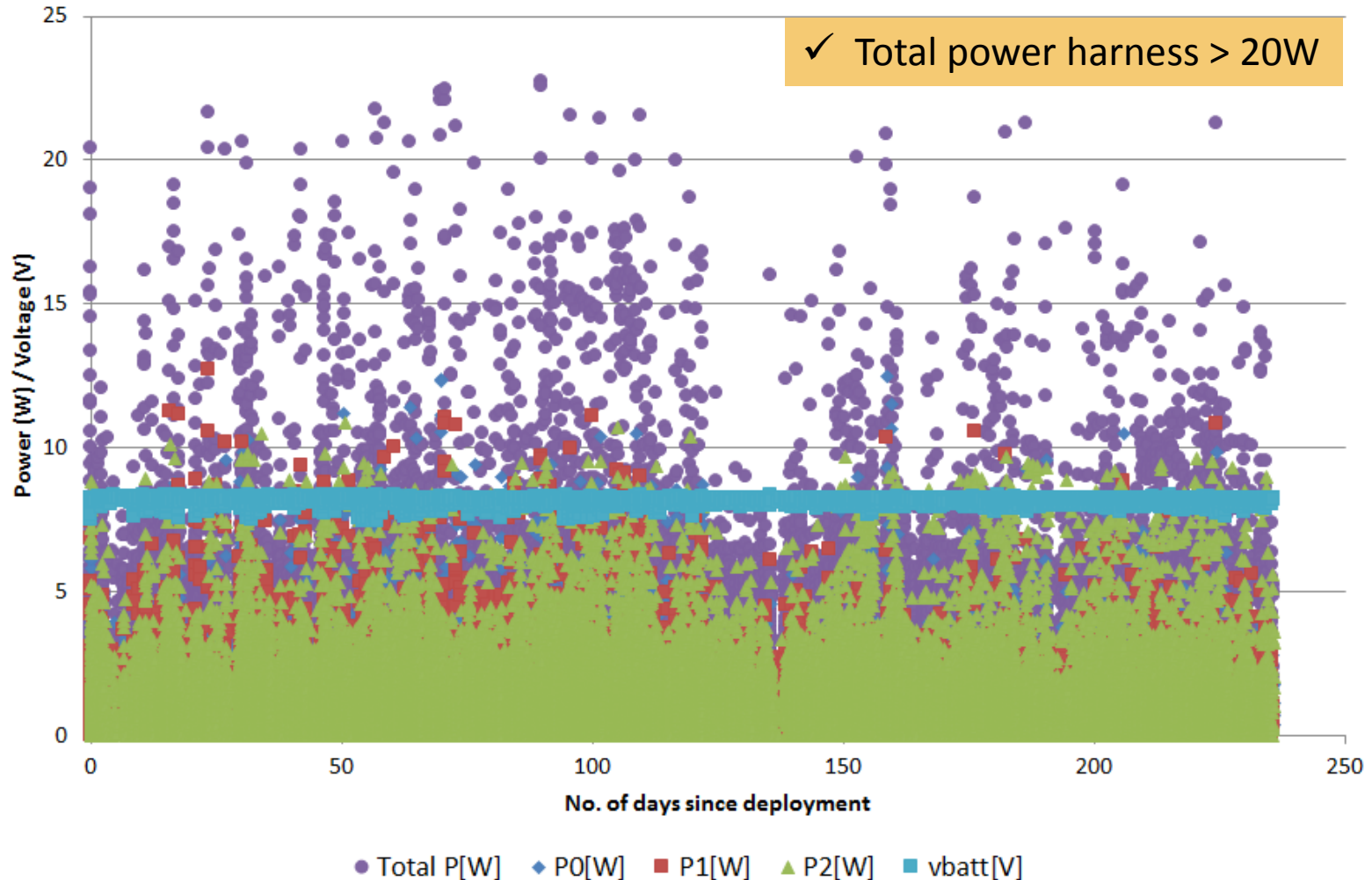
Athenoxat-1 Launch

On PSLV C29, 16th December 2015

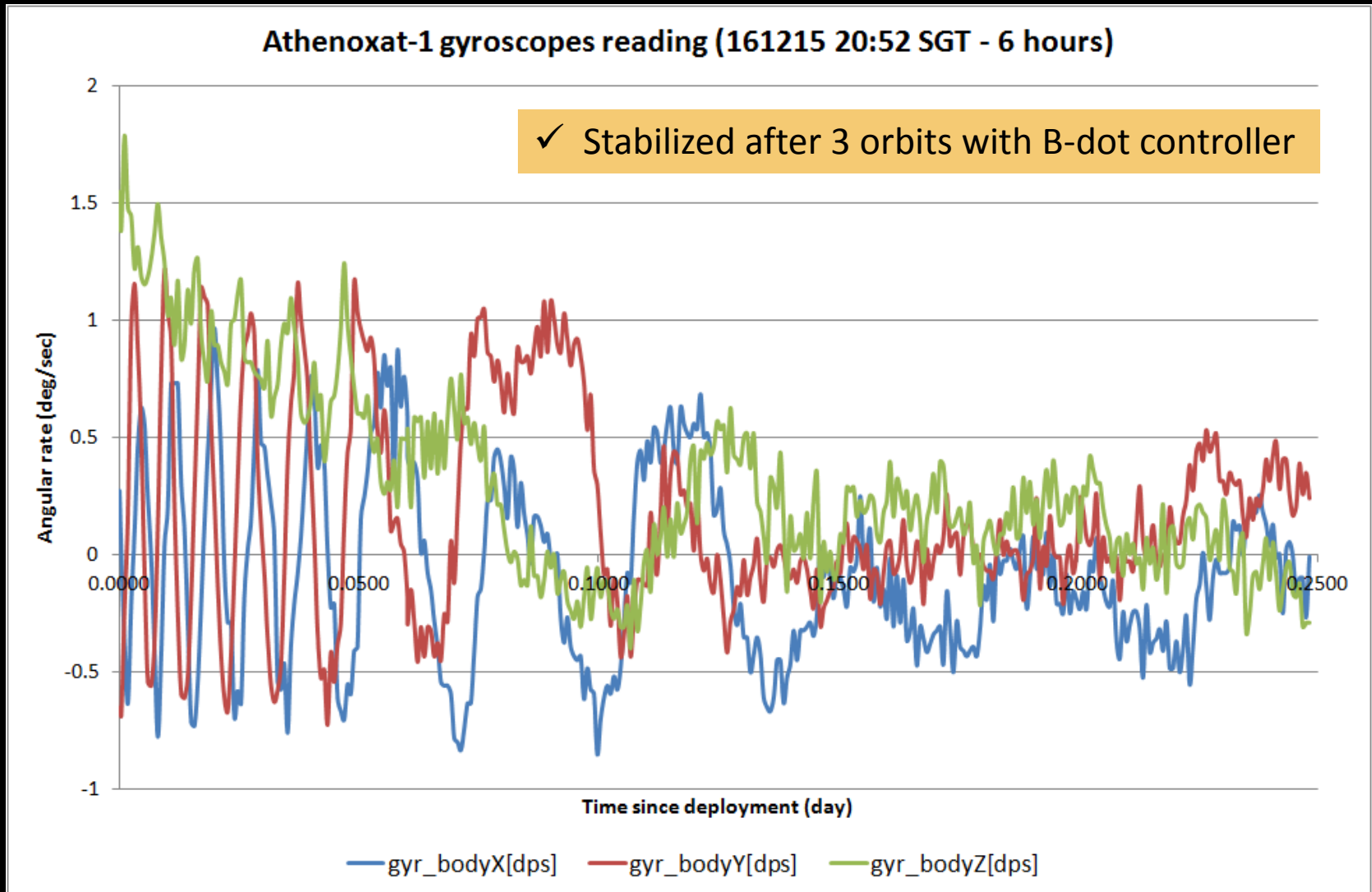


Power and Batteries

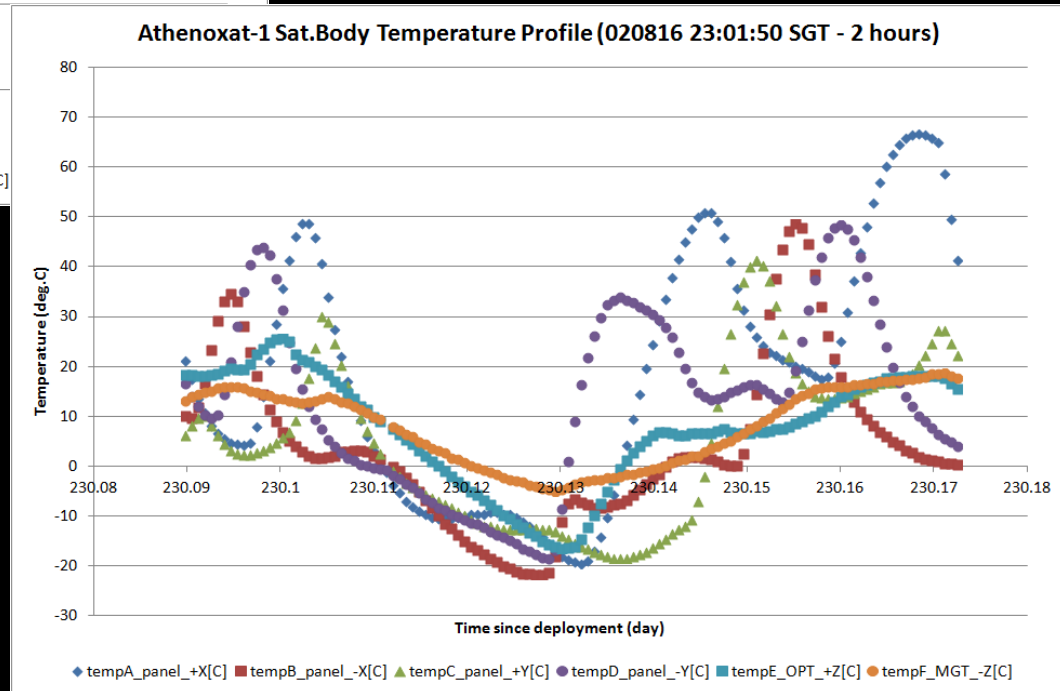
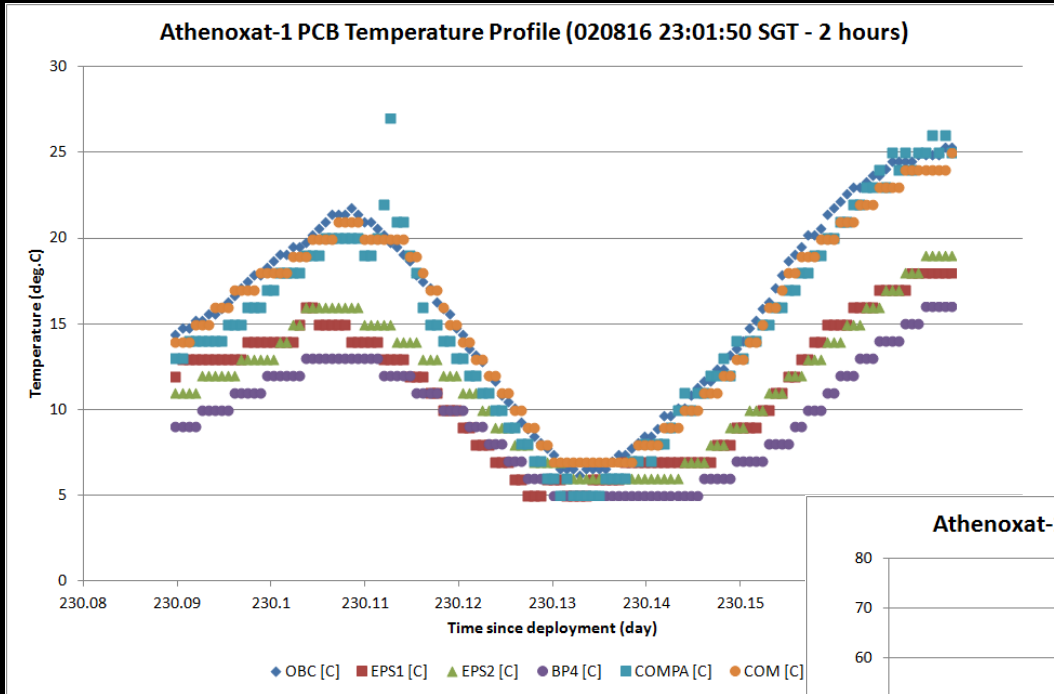
Athenoxat - 1 Solar Panels Power Harness & Battery Voltage Profile
(Available Data from 16/12/15 - 07/08/16)



Stabilization

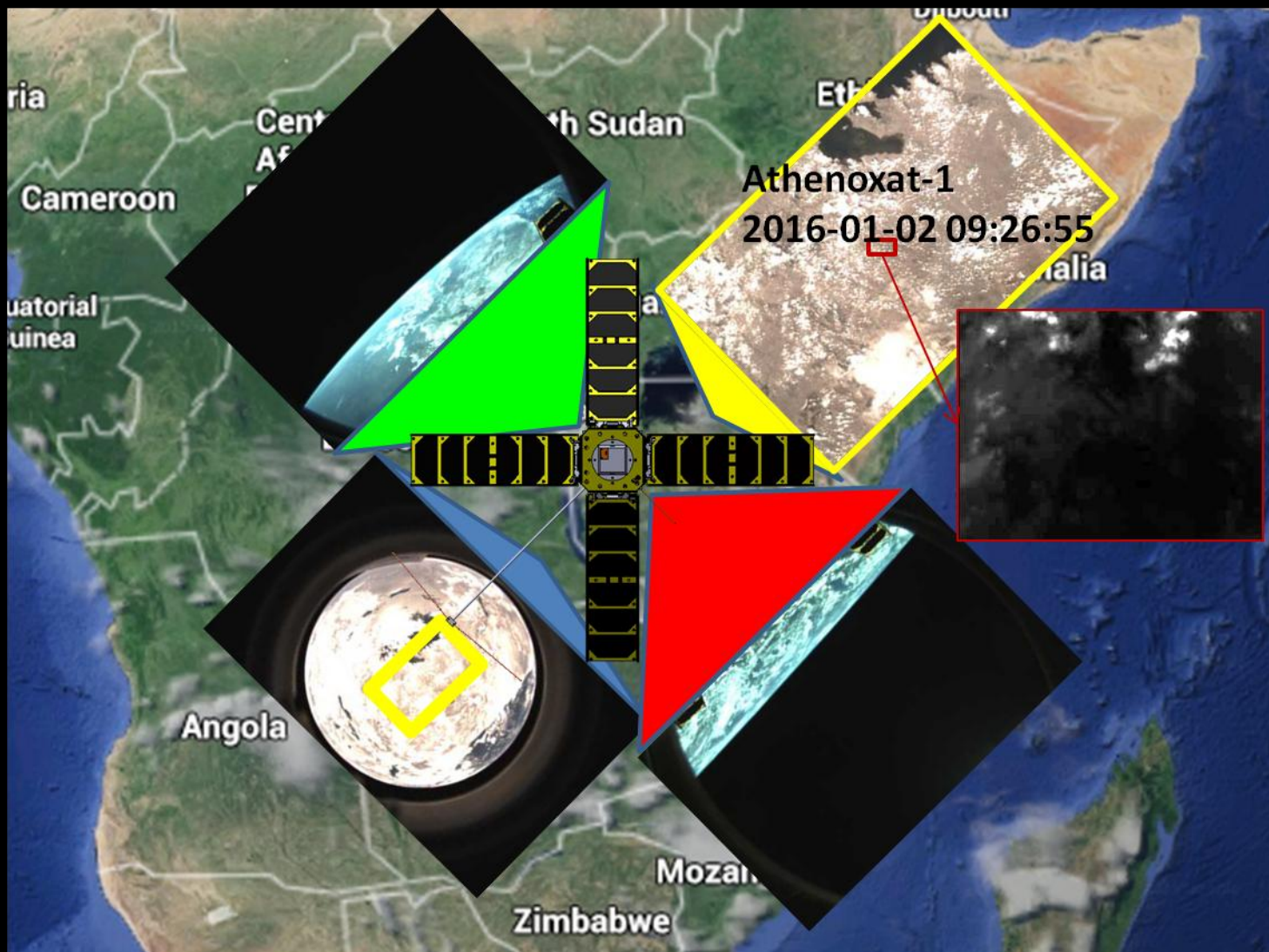


Temperatures



✓ Temperatures within expectation
 ✓ Healthy satellite 😊

5 view points in One Satellite



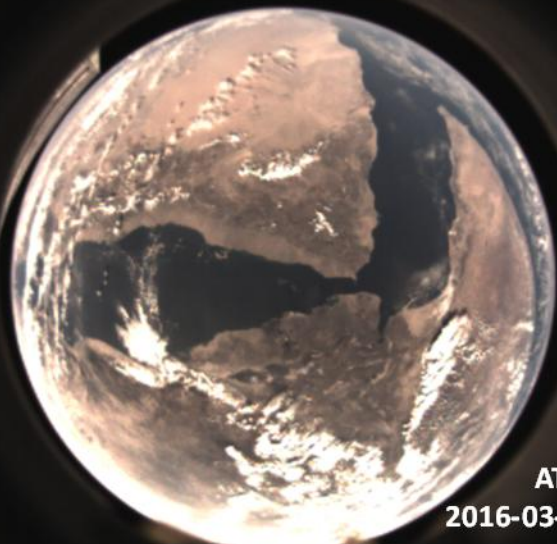
Fisheye Imaging (Bow)



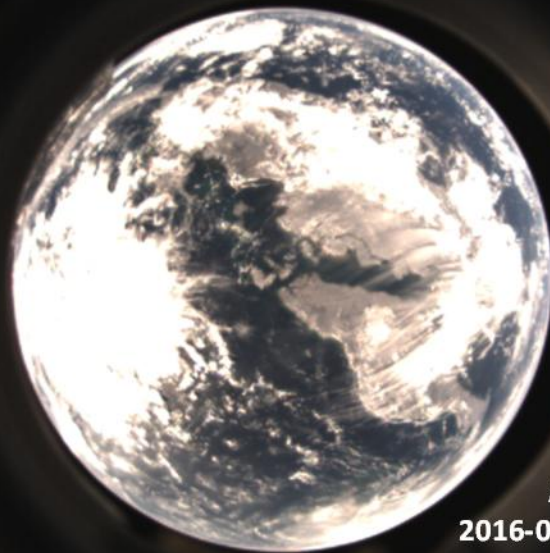
ATHENOXAT-1
2016-01-06 04:07:00



ATHENOXAT-1
2016-02-06 06:54:13

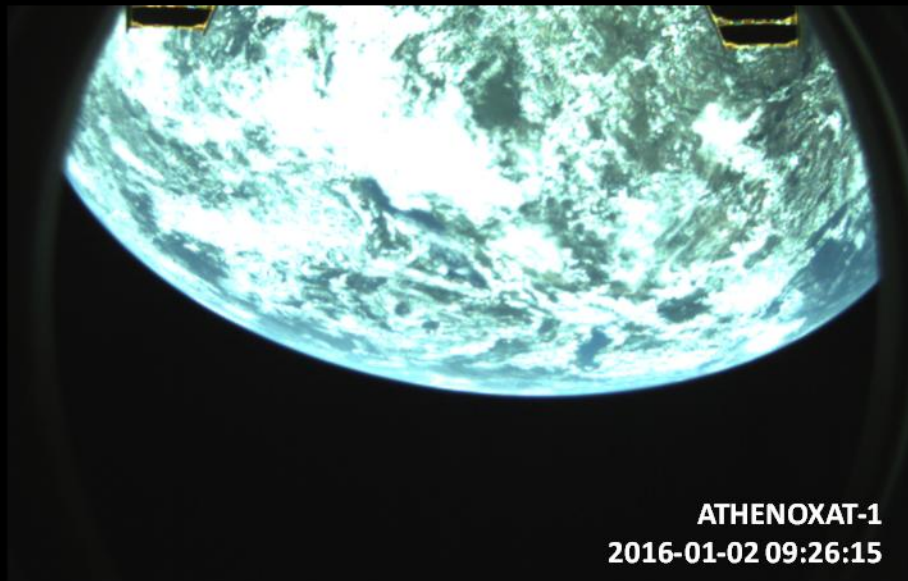
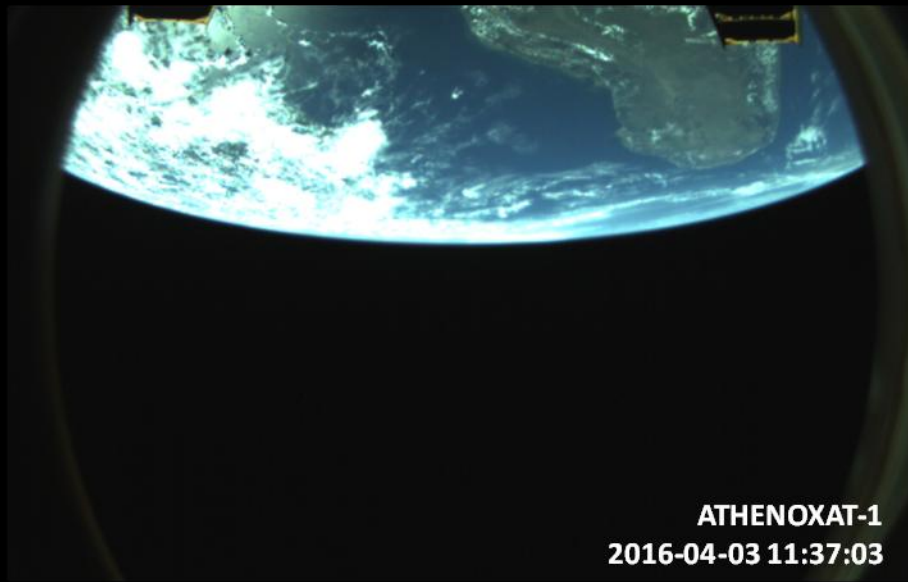
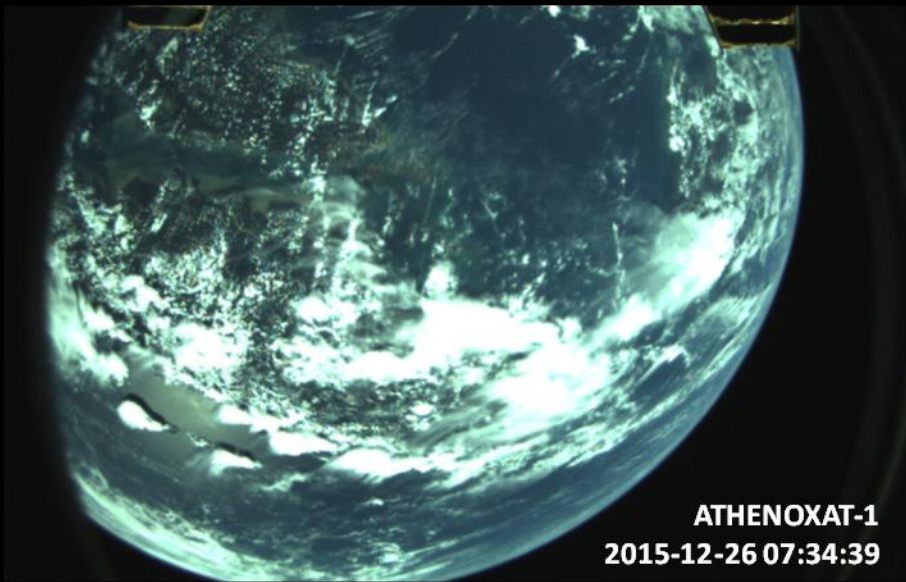


ATHENOXAT-1
2016-03-06 13:24:42



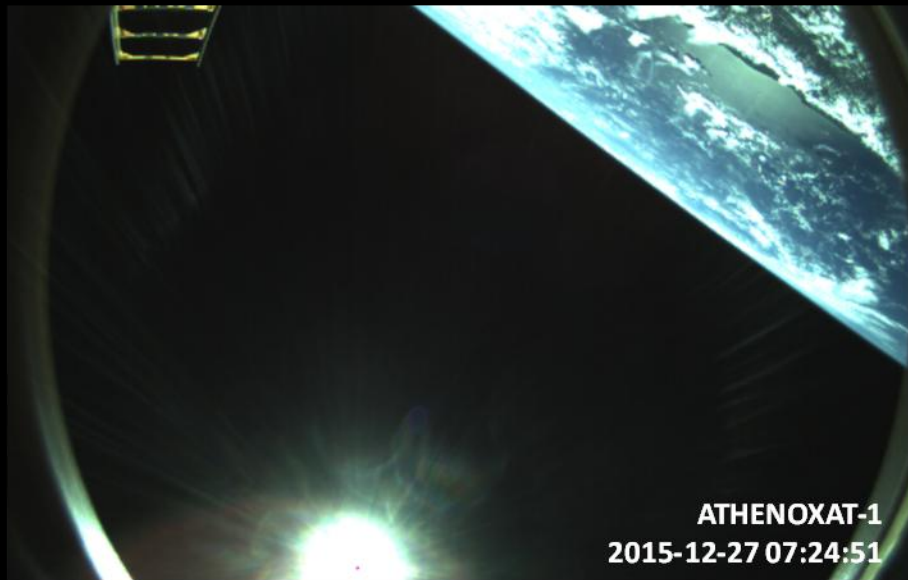
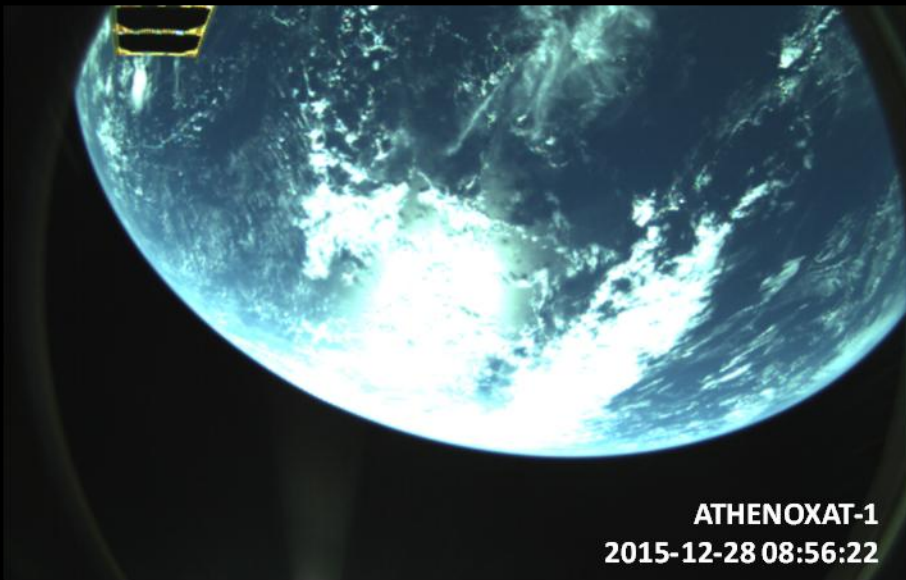
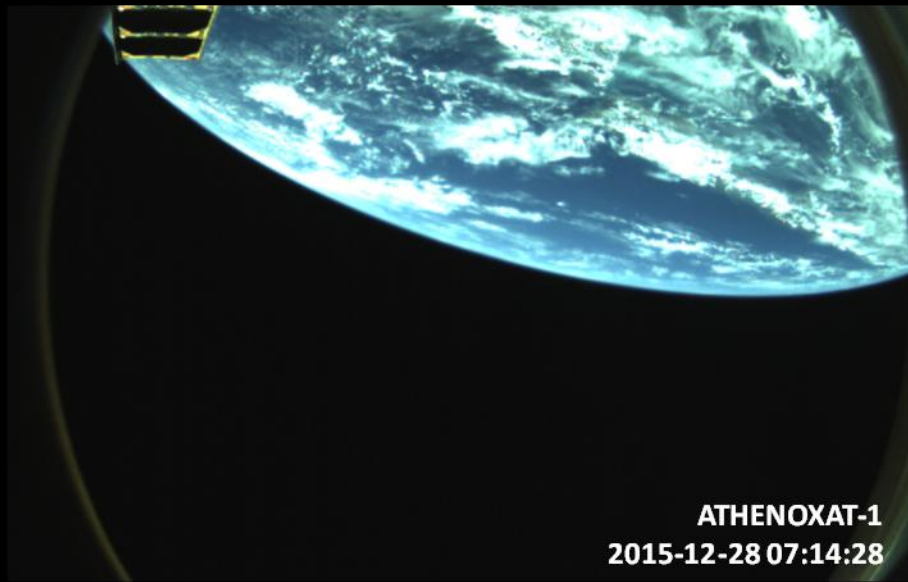
ATHENOXAT-1
2016-04-02 01:52:10

Fisheye Imaging (Port)



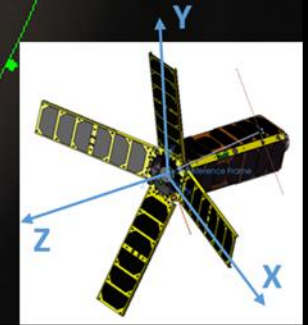
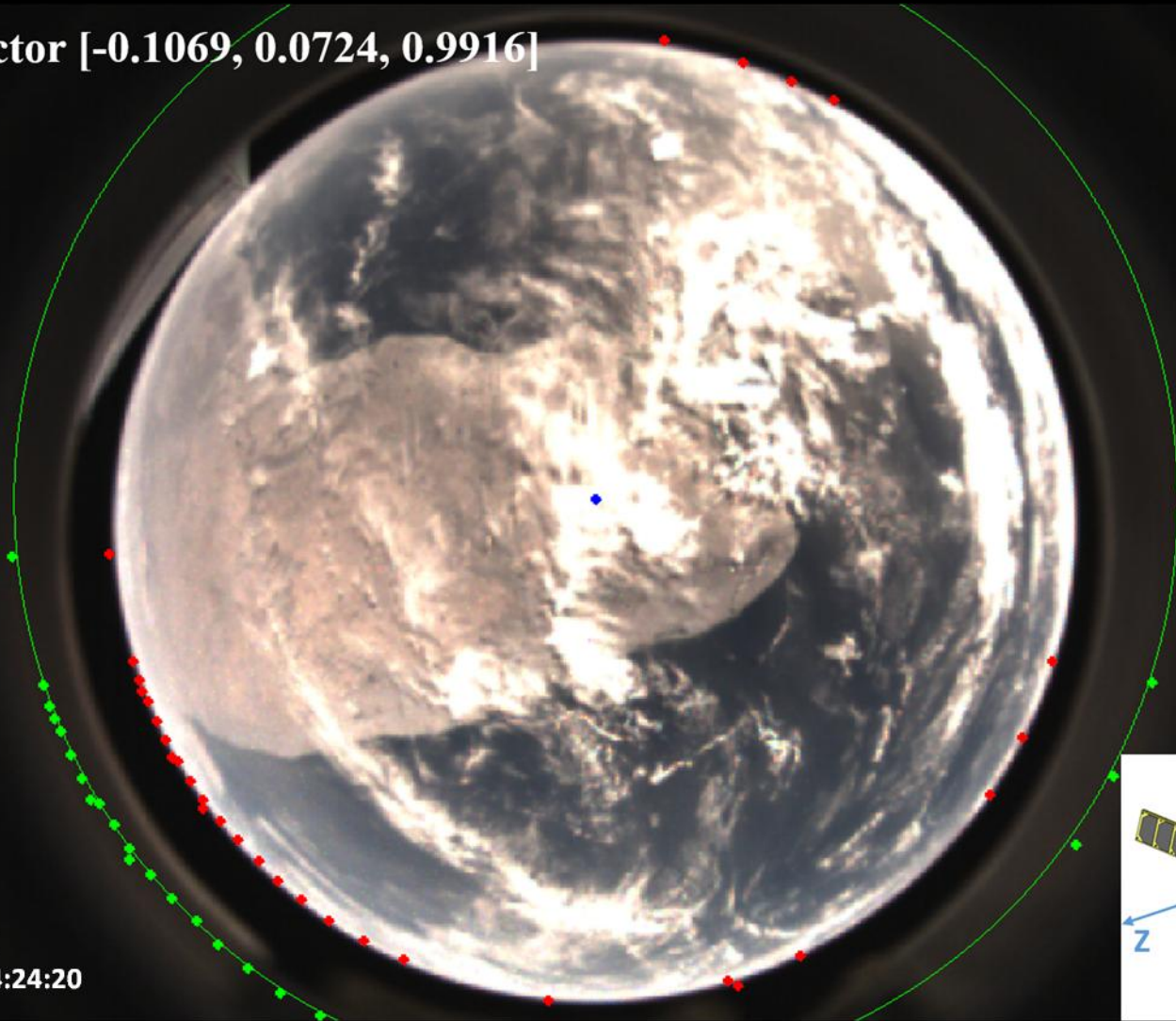


Fisheye Imaging (Starboard)



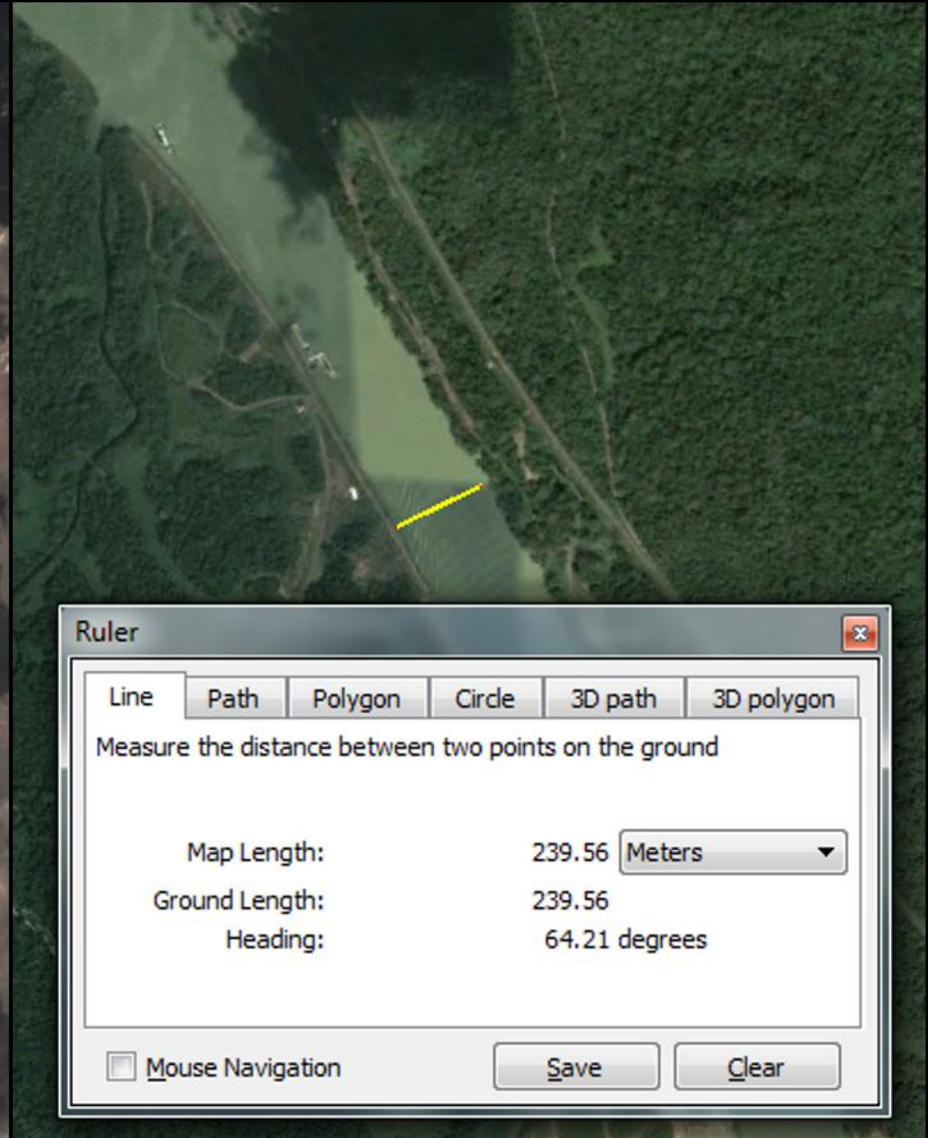
Fisheye Imaging – Nadir Determination

Nadir Vector [-0.1069, 0.0724, 0.9916]

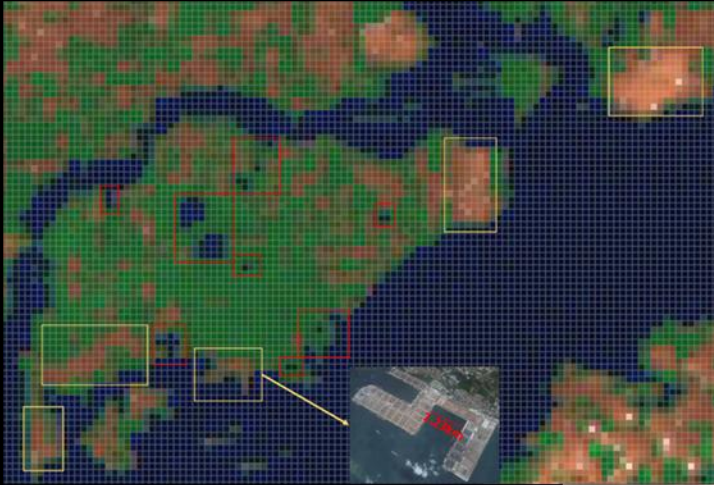


ATHENOXAT-1
2016-02-01 04:24:20

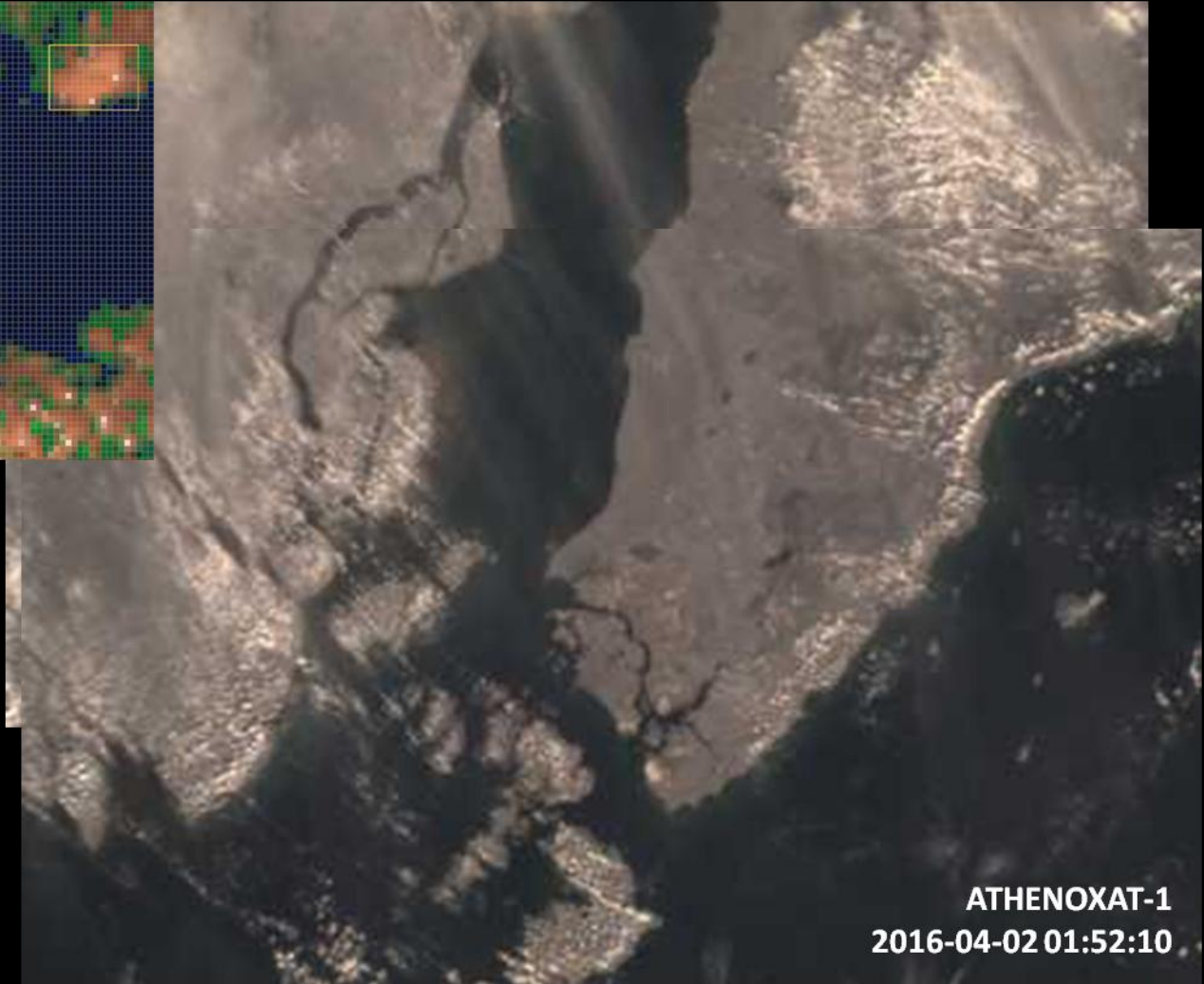
Wide Angle Imaging – Resolution



Wide Angle Imaging Sumatra – Singapore – Malaysia

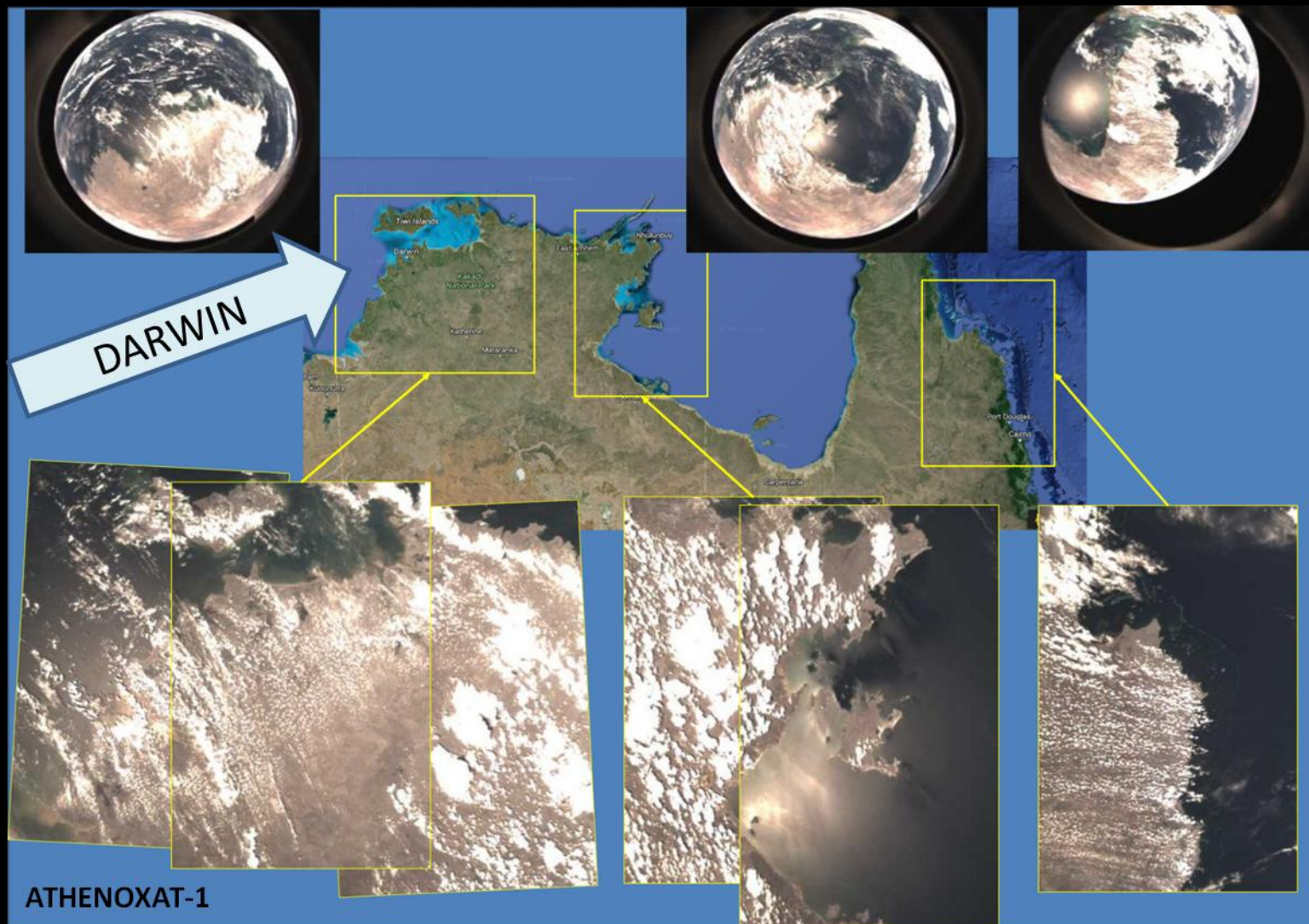


- Analysis based on RGB channel values
- ✓ Land-use monitoring
- ✓ Water pollution study
- ✓ Weather nowcast



ATHENOXAT-1
2016-04-02 01:52:10

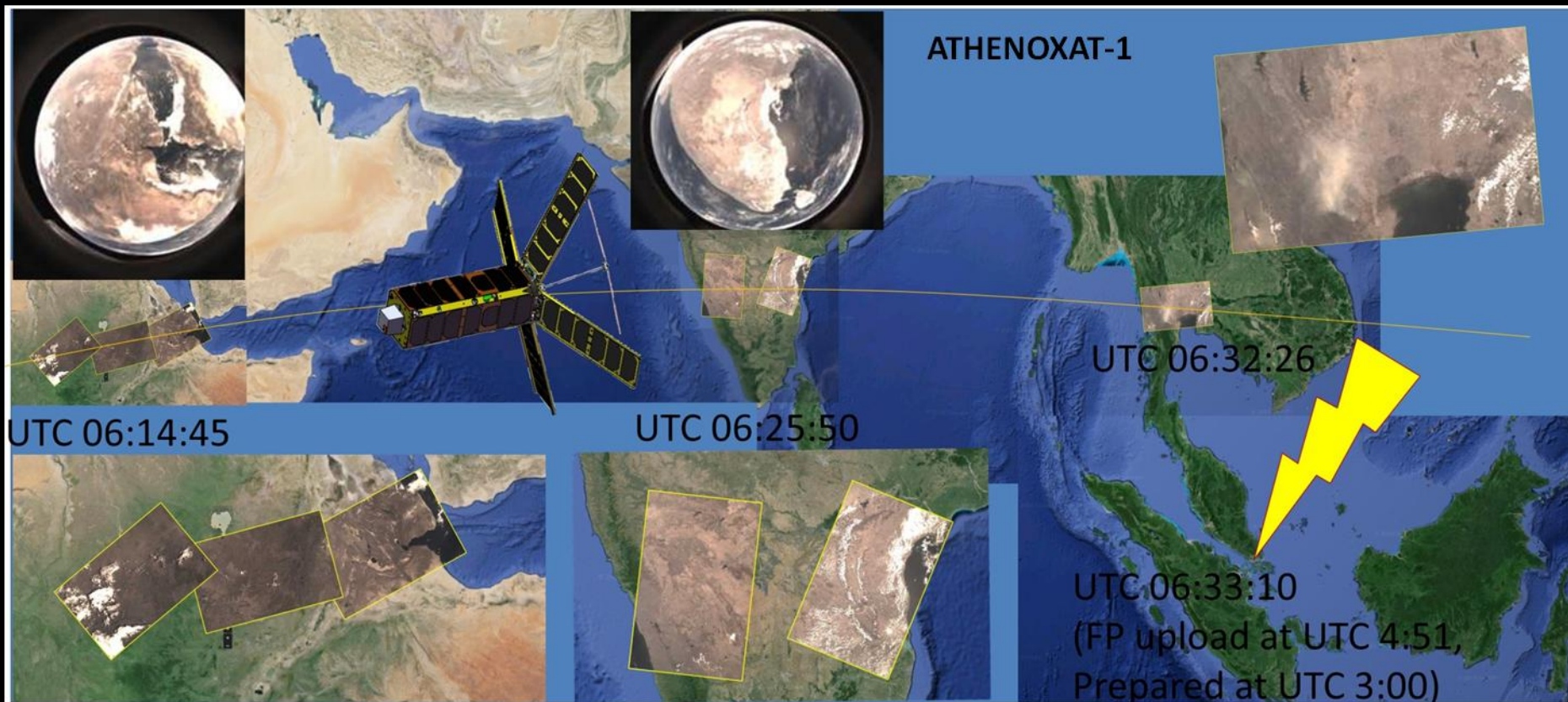
Wide Angle Imaging North Australia



DARWIN

ATHENOXAT-1

Wide Angle Real-time Imaging

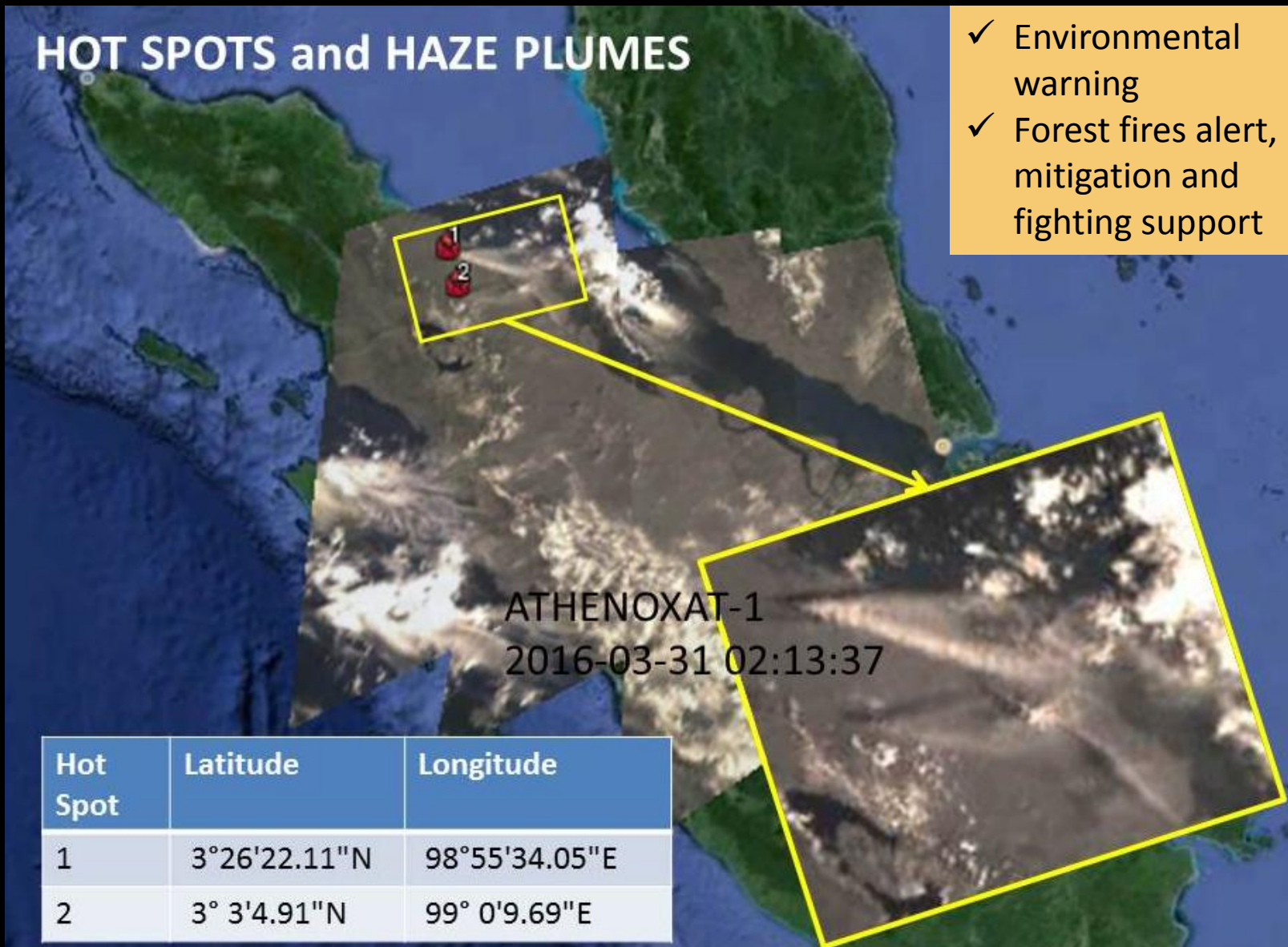


- ✓ Scouting in formation flight
- ✓ Avoiding imaging of cloudy areas

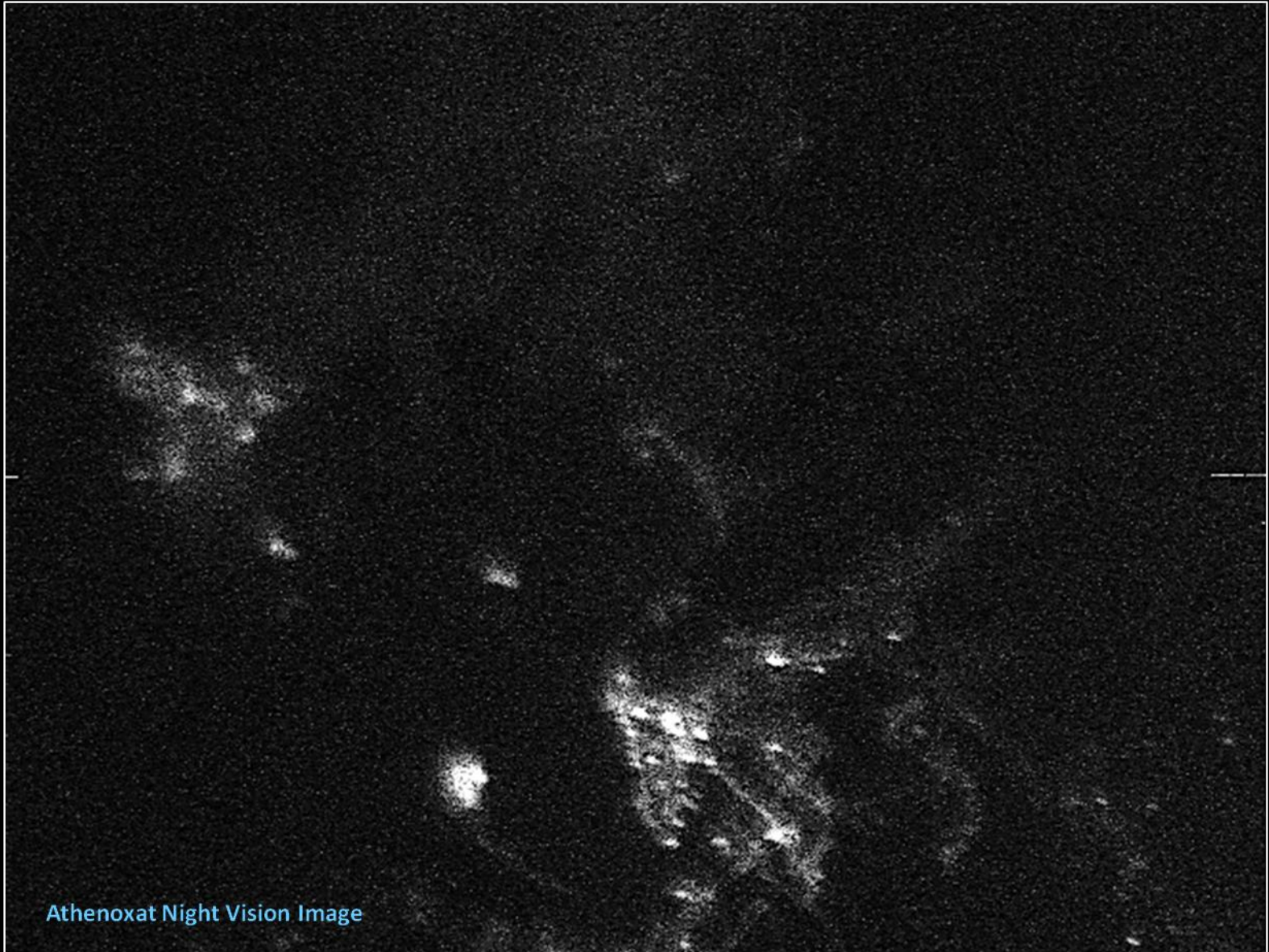
Wide Angle Imaging – Haze

HOT SPOTS and HAZE PLUMES

- ✓ Environmental warning
- ✓ Forest fires alert, mitigation and fighting support

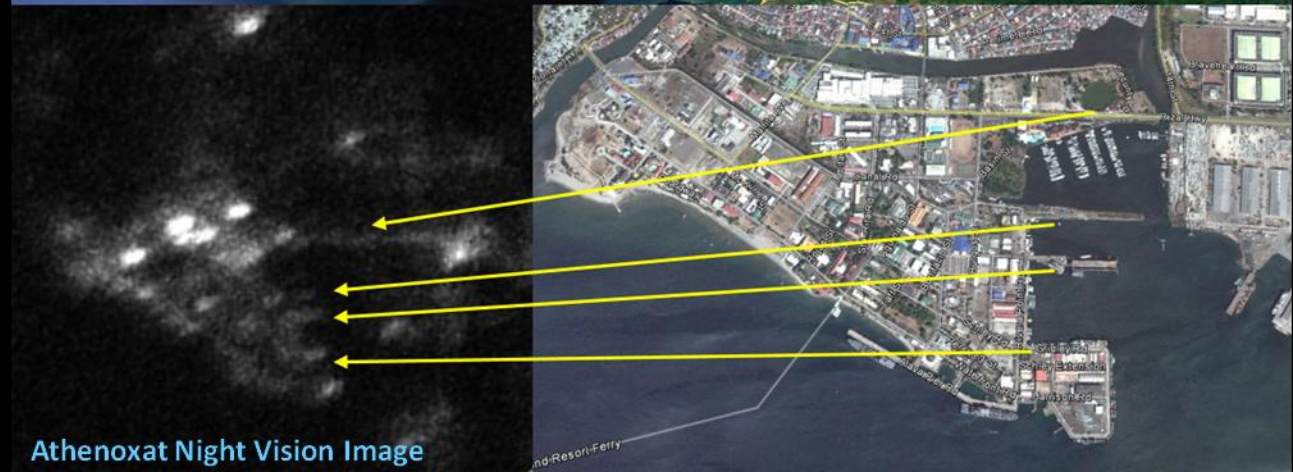


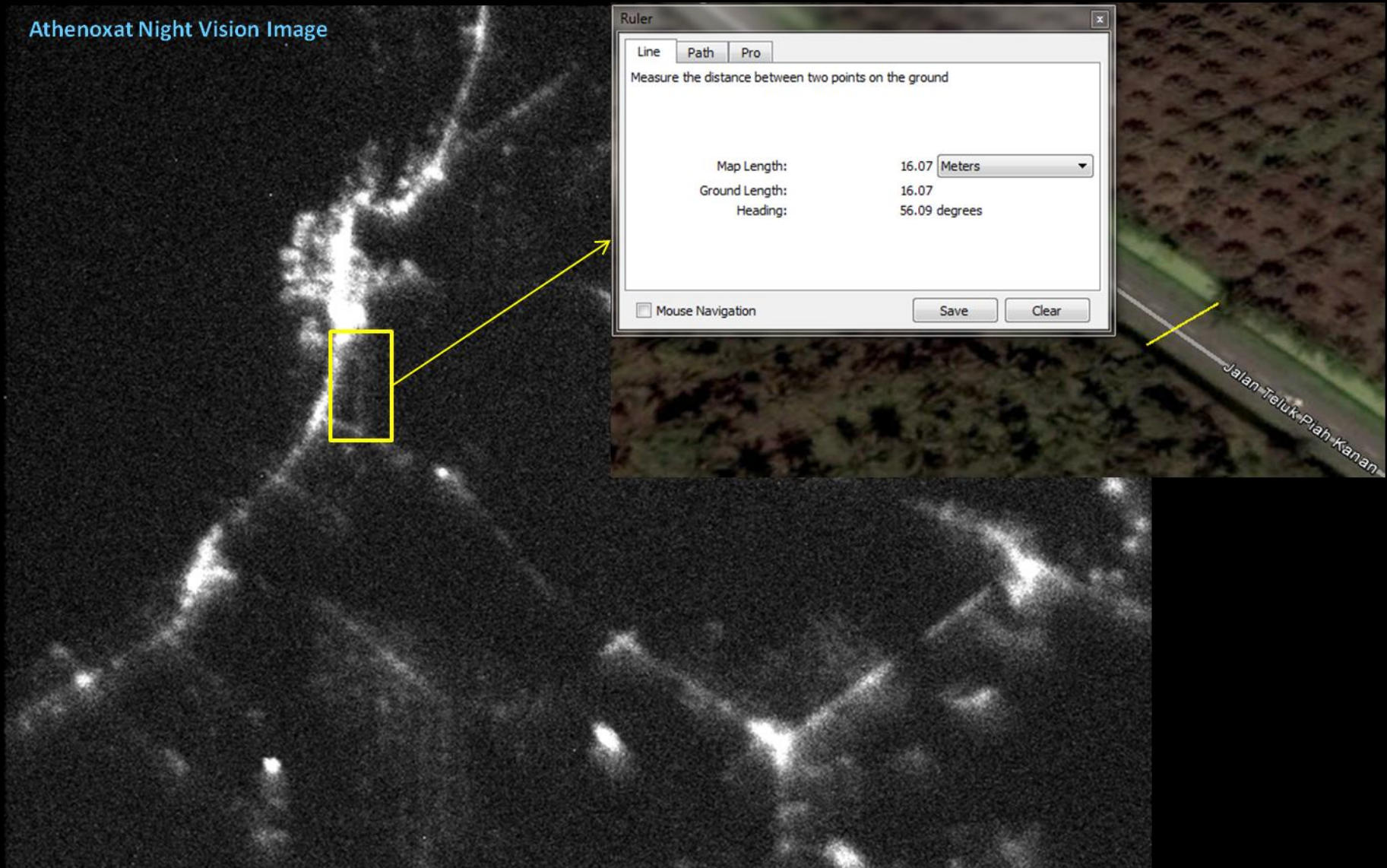
Hot Spot	Latitude	Longitude
1	3°26'22.11"N	98°55'34.05"E
2	3° 3'4.91"N	99° 0'9.69"E

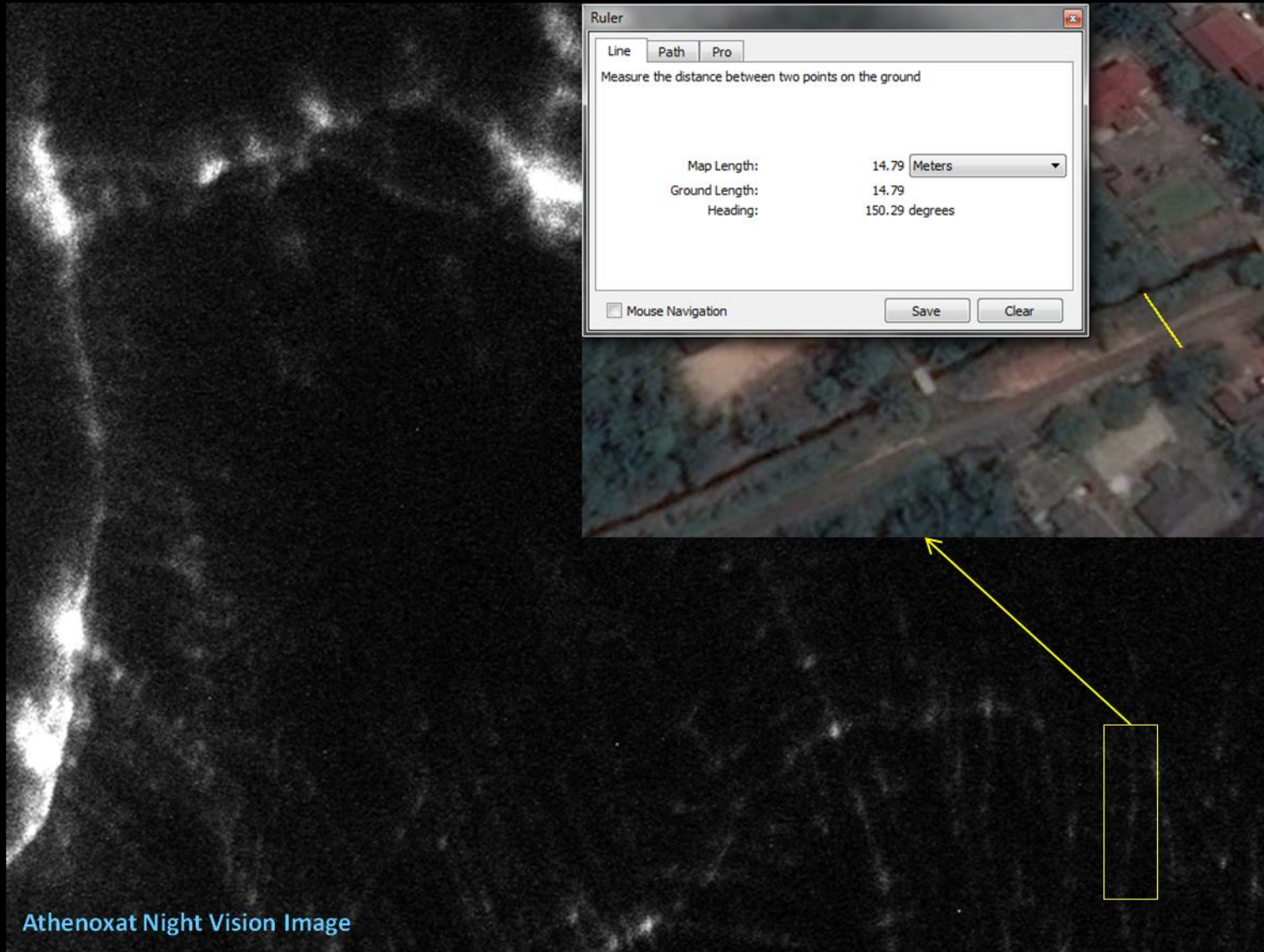


Athenoxat Night Vision Image

- Rizal Hwy bridge: 50m
- Land protrusion at Causeway Road: <50m
- **Pier at Quezon Street: 25m**
- Subic dock: 100 to 200m

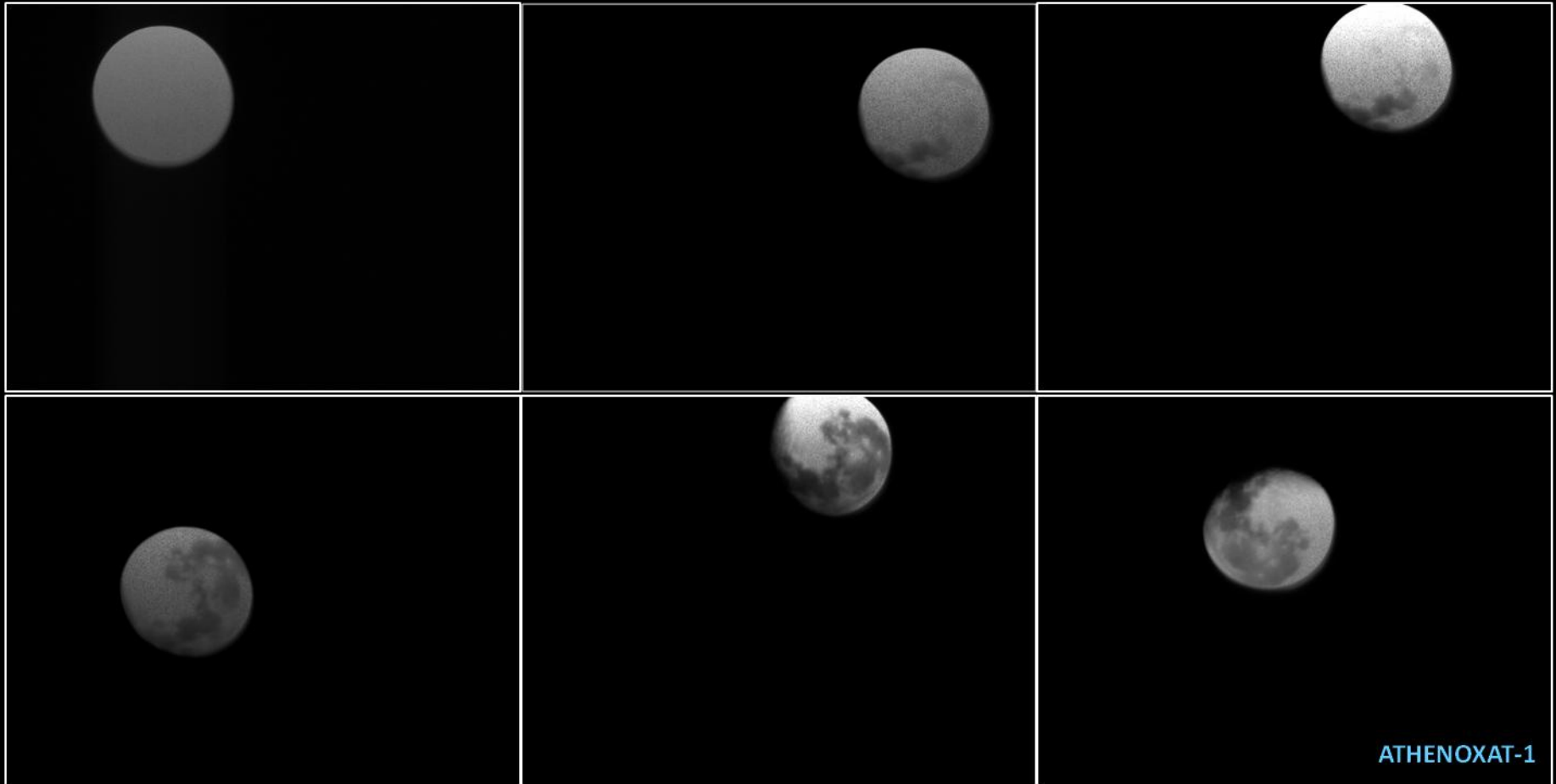






Athenoxat Night Vision Image

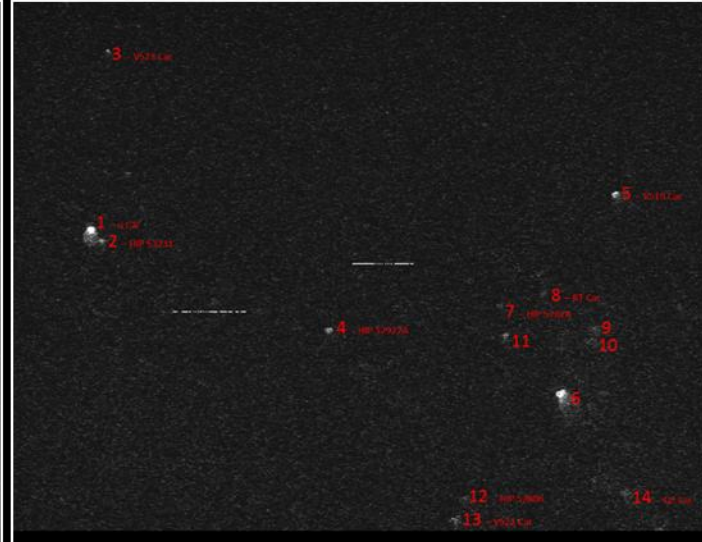
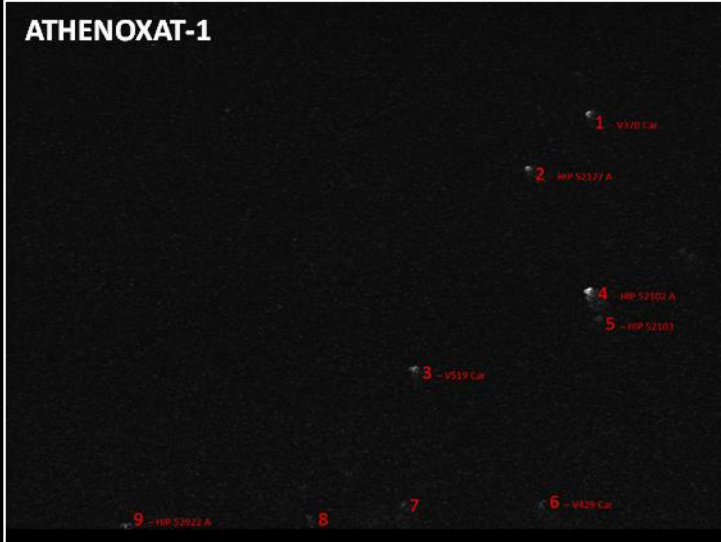
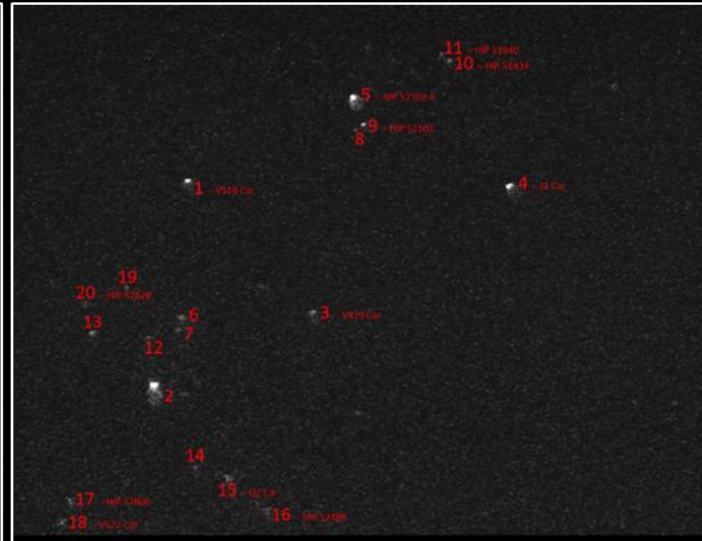
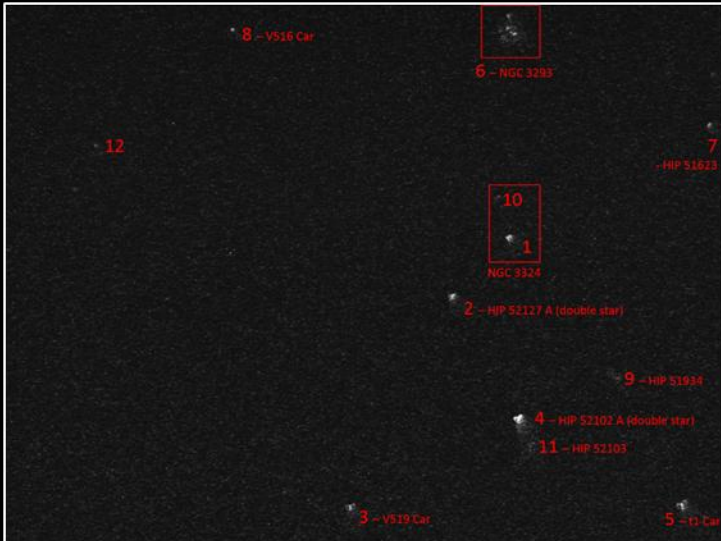
Night Vision Imaging – Moon Pointing Accuracy < 1°



ATHENOXAT-1

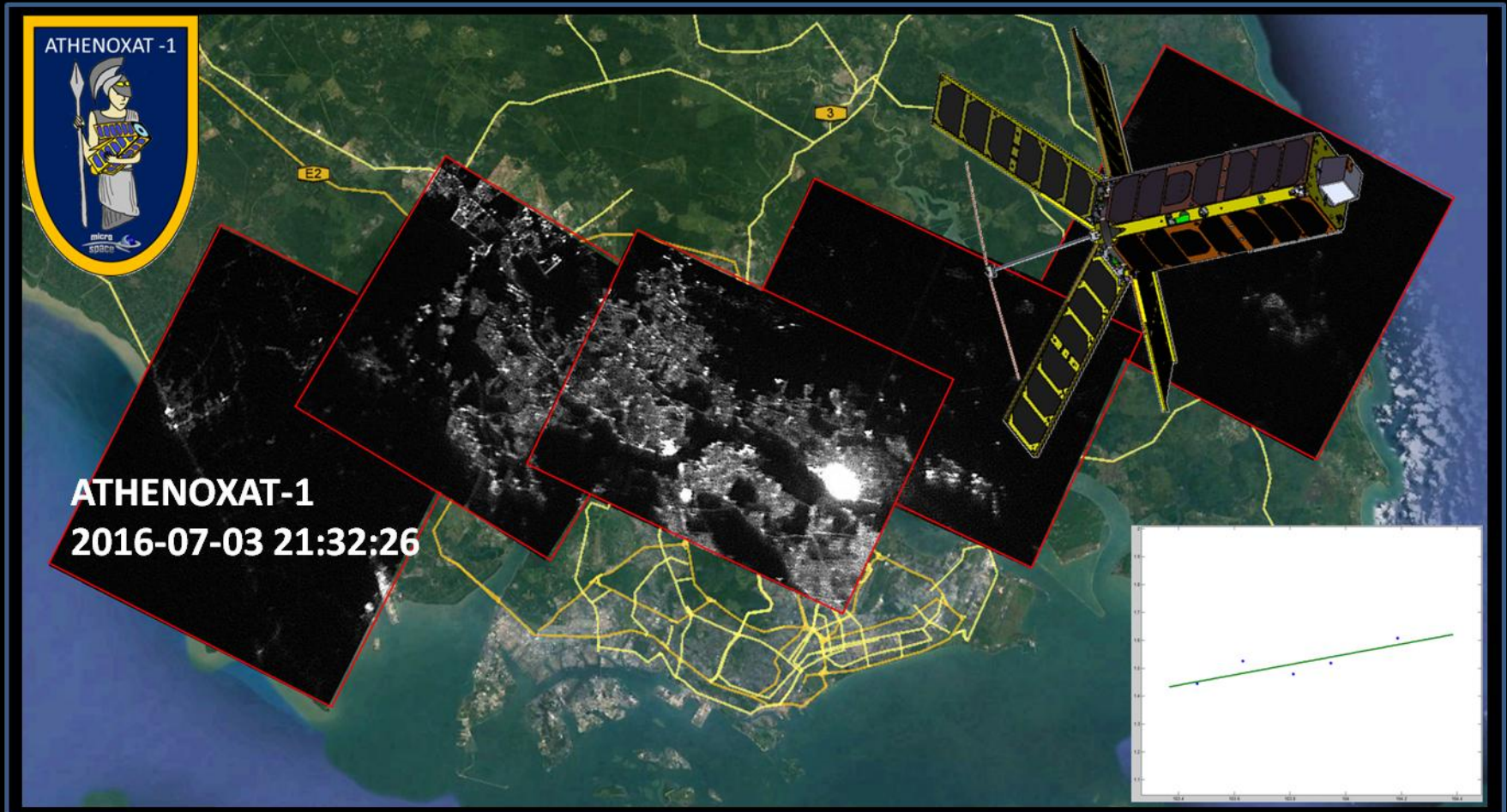
Night Vision Imaging – Stars

Pointing Accuracy < 1°



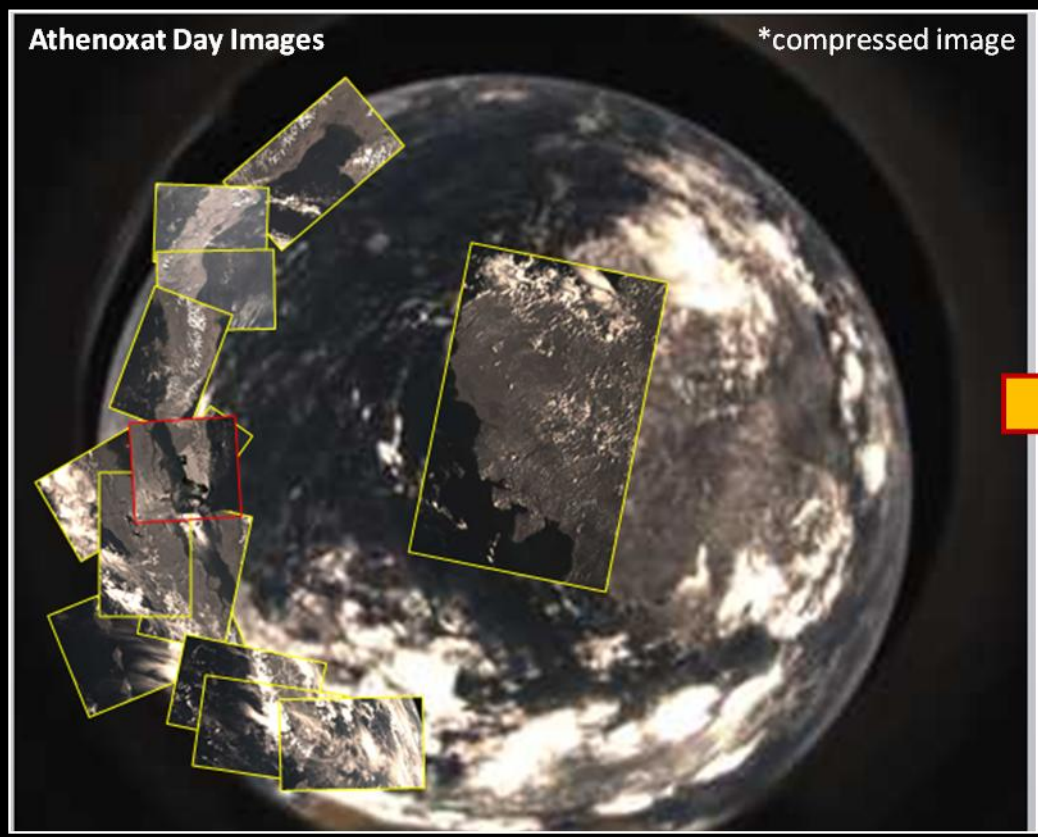
Night Vision Imaging – Singapore & Johor

Pointing Stability $3\sigma = \sim 0.27^\circ$



✓ ADS based on only coarse sun sensors and magnetometer

Summary

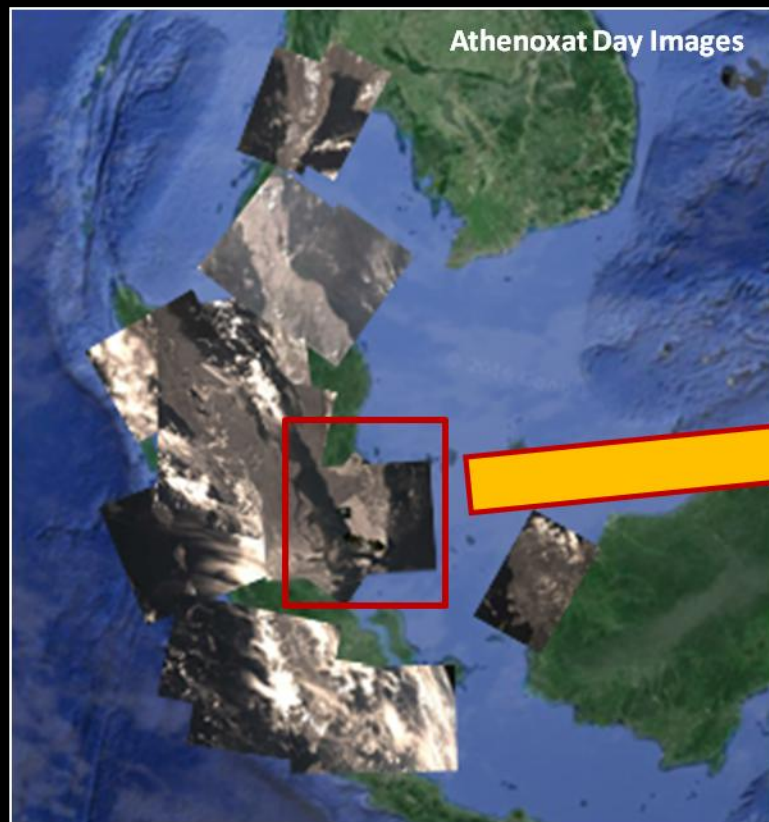


3x Fisheyes
GSD ~4km minimum
D=1800km



Wide Angle
GSD 300m
D=550km

Summary



Athenoxat Day Images



Athenoxat Day/Night Images

Wide Angle
GSD 300m
D=550km

Summary

**Wide Angle
GSD 300m
D=550km**

**Night Vision
GSD 25m
D=21km**

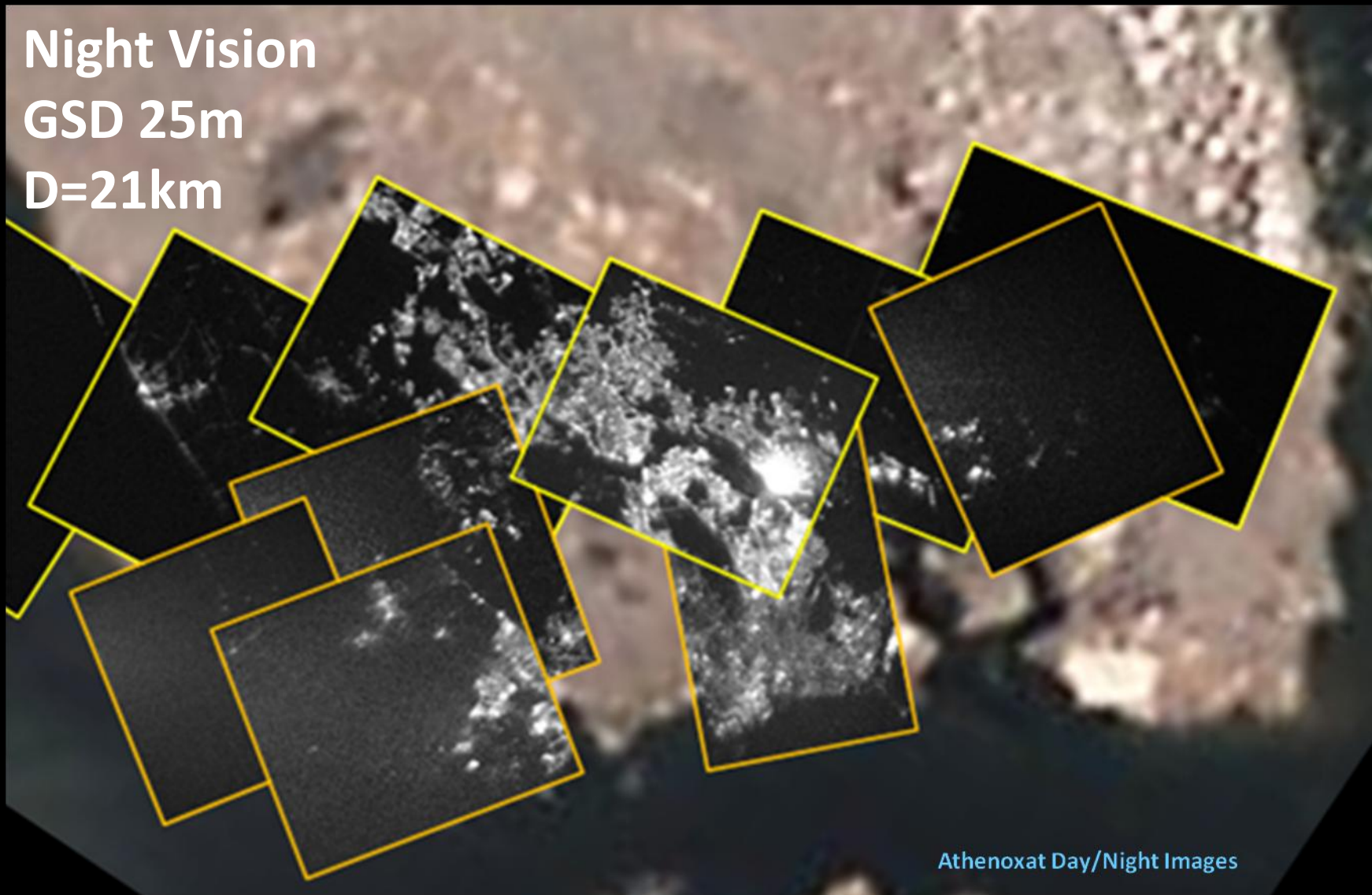


Summary

Night Vision

GSD 25m

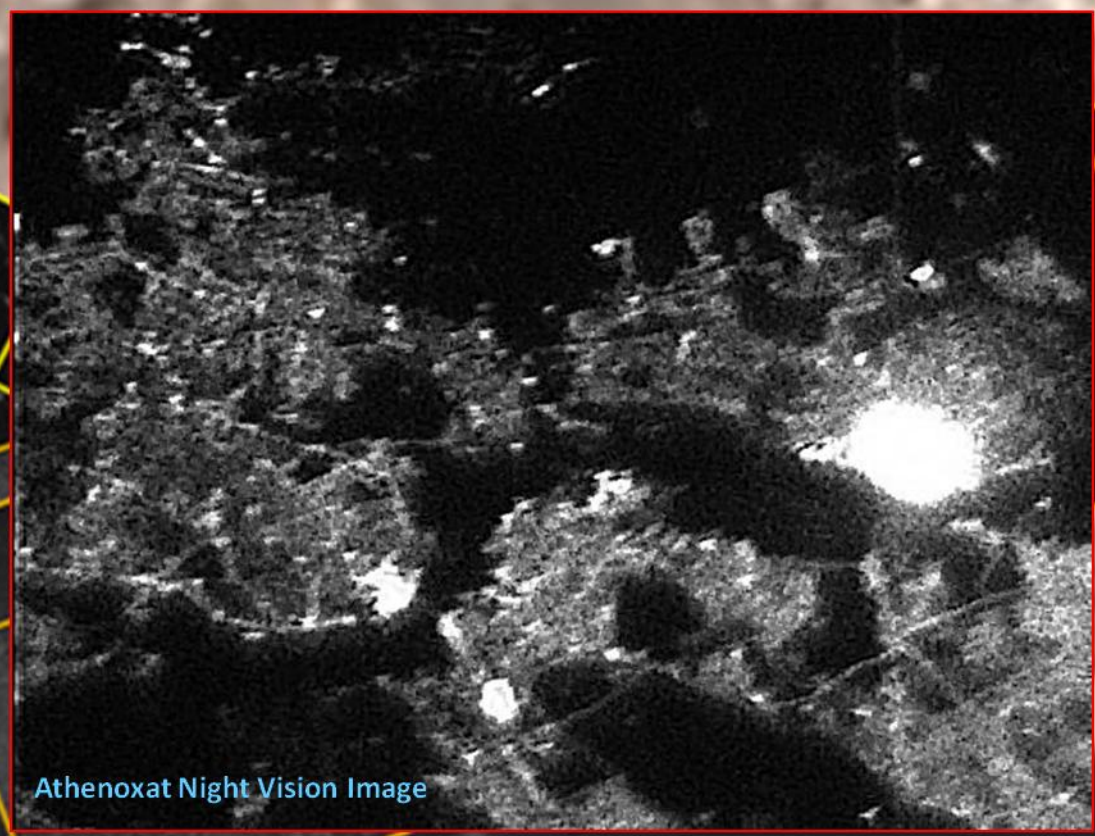
D=21km



Athenoxat Day/Night Images

Summary

Night Vision
GSD 25m
D=21km



Athenoxat Night Vision Image

Thanks !

ATHENOXAT-1
2015-12-28 07:14:28

